

## Use of procalcitonin and C-reactive protein as predictors and diagnostic tool of acute appendicitis

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### ABSTRACT

The aim of the study was to evaluate the role of PCT and CRP in patients with acute appendicitis. The study was conducted in Kirkuk city for the period from January, 2018 to April, 2018 on 50 patients with acute appendicitis with age group 15-54 years. Based on the clinical signs of patients, diagnostic tests and sonar rays, the number of patients with acute appendicitis was assigned to the present study. The study also included 40 healthy persons as control group. The study included the collection of 3 ml of venous blood for identification and measurement of PCT by using ELISA technique and CRP test by using Commercial manual kits. The study also included taking of full information from cases like living situation, age. The study indicated that the maximum mean of PCT was observed in patients with acute appendicitis as compared with healthy persons ( $17.31 \pm 0.51$  versus  $6.22 \pm 0.34$  ng/ml) with highly significant difference between the two groups. The maximum rate of CRP +ve was observed in patients with acute appendicitis as compared with healthy persons (84% versus 10% ng/ml) with highly significant difference between the two groups. The study found that means of WBCs count and neutrophils count were significantly higher in patients with acute appendicitis as compared with healthy persons. The study showed that there was positive correlation of PCT and CRP with each of WBCs and neutrophil counts and a strong positive correlation of PCT with CRP in patients with acute appendicitis. The highest rate of patients with acute appendicitis (40%) was in the age group 15-24 years followed by the age group 25-34 years while the lowest rate was in the age group 45-54 years. It was concluded that PCT and CRP considered as an important non-invasive diagnostic tool of acute bacterial appendicitis

Key words: PCT; CRP; Diagnostic tool; Appendicitis.

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## استخدام البروكالسيتونين والبروتين التفاعلي C كعامل للتنبؤ وأداة تشخيصية للتهاب الزائدة الدودية الحاد

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### المخلص

كان الهدف من الدراسة هو تقييم دور البروكالسيتونين والبروتين التفاعلي C في المرضى الذين يعانون من التهاب الزائدة الدودية الحاد. أجريت الدراسة في مدينة كركوك للفترة من يناير 2018 إلى أبريل 2018 على 50 مريضا مصابا بالتهاب الزائدة الدودية الحاد من الفئة العمرية 15-54 سنة. وتم تشخيص الحالات بناءً على العلامات السريرية للمرضى والاختبارات التشخيصية وأشعة السونار ومن ثم تعيين عدد المرضى الذين يعانون من التهاب الزائدة الدودية الحاد في هذه الدراسة. وشملت الدراسة أيضا 40 شخصا صحيحا كمجموعة السيطرة. شملت الدراسة جمع 3 مل من الدم الوريدي لتحديد وقياس البروكالسيتونين باستخدام تقنية ELISA واختبار البروتين التفاعلي C. وشملت الدراسة أيضا أخذ معلومات كاملة من حالات مثل الوضع المعيشي، والعمر. أشارت الدراسة إلى أن أعلى معدلات البروكالسيتونين لوحظت في المرضى الذين يعانون من التهاب الزائدة الدودية الحاد مقارنة مع الأشخاص الأصحاء ( $0.51 \pm 17.31$  مقابل  $6.22 \pm 0.34$  نانوغرام / مل) مع وجود فرق كبير للغاية بين المجموعتين. وقد لوحظ أن الحد الأقصى لمعدل CRP + ve في المرضى الذين يعانون من التهاب الزائدة الدودية الحاد بالمقارنة مع الأشخاص الأصحاء (84% مقابل 10% نانوغرام / مل) مع اختلاف كبير للغاية بين المجموعتين. ووجدت الدراسة أن معدل تعداد كريات الدم البيضاء وعدد الخلايا العدلات كانت أعلى بكثير في المرضى الذين يعانون من التهاب الزائدة الدودية الحاد بالمقارنة مع الأشخاص الأصحاء. وأظهرت الدراسة أن هناك علاقة إيجابية للبروكالسيتونين و CRP مع كل من WBCs وتعداد الخلايا العدلة وعلاقة إيجابية قوية من البروكالسيتونين مع CRP في المرضى الذين يعانون من التهاب الزائدة الدودية الحاد. كان أعلى معدل للمرضى الذين يعانون من التهاب الزائدة الدودية الحاد (40%) في الفئة العمرية 15-24 سنة تليها الفئة العمرية 25-34 سنة في حين أن أدنى معدل كان في الفئة العمرية 45-54 سنة. يستنتج من الدراسة أن البروكالسيتونين و البروتين التفاعلي C يعتبران من أهم عوامل التنبؤ والتشخيص للتهاب الزائدة الدودية الحاد

الكلمات الدالة البروكالسيتونين ؛ البروتين التفاعلي C ; أدوات التشخيص. التهاب الزائدة الدودية.

## 1. Introduction

Appendectomy for acute appendicitis is the most normally performed crisis activity on the planet. A ruptured appendix is an illness of the youthful with 40% of cases happening in patients between the ages of 10 and 29 years[1]. Perioperative wide range anti-infection agents are normally utilized, permitting freedom of vigorous and anaerobic microbes. While anti-microbials are observationally focused at the standard stomach related greenery, there is poor agreement on the length of anti-toxin treatment, and most foundations have embraced their very own guidelines[2]. All things considered, suitable shortening of the treatment term might be a vital viewpoint restricting anti-toxin obstruction, costs, span of medical clinic remain, and improving patient's results [3]. The utilization of biomarkers to survey the treatment adequacy on diseases is normally known, however a particular parameter to screen the term of anti-infection agents has been deficient. Procalcitonin (PCT) has been appeared to increment during extreme contamination and endotoxaemia [4]. PCT might be a valuable apparatus in the early analysis of postoperative sepsis. Early analysis could permit early objective coordinated treatment which has been appeared to diminish mortality in extreme sepsis[5]. CRP is an intense stage reactant, and CRP level estimations are as often as possible used to help in the finding of bacterial diseases. CRP is blended by the liver, for the most part in light of IL-6, which is created during contamination as well as in numerous kinds of irritation [6]. It ties to polysaccharides in pathogens, enacting the traditional supplement pathway. The announced indicative exactness of PCT and CRP for the analysis of bacterial contaminations has differed crosswise over studies[7]. The aim of the study was to assess the role of PCT and CRP in patients with acute appendicitis.

## 2. Material and methods

The study was conducted in Kirkuk city for the period from January, 2018 to April, 2018 on 50 patients with acute appendicitis with age group 15-54 years. Based on the clinical signs of patients, diagnostic tests and sonar rays, the number of patients with acute appendicitis was assigned to the present study. The study also included 40 healthy persons as control group. The study included the collection of 3 ml of venous blood for identification and measurement of PCT by using ELISA technique (KomaBiotech, Co, USA) and CRP test by using Commercial manual kits. The study also included taking of full information from cases like living situation, age

### Statistical test.2.1

The study and analysis of the results was carried out using SPSS version 22.1, which included the extraction of the P. value, which indicates the level of the difference between all the subjects in the study.  $P < 0.01$  considered significant.

### 3. Results and Calculations

Table 1 shows that the maximum mean of PCT was observed in patients with acute appendicitis as compared with healthy persons ( $17.31 \pm 0.51$  versus  $6.22 \pm 0.34$  ng/ml) with highly significant difference between the two groups.

**Table 1:** Relation of PCT with appendicitis .

PCT (ng/ml)	Patients with acute appendicitis	Control group	P. value
No.	50	40	0.001
Mean	17.31	6.22	
SD.	0.51	0.34	

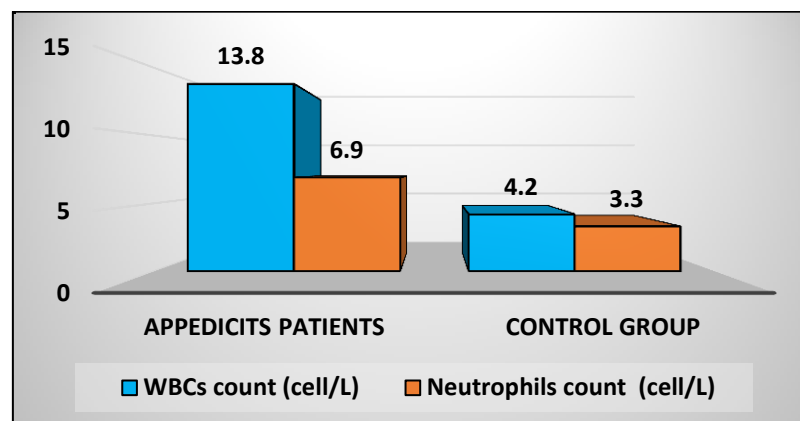
Table 2 shows that the maximum rate of CRP +ve was observed in patients with acute appendicitis as compared with healthy persons (84% versus 10% ng/ml) with highly significant difference between the two groups.

**Table 2:** Relation of CRP with appendicitis.

CRP (> 6 mg/dl)	Patients with acute appendicitis		Control group		P. value
	No.	%	No.	%	
Positive	42	84	4	10	0.001

Negative	8	16	36	90	
Total	50	100	40	100	

**Fig.1** shows that means of WBCs count and neutrophils count were significantly higher in patients with acute appendicitis as compared with healthy persons



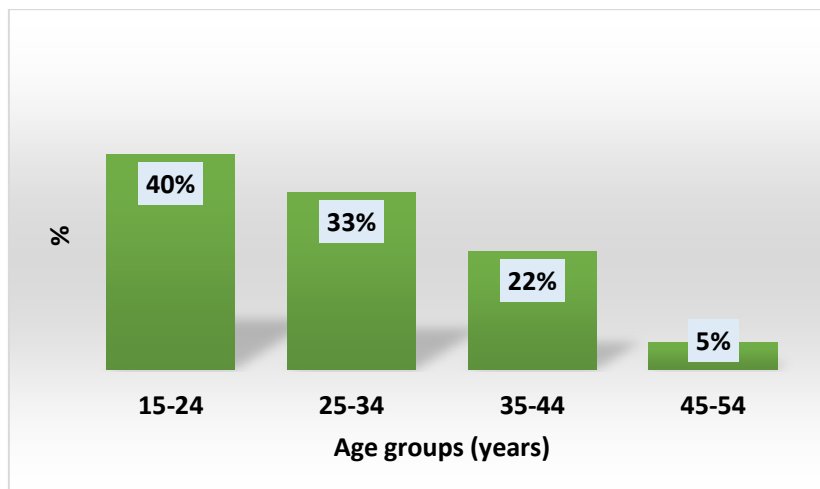
**Fig. 1:** Means of WBCs count and neutrophils count in the studied group

The study showed that there was positive correlation of PCT and CRP with each of WBCs and neutrophil counts and a strong positive correlation of PCT with CRP in patients with acute appendicitis **Table 3**.

**Table 2:** Correlation of PCT and CRP with WBCs and neutrophil counts appendicitis.

Parameter	Parameter	r. value	Parameter	Parameter	r. value
PCT	CRP	0.78	CRP	WBCs count	0.31
PCT	WBCs count	0.38	CRP	Neutrophils count	0.33
PCT	Neutrophils count	0.44	CRP		

**Fig. 2** shows that the highest rate of patients with acute appendicitis (40%) was in the age group 15-24 years followed by the age group 25-34 years while the lowest rate was in the age group 45-54 years.



**Fig. 2:** Distribution of patients with acute appendicitis according to their age

#### 4. Conclusion

It was concluded that PCT and CRP considered as in important non-invasive diagnostic tool of acute bacterial appendicitis

#### 5. Discussion:

Many studies have shown that patients undergoing surgery, including appendectomy, are the most frequently exposed to bacterial infections that have exacerbated the condition and subsequently surgeries [1]. There are also ongoing efforts to use chemical and protein indicators to diagnose inflammation of the glands and membranes in various organs of the body and for the early diagnosis of these diseases as well as the serious endeavor to avoid and surgeries [5,8]. Numerous studies have shown that PCT level was high in the ideology of bacterial origin, especially in infected people as in our study patients [9-11]. It was in sync with elevated leukocytes and neutrophils in those patients compared with normal subjects [12-14]. Other studies conducted in different regions in the media have shown that PCT, CRP, or both can be used for freedom from bacterial pathogens and that there is a positive significant correlation between the increase in their level in patients with appendicitis [4,9]. Kaya *et al* [15] demonstrated in similar work that PCT accompanied by total WBC count were good predictor for diagnosis of acute appendicitis and they also found that people below 30 years

were more frequently associated with appendicitis than above 30 years old. Additionally Yu et al [16] in meta-analysis study used procalcitonin, C-reactive protein and white blood cell count for suspected acute appendicitis and found positive correlation for mentioned parameters in patients and recommended for using in diagnosis of the disease.

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