

The interaction between Hyperglycaemia and Rheumatoid Factor in Iraqi Diabetic Patients with type I

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Abstract:

Diabetes mellitus (DM) is a clinical disorder characterized by hyperglycemia caused by a lack of insulin, when an individual's body can't make enough insulin or utilize insulin to create energy from glucose. Many kinds of diabetes are perceived: type 1 (T1DM) and type 2 (T2DM), previously named "insulin"-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM).

Rheumatoid factor has a positive indicative value on diagnosis and has an association with the prognosis of rheumatoid arthritis. In some instances, RF was found in the serum of patients with different illnesses including DM, because of the presence of pro-inflammatory cytokines like TNF- α which assume a significant part in the autoimmune system, and chronic inflammation like rheumatoid arthritis (RA). This study aimed to find the interactions between T1DM & RA regarding rheumatoid factors (RF) and hyperglycemia in patient groups. One hundred patients with type 1 diabetes mellitus were included in this study from patients attending the National Diabetes Center from 2023 to 2024 and twenty healthy non-diabetic, non-arthritic volunteers as a control group, the age range of all participants were within (30-80) years. From one hundred T1DM patients (fifty-one females and forty-nine males), twelve of them (12%) had positive RF compared with control groups $P=0.01$ with female dominance 7(58.3%) compared to males 5(41.7%). moreover, the majority of diabetic patients were within the age group (41-50) to male and (51-60) to female respectively with the most elevated level of glucose blood (20.7mmol/L). The results of the current study demonstrated that the highest proportion of patients with T1DM and RF positive values were in the age category (51-60) years, with significantly different values ($P = 0.01$). We can conclude from this study that there is a correlation between hyperglycemia in type 1 diabetic patients and rheumatoid factor, especially in older females than older males.

Keywords: Hyperglycaemia, Rheumatic factor, diabetes type 1, Rheumatoid Arthritis.



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Introduction

Diabetes mellitus (DM) is characterized as a clinical disorder described by hyperglycemia because of outright or relative lack of insulin which means DM is a condition wherein an individual's body can't make enough insulin or utilize insulin for the creation of energy from glucose , the fasting plasma glucose level will be more than 7.0 mmol/L (126mg/dl) or a 2 hours' plasma glucose more than 11.1mmol/L (200mg/dl) [1,2].

Type 1 diabetes is supposedly due to the inability to produce insulin, type 2 diabetes is a condition in which a person's cells are not recognizing insulin, and pre-diabetes is a state of raised glucose concentrations above the normal but below the levels at which an individual can be diagnosed with type 2 diabetes while at a certain point are associated with relatively insufficient amounts of insulin. [3,4].

Rheumatoid Arthritis (RA) is a fundamental, immune system problem that appears as constant synovial irritation of numerous joints. The illness is moderate and results in agony, solidness, and expansion of joints .

Rheumatoid Factor (RF) is an autoantibody against citrullinated proteins in RA. It is a neutralizer delivered against the Fc portion of IgG, which is itself an immunizer, RF and IgG join safe edifices which add to the sickness interaction. Elevated degrees of RF are demonstrative of RA (present in 80%) and sjogen's syndrome (present in practically 100 %) [5,6].

Over the last few years, it has become progressively obvious that persistent actuation of autoimmune disorders such as RA is related to changes in intermediary metabolism, especially DM (7). RA and DM have been seen to co-happen within individuals. However, the specific etiologic of RA and T1DM is logical because of a blend of hereditary defenselessness and associations between natural gamble elements and qualities. Thus this study was meant to determine levels of Rheumatic factor (RF) in DM patients compared to healthy group according to age and gender, and also determine the relation between DM and RA diseases [7,8].

Material and Methods:

I. Selected of patients:

One hundred patients with T1DM (49 male and 51 female patients) aged between 30-80 years were included in this study. All patients didn't get antibiotics under any condition for no less than 2 weeks prior; twenty healthy volunteers, with age and sex-matched were selected as a control group and their estimated fasting blood glucose levels were within the normal range < 125 mg/dl (6.9 mmol/l) with a negative value to RF test.

The samples were collected from the National Diabetes Center of Al-Mustansiriyah College in Baghdad City in the period (October 2023 to February 2024)

II. Collection of clinical specimens:

A volume of 5 ml of blood was gathered from each patient by veinpuncture utilizing by dispensable needles. Gathered blood was permitted to clot at room temperature for 30min., and afterward centrifuged for 10min. at 4000 rpm, the serum was isolated in tubes to assess glucose levels stored away at -20 C° and defrosted promptly before estimated RF levels.

III. Determination of blood glucose levels (enzymatic):

Blood glucose was estimated in the serum of T1DM patients and control groups by enzymatic technique as to manufacturer instructions (linear, Spanish). After that determined fixation (mg/dL) was by utilizing the condition: OD test/OD standard X standard focus, moreover, it tends to be utilized of condition mg/dl glucose X 0.06 to get of glucose level in 1mmol/l unit.

IV. Qualitative determination of RF (slide latex agglutination):

Qualitative RF was assayed in the sera of T1DM patients and control groups by slide latex agglutination technique as per manufacturer instructions (linear, Spanish), Results may be observed as either positive or negative. The adequacy or inadequacy of visible agglutination was noted by the eye naked immediately after pulling out the slide from the rotator.

Results:

- Determination of the blood glucose levels in studied groups:

Table (1) shows the mean levels of blood glucose in T1DM patients group compared to the control group according to age, also it showed the highest level of glucose blood which was (20.7mol/L) in T1DM patients groups located in (the 51-60) age group.

Table (1) Mean value of blood glucose levels (mmol/L) in studied groups		
Age groups	T1DM patients group	Control group
29-40	10.8	4.4
41-50	11.8	5.6
51-60	20.7	5.3
61-70	11.45	6.1
71-80	17.7	6.3

- Distribution of studied groups according to gender and age:

Table (2) shows the distribution of T1DM patients compared to the healthy control group according to gender and age.

Most type 1 diabetic patients were located within the age group (41-50) to male and (51-60) to female respectively.

Table (2) Distribution of the studied groups in relation to the gender and ages of the participants					
Gender	T1DM patients group			Control group	
	Age groups	No.	Percent (%)	No.	Percent (%)
Male	30-40	11	25%	9	45%
	41-50	13	29.5%		
	51-60	10	22.7%		
	61-70	8	18.2%		
	71-80	2	4.5%		
Total	-----	44	100%		
Female	30-40	14	25%	11	55%
	41-50	12	21.4%		
	51-60	15	26.8%		
	61-70	9	16.1%		
	71-80	6	10.7%		
Total	-----	56	100%	20	100%
* P = 0.01					

Also, 56 females were infected while 44 males were infected; that means female type 1 diabetic patients were highly infection more than males compared to the control group.

- RF agglutination test in the studied groups:

Table (3) illustrates that out of 100 type 1 diabetic patient, only 12 of them had positive RF, and the disruption was 5(41.7%) males and 7(58.3%) females respectively compared to healthy control with significant differences (P= 0.01).

Gender RF	T1DM patients group				Healthy control group			
	Male	Female	Total	Percent	Male	Female	Total	Percent
Positive	5	7	12	12%	1	0	1	5%
Negative	39	49	88	88%	8	11	19	95%
Total	44	56	100	100%	9	11	20	100%

* P= 0.01

- Distribution of studied groups based on the age status and having positive RF value:

The results of the present study in Table (4) shows that highest percent of T1DM patients with positive RF values are found in the age group (51-60) years comparing with healthy controls with significant different value (P =0.01).

Age groups	RF result			
	T1DM patients group (n=100)		Control group (n=20)	
	Total	%	Total	%
31-40	0	0	0	0
41-50	0	0	0	0
51-60	8	66.7	1	0
61-70	0	0	0	0
71-80	4	33.3	0	0
Total	12	100.0	0	0

Discussion:

The outcomes in Table (1) show that most of the type 1 diabetic patients in the (51-60) age group have the highest fasting plasma glucose (FPG) levels ($\geq 20.7\text{mmol/l}$) in comparison with other age groups. These results corroborate other authors who found that 68% of the patients with T2DM had $\text{FPG} > 11.1\text{mmol/l}$ while 32% had $\text{FPG} < 11.1\text{mmol/l}$ in the age group (51-60).

The results in Table (3) show that (12.0%) of the patients with type 1 diabetes have positive blood RF compared with the control group that have positive RF value (5%). These rates concur with the outcomes obtained by Mohammed Salih et al., (2012) and Moustschen, 1992. Furthermore, compared with a study conducted by Al-Gharawi et.al, 2009, in Clinical City, Baghdad reported (62.5%) of T2DM patients had positive RF values ; 49 % were reported in Al-Umara City by Khalawi 2009 [5] while 15.5% were detected in al-Adhamiya in Baghdad city by Al-Hammami [6]. Lack of health awareness of diabetes for the elderly, geographical reasons, and modes of living may be reasons to explain percentage differences in these studies. 12.0% RF positive results were obtained in T1DM patients (1.5:1 ratio) which synchronizes with another study that revealed the females with RA are more compared to males, with a ratio of (3:1) [9,10]. Research indicates that hormone levels play a significant role. Both epidemiological and immunological evidence suggest that female sex hormones may influence the development and progression of chronic inflammatory diseases. Factors such as the menstrual cycle, pregnancy, and menopausal status are crucial in this context. Diabetes mellitus and RA are connected with a disagreeable cardiovascular risk profile, particularly dyslipidaemia, and in obesity-related to diabetes increased concentrations of C-reactive protein, IL-6, and other inflammatory markers [11,13,14]. Pro-inflammatory cytokines, such as TNF- α , IL-18, and IL-6, were established to be raised in patients with diabetes mellitus (DM). Specifically, TNF- α , a key pro-inflammatory cytokine in rheumatoid arthritis (RA), is produced by adipose tissue throughout chronic hyperglycemia associated with DM. This cytokine has detrimental effects on the insulin signaling pathway [15,16,17].

Tables (2) and (4) showed a high percentage of T1DM patients who have RF-positive values are aged 50 years or older. Approximately 18.3% (8.6 million) of Americans aged 60 and older have diabetes with RF, according to the American Diabetes Association (ADA). Additionally, the age range for diabetes mellitus patients typically falls between 40 and 70 years, which

aligns with findings from other studies [18]. high incidence of diabetes mellitus with age as in Table 2 In females with type 1 diabetes mellitus (T1DM), the impact of menopause and pro-inflammatory cytokine activity is more pronounced compared to males because the fall of estrogens and other gonadal steroids. This is especially relevant for chronic diseases that have not typically been categorized as “inflammatory diseases,” such as bone resorption. It's significant to note that the incidence rate for osteoporosis increases with age, closely paralleling the occurrence rates of inflammatory markers like rheumatoid arthritis (RA) [19,20].

Conclusions:

This study concluded, that there is a correlation between hyperglycemia in Iraqi patients with type 1 diabetes mellitus and rheumatoid factor, especially in older female patients than older male patients.

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التداخلات بين ارتفاع سكر الدم وعامل الروماتويد لدى مرضى السكري العراقيين من النوع الأول
مستخلص البحث:

داء السكري (DM) اضطراب سريري يتميز بارتفاع سكر الدم الناتج عن نقص الأنسولين، عندما يعجز جسم الشخص عن إنتاج كمية كافية من الأنسولين أو استخدامه لإنتاج الطاقة من الكلوكوز. هناك أنواع عديدة من داء السكري: النوع الأول (T1DM) والنوع الثاني (T2DM)، وكان يُعرف سابقاً باسم داء السكري المعتمد على الأنسولين (IDDM) وداء السكري غير المعتمد على الأنسولين (NIDDM). يعد لعامل الروماتويد قيمة دلالية إيجابية مهمة في التشخيص وله ارتباط بتوقع الإصابة بمرض التهاب المفاصل الروماتويدي. في بعض الحالات، وُجد عامل الروماتويد في مصل المرضى الذين يعانون من أمراض مختلفة بما في ذلك مرض السكري، وذلك بسبب وجود السيتوكينات المؤيدة للالتهابات مثل $TNF-\alpha$ التي تلعب دوراً مهماً في الجهاز المناعي الذاتي، والالتهابات المزمنة مثل التهاب المفاصل الروماتويدي (RA) هدفت هذه الدراسة إلى إيجاد التداخلات بين داء السكري من النوع الأول والتهاب المفاصل الروماتويدي فيما يتعلق بعوامل الروماتويد RF وفرط سكر الدم في مجاميع المرضى. شملت هذه الدراسة مائة مريض مصاب بداء السكري من النوع الأول من المرضى الذين حضروا الى المركز الوطني للسكري من عام 2023 إلى عام 2024 وكذلك عشرين متطوعاً سليماً غير مصابين بالسكري والتهاب المفاصل كمجموعة سيطرة، وتراوحت أعمار جميع المشاركين بين (30-80) عاماً. اوضحت النتائج ان من بين مائة مريض مصاب بمرض السكري من النوع الأول (واحد وخمسون أنثى وتسعة وأربعون ذكراً)، كان لدى اثني عشر منهم (12%) عامل روماتويدي إيجابي مقارنة بمجموعات الضبط $P = 0.01$ مع هيمنة الإناث 7 (58.3%) مقارنة بالذكور 5 (41.7%). علاوة على ذلك، كانت غالبية مرضى السكري ضمن الفئة العمرية (41-50) للذكور و (51-60) للإناث على التوالي مع أعلى مستوى من الكلوكوز في الدم (20.7 مليمول / لتر). أظهرت نتائج الدراسة الحالية أن أعلى نسبة من المرضى الذين يعانون من مرض السكري من النوع الأول وقيم عامل الروماتويد الإيجابية كانوا في الفئة العمرية (51-60) عاماً، وباختلاف معنوي عالي $P = 0.01$ يمكننا أن نستنتج من هذه الدراسة أن هناك علاقة بين ارتفاع سكر الدم لدى مرضى السكري من النوع الأول وعامل الروماتويد، وخاصة لدى الإناث الأكبر سناً من الذكور الأكبر سناً.

الكلمات المفتاحية: ارتفاع مستوى سكر الدم، العامل الروماتويدي، مرض السكري من النوع الأول، التهاب المفاصل المزمن.