

**Clinical Study for Thyroid Status in Type 2
Diabetes Mellitus Patients**

assist.prof. Dr. Fatin Fadhel AL-kazzaz, researcher.Ali Abd AL-Rassol Hussein

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Abstract:

The fact that insulin and thyroid hormones influence each other's actions assumes significance since diabetes mellitus and thyroid disease are two common endocrine disorders in adult population in Iraq. Hyperglycemia is considered a major initiator to other tissue damage throughout diabetes mellitus development, for all above the present study aimed to investigate the glycemia affect type 2 on thyroid gland measuring T3, T4, TSH and F.B. glucose in sera of 26 patients with DM2 who diagnosed by supervision in teaching AL-Kadhimiya Hospital during the period February 2010 and April 2010. The investigation have been compared with 33 healthy individuals as control group

This study revealed that DM2 is prevalent among female at age (40-49) years with non significant differences ($p > 0.05$)

Laboratory investigations showed that hormones levels of T3 & T4 had been increased significantly ($p < 0.05$) among diabetic patients type 2 while pituitary hormone TSH had decreased non-significantly in compared to control group ($p > 0.05$).

Finally the study revealed a positive correlation between F.B. glucoses and TSH and negative association for F.B. glucoses with T3 & T4

In conclusion it can be said patients with DM2 would be with hyperthyroidism through time

Key words:

Diabetes Mellitus type 2, thyroid dysfunction, TSH, T3, T4 hormones.

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Introduction :

The origin of diabetes is latin “diabainein” sense disorder in the concentration of blood sugar(1) . while mellitus , means honey proportion to the sweet taste of urine(2). In1921 sir Frederick & Charles Herbert received Nobel prize for purified insulin from cow’s pancreas(3,4).

World Health organization (WHO) reported that there are (2.8%) in the world suffering from diabetes(5).

In Iraq , diabetes is widely diffusive and statistics in year (2004)reported that (1,492,628)of Iraqi population are suffering of this disease(6).

Diabetes is an accumulated glucose in blood (7)it is a group of metabolic disease characterized by hyperglycemia from defects in insulin secretion (DM1) insulin action (DM2)or both (8,9). There are other types of diabetes which are located within DM1(10,11,12) and DM2(13,14,15) caused by several reasons (16,17,18) .

1)The receptors did not respond to insulin

2)Mutation lead to abnormalities in the pancreatic beta cells .

3)Abnormal functioning of insulin .

4)Disease leads to acute pancreatitis leading to diabetes (chronic pancreatitis ,cirrhosis)
(WHO)has derived malnutrition as a type of DM(19).

Monosaccharides absorbed into small intestine transported to liver which would metabolize through different processes include :glycolysis (20) ,glycogenesis(21), glycogenolysis(22), gluconeogenesis(23), hexose mono phosphate shuttle(24)and oxidative pathway to acetyl coA(24)

Hormones have many effects on the body ,such as regulation of the metabolism . the level of blood glucose is affected by some hormones include :Insulin , glucagon ,growth hormone ,cortisol , epinephrine & thyroid hormones (25).

Thyroxine (T4)and tri iodo thyronine (T3)produced by thyroid gland . there is an abnormal response to glucose tolerance testing in hyperthyroidism because glucose rises faster than normal (26).And increase insulin degradation .In hypothyroidism liver secretion of glycogen increases absorption of glucose and glucose utilization is slowed (27,28).

Diabetes mellitus and thyroid disease are the two common endocrinopathies seen in adults population with insulin and thyroid hormones being intimately involved in cellular metabolism and thus excess or defect of these hormones could result in the functional derangement of the other (29) .

The aim of this research is evaluate how diabetes mellitus type 2(DM2) affect on thyroid function in individuals pre-existing thyroid disorders.

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Subjects & Methods:

The study was conducted in AL- kadhimiya teaching Hospital ,Baghdad ,Iraq . Twenty six patients with diabetes mellites (5male &21female)were involved in this study . the patients where diagnosed by Dr.Nazar AL-Chalbi depending on their clinical examination fasting glucose ,glucose tolerance test furthermore the mean age of patients was 50 ± 10 years . control group consisted of thirty three healthy subjects (8male &25female) with mean age 55 ± 10 years . Samples collecting to take 30 days from February 2010 to March 2010 from each subject included in this study .

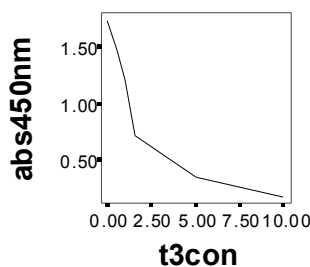
Five to ten ml of blood was collected by vein puncture at fasting using disposable syringes the blood was placed in plastic disposable pain tubes , and allowed to clot at room temperature and serum was separated by centrifugation at $1500 \times g$ for 5min , and then sera stored at -20°C .

Estimation of glucose Leveal was carried by enzymatic colorimeteic assay (GOD-PAP) test kit supplied by RANDOX while determin serum thgroixine (T4)&tri iodo thyronine hormone (T3) and were carried by Enzymatic Immuno assay (EIA) using test kit supplied by Bioactive diagnostics Germany (Homburg) . Thyroid stimulating Hormones (TSH)was measured by using Enzyme Linked Immuno sorbed assay (ELISA)using truno assay test .

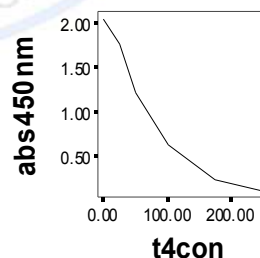
Both method are quantitative test for use on the (mini VIDAS)analyzer . The assay principle combines a two –steps enzyme immunoassay sandwich method with a final fluorescent detection

Calculation :

Level of the three hormones T3,T4,TSH were calculated throught the standard winer as shown in figure1,2,3.



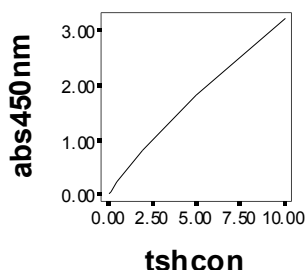
Figure(1)Stander curve for T3



Figure(2)Stander curve for T4

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Figure(3)Stander curve for Tsh

Statistical analysis :

The data was analyzed on the computer statistical programme spss(version10).

the mean $\pm$ SD was also computed for the comparison of results . result were considered statistically significant if Pvalue is less than 0.05(30).

Result and Discussion :

The patients with DM2 were selected from people attended AL-Kadhimiya Hospital the effect of gender on type2 diabetic patients is illustrated in table(1). This table reveals that most of the patients are female (88.46%) rather than males (11.54%) though no significant differences are shown ($p > 0.05$).

Table (1) Distribution of diabetic patients according to their gender

Gender	Patients		Control group	
	NO.	%	NO.	%
Male	5	11.54	8	25
Female	21	88.46	24	75
Total	26	100	33	100

The distribution of type2 diabetic patients according to their age groups is listed in table(2). The table shows the majority of patients (49.99%) are at the age 40-49 years . Moreover , there is a highly frequency (30.77%) at age 50-59 years with non significant differences ($p > 0.05$) compared to normal subject while the minority of patients (19.23%) is above 60 years .

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Table (2) distribution of diabetic patients according to the age

Age group	Patients		control		P value
	No.	%	No.	%	
40-49	13	49.99	13	39.39	0.314
50-59	8	30.77	8	24.24	
>60	5	19.23	12	36.36	0.975
total	26	100	33	100	0.259

The above results agree with (31,32) which demonstrated that Insulin resistance and subsequent development of type 2 diabetes is commonly observed in the elderly, and in individuals who are obese, physically inactive, or in women who are pregnant.

The explanation for these results suggests that an environmental factor may preferentially accelerate the subclinical disease process in old women. On the other hand, these results disagree with that of some others who explain the effect of racial & genetic susceptibility (33,34).

F.B.glucose and T3, T4, TSH have been estimated in the sera of diabetic patients and healthy individuals. The result listed in table (3) which reveals that there is a non-significant elevation in the level of F.B.glucose among patient samples (7.01 ± 2.9597 mmole/L) in comparison with control group (4.8594 ± 0.7645 mmole/L).

It is well-accepted that diabetic patients are suffering from significant elevation in F.B.glucose which rises due to carbohydrate consumption, which are converted to glucose within hours. Insulin is released into blood stream by beta cells of the pancreas in response to the arising level of glucose into most cells. Deficiency of insulin due to β -cells destruction as in DM2 or in sensitivity of its receptors as in DM2 results of the current study are compatible with others (35,36) which emphasized that F.B.sugar is elevated among DM2 patients.

The other results in table (3) shown there is a significant increment in the level of T4 (94.2308 ± 21.8958 mmole/L) and serum TSH (2.8192 ± 2.3212 MIU/L) among the diabetic cases in comparison with control cases (14.6207 ± 2.5846 mmole/L, 1.6031 ± 2.3212 MIU/L) respectively ($p < 0.05$).

The results of control group revealed that there is non significant variation in the mean of T3 level (0.969 ± 0.4738 ng/L) in the sera of DM2 patients in comparison with control group (0.9688 ± 0.2879 ng/L). Recent studies referred to use either T4 alone or TSH level as indicator for thyroid dysfunction (37).

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Little information has been published about the effect type2 diabetes mellitus on thyroid function .The present study reveals a high prevalence of hyperthyroidism in patients with DM2 depending on T4 level .

Result of mean TSH level in table(3) indicate an increase in patients group (2.8192 ± 2.3212 MIU/L) in comparison to control group (1.6031 ± 0.8797 MIU/L) with non-significance variation ($p > 0.05$).

The current thyroid hormones picture is similar to that in previous study (29) indicated that poorly controlled diabetes may result in impaired TSH response to thyroid releasing hormone (TRH) or loss of normal nocturnal TSH.

The relationship between the possible correlation relationship for all previous parameters of the thyroid gland tests (i.e. T3, T4, TSH) and F.B.glucose (FBS) levels in DM2 patients are listed in table (4), which shows that the correlation between F.B.glucose and TSH is positive ($r = -0.001$, -0.163) respectively with non-significant ($p > 0.05$). these findings suggest that the thyroid gland of patients with DM2 will have hyperthyroidism in the future .

Table (4) correlation between parameters F.B.glucose ,T3,T4,TSH of diabetic patients

Person correlation		T4	TSH	F.B.glucose
T3	r	0.560**	0.109	-0.001
	sig	0.003	0.597	0.997
T4	r		-0.419	-0.163
	sig		0.469	0.425
TSH	r			0.217
	sig			0.286

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Conclusion :

Our results confirm a higher prevalence of thyroid dysfunction (especially sub-clinical hyperthyroidism) in our diabetic population compared to that healthy individuals .

References :

- 1)Rother ,K.I;April."Diabetes treatment bridging the divide"(2007) "The New England Journal of Medicine 356 (15):1499-1501..
- 2)Marshall,W.J; "clinical chemistry" (2000),4th ed.Mosby, Harcourt Publishers Limited,Spain,PP277-285;.
- 3)Nabipour,I;"Clinical Endocrinology in the Islamic civilization in Iran" (2003)..International Journal of Endocrinology and Metabolism .1:43-45[44-5];
- 4)Ian Murray;"Paulesco and the Isolation of Insulin" (2009). Journal of the History Medicine and Allied Sciences. 26;(2):150-157;.
- 5)Wild,S;Roglic;Green,A;Sicree R.,King,H,;"Global prevalence of diabetes:estimates for the year 2004 and Projections for 2030" (2004).diabetes care.27(5):1047-53;.
- 6)Mandrup-Poulsen T."Recent advances in diabetes" (2008),BMJ:316:1221-1225;.
- 7)Buse ,J.B.,Polousky,K.S,BurantC.F,Kronenberg,HM,;"Disorders of carbohydrates and lipid metabolism" (2003)P.1427-85;.
- 8)Emanuel,N.,Klein,R., Moritz, M;et al;"comparison of dilated fundus examinations with seven -field stereo fundus photographs in the veterans affairs Diabetes Trial";. 2008
- 9)American diabetes association Inc. (2005)Diagnosis &classificationof diabetes mellitus (diabetes care J.) 28:542
- 10)Handelsman ,Yehuda,M.D; "A Doctors Diagnosis:Prediabetes" (2007)power of Prevention. Vol1,Issue 1;1009.
- 11)Krebs,N.F;Jacobson,M.S;"Prevention of pediatric overweight and obesity" (2003) pediatrics.112:424-430;.
- 12)Daneman,D;"Type 1diabetes"(2006).Lancet 367(9513):847-58;
- 13)Arlan,Rosebloom, JanetH.; silversting "Type 2diabetes in children and Adolescents:" (2003)"A Clinicians Guid-to Diagnosis, Epidemiology,Pathogenesis,Prevention,and Treatment"..American Diabetes Association,U.S.PP.I;
- 14)Rubino,f,Gagner,M,;"Potential of Surgery for Curing type2 Diabetes mellitus" (2002).Ann.Surg.236(5):554-9;.
- 15)Bankauskaite,V,;"Type2 diabetes programmes in EUROPE" (2005)..Euro observer 7:(2):5-6;
- 16)Rosenbloom,a.,Young,R.,and winter,w., "Emerging Epidemic of Type 2 diabetes in youth" (2001).diabetes care.22:867-71;.
- 17)American Diabetes Association .Ins;"Diagnosis and classification of diabetes mellitus" (2005),diabetes care journal 28:542.
- 18)Babior ,B.M.,Screening for Type2 Diabetes .clinical practice recommendation(2004) Diabetes care . 27(1):511-514;
- 19) Tierney, L.M; Mcphee, S. JMAPapadakis.Current medical diagnosis and treatment. International edition. (2002) New York:Lange Medical book/McGraw-Hill,1203-1215.
- 20)Langseth, L,;"Oxidants ,antioxidants and disease prevention" (2006).Belgium, International Life Science Institute;.

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- 21) Baynes, J.W., "Perspective in Diabetes .Role of Oxidative Stress in development of complication in diabetes" (2001)40:405-41;.
- 22) Ha, H., Kim, K.H., "Role of Oxidative Stress in Development of diabetic nephropathy" (2005). Kidney Int;51(suppl):18-21;.
- 23) Fujiwara, Y., Kondo, T., Murakami, K., Kawakami, Y., "Decrease of the inhibition of lipid peroxidation by glutathione dependent system in erythrocytes of non-insulin dependent diabetics" (2001). klin Wochenschr. 67:336-41;
- 24) Daniels, M.E., "Lillys Humatrope Experience" (2002); Nature Biotechnology. 10:812;
- 25) Couri, C.E., Oliveria, M.C., Statacieri, A.B.; "C-peptide levels and insulin independence following autologous non-myelo ablative hematopoietic stem cell transplantation in newly diagnosed type 1 diabetic mellitus" (2009) JAMA, 301 (15):1573-9.
- 26) Hoffner, S.M., "Sex, obesity, fat distribution, type 2 diabetes and insulin resistance: epidemiological and clinical correlation" (2005) Int. J. Obes. Relat. Metab. Disord. 24 (Suppl.) 556-558.
- 27) Noe, G., Cheng, Y.C., Dabik, M.; "Transcriptional regulation by hormones" (2002) "Biology of reproduction" 47:970-976.
- 28) Simon, D., et al., "Inter relation between plasma testosterone and plasma insulin in healthy adult men: The Telecom Study" (2008) Diabetologia 35:173-177.
- 29) Sathish R., Mahan, V.; "Diabetes & thyroid disease: A review" (2003) (Int. J. Diab. Dev. countries) 23, 120, 1-3.
- 30) Kaplan A. & Pascoe AJ "clinical Chemistry, Theory Analysis, Correlation" (1999), 3rd ed. pp 772 the C.V. Mosby company.
- 31) Richard A., Harvey, P., Melander, D., Denise R. Ferrier (Lippincott's Illustrated Reviews Biochemistry) (2008) 4th ed. Lippincott Williams and Wilkins. Philadelphia, New York. p. 34v.
- 32) Lindholm A., Jensen L.B., Home P.D. et al.; "Immune responses to insulin as part in people with type 1 & 2 Diabetes" (2002) Diabetes Care 25 (5):876-887.
- 33) Dharmayaa H. Salih; M.Sc. thesis "Dyslipidemia in type 1 diabetic mellitus" (2007) College of Health and Medical Technology, Foundation of Technical Education Iraq Baghdad.
- 34) Weet I., Rooman R., Coeckelberghs M., et al.; "The age at diagnosis of type 1 diabetes continues to decrease in Belgian boys but not in girls: a 15-years survey" (2007) Diabetes Metab. Res. Rev. 13 [Epub ahead of print 17631647 Abstract].
- 35) Rother KI. "Diabetes Treatment-bridging the divide" (2007) N. Engl. J. Med., 356.(15): 1499-1501.
- 36) World Health Organization Department of Non-communicable Disease Surveillance "Definition, diagnosis & classification of diabetes Mellitus & its complications" (1999) WHO.
- 37) Thomas M. Devlin; (Text book of Biochemistry with clinical correlations) (2011) 6th ed. Avtley-Liss ch. 23 p. 891.

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دراسة سريرية لوضع الدرقية عند مرضى بداء السكري من النوع الثاني

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الخلاصة :

ان حقيقة تأثير عمل هورمونات الغدة الدرقية والانسولين ادهم على الاخر يبدو معروفاً ان داء السكري وامراض الدرقية من الامراض الغديه الشائعة بين الناس البالغين في العراق . ويعتبر ارتفاع مستوى الكلوكوز في الدم البادىء على الغدة الدرقية من خلال قياس T_3, T_4 الرئيسي للتلف لبقية انسجة الجسم خلال تطور مرض السكري هدفت الدراسة الحالية الى تقييم تأثير داء السكري نوع الثاني DM2

TSH ومستوى الكلوكوز الصائمي في امصال 26 من المرضى ب DM2 الذين تم تشخيصهم من قبل اطباء

اخصائين في مستشفى الكاظميه التعليمي خلال فترة شباط 2010 الى نيسان 2010 . ثم مقارنة النتائج مع 32 من الاشخاص الاصحاء كمجموعة سيطرة .

بينت نتائج الدراسة ان DM2 اكثر انتشاراً ما بين النساء وباعمار 40-49 سنه بصورة غير ملحوظه $0.05 < P$. واشارت النتائج المختبريه ارتفاع مستويات T_3, T_4 بصورة ملحوظه $0.05 > P$ ما بين المرضى المصابين ب DM2 في حين انخفض مستوى الهورمون النخامي المحفز للدرقية TSH بصورة غير ملحوظه $0.05 < P$ مقارنة بمجموعة السيطرة .

اخيرا عكست الدراسة وجودعلاقه طرديه (موجبه) ما بين مستوى الكلوكوز الصائمي وال نستنتج TSH وعلاقه عكسيه (سالبه) الثاني فان افرازات F.B.GLUOSE مع T_3, T_4 يمكن القول ان المصابين بداء السكري النمط الغدة الدرقية لديهم سوف تزداد وسيصابون (بفرط الدرقية) بمرور الزمن

كلمات مفتاحيه : داء السكري نوع الثاني ,خلل الدرقية ,هرمون T_3, T_4, TSH