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Effect of Nutrition Education Program Implementation on Nutritional Status and some Biochemical Indicators of Hypothyroidism Patients

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Abstract

This Study was undertaken to evaluate the effect of nutrition education program intervention on nutritional status and some biochemical indicators of hypothyroidism patients. A random sample of 40 hypothyroidism patients 5 males and 35 females were selected from Kasr El-Aini Hospital out patients with age from (30-45) years. Three tools were used for data collection, structured interview questionnaire, dietary assessment questionnaire , nutritional intake knowledge food habitsand anthropometric measurements. In previous study were performed at baseline revealed prevalence of malnutrition companied with poor food habits, based on these findings, this study aimed to conduct nutrition education program intervention for three months to improve patients' ability to look after

their nutritional health by improving their food literacy, understanding their nutritional needs. Our patients were subjected to nutritional assessment and laboratory investigation at baseline and after 12 weeks to determine serum free T4, free T3 TSH, zinc, iron, selenium level and iodinelevel in urine. According to the present study at the end of nutrition education program intervention for 3 month, results recorded a high significant correction in food habits, food choices, enhancing and hindering some minerals absorption and adequacy of nutrients intake. Results of the nutritional assessment after intervention confirmed by biochemical analysis as comparing at baseline vs. after 12 week of (NEP) intervention. Results revealed a significant difference increase ($P<0.05$) in serum ferritin, selenium, zinc and urinary iodine levels .Concerning the levels of FT3, FT4 and TSH at baseline vs. after intervention, result revealed non significant differences. In conclusion 12 weeks of (NEP) intervention induced a significant improvement in adequacy intake from some minerals and vitamins which reflected as an induced a significant increase ($P<0.05$) in serum ferritin, Se, Zn, and urinary iodine. We suggest that malnutrition or presence of numerous nutritional deficiencies in hypothyroidism patients' body can be cause of thyroid disorders. The co-existing deficiencies of such elements as iodine, iron, selenium, zinc and vitamin C may impair the function of the thyroid gland**.**

Introduction

Malnutrition or nutritional deficiencies in the body can be the cause of thyroid disorders some mineral components are necessary for synthesis and metabolism of thyroid hormones.). Iron deficiency is

a common nutrient deficiency.It is diagnosed in up to 60% of patients with hypothyroidism and it is not related to severity or duration of thyroid insufficiency iron deficiency impairs thyroid hormone synthesis by reducing the activity of heme *(**Zimmerman and Kohrle, 2002**).* One of the key enzymes called thyroid iodine peroxidase, which contains iron in its molecules is necessary for thyroid function. In this case, iron deficiency leads to reduction in the synthesis of thyroid hormones in plasma, increase (TSH) secretion and enlarge the thyroid ***(Eftekhariet al., 2007).***

In order to attain normal levels of thyroid hormone synthesis, an adequate supply of iodine is essential. It is recommended to increase the supply of iodine in hypothyroidism due to the fact that it is necessary for synthesis of T3 and T4. The human body contains approximately 15 to 20 mg of iodine, from which about 80% is accumulated in the thyroid. ***Arthur et al., (1993)*** reported that both selenium and iodine deficiencies caused a significant increase in weight of the thyroid gland and increased the thyrotrpin activity in serum more than the iodine deficiency alone. The coexistence of iodine and selenium deficiency may be a major determinant of thyroid disorders. Zinc is an essential element for the proper synthesis and metabolism of thyroid hormones occurrence of zinc deficiency can reduce thyroid activity. ***Betsy et al., (2013)*** cleared that zinc deficiency is a cause of subclinical hypothyroidism. Zinc supplementation improved thyroid function in nine patients with low zinc levels ***(Napolitano et al., 1990).*** Zinc is required for the T3 receptors to adopt its biologically active confirmation. Some of the effects of zinc deficiency therefore, may be due to loss of zinc from T3 receptor and impairment of T3 action ***(Frake et al., 2001).***

Nutrition plays a critical role in thyroid hormone synthesis. Malnutrition or the presence of numerous nutritional deficiencies in a patient's body can be the cause of thyroid disorders ***(Curley, 2009).***

Subjects and Methods

Subjects:

A random Sample of 40 hypothyroidism patients (5 males and 35 females) were selected from Kasr El-Aini Hospital, endocrinology clinic out patients with age ranging from (30-45) years. Thyroid enlargement defined as thyroid volume>1.8 ml in women, 2.5 ml in >1.8 ml men. The thyroid nodules recorded if > 10 Mm sonar performed by the same operator .

Criteria for Subject Selection :

Subjects who were not under medical treatment and did not have previous thyroid surgery or radio-iodine treatment were included .

Exclusion Criteria for Subject are as Follows:

Recent radiotherapy or recent thyroid scan, renal failure and hepatic patients.

A- Anthropometric Assessments:

Weight, height and body mass index according to ***Mitch and Klahr, (1993)*****,** as the weight (kg)/ height (m^2). The prevalence of overweight or obesity was determined .

B- Dietary Assessments :

1-Dietary Recall Methodology :

Three tools were used for data collection; structured seven-pass 24 h dietary recall was used to record all foods and beverages, dietary assessment questionnaire, nutritional intake and some food habits questionnaire at baseline and after 12 weeks after (NEP) intervention, food pattern and diet history were used. The energy and nutrient content if the 24 hour computed through the food composition table of National Institute ***(Food Composition Tables for Egypt, 1996) .***

2-Nutrition Education Program Intervention :

Nutrition education program interventions are those activities that are planned and implemented for the purpose of solving the nutrition problem prevailing in a society. They are aimed at improving the nutrition knowledge, food intake and eating habits of a specific population *(**Austin, 2017**).*

In this study the main goal of our nutrition education program was to improve the patient's ability to look after their nutritional heath by improving their food literacy, understanding their nutritional needs and empowering them to meet them by teaching them how to shopping smart, how to cook real nutrient dense meals to help hypothyroidism patients to take control of their own situation and health. Highlighting healthier food options for hypothyroidism patients to select of these foods and the basis of this guide book. Make the healthy choice the easy choice. Twenty four nutrition education seasons were delivered to male and female patients.

Education program intervention, specifically goals aimed to enhance knowledge of food groups serving in a healthy diet, food habits , enhancing and hindering some minerals absorption, food rich in vitamin C, food rich in iron, food rich in iodine, food rich in zinc and food rich in selenium, moreoverhealth benefits of essential nutrients.

Our program also aimed to change poor food habits to improve nutritional knowledge and eating habits. The program intervention sessions were four seasons every week for (45 to 65) minute.

C- Biochemical Analysis of Serum :

Blood samples were collected from patients at baseline and after 12 weeks of intervention to determine the following parameters:

1-Determination of serum ferritin according to ***Clemnt and Vittorio (1986).***

2- Determination of selenium in serum according to ***Sheehan and Halls, (1999).***

3-Determination of zinc in serum according to ***Lampugnanic et al., (1990).***

D- Biochemical analysis of urine:

1-Determination of iodine in urinewas according to ***WHO (2013).***

E- Statistical Analysis:

Statistical analysis was carried out using SPSS statistical soft ware version 20 ***(SAS, 2004).***

Results and Discussion

Socio-demographic Characteristics and Hypothyroidism Prevalence among Male and Female Patients :

Table (1) shows the sample number of cases. Results revealed that 15% of the total sample less than 30 years, while age group ≤ 30-40 years and > 40 years reached 42.5 for each group. Concerning the gender, results revealed that female patients were represented 87.5% of the total sample, while male reached 12.5%. Results revealed that 65% of sample sizes were from rural area, while 35% from urban area .

Concerning the educational level of patients, results revealed that 62.5% of sample size was illiterate, while 27.5% in prep and secondary school level, while only 10% were at university degree. Results also revealed that 85% of the sample size was at income level ≤ 3000-5000 L.E., while 10% at income level > 5000 L.E.

In this concern ***(Divi et al., 1997)*** who demonstrated that in both sexes the prevalence of hypothyroidism increase with age and it's about 5 times more in women than in men .

Relationship between some Anthropometric Measurements and Hypothyroidism Disease:

Table (2) illustrate some anthropometric measurements weight, height, body mass index(BMI), Mid upper arm (MUA) and neck circumference (NC) of male and female patients. Results revealed a significant increase ($P<0.05$) in all parameters and prevalence of obesity without non significant difference between gender, age, residence, education and income level. Our results are

at the same line with ***(Pietrych et al., 2011)*** who demonstrated that hypothyroidism is usually associated with weight gain and reduction of thermogesis and metabolism.

Effect of Nutrition Education Program Implementation on Nutritional Status of Hypothyroidism Patients:

In another previous study ***(Nour El-Dein et al., 2022)*** we evaluated nutritional status and the level of nutritional awareness of random sample of hypothyroidism patients, our results revealed that 100% of patients were suffering from obesity and malnutrition combined with poor food habits .

Our previous study revealed also that hypothyroidism patients had poor knowledge about healthy eating and knowledge about servings at baseline; therefore our previous study recommended that nutrition education program intervention strives to make patients aware of healthier food option at their local food .

Therefor this study showed that our nutrition education intervention, specifically the intervention to enhance knowledge of food groups serving in a healthy diet, food habits enhancing and hindering some minerals absorption, foods rich in iron, foods rich in iodine, foods rich in selenium, foods rich in zinc and health benefits of essential nutrients .

Results presented in table (3) illustrate the impact of nutrition education program intervention (NEPI) on nutritional knowledge score (NKS) of hypothyroidism patients at baseline compared to after

3 months of NEPI). Results of this study revealed that (NKS) of male and female patients about the benefits of essential nutrients at baseline vs after (NEPI) recorded as poor level with percentage (100% and 94.3%) respectively vs after NEPI since recorded a significant change to a good score with percentage (90% and 97.1%) respectively. Results revealed a significant statistical ($P<0.01$) improvement in basic knowledge score of health benefit of essential nutrients .

Concerning nutrition knowledge score of food habits enhancing and hindering some minerals absorption at baseline compared to after (NEPI). Results revealed that male and female patients at baseline recorded poor score with percentage (60% and 85.71%) respectively while after (NEPI) there were a significant recorded change to good score with percentage (80% and 80%) respectively. Concerning nutrition knowledge score of foods rich in iron, male and female patients recorded poor and fair with percentage (80%, 20% and 88.7%, 11.5%) respectively. While (NKS) changed after (NEPI) to fair and good score with percentage (40%, 60% and 40%, 80%) respectively.

Concerning (NKS) of male and female patients knowledge about foods rich in iodine at baseline results revealed that (100%) of male and female patients were ranked at poor level vs. (80%, 74.3%) and (20%, 25.7%) respectively at good and fair levels after (NEPI) .
Table (3) shows the effect of (NEPI) on (NKS) of male and female patients about foods rich in zinc. Results revealed that 100% of male and female recorded poor score, at baseline while after (NEPI)

results revealed that (NKS) changed to good and fair level score with percentage to (60%, 40% and 5% ,95%) respectively .

Concerning (NKS) about foods rich in selenium at baseline, results revealed that 100 of male and female were at poor score, while after (NEPI) results changed to good level score with percentage (60% and 100%)respectively. Meanwhile (40%) of male were at fair level. Results showed a significant (P<0.01) improvement in (NKS) of male and female patients after (NEPI) .

In this respect ***(Hoelschey et al., 2002)*** reported that a gap between pre and post testing is required to bring changes in nutrition knowledge attitude and practices of the participants ***(Contrnto et al., 2002),*** also suggested that adequate implementation period is required to produce the large effect. ***Blow-hoffman et al., (2004)*** recommended that 5-13 weeks was sufficient time to improve nutrition knowledge of the participant. In our study gap of 12 weeks between pre and post testing produced a significant difference in (NKS) of hypothyroidism patients .

Effect of Nutrition Education Program Intervention on some Minerals Intake by Hypothyroidism Patients

Table (4) illustrates the impact of (NEPI) on the level of some minerals intake by hypothyroidism patients to compare the effectiveness of nutrition education program by pre and post test. Results of this study revealed that iron intake by male and female patients as percentage of the recommended dietary allowance (RDA) by patients at baseline vs. after 3 months of (NEPI).

Concerning to iron intake recorded that (89.5 and82.48) VS (135.88 and 119.59) male and female respectively. Statistically results showed a high significant increase ($p<0.01$) in iron intake after (NEPI).

Concerning zinc intake by male and female patients as percentage of (RDA) at baseline vs. after (NDPI) results recorded (66.16%and 100.73%)Vs (70.8% and 144.42%) respectively. Statistically results revealed a high significant increase in zinc intake ($P<0.01$) .

Concerning iodine intake by male and female hypothyroidism patients as percentage of (RDA) at baseline vs. after (NEPI) results recorded (69.64% and108%) Vs (70.02% and 123.98%) respectively. Statistically results showed high significant increase in iodine intake after (NEPI).

Selenium intake by male and female patients as percentage of (RDA) at baseline vs. after 3 months of (NEPI) recorded (39.24% and 105.4%) Vs (43.02% and 110.7%) respectively. Results revealed a high significant increase in selenium intake ($P<0.01$) increase .
Our results revealed a high significant increase ($P<0.01$) in minerals intake after (NEPI) .

Our results are at the same line with ***(Wardle et al., 2000)*** who recognize that knowledge has been as an essential component in behavioral change theories of health promotion.

Effect of Nutrition Education Program Intervention on some Vitamins Intake by Hypothyroidism Patients:

Table (5) shows the impact of (NEPI) on dietary adequacy from vitamin C, B1 and B2 by comparing the vitamins intake at baseline vs. after (NEPI) .

Results revealed that total intake from vitamin C by male and female hypothyroidism patients as percentage of the recommended dietary allowances (RDA), at baseline vs after (NEPI),were (48.02% and 68.19%)vs. (100% and 101.25%) respectively .

Concerning the consumption by male and female hypothyroidism of patients from vitamin B1 results revealed that at the percentage of daily intake as a percentage of (RDA) were (78.33% and 80.55% vs. 101.00%and 107.14%) respectively, while vitamin B2 consumption recorded (43.69% and 45.6% vs. 110% and 155.17%) respectively .

Concerning the effect of (NEPI) on vitamins intake as percentage of (R.D.A) from vitamins C, B1 and B2 statistical analysis of results revealed a high significant increase ($P<0.001$) in the daily intake from vitamins C, B1 and B2.

Our results revealed a high significant positive effect of (NEPI) reflected as a high significant increase ($P<0.001$)in vitamins C,B1 and B2 intake by hypothyroidism patients.

Impact of Improvement of Dietary Adequacy Intake of some Minerals and Vitamins on some Biochemical Parameters of Hypothyroidism Patients:

A- Effects of Correction in Dietary Adequacy of some Minerals Intake on Serum Ferritin, Selenium and Zinc

Table (6) illustrates the effect of correction in dietary intake and adequacy from Se, Zn, Fe, vitamins C, B1 and B2 on some biochemical parameters. Results revealed that male and female selenium serum level of selenium at baseline vs. after 3 months of (NEPI) recorded as the following (73.48±34.33 and 55.06±28.86 vs. 95.32±13.91 and 80.82±21.31ng/ml) respectively. Statistically results revealed a high significant increase ($P<0.01$) in serum Selenium level of hypothyroidism patients after (NEPI) as compared to baseline .

In this respect ***(Beard et al., 1990)*** cleared that coexistence of Se deficiency with thyroid hormone disturbances may be results of poor nutrition of children, adults and the elderly. Considerable Se deficiencies disturb the metabolism of thyroid hormone by inhibiting the synthesis and activity of deiodinase iodothyronine, which is responsible for the conversion of thyroxin into more active metabolically, forms ***(Corvilainet al., 1993).*** Table (6) shows the effect of correction in dietary intake from Zn on serum zinc level of male and female patients after (NEPI) vs. at baseline since results recorded (1.1±21.76 and 1.6±16.78 vs. 0.84±14.09 and 0.70±17.28 **µg**/dl) respectively. Results revealed a high significant increase ($p<0.01$).Which reflect the effect of dietary intake correction.

Table (6) illustrate the effect of correction in dietary intake from iron as a positive result of (NEPI) and its effect on serum

ferritin level of male and female patients by compared levels at baseline vs. after 3 month of (NEPI). Values recorded (79.2±44.27 and 89.5±28.26 vs. 146.28±33.92 and 115.39±26.23 ng/ml) respectively .

Results revealed a high significant increase (P<0.01) in serum ferritin .AlsoserumZn level. In this concern (**Maxwell and Volpe, 2007**) evaluate the effect of Zn supplementation on Zn and ferritin concentration in plasma and on T3 and T4 activity in serum. The authors confirmed the beneficial effect of zinc supplementation on the activity of thyroid hormones in serum .

In this concern ***(Zimmerman and Kohrle, 2002)*** cleared that iron deficiency impairs thyroid hormone synthesis by reducing the activity of heme, one of the key enzymes called thyroid iodine peroxidase, which contain iron in its molecules, is necessary for thyroid function.

In this respect ***(Kimberly et al., 2019)*** cleared that naturopathic nutrition education series may promote dietary behavior change with associated changes in clinical biomarkers.

B- Effect of Correction in Dietary Adequacy from Iodine Intake on Urinary Iodine Level of Hypothyroidism Patients:

Results presented in table (7) shows the effect of correction in dietary intake and adequacy from iodine on urinary iodine level of hypothyroidism patients. Results of this study revealed that urinary iodine level of male and female patients as (µ/L) at baseline vs. after

3 months of (NEPI) recorded (75.48±21.56 and 82.58±49.45 vs.231.7±121.23 and 155.52 ±74.80 µ/L) respectively .

Our results revealed a significant increase (P<0.05) in urinary iodine level of male patients while female patients recorded a high significant increase (p<0.01) after (NEPI) as compared to at baseline.

The status of iodine within blood can be evaluated through measurements of urinary iodine level and low urinary concentration is an indicative of hypothyroidism. The association between iodine status and the prevalence of goiter and thyroid nodules has been well established but the extent to which different iodine intake levels influence the incidence of goiter and thyroid nodules is unclear ***(Yu et al., 2008).***

C- Effects of correction in Dietary Adequacy of some Minerals and Vitamins intake on Thyroid Function Free T3, T4 and TSHin Thyroid Patients:

Table (8) illustrates the effect of correction in dietary intake and adequacy from some nutrients related to thyroid gland function as iodine, zinc, iron, selenium and some vitamins C, B1 and B2 and thyroid function (FT3, FT4 and TSH) in hypothyroidism male and female patients by comparing values of this indicators at baseline vs. after 3 months of (NEPI) .

Results of this study revealed that male and female patients recorded FT3 values at baseline vs. after 3 months (NEPI) as

(2.302±1.08 and 2.82±1.14 vs. 2.25±1.02 and 2.67±0.99) respectively .

Concerning FT4 values recorded at baseline vs. after (NEPI) recorded (1.48±1.91 and 1.95±2.32 vs. 1.82±1.52 and 1.61±1.9) respectively. Meanwhile results also revealed that TSH levels of male and female patients at baseline vs. 3 months after (NEPI) recorded (5.91±2.17 and 5.86±3.65 vs. 6.91 ±2.57 and 5.16± 2.88) respectively .

Our results revealed non significant changes in FT3, T4 and TSH level of hypothyroidism patients after 3 months of (NEP). However there was a significant increase ($P<0.01$) in ferritin, selenium, zinc and iodine in serum and there was a significant increase ($P<0.01$) in urinary iodine level after 3 months of (NEPI) .
Based on finding in this study hypothyroidism patients had iodine, zinc, selenium and iron deficiency which were corrected with statistically significant ($P<0.01$) after nutrition education program intervention, 48 sessions for 3 months.

Conclusion

In conclusion lack of awareness is still the main obstacles in attaining sustained elimination iron, selenium, zinc and iodine deficiencies. So it is highly important to increase the awareness of the community. Information and education activities of hypothyroidism patients about the importance of their nutritional

health by improving their food literacy, understanding their nutritional needs.

It could be suggests, further studies on nutritional status of hypothyroidism patients with regular follow up every 6-12 months to monitor and reevaluate the effect of adequacy intake from iodine, iron, selenium and zinc on indicators thyroid gland function by physicians and dietitians.

Table (1): Relation between Socio-demographic Characteristics and Hypothyroidism Prevalence among Male and Female patients.

Soci demographic characteristic	Male (n=5)		Female (n=35)		Total (n=40)		P Value
	No	%	No	%	No	%	
Age group							
<30	1	20	5	14.29	6	15	0.821
≤30-40	2	40	15	42.86	17	42.5	
>40	2	40	15	42.86	17	42.5	
Total	5	12.5	35	87.5	40	100	
Residence							
Rural	3	60	23	65.71	26	65	0.803
Urban	2	40	12	34.29	14	35	
Total	5	12.5	35	87.5	40	100	
Educational Level							
Illiterate	2	40	23	65.71	25	62.5	0.434
Prep and Secondary	1	20	10	28.57	11	27.5	
University Degree	2	40	2	5.71	4	10	
Total	5	12.5	35	87.5	40	100	
Income Level							
< 3000 L.E	0	0	2	5.71	2	5	0.296
≤3000-5000 L.E	4	80	30	85.71	34	85	
>5000 L.E	1	20	3	8.57	4	10	
Total	5	12.5	35	87.5	40	100	

P value with no star not significantly different* P value Significant at ≤0.05** P value Highly Significant at ≤ 0.01

Table (2): Relationship between some Anthropometric Measurements and Hypothyroidism Disease

Assessment Parameters	Weight	P-value	Height	P-value	Body Mass Index (BMI) (kg/m2)	P-value	Mid Upper Arm	P-value	Neck circumference	P-value
Gender										
Male	79.00± 19.22	0.89	160.40± 4.561	0.413	30.46± 5.74	0.558	34.8± 6.53	0.982	39.80± 7.09	0.948
Female	80.07± 15.88		158.31± 5.35		32.14± 5.67		34.74± 5.15		39.63± 5.25	
Age										
< 30	87.00± 18.93	0.626	159.±7.753	0.623	33.79± 6.28	0.709	35.67± 6.87	0.892	39.67± 5.36	0.553
≤30-40	74.94± 10.94		158.1± 4.631		30.42± 4.89		34.0± 4.98		39.813±5 .84	
> 40	81.03± 17.98		158.2± 4.234		32.42± 5.930		35.00± 4.68		39.47± 5.32	
Residence										
Urban	78.79± 14.96	0.744	158.4± 4.52	0.496	31.20± 5.39	0.557	35.37± 5.76	0.598	40± 7.26	0.768
Rural	80.56± 16.28		158.6± 5.505		32.318± 5.61		34.42± 4.81		39.46± 3.91	
Educational Level										
Illiterate	81.08± 15.05	0.935	159.42± 4.167	0.762	32.17± 5.20	0.849	35.83± 6.37	0.519	40.75± 7.92	0.709
Prep and Secondary	81± 17.82		154.2± 4.27		33.23± 7.27		32.6±4.93		39± 5.15	
University Degree	79.11± 16.86		159.09± 5.64		31.52± 5.70		34.65± 4.73		39.22± 3.823	
Income Level										
< 3000 L.E	78± 32.53	0.922	162.5± 10.61	0.273	28.19± 9.49	0.755	34.75± 4.66	0.558	39.5± 3.32	0.96
≤3000-5000 L.E	79.69± 16.03		158.35± 5.27		31.93± 5.60		34.56± 5.26		39.62± 5.62	
>5000 L.E	83± 12.49		158.5± 1.915		33.76± 4.84		38± 8.49		40.5± 7.78	

P-value without star is not significantly different(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (3): Evaluation of Nutritional Awareness Level Between Hypothyroidism Patients

Score of Knowledge	Male				P-Value	Female				P-Value	Total				P-Value
	At Baseline		After Intervention			At Baseline		After Intervention			At Baseline		After Intervention		
	N	%	N	%		N	%	N	%		N	%	N	%	
Health Benefit of Essential Nutrients awareness level of hypothyroidism patients about the health.															
Poor	5	100.00	0	0.00	--	33	94.30	0	0.00	0.02**	38	95.00	0	0.00	0.046*
Fair	0	0.00	1	10.00	--	2	5.70	1	2.90	--	2	5.00	2	5.00	0.43
Good	0	0.00	4	90.00	--	0	0.00	34	97.10	--	0	0.00	38	95.00	0.55
Total	5	100.00	5	100.00	0.012**	35	100.00	35	100.00	0.032**	40	100.00	40	100.00	0.001**
Food Habits Enchaining and Hindering some Minerals Absorption Enhancing															
Poor	3	60.00	0	0.00	--	30	85.71	0	0.00	--	29	72.50	0	0.00	--
Fair	2	40.00	1	20.00	--	5	14.29	7	20	0.067	10	25.00	8	20.00	0.042**
Good	0	0.00	4	80.00	--	0	0.00	28	80.00	0.082	1	2.50	32	80.00	0.06
Total	5	100.00	5	100.00	0.032**	35	100.00	35	100.00	0.045**	40	100.00	40	100.00	0.034**
Sources of Foods Rich in Iron															
Poor	4	80.00	0	0.00	--	31	88.57	0	0.00	0.00**	35	87.50	0	0.00	--
Fair	1	20.00	2	40.00	--	4	11.48	14	40.00	0.012**	5	12.50	16	40.00	0.016**
Good	0	0.00	3	60.00	--	0	0.00	21	80	--	0	0.00	24	60.00	--
Total	5	100.00	5	100.00	0.781	35	100.00	35	100.00	0.00**	40	100.00	40	100.00	0.014**
Sources of Foods Rich in Iodine															
Poor	5	100.00	0	0.00	--	35	100.00	0	0.00	--	40	100.00	0	0.00	--
Fair	0	0.00	1	20.00	--	0	0.00	9	25.70	--	0	0.00	10	25.00	--
Good	0	0.00	4	80.00	--	0	0.00	26	74.30	--	0	0.00	30	75.00	--
Total	5	100.00	5	100.00	0.01**	35	100.00	35	100.00	0.014**	40	100.00	40	100.00	0.031**
Sources of Foods Rich in Zinc															
Poor	5	100.00	0	0.00	--	35	100.00	0	0.00	--	40	100.00	0	0.00	--
Fair	0	0.00	2	40.00	--	0	0.00	0	0.00	--	0	0.00	2	5	--
Good	0	0.00	3	60.00	--	0	0.00	35	100	--	0	0.00	38	95	--
Total	5	100.00	5	100.00	0.011**	35	100.00	35	100.00	0.034**	40	100.00	40	100.00	0.021**
Sources of Foods Rich in Selenium															
Poor	5	100.00	0	0.00	--	35	100.00	0	0.00	--	40	100.00	0	0.00	--
Fair	0	0.00	2	40.00	--	0	0.00	0	0.00	--	0	0.00	2	5.00	--
Good	0	0.00	3	60.00	--	0	0.00	35	100	--	0	0.00	38	95	--
Total	5	100.00	5	100.00	0.423	35	100.00	35	100.00	0.056	40	100.00	40	100.00	0.044**

Score of Knowledge (Poor < 50, Fair 50-75, Good > 75)

P-value without star is not significantly different,(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (4): Effects of Nutrition Education Program Intervention on Some Minerals Intake by Hypothyroidism Patients

Mineral	Male					Female					Total				
	At Baseline	% RDA	After Intervention	% RDA	P value	At Baseline	% RDA	After Intervention	% RDA	P value	At Baseline	% RDA	After Intervention	% RDA	P value
Iron (mg)	7.16	89.5	10.87	135.88	0.057*	13.01	82.48	19.24	119.59	0.000**	12.53	86.49	18.19	121.63	0.000**
Zinc(mg)	7.29	66.16	11.08	100.73	0.052*	5.66	70.8	11.55	144.42	0.000**	9.04	109.84	11.49	138.96	0.000**
Iodine(µg)	100.46	66.97	162	108	0.064	105.03	70.02	185.97	123.98	0.009**	104.46	69.64	178.78	119.19	0.009**
Selenium(µg)	21.58	39.24	57.97	105.4	0.075	23.66	43.02	60.93	110.7	0.000**	23.40	42.55	56.65	103	0.000**

P-value without star is not significantly different,(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (5): Effects of Nutrition Education Program Intervention on Some Vitamins Intake by Hypothyroidism Patients

Mineral	Male					Female					Total				
	At Baseline	% RDA	After Intervention	% RDA	P value	At Baseline	% RDA	After Intervention	% RDA	P value	At Baseline	% RDA	After Intervention	% RDA	P value
Vit.C(mg)	33.62	48.02	77	100	0.0236*	36.14	68.19	75.94	101.25	0.001**	35.83	46.83	78.16	103	0.001**
Vit.B1(mg)	0.94	78.33	1.21	101	0.058*	0.89	80.55	1.18	107.14	0.003**	0.89	80.27	1.18	106.38	0.003**
Vit.B2(mg)	0.57	43.69	1.43	110	0.011**	0.41	45.6	1.71	155.17	0.004**	0.5	55.6	1.67	149.50	0.004**

P-value without star is not significantly different,(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (6): Effects of Correction in Dietary Adequacy Intake of Minerals and Vitamins on some Biochemical Parameters of Hypothyroidism Patients

iochemical Parameters	Control Normal	Male			Control Normal	Female			Total		
		At Baseline	After Intervention	P value		At Baseline	After Intervention	P value	At Baseline	After Intervention	P value
Ferritin (ng/mL)	12-300	79.2± 44.27	146.28± 33.92	0.435	12-150	89.54± 28.26	115.39± 26.23	0.003*	88.25± 30.15	119.26± 28.72	0.002**
Selenium (ng/mL)	70-150	73.48± 34.33	95.32± 13.91	0.359	70-150	55.06± 28.86	80.82± 21.31	0.000**	57.36± 29.75	82.64± 20.96	0.000**
Zinc (µg/ml)	0.66-1.1	0.84± 14.09	1.1± 21.76	0.970	0.66-1.1	0.70± 17.28	1.60± 16.78	0.049*	0.898± 16.98	1.29± 17.50	0.000**

P-value without star is not significantly different(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (7): Effects of Correction in Dietary Adequacy from Iodine Intake on Urinary Iodine level of Hypothyroidism Patients

Biochemical Parameters	Control Normal	Male		Female		Total	
		At Baseline	After Intervention	At Baseline	After Intervention	At Baseline	After Intervention
Iodine (µg/L)	100-199	75.48±21.56	231.7±121.23	82.58±49.45	155.52±74.80	81.69±46.74	165.04±83.88
P value		0.039*		0.006**		0.108	

P-value without star is not significantly different (*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

Table (8): Impact of Improvement of Dietary Adequacy from Some Minerals and Vitamins on Thyroid Function Free T3, Free T4 and TSH of Hypothyroidism Patients

Biochemical Parameters	Control Normal	Male			Female			Total		
		At Baseline	After Intervention	P value	At Baseline	After Intervention	P value	At Baseline	After Intervention	P value
Free T3(pg/mL)	2.3-4.1	2.302±1.08	2.25±1.02	0.939	2.82±1.14	2.67±0.99	0.563	2.752±1.13	2.62±0.99	0.569
Free T4 (ng/dL)	0.8-1.8	1.48±1.91	1.82±1.52	0.562	1.95±2.32	1.61±1.90	0.505	1.02±2.25	1.64±1.84	0.412
TSH(mIU/ml)	0.27-4.2	5.91±2.17	6.91±2.57	0.221	5.86±3.65	5.16±2.88	0.301	5.11±3.55	6.13±2.81	0.176

P-value without star is not significantly different,(*) P value Significant at ≤0.05, (**) P value Highly Significant at ≤ 0.01

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تأثيرتطبيق برنامج للتثقيف التغذوى على الحالة التغذوية وبعض المؤشرات البيوكميائية لمرضى نقص افرازهرمون الثيروكسين

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الملخص العربى

اجريت هذه الدراسة لمعرفه تأثير تطبيق برنامج للتثقيف التغذوى علالحالة التغذوية وبعض المؤشرات البيوكميائية لمرضى نقص افراز هرمون الغدة الدرقية وقد شملت الدراسة عينة عشوائية من 40 مريض (5 ذكورو 35 اناث) مصابيين بنقص افراز هرمون الغدة الدرقية تم تشخيصهم واختيارهم من العيادة الخارجية بمستشفى القصر العينى تتراوح اعمارهم بين (30-45عام) . وقد تم اعداد الاستبيانات الخاصة مسبقا لكى تتمكن من تقييم الحالة الغذائية باستخدام استمارات استرجاع24 ساعة واستمارات التاريخ الغذائى وكذلك استمارات التعرف عل العادات الغذائية والنمط الغذائى لافراد العينة بجانب استمارات تقييم المقايس الجسمانية عند بداية التجربة. وبناء على نتائج التقييم للحالة الغذائية للمرضى فبداية التجربة والتى اظهرت انتشار سوء التغذية مصحوبا بالعادات الغذائية السيئة تمتصميم برنامج للتثقيف التغذوى لمدة 3 شهور وذلك لتحسين قدرة المرضى عل معرفة الغذاء الصحى وذلك عن طريق الحد من الجهل التغذوى وفهمهم لاحتياجاتهم الغذائية. وقد خضع المرضى للفحوص المعملية عند بداية التجربة وكذلك مره ثانية بعد 12 أسبوع وذلك لقياس مستوى الفرتيين والزنك والسيلينوم في السيرم وأيضا قياس FT3, FT4 TSHوايضا مستوى اليود في البول. وقد أظهرت نتائج هذه الدراسة انه بعد 3 شهورمن تطبيق برنامج التثقيف التغذوى أظهرت النتائج وبدرجة معنوية كبيرة تصحيح العادات الغذائية والاختيارات الصحية للغذاء من حيث العوامل التى تساعد والتي تعوق امتصاص الاملاح المعدنية وكذلك المأخوذ من العناصر الغذائية. وقد تم تأكيد نتائج تحسين الحالة التغذوية بما اثبتها لتحاليل البيوكميائية حيث حدث ارتفاع معنوى في مستوى الفرتتين والسلينيوم والزنك في السيرم واليود في

البولبينما لم يحدث تغير معنوى في مستوى كلا منFT3,FT4,TSH في السيرم. والخلاصة انالتدخلب برنامج تثقيف تغذوى لمده 12 أسبوع قد أدى الى تحسين معنوى في كفاءة المأخوذ من بعض الاملاح المعدنية (الحديد والزنك واليود والسلينيوم) وكذلك فيتامين ج وب1وب2 والذى انعكس على زيادة معنوية في مستوى السيرم للمرضى من الفرتين والسلينوم والزنك وكذلك اليود في البول وذلك مقارنة بمستويات قياسها عند بداية التجربة. والخلاصة من هذه الدراسة اننقص العديد من العناصر الغذائية كاليود والحديد والسلينيوم والزنك وفيتامين ج يمكن ان يكون سببا في الاضرار بوظائف الغدة الدرقية لذا تبرز أهمية زيادة الوعى عن طريق برامج التثقيف الغذائي لمرضي نقص افراز هرمون الغدة الدرقية. وتقترح هذه الدراسة اجراء مزيد من الدراسات على هؤلاء المرضى على ان يتم المتابعة والتقييم الطبي والتغذوى للحالة التغذوية والصحية كل 6-12 شهرللوصول الى تأثيركفاءة المأخوذ من هذه الاملاح على وظائف الغدة الدرقية.