Serum Vitamin A and Urinary Iodine Levels in Secondary School Pupils with Endemic Goitre in Mosul, Iraq

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Abstract
To study the effect of age and sex on serum vitamin A and urinary iodine excretion in secondary school pupils in Mosul city. Bloods and urine samples were collected from different schools of this area. Serum vitamin A,TSH, Albumine, creatinine and urinary iodine excretion have been measured. A highly significant correlation was observed in goitrous pupils between serum vitamin A and urinary iodine excretion ,and between serum vitamin A and serum albumin .Serum vitamin A levels in non-goitrous pupils were higher in females than in males. Urinary iodine excretion was higher in males than in females. Among goitrous pupils urinary iodine excretion was higher in males than in females in the age group of (17-20) years. While for serum vitamin A the opposite than that in control group) was observed between males and females for both age groups and this may account for the high incidence of goitre among females that in males especially in the age group of(17-20) years.

Key words: Iodine, vitamin A, goiter.

Introduction
Goitre is an endemic health problem world wide including Iraq particularly in northern area[(1)]. The first survey in Iraq was carried out in 1965, and it revealed a high prevalence rate of goitre among school girls in Mosul. Later on, in 1993, 1994, and 1998, further more surveys have been done in the same area revealed a varied goitre rate[(2)]. Iodine deficiency is the most common cause of this endemicity, and goitre is termed endemic when it affects >5% of the population[(3)].Goitre is especially seen in school-age children because of the relatively high need for thyroxine to regulate growth, and its also the period of increasing demand of vitamin A[(4,5)]. For this reason, school-aged children are usually the first examined groups used to assess iodine deficiency disorders in population through goitre detection[(6)].A recent meta-analysis of 18 studies concluded that iodine deficiency alone lowered mean IQ scores in children by 13.5 points [(7)]. In Mosul, low iodine in water[(8)], and, in addition to high consumption of goitrogens in this area such as cabbage, turnip, cauliflower and peanut[(9)], all contributed in the endemicidy of goitre in this area. However, geographic properties of this area, like many other mountainous areas, are often deficient in iodine. Fertile lands are deficient in both iodine and vitamin A, in addition, rainfall and humid areas may be deficient in vitamin A[(10)], as it's the case in Mosul.Although vitamin A deficiency is endemic in many developing countries and its elimination started not before the year 2000, it was not identified as a clinical health problem in Iraq till 1996 by WHO[(11,12)]. The clinical disorders of iodine deficiency tend to be more prefound in geographic areas associated with co-existing vitamin A deficiency and in regions where goitrogens are major staples of the diet because vitamin A deficiency exacerbates the effect of iodine deficiency[(13,14)]. varying level of VAD can occur at any age. However, school age is a period of increased susceptibility, this may be due to increased requirements for growth especially during the adolescent growth spurt[(15)]. Most of the evidence is toward that males are more susceptible to VAD than females. The reasons have been much debatable but are not fully understood[(16)]. Thinking of factors other than iodine contributing to goitre formation is very important. Many authors think of vitamin A as one of these factors contributing to goitre formation due to its role in the synthesis of protein and glycoprotein (such as thyroglobulin), and its role on other processes involved in thyroid hormones synthesis and secretion. In Vietnam the Draft Master Plane of Nutrition (MPN) for the period 2003-2004 has been developed to provide a basis for implementation of the National Nutrition Strategy (NNS).The prevalence of goiter among school-aged children ranged from 9.9٪ to 43.7٪ in different areas. A 1993 survey among children aged from 8-12 years found that 84٪were affected by iodine deficiency, using urinary iodine as an indicator[(17)].
The aims of the present study to study the effect of age and sex on serum vitamin A and urinary iodine excretion in goitrous pupils.

Subjects and Methods
This study include of 473 pupils of, secondary and intermediate schools in Mosul city in Northern Iraq. They were 148 males and 225 females aged 13-20 years. The study was started from 1st November 2002 to 31st April 2004. These 473 pupils were divided into two groups: the first one was consisted of 373 pupils (148 males and 225 females) from schools in low socio-economic districts. These pupils were screened for goitre. While the second group included 100 pupils (35 males and 65 females) from schools in high socio-economic districts chosen as a control group. Out of 148 male pupils examined in the low socio-economic district, 35 pupils were diagnosed clinically to have goitre, while out of 225 female pupils examined, 65 students had goitre. pupils in the control group with higher socio-economic state were selected on their willingness to participate in the study.A complete record of every student was obtained including name, age, occupation of the father, address, duration of the neck swelling (when present),

medical and surgical history of thyroid gland. Physical examination of the thyroid gland was then done including size grade, consistency, tenderness. Indeed, signs and symptoms of VAD were involved in this record such as night blindness, respiratory disease, pupils were excluded if they had symptoms and signs of acute or chronic infections such as pneumonia, typhoid fever or malaria to avoid false positive result of VAD[18,19,20]. Classification of goitre has been made according to WHO criteria as follows[6,21]:

Grade 0: No palpable or visible goiter control group).

Grade1:goitre that is palpable but not visible.

Grade 2: A swelling in the neck.

Blood samples were obtained from all pupils used for determination of the following tests: thyroid stimulating hormone (TSH) by radioimmunoassay (RIA) using immunoradiomtric technigue (IRMA) method.[22]Vitamin A was destroyed by ultraviolet (UV) light .The optical density differnces between irradiated and non-irradiated serum extracts, can therefore be used to measure the vitamin A content [23]. Albumin was determined using kits obtaind from Boehring , Mannhein ,GmbH, west Germany.[24] Urine samples were collected from all cases. Creatinine was measured spectrophotometricaly using the jaffe reaction[25], by a kit purchased from Randox L.td (England) .Urinary iodine was determined by the sensitive colorimetry of Sandell-Kolthoff reaction. The method is based on the catalytic role of iodine in the reduction of ceric ammonium sulfate to the cerous form (colourless) in the presence of arsenious acid which ends to Sandell-Kolthoff reaction[16,21,26] .

Standard statistical methods to determine the mean, median, standard deviation (SD), and range. Paired student Z-test was used to compare results for various biochemical parameters among subjects of the same group.Unpaired student Z-test was used to compare results for various biochemical parameters among subjects in different groups.Linear regression analysis was performed for finding the relationship between the dependent and independent variables. All value quoted as the mean ± SD. Differences between observations were considered not significant at $P > 0.05$[27].

Results

The pupils were initially divided into three groups according to the size grade of goitre depending on criteria of WHO (2001)[6]. Group 1: pupils with Size Grade O Goitre (Non-Goitrous Control):This group included 100 apparently healthy pupils 65 females and 35 males aged 13-20 years. All of them were chosen from schools of high socio-economic district selected to have urinary iodine concentration≥ 100 µg/L,. Table (1). They were normal according to the criteria of the WHO (2001)[20]. The mean ± SD of urinary iodine concentration in this group was 158.50 ± 20.29 µg/L (range 116.73-195.9 µg/L) with a median of 160.86 µg/L. The mean ± SD of serum vitamin A of this group was 0.83 ± 0.17 µmol/L with the median of 0.82 µmol/L. Regrouping of non-goitrous students in group 1 was then done according to 1996 WHO criteria[12] based on the result of serum vitamin A concentration as follows:

Group 1 A: pupils with Serum Vitamin A Values ≥ 0.7 µmol/L.This group included 77 out of 100 apparently healthy pupils, 56 females (28%) and 21 males (10.5%), Table (2). They were normal according to 1996 WHO criteria[20]. The mean ± SD of serum vitamin A among this group was 0.83 ± 0.17 µmol/L (range 0.73-1.43 µmol/L) with a median of 0.85 µmol/L.

Table (1) Urinary iodine concentrations among all pupils (n =200)

Age (year) / Urinary iodine criteria	13-16				17-20				Total			
	M		F		M		F		M		F	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Severe urinary iodine deficiency <20 µg/l	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Moderate urinary iodine deficiency 20-49 µg/l	9	4.5	12	6.0	12	6.0	29	14.5	21	10.5	41	20.5
Mild urinary iodine deficiency 50-99 µg/l	6	3.0	8	4.0	9	4.5	15	7.5	15	7.5	23	11.5
Normal urinary iodine excretion ≥100 µg/l	10	5.0	25	12.5	25	12.5	0	20.0	35	17.5	65	32.5
Total	25	12.5	45	22.5	46	23.0	84	42.0	71	35.5	129	64.5

Table (2) Serum vitamin A values among all pupils (n = 200)

Age (year) / VA criteria	13-16				17-20				Total			
	M				M		F		M		F	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Deficient serum VA <0.35 µmol/L	15	7.5	20	10.0	20	10.0	45	22.5	35	17.5	65	32.5
Subclinical VAD 0.35-0.69 µmol/L	3	1.5	6	3.0	12	6.0	2	1.0	15	7.5	8	4.0
Normal serum VA ≥0.7 µmol/L	7	3.5	19	9.5	14	7.0	37	18.5	21	10.5	56	28.0
Total	25	12.5	45	22.5	46	23.0	84	42.0	71	35.5	129	64.5

Group 1B: pupils with serum vitamin A values between 0.35-0.69 μmol/L.This group included 23 pupils, 15 males (7.5%) and 8 females (4%), Table (2). pupils in this group were considered as subclinically vitamin A deficient pupils according to 1996 WHO criteria[20]. The mean ± SD of serum vitamin A of this group was 0.63 ± 4.1 μmol/L (range 0.55-0.69 μmol/L) with a median of 0.62 μmol/L.Estimation of TSH, and albumin in serum, iodine and creatinine in urine has been done in this study; and for the non-goitrous control pupils in group 1, the mean ± SD was (1.79 ± 0.7 mU/L) for serum TSH, (47.51 ± 2.26 g/L) for serum albumin, (158.50 ± 20.29 μg/L) for urinary iodine concentration and for creatinine was (1.31 ± 0.28 g/L).

All the non-goitrous control in group 1 were subdivided to those aged (13-16y) and (17-20y). A comparison of biochemical parameters, according to age groups and sexes has been done, revealed a significant differences in serum TSH between males and females in the second age group ($t = 2.09$, $P<0.05$), in serum vitamin A for both sexes in the second age group ($t=2.43$, $P<0.05$), and the same was observed between both sexes and the same age group ($t=1.21$, $P<0.05$) for urinary iodine. Finally, a significant difference was observed between males and females in the first and second age groups for urine creatinine concentration, ($t=2.07$, $P<0.05$) for the first, and for the second group ($t = 2.33$, $P<0.05$) where creatinine is the only parameter which revealed this difference in the first age group. However, there were no significant differences in serum albumin between males and females for both age groups in this non-goitrous group of students, Table (3).

Table (3) Comparison of biochemical parameters according to age group for both sexes of non-goitrous (group 1)pupils (n =100), all expressed as mean ± SD

Age	Parameters	Mean ± SD		t-value	p-value
		Males	Females		
13-16	Serum TSH (mU/L)	1.31 ± 0.35	1.90 ± 1.00	0.79	>0.05
	Serum VA (μmol/L)	0.75 ± 0.10	0.82 ± 0.15	1.31	>0.05
	Serum Albumin (g/L)	47.51 ± 2.61	47.27 ± 1.87	0.31	>0.05
	Serum Total protein (g/L)	78.30 ± 10.78	81.51 ± 3.86	1.32	>0.05
	Urinary iodine (μg/L)	167.34 ± 21.03	157.11 ± 19.68	1.36	>0.05
	Urine Creatinine (g/L)	1.41 ± 0.37	1.20 ± 0.22	2.07	<0.05
17-20	Serum TSH (mU/L)	2.18 ± 0.64	1.60 ± 0.75	2.09	<0.05
	Serum VA (μmol/L)	0.78 ± 0.19	0.88 ± 0.17	2.43	<0.05
	Serum Albumin (g/L)	47.92 ± 2.29	47.39 ± 2.42	0.88	>0.05
	Serum Total protein (g/L)	82.33 ± 2.77	81.38 ± 4.95	0.87	>0.05
	Urinary iodine (μg/L)	161.54 ± 19.79	155.25 ± 20.62	1.21	<0.05
	Urine Creatinine (g/L)	1.44 ± 0.32	1.28 ± 0.23	2.33	>0.05

II. Group 2: pupils with Size Grade 1 Goitre (Goitrous Cases)This group included 93 pupils; 58 females (62.4%) and 35 males (37.6%), included in goitrous pupils according to WHO criteria[20].III. Group 3: pupils with Size Grade 2 Goitre (Goitrous Cases).This group included 7 pupils, all of them were females. This group was included in goitrous cases according to WHO criteria[28].Goitrous cases in group 2 & 3 were subdivided into two age groups as in non-goitrous (group 1) pupils All the goitrous pupils in group 2 & 3 had serum vitamin A concentration<0.35 μmol/L. They were 65 females (32.5%) and 35 males (17.5%) and they represented serum vitamin A deficiency field according to WHO criteria[20], Table (2). The mean ± SD of serum vitamin A concentration in this goitrous groups was 0.27 ± 0.05 μmol/L (range 0.12-0.34 μmol/L) with a median of 0.28 μmol/L.Regrouping of goitrous cases in group 2 & 3 was done according to WHO criteria[20], based on urinary iodine concentration into two groups:Group A Goitrous Cases: Goitrous pupils with Mild Urinary Iodine Deficiency :This group included 38 pupil15 males (7.5%) and 23 females (11.5%) with mild urinary iodine deficiency (50-99 μg/L) (Table 1). The mean ± SD of urinary iodine excretion of this group was 70.9 ± 11.5 μg/L (range 51.2-95.4 μg/L) with a median of 70.2 μg/L:Group B Goitrous Cases: Goitrous pupils with Moderate Urinary Iodine Deficiency. This group included 62 pupils, 21 males (10.5%) and 41 females (20.5%) with moderate urinary iodine deficiency (20-49 μg/L), Table (1). The mean ± SD of urinary iodine concentration in this group was 42.2 ± 4.3 μg/L (range 28-48.3 μg/L) with a median of 42.1 μg/L.There were no pupils with severe urinary iodine deficiency in the study population (where severe urinary iodine deficiency is <20 μg/L according to WHO criteria[20].According to size grade of goitre, 38 pupils (100%) from size grade 1 presents in the range of mild urinary iodine deficiency (50-99 μg/L); while 55 goitrous pupils (88.7%) from size grade 1 in addition to 7 (11.3%) from size grade 2 presents in the range of moderate urinary iodine deficiency (20-49 μg/L), Table (4).

Table (4) Urinary iodine loss according to size grade of goitre in goitrous (group 2 & 3) pupils (n = 100)

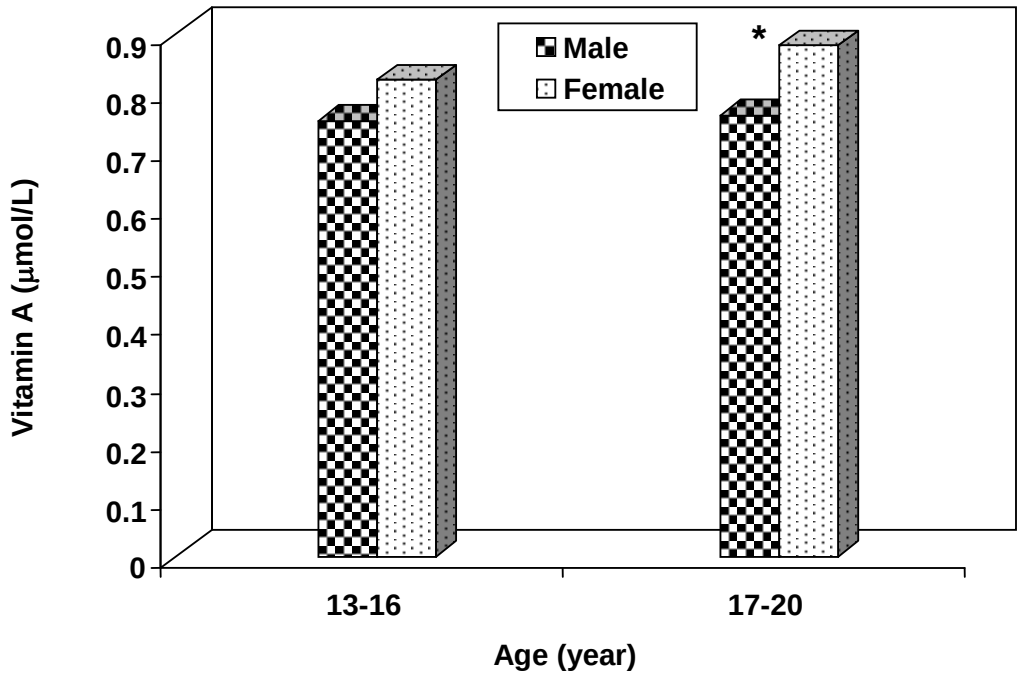
Urinary Iodine loss (μg/L)	0 (n =100)		1 (n =93)		2 (n= 7)	
	No.	%	No.	%	No.	%
Mild (50-99)	0	0	38	100	0	0
Moderate (20-49)	0	0	55	88.7	7	11.3
Severe (<20)	0	0	0	0	0	0

Estimation of serum TSH, albumin, in addition to creatinine in urine has been done also and all expressed as mean ± SD, in which for serum TSH (1.83 ± 0.82 mU/L), (41.61 ± 6.84 g/L) for serum albumin, and for creatinine in urine (1.08 ± 0.17 g/L). A comparison of the results of biochemical assay between both sexes in two age intervals of goitrous cases has been done which revealed significant differences in serum TSH between males and females in the second age interval (t=0.45, P<0.05), in serum vitamin A between the two sexes for the second age group (t =2.12, P<0.05) and the same was observed in serum albumin for both sexes in the same age group (t= 2.98, P<0.05). However, there were no significant differences between males and females in the second age group for urinary iodine concentration and urine creatinine. No significant differences were obtained from all of the parameters for the first age group goitrous cases as it shown in Table (5).

Table (5) Comparison of biochemical parameters according to age group for both sexes of goitrous (group 2 & 3) pupils (n=100), all expressed as mean ± SD

Age	Parameters	Mean ± SD		t-value	p-value
		Males (n=35)	Females (n=65)		
13-16	Serum TSH (mU/L)	2.03 ± 0.60	2.38 ± 0.61	0.94	>0.05
	Serum VA (μmol/L)	0.29 ± 0.04	0.27 ± 0.05	0.71	>0.05
	Serum Albumin (g/L)	44.91 ± 4.16	43.58 ± 5.73	0.76	>0.05
	Serum Total protein (g/L)	79.00 ± 6.53	78.14 ± 7.86	0.34	>0.05
	Urinary iodine (μg/L)	51.59 ± 16.43	53.04 ± 14.59	1.02	>0.05
	Urine Creatinine (g/L)	1.04 ± 0.12	1.11 ± 0.21	0.27	>0.05
17-20	Serum TSH (mU/L)	1.69 ± 0.88	1.51 ± 0.89	0.45	<0.05
	Serum VA (μmol/L)	0.29 ± 0.04	0.26 ± 0.06	2.12	<0.05
	Serum Albumin (g/L)	44.61 ± 3.68	39.17 ± 7.72	2.98	<0.05
	Serum Total protein (g/L)	77.72 ± 4.68	78.17 ± 6.74	0.27	>0.05
	Urinary iodine (μg/L)	55.59 ± 16.59	53.54 ± 17.40	0.95	>0.05
	Urine Creatinine (g/L)	1.11 ± 0.22	1.06 ± 0.15	0.44	>0.05

Effect of Age and Sex on Serum Vitamin A and Urinary Iodine Concentrations: To examine any possible effect of age and sex on serum vitamin A and urinary iodine concentration, all the non goitrous pupils in group 1 where subdivided into those aged 13-16 years and 17-20 years, Table (3) summarizes serum vitamin A values and urinary iodine concentrations for males and females respectively in each age group, in addition to serum TSH, and urine creatinine. The distributions of serum vitamin A and urinary iodine excretion according to age and sex are shown in Fig. (1) and Fig. (2) respectively.A statistical t-test revealed a significant differences in serum vitamin A between males and females in the second age group (17-20 years) (t=2.43, P<0.05), and in urinary iodine excretion (t=1.21, P<0.05). No significant differences have been observed for other parameters with the exception of urine creatinine which revealed a significant difference between males and females in the first age group (t=2.07, P<0.05).For goitrous cases, the distribution of serum vitamin A and urinary iodine excretion according to age and sex are shown in Fig. (3) and Fig. (4) respectively.



* Significant difference ($p \leq 0.05$)

Figure (1) Distribution of measured serum vitamin A in non-goitrous pupils (group 1) according to age and sex.

figure (2) Distribution of measured urinary iodine concentration in non-goitrous pupils (group 1) according to age and sex

* Significant difference ($p \leq 0.05$)

Figure (3) Distribution of measured serum vitamin A in goitrous pupils (group 2 & 3) according to age and sex

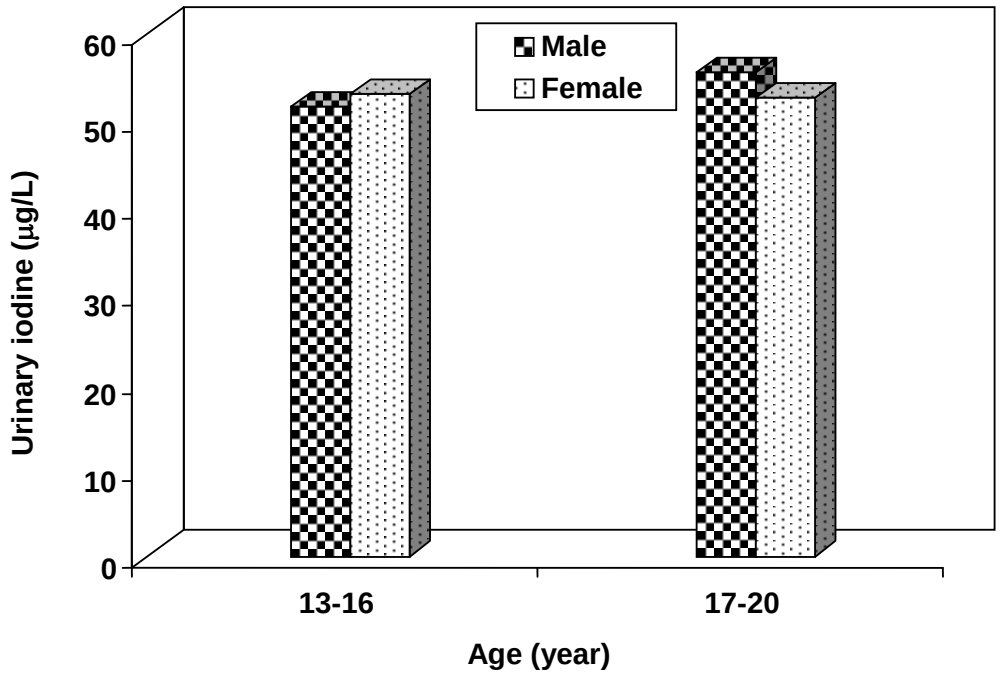


Figure (4) Distribution of measured urinary iodine concentration in goitrous pupils (group 2 & 3) according to age and sex

Discussion

Urinary iodine concentration is currently the most practical biochemical marker for iodine nutrition. A criteria for this purpose, based on urinary iodine concentrations in school-aged children, has been done by WHO[6], which included six degrees of iodine concentration in urine: sever urinary iodine deficiency, moderate urinary iodine deficiency, mild urinary iodine deficiency, normal urinary iodine excretion and the last two degrees deal with more than adequate and excessive excretion of iodine in urine.Vitamin A concentration in serum was indicated in this study which reflected body store of this vitamin. Normal serum vitamin A indicated value ≥ 0.7 μmol/L and the deficient value was < 0.35 μmol/L. The WHO 1996 report recommended to retain the "low" value at 0.35-0.69 μmol/L and to considered consistent with the presence of a subclinical deficiency status of this fat soluble vitamin[29].The prevalence of goitre in this population was (28.8%) in females and (23.6%) in males. It lies in the range of mild to moderate iodine deficiency disorders, according to WHO, UNICEF, and International Councils for control of iodine deficiency disorders (ICCIDD) criteria[2,6]. This higher rate among females may be due to the high demand for thyroid hormones in females than in males in this period of life (puberty). This may reinforced with the result of urinary iodine excretion in the non-goitrous control group of students in which indicated higher values in males than it in females. This result agrees, with those of Ghalioungu *et al*,., Al-Jawadi), [8,,9,)]

The median urinary iodine concentration (46.7 μg/L) indicated an inadequate iodine supply[6,28,29]. The government had begun iodizing salt using potassium iodate in 1990. In 1993, the government established a National coordinating Committee and began work on a plan of iodizing all salt in the country[2]. An estimate of the Ministry of Health had shown an encouraging trend. Household consumption of iodized salt increased from 51 percent in 1997 to some 90 percent in 2000[7].

Relation between Serum Vitamin A, Urinary Iodine and Albumin

Thyroid-binding pre albumin (TBPA) forms a complex with the RBP. Thyroid-binding prealbumin and RBP have very different turnover rates, but TBPA, RBP and retinal remain in a molar 1/1/1 ratio in the circulation, probably because TBPA is a limiting factor in the transport of the two other factors[30,31,32,). This concept is strongly reinforced by the fact that the blood concentration of each component of the tri-molecular complex decrease in parallel, whereas increasing amount of RBP and retinal are recovered from the urine[33, 34].

Albumin level and retinol status of goitrous patients decreased as goitre develops. Endemic goitre was found to be associated with generalized malnutrition and this becomes significant with grade 2 goitre[33, 35]. This work showed a significant difference in serum vitamin A (Z=3.88, P<0.01), serum albumin (Z=3.51, P<0.0001), and urinary iodine (Z=2.14, P<0.05) between patients with size grade 1 and those with grade 2 goitre. Also there was a significant difference in serum albumin between the two age groups of the study population (Z=2.35, P<0.05). This finding is similar to those of Ghalioungui *et al*.[9], Gambert *et al*.[30] and Sebotsa *et al*.[36]. On the other hand, binding of retinoic acid and it's analogus to serum albumin indicates that, no correlation exists between binding affinity for albumin and its biological potency, and non of the other vitamins, hormones and cofactors showed appreciable affinity for retinoic acid binding site on albumin[37].

The rate of goitre in females was more than that in males, and this could account for the difference in serum vitamin A between both sexes (Z=2.02, P<0.05); in which vitamin A deficiency was more in females than it in males in goitrous condition. This is in contrast with the findings in the control group of students. This ascertains the concept, which refers to the interaction between iodine and vitamin A in goitre formation.

The 35 cases chosen for the determination of serum TSH and TT_4 which were mentioned before showed severe vitamin A deficiency, moderate iodine deficiency and decrease in the values of serum albumin. This means that when goitre becomes larger, serum albumin will decrease[33, 35], and so iodine will fall causing vitamin A deficiency by affecting the conversion of carotene to vitamin A. As a result, vitamin A deficiency will worsen the case by affecting thyroid hormones synthesis.

According to this work, vitamin A may be deficient from the body in three ways:Iodine deficiency, which decreases the conversion of carotene to vitamin A.Albumin deficiency according to size grade of goitre which leads to vitamin A deficiency because of decreased binding sites of retinoic acid.Low economic state of the population, who consume goitrogens in relative excess in addition to the co-existing protein-calorie malnutrition (PCM).

Urinary Iodine and Iodine/Creatinine Ratio (I/C Ratio)

In the past, levels have often been expressed per gram of creatinine excretion[38]. More recent studies have indicated that the creatinine level is variable depending on the general nutritional status of the population. This represents an independent source of variation that invalidates the ratio[21], and gives an overestimate of urinary iodine excretion[39], because of the low economic state of the study population which consume diet with low protein constitute. For this reason I/C ratio was significantly correlated with serum albumin in cases with moderate urinary iodine deficiency (46.28 ± 11.14) μg/L and serum albumin <35 g/L (31.16 ±1.56); while it was not significantly correlated with those with mild urinary iodine deficiency (55.43 ±16.77) μg/L and normal serum albumin (44.95 ± 4.09) g/L. All these cases were females with more developed goitre.

There were no significant sex differences in urinary iodine concentration (Z=0.33, P>0.05) as in the result of Mossa *et al*. [40], however no significant difference was revealed by comparing the two age groups (Z=0.11, P>0.05). Iodine/creatinine ratio gave an over estimate because of the thin built of the study population. Values of normal, mild, moderate and severe urinary iodine deficiency was the same, used to detect degree of iodine excretion in urine by this ratio[41].

Effect of Age and Sex on Serum Retinol

There is a highly significant age and sex related difference of serum retinol concentration, which reached plateau in males by the fifth decade of life (aged 40-49y); while in females it increased during the first two decades of life, remained constant between (20-40y) of age, and then increased by (60-69y) of age to values equivalent to those for men. Thus serum retinol concentration was significantly higher in males than in females between (20-49y) of age, but not in younger or older subjects. It has been found that for all aspects of vitamin A deficiency, males are more susceptible than females[42], as it was shown in this study for non-goitrous group of students. These results were in contrast with Sickle *et al*.[29], who believed that serum retinol is higher in males than in females. The reasons for sex differences have been much debated but not fully understood[43]. Such sex difference is not present in infants.

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قياس فيتامين (أ) في مصل الدم واليود في البول لدى طلاب المدارس الثانوية المصابين بالدراق المستوطن في الموصل–العراق

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الملخص

الهدف من الدراسة، تاثير العمر والجنس على قياس فيتامين(أ) واليود في البول بين الطلبة المصابين وغير المصابين بالدراق.. تم جمع عينات دم والبول لمئتي طالب وطالبة من مدارس مختلفة. حيث تم قياس فيتامين (أ)والهورمون المحفز للدرقية والزلال في مصل الدم اليود والكرياتين في البول لهؤلاء الطلبة . صنفت مجموعة السيطرة للطلبة والطالبات غير المصابين بالدراق (المجموعة الأولى) حسب تركيز فيتامين (أ) في مصل الدم إلى المجموعة (١أ): كان تركيز فيتامين (أ) لديهم اكبر أو يساوي ٠,٧ مايكرومول/لتر (العدد ٧٧)، المجموعة (١ب): كان تركيز فيتامين (أ) لديهم بين ٠,٣٥–٠,٦٩ مايكرومول/لتر (العدد ٢٢). صنف المصابون بالدراق (المجموعة الثانية والثالثة) حسب تركيز اليود في البول إلى مجموعتين ، مجموعة الطلبة المصابة بالدراق (أ): كان لديهم نقص غير شديد (خفيف) في تركيز اليود في البول بين ٥٠–٩٩ مايكروغرام/لتر (العدد ٣٨) ، مجموعة الطلبة المصابة بالدراق (ب): كان لديهم نقص متوسط في تركيز اليود ٢٠–٤٩ مايكروغرام/ لتر (العدد ٦٢) . لم يكن هناك نتائج تشير إلى نقص شديد في اليود لدى أي من الطلبة المشمولين في هذه الدراسة. جميع الطلبة والطالبات المصابين بالدراق المشمولين في هذه الدراسة كان لديهم مستوى فيتامين (أ) في مصل الدم <٠,٣٥ مايكرومول/لتر حيث يعد نقص في مستوى هذا الفيتامين حسب معايير منظمة الصحة العالمية. ،. كما أظهرت الدراسة كذلك ترابطاً معتداً بين تركيز اليود في البول وتركيز الزلال في مصل الدم .تركيز فيتامين (أ) في مجموعة السيطرة للطلبة غير المصابين بالدراق ، في الإناث أعلى منه في الذكور في هاتين الفئتين . أما بالنسبة لتركيز اليود في الإدرار ، فقد كان أعلى عند الذكور منه في الإناث للفئتين العمريتين ، من ناحية أخرى للطلبة المصابين بالدراق ، كان تركيز اليود أعلى في الذكور منه في الإناث خاصة في الفئة العمرية (١٧–٢٠) سنة. أما بالنسبة لفيتامين (أ) فقد لوحظ عكس ما هو موجود في مجموعة السيطرة بين الإناث والذكور في تلك الفئتين العمريتين ، مما قد يفسر نسبة حدوث الدراق المرتفعة لدى الإناث مقارنة بالذكور خاصة في الفئة العمرية ١٧–٢٠ سنة.