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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF C- REACTIVE PROTEIN LEVELS IN PREGNANT PATIENTS WITH AND WITHOUT PERIODONTITIS

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ABSTRACT

The present study was undertaken to assess plasma C-reactive protein levels in pregnant women with and without periodontal disease. The study was designed as a prospective cohort study involving a sample size of 45 pregnant subjects in the age of 20-40 were selected from RavindraNath Tagore Medical College and hospital with gestational age of 2-12 weeks divided into 3 groups : Control group (15 healthy non pregnant female without periodontitis; group A; study group – 15 pregnant females with periodontitis – group B) study group (15 pregnant patients without periodontitis) Group C. Periodontal disease activity was recorded at baseline for all groups using month mirror and UNC-15 periodontal probe and Russell's Index was recorded. Samples were taken for estimation of C-reactive protein levels from all groups at 2-12 weeks of gestation. CRP levels were determined using latex-agglutination-test. The results revealed a statistically significant increase in the levels of CRP in pregnant women with periodontitis. As the value of RPI increased, as increase in CRP levels also was observed. The conclusion that can be drawn from this study is "Periodontal disease in pregnant women is associated with increased CRP levels in early pregnancy. The present study provides ground work data regarding the correlation of plasma – CRP levels in pregnant women, with and without periodontal disease. Further longitudinal studies are still required to establish the exact association between elevated CRP levels in pregnancy with periodontal disease.

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INTRODUCTION

C-reactive protein is an acute phase reactant produced by liver in response to diverse inflammatory stimuli, including heat, trauma, infection and hypoxia. Circulating C-reactive protein levels are a marker of systemic inflammation and are associated with periodontal disease, a chronic bacterial infection associated with elevation of proinflammatory cytokines and prostaglandins. Elevated immunoglobulin G induced by bacterial species associated with destructive periodontal disease, is associated with increase in C-reactive protein. C-reactive protein is the best studied major acute phase protein in humans, was initially described in 1930 by Tillet and Francis Jr. as a serum factor responsible for the precipitation of acute phase sera with the C-substance (C-Polysaccaride, CPS) of pneumococcal cell wall. C-reactive protein is 120,000-140,000 molecular weight pentameric protein comprising five identical non-covalently bound subunits arranged symmetry on a single plane. C-reactivein cyclic protein level has served as index for assessing the severity of infection in the patient. C-reactive protein has an ability to initiate several biological proteins including precipitation, opsonization, capsular swelling and agglutination. To major biological properties of CRP include:

- Its ability to bind several biological substances that are distributed widely in nature.
- It has significant activation capabilities, in particular to activate complement system and to bind/modulate function of phagocytic leukocytes.

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C-reactive protein has been associated with adverse pregnancy outcomes including preterm delivery, preeclampsia and intrauterine growth restriction. Chronic infections like intrauterine infection and chorioamnionitis are linked to both preterm birth and elevated C-reactive proteins levels. Furthermore, periodontal disease has been associated with increased risk of preterm low birth weight, low birth weight and preterm birth. Therefore, C-reactive protein might be a plausible mediator of the association between periodontitis and adverse pregnancy outcomes. Elevated C-reactive protein could amplify the inflammatory response through complement activation, tissue damage and induction of inflammatory cytokines in the monocytes and therefore may mediate the relationship between periodontitis and adverse pregnancy outcomes. Alternatively, periodontal disease and C-reactive protein may share a common risk factor predisposing certain individuals to a hyper inflammatory response. Preterm birth is major medical, social and economic problem accounting for large proportion of maternal and especially, neonatal mortality and morbidity. Preterm infants are at elevated risk for death, neurodevelopment disabilities, cognitive impairment, and behavioural disorders. Recently, it has been suggested that periodontitis, an inflammatory disease caused primarily by gram negative bacteria that destroy tooth supporting connective tissue and bone, is associated with an increased risk of preterm as well as low birth weight and preeclampsia.

Preterm definition (WHO)

If periodontal infections are a cause of preterm birth, it might be expected that eradication of such infections would reduce the risk of preterm birth. Also, standard nonsurgical periodontal therapy can result in a decrease in serum C-reactive protein levels. Since periodontal infection is considered to be one of the risk factors for preterm delivery.

Aims and objectives

The present study was conducted with following aims and objectives:

To assess plasma C-reactive protein levels in pregnant women with and without periodontal disease.
Comparison of C-reactive protein levels with RPI values in pregnant & non-pregnant patients.

MATERIALS AND METHODS

This study was designed as a comparative study involving a sample size of 45 women – 30 pregnant and 15 non pregnant women divided into 3 equal groups of 15 each.

Group A – Control Group
15 Healthy non-pregnant females without periodontitis.

Group B – Study Group
15 pregnant females with periodontitis

Group C – Study Group
15 pregnant patients without periodontitis
Informed consent was taken.
Maternal demographic and medical data was collected by:

- Medical history
- Dental history
- Obstetric History
- Periodontal Status – Russell's Periodontal Index

Blood Samples was taken from all patients at 2-12 weeks of gestation period and was sent to Anil Diagnostic Lab for C-reactive protein analysis.

Estimaton of CRP

Using latex agglutination test

Inclusion Criteria

- Age group subjects 20-40 years
- Subjects in good health without systemic disease.
- Subjects with gestation age between 2-12 weeks
- Patients with first pregnancy.

Exclusion Criteria

- Subjects with systemic disease
- Subjects with multiple pregnancies
- Subjects with diabetes prior to pregnancy.
- Patients with smoking, alcohol intake drug-abuse habits etc.

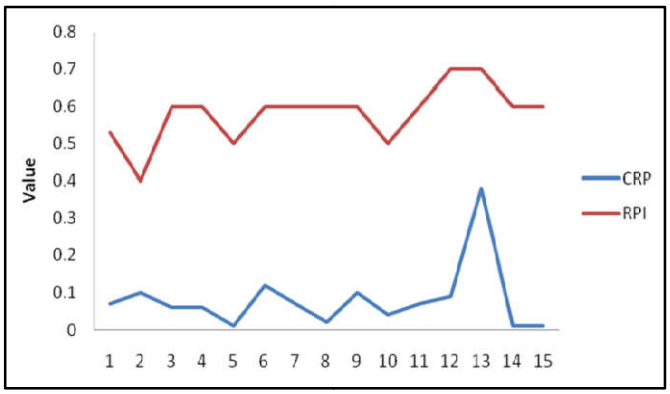

Fig. 1. Relationship between CRP and RPI in group A

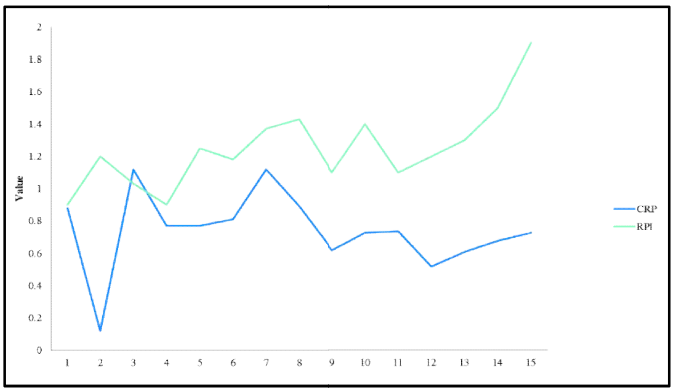

Fig. 2. Relationship between CRP and RPI in group B

RESULTS

A total of 45 women with a gestational age between 2-12 weeks were recruited for the study. Out of those 45 patients, 15 women were non-pregnant (healthy, group A), 15 were pregnant with periodontitis (Group B) and the remaining 15 were pregnant without periodontitis (Group C). Two

parameters, viz Russell's Periodontal Index (RPI) and C-reactive protein (CRP) were taken for comparative evaluation of these patients. The mean and standard deviation of RPI and CRP levels were assessed. The intergroup comparison of RPI values and CRP values were assessed using ANOVA.

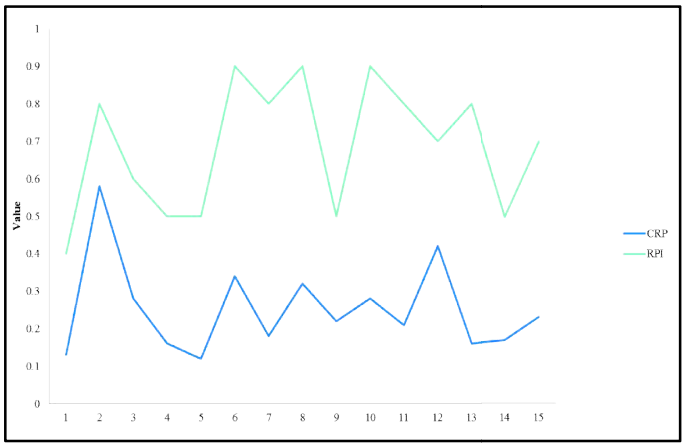

Fig. 3. Relationship between CRP and RPI in group C

Russell's Periodontal Index (RPI)

The RPI was calculated for every patient in all the 3 groups. The results are shown in table 1.

Table 1. RPI Values of patients in the 3 Groups

Treatment	Group A	Group B	Group C
1	0.53	0.40	0.90
2	0.40	0.80	1.20
3	0.60	0.60	1.03
4	0.60	0.50	0.90
5	0.50	0.50	1.25
6	0.60	0.90	1.18
7	0.60	0.80	1.37
8	0.60	0.90	1.43
9	0.60	0.50	1.10
10	0.50	0.70	1.40
11	0.70	0.80	1.10
12	0.70	0.70	1.20
13	0.70	0.80	1.30
14	0.60	0.50	1.50
15	0.60	0.70	1.90

The mean RPI was calculated for all the 3 groups which was 0.58 for group A, 1.25 for Group B and 0.67 for Group C (Table 2). The sum total of RPI was calculated for all the 3 groups (Table 2A) From the above date, we can deduce that the mean RPI was greatest in group B patients i.e. pregnant patients with periodontitis.

Table 2. Mean – RPI in all 3 Groups

Group A	Group B	Group C
0.58	1.25	0.67

The mean and standard deviation (S.D.) values for group B patients are comparatively higher than that in Group C and A respectively; as seen in table 3.

Table 3. Sum – Total of RPI in all 3 Groups

Group A	Group B	Group C
8.73	18.76	10.10

Table 4. CRP Values of patients in the 3 groups

Treatment	Group A	Group B	Group C
1	0.070	0.88	0.13
2	0.100	1.12	0.58
3	0.060	1.12	0.28
4	0.060	0.77	0.16
5	0.010	0.77	0.12
6	0.120	0.81	0.34
7	0.070	1.12	0.18
8	0.020	0.89	0.32
9	0.100	0.62	0.22
10	0.040	0.73	0.28
11	0.070	0.74	0.21
12	0.090	0.52	0.42
13	0.380	0.61	0.16
14	0.010	0.17	0.68
15	0.010	0.23	0.73

Table 7. Intergroup Comparison of RPI between the 3 Groups

RPI	A/B	A/C	B/C
T Value	-9.76	-2.15	7.11
P Value	<0.001	<0.05	<0.001

Table 8. Intergroup Comparison of CRP between the 3 Groups

RPI	A/B	A/C	B/C
T Value	-9.98	-4.39	6.99
P Value	<0.001	<0.001	<0.001

C - reactive protein levels

The C-RP values was calculated for all patients in the 3 groups and is tabulated in table 4. The mean CRP levels for group A was 0.08, Group B–0.74 and Group C–0.25 (Table5). The sum total of CRP was calculated in all the 3 groups shown in table 5(A). The above data indicates the highest values of CRP was observed in Group B patients. Group B are comparatively higher than group C and A respectively as shown in Table 6. One way analysis of variance (ANOVA) was used for comparison of CRP and RPI between the 3 groups. Intergroup comparison of RPI values between the 3 groups shows satisfactorily significant difference ($P < 0.05$) between A and C and highly statistically – significant ($P < 0.001$), results between groups A and B and Group B and C. (Table 7). Intergroup comparison of CRP values shows that the CRP levels are highly statistically significant ($P < 0.001$), among the 3 groups i.e. between group A and B, Groups A and C and Group B and C as shown in Table 8.

DISCUSSION

In this study an attempt was made to evaluate the CRP levels in pregnant women and compare them with CRP levels in non pregnant patients with and without periodontitis and CRP was determined using latex agglutination test with a detection limit of 0.015 mg/dl. The result of this study demonstrated that elevated CRP levels are in pregnant women with periodontitis compared to non-pregnant women without periodontitis. Significantly elevated CRP levels were found in subjects with periodontitis. The results of this study are consistent with outcomes of recent studies reporting on elevation of CRP levels in periodontitis patients. The reasons proposed for this increase in CRP levels in periodontitis patients in that the periodontal pathogens. There are very few studies to evaluate the association between periodontal disease, CRP levels and preterm – low birth weight infants and pregnancy. Periodontal

pathogens do not induce only local inflammation and tissue destruction, they are involved in systemic increase in inflammatory and immune response. Low levels of bacterimia, LPS and other bacterial components may provide a stimulus for systemic – inflammatory responses such as increased CRP production due to the activation of the cascade of inflammatory cytokines production by monocytes and other cells in periodontal tissues 'Chronic – infections which are known to cause a rise in circulating CRP levels also lead to a higher risk for cardiovascular disease. Periodontal disease being a chronic infection, shares pathogenic – mechanism of cardiovascular diseases with the release of some inflammatory mediators like PGE, IL-1, IL-6 and TNF-α. These mediators can also initiate a systemic acute phase response. In this study, the association observed between CRP and periodontitis in pregnancy may or may not be casual. Periodontitis may increase CRP levels in pregnancy. CRP could amplify the inflammatory cytokines in monocytes and therefore may mediate the association between periodontitis and adverse pregnancy outcomes. However; since there are very few studies which have studied the relationship of periodontitis on CRP levels in pregnant women, further long term longitudinal studies have to be undertaken to study the relationship throughout the entire gestational period using were periodontal parameters.

Summary and Conclusion

The present study was undertaken to assess plasma C-reactive protein levels in pregnant women with and without periodontal disease. The study was designed as a prospective cohort study involving a sample size of 45 pregnant subjects in the age of 20-40 were selected from Ravindra Nath Tagore Medical College and hospital with gestational age of 2-12 weeks divided into 3 groups : Control group (15 healthy non pregnant female without periodontitis; group A; study group – 15 pregnant females with periodontitis – group B) study group (15 pregnant patients without periodontitis) Group C. Periodontal disease activity was recorded at baseline for all groups using month mirror and UNC-15 periodontal probe and Russell's Index The present study was undertaken to assess plasma C-reactive protein levels in pregnant women with and without periodontal disease. The study was designed as a prospective cohort study involving a sample size of 45 pregnant subjects in the age of 20-40 were selected from RavindraNath Tagore Medical College and hospital with gestational age of 2-12 weeks divided into 3 groups : Control group (15 healthy non pregnant female without periodontitis; group A; study group – 15 pregnant females with periodontitis – group B) study group (15 pregnant patients without periodontitis) Group C. Periodontal disease activity was recorded at baseline for all groups using month mirror and UNC-15 periodontal probe and Russell's Index CRP levels in pregnant women, with and without periodontal disease. Further longitudinal studies are still required to establish the exact association between elevated CRP levels in pregnancy with periodontal disease.

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