

Frequency of Hypocalcaemia after Thyroid Surgery in the Omdurman Military Hospital in 2018

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Abstract

Background: Hypocalcaemia is a serious complication that may follow thyroid surgeries. So, the purpose of this study was to determine the frequency of postoperative hypocalcaemia after thyroid surgery in Omdurman military hospital (Jan.-July 2018). **Materials & Methods:** In this retrospective facility based cross sectional study, 124 files were reviewed, the recorded data were age, sex, residence, diagnosis, type of surgery & postoperative calcium level, data were collected by a designed pretested checklist, data were analyzed by SPSS version 20 by using frequencies & cross tabulations, for postoperative hypocalcaemia. **Results:** Majority of the patients were between 21 - 41 years 49.2%, majority of them were females 83.9%. 97.6% of them underwent total thyroidectomy, 25% of the patients developed postoperative hypocalcaemia, also we found that there was no relation between sex, type of thyroid surgery & development of postoperative hypocalcaemia ($P > 0.001$). **Conclusion:** Our research showed that 25% of the patients who underwent thyroid surgery developed postoperative hypocalcaemia.

Keywords

Thyroid Diseases, Hypocalcaemia, Thyroidectomy

1. Introduction

Hypocalcaemia is defined as a decrease in plasma calcium lower than 2.1 mmol/l.

The normal range is 2.1 - 2.6 mmol/l (8.8 - 10.7 mg/dl) [1].

Hypocalcaemia is a major postoperative complication of total thyroidectomy,

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causing severe symptoms & increasing hospitalization time [2].

Following thyroid surgery, the extent of thyroid resection is associated with an increase in the degree & duration of hypocalcaemia [3].

Devascularization or excision of parathyroid glands, excretion of endothelin 1, venous stasis as a result of surgical dissection & hematoma are the causes of hypocalcaemia associated with a thyroidectomy [4].

1.1. Features of Hypocalcaemia

When the decrease in Calcium level is mild, it has no symptoms. But when the calcium level is severely decreased, it will result in neuromuscular symptoms which are caused by positive bathmotropic effect (is the modification of the degree of excitability of the musculature in general) due to the decreased interaction of calcium with sodium channels. Since calcium blocks sodium channels & inhibits depolarization of nerve & muscle fibers.

SPASMODIC:

- Spasm (carpopedal spasms: Trousseau's sign).
- Perioral paresthesia.
- Anxious, irritable & irrational.
- Seizures.
- Muscle tone increased in smooth muscle, hence colic, wheeze, & dysphagia.
- Orientation impairment & confusion.
- Dermatitis (e.g., atopic/exfoliative).
- Impetigo herpetiformis.
- Chvostek's sign; Choreoathetosis; Cataract & Cardiomyopathy (long QT interval on ECG) [5].

1.2. Causes

With increased PO_4^{3-} :

1. Hypoparathyroidism (includes thyroid or parathyroid surgery), because calcium is tightly regulated by the parathyroid hormone "PTH". When there is low calcium level, the PTH induces the kidneys to reabsorb the calcium & increase calcitriol secretion (active form of vitamin D), thereby increases the intestinal absorption of calcium & the bones to release the calcium & this action leads to rebalance of the blood calcium levels & thus, when there is absent, decreased, or ineffective PTH, the body loses this regulatory functions & hypocalcaemia occurs. So, hypocalcaemia was firstly attributed to injury, devascularization or inadvertent parathyroid removal.

2. Pseudohypoparathyroidism.
3. Acute rhabdomyolysis.
4. Hypomagnesaemia.
5. Chronic kidney disease.

1.3. Problem Statement

When hypocalcaemia does not normalize after 6 months, it's considered as per-

manent [6].

Hypocalcaemia has a life-threatening complication such as laryngospasm & cardiac arrhythmias.

According to a study that was done in India, Permanent hypocalcaemia following thyroidectomy causes considerable morbidity. & According to the same study, they find that the overall incidence of hypocalcaemia was 23.6% & that of permanent hypocalcaemia was 1.61% [7].

1.4. Justification

The high frequency and occurrence of these post thyroidectomy hypocalcaemia even after simple thyroid lobectomies, and some authors doubted the traditional explanation after analyzing the successive postoperative calcium variations since it seemed doubtful that the parathyroids could experience damage or injury in nearly all thyroidectomies [3] and due to lack of researches about this topic in Sudan, this retrospective study is an attempt to determine the prevalence of hypocalcaemia after thyroid surgery.

1.5. Research Question

What is the prevalence of hypocalcaemia after thyroid surgery?

2. Objectives

2.1. General Objective

To measure the frequency of hypocalcaemia after thyroid surgery in Omdurman military hospital in (2018).

2.2. Specific Objectives

- 1) To estimate the frequency of postoperative hypocalcaemia in patients after thyroid surgery.
- 2) To determine the association between age & postoperative hypocalcaemia.
- 3) To measure the association between sex & postoperative hypocalcaemia.
- 4) To estimate the association between diagnosis & postoperative hypocalcaemia.
- 5) To measure the association between type of surgery & postoperative hypocalcaemia.

3. Materials & Methods

3.1. Study Design

A retrospective cross-sectional hospital-based study, made in patients who underwent thyroid surgery in Omdurman military hospital in (2018).

3.2. Study Area

The study is carried out in Omdurman Military hospital, which were first founded in November 1958 and its first commander was Dr. Hussein Abdu

Alrahaman Alshalaly.

The hospital is located in Omdurman near the White Nile bridge {GPS location: 15.615194, 32.458361}, and it contains the following departments: pediatrics, obstetrics and gynecology, medicine, surgery, dentistry, psychiatric, emergency & community medicine.

3.3. Study Population

All patients who present to Omdurman military hospital, department of surgery, seen by surgeons, diagnosed with thyroid diseases & underwent thyroid surgery.

3.4. Inclusion Criteria

Sudanese patients who underwent thyroid surgery in the area of the study.

3.5. Exclusion Criteria

Patients who present to the department of surgery in the hospital but not diagnosed with thyroid disease. Thus, underwent other surgery.

3.6. Variables

Prevalence related independent variables are: age, sex & residence.

Prevalence related dependent variables are: diagnosis, type of surgery & post-operative serum calcium level.

4. Sampling

4.1. Sample Frame

All patients who present to the department of surgery in Omdurman military hospital.

4.2. Sample Size

Using the equation:

$$n = z^2 * p * q / d^2$$

n : Sample size.

z : Standard deviation (1.96).

p : Proportion of population.

q : Error sample (1 - p).

d : degree of precision (0.05) [8].

$$n = (1.96)^2 * 0.5 * 0.5 / (0.05)^2 = 384.$$

Due to certain limitations, we include only 124 patients.

4.3. Sample Technique

Simple random sampling.

4.4. Data Collection Tool

A designed pretested checklist.

4.5. Data Analysis

We entered the data by ourselves in SPSS version 20, we used frequencies & cross tabulations.

5. Results

5.1. General Characteristics of the Study Participants

Out of 124 checklists were filled from 124 files 100%.

37.9% of the cases were found between the age of 20 and 40 years, 49.2% of the cases were found between the age of 41 and 61 years and 12.9% were found above the age of 61 years (**Figure 1**).

16.1% of them were males and 83.9% were females (**Figure 2**).

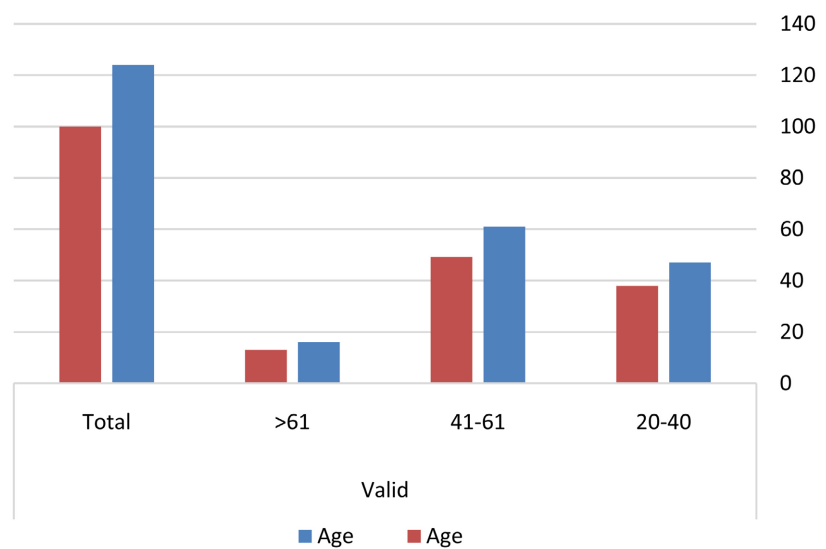


Figure 1. Shows distribution of patients by age.

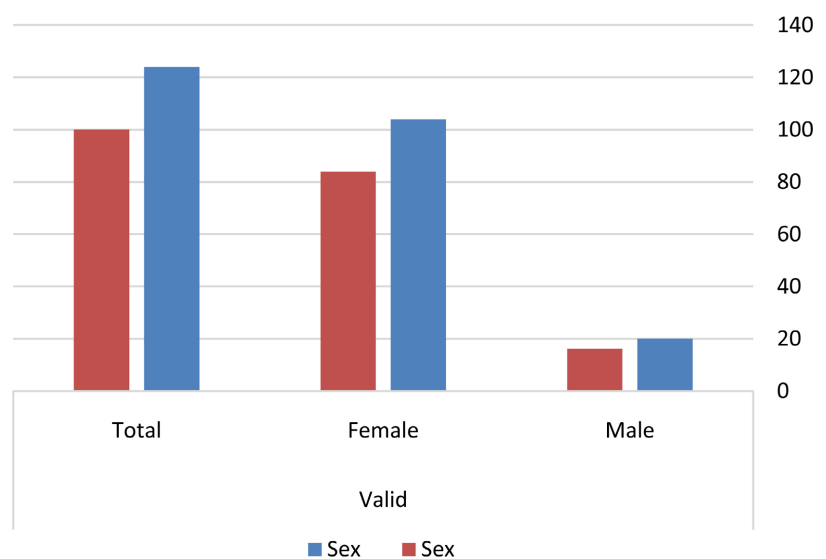


Figure 2. Shows distribution of patients by sex.

57.3% of the cases were living in Khartoum state and 42.7% were living in other states (Figure 3).

76.6% of the cases were diagnosed with simple multinodular goiter “SMNG”, 5.6% were diagnosed with toxic multinodular goiter “TMNG”, 4.8% were diagnosed with controlled toxic multinodular goiter “CTMNG”, 5.6% were diagnosed with Recurrent MNG, 0.8% were diagnosed with follicular carcinoma “FCA”, 0.8% were diagnosed with grave’s disease, 2.4% were diagnosed with solitary toxic nodule “STN” and 3.2% were diagnosed with simple diffused goiter “SDG” (Figure 4).

97.6% of patients underwent total thyroidectomy, while 2.4% underwent thyroid lobectomy (Figure 5).

75% of patients had normal postoperative serum calcium and 25% had decreased levels (Figure 6).

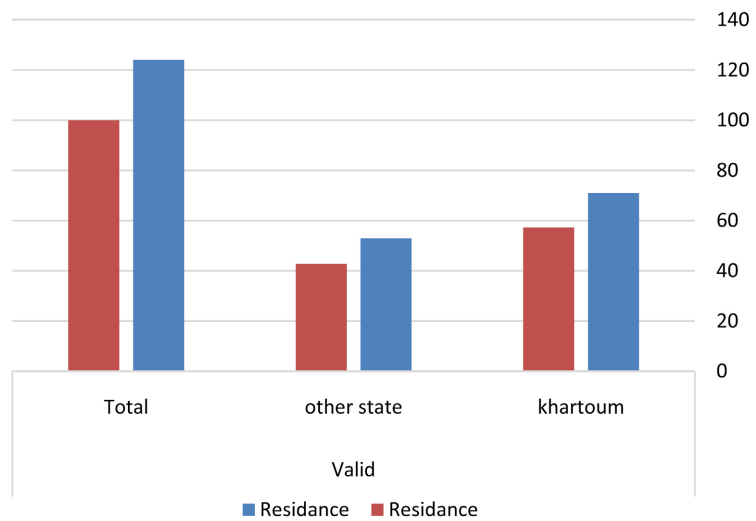


Figure 3. Shows distribution of patients by their residence.

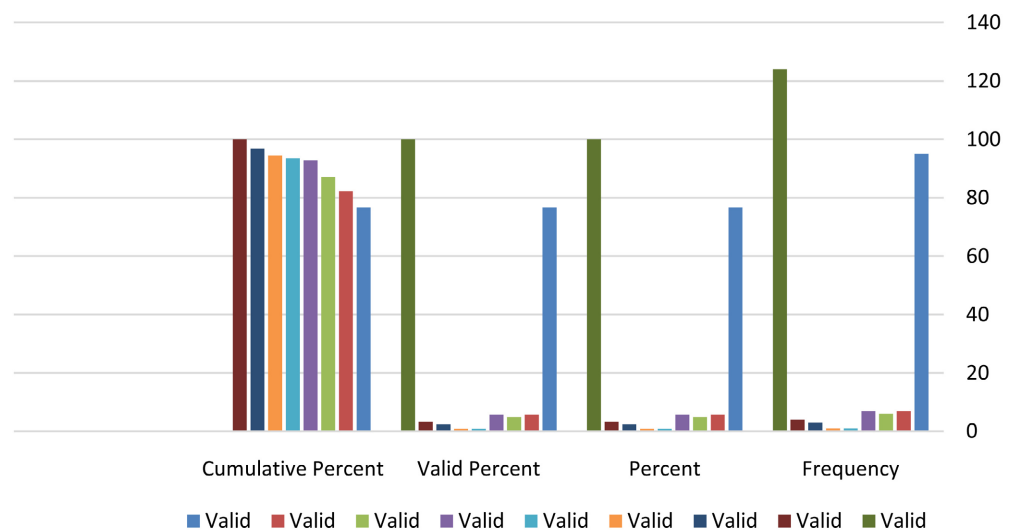


Figure 4. Shows distribution of patients by their diagnosis.

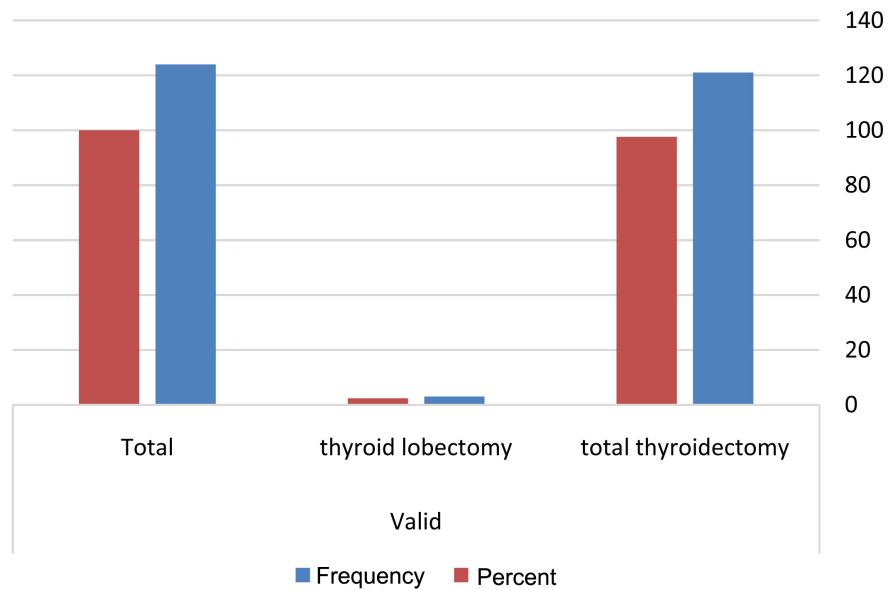


Figure 5. Shows Distribution of patients by the type of surgery that was performed.

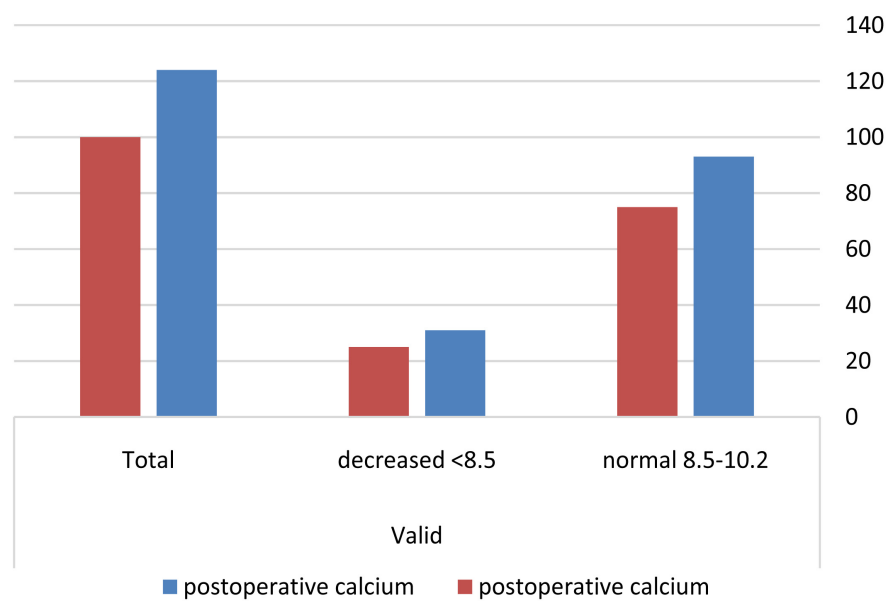


Figure 6. Shows distribution of patients by the postoperative serum calcium level.

5.2. Cross Tabulation of the Participant's Characteristics

There was no relation between sex & postoperative hypocalcaemia ($P < 0.001$) (Table 1 and Table 2).

Also there was no relation between type of surgery & postoperative hypocalcaemia (Table 3 and Table 4).

6. Discussion

Hypocalcaemia is a serious complication that may occur following thyroid surgeries.

Table 1. Shows sex * postoperative calcium tabulation.

		Sex		Total
		Male	Female	
Postoperative calcium	Normal 8.5 - 10.2	17	76	93
	Decreased > 8.5	3	28	31
Total		20	104	124

Table 2. Shows Chi-square Test for sex & postoperative sCa²⁺.

	Value	df	Asymp. Sig. (2-Sided)	Exact Sig. (2-Sided)	Exact Sig. (1-Sided)
Person Chi-Square	1.272	1	0.259		
Continuity Correction	0.715	1	0.398		
Likelihood Ratio	1.392	1	0.238		
Fishers Exact Test				0.398	0.202
Linear-by-Linear association	1.262	1	0.261		
N of Valid cases	124				

Table 3. Shows type of surgery cross * postoperative calcium tabulation.

		Type of surgery		Total
		Total thyroidectomy	Thyroid lobectomy	
Postoperative calcium	Normal 8.5 - 10.2	92	1	93
	Decreased < 8.5	29	2	31
Total		121	3	124

Table 4. Shows Chi-Square tests for surgery type & postoperative sCa²⁺.

	Value	df	Asymp. Sig. (2-Sided)	Exact Sig. (2-Sided)	Exact Sig. (1-Sided)
Person Chi-Square	2.847	1	0.092		
Continuity Correction	1.025	1	0.311		
Likelihood Ratio	2.371	1	0.124		
Fishers Exact Test				0.154	0.154
Linear-by-Linear association	2.824	1	0.093		
N of Valid cases	124				

Treatment for hypocalcaemia depends on the severity of the symptoms. In order to ensure optimal absorption, patients with mild symptoms should receive calcitriol 0.5 mcg orally twice daily and calcium in the combined form of calcium carbonate administered with 500 mg orally four times daily [9].

While in cases of severe hypocalcaemia, it's essential to keep the calcium level in hypocalcaemic patients with severe symptoms above 8 mg/dL (2 mmol/L). In order to prevent cardiac issues like arrhythmias, calcium gluconate can be administered by continuous intravenous drip over a duration of 10 to 20 minutes [10].

The aim of this retrospective facility based cross sectional study was to estimate the frequency of hypocalcaemia after thyroid surgery In Omdurman military hospital in Jan.-July 2018, 124 files were reviewed, we found that majority of patients 49.2% were 41 - 61 years, 83.9% were females, 57.3% of the participants were from Khartoum state, 76.6% of them were diagnosed with simple multinodular goiter & 97.6% of them underwent total thyroidectomy.

Regarding the postoperative sCa^{2+} , we found that the frequency of postoperative hypocalcaemia is 25%, correlate to study that conducted in Sudan (2014-2015) [11].

In India there was a study that was conducted during January 2005 to December 2009, they found that the incidence of hypocalcaemia was 23.6%, also they found that there was no relation between sex & incidence of postoperative hypocalcaemia, which is similar to our study [7].

There was another study that was conducted in Korea & Published in 2015, in this study 349 patients were included & they found that 145 (42%) of the patients developed hypocalcaemia, 99 of them developed transient hypocalcaemia while 46 patients developed permanent hypocalcaemia [12]. In comparison with this study, the frequency of postoperative hypocalcaemia in our study was less than their percentage & we think that this difference was due to the differences in the number of the included patients & also due to advanced surgical techniques in Sudan.

We also found that there was no relationship between sex & postoperative hypocalcaemia, which was similar to the same study that was mentioned above [12]. Regarding to the relation between type of thyroid surgery & postoperative hypocalcaemia, we did not find any relation, opposites to the above study in which they found that the extent of surgery had a significant effect on postoperative hypocalcaemia ($P < 0.001$) [12].

7. Limitations

Firstly, we went to the statistics office in the department of surgery where the patient's files were kept, we searched for the files of patients who underwent thyroid surgery & we didn't find a lot of files & even the files that we found were incomplete, the sCa^{2+} was ordered by the doctors, but the results were not recorded. So, we went to the central laboratory looking for the investigation's results, but also, we faced a lot of difficulties in finding the results, we found some of them & we came back to the statistics office looking for more files.

8. Recommendation

Firstly, we recommend that the hospitals should ensure & pay attention to the

recording system of the files & data of the patients in appropriate manner.

Secondly, this topic needs more researches about the causes, predictors & risk factors that aids in development of postoperative hypocalcaemia in patients after thyroid surgery, so we recommend that the ministry of health and all health facilities to conduct more researches about it.

9. Conclusions

In this study, it was found that a quarter of patients who underwent thyroid surgery had higher risk of developing postoperative hypocalcaemia. Also, we found that there was no relation between sex, surgery type & postoperative sCa²⁺ (P < 0.001).

Majority of patients were 41 - 61 years old, females, from Khartoum state, diagnosed with simple multinodular goiter & underwent total thyroidectomy.

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Benjamin Franklin once said:

“An investment in knowledge pays the best interest.”

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We hope that you see our efforts worth your full and non-dividing attention.

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Ethical Consideration

The permission was obtained from the head of surgery department in the Military Hospital.

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Conflicts of Interest

The authors declare that they have no competing interests.

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