ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 04, pp. 29841-29844, April, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EFFECT OF THYROID HORMONE DISORDER ON DIABETES MELLITUS AND HYPERTENSION

***,[1]Elsayed A. M. Shokr, [2]Abdullah E. Alshamari, [2]Khalaf F Alaql, [2]Huwayt A. Alshamari, [2]Khalid T. Alshamari, [2]Meshari F. Alshamari, [2]Ahmed A. Alomaim, [2]Abdullah F. Alsunaitan and [2]Badr F. Alshamari**

*,[1]Physiology Department, Faculty of Medicine, Hail University
*,[1]Physiology Department, CLAR, ARC, Giza, Egypt
[2]Faculty of Medicine, Hail University

ARTICLE INFO

Article History:
Received 01st January, 2016
Received in revised form
11th February, 2016
Accepted 19th March, 2016
Published online 26th April, 2016

Key words:

Thyroid hormones,
Hypertension,
Diabetes, Age.

ABSTRACT

The present work was conducted at the diabetic and hypertention patients that have thyroid disorder. Fifty-diabetic and hypertention patients that have thyroid disorder from three hospitals in Hail, KSA were consecutively selected. Diabetic patients have a higher prevalence of thyroid disorders than the general population, this may influence diabetic management. In this study, we investigated thyroid hormone levels in diabetic and hypertention patients. The subjects in all groups were above 60 years of age. The concentration of thyroid stimulating hormone (TSH), free triiodothyronine (T3) and thyroxine (T4) were evaluated using a Microparticle Enzyme Immunoassay (MEIA) procedure. Patients with type 2 diabetes had significantly lower serum T3 levels (p=0.000). There were no significant differences observed in serum T4 (p=0.339) and TSH (p=0.216) levels between the all subjects. All the diabetic patients had high fasting blood glucose levels. The effect of diabetic and hypertention patients that have thyroid disorder on blood glucose showed that high significant increase on blood glucose with increasing aging. On the other hand there were a significant increase on fasting blood glucose in the population that increase in aging than young one. The liver enzymes AST, ALT and ALP were a significant increase in blood of human in the population that increases in aging and diabetic and hypertention patients that have thyroid disorder than young one. Concerning lipid profile, we noted that variety induced high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder. Results generally showed that increase in aging and diabetic and hypertention patients that have thyroid disorder were always high significant increase in their blood glucose and fasting blood glucose. Also, there is high significant increase in liver functions in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young one and high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young one. We conclude that T3 levels were altered in the diabetic and hypertention patients that have thyroid disorder.

Citation: Elsayed A. M. Shokr, Abdullah E. Alshamari, Khalaf F Alaql, Huwayt A. Alshamari, Khalid T. Alshamari and Meshari F. Alshamari *et al*, 2016. "Effect of thyroid hormone disorder on diabetes mellitus and hypertension", *International Journal of Current Research*, 8, (04), 29841-29844.

INTRODUCTION

Thyroid disease is common in the gen- eral population and the prevalence increases with age (Hegedus *et al,* 1983). Hypothyroid- ism is the most common thyroid disorder in the adult population, especially in older women. It is usually autoimmune in origin, pre- senting as either primary atrophic hypothyroid- ism or Hashimoto's thyroiditis (Kamel, 1999).

Corresponding author: Elsayed A. M. Shokr
*,[1]Physiology Department, Faculty of Medicine, Hail University,
*,[1]Physiology Department, CLAR, ARC, Giza, Egypt

In types 1 and 2 diabetes, the metabo- lism of foodstuff is altered (Briscoe *et al,* 2006). Lack of insulin or insulin resistance prevents the efficient uptake and utilization of glucose by most cells of the body, except those of the brain. As a result, blood glucose concentra- tion increases, cell utilization of glucose de- creases and utilization of fats and proteins in- creases (Briscoe *et al,* 2006; Guyton and Hall, 2006). Diabetes patients have a higher preva- lence of thyroid disorders than the normal population (Wu, 2000). Thyroid disease is found in both types 1 and 2 diabetes. People with type 1 diabetes and underlying autoim- mune disease may have associated thyroid disease (Johnson, 2006). Since thyroid hor- mones regulate metabolism and diabetes can alter metabolism of foodstuff, the metabolism of the organism may

be further affected by the combination of thyroid disease and dia- betes (Bernal and Refeloff, 1977; Notarbartolo *et al*, 1983; Wu, 2000). The association be-tween thyroid dysfunction and poor glycemic control in diabetic patients is not known. We carried out this study in order to evaluate the magnitude of the problem of thyroid dysfunc- tion in diabetic patients. The aim of this work to study the effect of thyroid hormone disorder on the diabetics and hypertention patients and show the changes in blood glucose, fasting blood glucose, liver functions enzymes and variety in the blood lipid profile cholesterol, LDL and HDL.

MATERIALS AND METHODS

This study was conducted at the diabetic and hypertention patients that have thyroid disorder in three hospitals in Hail, KSA. Fifty patients from each hospital with diabetic and hypertention patients that have thyroid disorder in this study. All patients in the study were between 60 and 65 years of age. All had high fasting blood sugar levels. The patients were receiving either oral hypoglycemic agents or insulin according to the severity of the disease. The study was approved by the Ethics Committee and verbal consent was obtained from each study subject before being enrolled in the study. The TSH, T3 and T4 levels for the preserved serum samples were measured using the Abbott AxSYM System (Abbott AxSYM, Abbott Laboratories Diagnostics Division, IL). Blood glucose levels were also measured. These samples were analyzed by using ICP emission instrument on Perkin Elmer ICP-400 at the University of Hail, KSA. Each hospital is represented by 50 blood samples for chemical and blood analysis with a total of 150 samples. Collect the blood samples to determine the Blood liver functions and sugar was measured in capillary blood samples with Lifescan One Touch II ® Glucometer, which has been tested for accuracy and precision against a Beckman Synchron CX7 analyzer of a laboratory that uses the glucose oxidase method.The assays of total cholesterol (TC), HDL-cholesterol, LDL cholesterol and triglycerides (TG) were performed by enzymatic colorimetric methods using kits marketed by Bio Systems, Spain. The blood pressure measured bysemi-automatic-blood-pressure-monitor-arm-67468-104993.

Statistical Analysis

Data were expressed as M ± SD. The SPSS program version 15 was used in analysis. One way analysis of Variance (ANOVA) followed by Duncan post hoc test and/or t-test were used in analysis. Pearson correlation Coefficient was used to study correlations. P-values less than 0.05 were significant.

RESULTS

In this study the diabetic and hypertention patients that have thyroid disorder. Fifty- diabetic and hypertention patients that have thyroid disorder from three hospitals in Hail, KSA were consecutively selected. Diabetic patients have a higher prevalence of thyroid disorders than the general population, this may influence diabetic management. In this study, we investigated thyroid hormone levels in diabetic and hypertention patients. The subjects in all groups were above 60 years of age. The concentration of thyroid stimulating hormone (TSH), free triiodothyronine (T3) and thyroxine (T4) were evaluated using a Microparticle Enzyme Immunoassay (MEIA) procedure. Patients with type 2 diabetes had significantly lower serum T3 levels. There were no significant differences observed in serum T4 and TSH levels between the all subjects. All the diabetic patients had high fasting blood glucose levels. The effect of diabetic and hypertention patients that have thyroid disorder on blood glucose showed that high significant increase on blood glucose with increasing aging. On the other hand there were a significant increase on fasting blood glucose in the population that increase in aging than young one as shown in Table 1.

Table 1. Effect of Thyroid Hormone disorder on blood glucose and Hypertension

Area / Contents	Hospital 1	Hospital 2	Hospital 3
	Mean ± SE	Mean ± SE	Mean ± SE
Hypertention	151 ± 0.54	160 ± 0.36	161 ± 0.45
Glucose	7.31 ± 0.51	10.23 ± 0.63	9.54 ± 0. 29
TSH (IU/ml)	1.8 ± 0.12	1.52 ± 0.56	1.45 ± 0.18
FT3 (pmol/l)	1.62 ± 0.74	2.11 ± 0.21	2.22 ± 0.36
FT4 (pmol/l)	12.22 ± 0.89	12.98 ± 0.85	13.11 ± 0.71
Ratio FT3/FT4	0.13 ± 0. 83	0.16 ± 0. 24	0.17 ± 0.51

Table 2 showed that there were a significant increase on fasting blood glucose in the population that increase in aging and the diabetic and hypertention patients that have thyroid disorder than young one.

Table 2. Effect of Thyroid Hormone disorder on fasting blood glucose

Area /Contents	Hospital 1	Hospital 2	Hospital 3
	Mean ± SE	Mean ± SE	Mean ± SE
Age	62 ± 0.12	60 ± 0.22	65 ± 0.52
Height (cm)	163.88 ± 0.64	154.96 ± 0.43	165.88 ± 0.64
Weight (kg)	58.86 ± 0.97	51.71 ± 0.90	58.86 ± 0.97
BMI (kg/m2)	21.90 ± 0.73	21.57 ± 0.08	22.51 ± 0.73
FBG (mmol/l)	8.31 ± 0.44	9.15± 0.12	7.51 ± 0.24

Table 3 revealed that the liver enzymes AST, ALT and ALP were a significant increase in blood of human in the population that increases in aging and diabetic and hypertention patients that have thyroid disorder than young one.

Table 3. Effect of Thyroid Hormone disorder on the liver functions enzymes AST, ALT and ALP

Area /Contents	Hospital 1	Hospital 2	Hospital 3
	Mean ± SE	Mean ± SE	Mean ± SE
AST	22.04 ± 0.012	25.66 ± 0.667	29.28 ± 0.201
ALT	29.54 ± 0.331	34.66 ± 0.667	39.83 ± 0.088
ALP	65.28 ± 0.421	71.66 ± 0.667	74.83 ± 0.132

Concerning lipid profile, we noted that variety induced high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder as shown in table 4. Results generally showed that increase in aging and diabetic and hypertention patients that have thyroid disorder were always high significant increase in their blood glucose and fasting blood glucose. Also, there is high significant increase in liver functions in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young

one and high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young one. We conclude that T3 levels were altered in the diabetic and hypertention patients that have thyroid disorder.

Table 4. Effect of Thyroid Hormone disorder on the triglycerides, LDL, HDL and cholesterol

Area /Contents	Hospital 1	Hospital 2	Hospital 3
	Mean ± SE	Mean ± SE	Mean ± SE
Cholesterol	4.694 ± 0.85	5.63 ± 0.3333	6.31± 0.8945
Triglyceride	1.362 ± 0.321	1.81 ± 0.6667	1.85 ± 0.4965
LDL	2.944 ± 0.235	2.17 ± 0.3333	2.86 ± 0.2906
HDL	1.096 ± 0.05	0.85 ± 0.3333	0.93 ± 0.2742

DISCUSSION

In this study the diabetic and hypertention patients that have thyroid disorder. Fifty- diabetic and hypertention patients that have thyroid disorder from three hospitals in Hail, KSA were consecutively selected. Diabetic patients have a higher prevalence of thyroid disorders than the general population, this may influence diabetic management. In this study, we investigated thyroid hormone levels in diabetic and hypertention patients. The subjects in all groups were above 60 years of age. The concentration of thyroid stimulating hormone (TSH), free triiodothyronine (T3) and thyroxine (T4) were evaluated using a Microparticle Enzyme Immunoassay (MEIA) procedure. Patients with type 2 diabetes had significantly lower serum T3 levels. There were no significant differences observed in serum T4 and TSH levels between the all subjects. All the diabetic patients had high fasting blood glucose levels. The effect of diabetic and hypertention patients that have thyroid disorder on blood glucose showed that high significant increase on blood glucose with increasing aging. On the other hand there were a significant increase on fasting blood glucose in the population that increase in aging and the diabetic and hypertention patients that have thyroid disorder. Although we could not measure the re- verse T3 (rT3) level, previous reports have shown that rT3 and FT3 levels may be altered by other conditions (Eftekhari *et al,* 2006; Zoccali *et al,* 2006; Pinelli *et al,* 2007). A study by Saunders *et al* (1978) also showed a significantly higher T4:T3 ratio in patients when compared with normal controls. Our study also showed a significantly different T3:T4 ratio between the diabetic and hypertention patients that have thyroid disorder. Avogaro, *et al*., 1967 reported that in both dia- betic groups (IDDM and NIDDM) T3 levels may be lower, with a corresponding rise in the rT3 level and a normal T4 level, which may be related to the uncontrolled diabetic conditions found in our diabetic patients (Schlienger *et al,* 1982).

Our study corroborates the findings of Schlienger *et al* (1982) who showed a sig- nificant decrease in T3 levels in NIDDM pa- tients. Our study there were a significant increase on fasting blood glucose in the population that increase in aging and the diabetic and hypertention patients that have thyroid disorder than young one. The liver enzymes AST, ALT and ALP were a significant increase in blood of human in the population that increases in aging and diabetic and hypertention patients that have thyroid disorder than young one (elsayed shokr, 2016 and Schlienger *et al,* 1982).). We noted that variety induced high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder. Results generally showed that increase in aging and diabetic and hypertention patients that have thyroid disorder were always high significant increase in their blood glucose and fasting blood glucose. Also, there is high significant increase in liver functions in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young one and high significant variation of different lipid parameters in the population that increase in aging and diabetic and hypertention patients that have thyroid disorder than young one. We conclude that T3 levels were altered in the diabetic and hypertention patients that have thyroid disorder as reported by Schlienger *et al,* 1982. The aim of this work to study the effect of thyroid hormone disorder on the diabetics and hypertention patients and show the changes in blood glucose, fasting blood glucose, liver functions enzymes and variety in the blood lipid profile cholesterol, LDL and HDL.

Conclusion

We conclude that alteration of thyroid hormones is a common feature in diabetic patients. Glycemic control is important for the management of diabetes. Further study is needed to compare thyroid hormone levels and thyroid antibodies in diabetic patients. Glycosylated hemoglobin levels would need to be measured to evaluate the level of control of diabetes. A reverse T3 level should also be determined to further evaluate the degree of thyroid abnormalities in the study and control groups.

Acknowledgements

We are grateful to physiology department Faculty of Medicine Hail University, for their support with instruments for analysis of blood samples and funding.

REFERENCES

Avogaro P, Crepaldi G, Enzi G, Tiengo A. Association of hyperlipe- demia, diabetes mellitus, and mild obesity. Acta Diabetol Lat, 1967,

Bernal J, Refetoff S. The action of thyroid hormone.Clin Endocrinol 1977; 6: 227-49.

Briscoe VJ, Davis SN. Hypoglycemia in type 1 and type 2 diabetes: physiology, pathophysiology, and management. Clin Diabetes 2006; 24: 115-21.

Eftekhari, M.H., Keshavarz, S.A., Jalali, M., Elguero, E., Eshraghian, M.R., Simondon, K.B. The relationship between iron status and thyroid hormone con-centration in iron-deficient adolescent Iranian girls. *Asia Pac J Clin Nutr* 2006; 15: 50-5

Elsayed A. M. Shokr, *et al*., (2016). Chronic Renal Failure Associated with Heavy Metal Contamination of Drinking Water in Hail, KSA. Global Advanced Research Journal of Medicine and Medical Sciences (ISSN: 2315-5159) Vol. 5(1) pp. 006-013,

Guyton AC, Hall JE. Textbook of medical physiology.11th ed. New Delhi: Elsevier, 2006: 972-7.

Hegedus L, Perrild H, Poulsen LR, *et al*. The deter- mination of thyroid volume by ultrasound and its relationship to body weight, age, and sex in normal subjects. J Clin Endocrinol Metab 1983; 56: 260-3.

Johnson JL. Diabetes control in thyroid disease.Diabetes Spect 2006; 19: 148-53.

Kamel HK. Hypothyroidism in the elderly. Clin Geriatr 1999; 7: 1070-389.

Notarbartolo A, Rini G, Licata G, *et al*. Correlation between different degree and duration of metabolic control and thyroid hormone levels in type 1 and type 2 diabetics. Acta Diabetol 1983; 20: 341-6.

Pinelli M, Bindi M, Cassetti G, *et al*. Relationship between low T3 syndrome and NT-proBNP levels in non-cardiac patients. Acta Cardiol 2007; 62: 19-24.

Saunders J, Hall SHE, Sonksen PH. Thyroid hor- mones in insulin requiring diabetes before and after treatment. Diabetologia 1978; 15: 29-32.

Schlienger JL, Anceau A, Ghabrier G, North ML, Stephan F. Effect of diabetic control on the level of circulating thyroid hormones. Diabetologia 1982; 22: 486-8.

Wu P. Thyroid disease and diabetes. Clin Diabetes 2000; 18: 38.

Zoccali C, Benedetto F, Mallamaci F, *et al*. 2006. Low tri-iodothyronine and cardiomyopathy in pa- tients with end-stage renal disease. *J Hypertens*; 24: 2039-46.

****