The Consequences of Heavy Metals Resulting from Terrorist Operations in Three Regions of Baghdad, Iraq on Thyroid Function

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Abstract

The heavy metals mercury (Hg), lead (Pb) and cadmium (Cd) are widely known of being toxicants. exposure to a variety of dangerous toxic effects has been attached in all humans.in this paper the effect of terrorist operation on thyroid gland functions in a sample of Iraqi individual (Al-karradah and Abo-Gharib) comparison with Al-jadria rejoin as (control). the correlation between sera thyroid hormones thyroxine T4, triiodothyronine T3, Thyrotropin TSH and Thyroglobulin-Ab (Tg-Ab) and the levels-of lead, cadmium, also mercury have-been measured. 75 volunteers from three Iraqi areas were included in this study. our examination proposes an inverse relationship between Hg presentation and thyroid hormones, a positive correlation between Cd exposure and thyroid hormones, but the associations with Pb was negative. there were significant positive correlations between the heavy metals themselves. In this manner, increased heavy metals exposure might be a factor in the etiology of hypothyroidism diseases and thyroid gland function. the result of this study showed that the effect of heavy metals (blood serum Hg, blood serum Pb, blood serum Cd) on thyroid hormones, and the effect of military and terrorist operations on the thyroid gland. In the end we concluded that the heavy elements resulting from the explosions and terrorist operations in the area of (Al-karadah, Abo-Gharib) high compared with the control (Al-jadria), this leads to many diseases on the health of the human body and also the effect of heavy elements on the thyroid gland and its negative effect on thyroid hormones and cause thyroid disease. [DOI: 10.22401/JNUS.21.2.02]

Keywords: cadmium, heavy metals, lead, mercury, thyroid hormones, Thyroglobuline-Ab, pollution, Baghdad area.

Introduction

A focal factor recognizing psychological warfare from other significant sorts of viciousness or terrorizing is that it is generally centered by the culprits around particular high esteem targets, by its extremely nature, the harms from fear based oppression go past the prompt death toll, human wellbeing,air contamination, and property. Accordingly, an investigation of the impacts of psychological warfare on the ecological ailment, even if people are exposed to direct dangers, direct exposure to radiation, leads to risk of certain cancers, like as leukemia and thyroid cancer. It has been destroyed the lives of a number of people are much greater than justified time [(1)]. The study of pollution is very important to keep human in health.

Pollutant (Toxin) is any substance influencing the earth by human exercises that could have risky effects on human wellbeing, harm living assets, and biological systems. ecological wellsprings of cadmium poisonous quality incorporate nourishments, for example, ocean bottom, vegetables and grains, Indian restorative herbs, natural wellsprings of mercury incorporate tainted fresh water angle[(2)]. Studies of the effects of metal contamination in any type of environmental pollution might adjust -(TH),level by- various -mechanism, contains,,- disorder -of TH-peroxidases, TH-–restricting-protein, hepatic-catabolism, receptor-binding –de-iodinases, disorder of iodine- transports, increased.-TH gland-length due to-increased-absorption-of iodine, thyroid dysfunction, endocrine-disorders and-the-impacts of toxic metal contamination on thyroid function. minerals containing toxins that negatively affect health, such as lead and mercury and some metals such as cadmium, which is deposited in the body and is difficult to get rid of. Naturally occurring, and temporal poisons that are concentrated in heavy metals pose a danger to enzymes and inhibit their function.[(3)]

Cadmium (Cd) is considered a group one carcinogen in prostate, testicles, and lungs. Cd accumulates in kidneys, thyroid,pancreas, and

liver. In chronic Cd toxicity, multinodular goiter and thyroglobulin hyposecretion and revealed through air contamination and water contamination, nourishment developed in polluted soil, tobacco smoke and water contamination. There are various examinations binding thyroid disease to cadmium exposure[4]. A study in Germany 636 children had their human serum tested for TH and association human serum levels of toxic metals. It was determined that children with alterations in TH had high human serum levels of cadmium.[5]

Mercury (Hg) is also linked to thyroid disease in women and children, mercury is a standout amongst the most dangerous metals in the earth and speaks to a noteworthy risk to human and ecological well-being, extreme exposure can cause neurological issues, with symptoms including subjective, memory misfortune, neuromuscular impacts, cerebral pains, tremors and dazedness, mercury is linked to alterations in thyroid hormones via the mechanism of depleting selenium. Se is a metal that is needed for proper thyroid and immune system function.[6]

Lead (Pb) is another toxic metal which provided to every day through our food, air, coal burning, manufacturing of batteries, and water. which adversely affects thyroid gland function and structure; it too is linked to thyroid disorders in many studies. one of note shows how sensitive a female hormonal system is compared to male. female hormones appear to be more interconnected than male hormones. for example, many of female increase thyroid disease during pregnancy lead to increases in estrogens and progest-erone. one study compared female and male human serum levels of lead and mercury to alterations in thyroid hormones and found female were more affected by the toxic metals[7]. A critical concentration in clinical thyroid disease is to identify and assess thyroid disease at the soonest organizes unusual thyroid capacity recognized in a relationship with an ecological exposure is normally thought to be an immediate impact of the operator. The dysfunction of the thyroid, in any case, could be because of the operator activating immune system thyroid disease[8]. Regions of (Fallujah and Basrah) two heavily bombarded cities by terrorist attacks and explosions, are both highly polluted toxic metals like as, Hg and Pb, the resulting contamination is causing, a high number of dangerous diseases throughout Iraq[9]. The three most poison metals in nature are cadmium, lead and mercury. This current examination's objective was to limit the known variables of blood Hg, blood Pb, blood Cd and thyroid hormones and the effect of military and terrorist operations in three regions of Baghdad, Iraq on thyroid function.

Materials and Methods

The present study comprised of 75 individual (40 Female and 35 Male) no symptoms of thyroid disease or any endocrine disease and an individual must be nonsmoker and pregnant women. The studied group was divided into three subgroups [Al-Jadria group (control group) (25), Al-karradah group (25) Abo-Gharib(25)] aged between 15–65 years. blood samples were collected from individual in three hospitals, 1) Abdul Majeed private hospital 2) Abu Ghraib General Hospital 3) Jadria Health Center. samples were hospitalized at laboratories in the Abdul Majeed private hospital. the samples were collected from October 2016 to February 2017. blood samples were collected (5 ml) and centrifuged at [4000 rpm] for 10 min after clotting, to separate the serum from the cells to determine human serum lead, mercury, and cadmium levels. the resultant serum was separated and stored at [-20]°C until time of analyses. Patients with endocrine disease were excluded. human serum thyroxine (T4), Thyrotropin (TSH), triiodothyronine (T3) and Thyroglobulin-Ab (Tg-Ab) were measured using by (ELISA) an enzyme-linked- immune-sorbent assay kit (Sandwich) technologies for individual in three hospitals using commercially available kits T3, T4, TSH, and Tg-Ab (Human, Germany).

Measurement of human serum lead, mercury and cadmium [10]

Lead, Mercury and Cadmium were determined using furnace _Atomic _absorption spectrophotometer (Analytica Jen, Germany). it is an analytical method based on absorbing the ultraviolet and visible light by atoms of material in the gas state. and the sample is converted to atoms bypass the sample solution

to the furnace as in the form of a spray. all sera samples of the studied group were digested by 5 ml of Triton X-100 (10%) was added in 50 ml of distilled water and 1ml HNO_3 (conc.) then Ammonium dihydrogen phosphate (20%): 20gms of ammonium dihydrogen phosphate were weighted and dissolved in 100ml of distilled water with a volume of 25ml of Triton X-100 (10%), 5ml of ammonium dihydrogen phosphate (20%) and drops of HNO3 (conc) were mixed in a volumetric flask (1000ml), the volume completed to the sign with distilled water and finally nine ml of the above solution were added to one ml of each sample then lead,,mercury and,cadmium were determined using furnace _atomic _absorption.

Statistical Analysis

Statistical analysis of-data,-was-performed-using-**SAS**-(**System- version 9.1**). One-way ANOVA and Least significant differences (LSD) post hoc test were performed to assess significant differences among means. *P value* < 0.05 was-considered, factually significances.

Results and Discussion

Concentration of lead,-cadmium and-mercury were measured in the sera of three studied groups as shown in table 1. as shows that the lead, mercury and cadmium levels have high- significant different (*p <0.0001)* in the Al-Karradah group and Al-jadria group, as well as high- significant different *(P<0.0001)* between Abo-Gharib group and AL-jadria group, and finally significant different between al-karradah group and abo-Gharib group.

Comparison of heavy metals in pollutants areas (Al-karadah, Abo-Gharib) and controls (Al-Jadria group) showed that the Pb, Hg and Cd levels of AL-Karradah group were higher than the control group Pb(52.41±0.81 µg/L vs. controls 42.73±1.02 µg/L, *P<0.0001*). respectively; Hg (2.82±0.12 µg/L vs. controls 2.09±0.12 µg/L, P <0.0001) and Cd (107.02±2.33 µg/L vs. 75.99±2.05 µg/L, *P<0.0001*) and also Pb, Hg and Cd levels of the Abo.Gharib group was higher Pb (47.13±0.41 µg/L vs. 42.73±1.02 µg/L, *P<0.0001*). respectively: Hg (3.88±0.17 µg/L vs.2.09±0.12 µg/L, *P<0.0001*) and Cd (94.47±0.76 µg/L vs. 75.99±2.05 µg/L, *P<0.0001*).

Lead lesion causes not only functional, but also structural changes in various organs, for example, liver dysfunctions, nervous in numerous organs, for example, renal dysfunction, thyroid dysfunction, nervous system disorders, hematological changes, and glucose digestion anomalies, likewise-Pb negatively effect on excretion, biolo-gical activities of TH-and stress-hormone attached digestion and production. in concurrence with existing study, Thyrotropin blood elevated in the levels of workers expos-ed to Pb –and source-of-lead.[11].

Table (1)

Mean values, standard error, (mean ± standard error), maximum, minimum and standard-deviation of Pb, Cd and Hg levels in the human serum from three different hospitals in Baghdad.

Region	Pb(µg/L)	Hg(µg/L)	Cd(µg/L)
Al-Karadah **Min-Max** **STD**	52.41±0.81a (50.30-55.80) 2.00	2.82±0.12b (2.27-3.12) 0.30	107.02±2.33a (99.32-114.11) 5.72
Abo-Gharib **Min-Max** **STD**	47.13±0.41b (45.90-48.70) 1.00	3.88±0.17a (3.25-4.50) 0.42	94.47±0.76b (91.93-96.54) 1.88
Al-Jadria **Min-Max** **STD**	42.73±1.02c (39.80-45.50) 2.51	2.09±0.12c (1.55-2.43) 0.31	75.99±2.05c (68.68-82.56) 5.02
LSD	2.3929	0.4305	5.5718
P	<0.0001	<0.0001	<0.0001

Means with different letters in the same _column significantly different
Pb: Lead / Cd: Cadmium / Hg: Mercury
LSD: Least significant differences / STD: standard deviation.

Table (2) shows the means, standard-deviation, maximum and minimum of thyroxine (T4), Thyrotropin (TSH) triiodothyronine (T3), and Thyroglobulin-Ab (Tg-Ab) for the three studied groups. results in Table (2) showed that the serum T3 and Thyrotropin levels were similar across each group (*P>0.05*) as compared to T4 of Al-Jadria controls. comparison of thyroid hormones in pollutants areas (Al-karadah, Abo-Gharib) and (Al-Jadria) controls as shown that T3 and TSH levels were not significantly differences between both groups Al-Karradah and Al-Jadria control; T3 (1.13±0.07 ng/ml vs. control: 1.13±0.04 ng/mL, *P=0.44*) respectively.; TSH (2.20±0.30 mIU/l vs. control: 1.98±0.23 mIU/l, *P=0.43*) also shown that The T3 and TSH levels were not significantly differences between both groups Abo.Gharib and Al-Jadria controls:T3 (1.28±0.08 ng/ml vs. control: 1.13±0.04 ng/mL, *P=0.44*). respectively; TSH (2.06±0.26 mIU/l vs. control: 1.98±0.23 mIU/l, *P=0.43*). and showed that similar Thyroglobulin-Ab (Tg-Ab) compared to AL-Jadria controls.

Comparison of thyroid hormones in pollutants areas (Al-karadah, Abo-Gharib) and (Al-Jadria) controls as for T4 Levels were significant statistically (*p<0.05*), between both groups Al-Karradah and Al-Jadria controls; T4 (9.14±0.37 ng/ml vs. control: 8.44±0.38 ng/mL, *P = 0.046*).also shown that the T4 levels were significant statistically (*p<0.05*), between both groups Abo.Gharib and Al-Jadria controls: T4 (9.42±0.37 ng/ml vs. control: 8.44±0.38 ng/mL, *P = 0.046*).

Comparison of Thyroglobuline-Ab (Tg-Ab) in pollutants areas (Al-karadah, Abo-Gharib) and (Al-Jadria) control were significant statistically (*p<0.05*), between both groups Al-Karradah and Al-Jadria control; Tg-Ab (69.87±6.30 ng/ml vs. control: 56.03±3.75 ng/mL, *P = 0.033*). also shown that the Tg-Ab levels were significant statistically (*p<0.05*), between both groups Abo.Gharib and AL-Jadria controls: Tg-Ab(65.61±5.21 ng/ml vs. control: 56.03±3.75 ng/mL, *P = 0.033*).

Table (2)

Mean values, standard error, (mean ±standard error), maximum, minimum and standard-deviation T3, T4, Tg-Ab and TSH levels in the human serum from three different hospitals in Baghdad.

Region	T3 (ng/ml)	T4 (ng/ml)	TG-Ab (IU/ml)	TSH (mIU/l)
Al-Karadah **Min-Max** **STD**	1.13±0.07 (0.85-2.63) 0.36	9.14±0.37a (5.09-12.40) 1.87	69.87±6.30a (27.50-298.20) 66.53	2.20±0.30 (0.37-5.53) 1.51
Abo-Gharib **Min-Max** **STD**	1.28±0.08 (0.92-2.70) 0.44	9.42±0.37a (5.56-13.50) 1.89	65.61±5.21a (31.00-364.70) 76.06	2.06±0.26 (0.40-6.09) 1.32
Al-Jadria **Min-Max** **STD**	1.13±0.04 (0.93-2.03) 0.21	8.44±0.38b (4.85-11.20) 1.89	56.03±3.75b (20.00-264.30) 48.79	1.98±0.23 (0.44-4.04) 1.14
LSD	0.1984	0.9628	8.532	0.7538
P	0.44	0.046	0.033	0.43

Means with different letters in the same column significantly different
T3 : Triiodothyronine / T4 : Thyroxine / TSH : Thyrotropin /Tg-Ab : Thyroglobulin-Ab/ TH: Thyroid hormone

We examined associations of human serum Pb, Hg, and Cd with T4, T3, TSH, and Tg-Ab, using correlation coefficients for each exposure-outcome association.

Statistically significant negative associations between human serum Hg, T4 and T3 were observed in al-karadah &Abo. Gharib when comparing with control group (Al-jadria group) Table (3). human serum Cadmium(Cd) concentration was positively connected with the level of T3. Table (3 and 4) demonstrates that in al-karadah & Abo. Gharib, human

serum Pb exposure was relatively weak associated with any thyroid hormone levels. human serum Hg had a critical negative relationship with T4, and T3, on the other hand human serum cadmium concentration was (positively) associated with T4 and Tg-Ab. our results were agreed with another study [12].

a negative relationship between human serum lead(Pb) and thyroid function parameters (T3, T4 and TSH) in the groups of al-karadah & Abo. Gharib revealed a lead poisoning as compared with the control group (Al-jadria group), Thyrotropin level expanded among laborers presented to lead. our results were disagreed with other study[13]. who reported no correlation between blood lead levels and thyroid function.

In our study, human serum Cd concentration was positively associated with thyroid hormones levels. This result agreed with[14] who suggest a positive correlation between blood serum cadmium levels and serum thyroid hormones.

A positive association of the Concentration of human serum Hg with Thyroglobulin-Ab (Tg-Ab) was observed in this study which agreed with[15] who found a positive a relationship between blood serum mercury levels and serum Thyroglobulin-Ab (Tg-Ab).

In the three-metal analysis in al-karada & Abo. Gharib, the negative relationship amongst mercury and T4 and T3 was clear with and without exposures to compact cadmium or Pb above middle levels, and the positive relationship amongst cadmium and Tg-Ab was obvious for all combinations with a presentation to Cd over the middle, paying little mind to introduction to Hg or Pb. our results were agreed with other study[16].

The thyroid.-is a main-part associated-with thyroxin-combination, a-reduction of TH levels-in a blood of cadmium-and lead exposed, perhaps-recommend-that's compact cadmium-and lead impacts-a-creation also, excretion of thyroxin by follicular-cell.an uncovered harming-activity of-cadmium also Pb on -structures of follicular-cell, of -TH. An inclination towards an expansion in the serum TSH focus saw at the introduction to cadmium and Pb is a presumable reaction to diminished serum T4 and T3 level. the absence of critical reaction of TSH to diminished serum T4 and T3 level may recommend cadmium and Pb impedance with the pituitary regulation of TH generation and discharge[17].

a negative relationship between blood human serum lead (Pb) and thyroxine (T4) levels in the group of al-karadah & Abo. Gharib harmed contrasted and the control group. our results were agreed with other study[18].

Finally, there were significances positive association between toxic metals themselves. this is a suggestive of an analogous, if not identical, radix of the heavy metals (Pb, Hg, and Cd) and referring that anthropic activities could promote the mobility of these elements. our results were agreed with other study[19]. They are defined as metallic chemical elements (Pb, Cd, and Hg) that have a relatively -high density and are toxic at even low levels [20].

Table (3)
Correlation coefficients of the human serum Lead, Mercury, and Cadmium in connection to THs in Al-karadah.

Al-karadah		Hg(ppm)	Cd(ppb)	T3(ng/ml)	T4(ng/ml)	Tg-Ab(IU/ml)	TSH(mIU/l)
Pb	Pearson Correlation	.799*	.913*	-.175	-.405	-.607-	-.775-
	P	.057	.011	.740	.426	.202	.070
Hg	Pearson Correlation		.900*	-.276*	-.087	.253	-.891-*
	P		.014	-.596	.869	.628	.017
Cd	Pearson Correlation			489	.482*	.455*	714
	P			.325	.333	.365	.111
T3	Pearson Correlation				-.702	-.210-	.143
	P				.120	.689	.787
T4	Pearson Correlation					-.611-	.144
	P					.197	.786
Tg-Ab	Pearson Correlation						.344
	P						.505

Table (4)
Correlation coefficients of the human serum Pb, Hg, and Cd in relation to THs in Abo-Gharib.

Abo-Gharib		Hg(ppm)	Cd(pmb)	T3(ng/ml)	T4(ng/ml)	Tg-Ab(IU/ml)	TSH(mIU/l)
Pb	Pearson Correlation	.976**	.916*	.-319	.-089	.-226	-.177
	P	.001	.010	.537	.866	.667	.737
Hg	Pearson Correlation		.885*	-.904-*	-.102-*	.042	.-277
	P		.019	-.013	.848	.938	.595
	Pearson Correlation			-.298	.047*	.233*	-.220
	P			.567	.930	.657	.675
T3	Pearson Correlation				-.214	.235	-.316-
	P				.683	.654	.542
T4	Pearson Correlation					.848*	.229
	P					.033	.662
Tg-Ab	Pearson Correlation						.010
	P						.985

Table (5)
Correlation coefficients of the human serum Lead, Mercury, and Cadmium in relation to THs in Al-Jadria.

Al-Jadria		Hg(pmm)	Cd(pmb)	T3(ng/ml)	T4(ng/ml)	Tg-Ab(IU/ml)	TSH(mIU/l)
Pb	Pearson Correlation	.878	.956**	.637	.423	.043	546
	P	.021	.003	.173	.403	.936	.263
Hg	Pearson Correlation		.964**	.322	.025	-.398	.062
	P		.002	.533	.962	.434	.908
Cd	Pearson Correlation			.769*	.234	.318	.324
	P						
T3	Pearson Correlation				.369	-.403-	-.183-
	P				.472	.428	.728
T4	Pearson Correlation						.496
	P						.317
Tg-Ab	Pearson Correlation						-.729-
	P						.100

Conclusions

Through our research, we found that the presence of heavy metals in the area of al-Karadah and Abo. Gharib resulting from explosions and terrorist operations also environmental pollution in high quantities, also studied the relationship among toxic metals and TH and endocrine. In general al-karadah and Abo.Gharib populace observed inverse associations between the sera mercury (Hg), and lead and T3,TSH and T4 levels, and positive associations between cadmium (Cd) and TH levels and Thyroglobuline-antibodies (Tg-Ab). T4, and (T3) contrarily corresponded with thyroglobulin-antibodies (Tg-Ab), and positive correlations between mercury (Hg), and Thyroglobulin-antibodies (Tg-Ab). There were huge positive relationships between the substantial metals themselves. exploration is expected to quantify the affiliations at more elevated amounts of introduction cause psychological oppressor operations and to inspect thyroid malady of Hg, Cd and Pb thyroid poisonous. In the end we concluded that the heavy metals resulting from the explosions and terrorist operations in the area of (Al-karadah, Abo-Gharib) were high as

compared with the control (Al-jadria), this could lead to many lesions for human body, and also the effect of heavy elements on the thyroid-hormones were negative which could cause thyroid disease.

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