Original Article

Impacts of chemotherapy, radiotherapy and radioactive iodine ablation on improve symptomatology in thyroid cancer patients

Saeed Akhtar Tunio, Naseem Aslam Channa, Syed Irffanullah Shah, Aneel Kapoor, Muhammad Haneef Mugheri, Lubna Noorani

Institute of Biochemistry, University of Sindh, Jamshoro, Riyadh Care Hospital, Saudi Arabia and Department of Science and Technical Education, University of Sindh, Jamshoro, Pakistan

Objective: To explore the impacts of Chemotherapy, Radiotherapy and Radioactive Iodine Ablation (RAI) on symptomatology before and after treatment of Thyroid cancer (TC) patients at Nuclear Institute of Medicine and Radiotherapy (NIMRA) Jamshoro and Larkana Institute of Nuclear Medicine and Radiotherapy (LINAR), Larkana, Pakistan.

Methodology: The study included 174 thyroid cancer (TC) patients and 174 controls with age and gender matched having negative personal or family history of any cancer or other chronic illness. Both groups before and after treated thyroid cancer patients were interviewed through a standard questionnaire regarding the association and impacts of undesirable consequences of chemotherapy, radiotherapy and RAI ablation upon various symptomatology.

Results: Before and after treatment, there was variety of symptomatology found which badly disturbed the patients. The effects of radiotherapy were not considerable outcomes of RAI ablation occurred and disturbed a lot, although most of them were reversible while the chemotherapy results were very serious and troubling.

Conclusion: Radiotherapy and chemotherapy improved symptomatology in TC patients. In post radio and chemo therapy, present study revealed positive changes in the disease associated outcome.

Keywords: Thyroid cancer, radiotherapy, chemotherapy.

INTRODUCTION

Thyroid cancer (TC) is the most common among the endocrine malignancies. Its frequency is higher in females involving age groups from 30 to 45years. In Pakistan, the prevalence is quite significant (3.8%) and is found in harmony with world statistics. TC is treated with surgery, radioactive iodine ablation (RAI) therapy, chemotherapy and external beam radiotherapy (EBR).[1,2] Besides the benefits of treatment, there are adverse clinical effects may be either transient or permanent. Therefore, to evaluate different signs and symptoms, demographic variables and symptomatology of TC patients and their association with various treatment methodologies specifically at LINAR Larkana and NIMRA Jamshoro compelled us to undertake present study as to assess the impact of these modalities.

METHODOLOGY

This cross-sectional prospective study was carried out from February 2017 to January 2018. Total of 148 subjects were enrolled; among them 74 diagnosis cases of TC (age range 24.27 – 43.48 years) selected from LINAR and NIMRA. For comparison, 74 age and gender matched controls were also engaged with negative personal and family history of any cancer. The study subjects involved in other chronic illness, pediatric age groups, non-malignant thyroid disorders were excluded. The study was approved by ethical committee of Institute of Biochemistry, University of Sindh and all subjects signed written informed consent.

Patients were interviewed through a standard questionnaire especially designed for this study in detail regarding the anthropometric information, demographic characteristics, while TC patients were evaluated for medical and surgical history and especial association and effects on various symptomatology with the side effects of radiotherapy, radioactive iodine ablation and chemotherapy.

Seven ml intravenous blood samples were collected from Controls (once) and TC patients (before treatment and after treatment samples separately). Sample collection, storage, estimation and analysis were done and followed by international research standard operative procedures.

Statistical Analysis: Data were analyzed by SPSS version 22.

RESULTS

Table 1 shows the information regarding socio demographic characteristics in both the thyroid cancer

Table 1: Socio-demographic characteristics patients and controls.

Socio-demographic Characteristics	Thyroid Cancer Patients n = 174 (%)	Controls n = 174 (%)
Mean Age Range (Years)	24.2 – 43.4	24.4 – 43.3
Genders		
Male	32.5	35.2
Female	67.5	64.8
Marital Stats		
Married	77.1	75.7
Unmarried	22.9	24.3
Age Groups		
≤ 16 – 30 years	46.0	45.1
31 – 45 years	41.8	43.2
46 – 60 years	8.1	9.4
≥ 60 years	4.1	2.3
Body Mass Index (BMI)		
Underweight (≤ 18.5 kg/m2)	12.1	9.4
Normal weight (18.5 – 24.9 kg/m2)	50.1	51.3
Overweight (25 – 29.9 kg/m2)	24.3	27.1
Obese (≥ 30 kg/m2)	13.5	12.2
District		
Urban	54.05	62.2
Rural	45.95	37.8
Socioeconomic Stats		
Poor	35.1	27.1
Middle	47.3	45.9
Upper	17.6	27.0
Life Style		
Active	94.3	97.27
Sedentary	5.7	2.73
Profession		
Business Man	10.0	13.0
Government job	10.4	9.4
House Wife	61.1	41.2
Labour	2.3	12.1
Student	16.2	24.3
Cigarette Smoking		
Smokers	36.49	25.4
Non-smokers	63.51	74.6
Sleep		
< 7 Poor	5.4	2.7
7 Good	19.0	52.3
> 7 Fair	75.6	45.0
Appetite		
Good	63.5	74.3
Fair	34.0	23.0
Poor	2.5	2.7

patients and controls. We found in majority of before treatment patients palpitation (87.8%) weight loss (93.2%) increased appetite (89.1%) difficulty in tolerating heat (93.2%) and hand tremors in (83.8%). Whereas after treatment TC patients showed majority, low pulse rate (63.5%)weight gain (95.9%) reduce cold tolerance (94.5%) excessive sleep (which was more than 07 hours per day, 85.1%) and hoarseness(83.7%) (Table 2).

The effects of chemotherapy have shown in Fig. 1. We

Table 2: Symptomatology before (Hyperthyroidism) and after treatment (Hypothyroidism).

Signs and Symptoms	Before Treatment n = 174 (%)	Signs and Symptoms	After Treatment n = 174 (%)
Palpitations	87.8	Low Pulse Rate	63.5
Normal Heart Rate	12.1	Normal Pulse	14.8
Weight Loss	93.2	Weight Gain	95.9
No Weight Loss	6.7	Normal Weight	4.0
Sweating	84.8	Normal Skin /No Sweating	75.6
No Sweating	15.1	Dry Skin	24.3
Increased Appetite	89.1	Decreased Appetite	80.0
Normal Appetite	10.8	Normal Appetite	20.0
Fatigue	68.7	Tried All The Time	74.3
Normal And Active	31.2	Normal And Active	25.8
Difficulty In Tolerating Heat	93.2	Reduced Cold Tolerance	94.5
Normal Heat Tolerance	6.7	Normal Cold Tolerance	5.4
Decreased Sleep	53.0	Excessive Sleep	85.1
Normal Sleep	47.0	Normal Sleep	22.9
Hoarseness	79.0	Hoarseness	83.7
Normal Voice	20.9	Normal Voice	16.2
Constipation	4.0	Constipation	56.4
Normal Defecation	95.9	Normal Defecation	43.5
Irritability	55.4	Depression	77.0
Normal Attitude	44.5	Normal	22.9
Protrusion Of Eyes	28.3	Blurred Vision	70.2
Normal Eyes	71.6	Normal Vision	29.7
Hand Tremors	83.7	Brittle Nails	12.1
No Tremors	16.2	Normal Nails	87.8
Poor Concentration	31.0	Irregular Menstrual Cycle (Female)	59.5
Normal	68.9	Normal Menstrual Cycle	40.5
Swelling In Front of Neck	94.5	Unusual Hair Fall	79.7
Normal Looking Neck	5.4	No Hair Fall	20.2

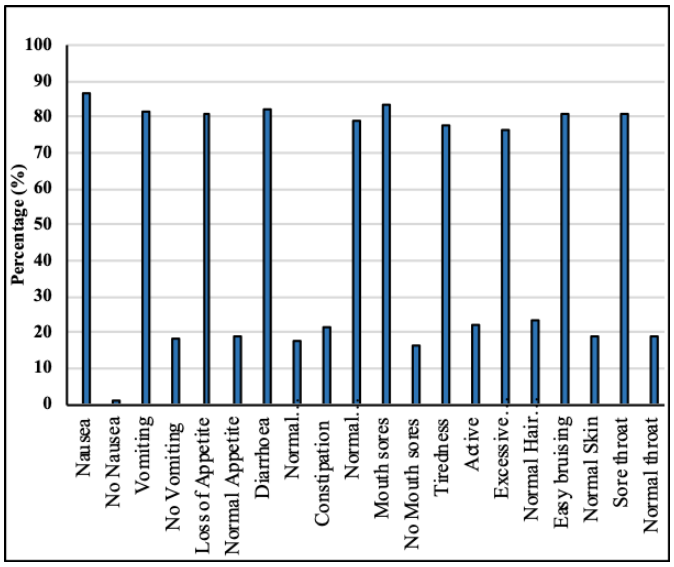

Fig. 1: Effects of chemotherapy on thyroid cancer patients.

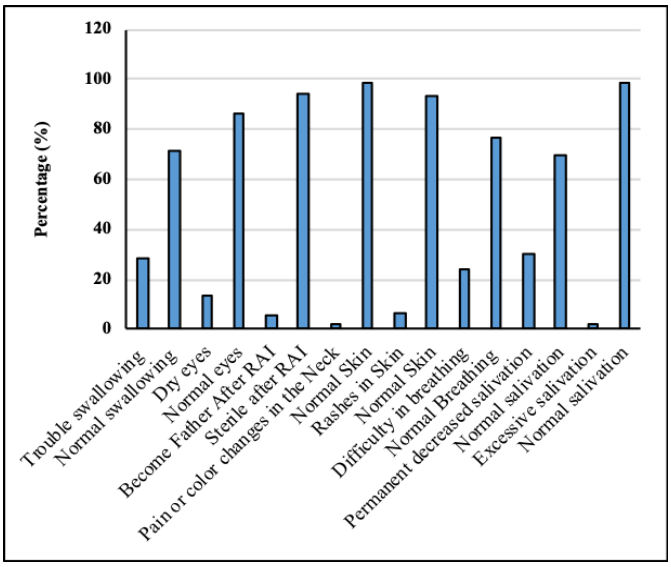

Fig. 2: Effects of Radioactive Iodine Ablation in Thyroid Cancer Patients.

have not found any prominent side effects of EBR on TC patients, but on the contrary we found majority of TC patients with effects of chemotherapy nausea (86.7%) vomiting (81.8%) loss of appetite (81.05) diarrhoea (82.1%) mouth sores (83.7%) excessive hair loss (76.2%) and easy bruising (81.0 %) in after treated with chemotherapy. Fig. 2 depicted the effects of RAI in TC patients which were found to be dry oral cavity (81.6) mouth ulcers (80.6) dental caries (76.6) loss of smell (80.7) loss of taste (90.0) hoarseness (86.7) in TC patients.

DISCUSSION

It is a certain fact that most of TC clinically become non noticeable and the diagnosis becomes very late or remained undiagnosed. Hence, in an autopsy studies, reported from numerous areas of the world found enormous increased incidence (11%) of this disease.[3,4] Some studies reported that the females were more prone to develop thyroid cancer as compared to males.[5,6] Comparable results for age groups and marital status were found by other studies as well.[6,11] BMI has positive association with thyroid cancer patients but the biological mechanism is unknown.[3,5,6]

The low socioeconomic status is also reported by a number of studies, as they were lacking basic knowledge about the disease may be due to lower educational status, having false religious beliefs and are unaware of the significance of early and appropriate treatment in contrast to high socioeconomic class.[12,14] Myung et al reported non-significant positive association of labour, office worker, unemployed and businessman but house wives (61.7% in TC) and (63.9% in controls) were significantly associated with TC patients.[12] It may be due to difference in sex hormones, reproductive and fertility aspects of females that may interfere with the physiological functions of thyroid gland.[15,16]

In some studies, cigarette smoking is correlated to a significant decline in the concentrations of TSH, therefore, causing thyroid dysfunction. Some studies showed lower risk of TC in smokers and linked it with low concentration of TSH as well as low BMI which is in contradiction with present study.[9,17]

During the course of TC we found that most patients in state of hyperthyroidism (before treatment). Usually, TC patients came with swelling in front of the neck, palpitation, weight loss, sweating, increased appetite, fatigue, difficulty in tolerating heat and hoarseness whereas, After diagnosing TC, patients went in to different treatment modalities and became in the state of hypothyroidism (after treatment) with prevailing symptoms of it like low pulse rate, weight gain, decreased appetite, reduced cold tolerance, excessive sleep, hoarseness, tiredness, hair loss, and psychological disturbances. These observations are similar to a study published earlier.[18]

Regular followup of TC is crucial, which include serial check-ups of recommended parameters. American Cancer Society in 2016 and Cedar Sinai thyroid cancer institute in 2017 reported almost same adverse effects as reported in present study.[19] The side effects of EBR treatment are temporary and usually disappear within a few weeks, as reported by Lara et al[20] and Fard-Esfahani et al.[21]

EBR has got reversible clinical effects while the RAI ablation exerts mild to moderate side effects which can be manageable with some advance precautions. In the light of present research work. We suggest and recommended the patients to improve their nutrition during the treatment as to reduce or minimize the treatment related adverse effects in TC patients.

CONCLUSION

Radiotherapy and chemotherapy improve symptomatology in TC patients. In post radio and chemo therapy, some serious transient and permanent side effects and hazards are well known but on the contrary present study also reveals positive changes in the disease associated outcome.

Author Contributions:
Conception and design: Saeed Akhtar Tunio, Naseem Aslam Channa.
Collection and assembly of data: Syed Irfanullah Shah, Saeed Akhtar Tunio.
Analysis and interpretation of the data: Muhammad Haneef Mugheri, Saeed Akhtar Tunio.
Drafting of the article: Aneel Kapoor, Naseem Asalam Channa.
Critical revision of the article for important intellectual content: Naseem Aslam Channa.
Statistical expertise: Muhammad Haneef Mugheri, Aneel Kapoor.
Final approval and guarantor of the article: Naseem Aslam Channa.
Corresponding author email: Naseem Aslam Channa: nachanna2000@gmail.com
Conflict of Interest: None declared.
Rec. Date: Sep 30, 2019 Revision Rec. Date: Mar 14, 2021 Accept Date: October 14, 2021.

REFERENCES

1. Cancer Council of Australia. Understanding Thyroid Cancer Email info@cancer.org.au Website cancer.org.au.
2. Schmidbauer B, Menhart K, Hellwig D, Grosse J. Differentiated Thyroid Cancer-Treatment: State of the Art. Int J Mol Sci. 2017; 18: 1292-3.
3. Muhammad HM, Naseem AC, Safdar AQ, Khuhro Najaf A, Paras M, Azhar AA. Risk factors for oral cancer disease in Hyderabad and adjoining areas of Sindh, Pakistan. Rawal Med J. 2018; 43: 606-10.
4. Pramod T, Shivaswamy B, Ananth G, Rajashekara B, K Latha, Jagadeesh K. Clinical Study of Carcinoma Thyroid and its Management International; Int J Sci Res. 2016; 10: 36-42.
5. Kitahara CM, McCullough ML, Franceschi S, Rinaldi S, Wolk A, Neta G, et al. Anthropometric Factors and Thyroid Cancer Risk by Histological Subtype: Pooled Analysis of 22 Prospective Studies. Thyroid. 2016; 26: 306-18.
6. Li X, Meng Z, Tan J, Liu M, Jia Q, Zhang G, et al. Gender impact on the correlation between thyroid function and serum lipids in patients with differentiated thyroid cancer. Exp Ther Med. 2016; 12: 2873-80.
7. Arjumand I, Tasleem S, Baig I, Rhematullah A, Zafar S. A cross sectional study of 1198 cases of thyroid carcinomas in an academic referral centre of Pakistan; Glob Adv Res J Med Sci. 2017; 5: 75-78.
8. Iftikhar A, Naseeb AK, Khwaja A, Mati H, Karim K, Hameeda N. Patterns of differentiated thyroid cancer in Baluchistan Province of Pakistan: some initial observations. Med J Malaysia, 2011; 66: 322-5.
9. Choi S, Ryu S, Han M, Park J. The Association Between the Socioeconomic Status and Thyroid Cancer Prevalence; Based on the Korean National Health and Nutrition Examination Survey 2010-2011. J Korean Med Sci. 2013; 28: 12-1734.
10. Goodarzi E, Moslem A, Feizhadad H, Jarrahi AM, Adineh HA, Sohrabivafa M, et al. Epidemiology, incidence and mortality of thyroid cancer and their relationship with the human development index in the world: an ecology study in 2018. Am J Hum Biol. 2019; 9: 162-5.
11. Shi RL, Qu N, Lu ZW, Liao T, Gao Y, Ji QH. The impact of marital status at diagnosis on cancer survival in patients with differentiated thyroid cancer. Can Med. 2016; 5: 2145-54.
12. Myung SK, Lee CW, Lee J, Kim J, Kim HS. Risk Factors for Thyroid Cancer: A Hospital-Based Case-Control Study in Korean Adults. Cancer Res Treat. 2017; 49: 70–78.
13. Park SH, Lee B, Lee S, Choi E, Choi EB, Yoo J, et al. A qualitative study of women's views on over diagnosis and screening for thyroid cancer in Korea. BMC Can. 2015; 15: 1-8.
14. Cabanillas ME, McFadden DG, Durante C. Thyroid cancer. Lancet. 2016; 388: 2783-95.
15. Altekruse S, Das A, Cho H, Petkov V, Yu M. Do US thyroid cancer incidence rates increase with socioeconomic status among people with health insurance? An observational study using SEER population-based data. BMJ Open, 2015; 5: e009843.
16. Fiore U, De Santis A, Perla F, Zanetti P, Palmieri F. Using generative adversarial networks for improving classification effectiveness in credit card fraud detection. Inf Sci. 2019; 479: 448-55.
17. Husson O, Haak H R, Buffart L M, Nieuwlaat W A, Oranje W A, Mols F, et al. Health-related quality of life and disease specific symptoms in long-term thyroid cancer survivors: A study from the population-based PROFILES registry. Acta Oncologica. 2013; 52: 249-58.
18. Canaris J, Steiner J. Do traditional symptoms of hypothyroidism correlate with biochemical disease. J Gen Intern Med. 1997; 12: 544-50.
19. Cedars- Sinai thyroid cancer institute online information, guidelines for thyroid Cance. 2017.
20. Lara P, Holt E, Glenda G, David C, Hari A. Management of Papillary Thyroid Cancer: An Overview for the Primary Care Physician Case Study and Commentary, 2014; 21: 233-35.
21. Fard-Esfahani A, Emami-Ardekani A, Fallahi B, Fard-Esfahani P, Beiki D, Hassanzadeh-Rad A, et al. Adverse effects of radioactive iodine-131 treatment for differentiated thyroid carcinoma. Nuc Med Com. 2014; 35: 808-17.