 DOI: 10.18231/2455-6769.2016.0006

Clinical spectrum of cutaneous manifestations of thyroid disorders in patients attending MediCiti Institute of Medical Sciences

B. Srujana[1], B. Narayan Reddy[2,*], GK Prasad[3]

[1]Junior Resident, [2]Associate Professor, [3]Professor & HOD, Dept. of DVL, MediCiti Institute of Medical Sciences

***Corresponding Author:**
Email: bnreddy53@yahoo.com

Abstract

Background: The cutaneous manifestations of the thyroid disorders are often varied. The thyroid diseases may cause diverse symptoms, including skin changes, affecting all age groups and manifesting in various ways. The aim was to study the cutaneous manifestations in thyroid disorders and to suggest appropriate intervention, wherever pertinent, and to identify various cutaneous associations with thyroid disorders, in patients attending our hospital.

Methodology: This study was conducted at MediCiti Hospital, from January 2014 to June 2015, in which, 191 in and out patients of all ages and both sexes, attending Dermatology, and other OPDs were screened for evidence of cutaneous manifestations of thyroid disorders.

Exclusion criteria: Pregnant women, Known Diabetics, Patients without any cutaneous manifestations of thyroid disorder.

Results: The cutaneous manifestations are much higher in females than in males, in both hypothyroidism and hyperthyroidism cases, and age group of 21 to 30 years was most affected. The commonest cutaneous sign, in hypothyroidism, among females was xerosis, noted in 62% and in males, both xerosis and hair changes were seen in 68% cases. When cutaneous signs of hyperthyroid females were examined, hair changes were seen to a maximum extent i.e., in 55% of cases and among males, hair changes were seen in 50% cases.

Conclusion: Females are affected to a much larger extent than males and there is preponderance of more cutaneous manifestations in hypothyroidism cases when compared with hyperthyroidism cases. A better understanding of these features, helps in diagnosing the underlying thyroid abnormality.

Keywords: Thyroid disorders, Cutaneous manifestations, Hypothyroidism, Hyperthyroidism, MediCiti Institute.

Introduction

Thyroid disease is a medical condition in which the normal functioning of the thyroid gland is affected due to abnormal production of thyroid hormones, triiodothyronine (T3) and thyroxine (T4). Excess production of thyroid hormones results in a condition, known as hyperthyroidism while its insufficiency leads to hypothyroidism. T3 is an iodine-containing hormone, derived from T4. It is the more metabolically active hormone produced from T4. It affects almost every physiological process in the body, including growth and development, metabolism, body temperature, heart rate.[(1)] Iodine deficiency remains the most common cause of hypothyroidism worldwide. In areas of iodine sufficiency, the auto-immune diseases (Hashimoto's thyroiditis), followed by iatrogenic causes are the most common etiological factors. Grave's disease, Toxic multinodular goitre, and toxic adenoma are the most common causes for hyperthyroidism. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India, suffer from thyroid diseases.[(2)]

The thyroid disorders may cause diverse symptoms, affecting all age groups and manifesting in various ways and its cutaneous manifestations are often varied. In many instances, especially in a rural set-up, the cutaneous manifestations of the thyroid disorders remain under-diagnosed for different reasons such as illiteracy, lack of access to medical care, poverty, negligence on the part of patients to approach hospital in time etc. Hence, we carried out this study to identify the cutaneous manifestations in thyroid disorders and its various cutaneous associations, so as to suggest appropriate intervention, wherever pertinent, in patients attending our hospital.

Methodology

This study was a cross-sectional and observational study, conducted at MediCiti Hospital from January 2014 to June 2015. During this period, 191 in and out patients of all ages and both sexes, attending Dermatology, and other OPDs were screened for evidence of cutaneous manifestations of thyroid disorders. Institutional ethical clearance was obtained before the start of the study.

The patients were clinically examined in good light for various cutaneous manifestations of thyroid disorders such as skin lesions, nail changes, hair changes. A detailed history and relevant clinical details, were taken after obtaining consent from all the participants who were included in the study. Laboratory investigations, including Haemogram, Complete urine examination, Random blood sugar, Liver function tests, Renal function tests, Fasting lipid profile, Thyroid profile was done for all the cases. Skin biopsy was done in relevant cases. Pregnant women, Known Diabetics, and Patients without any cutaneous manifestations of thyroid disorders were excluded from the study. All

patients, both old and new, with cutaneous manifestations of thyroid disorders, all age groups and both sexes were included in the study, the results were analyzed statistically using relevant software (SPSS 22.0). P-values, were calculated wherever possible.

Results

The study included 191 cases with thyroid disorders, who regularly attended MediCiti institute of medical sciences and hospital, Ghanpur, Ranga Reddy district. Out of 191 cases, there were 148 cases (77%) with manifestations suggestive of hypothyroidism while the rest 43 cases (23%) had manifestations suggestive of hyperthyroidism. (Table 1). In the hypothyroidism group, there were 25 males (17%) and 123 females (83%). In the hyperthyroidism group, 14 were males (33%) and 29 were females (67%), indicating a female preponderance in both the groups. (Table 2). This study also identified that, age group of 21 to 30 years was most affected, in both hypo- and hyperthyroidism. (Table 3, 4). There were 79 cases (41%) with a positive family history (Table 5) and 150 cases (79%) with other auto-immune disorders (Table 6). In this study, when general symptoms were considered, in the hypothyroidism group (148), most cases experienced lethargy, in both males and females i.e., 11 cases (44%) and 59 cases (48%) respectively. (Table 7). Similarly, in hyperthyroidism group, most cases experienced lethargy and irritability, in both males and females i.e., 5 cases (36%) and 11 cases (38%) respectively and heat intolerance showed a P-Value of 0.000, which is highly significant. (Table 8).

Table 1: Total cases with cutaneous manifestations

S. No	Description	Number of patients (191)	%
1.	Hypothyroidism	148	77%
2.	Hyperthyroidism	43	23%
3.	Total	191	100%

Table 2: Sex-wise distribution of total cases

S. No	Description	Number of Hypothyroidism cases (a)	Number of Hyperthyroidism cases (b)	Total (a+b)
1.	Male	25 (17%)	14 (33%)	39 (20%)
2.	Female	123 (83%)	29 (67%)	152 (80%)
3.	Total	148 (77%)	43 (23%)	191 (100%)

Table 3: Hypothyroidism cases (148) with cutaneous manifestations according to age and sex

S. No	Age group in years	Female	Percentage	Male	Percentage	Grand Total	
						No.	Percentage
1.	1-10	1	0.8%	1	4%	2	1.4%
2.	11-20	23	18.7%	2	8%	25	16.8%
3.	21-30	51	41.4%	13	52%	64	43.2%
4.	31-40	29	23.6%	6	24%	35	23.6%
5.	41-50	9	7.3%	1	4%	10	6.8%
6.	51-60	5	4.1%	1	4%	6	4.1%
7.	61-70	4	3.3%	1	4%	5	3.4%
8.	71-80	1	0.8%	0	0	1	0.7%
9.	Total	123	100%	25	100%	148	100%

Table 4: Hyperthyroidism cases (43) with cutaneous manifestations according to age and sex

S. No	Age group	Female	Percentage	Male	Percentage	Grand Total	
						No.	Percentage
1.	1-10	1	3.5%	1	7.1%	2	4.7%
2.	11-20	5	17.2%	2	14.3%	7	16.3%
3.	21-30	12	41.3%	6	42.9%	18	41.9%
4.	31-40	6	20.7%	3	21.5%	9	20.9%
5.	41-50	3	10.3%	1	7.1%	4	9.3%
6.	51-60	1	3.5%	1	7.1%	2	4.7%
7.	61-70	1	3.5%	0	0	1	2.3%
8.	71-80	0	0	0	0	0	0
9.	Total	29	100%	14	100%	43	100%

Table 5: Family history

S. No	Family History	Total Cases	Percentage
1.	Present	79	41%
2.	Absent	112	59%
3.	Total	191	100%

Table 6: Total cases with other autoimmune disorders

S. No	Associated autoimmune disorder	Total number of cases	Percentage
1.	Present	150	79%
2.	Absent	41	21%
3.	Total	191	100%

Table 7: Hypothyroidism cases (148) according to general symptoms

S. No	General symptoms	Number of cases(148)		P-Value
		Female (123)	Male (25)	
1.	Lethargy	59(48%)	11(44%)	0.773
2.	Cold intolerance	57(46%)	12(48%)	0.880
3.	Menstrual disturbances (Oligomenorrhea or amenorrhea)	52(42%)	NA	_
4.	Hoarseness of voice	45(37%)	7(28%)	0.412
5.	Puffiness of face	36(29%)	6(24%)	0.594
6.	Decreased Appetite	32(26%)	6(24%)	0.833
7.	Swelling of hands and feet	31(25%)	2(8%)	0.060
8.	Constipation	29(24%)	4(16%)	0.407
9.	Decreased sweating	15(12%)	2(8%)	0.549
10.	Depression	11(9%)	2(8%)	_

Table 8: Hyperthyroidism cases (43) according to general symptoms

S. No	General symptoms	Number of cases(43)		P value
		Female (29)	Male (14)	
1.	Fatigue & irritability	11(38%)	5(36%)	_
2.	Menstrual Disturbances (Oligomenorrhea)	8(28%)	NA	_
3.	Heat intolerance	6(21%)	5(36%)	0.000**
4.	Appetite changes (Decrease or increase)	5(17%)	3(21%)	0.965
5.	Diarrhea	5(17%)	3(21%)	_
6.	Increased perspiration	3(10%)	4(29%)	0.164
7.	Palpitations	2(7%)	1(7%)	_

** Highly significant

Cutaneous symptoms: The present study revealed that, the most common cutaneous symptom, in hypothyroidism group, among both males and females was dry skin i.e., 19 cases (76%) and 96 cases (78%) respectively. (Table 9). In the hyperthyroidism cases, the most prominent cutaneous symptom, among females, was moist and smooth skin, in 21 cases (72%), while in males, the prominent symptom was soft nails, noted in 7 cases (50%). (Table 10).

Table 9: Hypothyroidism cases (148) according to cutaneous symptoms

S. No	Skin symptoms	Number of cases(148)		P-Value
		Female (123)	Male (25)	
1.	Dry skin	96(78%)	19(76%)	0.681
2.	Hair fall + slow growth of hair	68(55%)	8(32%)	0.028
3.	Itching	42(34%)	7(28%)	_
4.	Brittle nails	33(27%)	5(20%)	0.833
5.	Thickening of palms and soles	30(24%)	4(16%)	_

Table 10: Hyperthyroidism cases (43) according to cutaneous symptoms

S. No	Skin symptoms	Number of cases(43)		P-Value
		Female (29)	Male (14)	
1.	Warm, moist & smooth skin	21(72%)	3(21%)	0.001**
2.	Soft nails	15(51.7%)	7(50%)	_
3.	Thinning of hair or hair loss	13(45%)	5(36%)	_
4.	Koilonychia	8(27.5%)	5(36%)	_
5.	Increased sweating	6(20.6%)	4(29%)	0.164
6.	Itching	6(21%)	4(29%)	_

** Significant

Cutaneous signs: The study also observed that among female hypothyroidism cases, the common cutaneous sign was xerosis, noted in 76 cases (62%) and in males, it was both xerosis and hair changes, in 17 cases (68%). (Table 11). When cutaneous signs of hyperthyroid females were examined, most patients had hair changes i.e., in 16 cases (55%) and among males, 7 cases (50%) had hair changes. (Table 12).

Table 11: Cutaneous signs in hypothyroid cases (148)

S. No	Cutaneous signs	No. of Patients(148)	
		Female(123)	Male(25)
1.	Xerosis	76(61.7%)	17(68%)
2.	Hair changes (coarse, brittle, straw-like)	69(56%)	17(68%)
3.	Ichthyosis	45(36.6%)	9(36%)
4.	Cool skin	43(34.9%)	8(32%)
5.	Pallor	34(27.6%)	5(20%)
6.	Myxedema	32(26%)	5(20%)
7.	Wrinkling	19(15.4%)	4(16%)
8.	Multinodular Goitre	11(8.9%)	6(24%)

Table 12: Cutaneous signs in hyperthyroidism cases (43)

S. No	Cutaneous signs	No. of Patients (43)	
		Female (29)	Male (14)
1.	Hair changes (fine, soft and thinned)	16(55%)	7(50%)
2.	Increased skin pigmentation	11(38%)	6(42.8%)
3.	Overgrown nails (acropachy, clubbing, onycholysis, Beau's lines)	9(31%)	6(42.8%)
4.	Tremors	6(21%)	5(35.7%)
5.	Tachycardia	5(17%)	5(35.7%)
6.	Flushing of face and hands	3(10.3%)	1(7.1%)

Associations: Among hypothyroidism cases, in females, there were 52 cases (42.2%) showing association with Melasma and in males, 6 cases (24%) showed association with Alopecia areata and Urticaria. Among hyperthyroidism cases, in females, most cases had Melasma i.e., in 20 cases (68%). In contrast, most of the male patients had association with Alopecia areata i.e., 9 (64.2%). (Table 13).

Table 13: Total cases according to associated co-morbid conditions

S. No	Dermatological disorders	Hypothyroidism(148) (a)		Hyperthyroidism(43) (b)	
		Female(123)	Male(25)	Female(29)	Male(14)
1.	Melasma	52(42.2%)	3(12%)	20(68%)	6(42.8%)
2.	AA	41(33.3%)	6(24%)	10(34%)	9(64.2%)
3.	Urticaria	34(28%)	6(24%)	6(21%)	7(50%)
4.	Psoriasis	27(22%)	1(4%)	6(21%)	8(57.1%)
5.	Vitiligo	21(17%)	2(8%)	4(13.7%)	4(29%)
6.	LP	20(16%)	2(8%)	2(6.8%)	3(21%)
7.	BP	3(2.4%)	1(4%)	1(3.4%)	3(21%)
8.	PV	11(8.9%)	1(4%)	3(10%)	1(7.14%)

9.	LSA	19(15.4%)	1(4%)	1(3.4%)	3(21%)
10.	AN	2(1.62%)	4(16%)	6(21%)	3(21.4%)
11.	Xanthelasma palpebrum	2(1.62%)	3(12%)	2(6.8%)	1(7.14%)
12.	Scleroderma	1(0.8%)	2(8%)	1(3.4%)	1(7.14%)

Discussion

TSH hyposecretion (Hypothyroidism) and hypersecretion (Hyperthyroidism) are associated with various cutaneous manifestations, many of which may predate the appearance of other overt symptoms, and are often unnoticed and/or neglected by the patients. In the developed world, the prevalence of overt hypothyroidism is about 4-5% and is about 4-15% for subclinical hypothyroidism.

In an epidemiological study from Cochin (India), subclinical and overt hyperthyroidism were present in 1.6% and 1.3% of subjects participating in a community survey. However, it is observed that not many studies are available in the literature, till date, depicting the cutaneous manifestations of thyroid disorders cases in Ranga Reddy district. Keeping this constraint in view, while studying the reviews available on the subject, the present study was undertaken up.

This study included 191 cases (76%) with cutaneous manifestations of thyroid disorders, of whom 148 (77%) were of hypothyroidism and 43 (23%) were of hyperthyroidism (Table 1). These 191 cases, as aforesaid, were analyzed for the presence of thyroid hormone abnormalities in their sera and also for cutaneous manifestations.

When considered sex-wise, among 148 hypothyroid cases (77%), females were 123 (83%) while males were 25 (17%), the male to female ratio being 1:5. Likewise, in respect of hyperthyroid cases numbering 43 (23%), females were 29 (67%) and males were 14 (33%), the male to female ratio being 1:2 (Table 2). The findings of the present study were akin to a study conducted by Dr. Joan Samson et al. (2011, Kerala),[3] in which there was female preponderance in both groups, with a male to female ratio of 1:4.2 in hypothyroidism and 1:2.27 in hyperthyroidism. This may be related to different hormonal leaps in women. In another study conducted by Neerja Puri (2012, Punjab),[4] 72% patients had hypothyroidism and 28% had hyperthyroidism, which is similar to the present study. In 2013, in a study conducted by Ahad Razi et al.,[5] there were 71% of hyperthyroidism and 29% of hypothyroidism cases, unlike in the present study, which revealed more of hypothyroidism cases. This variation could be due to area-specific nature and small sample size in their study. Daciana Elena Branisteanu et al. (2014, Iasi, Romania)[6] conducted a study on cutaneous manifestations associated with thyroid disease on 36 patients and noted 10.7% cases of hypothyroidism and no cases of hyperthyroidism, which is in contrast to the present study. It is presumed that the small sample size in their study resulted in these kind of findings.

The common age group affected, in this study, was 21 to 30 yrs, followed by 11 to 20 yrs, in both the groups (Table 3, 4). When analyzed statistically, this study revealed that, hypothyroidism in females and males is highly correlated, r=0.949, indicating the significance (correlation is significant at 0.01 level) and in hyperthyroidism cases, correlation r=0.978, which means cases are correlated.

It was noticed that in 79 cases (41%), a positive family history was noticed (Table 5). This observation finds credence from the study conducted by Kawther T. El- Shafie[7] entitled "Clinical presentation of hypothyroidism". There were 150 cases (79%) showing association with autoimmune disorders (Table 6). Literature indicates that altogether, 8.2% of systemic autoimmune patients had either Hashimoto thyroiditis or Grave's disease.

In this study, when both males and females were considered, among hypothyroid cases, the prominent symptoms noticed were lethargy in 70 cases (47%), cold intolerance in 69 cases (47%), hoarseness of voice in 52 cases (35%), puffiness of face in 42 cases (28%), decreased appetite in 38 cases (26%), swelling of hands and feet in 33 cases (22%), constipation in 33 cases (22%), decreased sweating in 17 cases (11%) and depression in 13 cases (9%). The menstrual disturbances were noted in 52 cases (42%) (Table 7). Alka Dogra et al.[8] found 21 cases of lethargy (65.62%) to be the most common complaint, which is in contrast to the present study. Mohammad Abid Keen et al.[9] found puffy face in 132 cases i.e., 28.69% and puffy edema of hands and feet in 177 cases (38.48%), decreased sweating in 39 (8.48%). These findings are similar to the present study which showed 29% cases of puffy face and swelling of hands and feet in 25% cases and decreased sweating in 12%. Maripati Lavanya et al. (2015)[10] noticed that 44.64% of cases have lethargy, 30.36% patients have cold Intolerance, hoarseness of voice in 41%, constipation in 21.4%, similar to the present study. However, in contrast, they reported that menstrual abnormalities were the main complaints.

When total hyperthyroidism cases were considered, the prominent symptoms noticed were lethargy and irritability in 16 cases (37%), heat intolerance in 11 cases (26%), appetite changes in 8 cases (19%), diarrhea in 8 cases (19%), increased perspiration in 7 cases (16%) and palpitations in 3 cases (7%) (Table 8).

Among hypothyroidism cases, the prominent skin symptoms noticed were dry skin in 115 cases (78%), followed by hair fall in 76 cases (51%) (Table 9).

Among hyperthyroidism cases, the most cases showed warm, moist and smooth skin in 24 cases (56%), soft nails in 22 cases (51%) and least experienced increased sweating and itching in 10 cases (23%) (Table 10). Sweating in thyrotoxicosis is a reflection of the underlying metabolic state. It is thought to be related to the increased sympatho adrenal activity resulting from the synergistic action between catecholamines and thyroid hormone.[11] In contrast, Neerja puri (2006)[4] noted palmoplantar hyperhidrosis in 64.3% of the cases and Ahad Razi et al. (2013)[5] observed 60 cases (50%) of perspiration.

Ahad Razi et al.[5] noted, among hypothyroidism cases, dry skin in 35 cases (70%), fragile nails in 35 cases (70%).

Among hyperthyroidism, his study, noted smooth skin in 80 cases (66%), soft nails in 100 (83%), in contrast to present study. A study by Aditi jamwal et al.[12] observed in cases of hypothyroidism, dry skin was noted in 65%, and hair loss in 48%, similar to the present study.

The study revealed, among hypothyroidism group, xerosis was seen to maximum extent i.e.; in 93 cases (63%), hair changes in 86 cases (58%) (Table 11). Mohammad Abid Keen et al.[9] noted xerosis in 57.17% of cases, diffuse hair loss in 46.09%, coarse scalp hair in 29.35% of cases, in contrast to the present study. S. Haritha, K. Kirthi Sampath[13] reported xerosis in 38.09%. The etiology of xerosis in hypothyroidism is unknown. However several theories have been proposed, including hypohydrosis related to cytologic alterations in the eccrine apparatus, diminished sebaceous gland secretion, and diminished epidermal sterol biosynthesis, predominantly cholesterol and its esters. The periodic acid-schiff (PAS) positive, diastase-resistant granules in the pale cells of the secretory coil of the eccrine apparatus may be altered.[14]

Out of total 43 hyperthyroid cases studied, fine, soft and thinned hair was noted in 23 cases (53%), increased skin pigmentation in 17 cases (40%) (Table 12). It was described in thyrotoxic cases in both localized and generalized distribution similar to that of Addison disease. There is speculation that it is due to increased release of pituitary adrenocorticotropic hormone compensating for accelerated cortisol degradation.[15]

In the present study, when hypothyroid cases were analyzed for any associated co-morbid conditions, in the sample size of 148, there were more cases with Melasma, noted in 55 cases (37%), followed by Alopecia areata in 47 cases (32%). Hypothyroidism manifests clinically with dry, coarse, brittle hair with a decreased diameter of the shaft and increased tendency to fall out, resulting in diffuse, partial Alopecia areata. Cases with hypothyroidism have increased telogen hair, demonstrating the effect of thyroid hormone on initiation as well as duration of hair growth.[16] The study also showed Urticaria in 40 cases (27%), Psoriasis in 28 cases (19%), Vitiligo in 23 cases (16%). Mason CP et al. (2005)[17] found AITD in 14 cases (34%). Neerja Puri (2006),[4] Maria Susana gomezzanni et al. (2008),[18] Artantaş S (2009),[19] Dr. Joan Samson, et al. (2011),[3] M. Lavanya, et al. (2015)[10] found Vitiligo in 8%, 13.33%, 6.8%, 3% and 4% of cases respectively, in contrast to the present study. The study noted Lichen planus in 22 cases (15%), Lichen sclerosus et atrophicus in 20 cases (14%), Pemphigus vulgaris in 12 cases (8%), Acanthosis nigricans in 6 cases (4%), Xanthelasma palpebrum in 5 cases (3.3%), Bullous pemphigoid in 4 cases (2.7%), Scleroderma in 3 cases (2%) (Table 13).

In the hyperthyroidism cases, Melasma was found in 26 cases (60%), followed by Alopecia areata in 19 cases (44%), Psoriasis in 14 cases (33%), Urticaria in 13 cases (30%), Acanthosis nigricans in 9 cases (21%), Vitiligo in 8 cases (19%), Lichen planus in 5 cases (12%), Bullous pemphigoid in 4 cases (9%), Pemphigus vulgaris in 4 cases (9%). Dr. Joan Samson et al.[3] noted Vitiligo in 4% of cases, out of which 3 were hypothyroid and 1 hyperthyroid. Pitoia F, et al. (2005)[20] noted 7 cases (46.6%) of the PV group disclosed thyroidal alterations. Alka Dogra et al. (2006)[8] noted one case (3.12 %) of Pemphigus vulgaris. Kavala M et al. (2012)[21] noted significant changes in the serum thyroid profile in 16% (13/80) of the PV group. This study also showed Lichen sclerosus et atrophicus in 4 cases (9%), xanthelasma in 3 cases (7%), Scleroderma in 2 cases (5%) (Table 13).

Conclusion

The present study showed that females are affected to a much larger extent than males and there is preponderance of cutaneous manifestations in hypothyroidism cases when compared with hyperthyroidism cases, probably hormonal. It also showed the maximum affected cases were in the age group of 21-30 years. Our study also noted positive correlation between thyroid disorders and other autoimmune disorders. It also identified various cutaneous manifestations in thyroid disorders. A better understanding of these features help us not only to diagnose underlying thyroid abnormality but also suggest treatment, wherever pertinent.

References

1. Bowen, R. (2010-07-24). "Physiologic Effects of Thyroid Hormones"-Colorado State University - Retrieved 2013-09-29.
2. Ambika Gopalakrishnan Unnikrishnan and Usha V. Menon - Thyroid disorders in India: An epidemiological perspective. Indian J Endocrinol Metab. 2011 Jul; 15(Suppl2): S78–S81.
3. Joan Felicita Samson, P.S. Mathew, G.K. Libu, B. Jayakumar. ―A study of cutaneous manifestations of hypothyroidism and hyperthyroidism‖. Kerala Medical Journal 2011;52-54.

4. Neerja Puri. ―Cutaneous Manifestations of Thyroid Disease: A clinical study‖. Indian J Dermatol. 2012;57(3):247–248.
5. Ahad Razi, Farideh Golforoushan, Amir Bahrami Shahla Babaee Nejad and Mohamad Goldust, 2013. Evaluation of Dermal Symptoms in Hypothyroidism and Hyperthyroidism. Pakistan Journal of Biological Sciences, 16:541-544.
6. Daciana Elena Branisteanu et al. ―Cutaneous manifestations associated with thyroid disease‖. Rev. Med. Chir. Soc. Med. Nat., Iasi - 2014 - Vol.118, no. 4.
7. Kawther T. El-Shafie. ―clinical presentation of hypothyroidism. j family community med‖. 2003 Jan-Apr;10(1):55–58.
8. Dogra A, Dua A, Singh P. ―Thyroid and skin‖ Indian J Dermatol 2006;51:96-9.
9. Mohammad Abid Keen et al. ―Cutaneous Manifestations of Hypothyroidism in Kashmir Valley: A clinical study‖. Indian J Dermatol. 2013;58(4):326.
10. Maripati Lavanya, Sandeep Kodali, Linganagari Venkata Narasimha Reddy. ―A Study on Cutaneous Manifestations of Hypothy-roidism in a Tertiary Hospital in South India‖. Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 35, April 30; Page: 6059-6067, DOI: 10.14260/jemds/ 2015/883.
11. Robertshaw D. Hyperhidrosis and the sympathoadrenal system. Med Hypotheses. 1979;5:317.
12. Jamwal A, Sharma A, Rather PA. ―Cutaneous Manifestations of Hypothyroidism: Prospective Hospital Based Clinical Study‖. J Adv Med Dent Scie 2013;1(2):5-12.
13. S.Haritha, K. Kirthi Sampath. ―Skin Manifestations of Hypothyroidism: A clinical study‖. IOSR Journal of Dental and Medical Science. 2013;(2):58-60.
14. Means MA, Dobson RL. Cytologic changes in sweat gland in hypothyroidism.JAMA1963;186:113-115.
15. Diven DG, Gwinup G, Newton RC. ―The thyroid. Dermatol Clin‖. 1989;7:547–557.
16. Freinkel RK, Freinkel N. ―Hair growth and alopecia in hypothyroidism‖. Arch Dermatol 1972;106:349-362.
17. Mason CP, Gawkrodger DJ. ―Vitiligo presentation in adults. Clin Exp Dermatol‖. 2005 Jul;30(4):344-5.
18. María Susana Gómez Zanni, Ricardo Campana et al. ―cutaneous manifestations in hypothyroid patients‖: Research article. 2008;47-50.
19. Artantaş S, Gül U et al. ―Skin findings in thyroid diseases‖: Eur J Intern Med. 2009;20(2):158-61.
20. Pitoia F, Moncet D, Glorio R et al. ―Prevalence of thyroid autoimmunity in patients with Pemphigus vulgaris‖. Medicina (B Aires). 2005;65(4):307-10.
21. Mukaddes Kavala, Esra Kural. et al. ―The Evaluation of Thyroid Diseases in Patients with Pemphigus vulgaris‖. 2012. pg 1-3.