

# Procalcitonin as a Marker of the Systemic Inflammatory Response to Infection on Newborn and Children (up to 1 year)

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*In the last years, procalcitonin (PCT) has been proposed as an early marker of infections in newborns having registered different results. In this study, we aimed to investigate the value of serum procalcitonin for the diagnosis of sepsis in neonates and children procalcitonin in the diagnosis of neonatal sepsis and in children up to 1 year in the pathology of the respiratory system, gastrointestinal pathology, etc. At first, we established the clinical and paraclinical signs of systemic inflammation: increasing the temperature of the system, tachycardia, laboratory test: leukocytosis, C-reactive protein - for the diagnosis of sepsis. Some studies show that PCT gave a sensitivity between 83-100% and a specificity between 70-100% in early diagnosis of neonatal sepsis [1-7]; other researches question the accuracy of PCT in detecting neonatal sepsis. Procalcitonin (PCT) has been proposed as a marker of bacterial sepsis in critically ill patients. PCT is a precursor of calcitonin and a 116 amino acids protein. PCT levels more than 0.5 mg/dl are useful to determine the type of infectious process (bacterial or not).*

**Keywords:** PCT, procalcitonin, newborns, childrens

Biomarkers are becoming more and more important in the early diagnosis of infectious disease. The characteristics of an ideal biomarker include excellent sensitivity and negative predictive value as well as excellent specificity and positive predictive value [8-9].

Biomarker levels that are found modified at the disease onset and afterwards could provide physicians the opportunity to correlate the results of the biomarker analyses in order to optimize clinical management, monitor disease progression, and guide anti-infective treatment [10-13].

Numerous studies and research in the field trying to elucidate the immune system of the newborn. In the past decade, more and more studies have been focused on this immune complex identifying and using various biomarkers having great potential for early diagnosis of sepsis and the pathology associated with pregnancy [14-19].

The level of procalcitonin reflects the degree of systemic inflammatory response [20-24].

Bacterial endotoxins have a crucial role in the process of inducing this protein; Procalcitonin levels closely correlate with the severity and spread of the infection.

Other factors that influence the level of procalcitonin are: the type and size of the infected organ, the bacterial species, the degree of inflammation and the immune reactivity of the body. PCT becomes measurable within 2-4 hours of the trigger event, reaching maximum levels after 12-24 hours [25-30].

With the increase in the incidence of obesity worldwide, DZ prevalence predisposes some women to gestational diabetes. The association between DZ and pregnancy can seriously affect the health of the mother and the future fetus (congenital malformations). Although maternal death is unusual, it may occur in association with other pathologies associated with pregnancy (preeclampsia, renal disease, ketoacidosis, HTAIS) [31-38].

## Experimental part

### Material and method

Our sample contains 134 subjects (67 newborns and 67 children). We considered the main diagnosis and the results of the PCT intervals. Diagnosis at admission was divided into three categories: abdominal pathology, respiratory and other pathologies. The PCT intervals have

been considered from the literature of speciality. The data was processed using SPSS v17 statistical package and Microsoft Excel software. The nominal data were compared with Chi-Square Test and the associations between these categorical series were achieved also with Chi2 Test.

The Odds Ratio (OR) and the confidence interval for OR were calculated by risk analysis. For  $OR > 1$  and if the confidence interval for OR does not contain 1, the risk factor is considered to exist. For  $p < 0.05$  were considered statistical significance.

## Results and discussions

Between the PCT reference intervals and the associated pathology, a significant association was determined (Chi-square Test,  $p < 0.001$ ) (table 1).

By comparing the percentages for each PCT reference interval between abdominal and respiratory pathology (Chi-square Test) we obtained statistical differences as follows:

- for normal PCT values, the abdominal percentage was significant greater than the respiratory percentage, which

is equivalent to the fact that the percentage of children with pathological PCT values is significantly increased in the case of respiratory pathology compared to the abdominal ( $p = 0.029$ ).

- for  $[0.5, 2)$  ng/mL reference values were found insignificant differences ( $p = 0.891$ )

- for  $(2, 10)$  ng/mL reference values were found insignificant differences ( $p = 0.387$ )

- for PCT values greater then 10, the abdominal percentage was insignificant lower than the respiratory percentage ( $p = 0.173$ ) (fig.2).

Respiratory pathology is a risk factor for increasing PCT values (Odds Ratio = 6.09 with the confidence interval  $[1.27; 29.29]$  and with a 87% specificity) (table 2).

No significant differences were found between the proportions of newborns and children by PCT reference intervals groups (Chi-square Test.  $p = 0.194$ ).

We plotted the comparison between children and newborns for the PCT values (fig. 3).

Table 1

Pathology	PCT reference interval				Total cases
	< 0.5 ng/mL	[0.5. 2) ng/mL	[2. 10) ng/mL	≥ 10 ng/mL	
Abdominal	13	1	0	1	15
	86.67%	6.67%	0.00%	6.67%	100.0%
Others	19	13	12	13	57
	33.33%	22.81%	21.05%	22.81%	100.0%
Respiratory	32	6	7	17	62
	51.61%	9.68%	11.29%	27.42%	100.0%

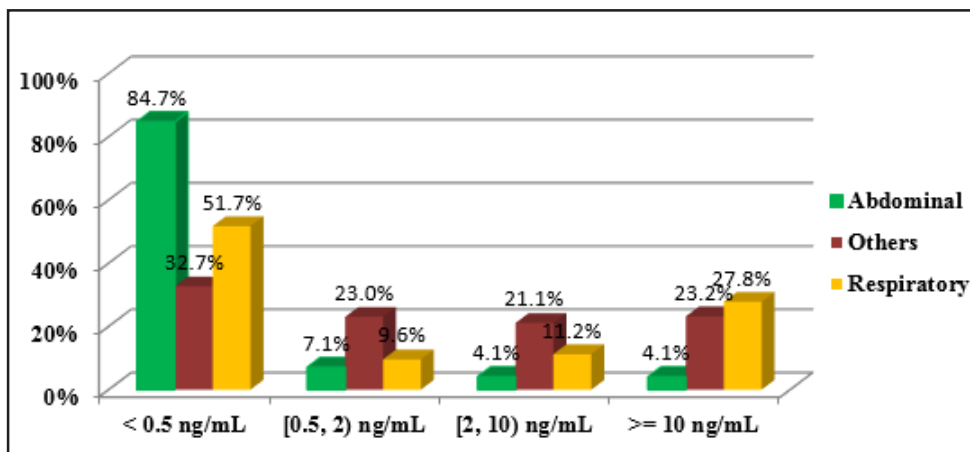


Fig. 1. Percentage distribution of cases by pathology and PCT reference range

Table 2  
COMPARISON BETWEEN CHILDREN AND NEWBORNS.

Case	< 0.5 ng/mL	[0.5. 2) ng/mL	[2. 10) ng/mL	≥ 10 ng/mL	Total
newborns	34	13	9	11	67
	50.7%	19.4%	13.4%	16.4%	100.0%
children	30	7	10	20	67
	44.8%	10.4%	14.9%	29.9%	100.0%

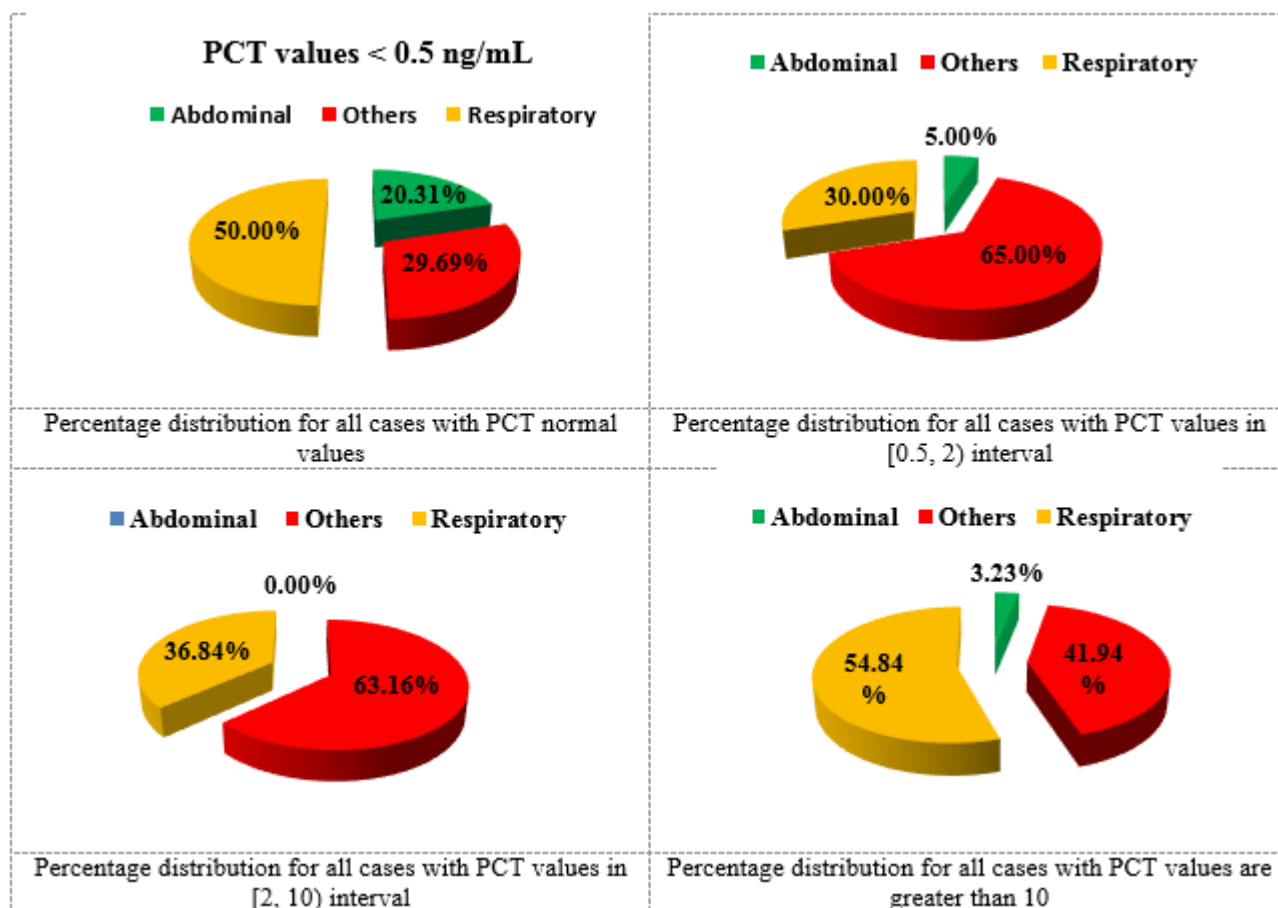


Fig. 2. We plotted the percentage distribution for the PCT values

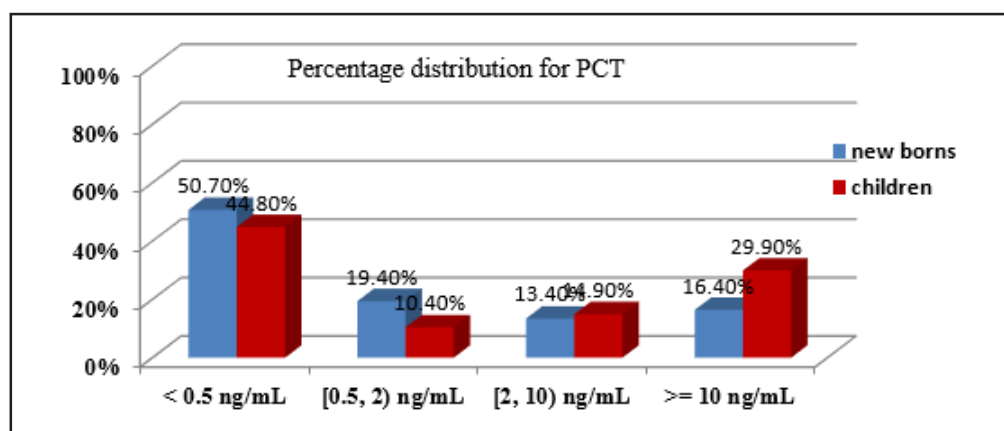


Fig. 3. The comparison between children and newborns for the PCT values

## Conclusions

Regarding the newborn, the immune function is dependent on the gestational age at which birth has been occurred, resulting in increased susceptibility to infection leading to an increased risk of morbidity and mortality due to sepsis.

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