The Effect of pulmonary tuberculosis and short course treatment on some hormones of patients women

Duaa Hamad Hamza, Kadam Mohammad Sabee

Abstract

The objective of this study was to investigate the changes that occurred on some hormones of patients women with pulmonary tuberculosis and the side effects of anti-tuberculosis drugs which used in Directed Observed Treatment Short course (DOTS) on some hormones. The study included follow-up (100) cases from the women who suffer from Pulmonary tuberculosis disease (before treatment ,after two months of treatment and after six months of treatment) , and the results were compared to control group composed of (100) healthy women , the patients groups and control group ages were ranged (21-60)years old .The results of this study showed non-significant differences at ($p>0.05$) in TSH levels of all groups patients as compared between them or as compared with control. also the results indicated non-significant differences at ($p>0.05$) in T4 and T3 levels of before treatment patients group as compared with control but the results indicated a significant decrease at ($P<0.05$) in T4 and T3 levels of after treatment patients groups (after two months of treatment group and after six months of treatment group) as compared with the control group or as compared with before treatment patients group. Also the results showed a significant decrease at ($P<0.05$) in T4 and T3 levels of after six months of treatment patients group as compared with after two months of treatment patients group. Our results indicated a significant decrease at($P<0.05$) in EPO level of before treatment patients group as compared with control group but the results recorded non-significant differences at ($p>0.05$) in EPO levels of after treatment patients groups (after two months of treatment group and after six months of treatment group) as compared with control group. Also the results recorded non-significant differences at ($p>0.05$) in EPO levels of after six months of treatment patients group as compared with after two months of treatment patients group.

Keywords: Pulmonary tuberculosis, Short course treatment, TSH, T4, T3, EPO, ELISA

* Correspondence author: salammm8970@yahoo.com
[1]Department of Biology/College of Science/Al-Muthanna University
Samawah, Iraq
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Introduction

Pulmonary tuberculosis disease caused many effects in the general physiology of the body in humans, as well as length of treatment with antituberculosis drugs that continue for several months and doses are relatively high, the multiplicity of these medications and frequent side effects that cause many hormonal and biochemical disorders in the body, which may cause physiological disease such as hypothyroidism (9,10).

Materials and methods

This study included follow-up (100) cases of women who suffer from Pulmonary tuberculosis disease (before taking the treatment, after two months of taking treatment and after six months of taking treatment), the patients groups ages were ranged (21-60) years old.
The study was carried out in (the Consultant on Clinic for respiratory and Chest diseases, the feminine and children teaching hospital laboratories and public health laboratory) in Al-Muthanna province. 5-ml was drawn from each patients in three time (before treatment, after 2 months of treatment and after 6 months of treatment). The blood samples allowed to coagulate at room temperature for (15-20) minutes then centrifuged at 3000 rpm for 10 min for separate on of serum. then frozen at (20 °C) until collected sufficient number for performing ELISA technique to estimate the hormones. Thyroid stimulating hormone(TSH), tetraiodothyronine (T4) andtriiodo thyronine (T3) levels were determined by (ELISA) technique using a kits provided by Monobind Inc, USA. The absorbance was read at wavelength (450nm) (11,12). Erythropoietin (EPO) levels were determined by (ELISA) technique using a kit providedby Elabscience, China. The absorbance was read at wavelength (450 nm).

Statistical analysis

In this thesis, several statistical tests were used to find the significant differences among the studied parameters of patients with PTB or between the studied parameters of patients with PTB and control group at ($P<0.05$) level of significance. This study designed by completely randomized design (CRD) that used in the analysis of variance for data by using one-way ANOVA test, independent t-test and treatment means were compared using the least significant difference (LSD) at ($P<0.05$) level of significance. Data were processed and analyzed by using statisticalprogram social science (SPSS 22) and the results were expressed as Mean±SD (13).

Results and Discussion

The results of this study showed non- significant differences at (p>0.05) in TSH levels of all groups patients(before treatment group, after two months of treatment group and after six months of treatment group) as compared with control group, also the results showed non-significant differences at (p>0.05) in T4 and T3 levels between before treatment patients group and the control group, but the results indicated a significant decrease at (P<0.05) in T4 and T3 levels of after treatment patients groups(after two months of treatment group and after six months of treatment group) as compared with control group, Table (1).

The results indicated a significant decrease at(P<0.05) in EPO level of before treatment patients group as compared with control group, but our results showed non-significant differences at(p>0.05) in EPO levels of after treatment patients groups (after two months of treatment group and after six months of treatment group) and control group, table (1).

Table 1.

The change in some hormonal parameters of patients groups as compared with control group

Control	After 6 months of treatment	After 2 months of treatment	Before Treatment	Hormonal parameters
2.6±0.55	2.65±0.58	2.6±0.57	2.66±0.6	TSH (µIU/ml)
5.24±1.35	*2.17±0.94	*3.24±0.85	5.35±1.55	T4 (µg/dl)
1.54±0.45	*0.44±0.25	*0.8±0.22	1.5±0.3	T3 (ng/dl)
±11.2 62.2	61.5±12.2	60.1±12.6	*22.9±9.5	EPO (Pg/ml)

*represent significant difference between control and PTB patients groups (p<0.05), the results are shown as a Mean±SD.

The results of this study indicated non-significant differences at P>0.05), in TSH levels between patients group (before treatment group, after two months of treatment group and after six months of treatment group), table 2, figure 1. Our results showed a significant decrease at (P<0.05) in T4 and T3 levels of after treatment patients groups(after two months of treatment group and after six months of treatment group) as compared with before treatment patients group. Also,

the results showed a significant decrease at (P<0.05) in T4 and T3 levels of after six months of treatment patients group as compared with after two months of treatment patients group, table (2), figure (1). The results indicated a significant increase at (P<0.05) in EPO levels of after treatment patients groups (after two months of treatment group and after six months of treatment group) as compared with before treatment patients group, but our results showed non-significant differences at (p>0.05) in EPO levels of after six months of treatment patients group as compared with after two months of treatment patients group table (2), figure (2).

Table (2).

Comparison of some hormonal parameters between patients groups.

Hormone parameters	Before Treatment	After 2 months of treatment	After 6 months of treatment
TSH (µlU/ml)	2.66±0.6	2.6±0.57	2.65±0.58
T4 ** (µg/dl)	5.35±1.55	3.24±0.85	2.17±0.94
T3 ** (ng/dl)	1.5±0.3	0.8±0.22	0.44±0.25
EPO * (Pg/ml)	22.9±9.5	60.1±12.6	61.5±12.2

*represents a significant difference between group after treatment patients groups (after two months of treatment group and after six months of treatment group) and before treatment patients group at (p<0.05), the results are shown as a Mean±SD.** represents the significant differences between all patients groups (before treatment patients group, after two months of treatment group and after six months of treatment group) at (p<0.05), the results are shown as a Mean±SD.

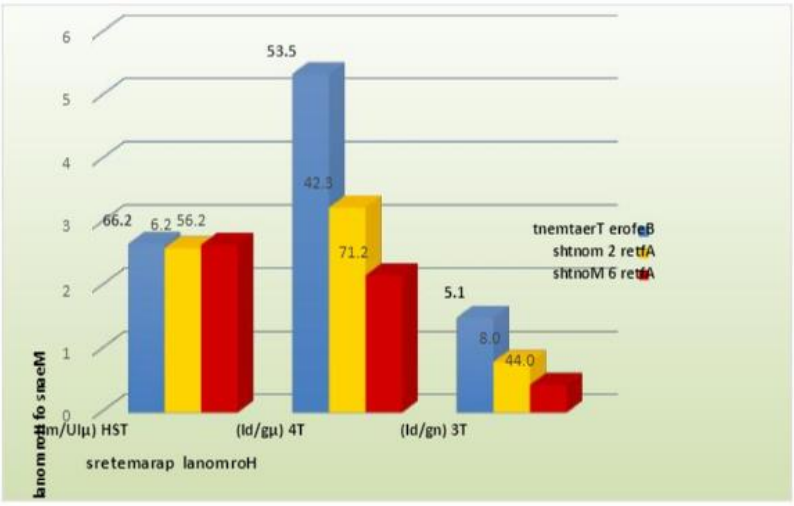

Figure 1.

Comparison of some hormonal parameter between patients groups

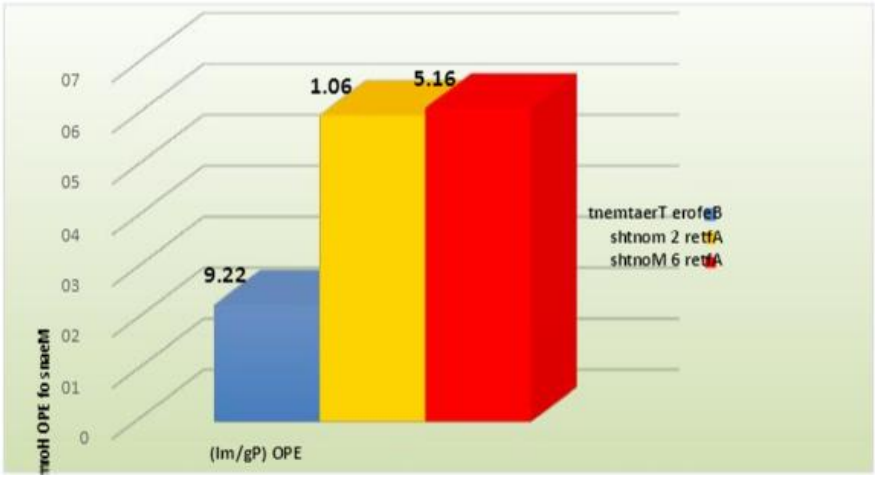

Figure 2.

Comparison of EPO levels between patients groups.

Results of the present study showed non-significant differences in TSH levels between all groups of patients (before treatment group, after two months of treatment group and after six months of treatment group) and control group also, there are no significant differences when compared between groups of patients. This result is agreement with (14) but disagreement with (15,10). These results may be due to Pulmonary tuberculosis disease and antituberculosis drugs don't effect on hypothalamus gland and TRH receptor on pituitary gland. Hypothalamus gland secreted thyrotropin releasing hormone(TRH), TRH regulated the secretion of thyroid stimulating hormone (TSH) from pituitary gland by binding to TRH receptor on pituitary gland (16). The results showed non-significant differences in T4 and T3 levels between before treatment patients group and the control group, this result is agreement with (17) but disagreement with (18). This result may be due to of Pulmonary tuberculosis disease does not effect on (hypothalamus-pituitary-thyroid axis), these axis regulated the secretion of T4 andT3from thyroid gland, hypothalamus senses when levels of T3 and T4 are low, it releases thyrotropin releasing hormone (TRH), this hormone stimulates the pituitary to secret thyroid stimulating hormone (TSH).TSH is released from the pituitary gland into blood stream and travels to the thyroid gland, TSH stimulate thyroid gland to secretT3 and T4, the mechanism of secreted thyroid hormones called negative feedback (19). The results obtained in this study indicated a significant decrease in T4 and T3levels of after treatment patients groups (after two months of treatment group and after six months of treatment group) as compared with before treatment patients group and control group, also the results show significant decrease in T4 and

T3 levels of after treatment six month patients groups as compared with after treatment two month patients group. These results are agreement with (20,21) but disagreement with (17). These results may be due to antituberculosis drugs especially Rifampicin effect on TSH receptor on thyroid gland. So TSH cannot link to TSH receptor on thyroidgland, this lead to does not stimulating thyroid gland by TSH to secreted T4 and T3, therefor decreased T4 and T3 levels and occurrence hypothyroidism (22).

The decline in T4 and T3 levels in these results may be due to effect anti-tuberculosis drugs on iodide trapping in thyroid gland, this effect lead to prevent or decreased from iodine entry to inside thyroid gland for synthesis T4 and T3. Hill et al., (1995) found the treatment of pulmonary tuberculosis (Isoniazid, Rifampicin, Pyrazinamid and Ethambutol) acted on increased binding T4and T3 to proteins (thyroxinbinding globulin, transthyretin, and albumin). So to prevent their liberation and decrease T4 and T3 levels in the blood. The effect of anti-tuberculosis drugs on the thyroid gland increased with the progress of the treatment period (24). Generally, drugs may effect on thyroid homeostasis at four various levels: inhibition synthesis or secretion of thyroid hormone, change the serum concentrations of thyroid hormones by act on increased binding thyroid hormones to the proteins, the drugs effect by competing for their hormone binding sites, and drugs may interfere with hormones action at the target tissue (25). Results of the present study showed a significant decrease in EPO level of before treatment patients group as compared with control group, this result is agreement with (26). The decline in EPO levels in these results may be due to invasion of bacteria leads to stimulation of T-lymphocytes and macrophages, which induce the production of the cytokines like interferon gamma (INF-gamma), tumor necrosis factor-alpha (TNF-alpha), interleukin-1 (IL-1) and interleukin-6 (IL-6), these cytokines will caused inhibit the production of erythropoietin (27).

The results showed non-significant differences in EPO levels of after treatment patients groups and control group, also our results indicated that a significant increase EPO levels of after treatment patients groups as compared with before treatment patients group, these results are used as markers reflecting response to treatment and the ability of therapy to inhibit or kill Mycobacteria tuberculosis, this lead to reduced production cytokins from T-lymphocytes and macrophages, therefore EPO will return to normal level.

Conclusion:

Pulmonary tuberculosis disease and antituberculosis drugs do not effect on thyroid stimulating hormone level; there were a great side effect of anti-tuberculosis drugs on thyroid

hormones (Tetraiodothyronine and Ttriiodothyronine hormones); Pulmonary tuberculosis disease caused a greater decrease in erythropoieten hormone level in patients with pulmonary tuberculosis before taking treatment; erythropoieten hormone returned to normal value in patients with pulmonary tuberculosis after taking anti-tuberculosis drugs.

References

1. Lo Bue A, Moser KS. Use of isoniazid for latent tuberculosis infection in a public health clinic. JAm.J.Respir.Crit.Care Med.J; 2003;168(4):443-447.
2. Ilic M, Kuruc V, Pavlovic S, et al. Tuberculosis in a developing country how much patients know about disease.Central Eup. J. of Med. 2012;1-9.
3. Neilson AA, Mayer CA. Tuberculosis--prevention in travelers. Australian Family Physician 2010;39(10):743-50.
4. Kumar V, Abbas AK, Fausto N, Mitchell RN. Robbins Basic Pathology (8th ed.). Saunders Elsevier. 2007;P.P. 516–522.
5. Lawn SD, Zumla AI. Tuberculosis. Lancet 2011;378(9785):57-72.
6. Harvey RA .Lippincott's illustrated reviews:pharmacology (4thinternationalEd.) Recherche 2008;67:02.
7. Donlan R, Costerton J. Biofilm : survival mechanisms of clinically relevant microorganisms. Clin. Microbiol. Rev. 2002;15:167-193.
8. Rieder HL. Interventions for tuberculosis control and elimination. Paris,France: International Union Against Tuberculosis and Lung Diseases 2002; 15–93.
9. Charles M, Arthur B, Neel H. The Hematological and Biochemical Changes in Severe Pulmonary Tuberculosis.Q.J.M.:An International Journal of Medicine 1989 73(3): 1151-1159.
10. Takasu N, Kinjou Y, Kouki T, et al. Rifampin-induced hypothyroidism. J .Endo. Invest 2006;29(7):645-9.
11. Braverman LE. Evalution of thyroid status in patients with thyrotoxicosis. Clin. Chem 1996;42(1): 174-178.
12. Mazzafferi EL, Gharib H. Thyroxine superessive therapy in patientswith nodular thyroid disease . Ann. Intem. Med 1998;128:386-394.
13. McDonald JH. 2014. Handbook of Biological Statistics. 3rded. USA: Sparky House Publishing.
14. Sajid KM, Parveen R, Sabih DE, Mahmood R. Thyroid function in pulmonary tuberculosis. J. Coll. Physi. Surg. Pak 2006;16(10):633-6.
15. Lam KS, Sham MM, Tam SC. Hypopituitarism after tuberculous meningitis in childhood. Intern. Med 1993;118:701-6.
16. David B Mulier, Tomoko Zhang, Jill Risau, Petr Folkman, Ling Yao. Manipulation of angiogenesis and clinical applications. American Journal of BioMedicine 2015;3: 100-110.
17. Ilias I, Tselebis A, Boufas A, Panoutsopoulos G, Filippou N, Christakopoulou J. Pulmonary tuberculosis and its therapy do notsignificantly affect thyroid function tests. Int. J. Clin. Pract.1998;52(4):8.
18. Khan EM, Haque I, Pandey R, Mishra SK, Sharma AK. Tuberculosis of the thyroid gland: a clinicopathological profile of fourcases and review of the literature. Aust N. Z. J. Surg1993;63:807-10.

19. Bedoya MF, Hegeman MA, Rovere MG, Bron A, Fukumoto J. Role of IL-8 polymorphisms of gene in HIV patients in South Africa. American Journal of BioMedicine 2015;3(5):220-231.
20. Matveyeva SL. The Influence of Antituberculosis Chemotherapy on theThyroid Function // Collection of scientific publications of Main MilitarClinicalCentre"MMCH" of Health ministry of Ukraine «Modern Aspects ofMilitary Medicine», Kiiv 2010;17: 264-270.
21. Matveyeva SL. Comparative Study of Thyroid State In New Cases OfPulmonary Tuberculosis And Tuberculosis Cases Treated Previously. Inter.J.collegas 2014;1(1).
22. Slimani H, Zhai Y, Ao L, Zeng Q, Fullerton DA, Meng X. Enhanced monocyte chemoattractant protein-1 production in aging mice exaggerates cardiac depression during endotoxemia. Critical Care 2014;18 (5):527.
23. Hill AR, Schmidt MF, Schussler GC. Rapid changes in thyroid function on testsupon treatment of tuberculosis. Tuber Lung Dis1995;76:223-9.
24.Kim DL, Song KH, Lee JH, Lee KY, Kim SK. Rifampin-induced hypothyroidism without underlying thyroid disease. See comment in PubMedCommons below thyroid. 2007;17(8):793-5.
25.History of Traumatic Brain Injury (TBI). American Journal of BioMedicine 2015;3(7):381-409.
26.Ebrahim O, Folb PI, Robson SC, Jacob P. Blunted erythropoietinresponse to anaemia in tuberculosis. Eup. J.of haemato 1995; 55(4):251-254.
27.Jelkman W. Proinflammatory cytokines lowering erythropoietin production. J.inter. cyto.1998;18(8):555-9.