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Correlation Of CRP Level In Glycemic Control In Diabetic Foot Ulcer.

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ABSTRACT

Diabetes mellitus is a major public health problem globally and in Indian population and diabetic foot is reported as the most common cause of non-traumatic amputation of the lower limbs in India. There is renewed interest in various inflammatory markers and their association with various chronic complications of diabetes mellitus. There is a scarcity of data on the subject in Indian population The purpose of the present study is To analyze the level of CRP and adequacy of glycemic control To correlate the level of CRP with sequelae of diabetic foot.The study was conducted in Department of General Surgery in the year 2021, at Government medical college, krishnagiri, tamil nadu, india.Approx. 100 patients. Inclusion Criteria: All type 2 DM on treatment and diabetic foot. Exclusion Criteria: Patients with clinical or biochemical evidence sepsis other than diabetes foot. Patients with active auto immune disease (RA, SLE, systemic sclerosis). Admission sugar values, CRP values are obtained. Blood and estimation done by standard method. Grading of diabetic foot is as per wagner classification. As the protocol all patients treated with medical surgical care available in institution. Throughout admission serial measurements blood documented. Weekly obtained till discharge. Using statistical analysis correlated grade treatment outcome. The study after sign informed consent form. Blood sugar values both fasting and post prandial and c reactive protein levels were checked in all patients. Both oral and intravenous antibiotics were prescribed according to the pus culture and sensitivity report. Initial through surgical debridement was done. Daily dressings were done. The fasting blood sugar value ranges from 127 to 225 .minimum value is presentation 127 and the maximum value 225.patients are categorized into five groups to find the distribution. From our study it is concluded that glycemic control and CRP has definitive correlation with outcome which is proved by patients with persistently elevated blood sugar levels and CRP went in for amputation in our study. It is also concluded that 33.33% (9 patients out of 27) patients with elevated CRP above the critical value of 40 have went in for amputation. Rest of the patients with CRP < 40 went in for wound healing with appropriate surgical management.
Keywords: C-reactive protein, diabetes mellitus, glycated hemoglobin, renal impairment.

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INTRODUCTION

Diabetes mellitus (DM) has extended epidemic scopes worldwide. Diabetic kidney disease is the main reason of morbidity and mortality in diabetes [1]. Actually, the excess mortality of diabetes happens mostly in individuals with diabetes and proteinuria, and consequences not only from end-stage renal disease (ESRD) but also from cardiovascular disease (CVD), with the latter being principally mutual in patients [2]. Renal failure is a systemic disease and induces a slow and progressive deterioration of kidney function improved by numerous influences counting autoimmune diseases, diabetes, cancer, and toxic chemicals [3]. It is generally a consequence of complications arising from other severe medical situations [4]. Increased urea and creatinine levels represent kidney defects. Serum creatinine level is usually construed as a degree of the glomerular filtration rate (GFR) which is used as an index of renal function in the clinical field [5]. In greatest patients, the first sign of diabetic nephropathy is moderately improved urinary albumin excretion (UAE), i.e., 30–300 mg/24 h in a spot urine sample also termed microalbuminuria. Patients who progress albuminuria, i.e., >300 mg/24 h also termed macro- or clinical albuminuria, are at principally great risk for increasing a failure in renal function [6]. Nevertheless, up to 40% of patients with moderate albuminuria return to normoalbuminuria. Furthermore, up to 50% of patients with type 1 or type 2 diabetes experience a deterioration in GFR, although the presence of only moderate or even normoalbuminuria. Consequently, high UAE is not an essential precondition for the progress of diabetic nephropathy [7]. In DM, hyperglycemia causes the excess of glucose to associate with free amino acids on circulating or tissue proteins. This nonenzymatic reaction yields advanced glycosylation end-products (AGEs) through an Amadori rearrangement. Good glycemic control can lessen the occurrence of nephropathy [8]. However, accumulating evidence indicates that inflammation may show a central intermediary part in the pathogenesis of type 2 DM (T2DM), thus connecting diabetes to a number of generally parallel conditions supposed to invent through inflammatory mechanisms. It has been recommended that C-reactive protein (CRP) is associated with T2DM [9]. It is synthesized in the liver and one of the greatest sensitive acute phase reactants after tissue damage of inflammation which triggers the typical complement pathway due to the inflammatory response. Raised levels of CRP and poor glycemic control lead to macrovascular events and lead to raised diabetes risk in the future [10].

MATERIALS AND METHODS

The study was conducted in Department of General Surgery in the year 2021, at Government medical college, Krishnagiri, Tamil Nadu, India. Approx. 100 patients. Inclusion Criteria: All type 2 DM on treatment and diabetic foot. Inclusion Criteria: All type 2 DM patients on treatment and diabetic foot. Exclusion criteria: patients with clinical or biochemical evidence of sepsis other than diabetic foot. Patients with active auto immune disease (RA, SLE, systemic sclerosis). All patients admitted in diabetes and diabetic foot during JAN 2021 – NOV 2021 are included in this study. Thorough history and clinical examination done. Admission sugar values, CRP values are obtained. Blood sugar and CRP estimation done by standard method. Grading of diabetic foot is done as per Wagner classification. As per the standard protocol all patients treated with medical and surgical care as available in institution. Throughout the admission serial measurements of blood sugar are done and documented. Weekly CRP values are obtained till discharge. Using statistical analysis sugar values and CRP values are correlated with the grade of diabetic foot and treatment outcome. The study is done after the patients sign the informed consent form.

RESULTS

After admission routine blood investigations radiological evaluation. Wound swab culture and sensivity were done. Blood sugar values both fasting and post prandial and c reactive protein levels were checked in all patients. Both oral and intravenous antibiotics were prescribed according to the pus culture and sensitivity report. Initial through surgical debridement was done Daily dressings were done. The fasting blood sugar value ranges from 127 to 225 .minimum value is presentation 127 and the maximum value 225.patients are categorized into five groups to find the distribution and they are shown in the table below.

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Table 1: Distribution Of Patients In Relation To Fasting & Post Prandial Blood Sugar

FASTING BLOODSUGAR	NO OF PERSONS	PERCENTAGE
126-146	21	21%
147-166	27	27%
167-186	22	22%
187-206	17	17%
>206	13	13%

POST PRANDIAL BLOOD SUGAR	NO OF PERSONS	PERCENTAGE
200-240	18	18%
241-280	31	31%
281-320	23	23%
321-360	15	15%
>360	13	23%

Similarly, patients are classified into five groups based on the postprandial blood sugar values. Lowest value 203 and highest sugar level394. The distributions are shown in the table above.

Table 2: Distribution Of Patients According To Wagner's Grading

WAGNER'SGRADING	NO OF PATIENTS	PERCENTAGE
GRADE 1	48	48%
GRADE 2	27	27%
GRADE 3	16	16%
GRADE 4	3	3%
GRADE 5	6	6%

Table 3: Outcome

Outcome	Number
Amputated	9
Healed	91

This chart implies the outcome in diabetic foot patients. Out of 100 patients 9 got amputated and in 91 patients wound healed without complications.

Table 4 CRP Value

CRP VALUE	NO OF PATIENTS
< 40	73
>40	27

This chart depicts the number of patients whose CRP value was greater than and less than 40. Out of 100 patients 73 patients have got CRP value greater than 40 and 27 patients have got CRP value less than 40.

Table 5: CRP level above 40

CRP ABOVE 40	OUTCOME	PERCENTAGE
27	9	33.33
27	18	67.66

This table implies the outcome in patients whose crp values are above 40 out of 27 patients whose CRP values greater than 40 9 patientsgot amputated and 18 patients wound granulated and healed after adequate wound debridement and slough excision.

DISCUSSION

After analyzing CRP levels in all patients, it is observed that in patients with CRP level greater than 40 were 27. Out of which 9 got amputated and in the remaining patients the wound healed after surgical treatment. In our patients out of 100 patients who were evaluated in our study the least fasting value was 127 highest fasting value was 225 similarly patient with least post prandial level is 208 patient with highest post prandial level is 394.It is observed that persistently elevated fasting and post prandial also had elevated CRP level in the blood, which in term is poor prognosis in terms of outcome [11]. All the hundred patients were grouped into 5 subsets on increasing level of fasting blood sugar. In which highest number 27 persons (27%) falls in 2nd subset (blood sugar values between 147-166).22 patients falls in 3rd subset (blood sugar between 167-186).21 patients falls in 1 st subset (blood sugar between 126-146).17 patients falls in 4rth subset (187-206).and 13 patients falls under 5th subset (values >207) [12]. Similarly, the same patients were divided into 5 subsets based on rising post- prandial level. Out of which 31 patients (31%) falls in 2nd subset (blood sugar value between 241-280).23 patients falls under 3 rd subset (blood Sugar value between 281-320).18 patients falls in 1 st subset blood sugar value between 200-240. 15 patients falls under 4rth subset blood sugar value between 321-360.13 patients falls in 5th subset blood sugar value greater than 360.Based on several studies and results so far conducted , it has been clearly stated the glycemic control in terms of fasting and post- prandial plays a pivotal role in the outcome of diabetic foot patients [13], patients who had persistently elevated fasting and post prandial levels has gone for amputation, our study too concludes the same. That the patients who had persistently high fasting and post prandial level went in for amputation [14]. So we concluded that, by and far the most important factor influencing the outcome in diabetic foot patients is the glycemic control in terms of outcome amputation and wound healing [15]. In patients with elevated fasting and post prandial blood sugar in consistently elevated manner the response to treatment was poor with antibiotics and there was no improvement in Wagner's grading since the wound healing was low, the time taken for granulation tissue to appear was prolonged, when compared to patients with good glycemic control [16]. In certain patients the CRP level was also elevated to critical level of 40 according to our study and apparently was treated by amputation. So, it is highlighted and emphasized that there is a strong correlation between glycemic control and outcome in terms of amputation and wound healing in patients with diabetic foot [17]. Good glycemic control significantly reduces the morbidity in patients with diabetic foot. After analyzing the results drawn from 100 patients it has been clearly stated that CRP level assumes significance in relation to outcome in patients with diabetic foot. Usually the CRP level is not detectable in the blood, values<5 mg is normal [18], whereas in diabetes whose glycemic status is poor CRP is found to be significantly elevated, invariably in all those patients with diabetic foot [19]. In our study out of 100 patients 27 patients has elevated CRP levels > 40 mg .out of these 27 patients 9 patients were amputated either by above and below knee amputation and remaining patients healing of wound was observed [20]. It is interesting to note that patients who had elevated CRP > 40 also had extensive with gross level of infection when compared to rest of patients. this was assessed using Wagner's grading. Which grade the patients into 5 subgroups based on depth of tissue involvement. Out of 9 patients who went in for amputation 3 patients falls under Wagner's grade 4 and 6 patients Wagner's grade 5. By several studies and research conducted so far, in the medical literature it has been concluded that the patients in higher end of grading has ultimately gone for amputation which was similar to that of results drawn in our study. Out of 27% of patients with elevated CRP level >40, 9% of total patients went in for amputation and in 18 patients wound healed. So, the chance of having the risk of amputation when the CRP level is greater than 40 is 33.33%. It is also observed from our study that the patients have got elevated CRP but not went in for amputation have sustained slower rate of wound healing, whereas in those patients who have got CRP < 40 had good response to treatment with quick recovery and wound healing.

CONCLUSION

From our study it is concluded that glycemic control and CRP has definitive correlation with outcome which is proved by patients with persistently elevated blood sugar levels and CRP went in for amputation in our study.It is also concluded that 33.33% (9 patients out of 27) patients with elevated CRP above the critical value of 40 have went in for amputation. Rest of the patients with CRP < 40 went in for wound healing with appropriate surgical management.

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