THE RELATION OF C-REACTIVE PROTEIN, ERYTHROCYTE SEDIMENTATION RATE AND BODY MASS INDEX WITH DIABETIC RETINOPATHY IN PATIENTS ENROLLED FROM A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: To study the relation of C-Reactive Protein (CRP), Erythrocyte Sedimentation Rate (ESR) and Body Mass Index (BMI) with diabetic retinopathy in patients enrolled from a tertiary care hospital.

Study Design: Cross sectional comparative study.

Place and Duration of Study: Centre for Research in Experimental and Applied Medicine (CREAM-1) at Department of Biochemistry and Molecular Biology, Army Medical College, Rawalpindi in collaboration with Armed Forces Institute of Ophthalmology (AFIO), Rawalpindi over a period of 6 months from Jan 2016 to Jun 2016.

Material and Methods: There were 90 patients of diabetic retinopathy enrolled from AFIO. Their ages were in range 40-70 years. Their levels of ESR, CRP and BMI were assessed. These were then compared with 90 normal healthy controls from general population. Independent student's t-test was applied for scale variables and Chi square test was applied for nominal variables.

Results: Patients and controls were age and gender matched. Their mean ages were 60 ± 8.9 years in patients and 59 ± 13.02 years in controls. In 90 patients enrolled 51 (56.7%) were males and 39 (43.3) were females. And in 90 controls considered 49 (54.4%) were males and 41 (45.6%) were females. Both scale variables gave following results ESR= 27.9 ± 6.96 in patients and 16.02 ± 7.6 in controls with a *p*-value of <0.001 and BMI = 28.9 ± 2.94 in patients and 26.02 ± 4.16 in controls with a *p*-value of <0.001. CRP being a nominal variable gave *p*-value <0.001. Diabetic retinopathy gave a significant positive association with all the three variables under study.

Conclusion: There is a direct relationship of ESR and CRP with retinopathy signifying that inflammatory processes may be one of the underlying biochemical mechanisms in development of retinopathy. Moreover a direct relationship also exists between BMI and retinopathy indicating the contribution of weight gain in development of retinopathy.

Keywords: Body mass index, C-reactive protein, Diabetic complications, Erythrocyte sedimentation rate.

INTRODUCTION

Diabetes mellitus is a serious endocrine disorder of South Asia with special concern to urban areas of Pakistan[1]. Persistent hyperglycemia leads to production of glycated end products that ultimately end up in various microvascular pathologies of this disease. Multiple pathways involved in this respect are polyol pathway, protein kinase C activation, oxidative stress and AGEs formation[2].

Among the total patients of diabetes mellitus one third develop retinopathy as a complication[3]. Blindness is the ultimate result of poorly managed retinopathy in adults[4]. Tendency of blindness is about 25 times more in patients of diabetic retinopathy as compared to normal healthy individuals[5]. According to a study patients of diabetic retinopathy are expected to rise from 126.6 million in year 2011 to 191 million by the year 2030[6].

Inflammation is currently being investigated as a major contributing factor in development of diabetic complications[7]. Along with this, endothelial dysfunction is also been suspected as one of the contributing factor in this context[8].

In retinopathy dysfunctional retinal endothelium plays a critical role. Some other

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contributing factors in this regard include reduced bioavailability of NO, hyperglycemia, insulin resistance, hyperlipidemias, systemic inflammation and weight changes in diabetic patients[5].

C-Reactive Protein (CRP) a common inflammatory marker has been found to have a strong relation with diabetic retinopathy[9]. Patients with elevated CRP plasma levels are 2.6 times more likely to develop proliferative diabetic retinopathy (PDR) than those having low plasma CRP levels[10]. ESR being a nonspecific inflammatory marker has been found to be raised in multiple pathologic conditions including microvascular complications of diabetes[11]. Body Mass Index (BMI) is calculated by dividing weight in kg by height in square meter. According to WHO the criteria of BMI is underweight = <18.5kg/m^2, normal = 18.5-24.9 Kg/m^2, overweight 25-29.9 kg/m^2 and obese = >30kg/m^2. Inverse association has been reported between BMI and diabetic retinopathy[12].

The significance of this study is that it will focus on inflammation as an underlying mechanism in development of microvascular complications of diabetes mellitus. Moreover it will also focus on significance of weight gain in context of BMI in development of retinopathy in diabetic patients.

MATERIAL AND METHODS

This study was a cross sectional comparative study. It was conducted at Department of Biochemistry and Molecular Biology, Army Medical College, Rawalpindi. Formal approval was also taken from ethical review committee, Army medical College. Patients for this were enrolled from AFIO after permission from commandant AFIO. The time tenure of the study was 6 months (January 2016 to June 2016). Non probability purposive sampling was done for this purpose. Sample size was calculated by WHO sample size calculator.

A total of 90 patients of diabetic retinopathy were enrolled from AFIO. Their written informed consent was taken. ESR and CRP were assessed. ESR was measured using Westergren method and CRP was assessed by CRP latex test kit (Cat No. CRP/012) following standard protocol of the kit. Their weights and heights were measured and BMI was calculated. ESR less than 20 was considered to be normal. BMI was assessed on basis of World Health Organization criteria. CRP test were considered as positive and negative.

Table-I: Comparison of ESR and BMI levels between cases and controls.

Variables	Cases n=90 (mean ± S.D)	Controls n=90 (mean ± S.D)	*p*-value
ESR	27.9 ± 6.96	16.02 ± 7.6	<0.001
BMI	28.9 ± 2.94	26.02 ± 4.16	<0.001

Table-II: Comparison of qualitative CRP among cases and controls.

CRP	Controls n=90 n(%)	Cases n=90 n(%)	*p*-value
Positive	4 (4)	48 (53)	<0.001
Negative	86 (96)	42 (47)	

The patients excluded from the study were those having retinopathy due to some other cause and patients on any anti-inflammatory therapy.

Data were analyzed on SPSS version 22. Means and standard deviation were calculated for quantitative data. For qualitative data percentages were assessed. Means of numerical data i.e. ESR and BMI of both groups were assessed by independent student's t test. CRP test of cases and controls were compared by applying Chi square. The *p*-value <0.05 was considered statistically significant.

RESULTS

For the study 90 patients of ages 40-70 years were enrolled. Among those 51 (56.67%) were

males and 39 (43.3%) were females. Among 90 controls 49 (54.4%) were males and 41 (45.56%) were females. Their mean ages were 60 ± 8.9 years in cases and 59 ± 13 years in controls.

The means and standard deviations of ESR and BMI among patients and controls are given in table-I.

The CRP findings of patients and controls have been mentioned in table-II.

DISCUSSION

The three micro vascular complications of diabetes include retinopathy, neuropathy and nephropathy. Among these our field of interest was retinopathy.

Main focus of our study was to analyze the contribution of inflammation in development of complications of diabetes like retinopathy. For this we assessed the relation of ESR and CRP with retinopathy among our patients and controls. Moreover we also studied BMI. In this context we wanted to see the role of weight gain as a contributory factor in development of retinopathy.

Our study done on Pakistani population suggests that there is a strong positive association between CRP levels and Diabetic retinopathy. These results are similar to many previous studies already conducted in this context. Nowak et al reported a positive association between the two among population of Poland[13]. Sarangi et al also reported positive correlation of CRP and fibrinogen with diabetic retinopathy in Indian population[14].

A study on two types of Diabetic retinopathy i.e proliferative and non-proliferative diabetic retinopathy stated that inflammatory and angio-genic markers are raised in non-proliferative retinopathy and decreased in proliferative retinopathy signifying that inflammatory and angio-genic markers detect the progression of diabetic vascular disease and may lead to earlier inter-vention to prevent the systemic complications[15].

On the contrary Lim et al reported that higher CRP levels are not related to progression of diabetic retinopathy[16]. This may be due to small sample size of patients considered and the type of study design used i.e. cross sectional study.

When we assessed the BMI in our enrolled patients we saw that there exists a positive association between it and retinopathy. These results are similar to previous studies conducted worldwide. Gray et al suggested a positive correlation between the two among US population[17]. Shrote et al also suggested a positive association of BMI among Indian diabetics[18].

A study on Japanese population suggested that obesity has a positive relationship with development of micro vascular complications of diabetes[19]. In German and Austrian database a positive association was observed between BMI and retinopathy[20].

On the other hand Sujanitha et al reported no association between BMI and retinopathy among Sri Lankan population[21]. A study on asian population reported that higher BMI is inversely related to diabetic retinopathy while higher values of hip to waist ratio are positively related to diabetic retinopathy[22]. This may be due to ethnic variability in that region.

The inflammatory markers can be used as biochemical markar for early diagnosis of complications of diabetes[23]. Another approach can be that by introducing some antiinflam-matory therapies in future we can prevent the micro vascular complications of diabetes from developing[24]. As BMI has also been linked with diabetic retinopathy, weight reduction can be an important tool for prevention of diabetic complications from occurring.

CONCLUSION

There is a direct relationship of ESR and CRP with retinopathy signifying that inflammatory processes may be one of the underlying biochemical mechanisms in development of

retinopathy. Moreover a direct relationship also exists between BMI and retinopathy indicating the contribution of weight gain in development of retinopathy.

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CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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