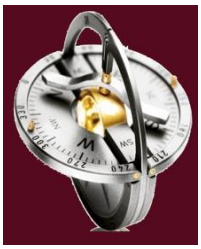
International Journal of Medicine
ISSN (P): 1468-3814; ISSN (e): 2667-7008

https://theinternationalmedicine.com/

Volume: 7(12) 2025



Original Research

Prevalence of Thyroid Dysfunction among Hospitalized Chronic Kidney Disease Patients in a Tertiary Care Centre of Eastern India: A Cross-Sectional Study

Vivek Paul Chowdhury[1], Kausik Munsi[2]*, Kumardip Banerjee[3], Souvik Sen[4]

[1]*Senior Resident, Dept of General Medicine, KPC Medical College & Hospital, Jadavpur, Kolkata, India*
[2]*Associate Professor, Dept of General Medicine, KPC Medical College & Hospital, Jadavpur, Kolkata, India*
[3]*Assistant Professor, Dept of General Medicine, KPC Medical College & Hospital, Jadavpur, Kolkata, India*
[4]*Assistant Professor, Dept of General Medicine, KPC Medical College & Hospital, Jadavpur, Kolkata, India*

Received: 11 Nov 2025 / Revised: 22 Nov 2025 / Accepted: 02 Dec 2025 / Published: 12 Dec 2025

Abstract

Background: Chronic kidney disease (CKD) is a significant global health concern, with significant variability in disease burden across different regions and countries, affecting >10% of the general population worldwide, amounting to >800 million individuals. Objective: to investigate the prevalence and associated factors of thyroid dysfunction in Indian CKD patients, which could potentially improve the care of this vulnerable population. Methods: This present institution based observational study was conducted from 1st August 2023 to 31st January 2025. After obtaining necessary approvals and permissions, data were collected from 236 Chronic Kidney Disease patients admitted to the general wards and ICU of KPC Medical College and Hospital during the study period. Result: Mean age of the study participants was 61.8 (±10.3) years and 36% of them were aged between 60-69 years. More than half (50.4%) of the study participants were female. 22% of the study participants were found to have subclinical hypothyroidism. Age, gender, religion, of the study participant was found to be significantly associated with their thyroid status. Conclusion: A significant association of thyroid dysfunction was found with the progression of CKD through its stages. Sociodemographic parameters such as age, gender, type of family, residence and history of comorbidities such as hypertension and type 2 diabetes mellitus were also found to be significantly associated with thyroid dysfunction among the study participants.

Keywords: *Chronic kidney disease (CKD), thyroid dysfunction, Prevalence*

Introduction

Although mortality has declined over the years in patients with CKD, the Global Burden of Disease (GBD) studies have shown that CKD has emerged as a leading cause of worldwide mortality.[1] Studies show that in 2019, there were 18,986,903 cases of CKD, with an average annual percent change (AAPC) of 1.82 (95% CI = 1.8 to 1.82) in incidence since 1990. [2]

Thyroid hormones play a very important role regulating metabolism, development, protein synthesis, and influencing other hormone functions. The two main hormones produced by the thyroid are triiodothyronine (T3) and thyroxine (T4). These hormones can also have significant impact on kidney disease so it is important to consider the physiological association of thyroid dysfunction in relation to chronic kidney disease (CKD). CKD has been known to affect the pituitary-thyroid axis and the peripheral metabolism of thyroid hormones. Both plasma triiodothyronine (T3) and thyroxine (T4) are reduced. The low serum T3 is not due to increased T3 degradation or to decreased thyroidal T3 secretion but is a result of impaired extrathyroidal T4 to T3 conversion. The reduction in T4 is attributed to the presence of circulating inhibitors, which impair binding of T4 to thyroxine-binding globulin. Despite decreased circulating T4 and T3, thyroid-stimulating hormone (TSH) is not elevated. This absence of TSH elevation is not due to dysfunction of the hypothalamo-pituitary axis, because truly hypothyroid renal failure patients can mount a high TSH response. Low T3 levels are the most common laboratory finding followed by subclinical hypothyroidism in CKD patients. Hyperthyroidism is usually not associated with CKD but has been known to accelerate it. One of the most important links between thyroid disorders and CKD is uremia. Patients who are appropriately treated for thyroid disease have a less chance of developing renal dysfunction. [3] According to global estimates, the prevalence of thyroid dysfunction in CKD patients ranges from 3% to 36%, depending on the definition and diagnostic criteria used. Studies have shown that CKD patients with thyroid dysfunction have worse health outcomes, including an increased risk of cardiovascular disease, mortality, and decreased quality of life. [4] In India, CKD is also a significant health concern, with an estimated prevalence of 17.2% among adults. The prevalence of thyroid dysfunction in Indian CKD patients has been reported to be around 25%. Studies have also suggested that Indian CKD patients with thyroid dysfunction have an increased risk of mortality and cardiovascular disease.

However, despite the high prevalence of both CKD and thyroid dysfunction in India, there is limited research on the coexistence of these conditions and their associated risk factors. Therefore, this cross-sectional study aims to investigate the prevalence and associated factors of thyroid dysfunction in Indian CKD patients, which could potentially improve the care of this vulnerable population.

Address for Correspondence Dr. Kausik Munsi, Associate Professor, Dept of General Medicine, KPC Medical College & Hospital, Jadavpur, Kolkata India.

DOI: 10.61336/im/25-12-13

Materials and Methods

This observational study with cross-sectional design was conducted among all patients aged ≥ 18 years with chronic kidney disease admitted to the general medicine wards, ICU of, K.P.C. Medical College and Hospital, during the study period i.e 1st August 2023 to 31st January 2025.

Sample size Calculation: Sample Size (n) was estimated to be 236, with the Cochrane's formula n=z2pq/l2 (z= 1.96, p=prevalence 19%=0.19 from study of Abdulkamil Abdullahi Adani et al [5], q=1-p=0.81, allowable error, l= 5%=0.05). Convenient Sampling was employed for the study. n= [{(1.96)2x0.19x0.81}/{0.05}2] + 10% = 236

Inclusion criteria:

1. Patients aged ≥ 18 years with chronic kidney disease admitted to the general medicine wards, ICU of, K.P.C. Medical College and Hospital, during the study period.
2. Those who provided a written, informed consent to participate in the study

Exclusion criteria:

1. Pregnant patients
2. Patients with thyroid malignancy

Study tools:

1. Predesigned, pretested, semi structured schedule with checklist.
2. Stethoscope
3. Syringe
4. Cotton
5. Blood vials
6. Sphygmomanometer
7. Analyzer
8. CKD-EPI Equation for calculating eGFR

Study technique:
- Face-to-face interview with the study participants.
- Clinical assessment
- Laboratory investigations
- Radiological aids

Study Variables:
Socio-demographic variables: Age, religion, residence, educational qualification, occupation, total monthly income, family size.
Clinical: Pulse, Temperature, BP, Respiratory Rate, General Examination, Cardiovascular Examination, Respiratory System, GI system Examination, Neurological Examination, h/o any chronic medication usage, h/o - HTN and T2DM.

K) Laboratory investigations and procedures

1) Complete blood count - Flow cytometry (FCM), Semi-conductor laser scatter, chemical dye method, Hb was measured by non-cyanide haemoglobin analysis method by MINDRAY BC- 5380 Auto haematology Analyser.
2) Blood sugar (FBS/PPBS/Random), HbA1C, serum sodium, potassium, urea, creatinine, calcium, magnesium, phosphate
3) Liver Function test, serum lipid profile - To be done by MINDRAY BS-390 auto analyser
4) Blood for HIV, HbsAg, Anti- HCV, Anti -HAV IgM, Anti- HEV lgM
5) Blood for FT3, FT4, TSH, Anti-TPO, Anti-TRAB (if relevant)
6) Urine - R/E, M/E, C/S, Albumin-Creatinine ratio
7) USG whole abdomen + KUB

Plan of study:
After proper ethical clearance from the Institutional Ethics Committee, informed consent was taken from all patients fulfilling inclusion/exclusion criteria admitted in general wards and ICU of Department of General Medicine, KPC Medical College and Hospital. Detailed history taking was done. Inclusion criteria fulfilled patient's blood reports data was collected.

Statistical Analysis: All the data required for this study were collected and analysed statistically to determine the significance of different parameters by using IBM SPSS Version 25.0.

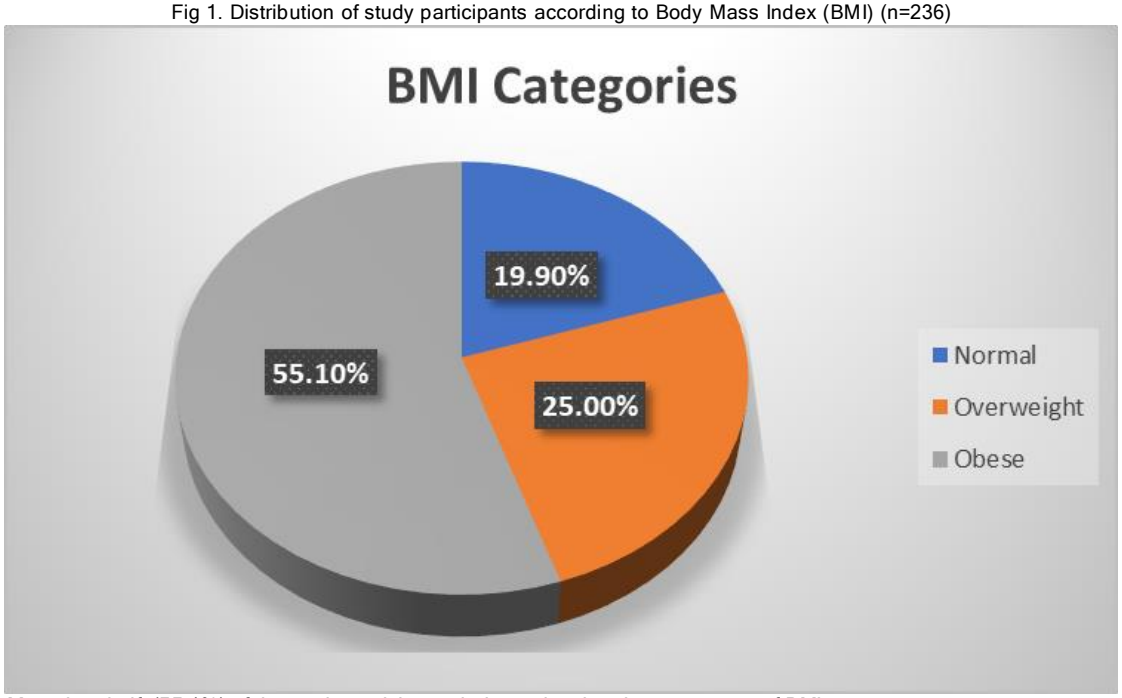
Results

36% of the study participants were aged between 60-69 years. Mean (± SD) of the study participants was 61.8 (±10.3) years. More than half (50.4%) of the study participants were female. Majority (77.5%) of the study participants belonged to an urban area. 33.5% of the study participant were graduates. Most (74.6%) of the participants were Hindu by religion. 39% of the study participants were homemaker by occupation. 69.5% of the study participants belonged to a joint family. Majority (78.4%) of the study participants had history of hypertension and 74.6% of the study participants had history of Type 2 diabetes mellitus. Majority (71%) of the study participants with diabetes had the disease for over 10 years

Table 1. Distribution of study participants according to urea and creatinine levels. (n=236)

Serum urea Mean (±SD)	65.54 (±36.94) mg/dl
Serum creatinine Mean (±SD)	3.03 (±2.60) mg/dl

Fig 1. Distribution of study participants according to Body Mass Index (BMI) (n=236)



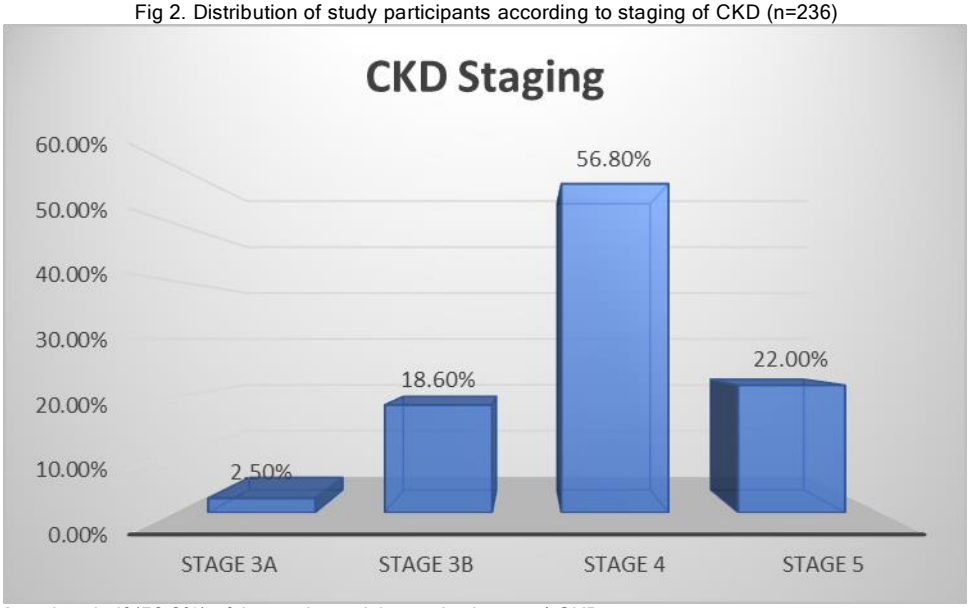
More than half (55.1%) of the study participants belonged to the obese category of BMI

Table 2. Distribution of study participants according to urinary ACR and eGFR (n=236)

Urinary ACR Mean (±SD)	833.3 (±770.75) mg/g
eGFR Mean (±SD)	22.5(±9.12) ml/min/1.73m^2

- The mean (±SD) urinary ACR levels were 833.3 (±770.75) mg/g
- The mean eGFR levels were 22.5(±9.12) ml/min/1.73m^2

Fig 2. Distribution of study participants according to staging of CKD (n=236)



More than half (56.8%) of the study participants had stage 4 CKD
Among the study participants only 33% were on hemodialysis

Table 3. Distribution of study participants according to thyroid status. (n=236)

Thyroid status	Frequency	Percentage (%)
Euthyroid	145	61.4
Hypothyroidism	33	14.0
Subclinical hypothyroidism	52	22.0
Subclinical hyperthyroidism	6	2.5
Total	236	100

22% of the study participants were found to have subclinical hypothyroidism.
Age of the study participant was found to be significantly associated with their thyroid status.
Gender of the study participant was found to be significantly associated with their thyroid status.
Residence of the study participants was found to be significantly associated with their thyroid status.
Religion of the study participants was found to be significantly associated with their thyroid status.
Type of family of the study participants was found to be significantly associated with their thyroid status.

Table 4. Distribution of study participants according to history of hypertension and thyroid status (n=236)

h/o hypertension	Thyroid status n (%)		p value
	Euthyroid	Hypo/hyperthyroid	
Present	119 (82.1)	25 (27.5)	χ^2= 23.2
Absent	26 (17.9)	66 (72.5)	
Total	145 (100)	91 (100)	p= <.001

Comment: Among the study participants, history of hypertension and history of T2DM were found to be significantly associated with their thyroid status.

Table 5. Distribution of study participants according to CKD stages and thyroid status (n=236)

CKD stages	Thyroid status n (%)		p value
	Euthyroid	Hypo/hyperthyroid	
Stage 3a	0 (0)	6 (6.6)	χ^2= 39.02
Stage 3b	32 (22.1)	12 (13.2)	
Stage 4	100 (68.9)	34 (37.4)	p= <.001
Stage 5	13 (9.0)	39 (42.8)	
Total	145 (100)	91 (100)	

Comment: Among the study participants, history of hypertension was found to be significantly associated with the stages of CKD

Table 6. Multinomial logistic regression to find the predictor of thyroid dysfunction in CKD (n=236)

						95% Confidence Interval	
Thyroid status	Predictor	Estimate	SE	p	Odds ratio	Lower	Upper
Euthyroid	Urea	0.12007	0.0221	< .001	1.1276	1.0797	1.1776
	Creatinine	1.51641	0.2452	< .001	4.5558	2.8177	7.3663
	Urinary ACR	-0.00402	0.0316	< .001	0.9960	1.0943	2.9977
	eGFR	0.01001	0.0545	0.854	1.0101	0.9077	1.1240
Subclinical Hypothyroidism - NO	Urea	-0.02261	0.0142	0.111	0.9776	0.9508	1.0052
	Creatinine	1.27399	0.2358	< .001	3.5751	1.2518	3.6760
	Urinary ACR	-0.00463	0.5137	0.038	1.9993	1.9987	2.4667
	eGFR	0.03188	0.0145	0.027	1.0324	1.0036	1.0621
Subclinical Hyperthyroidism - NO	Urea	7.75072	0.0692	< .001	2.0761	1.3541	3.5236
	Creatinine	145.32233	1.4632	0.963	0.8951	0.8671	1.4663
	Urinary ACR	-0.99977	0.0307	< .001	2.3127	1.3821	3.6331
	eGFR	20.97823	0.0732	0.782	1.0411	0.7439	1.3225

Subclinical hypothyroidism was found to be associated with serum creatinine, urea levels, urinary ACR and eGFR of the study participants. Subclinical hyperthyroidism was found to be significantly associated with serum urea levels and urinary ACR of the study participants.

Discussion

This cross-sectional study was conducted among 236 patients of Chronic Kidney Disease and the prevalence of thyroid dysfunction was estimated among them. The most commonly encountered thyroid dysfunction among the study participants was subclinical hypothyroidism that was found among 22% of the study participants. Similar findings were reported in a study conducted by Gupta et al[3] and Santha et al [6] where about 24.8% and 25% of the study participants had subclinical hypothyroidism respectively. Another study by Khatiwada S et al reported the prevalence of subclinical hypothyroidism to be 27.2%. [7] It has been estimated that the prevalence of subclinical hypothyroidism ranges between 4 and 10% in the general population and it has been well observed that hypothyroidism (overt or clinical) increases the risk for CVD. Although numerous hypothesis for contributing factors, like altered iodine metabolism, decreased peripheral sensitivity to hormones, and autoimmune thyroiditis, the exact underlying mechanisms linking advanced CKD and primary thyroid dysfunction remain unclear. [8] In a study by Gopinath et al [9] Participants with any level of thyroid dysfunction (either hyper- or hypothyroidism) were found to have a 67% increased likelihood of having CKD, as indicated by eGFR < 60 ml/min/1.73 m2. This association was independent of age, BMI, and the presence of diabetes and hypertension. In our study the prevalence of thyroid dysfunction was found to be significantly associated with the progression of the Chronic kidney disease through its stages, as well other parameters such as urinary ACR and eGFR levels. The participants' BMI, positive history of T2DM and hypertension were also found to be significant predictors of CKD. The association of hypertension may be explained by the increased requirement of erythropoietin in patients with thyroid dysfunction and those with Chronic Kidney Disease are already deficient in erythropoietin. This indirectly means that hypothyroid patients need more anemia management.[10] Erythropoietin use is known to cause elevated blood pressure, which may be one reason our patients with hypothyroidism had more hypertension than euthyroid patients. Our study also reported significant association of thyroid status with sociodemographic variables such as age, gender, residence, religion and type of family. Our findings were in conjunction with data from prior clinic- and population-based studies suggest that even a mild degree of thyroid deficiency could be associated with a higher likelihood of renal dysfunction. In order to ensure optimal diagnosis and management of their patients, both nephrologists and endocrinologists need to be aware that abnormal thyroid function and CKD could frequently co-exist and may exhibit overlapping symptom complexes. [11]

Another study conducted among hemodialysis patients in Nepal showed the combined prevalence of subclinical and clinical hypothyroidism in 26.6 % patients [12] A study by Ng et al. in peritoneal dialysis (PD) patients of Taiwan reported that, 98 (80.3 %) were having euthyroidism; 19 (15.6 %), subclinical hypothyroidism; and 5 (4.1 %), subclinical hyperthyroidism [13] High prevalence of thyroid dysfunction in CKD patients as observed in our study may also be due to high prevalence of thyroid autoimmunity in study population, excess iodine nutrition or iodine deficiency, and the inclusion of subjects with non-thyroidal illness. [14, 7] In the present study, we found that stage 4 and 5 patients had significantly high risk for thyroid dysfunction as compared to stage 3 patients, which is consistent with the findings of Lo et al., who observed increased risk for hypothyroidism with the decrease in GFR. [11] Song et al., also observed a positive relationship between eGFR and serum T3 and after adjusting for age and sex, compared with eGFR ≥ 60 ml/min/1.73 m2, eGFR < 60 ml/ min/1.73 m2 was associated with an increased odds of low T3 (odds ratio 2.40). [15] In a study in Saudi Arabia, there was a significant decrease in the levels of serum total T3, total T4 and total protein and albumin levels in CKD patients when compared with the controls. There was a significant increase in the level of TSH in the CKD patients compared with the controls. [16] A number of studies have also reported that subclinical hypothyroidism is associated with an increased risk of coronary heart disease and there appears to be a significant increase in a cluster of metabolic CVD risk factors among people with subclinical hypothyroidism. [17,18] he reduced T3 level, the reduced free T4 levels along with an elevated TSH raises the possibility of benefit from thyroid supplementation in CKD. However, it is still debatable about the importance and necessity of thyroid hormone supplementation in CKD patients and concrete evidence is not available for recommending supplementation of thyroid hormones in CKD patients. [26] It is well known that undetected and untreated hypothyroidism can lead to significant morbidity and mortality. In addition,

cardiovascular morbidity and mortality are higher among dialysis patients, and hypothyroidism can worsen their condition. [27]

Conclusion

Thyroid dysfunction was prevalent among considerable proportion of the study participants, the commonest being subclinical hypothyroidism. A significant association of thyroid dysfunction was found with the progression of CKD through its stages. Sociodemographic parameters such as age, gender, type of family, residence and history of comorbidities such as hypertension and type 2 diabetes mellitus were also found to be significantly associated with thyroid dysfunction among the study participants. These epidemiological findings provide further evidence for periodic evaluation of renal function among individuals either diagnosed with or at risk of thyroid disease. However, prospective data from population-based studies are still warranted to provide a better understanding of the pathophysiological significance of renal dysfunction in adults with sub-optimal thyroid function.

References

1. Kovesdy C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. Kidney international supplements, 12(1), 7-11. https://doi.org/10.1016/j.kisu.2021.11.003
2. Qin, K., Qing, J., Wang, Q. et al. Epidemiological shifts in chronic kidney disease: a 30-year global and regional assessment. BMC Public Health 24, 3519 (2024). https://doi.org/10.1186/s12889-024-21065-9
3.
4. Gupta A, K K, Virmani SK, Arora M. Thyroid dysfunction in patients of chronic kidney disease. International Journal of Advances in Medicine. 2017 Sep 22;4(5):1333-7.
5. Lim VS. Thyroid function in patients with chronic renal failure. American Journal of Kidney Diseases. 2001 Oct 1;38(4):S80-4.
6. Adani AA, Siyad MO, Adan AM, Jeele MOO. Prevalence and Determinants of Hypothyroidism in Patients on Routine Hemodialysis in Somalia: A Cross-Sectional Study. Int J Gen Med. 2023;16:905-13.
7. Shantha GPS, Kumar AA, Bhise V, Khanna R, Sivagnanam K, Subramanian KK. Prevalence of subclinical hypothyroidism in patients with endstage renal disease and the role of serum albumin. 2011;1(4):255-60
8. Khatiwada S, Rajendra KC, Gautam S, Lamsal M, Baral N. Thyroid dysfunction and dyslipidemia in chronic kidney disease patients. BMC Endocr Disord. 2015 Oct 29;15:65
9. Chonchol M, Lippi G, Salvagno G, Zoppini G, Muggeo M, Targher G. Prevalence of subclinical hypothyroidism in patients with chronic kidney disease. Clin J Am Society Nephrol. 2008;3(5):1296-300.
10. Gopinath B, Harris DC, Wall JR, Kifley A, Mitchell P. Relationship between thyroid dysfunction and chronic kidney disease in community-dwelling older adults. Maturitas. 2013 Jun;75(2):159-64.
11. Hussaini HA, Al Sahlawi MA, Alhussain F, Alja'afari LA, Aljohar HI, Al-Ramadhan MS, et al. Prevalence of Hypothyroidism Among Dialysis Patients in Eastern Region, Saudi Arabia. Cureus. 2023 Jan;15(1):e33807.
12. Lo JC, Chertow GM, Go AS, Hsu CY. Increased prevalence of subclinical and clinical hypothyroidism in persons with chronic kidney disease. Kidney International 2005;67:1047-52.
13. Paudel K. Prevalence and clinical characteristics of hypothyroidism in a population undergoing maintenance hemodialysis. J Clin Diagn Res. 2014;8(4):MC01-4.
14. Ng YY, Wu SC, Lin HD, Hu FH, Hou CC, Chou YY, et al. Prevalence of clinical and subclinical thyroid disease in a peritoneal dialysis population. Perit Dial Int. 2012;32(1):86-93.
15. 21. Jeena EJ, Malathi M, Sudeep K. A hospital-based study of anti-TPO titer in patients with thyroid disease. Muller J Med Sci Res. 2013;4(2):74-7.
16. 22. Song SH, Kwak IS, Lee DW, Kang YH, Seong EY, Park JS. The prevalence of low triiodothyronine according to the stage of chronic kidney disease in subjects with a normal thyroid-stimulating hormone. Nephrol Dial Transplant. 2009;24(5):1534-8.
17. 23. Rajeev G, Chickballapur Rayappa WD, Vijayalakshmi R, Swathi M, Kumar S. Evaluation of thyroid hormone levels in chronic kidney disease patients. Saudi J Kidney Dis Transpl. 2015;26(1):90-3.
18. 24. Rodondi N, den Elzen WP, Bauer DC, Cappola AR, Razvi S, Walsh JP, et al. Subclinical hypothyroidism and the risk of coronary heart disease and mortality. J Am Med Assoc. 2010;304(12):1365-74.
19. 25. Ashizawa K, Imaizumi M, Usa T, Tominaga T, Sera N, Hida A, et al. Metabolic cardiovascular disease risk factors and their clustering in subclinical hypothyroidism. Clin Endocrinol (Oxf). 2010;72(5):689-95
20. Rhee CM, Alexander EK, Bhan I, Brunelli SM: Hypothyroidism and mortality among dialysis patients . Clin J Am Soc Nephrol. 2013, 8:593-601.