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# Hyperthyroidism during Pregnancy: Clinical and Paraclinical Features and Maternal-Fetal Outcomes

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## Abstract

**Introduction:** During pregnancy, changes cause physiological hyperfunction of the thyroid gland. In some cases, this thyroid hyperfunction can be pathological. Therefore, we aimed to determine the clinical and biological aspects, and maternal-fetal complications of this condition in a Dakar hospital setting. **Methodology:** We conducted a prospective and retrospective descriptive study for analytical purposes covering the period from January 1, 2018, to June 30, 2023, in the Endocrinology-Diabetology-Nutrition Department of the Pikine National Hospital Center. All patients monitored for hyperthyroidism during pregnancy during this period were included. **Results:** Forty patients were included. The prevalence of pregnancy among women followed for hyperthyroidism was 2%. The average age was 29.63 years. Most patients had thyrotoxicosis syndrome and goiter. Acquired exophthalmos was present in 45% of patients. The mean T4L was 39.19 pmol/L. The most common etiology was Graves' disease. Benzylthiouracil was the most commonly prescribed ATS. The mean gestational age at the first endocrinology consultation was 14 weeks. Obstetric pathologies were found in 52.5% of patients. The most common route of delivery was vaginal. Subsequently, three patients underwent total thyroidectomy. **Conclusion:** Severity is associated with a higher risk of complications. Multidisciplinary collaboration and appropriate follow-up are essential as they determine the prognosis.

## Keywords

Hyperthyroidism, Pregnancy, Fetal, Etiology, Complications

## 1. Introduction

During pregnancy, dynamic changes in thyroid homeostasis are observed, leading to a 50% increase in thyroid hormone synthesis [1]. These physiological changes specific to pregnancy are necessary to meet increased hormonal needs, especially during the first half of gestation [1] [2]. In some cases, this physiological hyperfunction of the thyroid during pregnancy can be pathological. Persistent, uncontrolled hyperthyroidism can lead to obstetric and/or neonatal complications [3]. The risk of complications correlates with the degree of hyperthyroidism [2]. Hyperthyroidism occurs in approximately 2% - 3% of pregnancies [3]. It is linked to Graves' disease in 90% - 95% of cases [2]. The difficulty in managing hyperthyroidism during pregnancy is related to the teratogenic effect of synthetic antithyroid drugs (SATs) and the frequency of monitoring [4]. In Senegal, the latest data on the prevalence of hyperthyroidism during pregnancy date back to 2003 and was 0.1% [5]. Thus, we conducted this study in one of the main Endocrinology-Diabetology-Nutrition departments in Dakar (National Hospital Center of Pikine). The objectives of this study were to determine:

- The clinical and biological aspects,
- The maternal and fetal complications resulting from this combination in our patients.

## 2. Methodology

Our study was conducted in the Endocrinology–Diabetology–Nutrition, Gynecology, and Otolaryngology departments of the National Hospital Center of Pikine (CHNP) in Dakar, Senegal.

This was a retrospective and prospective, descriptive study with analytical purposes, monocentric, over a 66-month period from January 2018 to June 2023.

All patients followed in the aforementioned departments of the CHN of Pikine presenting one of the following situations were included:

- Occurrence of pregnancy in a patient followed for hyperthyroidism, confirmed by a positive urinary pregnancy test and/or ultrasound evidence of pregnancy, or serum $\beta$-hCG levels greater than 5 IU/L.
- Identification of clinico-biological thyrotoxicosis in a pregnant woman:
  - With suppressed TSH:
    - Less than 0.1 mIU/L in the first trimester,
    - Less than 0.2 mIU/L in the second trimester,
    - Less than 0.3 mIU/L in the third trimester,
  - And elevated free T4 greater than 22 pmol/L.

Hyperemesis gravidarum–related gestational transient thyrotoxicosis was differentiated from pathological hyperthyroidism based on clinical, biological, and evolutionary criteria. Transient hCG-mediated thyrotoxicosis was suspected in the presence of severe vomiting without prior history of thyroid disease, absence of goiter and extrathyroidal signs (particularly exophthalmos), mildly elevated free T4 levels, and spontaneous clinical and biochemical improvement with sup-

portive treatment alone.

The following parameters were studied:

- Data on hyperthyroidism: duration, regularity of follow-up, severity of hyperthyroidism, etiology, treatment, and follow-up of hyperthyroidism.

Hyperthyroidism was considered severe if any of the following criteria were met:

- Need for hospitalization,
- Presence of a complication such as cardiothyreosis or acute thyrotoxic crisis;
- T4L greater than 40 pmol/L.

- Pregnancy data: Gestational age at the first consultation, pregnancy monitoring, obstetric pathologies, delivery data, neonatal data, pregnancy progression.

Neonatal hypotrophy is defined as a birth weight of less than 2500 grams during a full-term pregnancy.

- Evolutionary Data: time between delivery and consultation, postpartum contraception, subsequent care.

Data were collected using a pre-established form and entered using SPSS software (Statistical Package for the Social Sciences), version 2.

Descriptive analysis was performed by calculating frequencies and proportions for qualitative variables and means for quantitative variables, with standard deviation.

The analytical study was conducted using cross-tabulation tables. To compare frequencies, we used Pearson's chi-square test or Fisher's exact two-tailed test, depending on their applicability. Means were compared using analysis of variance with a significance threshold of $p < 0.05$. Text processing was performed using Word XP Professional software.

In the discussion, the studied parameters were compared with data from the literature, and hypotheses were formulated.

## 3. Results

➢ **Descriptive Study**

During the study period, 40 patients had the study criteria.

A total of 1946 patients consulted for hyperthyroidism during this period. Among them, 40 patients were pregnant, corresponding to a hospital prevalence of 2%.

The mean age of patients in our study was 29.63 years, with extremes of 18 and 39 years and a standard deviation of 6.44.

- **Hyperthyroidism Data**

○ **Duration**

Hyperthyroidism was diagnosed before pregnancy in 72.5% of patients. The mean duration of hyperthyroidism was 28 months, with extremes of 5 months and 120 months (10 years) and a standard deviation of 31.01. The duration of hyperthyroidism exceeded 5 years in 21% of patients, was between 1 and 4 years in 55%, and less than 1 year in 24% of patients.

○ **Follow-up Regularity**

Among the 29 patients previously followed for hyperthyroidism, 13 had irregular

follow-up with voluntary treatment interruptions ranging from 1 month to 3 years.

All patients with regular follow-up were on antithyroid drugs (ATDs) at the time of pregnancy diagnosis, and two of them were on propranolol. Previous treatments of patients are presented in Table 1.

Table 1. Distribution of patients according to treatment among regularly followed hyperthyroid patients.

| Antithyroid Drugs (ATD) | Number (N = 16) | Percentage (%) |
|---|---|---|
| Carbimazole | 11 | 69 |
| Thiamazole | 4 | 25 |
| Benzylthiouracil | 1 | 6 |

- **Clinical Data at First Consultation**

**Clinical Signs of Hyperthyroidism at First Consultation**

A thyrotoxic syndrome was observed in 82.5% of patients at the first consultation (Figure 1).

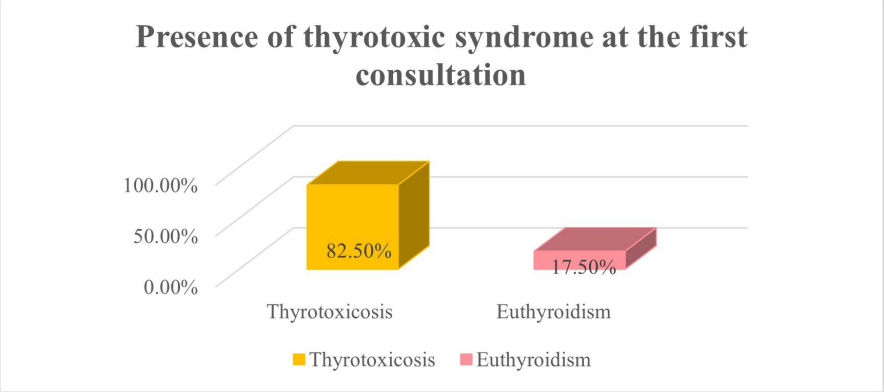


Figure 1. Distribution of patients according to the presence of thyrotoxic syndrome at the first consultation.

Vital signs are summarized in Table 2.

Table 2. Distribution of patients according to vital signs and measurements at first consultation.

| Vital Signs at First Consultation | Mean | Range |
|---|---|---|
| Heart rate (beats per minute) | 98.12 | 51 - 150 |
| Systolic blood pressure (mmHg) | 126 | 100 - 160 |
| Diastolic blood pressure (mmHg) | 77.5 | 60 - 102 |
| Mean gestational weight (kgs) | 62.92 | 43 - 80 |

Weight loss was reported in 57.5% of patients.

**Goiter at First Consultation**

Goiter was observed in 37 patients (92.5%). It was nodular on palpation in five

patients. Goiter stage is summarized in Table 3.

Table 3. Distribution of patients according to goiter stage.

| WHO Goiter Stage | Number (N = 40) | Percentage (%) |
|---|---|---|
| Stage I | 20 | 50 |
| Stage II | 11 | 26 |
| Stage III | 9 | 24 |

It was vascularized in 50% of cases.

**Exophthalmos at First Consultation**

Acquired exophthalmos was present in 18 patients (45%), and unilateral in one patient (2.5%). None of the patients showed signs of malignancy.

- **Paraclinical Data**

**Thyroid Hormones**

Initial thyroid function tests were performed at the beginning of pregnancy in 28 patients (Table 4).

Table 4. Distribution of patients according to thyroid function at early pregnancy.

| Thyroid Function | Number (N = 40) | Percentage (%) |
|---|---|---|
| Hyperthyroidism | 21 | 52.5 |
| Euthyroidism | 6 | 15 |
| Hypothyroidism | 1 | 2.5 |
| Not done | 12 | 30 |

Hyperthyroidism was found in 52.5% of patients.

Mean free T4 was 39.19 pmol/L (range: 7 - 68 pmol/L; SD: 18.15 pmol/L). Mean TSH was 0.64 IU/L (range: 0.0001 - 5 IU/L). TRAb was measured in early pregnancy in 3 patients (one negative, two positive with values 1.5 N and 6 N, respectively).

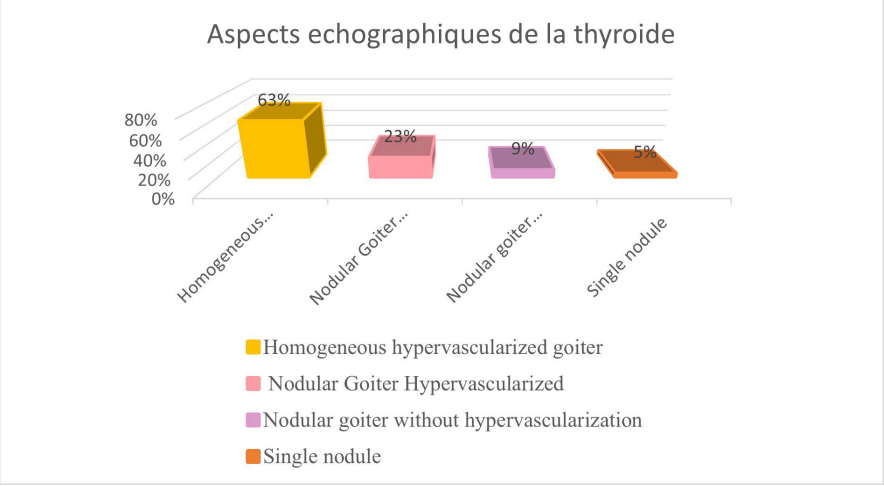


Figure 2. Distribution of patients according to thyroid ultrasound findings.

### Thyroid Ultrasound

Thyroid ultrasound was performed in 21 patients. Findings are presented in Figure 2.

- **Hyperthyroidism Severity**

Hyperthyroidism was considered severe in 16 patients.

Hospitalization following the first consultation occurred in 3 patients, with a mean hospital stay of 4.6 days (range: 4 - 6 days).

Free T4 > 40 pmol/L was observed in 14 patients. Cardiothyreosis was found in 2 patients.

- **Etiology of Hyperthyroidism**

Graves' disease was observed in 80% of patients (Figure 3).

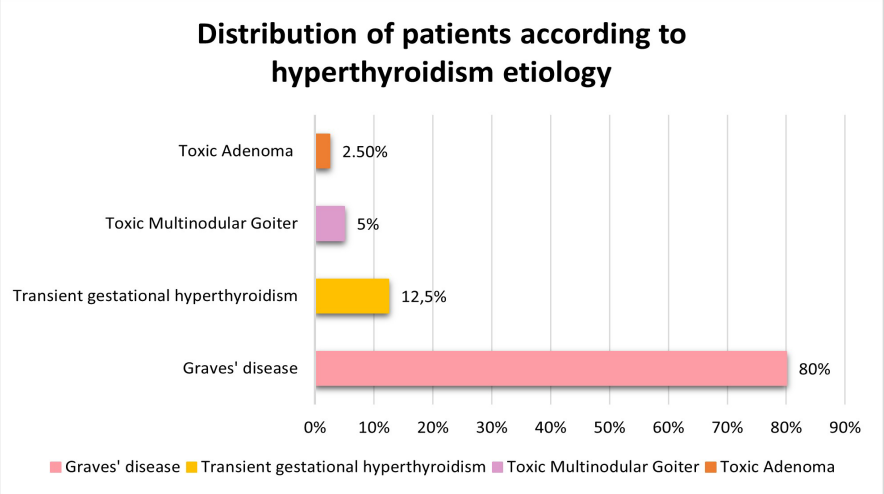


Figure 3. Distribution of patients according to hyperthyroidism etiology.

- **Therapeutic Data**

Antithyroid Drugs (ATD) were prescribed in 87.5% of patients.

Propranolol was prescribed in 40% of patients. Treatment is summarized in Table 5.

Table 5. Distribution of patients according to hyperthyroidism treatment.

| Treatment | Number (N = 40) | Percentage (%) |
|---|---|---|
| **Specific hyperthyroidism treatment** | | |
| Benzylthiouracil | 16 | 40 |
| Carbimazole | 12 | 30 |
| Propylthiouracil | 4 | 10 |
| Thiamazole | 3 | 7.5 |
| No ATD | 5 | 12.5 |
| **Symptomatic treatment** | | |
| Propranolol | 16 | 40 |
| Corticosteroids | 2 | 5 |
| Anxiolytics | 1 | 2.5 |

- **Hyperthyroidism Evolution (Figure 4)**

- Endocrinology follow-up was discontinued during pregnancy in 11 patients.
- Treatment interruption was reported in 5 patients.
- The mean number of free T4 measurements during pregnancy was 1 (range 1 - 3).
- Regarding hyperthyroidism complications, 5% had cardiothyreosis and 50% had persistent hyperthyroidism throughout pregnancy.

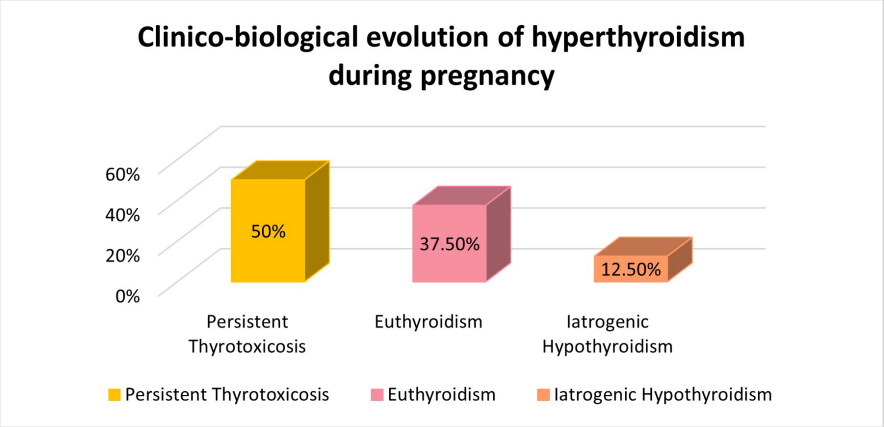


Figure 4. Distribution of patients according to clinico-biological evolution of hyperthyroidism during pregnancy.

One patient transitioned from Graves' disease to Hashimoto's thyroiditis during pregnancy.

- **Pregnancy Data**

Among included patients, 52% reported not being informed about the need for contraception.

- **Gestational Age at First Endocrinology Consultation**

Mean gestational age was 14 weeks of amenorrhea (range 6 - 34 weeks) (Figure 5).

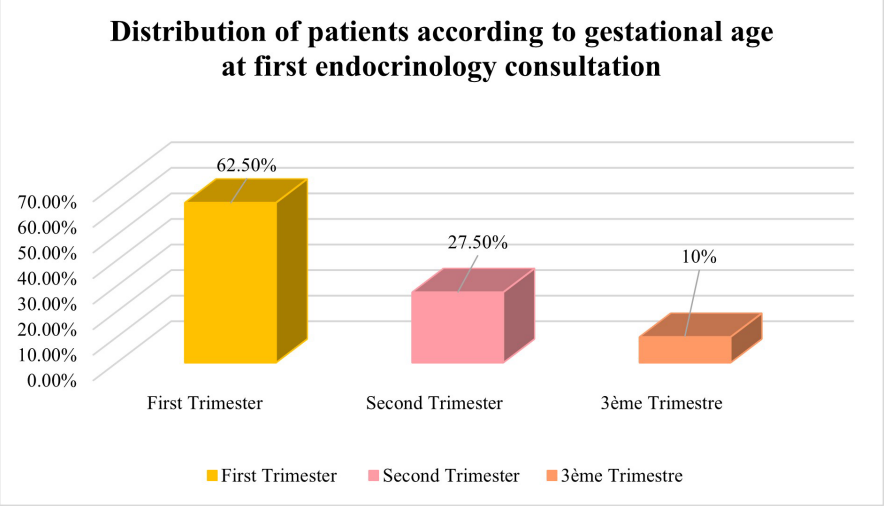


Figure 5. Distribution of patients according to gestational age at first endocrinology consultation.

- **Pregnancy Follow-up**

The mean number of prenatal consultations was 3.18 (range 1 - 6). One patient did not complete prenatal work-up.

During pregnancy, five patients developed anemia, and one had SARS-CoV-2 pneumonia.

Obstetric ultrasound was performed in all patients (range: 1 - 5), with a mean of 2.5 scans.

Two patients discontinued obstetric follow-up during pregnancy.

- **Obstetric and Fetal Complications**

Obstetric and/or fetal pathologies were observed in 21 patients (Table 6).

Table 6. Distribution of patients according to obstetric and fetal complications.

| Obstetric/Fetal Complication | Number (N = 40) | Percentage (%) |
|---|---|---|
| Miscarriage | 6 | 15 |
| Intrauterine fetal death (IUFD) | 4 | 10 |
| Retroplacental hematoma | 3 | 7.5 |
| Hypertensive disorders of pregnancy | 3 | 7.5 |
| Post-term pregnancy | 2 | 5 |
| Prolonged pregnancy | 2 | 5 |
| Threatened preterm labor | 2 | 5 |
| Premature rupture of membranes | 1 | 2.5 |
| Intrauterine growth restriction | 1 | 2.5 |
| Oligohydramnios | 1 | 2.5 |

One patient was treated with Nifedipine, one with Loxen, one with Aldomet, and one with Utrogestan.

- **Delivery Data**

Three pregnancies were ongoing at the time of the study. Miscarriage occurred

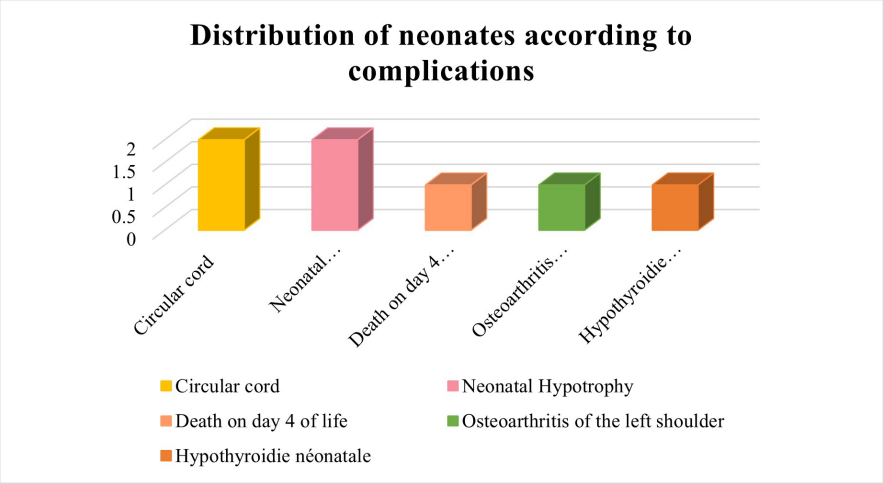


Figure 6. Distribution of neonates according to complications.

in 6 patients. Delivery occurred in 31 patients, with a mean gestational age of 37.7 weeks (range 24 - 42 weeks).

Vaginal delivery occurred in 68% of patients; low transverse cesarean section in 32%. One patient delivered prematurely at 33 weeks.

○ **Neonatal Data**

The perinatal period was defined between 22 weeks of gestation and day 6. Among 31 live births, 7 neonates had complications (Figure 6).

TSH measurement was performed in two neonates: one had hypothyroidism, and one was normal.

• **Evolutionary Data**

○ **Postpartum Hyperthyroidism Follow-up**

Mean duration from first endocrinology consultation postpartum was 3.6 months (range 10 days - 6 years).

Among postpartum patients, 60% continued regular follow-up, 16% irregular, and 24% discontinued.

Among the 22 regularly followed patients, 18 were euthyroid and 4 hyperthyroid.

TRAb was measured in 4 patients, mean 4.23, with 3 positive (range 0.34 - 6.94).

All 22 regularly followed patients continued ATD therapy: 12 on carbimazole, 8 on thyrozole, 3 on benzylthiouracil. Nine received beta-blockers, one anxiolytics.

○ **Gynecological and Obstetric Follow-up**

Two patients became pregnant before completing hyperthyroidism management.

After delivery, only one patient reported not being informed of contraception until euthyroid status was achieved. Among 22 regularly followed patients, 5 accepted contraception (intrauterine device). The remaining 17 refused, mainly due to fear of contraception.

One patient had persistent hypertension postpartum.

○ **One-Year Follow-up**

Among patients with Graves' disease, one patient achieved remission with negative TRAb.

Table 7. Distribution of patients according to thyroidectomy postpartum.

| Total Thyroidectomy | Number (N = 37) | Percentage (%) |
|---|---|---|
| Yes | 3 | 8 |
| No | 32 | 78 |
| Pending | 5 | 14 |

Three patients underwent total thyroidectomy, five were pending. Two available histopathology results confirmed Graves' disease. No patient received radioactive iodine therapy (Table 7).

➢ **Analytical Study**

• **Comparison of Main Etiologies**

Clinical, biological, and evolutionary characteristics according to hyperthyroidism etiology are summarized in Table 8.

Table 8. Comparison of main etiology characteristics.

| Etiologies / Characteristics | Graves' Disease (n = 32) | Toxic Nodule (s) (n = 3) | Transient Gestational Hyperthyroidism (n = 5) | p-value |
|---|---|---|---|---|
| Age | 29.56 ± 6.66 | 28.67 ± 6.51 | 30.60 ± 6.07 | 0.916 |
| Mean Gravidity | 2.72 ± 1.75 | 2.33 ± 2.31 | 4.00 ± 3.08 | 0.367 |
| Mean Parity | 1.31 ± 1.42 | 1.00 ± 1.73 | 2.00 ± 2.12 | 0.592 |
| Mean TSH | 0.77 ± 2.15 | 0.001 ± 0.01 | 0.04 ± 0.05 | 0.759 |
| Mean free T4 | 38.99 ± 18.69 | 39.59 ± 9.85 | 40.76 ± 32.17 | 0.991 |
| Obstetric Complications | 59.4% (19/32) | 33.3% (1/3) | 20% (1/5) | 0.205 |
| IUFD | 12.5% (4/32) | 0% (0/3) | 0% (0/5) | 0.839 |
| Miscarriage | 18.8% (6/32) | 0% (0/3) | 0% (0/5) | 0.414 |

The statistical power for these comparisons is low and p-values should be interpreted with caution.

- **Correlation Between Hyperthyroidism Severity and Obstetric Complications**

A non-significant positive correlation was observed between hyperthyroidism severity (free T4 at first consultation) and obstetric complications (Table 9).

Table 9. Correlation between free T4 levels and obstetric complications.

| T4 (pmol/L) / Obstetric Complications | Yes | No | Total | p |
|---|---|---|---|---|
| <12 | 0% | 23.1% | 11.1% | 0.098 |
| 12 - 22 | 7.1% | 15.4% | 11.1% | 0.471 |
| 23 - 40 | 28.6% | 23.1% | 25.9% | 0.546 |
| >40 | 64.3% | 38.5% | 51.9% | 0.18 |

A positive but non-significant correlation was also observed between hyperthyroidism complications and obstetric pathologies (p = 0.113).

- **Relationship Between Extrathyroidal Signs and Obstetric Complications**

The presence of extrathyroidal signs (exophthalmos) was significantly associated with obstetric and fetal complications (p = 0.0024) (Table 10).

Table 10. Cross-tabulation between extrathyroidal signs and obstetric complications.

| Exophthalmos / Obstetric Complications | Yes | No | Total | p |
|---|---|---|---|---|
| **Yes** | 72.2% | 36.4% | 52.5% | 0.028 |
| **No** | 27.8% | 63.6% | 47.5% | 0.028 |
| **Total** | 100% | 100% | 100% | 0.028 |

## 4. Discussion

We conducted a retrospective and prospective descriptive study with an analytical aim over a period of 66 months. This study included 40 patients. A hospital prevalence of pregnancy among women followed for hyperthyroidism of 2% was found. However, this study has several limitations:

- It was a hospital-based study, with a potential overestimation of prevalence.
- Part of the study was conducted retrospectively, with a possible risk of bias.
- Difficulties in performing certain biological tests, particularly TSH receptor antibody (TRAb) assays, due to the financial constraints of some patients.

**Data on Hyperthyroidism**

The prevalence reported in our study was 2%, which was higher than that reported in the literature [6]-[8] (1.3%). Most patients (72.5%) were already being followed for hyperthyroidism at the beginning of pregnancy.

Regarding the clinical data at the first consultation, the majority of patients (82.5%) presented with a thyrotoxicosis syndrome. This can be explained by the fact that most patients had been previously diagnosed but were poorly followed. Goiter was found in 92.5% of patients, a rate much higher than that reported in the literature (25% reported by Zakiri *et al.*) [2]. Acquired exophthalmos was present in 45% of patients, which is also higher than that reported by Zakiri (18.75%) [2] and Gheorghiu (31.8%) [4]. This can be explained by the predominance of Graves' disease in our cohort. The presence of extrathyroidal signs (exophthalmos) was significantly associated with obstetric and fetal pathologies in our study ($p = 0.0024$). TRAb are present in 100% of patients with dysthyroid orbitopathy [9], and a strong correlation exists between TRAb levels and the severity of orbitopathy [9]. Given the lack of TRAb testing in most patients, exophthalmos in our cohort was considered a clinical correlate of TRAb positivity [9]. Thus, TRAb negativity was associated with a lower risk of obstetric complications. In resource-limited settings, exophthalmos may serve as an orienting clinical marker but doesn't replace TRAb measurement, which remains the reference standard for immunological assessment. Exophthalmos'absence does not exclude the presence of circulating TRAb. Furthermore, the severity of ocular involvement does not always correlate with antibody titers, particularly during pregnancy, where immunological changes may modify clinical expression.

**Paraclinical Data**

The mean free T4 (FT4) level was 39.19 pmol/L. In our series, hyperthyroidism etiologies were dominated by Graves' disease (80%), followed by transient gestational thyrotoxicosis, consistent with the series of Livia *et al.* and Abdous *et al.*, where Graves' disease accounted for 76.6% of cases [10]. In contrast, the most frequent diagnosis in the series by Zakiri *et al.* was transient gestational thyrotoxicosis (82.5%) [2]. This difference may be explained by the fact that most of our patients were already diagnosed and followed for Graves' disease prior to pregnancy.

**Follow-up of Hyperthyroidism**

The recommended frequency of FT4 monitoring described in the literature was not respected in any of our patients. This can be explained, in part, by the lack of financial resources. Monthly hormonal monitoring, as recommended, could not be implemented in our setting due to the high cost of thyroid hormone assays. Several complications are associated with poorly controlled hyperthyroidism during pregnancy [11]. In our cohort, the two main complications were cardiothyreosis and the absence of remission. The presence of hyperthyroidism-related complications was associated with obstetric pathologies in 65% of cases. All patients who experienced intrauterine fetal death (IUFD) had developed complications related to hyperthyroidism during pregnancy (**Figure 7**). In active Graves' disease, there is an increased risk of heart failure, highlighting the importance of early treatment and follow-up when pregnancy occurs [12]. Two patients developed cardiothyreosis during pregnancy; both pregnancies were complicated by spontaneous abortion and IUFD. These patients had been diagnosed before pregnancy and had irregular follow-up, with therapeutic discontinuation lasting 4 months and 3 years, respectively.

Iatrogenic hypothyroidism was reported in 12.5% of patients, which is higher than the rate reported by Chambon (1.9%) [13]. One patient experienced conversion from Graves' disease to Hashimoto's thyroiditis during pregnancy. The literature describes cases of conversion from one autoimmune thyroid disease to another, possibly related to changes in the balance between stimulating and blocking antibodies against the TSH receptor [14]. Conversion from Graves' disease to Hashimoto's thyroiditis appears to be more frequent than the reverse [14].

**Pregnancy Data**

The mean gestational age at the first endocrinology consultation was 14 weeks of amenorrhea (WA), with extremes ranging from 6 to 34 WA. Compared to the literature, our patients consulted much later, which delayed management.

Regarding pregnancy follow-up, the mean number of prenatal consultations was 3.18 (range: 1 - 6). For adequate pregnancy follow-up, at least one prenatal consultation per trimester is recommended [15]. This frequency was not observed in any of our patients.

**Obstetric Complications**

Untreated maternal hyperthyroidism carries significant fetal risks, including growth restriction, threatened preterm labor, and intrauterine fetal death. In our study, we observed six spontaneous abortions, four cases of IUFD, three cases of placental abruption, two cases of gestational hypertension, two cases of threatened preterm labor, and one case of preeclampsia. The number of spontaneous abortions in our study was higher than those reported by Rchachi *et al.*, Zakiri *et al.*, and Abdous *et al.* [2] [10] [16]. Poorly treated hyperthyroidism in early pregnancy may contribute to spontaneous abortion. All six patients who experienced abortion had severe thyrotoxicosis with a mean FT4 level of 44.74 pmol/L:

- Two were newly diagnosed at the beginning of pregnancy and had never re-

ceived treatment.

- Two were previously followed but poorly compliant, with therapeutic discontinuation before pregnancy.
- Two were regularly followed but had severe clinico-biological hyperthyroidism at pregnancy onset.

Elevated maternal thyroid hormone levels late in pregnancy may also increase the risk of stillbirth. Our four cases of IUFD exceed those reported by Rchachi *et al.* [16], who reported none, and Zakiri *et al.* [2] and Hiéronimus *et al.* [17], who each reported one case. All four patients were diagnosed before pregnancy and had severe thyrotoxicosis early in pregnancy, with a mean FT4 level of 48.9 pmol/L:

- Three had irregular follow-up with voluntary therapeutic discontinuation before and during pregnancy.
- One patient was compliant but had persistent hyperthyroidism despite antithyroid drugs and regular follow-up.

Preeclampsia affects up to 8% of pregnancies worldwide and is a major cause of maternal morbidity and mortality [18]. Maternal hyperthyroidism has been associated with an increased risk of pregnancy-induced hypertension [18]. In our study, 5% of patients developed gestational hypertension, 2.5% developed preeclampsia, and three had placental abruption. These rates were lower than those reported by Zakiri and Mannisto (3.1% and 7.9%, respectively) [2] [19]. All patients with gestational hypertension had severe thyrotoxicosis and irregular follow-up.

One case of prematurity was reported in our cohort, compared to four cases in Abdous' series [10] and six cases in Hiéronimus' series [17]. The mean gestational age at delivery was 37 weeks, similar to that reported by Aggarwal and Hiéronimus [6] [17]. Vaginal delivery was the most frequent mode (68%), consistent with Abdous [10] and Hiéronimus [17], but contrasting with Dulek, where cesarean section was more frequent (54%) [20].

Only 5% of newborns underwent thyroid hormone testing, as most mothers reported that neonatal screening had not been requested. One case of neonatal hypothyroidism was reported, consistent with Abdous' findings [10]. Two cases of fetal growth restriction were observed. In the literature, increased maternal FT4 levels have also been associated with lower birth weight [21].

**Evolutionary Data**

Postpartum follow-up was discontinued in eight patients and irregular in five patients, mainly due to lack of financial resources. Among regularly followed patients, 22 continued antithyroid drug therapy, with a change in medication for most. Total thyroidectomy was performed after delivery, as no indication for surgery during pregnancy was identified. Two patients became pregnant again before completion of hyperthyroidism management. Most patients refused contraception postpartum, with fear of contraception being the most frequently cited reason.

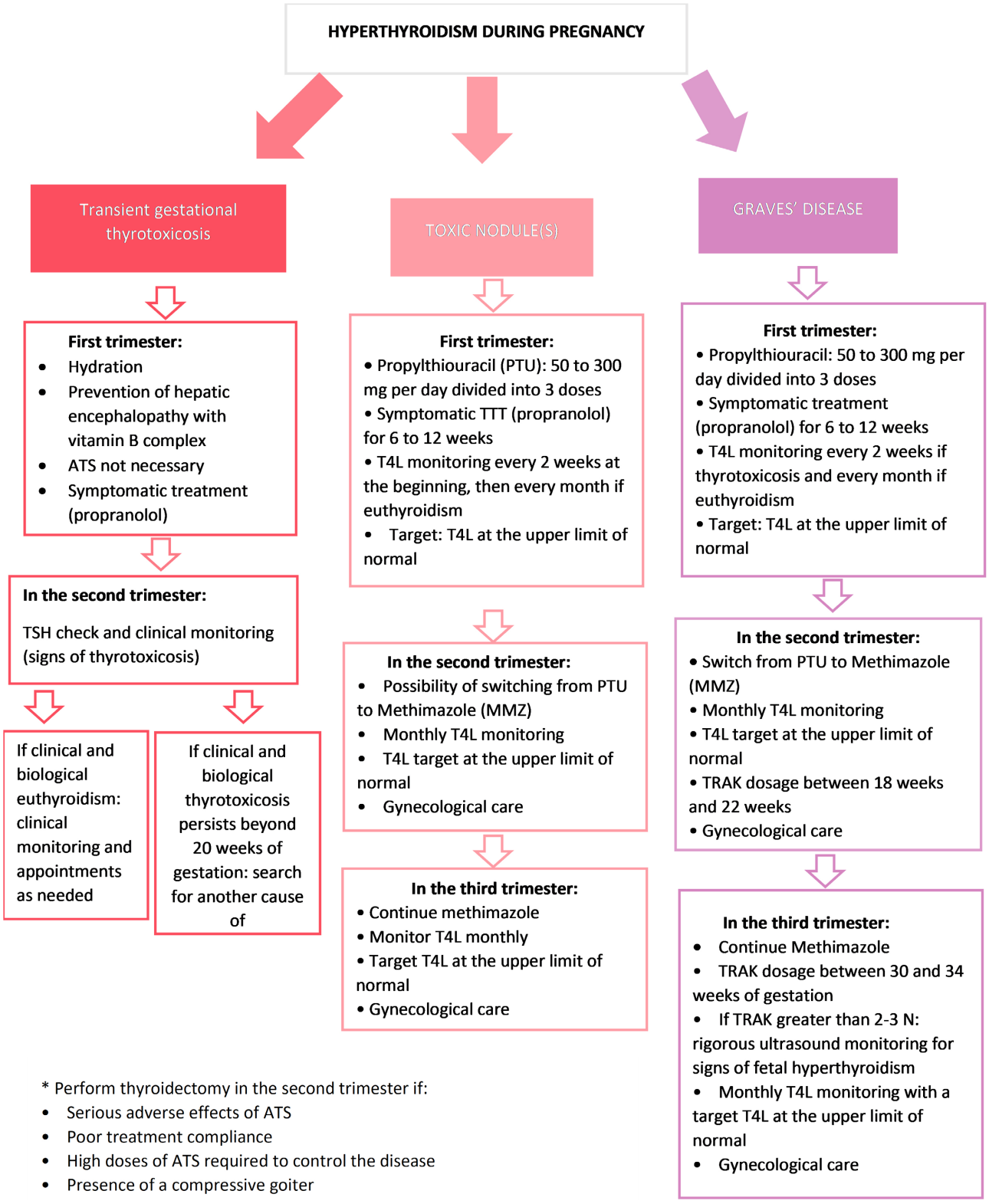


**Figure 7.** Algorithm for the treatment of hyperthyroidism during pregnancy.

## 5. Conclusion

Our study highlights a high obstetric morbidity associated with hyperthyroidism

during pregnancy, favored by limited resources, irregular follow-up, and poorly controlled hyperthyroidism. Persistent lack of postpartum contraception, mainly due to fear of contraception, exposes patients to unplanned pregnancies and recurrent maternal and fetal complications. The observed correlation between exophthalmos and obstetric complications suggests that clinical severity of hyperthyroidism is associated with poor obstetric outcomes. These findings emphasize the need to improve access to antithyroid treatments, particularly propylthiouracil, and to strengthen regular multidisciplinary follow-up to optimize maternal and fetal outcomes. We propose below a management algorithm.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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