The impact of educational intervention on knowledge and awareness of thyroid disorders among university students

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ABSTRACT

Introduction: Thyroid disorders are one of the most common endocrine problems. The prevalence of thyroid cancer is high in Oman, yet studies conducted in other countries show inadequate knowledge about thyroid disorders in medical students. This study aims to uncover students' understanding and perspectives on thyroid disorders, and intends to enhance awareness among students through educational initiatives.

Materials and Methods- It was a cross-sectional study with pre-and post-test designs, which was carried out among students at Sohar University. Educational intervention was given through a module designed for the purpose. Pre-validated questionnaires were used pre-and post the intervention for assessing their knowledge. Male and female participants from Sohar University in Oman participated in the study.

Results- 134 students participated in the study before the intervention (Pretest) and 114 participated post-training. For comparison purposes, only those who participated in both the sessions were included for the study. The majority of the participants were females, 93 (81.6%) and the mean age was 23.21±8.75. There was significant improvement in post-test knowledge scores in both undergraduate and postgraduate students in both male and female students ($p<.05$).

Conclusion- The educational intervention was successful in improving the knowledge of participants on thyroid disorders, as shown by the pre-post method. Such sessions should be conducted in the community in Oman to improve awareness about thyroid disorders.

Keywords: Thyroid disorders, educational intervention, pre-post intervention survey, University students' awareness

Introduction

Thyroid illness incidence has tripled in the previous three decades, and the prevalence is increasing rapidly regardless of gender or heredity. People must be educated about this rapidly spreading disease. There is a void in the literature that provides precise data on non-medical university students' knowledge and attitudes of thyroid problems in Oman.

Hyperthyroidism is characterized by elevated thyroid hormone production. Thyrotoxicosis, on the other hand, refers to the clinical condition of excessive thyroid hormones in the blood, regardless of the source [1, 2]. The most common cause of hyperthyroidism with toxic nodular goiter is Graves' disease. Hypothyroidism is described as a condition caused by suboptimal circulating levels of one or both thyroid hormones or insufficient activation of an otherwise normal thyroid gland by thyrotropin (TSH) [3].

Thyroid illnesses, particularly thyroid cancer, are common in Oman. According to the 2017 annual report of the National Cancer Registry, about 200 new instances of thyroid cancer are diagnosed each year. It looks to be the second most frequent female cancer in Oman right now. Thyroid cancer is more common in women worldwide, and it was discovered to be more common among Omani women. Any thyroid issue has a significant impact on health and well-being. [4-6]. The thyroid is the largest endocrine gland, butterfly in shape, with two lobes located on the trachea, right below the larynx, or voice box, in the human neck. The thyroid gland's main roles in humans are to secrete thyroid hormones, regulating metabolic rate, cognition, protein synthesis, and growth development in youngsters. Another function of the thyroid gland is the secretion of calcitonin hormone, which aids in calcium hemostasis.

Thyroid hormones (THs) are released into the bloodstream and delivered to all tissues of the body because they are responsible for every major function such as energy utilization (metabolism), heart, brain, and muscle functioning, and temperature regulation. Adequate iodine absorption from our diet is required for the thyroid gland's

basic activities. Iodine enters an individual's bloodstream and is absorbed and transferred to the thyroid gland, where it releases hormones required for the appropriate control of the body's complete metabolism. The thyroid gland produces and secretes three hormones: Triiodothyronine (T3) consists of three iodine atoms, Tetraiodothyronine (T4) consists of four iodine atoms, and Calcitonin. Despite the fact that the gland produces 80% T4 and only 20% T3. T3 and T4 are produced by the thyroid gland's follicular cells. T3 performs a more functional role than T4. T4 must be transformed to T3 before it can be used by the body. The conversion is carried out by specific enzymes from other tissues, such as the liver or kidneys.

The hypothalamus, which is located in the brain, generates a hormone called Thyrotropin-Releasing Hormone (TRH), which sends a message to the pituitary gland, which produces a hormone called thyroid-stimulating hormone (TSH), which stimulates the thyroid gland to make thyroid hormones. This tells the thyroid gland how many hormones it needs to generate. When thyroid hormones are low, both TRH and TSH encourage the gland to create additional hormones, indicating that the hypothalamic-pituitary-thyroid axis is functioning optimally. In the opposite direction, when thyroid hormone levels are greater than usual, TRH and TSH stimulate the gland to reduce hormone synthesis. [6,7] Thyroid diseases are among the most frequent endocrine problems. This study will aid in determining the proportion of students' knowledge and attitudes concerning thyroid problems, and also allow them to be subjected to additional diagnostic tests and, as a result, implement lifestyle changes and treatment as soon as possible to avoid long-term difficulties.

Significance of the study:

Patients' concerns about their health have grown in recent years as a result of the important issue of abnormal thyroid function in clinical practice. Thyroid illness is caused by iodine deficiency or autoimmune disorders. Other studies have shown that the major causes of thyroid disease are inflammation, certain medical operations such as radiation therapy or thyroid surgery, or a hereditary factor. Thyroid diseases are caused by hypertrophy of the thyroid gland and either excessive or insufficient thyroid hormone output. An estimated 1.6 billion people are at risk of thyroid disease, and one-third of the world's population is thought to be iodine deficient. Furthermore, previous studies discovered that physical stress may be a component in thyroid gland dysfunction. [8] It has been seen that health literacy and awareness can be used as a tool for chronic disease prevention. There is a need for development of strategic health awareness programs that fit the socio-demographics of the population they serve. [9] Findings of this study can serve as motivation to community awareness programs in the region.

Literature Review:

Thyroid problems are generally regarded as non-infectious and non-contagious. According to epidemiological data, they are the biggest cause of morbidity worldwide. Even though the etiology of reported deaths is usually a thyroid illness consequence, they could be the source of underreported premature deaths. Thyroid gland disorders are the second most common endocrine ailment after diabetes mellitus. Given that 200 million people globally suffer from thyroid disease. Thyroid dysfunction was discovered in 12.6% of diabetics. [9] Thyroid dysfunction was detected in 11.7% of patients with chronic kidney disease. [10]

Studies conducted in Saudi Arabia, and at the Dewan health complex in Muscat, discovered that a lack of knowledge was connected with a low concern for thyroid diseases. [11-14] There is also overlap of symptoms of thyroid disease with other metabolic diseases. [15] Tiredness, depression, cold intolerance, hoarseness, dry skin, constipation, bradycardia, and hyporeflexia are signs and symptoms of hypothyroidism. Common symptoms of hyperthyroidism include weight loss despite a normal appetite, sleeplessness, and sleep deprivation. Untreated or inadequately treated thyrotoxicosis has been connected to weight loss, osteoporosis, atrial fibrillation, embolic events, muscle weakness, tremors, and neuropsychiatric symptoms. [16]

A family history of thyroid disorders, being female, being older, autoimmune diseases, certain drugs, radiation therapy, and iodine shortage are all risk factors for hypothyroidism. A family history of thyroid diseases, being female, stress, some drugs, smoking, and radiation exposure are all risk factors for hyperthyroidism. [17,18]

Several tests are performed to evaluate thyroid gland function, as well as to diagnose or determine the etiology of thyroid disease. There are two kinds of tests: blood tests and imaging tests. TSH, T3, and T4 blood tests are used to detect thyroid hormone levels in the blood. Thyroid antibody testing aids in the diagnosis of autoimmune thyroid diseases.

Ultrasound, CT scans, and nuclear medicine tests are examples of imaging testing. Thyroid scans, which aid to build an image of the gland's size, shape, and position, and uptake tests, which measure the function, are examples of nuclear medicine tests. [18]

Benefits to community and nation by research: This research aims to uncover students' understanding and perspectives on thyroid disorders. Through educational initiatives, we intend to enhance awareness among students and the community regarding these conditions. This will facilitate prompt identification of undiagnosed cases and contribute to preventing disorders and cancers.

ISSN: 0034-8082

Methodology:

After obtaining ethical approvals from the College of Medicine and Health Sciences and Sohar University, the study was conducted. It was a cross-sectional study with pre- and post-test designs, which was carried out among students at Sohar University.

Sample Size and Sampling Technique: The sample size was calculated using the Raosoft sample size calculator. Considering 225 eligible participants with a 95% confidence interval and a 5% margin of error, the minimum sample size was calculated as 143, and a random stratified sampling technique was used.

Study Subjects: Male and female participants from Sohar University in Oman were taking part in the study.

Inclusion Criteria: Students who were volunteering to participate.

Exclusion Criteria:

- Those who were not giving their consent,
- Individuals with known thyroid disorders.

Data Collection Methods:

On the first day, a pre-validated data collection questionnaire, developed from a review of the literature (both English and Arabic versions), was administered via a Google form as a pretest. The questionnaire consisted of 3 sections:

A: Socio-demographic details of the participants.

B: Knowledge about the thyroid gland, its functions, and causes of thyroid disease (10 items).

C: Knowledge of respondents about the symptoms of hyper- and hypothyroidism (13 items).

An educational module to create awareness was developed in the form of PowerPoint presentations, videos, and simulations, which were validated. Immediately or after a week, the posttest was administered through Google Forms or hard copies.

Data Analysis:

Data were analyzed using the Statistical Package of Social Science (SPSS) software program, version 29. Frequency and percentage were being used for categorical variables, while the mean and standard deviation were being used for continuous variables. The Wilcoxon signed-rank test and Chi-square test were used to assess the

relationship between different variables. A P-value of <0.05 was considered statistically significant.

Results:

Table 1: Gender distribution, age, and educational status of study participants

Variable	Category	Frequency	Percent
Gender	Male	21	18.4
	Female	93	81.6
Mean age (in years)		23.21±8.75	
Educational level	Undergraduate	74	64.9
	Post Graduate	40	35.1

134 students participated in the study before the intervention (Pretest) and 114 participated post-training. For comparison purposes, only those who participated in both the sessions were included for the study. The majority of the participants were females, 93 (81.6%) and the mean age was 23.21±8.75. Educationally, 74 (64.9%) were undergraduates and 40 (35.1%) were postgraduates (Table 1).

In the pretest, 79.8% of students knew that the thyroid gland is an endocrine gland, and in post-test it was 108 students (94.7%). This is statistically significant (p <0.001). (Table 2) Similarly, the knowledge about women being at higher risk of developing thyroid disorders, and the belief that thyroid disorders can be hereditary improved significantly post-test (p= 0.006 and 0.001, respectively). The symptoms of thyroid dysfunction, as prolonged episodes of constipation and/or diarrhea, and the effect of thyroid disorder on menstruation, also improved significantly post-test (p= 0.006 and 0.014, respectively). Their familiarity with thyroid gland investigations/tests/examinations increased significantly post-test (p <0.001). The knowledge about location of the gland, role of the thyroid on regulation of body metabolism, and other symptoms also increased in post-test responses. However, this was not statistically significant (Table 2).

Table 2: Pre and post comparison of knowledge about the thyroid gland, functions, and causes of thyroid disease.

Factors		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Z	P-value
1. The thyroid gland is an endocrine gland.	Pre	43 (37.7%)	48 (42.1%)	15 (13.2%)	6 (5.3%)	2 (1.8%)	-5.399	<0.001
	Post	95 (83.3%)	13 (11.4%)	4 (3.5%)	0 (0.0%)	2 (1.8%)		
2. The gland is situated at the front of the neck.	Pre	63 (55.3%)	31 (27.2%)	11 (9.6%)	7 (6.1%)	2 (1.8%)	-0.431	0.666
	Post	69 (60.5%)	21 (18.4%)	10 (8.8%)	6 (5.3%)	8 (7.0%)		
3. The gland is located beneath the trachea	Pre	80 (70.2%)	20 (17.5%)	4 (3.5%)	4 (3.5%)	6 (5.3%)	-1.453	0.146
	Post	55 (48.2%)	43 (37.7%)	11 (9.6%)	4 (3.5%)	1 (0.9%)		
4. The thyroid does not regulate body metabolism.	Pre	22 (19.3%)	16 (14.0%)	41 (36.0%)	15 (13.2%)	20 (17.5%)	-1.476	0.140
	Post	29 (25.4%)	10 (8.8%)	21 (18.4%)	14 (12.3%)	40 (35.1%)		
5. Women are at higher risk of developing thyroid disorders.	Pre	61 (53.5%)	27 (23.7%)	20 (17.5%)	2 (1.8%)	4 (3.5%)	-2.762	0.006
	Post	89 (78.1%)	11 (9.6%)	10 (8.8%)	1 (0.9%)	3 (2.6%)		
6. Thyroid dysfunction results in neck swelling and alterations in voice.	Pre	68 (59.6%)	29 (25.4%)	10 (8.8%)	5 (4.4%)	2 (1.8%)	-1.562	0.118
	Post	85 (74.6%)	16 (14.0%)	9 (7.9%)	0 (0.0%)	4 (3.5%)		
7. Thyroid dysfunction leads to prolonged episodes of constipation and/or diarrhea.	Pre	28 (24.6%)	33 (28.9%)	42 (36.8%)	6 (5.3%)	5 (4.4%)	-3.811	<0.001
	Post	63 (55.3%)	26 (22.8%)	17 (14.9%)	4 (3.5%)	4 (3.5%)		
8. Thyroid dysfunction disrupts the menstrual cycle in women.	Pre	50 (43.9%)	39 (34.2%)	20 (17.5%)	4 (3.5%)	1 (0.9%)	-2.445	0.014
	Post	79 (69.3%)	19 (16.7%)	10 (8.8%)	3 (2.6%)	3 (2.6%)		
9. Is thyroid dysfunction hereditary?	Pre	28 (24.6%)	30 (26.3%)	43 (37.7%)	11 (9.6%)	2 (1.8%)	-3.393	0.001
	Post	61 (53.5%)	20 (17.5%)	22 (19.3%)	5 (4.4%)	6 (5.3%)		
10. Are you familiar with thyroid gland investigations / tests / examinations?	Pre	25 (21.9%)	28 (24.6%)	32 (28.1%)	16 (14.0%)	13 (11.4%)	-5.223	<0.001
	Post	66 (57.9%)	27 (23.7%)	11 (9.6%)	6 (5.3%)	4 (3.5%)		

** Based on Wilcoxon signed rank test*

Table 3: Comparison of knowledge about symptoms of hyper and hypothyroidism

Factors		Strongly agree	Agree	Neutral	Disagree	Strongly disagree	P-value*
11. Loss of weight despite a good appetite is not indicative of hyperthyroidism.	Pre	28 (24.6%)	35 (30.7%)	29 (25.4%)	11 (9.6%)	11 (9.6%)	0.274
	Post	45 (39.5%)	13 (11.4%)	13 (11.4%)	16 (14.0%)	27 (23.7%)	
12. Difficulty and inability to sleep are symptoms of hyperthyroidism.	Pre	37 (32.5%)	46 (40.4%)	26 (22.8%)	1 (0.9%)	4 (3.5%)	0.010
	Post	72 (63.2%)	17 (14.9%)	18 (15.8%)	4 (3.5%)	3 (2.6%)	
13. Increased heart rate is not a symptom of hyperthyroidism.	Pre	24 (21.1%)	21 (18.4%)	35 (30.7%)	18 (15.8%)	16 (14.0%)	0.707
	Post	37 (32.5%)	16 (14.0%)	13 (11.4%)	16 (14.0%)	32 (28.1%)	
14. Difficulty tolerating hot weather and wearing lightweight clothing in cold weather are indicative symptoms of hyperthyroidism.	Pre	30 (26.3%)	47 (41.2%)	27 (23.7%)	6 (5.3%)	4 (3.5%)	0.006
	Post	66 (57.9%)	26 (22.8%)	10 (8.8%)	4 (3.5%)	8 (7.0%)	
15. Scanty or absent menstrual periods are not indicative symptoms of hyperthyroidism.	Pre	19 (16.7%)	35 (30.7%)	34 (29.8%)	13 (11.4%)	13 (11.4%)	0.315
	Post	45 (39.5%)	18 (15.8%)	19 (16.7%)	12 (10.5%)	20 (17.5%)	
16. Can you discontinue treatment for hyperthyroidism when the test results are normal?	Pre	27 (23.7%)	38 (33.3%)	32 (28.1%)	6 (5.3%)	11 (9.6%)	0.744
	Post	34 (29.8%)	22 (19.3%)	39 (34.2%)	7 (6.1%)	12 (10.5%)	
17. Rapid weight gain is not indicative of hypothyroidism.	Pre	15 (13.2%)	36 (31.6%)	35 (30.7%)	11 (9.6%)	17 (14.9%)	0.358
	Post	32 (28.1%)	17 (14.9%)	19 (16.7%)	12 (10.5%)	34 (29.8%)	
18. Fatigue and drowsiness are symptoms of hypothyroidism.	Pre	42 (36.8%)	46 (40.4%)	22 (19.3%)	3 (2.6%)	1 (0.9%)	<0.001
	Post	81 (71.1%)	19 (16.7%)	9 (7.9%)	4 (3.5%)	1 (0.9%)	
19. Dryness of the skin and hair are symptoms associated with hypothyroidism.	Pre	35 (30.7%)	43 (37.7%)	28 (24.6%)	5 (4.4%)	3 (2.6%)	<0.001
	Post	84 (73.7%)	15 (13.2%)	12 (10.5%)	1 (0.9%)	2 (1.8%)	
20. Experiencing cold sensations in warm weather is a symptom of hypothyroidism.	Pre	37 (32.5%)	41 (36.0%)	30 (26.3%)	2 (1.8%)	4 (3.5%)	0.022
	Post	65 (57.0%)	25 (21.9%)	15 (13.2%)	5 (4.4%)	4 (3.5%)	
21. Should cabbage, cauliflower, and soy products be included in the diet for hypothyroidism?	Pre	29 (25.4%)	34 (29.8%)	35 (30.7%)	10 (8.8%)	6 (5.3%)	0.002
	Post	38 (33.3%)	12 (10.5%)	20 (17.5%)	11 (9.6%)	33 (28.9%)	
22. Does iodized has a role in the treatment of hypothyroidism?	Pre	35 (30.7%)	28 (24.6%)	39 (34.2%)	7 (6.1%)	5 (4.4%)	0.975
	Post	55 (48.2%)	17 (14.9%)	14 (12.3%)	11 (9.6%)	17 (14.9%)	

** Based on Wilcoxon signed rank test*

There was significant improvement of knowledge about the symptoms of hyperthyroidism as difficulty and inability to sleep [72.9 % vs 78.1%; p= .010] and heat intolerance (difficulty tolerating hot weather and wearing lightweight clothing in cold weather) with 8.8% being aware pretest and 10.5% in the post-test (p= .006) [Table 3]. Similarly, the knowledge about symptoms of hypothyroidism as fatigue and drowsiness [77.2% vs 87.8%], and dryness of the skin and hair [68.4% vs 86.5%] improved significantly after the training (p <0.001 for both). In the pre-test there were

78 students (68.5%) who believed that experiencing cold sensations in warm weather is a symptom of hypothyroidism. While in the post-test, the number reached 90 students (78.9%). This difference was significant with a p-value of 0.022. Although the awareness about other symptoms like tachycardia, loss of weight despite a good appetite, amenorrhea being symptoms of hyperthyroidism improved in the post-test, the difference was not statistically significant (Table 3).

When the knowledge about the thyroid gland, its functions, causes of thyroid disease, and symptoms of hyper and hypothyroidism was compared between male and female participants in the pre-test, there was no significant difference between them (Supplementary table 1 &2). Similarly, the post-test knowledge improved in all participants regardless of gender (Supplementary table 3 & 4). The male students had inadequate knowledge about the function of thyroid hormone as a regulator of body metabolism, in the post-test as compared to female students. This was statistically significant (p = .02) (Supplementary table -3).

The overall knowledge of postgraduates was higher than undergraduates. Although in most aspects the difference was not significant (Supplementary tables 5-8). The undergraduates had significantly better knowledge about the anatomical position of the gland than the postgraduates (p=.007). While there was no significant difference between the undergraduates and postgraduates about symptoms of hypo and hyperthyroidism, the post-test knowledge was better in the latter group in certain aspects (Supplementary table 7 & 8). 14 (35%) of the postgraduates disagree that loss of weight is not an indicator of hyperthyroidism. A large number of undergraduate participants, 49 (66.2%) believe that they will discontinue treatment for hyperthyroidism when the test results are found normal. Only a few of the postgraduates (n= 16; 40%), had the opinion that iodized salt has any role in the treatment of hypothyroidism ($p<0.05$) (Supplementary table 8).

Discussion:

In this study, 114 students participated. The majority of the participants were females (n= 93; 81.6%) and the mean age was 23.21±8.75. A total of 74 were undergraduates (64.9%) and 40 (35.1%) were postgraduates. It was observed that intervention was effective in achieving its intended outcome, also intervention led to a significant change in baseline knowledge levels about the anatomy, functions, symptoms and causes of thyroid disorders in all questions except the following two; In the pretest total of 94 students (82.5%) knew that gland is situated at the front of the neck in posttest it was 90 students (78.9%). In the pre-test, there were 65 students (57%) who believed that they could discontinue treatment for hyperthyroidism when the test results are normal. While in the post-test, the number reached 56 students (49.1%). Which were also statistically non-significant. These can be due to various reasons like a small sample size, insufficient statistical power, or variability in individual responses to the intervention. It is also probable that any changes observed are due to random variation

rather than the intervention itself.

Some questions showed (statistically non-significant) changes in post-test knowledge scores compared with pre-test. It does not necessarily mean that the intervention had no effect at all, this could imply that the teaching intervention did not lead to a measurable change in students' knowledge levels, indicating the need for further interventions. Good knowledge of the general population about disorders is expected to decrease, as there is an increase in detection of subtle undiagnosed cases, and with the decrease in overall incidence of preventable disorders due to intervention. [9]

In our study, the baseline (pre-test) knowledge levels of question 15, which where scanty or absent menstrual periods, are not indicative symptoms hyperthyroidism total percentage agreed was 47.4%, and after intervention (post-test) it was 55.3% these findings are much better comparing to another study by Kluwer (2022). [19] In this study, the baseline (pre-test) knowledge levels of the question about whether loss of weight despite a good appetite is not indicative of hyperthyroidism, the total percentage disagreed was 19.2%, and after intervention (post-test) it was 37.6%. These findings are similar to Alyahya (2021). [20]

In our study, the baseline (pre-test) knowledge levels of the question whether rapid weight gain is not indicative of hypothyroidism, the total percentage disagreed was 24.5%, and after intervention (post-test) it was 40.3%. These findings are similar to Alyahya (2021). [20] In our study, the baseline (pretest) knowledge level of the question where women are at higher risk of developing thyroid disorders, the total percentage agreed was (77.2%) and after intervention on (posttest) it was (87.7%). These findings are similar to Alshahrani et al. (2024). [21] Our study findings of the question on cold intolerance being a symptom of hypothyroidism, were in accordance with the study by Alzahrani (2023). [22] There were also similarities of our results with this study regarding whether thyroid dysfunction is hereditary. [22] Our findings on the knowledge about women being at higher risk of developing thyroid disorders, were similar to that reported by Alshahrani et al. (2024). [21]

Non-communicable diseases are chronic illnesses that last for 1 year and over, and require regular medical attention. [23] These conditions have become a major challenge to global health, but are preventable and can be easily treated with early screening and diagnosis. [24] It has been seen that health awareness and literacy are beneficial in early detection and treatment of both acute and chronic diseases [25-29], and lack of it along with limited access to health services pose a serious threat to disease prevention. Information about diseases and care, empowers patients for appropriate decisions, and improves outcomes. [30, 31] Lessons learnt from pandemic in Oman identified streamlining communication channels, addressing vulnerable communities, and providing professional technical leadership, among others, as opportunities for transformation of the health care system [32]. Hence, such an intervention can raise awareness among future healthcare practitioners about prevalent health issues in the

community and contribute to long-term disease prevention. Health authorities should implement health education initiatives and disseminate them through all available information channels.

Conclusion:

Overall, students, both male and female, demonstrated adequate knowledge of thyroid functions, causes, and symptoms of thyroid disorders. It was observed that the intervention was effective in achieving its intended outcome, and led to a significant change in knowledge levels. therefore, it is crucial to implement public health measures to enhance awareness and understanding of these diseases among students, regardless of gender or educational background, as this is essential for better management of any chronic condition. Emphasizing and continually reappraising these aspects is necessary. By increasing awareness and understanding, participants can develop proactive strategies for early detection and prevention of thyroid-related conditions and cancers, which may lead to improved health outcomes and a better quality of life.

Limitations:

Small sample size, and a single center study. The results may not be generalizable.

Recommendations:

We recommend launching intensive national campaigns and ongoing community health education programs to achieve significant benefits, such as reducing treatment costs, identifying early-stage cancer cases, and creating a comprehensive database on the familial prevalence of thyroid diseases.

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SUPPLEMENTARY TABLES

Supplementary table -1: Comparison of knowledge about the thyroid gland, functions, and causes of thyroid disease between GENDERS [PRE-TEST]

Factors	Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
1. The thyroid gland is an endocrine gland.	Male	8 (38.1%)	10 (47.6%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	2.018, 0.732
	Female	35 (37.6%)	38 (40.9%)	12 (12.9%)	6 (6.5%)	2 (2.2%)	
2. The gland is situated at the front of the neck.	Male	12 (57.1%)	4 (19.0%)	3 (14.3%)	2 (9.5%)	0 (0.0%)	2.150, 0.708
	Female	51 (54.8%)	27 (29.0%)	8 (8.6%)	5 (5.4%)	2 (2.2%)	
3. The gland is located beneath the trachea	Male	11 (52.4%)	7 (33.3%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	1.925, 0.750
	Female	44 (47.3%)	36 (38.7%)	8 (8.6%)	4 (4.3%)	1 (1.1%)	
4. The thyroid does not regulate body metabolism.	Male	6 (28.6%)	2 (9.5%)	10 (47.6%)	2 (9.5%)	1 (4.8%)	5.148, 0.272
	Female	16 (17.2%)	14 (15.1%)	31 (33.3%)	13 14.0%)	19 20.4%)	
5. Women are at higher risk of developing thyroid disorders.	Male	9 (42.9%)	5 (23.8%)	6 (28.6%)	0 (0.0%)	1 (4.8%)	2.897, 0.575
	Female	52 (55.9%)	22 (23.7%)	14 (15.1%)	2 (2.2%)	3 (3.2%)	
6. Thyroid dysfunction results in neck swelling and alterations in voice.	Male	10 (47.6%)	5 (23.8%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	7.747, 0.101
	Female	58 (62.4%)	24 (25.8%)	5 (5.4%)	4 (4.3%)	2 (2.2%)	
7. Thyroid dysfunction leads to prolonged episodes of constipation and/or diarrhea.	Male	6 (28.6%)	5 (23.8%)	9 (42.9%)	1 (4.8%)	0 (0.0%)	1.797, 0.773
	Female	22 (23.7%)	28 (30.1%)	33 (35.5%)	5 (5.4%)	5 (5.4%)	
8. Thyroid dysfunction disrupts the menstrual cycle in women.	Male	4 (19.0%)	11 (52.4%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	7.015, 0.135
	Female	46 (49.5%)	28 (30.1%)	15 (16.1%)	3 (3.2%)	1 (1.1%)	
9. Is thyroid dysfunction hereditary?	Male	7 (33.3%)	6 (28.6%)	8 (38.1%)	0 (0.0%)	0 (0.0%)	3.793, 0.435
	Female	21 (22.6%)	24 (25.8%)	35 (37.6%)	11 (11.8%)	2 (2.2%)	
10. Are you familiar with thyroid gland investigations / tests / examinations?	Male	7 (33.3%)	6 (28.6%)	5 (23.8%)	3 (14.3%)	0 (0.0%)	4.798, 0.309
	Female	18 (19.4%)	22 (23.7%)	27 (29.0%)	13 (14.0%)	13 (14.0%)	

Supplementary table -2: Comparison of knowledge about symptoms of hyper and hypothyroidism between GENDERS [PRE -TEST]

Factors	Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
11. Loss of weight despite a good appetite is not indicative of hyperthyroidism.	Male	7 (33.3%)	4 (19.0%)	8 (38.1%)	2 (9.5%)	0 (0.0%)	6.051, 0.195
	Female	21 (22.6%)	31 (33.3%)	21 (22.6%)	9 (9.7%)	11 (11.8%)	
12. Difficulty and inability to sleep are symptoms of hyperthyroidism.	Male	7 (33.3%)	9 (42.9%)	5 (23.8%)	0 (0.0%)	0 (0.0%)	1.187, 0.880
	Female	30 (32.3%)	37 (39.8%)	21 (22.6%)	1 (1.1%)	4 (4.3%)	
13. Increased heart rate is not a symptom of hyperthyroidism.	Male	6 (28.6%)	4 (19.0%)	9 (42.9%)	2 (9.5%)	0 (0.0%)	6.189, 0.186
	Female	18 (19.4%)	17 (18.3%)	26 (28%)	16 (17.2%)	16 (17.2%)	
14. Difficulty tolerating hot weather and wearing lightweight clothing in cold weather are indicative symptoms of hyperthyroidism.	Male	7 (33.3%)	7 (33.3%)	6 (28.6%)	0 (0.0%)	1 (4.8%)	2.601, 0.627
	Female	23 (24.7%)	40 (43.0%)	21 (22.6%)	6 (6.5%)	3 (3.2%)	
15. Scanty or absent menstrual periods are not indicative symptoms of hyperthyroidism.	Male	4 (19.0%)	8 (38.1%)	7 (33.3%)	2 (9.5%)	0 (0.0%)	3.667, 0.453
	Female	15 (16.1%)	27 (29.0%)	27 (29.0%)	11 (11.8%)	13 (14.0%)	
16. Can you discontinue treatment for hyperthyroidism when the test results are normal?	Male	6 (28.6%)	9 (42.9%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	3.623, 0.459
	Female	21 (22.6%)	29 (31.2%)	27 (29.0%)	5 (5.4%)	11 (11.8%)	
17. Rapid weight gain is not indicative of hypothyroidism.	Male	5 (23.8%)	9 (42.9%)	6 (28.6%)	1 (4.8%)	0 (0.0%)	7.770, 0.100
	Female	10 (10.8%)	27 (29.0%)	29 (31.2%)	10 (10.8%)	17 (18.3%)	
18. Fatigue and drowsiness are symptoms of hypothyroidism.	Male	6 (28.6%)	8 (38.1%)	7 (33.3%)	0 (0.0%)	0 (0.0%)	4.041, 0.400
	Female	36 (38.7%)	38 (40.9%)	15 (16.1%)	3 (3.2%)	1 (1.1%)	
19. Dryness of the skin and hair are symptoms associated with hypothyroidism.	Male	5 (23.8%)	9 (42.9%)	6 (28.6%)	1 (4.8%)	0 (0.0%)	1.433, 0.838
	Female	30 (32.3%)	34 (36.6%)	22 (23.7%)	4 (4.3%)	3 (3.2%)	
20. Experiencing cold sensations in warm weather is a symptom of hypothyroidism.	Male	8 (38.1%)	7 (33.3%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	2.594, 0.628
	Female	29 (31.2%)	34 (36.6%)	25 (26.9%)	1 (1.1%)	4 (4.3%)	
21. Should cabbage, cauliflower, and soy products be included in the diet for hypothyroidism?	Male	10 (47.6%)	5 (23.8%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	7.516, 0.111
	Female	19 (20.4%)	29 (31.2%)	30 (32.3%)	9 (9.7%)	6 (6.5%)	
22. Does iodized has a role in the treatment of hypothyroidism?	Male	7 (33.3%)	7 (33.3%)	5 (23.8%)	0 (0.0%)	2 (9.5%)	4.808, 0.308
	Female	28 (30.1%)	21 (22.6%)	34 (36.6%)	7 (7.5%)	3 (3.2%)	

Supplementary table -3 : Comparison of knowledge of Participants about the thyroid gland, functions, and causes of thyroid disease between genders [POST-TEST]

Factors	Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
1. The thyroid gland is an endocrine gland.	Male	16 (76.2%)	3 (14.3%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	3.451, 0.327
	Female	79 (84.9%)	10 (10.8%)	2 (2.2%)	0 (0.0%)	2 (2.2%)	
2. The gland is situated at the front of the neck.	Male	13 (61.9%)	6 (28.6%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	4.626, 0.328
	Female	56 (60.2%)	15 (16.1%)	8 (8.6%)	6 (6.5%)	8 (8.6%)	
3. The gland is located beneath the trachea	Male	16 (76.2%)	5 (23.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3.870, 0.424
	Female	64 (68.8%)	15 (16.1%)	4 (4.3%)	4 (4.3%)	6 (6.5%)	
4. The thyroid does not regulate body metabolism.	Male	11 (52.4%)	2 (9.5%)	3 (14.3%)	0 (0.0%)	5 (23.8%)	11.695, 0.020
	Female	18 (19.4%)	8 (8.6%)	18 (19.4%)	14 (15.1%)	35 (37.6%)	
5. Women are at higher risk of developing thyroid disorders.	Male	17 (81.0%)	4 (19.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5.545, 0.236
	Female	72 (77.4%)	7 (7.5%)	10 (10.8%)	1 (1.1%)	3 (3.2%)	
6. Thyroid dysfunction results in neck swelling and alterations in voice.	Male	14 (66.7%)	6 (28.6%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	5.314, 0.150
	Female	71 (76.3%)	10 (10.8%)	8 (8.6%)	0 (0.0%)	4 (4.3%)	
7. Thyroid dysfunction leads to prolonged episodes of constipation and/or diarrhea.	Male	12 (57.1%)	7 (33.3%)	1 (4.8%)	1 (4.8%)	0 (0.0%)	4.064, 0.397
	Female	51 (54.8%)	19 (20.4%)	16 (17.2%)	3 (3.2%)	4 (4.3%)	
8. Thyroid dysfunction disrupts the menstrual cycle in women.	Male	12 (57.1%)	5 (23.8%)	4 (19.0%)	0 (0.0%)	0 (0.0%)	5.790, 0.215
	Female	67 (72.0%)	14 (15.1%)	6 (6.5%)	3 (3.2%)	3 (3.2%)	
9. Is thyroid dysfunction hereditary?	Male	11 (52.4%)	6 (28.6%)	4 (19.0%)	0 (0.0%)	0 (0.0%)	4.275, 0.370
	Female	50 (53.8%)	14 (15.1%)	18 (19.4%)	5 (5.4%)	6 (6.5%)	
10. Are you familiar with thyroid gland investigations / tests / examinations?	Male	14 (66.7%)	5 (23.8%)	2 (9.5%)	0 (0.0%)	0 (0.0%)	2.601, 0.627
	Female	52 (55.9%)	22 (23.7%)	9 (9.7%)	6 (6.5%)	4 (4.3%)	

Supplementary table -4: Comparison of knowledge of Participants about symptoms of hyper and hypothyroidism between genders [POST -TEST]

Statements	Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
11. Loss of weight despite a good appetite is not indicative of hyperthyroidism.	Male	10 (47.6%)	4 (19.0%)	1 (4.8%)	3 (14.3%)	3 (14.3%)	3.709, 0.447
	Female	35 (37.6%)	9 (9.7%)	12 (12.9%)	13 (14.0%)	24 (25.8%)	
12. Difficulty and inability to sleep are symptoms of hyperthyroidism.	Male	11 (52.4%)	4 (19.0%)	5 (23.8%)	1 (4.8%)	0 (0.0%)	2.610, 0.625
	Female	61 (65.6%)	13 (14.0%)	13 (14.0%)	3 (3.2%)	3 (3.2%)	
13. Increased heart rate is not a symptom of hyperthyroidism.	Male	8 (38.1%)	3 (14.3%)	2 (9.5%)	2 (9.5%)	6 (28.6%)	.709, 0.950
	Female	29 (31.2%)	13 (14.0%)	11 (11.8%)	14 (15.1%)	26 (28.0%)	
14. Difficulty tolerating hot weather and wearing lightweight clothing in cold weather are indicative symptoms of hyperthyroidism.	Male	13 (61.9%)	4 (19.0%)	2 (9.5%)	1 (4.8%)	1 (4.8%)	.549, 0.969
	Female	53 (57.0%)	22 (23.7%)	8 (8.6%)	3 (3.2%)	7 (7.5%)	
15. Scanty or absent menstrual periods are not indicative symptoms of hyperthyroidism.	Male	12 (57.1%)	3 (14.3%)	3 (14.3%)	0 (0.0%)	3 (14.3%)	5.026, 0.285
	Female	33 (35.5%)	15 (16.1%)	16 (17.2%)	12 (12.9%)	17 (18.3%)	
16. Can you discontinue treatment for hyperthyroidism when the test results are normal?	Male	8 (38.1%)	5 (23.8%)	6 (28.6%)	1 (4.8%)	1 (4.8%)	1.993, 0.737
	Female	26 (28.0%)	17 (18.3%)	33 (35.5%)	6 (6.5%)	11 (11.8%)	
17. Rapid weight gain is not indicative of hypothyroidism.	Male	7 (33.3%)	4 (19.0%)	2 (9.5%)	2 (9.5%)	6 (28.6%)	1.375, 0.848
	Female	25 (26.9%)	13 (14.0%)	17 (18.3%)	10 (10.8%)	28 (30.1%)	
18. Fatigue and drowsiness are symptoms of hypothyroidism.	Male	14 (66.7%)	4 (19.0%)	1 (4.8%)	2 (9.5%)	0 (0.0%)	3.357, 0.500
	Female	67 (72.0%)	15 (16.1%)	8 (8.6%)	2 (2.2%)	1 (1.1%)	
19. Dryness of the skin and hair are symptoms associated with hypothyroidism.	Male	14 (66.7%)	4 (19.0%)	3 (14.3%)	0 (0.0%)	0 (0.0%)	1.874, 0.759
	Female	70 (75.3%)	11 (11.8%)	9 (9.7%)	1 (1.1%)	2 (2.2%)	
20. Experiencing cold sensations in warm weather is a symptom of hypothyroidism.	Male	13 (61.9%)	5 (23.8%)	1 (4.8%)	1 (4.8%)	1 (4.8%)	1.652, 0.799
	Female	52 (55.9%)	20 (21.5%)	14 (15.1%)	4 (4.3%)	3 (3.2%)	
21. Should cabbage, cauliflower, and soy products be included in the diet for hypothyroidism?	Male	9 (42.9%)	5 (23.8%)	3 (14.3%)	1 (4.8%)	3 (14.3%)	7.720, 0.102
	Female	29 (31.2%)	7 (7.5%)	17 (18.3%)	10 (10.8%)	30 (32.3%)	
22. Does iodized has a role in the treatment of hypothyroidism?	Male	8 (38.1%)	3 (14.3%)	2 (9.5%)	3 (14.3%)	5 (23.8%)	2.656, 0.617
	Female	47 (50.5%)	14 (15.1%)	12 (12.9%)	8 (8.6%)	12 (12.9%)	

Supplementary table -5 : Comparison of knowledge about the thyroid gland, functions, and causes of thyroid disease between undergraduates and postgraduates [PRE -TEST]

Factors	Qualification	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
1. The thyroid gland is an endocrine gland.	Undergraduate	29 (39.2%)	33 (44.6%)	9 (12.2%)	2 (2.7%)	1 (1.4%)	3.412, 0.491
	Post Graduate	14 (35.0%)	15 (37.5%)	6 (15.0%)	4 (10.0%)	1 (2.5%)	
2. The gland is situated at the front of the neck.	Undergraduate	40 (54.1%)	19 (25.7%)	9 (12.2%)	5 (6.8%)	1 (1.4%)	1.940, 0.747
	Post Graduate	23 (57.5%)	12 (30.0%)	2 (5.0%)	2 (5.0%)	1 (2.5%)	
3. The gland is located beneath the trachea	Undergraduate	43 (58.1%)	23 (31.1%)	6 (8.1%)	2 (2.7%)	0 (0.0%)	9.475, 0.050
	Post Graduate	12 (30.0%)	20 (50.0%)	5 (12.5%)	2 (5.0%)	1 (2.5%)	
4. The thyroid does not regulate body metabolism.	Undergraduate	14 (18.9%)	9 (12.2%)	27 (36.5%)	11 (14.9%)	13 (17.6%)	1.026, 0.906
	Post Graduate	8 (20.0%)	7 (17.5%)	14 (35.0%)	4 (10.0%)	7 (17.5%)	
5. Women are at higher risk of developing thyroid disorders.	Undergraduate	39 (52.7%)	17 (23.0%)	13 (17.6%)	2 (2.7%)	3 (4.1%)	1.331, 0.856
	Post Graduate	22 (55.0%)	10 (25.0%)	7 (17.5%)	0 (0.0%)	1 (2.5%)	
6. Thyroid dysfunction results in neck swelling and alterations in voice.	Undergraduate	46 (62.2%)	16 (21.6%)	8 (10.8%)	3 (4.1%)	1 (1.4%)	2.679, 0.613
	Post Graduate	22 (55.0%)	13 (32.5%)	2 (5.0%)	2 (5.0%)	1 (2.5%)	
7. Thyroid dysfunction leads to prolonged episodes of constipation and/or diarrhea.	Undergraduate	21 (28.4%)	18 (24.3%)	26 (35.1%)	5 (6.8%)	4 (5.4%)	4.369, 0.358
	Post Graduate	7 (17.5%)	15 (37.5%)	16 (40.0%)	1 (2.5%)	1 (2.5%)	
8. Thyroid dysfunction disrupts the menstrual cycle in women.	Undergraduate	31 (41.9%)	27 (36.5%)	12 (16.2%)	4 (5.4%)	0 (0.0%)	4.730, 0.316
	Post Graduate	19 (47.5%)	12 (30.0%)	8 (20.0%)	0 (0.0%)	1 (2.5%)	
9. Is thyroid dysfunction hereditary?	Undergraduate	20 (27.0%)	20 (27.0%)	25 (33.8%)	8 (10.8%)	1 (1.4%)	1.919, 0.751
	Post Graduate	8 (20.0%)	10 (25.0%)	18 (45.0%)	3 (7.5%)	1 (2.5%)	
10. Are you familiar with thyroid gland investigations / tests / examinations?	Undergraduate	19 (25.7%)	16 (21.6%)	23 (31.1%)	8 (10.8%)	8 (10.8%)	4.400, 0.355
	Post Graduate	6 (15.0%)	12 (30.0%)	9 (22.5%)	8 (20.0%)	5 (12.5%)	

Supplementary table -6 : Comparison of knowledge about the thyroid gland, functions, and causes of thyroid disease between undergraduates and postgraduates [POST -TEST]

Factors	Qualification	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
1. The thyroid gland is an endocrine gland.	Undergraduate	64 (86.5%)	8 (10.8%)	2 (2.7%)	0 (0.0%)	0 (0.0%)	4.407, 0.221
	Post Graduate	31 (77.5%)	5 (12.5%)	2 (5.0%)	0 (0.0%)	2 (5.0%)	
2. The gland is situated at the front of the neck.	Undergraduate	52 (70.3%)	12 (16.2%)	6 (8.1%)	3 (4.1%)	1 (1.4%)	14.205, 0.007
	Post Graduate	17 (42.5%)	9 (22.5%)	4 (10.0%)	3 (7.5%)	7 (17.5%)	
3. The gland is located beneath the trachea	Undergraduate	56 (75.7%)	13 (17.6%)	2 (2.7%)	0 (0.0%)	3 (4.1%)	9.286, 0.054
	Post Graduate	24 (60.0%)	7 (17.5%)	2 (5.0%)	4 (10.0%)	3 (7.5%)	
4. The thyroid does not regulate body metabolism.	Undergraduate	21 (28.4%)	7 (9.5%)	16 (21.6%)	8 (10.8%)	22 (29.7%)	4.100, 0.393
	Post Graduate	8 (20.0%)	3 (7.5%)	5 (12.5%)	6 (15.0%)	18 (45.0%)	
5. Women are at higher risk of developing thyroid disorders.	Undergraduate	57 (77.0%)	8 (10.8%)	7 (9.5%)	0 (0.0%)	2 (2.7%)	2.292, 0.682
	Post Graduate	32 (80.0%)	3 (7.5%)	3 (7.5%)	1 (2.5%)	1 (2.5%)	
6. Thyroid dysfunction results in neck swelling and alterations in voice.	Undergraduate	56 (75.7%)	11 (14.9%)	6 (8.1%)	0 (0.0%)	1 (1.4%)	2.948, 0.400
	Post Graduate	29 (72.5%)	5 (12.5%)	3 (7.5%)	0 (0.0%)	3 (7.5%)	
7. Thyroid dysfunction leads to prolonged episodes of constipation and/or diarrhea.	Undergraduate	38 (51.4%)	18 (24.3%)	12 (16.2%)	2 (2.7%)	4 (5.4%)	3.590, 0.464
	Post Graduate	25 (62.5%)	8 (20.0%)	5 (12.5%)	2 (5.0%)	0 (0.0%)	
8. Thyroid dysfunction disrupts the menstrual cycle in women.	Undergraduate	52 (70.3%)	10 (13.5%)	8 (10.8%)	2 (2.7%)	2 (2.7%)	2.294, 0.682
	Post Graduate	27 (67.5%)	9 (22.5%)	2 (5.0%)	1 (2.5%)	1 (2.5%)	
9. Is thyroid dysfunction hereditary?	Undergraduate	39 (52.7%)	12 (16.2%)	16 (21.6%)	2 (2.7%)	5 (6.8%)	3.084, 0.544
	Post Graduate	22 (55.0%)	8 (20.0%)	6 (15.0%)	3 (7.5%)	1 (2.5%)	
10. Are you familiar with thyroid gland investigations / tests / examinations?	Undergraduate	45 (60.8%)	16 (21.6%)	8 (10.8%)	4 (5.4%)	1 (1.4%)	3.789, 0.435
	Post Graduate	21 (52.5%)	11 (27.5%)	3 (7.5%)	2 (5.0%)	3 (7.5%)	

Supplementary table -7: Comparison of knowledge about symptoms of hyper and hypothyroidism between undergraduates and postgraduates [PRE -TEST]

Factors	Qualification	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
11. Loss of weight despite a good appetite is not indicative of hyperthyroidism.	Undergraduate	29 (39.2%)	10 (13.5%)	8 (10.8%)	14 (18.9%)	13 (17.6%)	7.808, 0.099
	Post Graduate	16 (40.0%)	3 (7.5%)	5 (12.5%)	2 (5.0%)	14 (35.0%)	
12. Difficulty and inability to sleep are symptoms of hyperthyroidism.	Undergraduate	43 (58.1%)	13 (17.6%)	15 (20.3%)	3 (4.1%)	0 (0.0%)	10.259, 0.036
	Post Graduate	29 (72.5%)	4 (10.0%)	3 (7.5%)	1 (2.5%)	3 (7.5%)	
13. Increased heart rate is not a symptom of hyperthyroidism.	Undergraduate	31 (41.9%)	10 (13.5%)	7 (9.5%)	11 (14.9%)	15 (20.3%)	11.200, 0.024
	Post Graduate	6 (15.0%)	6 (15.0%)	6 (15%)	5 (12.5%)	17 (42.5%	
14. Difficulty tolerating hot weather and wearing lightweight clothing in cold weather are indicative symptoms of hyperthyroidism.	Undergraduate	43 (58.1%)	18 (24.3%)	8 (10.8%)	2 (2.7%)	3 (4.1%)	4.244, 0.374
	Post Graduate	23 (57.5%)	8 (20.0%)	2 (5.0%)	2 (5.0%)	5 (12.5%)	
15. Scanty or absent menstrual periods are not indicative symptoms of hyperthyroidism.	Undergraduate	31 (41.9%)	14 (18.9%)	14 (18.9%)	5 (6.8%)	10 (13.5%)	7.062, 0.133
	Post Graduate	14 (35.0%)	4 (10.0%)	5 (12.5%	7 (17.5%)	10 (25%)	
16. Can you discontinue treatment for hyper-thyroidism when the test results are normal?	Undergraduate	27 (36.5%)	15(20.3%	22(29.7%	6 (8.1%)	4 (5.4%)	11.063, 0.026
	Post Graduate	7 (17.5%)	7 (17.5%)	17(42.5%	1 (2.5%)	8 (20%)	
17. Rapid weight gain is not indicative of hypothyroidism.	Undergraduate	26 (35.1%)	13 (17.6%)	11 (14.9%)	8 (10.8%)	16 (21.6%)	9.933, 0.042
	Post Graduate	6 (15.0%)	4 (10.0%)	8 (20.0%)	4 (10.0%)	18 (45.%)	
18.Fatigue & drowsiness are symptoms of hypo-thyroidism.	Undergraduate	53 (71.6%)	12(16.2%	6 (8.1%)	3 (4.1%)	0 (0.0%)	2.076, 0.722
	Post Graduate	28 (70.0%)	7 (17.5%)	3 (7.5%)	1 (2.5%)	1 (2.5%)	
19. Dryness of the skin and hair are symptoms associated with hypothyroidism.	Undergraduate	56 (75.7%)	12(16.2%	6 (8.1%)	0 (0.0%)	0 (0.0%)	8.334, 0.080
	Post Graduate	28 (70.0%)	3 (7.5%)	6 (15.0%)	1 (2.5%)	2 (5.0%)	
20. Experiencing cold sensations in warm weather is a symptom of hypothyroidism.	Undergraduate	45 (60.8%)	18 (24.3%)	8 (10.8%)	1 (1.4%)	2 (2.7%)	6.785, 0.148
	Post Graduate	20 (50.0%)	7 (17.5%)	7 (17.5%)	4 (10.0%)	2 (5.0%)	
21. Should cabbage, cauliflower, and soy products be included in the diet for hypothyroidism?	Undergraduate	30 (40.5%)	8 (10.8%)	12 (16.2%)	7 (9.5%)	17 (23.0%)	6.123, 0.190
	Post Graduate	8 (20.0%)	4 (10.0%)	8 (20.0%)	4 (10.0%)	16 (40.0%)	
22. Does iodized has a role in the treatment of hypothyroidism?	Undergraduate	41 (55.4%)	10 (13.5%)	10 (13.5%)	6 (8.1%)	7 (9.5%)	7.503, 0.112
	Post Graduate	14 (35.0%)	7 (17.5%)	4 (10.0%)	5 (12.5%)	10 (25.0%)	

Supplementary Table 8: Comparison of knowledge about symptoms of hyper and hypothyroidism between undergraduates and postgraduates [POST -TEST]

Factors	Qualification	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Chi-square, P-value
11. Loss of weight despite a good appetite is not indicative of hyperthyroidism.	Undergraduate	21 (28.4%)	21 (28.4%)	24 (32.4%)	5 (6.8%)	3 (4.1%)	14.348, 0.006
	Post Graduate	7 (17.5%)	14 (35.0%)	5 (12.5%)	6 (15.0%)	8 (20.0%)	
12. Difficulty and inability to sleep are symptoms of hyperthyroidism.	Undergraduate	29 (39.2%)	28 (37.8%)	16 (21.6%)	0 (0.0%)	1 (1.4%)	8.053, 0.090
	Post Graduate	8 (20.0%)	18 (45.0%)	10 (25.0%)	1 (2.5%)	3 (7.5%)	
13. Increased heart rate is not a symptom of hyperthyroidism.	Undergraduate	19 (25.7%)	11 (14.9%)	26 (35.1%)	9 (12.2%)	9 (12.2%)	7.224, 0.125
	Post Graduate	5 (12.5%)	10 (25.0%)	9 (22.5%)	9 (22.5%)	7 (17.5%)	
14. Difficulty tolerating hot weather & wearing lightweight clothing in cold weather are indicative symptoms of hyperthyroidism.	Undergraduate	22 (29.7%)	30 (40.5%)	17 (23.0%)	4 (5.4%)	1 (1.4%)	3.809, 0.432
	Post Graduate	8 (20.0%)	17 (42.5%)	10 (25.0%)	2 (5.0%)	3 (7.5%)	
15. Scanty or absent menstrual periods are not indicative symptom of hyperthyroidism.	Undergraduate	12 (16.2%	25 (33.8%)	23(31.1%	9 (12.2%)	5 (6.8%)	4.890, 0.299
	Post Graduate	7 (17.5%)	10 (25.0%)	11(27.5%	4 (10.0%)	8 (20.0%)	
16. Can you discontinue treatment for hyperthyr-oidism when the test results are normal?	Undergraduate	21(28.4%	28 (37.8%)	16(21.6%	5 (6.8%)	4 (5.4%)	11.200, 0.024
	Post Graduate	6 (15.0%)	10 (25.0%)	16 (40.%)	1 (2.5%)	7 (17.5%)	
17. Rapid weight gain is not indicative of hypothyroidism.	Undergraduate	10(13.5%	24 (32.4%)	25(33.8%	9 (12.2%)	6 (8.1%)	8.649, 0.070
	Post Graduate	5 (12.5%)	12 (30.0%)	10(25%)	2 (5.0%)	11 (27.5%)	
18. Fatigue and drowsiness are symptoms of hypothyroidism.	Undergraduate	25 (33.8%	32 (43.2%)	15(20.3%	2 (2.7%)	0 (0.0%)	2.930, 0.570
	Post Graduate	17 (42.5%	14 (35.0%)	7 (17.5%)	1 (2.5%)	1 (2.5%)	
19. Dryness of the skin and hair are symptoms associated with hypothyroidism.	Undergraduate	21 (28.4%)	28 (37.8%)	20 (27.0%)	4 (5.4%)	1 (1.4%)	2.707, 0.608
	Post Graduate	14 (35.0%)	15 (37.5%)	8 (20.0%)	1 (2.5%)	2 (5.0%)	
20. Experiencing cold sensations in warm weather is a symptom of hypothyroidism.	Undergraduate	23 (31.1%)	24 (32.4%)	24 (32.4%)	2 (2.7%)	1 (1.4%)	7.732, 0.102
	Post Graduate	14 (35.0%)	17 (42.5%)	6 (15.0%)	0 (0.0%)	3 (7.5%)	
21. Should cabbage, cauliflower, and soy products be included in the diet for hypothyroidism?	Undergraduate	23 (31.1%)	21 (28.4%)	21 (28.4%)	6 (8.1%)	3 (4.1%)	3.850, 0.427
	Post Graduate	6 (15.0%)	13 (32.5%)	14 (35.0%)	4 (10.0%)	3 (7.5%)	
22. Does iodized salt have a role in the treatment of hypo-thyroidism?	Undergraduate	30 (40.5%	17 (23.0%)	21(28.4%	3 (4.1%)	3 (4.1%)	10.511, 0.033
	Post Graduate	5 (12.5%)	11 (27.5%)	18 (45.%)	4 (10.0%)	2 (5%)	