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ORIGINAL RESEARCH

To evaluate the level of CRP in the serum as a potential biomarker of the disease activity in pulmonary TB

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ABSTRACT
Aim: The purpose of this study is to evaluate the level of CRP in the serum as a potential biomarker of the disease activity in pulmonary TB.
Materials & Methods: In this particular research, there were a total of fifty cases of pulmonary TB, split evenly between males and females. After receiving their signed agreement, everyone was enrolled in the study. Cases that had extrapulmonary TB or secondary tuberculosis were not included in the study because they did not meet the exclusion criteria. Information such as age, gender, and other demographics was recorded. 2 ml blood was withdrawn from the patient and was sent was quantitative analysis to assess the CRP level.
Results: There were 52% newly detected cases of pulmonary TB, 22% undergoing anti-tubercular treatment, 14% cured cases, 8% treatment defaulters and 4% treatment resistant. The difference was significant ($P< 0.05$). The mean CRP level (mg/dl) in the newly detected TB patients was found to be 53.55±6.11. Those undergoing anti-tubercular treatment had a mean CRP value of 43.69±4.85. CRP in patients who had completed their treatment was 4.63±1.33. Defaulters had a mean CRP of 66.74±5.28 and the treatment resistant had a mean CRP of 86.11±4.98. The difference was significant ($P< 0.05$).
Conclusion: The authors discovered that CRP levels were elevated in TB, but that these levels dropped and returned to normal by the time therapy was complete.
Keywords: Biomarkers, CRP, Pulmonary TB.

Introduction

The number of people who were diagnosed with tuberculosis in 2013 alone exceeded 9 million. People who are at a higher risk of developing a disease, such as those who are living with HIV (PLHIV), bear a disproportionately heavier disease burden. The World Health Organization (WHO) now advocates routine screening of high-risk populations; however, there is not yet a screening method that is both accurate and straightforward [1]. This is a fundamental hurdle. A good screening test would be able to rule out tuberculosis in the majority of patients who did not have the disease (sensitivity of at least 90 percent) and would limit referrals for additional, more expensive testing to patients who had a high likelihood of having TB (specificity of at least 70 percent). It has been determined to be one of the highest priority demands for tuberculosis diagnostics to develop a test that not only has these features, but is also economical and can be carried out by front-line health professionals.

The moderately high specificity requirement restricts referrals for more expensive confirmatory testing, such as Xpertw MTB/RIF and/or culture, to patients who have a high likelihood of having

tuberculosis. The high sensitivity requirement reduces the proportion of TB patients who are missed by screening. It has been determined that one of the highest priority demands for TB diagnostics is the development of a test that not only has these qualities, but also has a cheap cost and is capable of being carried out by frontline health workers.

C-reactive protein (CRP) is an acute-phase reactant whose levels increase in response to interleukin (IL) 6- mediated pyogenic illnesses such as active TB[4].

Prior research has shown, on a continuous basis, that CRP has a high sensitivity for tuberculosis and that increases in CRP levels linked with tuberculosis are independent of HIV status. In addition, CRP levels may be determined from capillary blood by employing a point-of-care (POC) test that is very inexpensive [5]. This research was carried out to evaluate the blood level of CRP as an indication of disease activity in pulmonary TB. The findings of this investigation are presented below.

Materials & Methods

In this particular research, there were a total of fifty cases of pulmonary TB, split evenly between males and females. After receiving their signed agreement, everyone was enrolled in the study. Cases that had extra pulmonary TB or secondary tuberculosis were not included in the study because they did not meet the exclusion criteria. Information such as age, gender, and other demographics was recorded. 2 ml blood was withdrawn from the patient and was sent was quantitative analysis to assess the CRP level. Findings so collected were submitted to statistical analysis. A significance level of 0.05 or less was required for the P value.

Results

Table 1: Gender and age of patients

Gender	Number	Percentage
Male	35	70
Female	15	30
Age		
below 25	6	12
25-35	11	22
35-45	20	40
45-55	10	20
Above 55	3	6

Table 1 shows that out of 50 patients, males were 35 and females were 15 and most of the patients from 35-45 years(40%) followed by 25-35(22%), 45-55(20%),below 25(12%) and above 55(6%).

Table 2: Patients characteristics

Cases	Number	Percentage	P value
Newly detected cases	26	52	0.03
Undergoing anti-tubercular treatment	11	22	
Cured cases	7	14	
Treatment defaulters	4	8	
Treatment resistant	2	4	

Table 2, shows that there were 52% newly detected cases of pulmonary TB, 22% undergoing anti-tubercular treatment, 14% cured cases, 8% treatment defaulters and 4% treatment resistant. The difference was significant ($P< 0.05$).

Table 3: CRP level in different TB patients

Cases	Mean	P value
Newly detected cases	53.55±6.11	0.03
Undergoing anti-tubercular treatment	43.69±4.85	
Cured cases	4.63±1.33	
Treatment defaulters	66.74±5.28	
Treatment resistant	86.11±4.98	

Table 3 shows that mean CRP level (mg/dl) in the newly detected TB patients was found to be 53.55±6.11. Those undergoing anti-tubercular treatment had a mean CRP value of 43.69±4.85. CRP in patients who had completed their treatment was 4.63±1.33. Defaulters had a mean CRP of 66.74±5.28 and the treatment resistant had a mean CRP of 86.11±4.98. The difference was significant ($P< 0.05$).

Discussion

Current TB screening tools that are endorsed by the WHO are inadequate. These tools include symptom assessment (a cough that has lasted more than two weeks for people who do not have HIV or any of four symptoms that are suggestive of TB for people who are living with HIV) and chest radiography (CXR) [6]. A symptom-based approach to tuberculosis screening has poor specificity for active TB, particularly among key high-risk groups like people living with HIV (specificity range: 5–61%). This is because a symptom-based approach to TB screening requires a priori knowledge of the patient's HIV status in order to be sufficiently sensitive. [7] Although CXR is sufficiently sensitive and has a higher specificity, it requires expensive infrastructure and trained interpreters, both of which are frequently absent in lower-level health centres where the majority of patients with symptoms suggestive of TB first present for care [8]. CXR also has a higher specificity than other diagnostic methods, which is an advantage. There is an immediate and pressing need to locate a screening tool that is both accurate and applicable in order to ease the scaling up of the process of systematic screening of high-risk populations. As CRP is primarily used as a marker of inflammation and infection, measuring and charting CRP levels may be of assistance in identifying the progression of tuberculosis as well as the effectiveness of anti-tuberculous therapy [9]. Hence, the treatment regimen may be adjusted at the appropriate moment if the patient does not respond well to the medications, which not only leads to early recovery but also prevents the development of multidrug-resistant tuberculosis [10]. This research was carried out to evaluate the blood level of CRP as an indication of disease activity in pulmonary TB. The findings of this investigation are presented below. The current investigation included 50 patients, with men averaging 35 years old and girls averaging 15 years old. There were 52% newly discovered instances of pulmonary tuberculosis, 22% of patients receiving anti-tubercular medication, 14% of patients declared cured, 8% of patients who defaulted on their treatment, and 4% of patients who were resistant to treatment. The difference was substantial ($P<0.05$). In the research conducted by Pansey et al. [11], which involved 50 patients with tuberculosis, we analysed the data and found that 52% of the patients had newly detected cases of pulmonary TB, 18% were receiving anti-tubercular treatment, 10% of the patients had been cured, 16% of the patients defaulted on their treatment, and 4% of the patients were resistant to treatment. It was discovered that the individuals who had just been diagnosed with TB had a CRP level of 51.22±30.54. Individuals having anti-tubercular therapy had a mean CRP value of 43.29±28.94 and it declined as the course of treatment continued. The CRP levels of patients who had just begun therapy were 66.55±17.22, whereas the CRP levels of patients who had finished treatment were 23.87±6.05. The CRP levels of the patients who were very close to finishing the therapy ranged from 4.78 to 4.34 on average. Defaulters had a mean CRP of 66.90±22.66 and the treatment failure had a mean CRP of 87.37±5.83. We discovered that the newly diagnosed TB patients had a mean CRP level (mg/dl) of 53.55 with a standard deviation of 6.11. Individuals who were receiving treatment for tuberculosis had a mean value of 43.69± 4.85 for their CRP. CRP levels were 4.63±1.33 among individuals who had reached the end of their therapy. The treatment-resistant patients had a CRP that was on average 86.11±4.98 points higher than the defaulters, who had a CRP that was on average 66.74±5.28 points higher. It was determined that there was a significant difference ($P<0.05$). Yoon et al. [12] discovered nine separate studies that included a total of 1793 people across in-patient (five studies, 672) and out-patient (five studies, 1121 patients) settings. Seventy-two percent of the participants in these studies were diagnosed with HIV. CRP demonstrated a high sensitivity (93%,) 95% confidence interval [CI] 88–98) and a moderate specificity (60%,) 95% confidence interval [CI] 40–75) for active PTB among outpatients. Specificity was found to be at its lowest among in-patients (21%,) 95% confidence interval [CI]: 6–52), while it was found to be at its maximum among out-patients undertaking TB screening (range: 58–81%). There was no significant variation in the overall predictions based on HIV status. After doing their research, F. C. de Beer et al. [13] came to the conclusion that patients with post-primary TB who did not have considerable pulmonary damage saw a quick decline in their C-

reactive protein levels once the therapy was started. After one month of therapy, Bajaj G et al. [14] observed that the increased CRP levels decreased dramatically to 5.93 g/ml. After three to six months of treatment, the elevated CRP levels had returned to normal values. Higher CRP readings were seen among patients who had stopped the therapy in the middle of its course, treatment defaulters, and treatment-resistant patients. The treatment-resistant patients had a mean CRP that was 87.37±5.83, while the defaulters had a CRP that was 66.90±22.66.

Conclusion

The authors discovered that CRP levels were elevated in TB, but that these levels dropped and returned to normal by the time therapy was complete.

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