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IS THERE A RELATIONSHIP BETWEEN GESTATIONAL DIABETES MELLITUS AND COMPLETE BLOOD COUNT RESULTS AND RATIOS DERIVED COMPLETE BLOOD COUNT

Internal Medicine

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ABSTRACT

Background: Gestational diabetes is a metabolic disease seen in pregnant women. Neutrophil lymphocyte rate (NLR), platelet lymphocyte rate (PLR) and platelet indices are easily and cheaply available ratios calculated from complete blood count and have been shown to be related to many medical conditions and pathologies.

Aim: Our aim was to evaluate the usability of indexes such as NLR, PLR for the diagnosis of gestational diabetes mellitus.

Methodology: In this retrospective study; pregnant women undergoing OGTT for preliminary diagnosis of gestational diabetes mellitus reviewed for two years. Patients was grouped normal, impaired glucose tolerance and gestational diabetes mellitus. Their hemogram parameters and NLR, PLR ratios was compared between groups.

Result: 112 of 145 patients were included. When complete blood count parameters and indexes calculated from these parameters were compared no difference was found between groups.

Conclusion: This study has found no correlation between complete blood count parameters and indices calculated from these parameters and IGT or GDM. The lack of concordance between results of such studies must lead to further research on this topic.

KEYWORDS

Gestational Diabetes Mellitus, Complete Blood Count, Neutrophil,

Introduction

Gestational diabetes is a metabolic disease seen in previously non-diabetic pregnant women, and usually resolves after birth. The incidence of gestational diabetes is between 2-5% with some known risk factors being mother's advanced age, family history and obesity [1]. Although the diagnosis of gestational diabetes may differ, a 75 mg oral glucose tolerance test is used in our country.

Neutrophil lymphocyte rate (NLR), platelet lymphocyte rate (PLR) and platelet indices are easily and cheaply available ratios calculated from complete blood count and have been shown to be related to many medical conditions and pathologies [2–4]. There are also reports of correlation between come metabolic and endocrinologic diseases and these index and ratios [5,6]. Systemic immune inflammatory index (SIII) is a ratio of neutrophil, platelet and lymphocyte numbers similar to previously mentioned ratios, but with fewer reports in literature [2,7].

There are few studies on a relationship between NLR, PLR and similar indexes and gestational diabetes diagnosis and severity [8,9]. In this study we evaluated the use of indexes such as NLR, PLR for the diagnosis of gestational diabetes in pregnant women with a high fasting glucose level who later underwent OGTT.

Material & Methodology:

Pregnant women undergoing OGTT for preliminary diagnosis of gestational diabetes at our institutes obstetrics and gynecology clinic between 1 January 2015 and 31 December 2016 were retrospectively reviewed. A 50 gram glucose challenge test (GCT) was performed in high-risk group of pregnant. All women with plasma glucose value > or = 140 mg/ dl were given a 3-hr, 100-gram glucose tolerance test (OGTT) to diagnose gestational diabetes mellitus. GDM diagnosis was made when two or more PG levels equals or exceed; fasting serum glucose of 105 mg/dl, 1-hour serum glucose of 190 mg/dl, 2-hour serum glucose of 165mg/dl, 3-hour serum glucose of 145 mg/dl.

Patients who did not complete OGTT, those who did not have a complete blood count within a week of OGTT, those with endocrinological, cardiological or other systemic diseases that could effect results plus those with a history of drug, alcohol or cigarette use, those who used non-steroid anti-inflammatory drugs within the last 3 days, and those with urinary or upper respiratory infections were not included in the study. In addition, patients with hyperlipidemia, hyperthyroidism, anemia, vitamin deficiency (Vitamins D and/or B12), leucocytosis, leucopenia or any other known haematological, biochemical or serological anomalies were excluded. Leucocytosis was accepted as being a total leukocyte count of >12200, considering that an increase of leucocytes is normal in the 2nd trimester. Patients' NLR, PLR and SIII were calculated from complete blood count parameters as follows:

NLR: Neutrophil number / lymphocyte number

PLR: Platelet number / lymphocyte number

SII Index: (Neutrophil number x Platelet number) / lymphocyte number

All complete blood counts were performed using Sysmex XT-2000i device.

Statistical Evaluation:

Statistical analysis was performed using IBM SPSS Statistics version 22.0. Descriptive data (average, standard deviation, minimum and maximum) was compared using t-test and ANOVA for multi-group analysis. Statistical significance was considered as being $p<0.05$.

Results

One hundred and fourty five patients' data were analysed retrospectively. Those excluded from the study were due to systemic disease (n=14), regular hormone replacement therapy use (n=6), missing medical data (n=7), thrombocytopenia (n=2) and other exclusion criteria (n=4). Therefore, data of 112 patients were included in final analysis.

Average age of patients was 30.13 years. Patients were grouped as control group, those with gestational diabetes and those with impaired glucose tolerance. Patients' age and OGTT results are shown in Table 1.

When complete blood count parameters and indexes calculated from these parameters were compared no difference was found between groups (Table 2).

Discussion:

In this study we were unable to find a correlation between gestational diabetes or IGT and WBC, neutrophil number, lymphocyte number, platelet number or other platelet indices or indexes.

There are limited studies in literature that have previously evaluated this relationship. In a retrospective study comparing CBC parameters to presence of absence of gestational diabetes in 767 healthy pregnant women, leucocyte, neutrophil and lymphpcyte numbers were found to significantly differ between those with gestational diabetes when compared to IGT, although there was no difference between NLR and PLR [8]. A separate study compared CBC parameters of 42 patients with gestational diabetes and 68 healthy controls [9]. The authors reported that NLR was significantly higher in those with gestational diabetes and reported that a NLR cut-off value of 2.92 had a 76.2% sensitivity and 94.1% specificity for the presence of gestational diabetes. Our study was unable to demonstrate similar results.

In a study evaluating a relationship between gestational diabetes and mean platelet volume (MPV), MPV was found to be significantly higher in those with gestational diabetes when compared to control group. Also, the authors found a positive correlation between MPV and insulin resistance index (HOMA-IR) [10]. In a separate study, MPV, RVW and platelet count were not found to be related to gestational diabetes, although platelet distribution width (PDW) was found to be higher in those with gestational diabetes [11]. These studies show a wide range of different results, which is interesting. Our study found no correlation between platelet indices and gestational diabetes or IGT.

In addition to these differing reports of any link between NLR, PLR, other platelet indices and GDM, there are also reports of the reliability of these studies. For example, in a study evaluating the effect of smoking on NLR, PLR and platelet indices, NLR was found to be higher in smokers and also, NLR and plateletcrit were found to be correlated with smoking density [2]. In another study, these parameters were evaluated in obese patients [7]. Studies of NLR, PLR and other indices must therefore take into account these factors when patient selection and grouping is performed.

Differing results from differing series means that more comprehensive studies that are prospective, controlled and multi-centered must be performed. Our study is limited by its retrospective nature. Despite being careful in choosing our inclusion and exclusion criteria in accordance with previous studies, it is possible that the lack of information on what effects the measures examined my account for our results.

To conclude, this study has found no correlation between CBC parameters and indices calculated from these parameters and IGT or GDM. The lack of concordance between results of such studies must lead to further research on this topic.

Table 1: Patients' age and OGTT results according to groups. Age is years ± SD, OGTT is mg/dl.

	All Patients (n=114)	IGT (n=20)	GDM (n=31)	Control group (n=31)
Age	30.1±5.2	29.6±4.93	31.8±5.52	29.3±5.14
OGTT 50 gr	161±14.1	161±11	171±17.8	158±9.2
OGTT 100 gr '0'	86±8.3	88±10	90±8.5	83±6
OGTT 100 gr '1'	162±36	161±32	205±22	141±22
OGTT 100 gr '2'	133±34	127±29	170±33	116±16
OGTT 100 gr '3'	96±27	98±26	112±28	88±24

Table 2: Comparison of groups and complete blood count parameters and index/ratios calculated from CBC.

	All patients (n=114)	İGT (n=20)	GDM (n=31)	Control group (n=31)	p
Hematocrit	34.74±2.92	35.04±2.89	34.72±3.18	34.64±2.83	0.86
Platelet ($x10^3$)	230±52	239±62	211±46	237±50	0.05
WBC count	8.80±1.86	8.99±1.76	8.46±1.72	8.89±1.96	0.49
Neutrophil number	5.97±1.81	6.05±1.71	5.47±1.97	6.20±1.73	0.18
Lymphocyte number	1.97±0.56	2.15±0.54	1.85±0.57	1.98±0.52	0.17
Monocyte number	0.66±1.04	0.59±0.16	0.55±0.19	0.52±0.15	0.24
PDW	16.4±1.18	16.1±1.40	16.72±1.37	16.34±0.96	0.18
MPV	8.74±0.91	8.73±0.89	8.66±1.00	8.79±0.88	0.78
PCT	0.20±0.05	0.20±0.05	0.19±0.05	0.21±0.05	0.19
NLR	3.21±1.13	3.03±1.13	3.13±1.16	3.32±1.12	0.54
PLR ($x10^3$)	126±67	113±26	137±119	124±31	0.44
SIII ($x10^3$)	727±283	686±241	662±283	773±292	0.16

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