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# Prevalence of, and Factors Associated with Thyroid Dysfunction among women with First Trimester Spontaneous Abortion at a Tertiary Hospital, Southwestern Uganda: A Cross-Sectional Study

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## ABSTRACT

**Background:** Endocrine disorders, including thyroid dysfunction, remain a common cause of first-trimester abortions worldwide. Studies indicate that early identification and management of these disorders improve pregnancy outcomes. Despite the high burden of first-trimester abortions at Mbarara Regional Referral Hospital (MRRH), routine screening for possible causes is not routinely done. The study aimed at determining the burden of thyroid dysfunction and its associated factors among women with first-trimester spontaneous abortions admitted at the Gynaecological ward of MRRH.

**Methods:** We conducted a cross-sectional study and consecutively enrolled 146 women with first trimester spontaneous abortions admitted at MRRH from August 2023 to January 2024. Data on study variables were obtained using a structured questionnaire and blood samples for thyroid function tests (TSH and T4). The prevalence of thyroid dysfunction was computed as the number of women with hypothyroidism and hyperthyroidism divided by the total number of participants. A modified Poisson regression analysis was used to determine the associated factors with thyroid dysfunction among women with first-trimester spontaneous pregnancy loss. Results: A total of 146 women with first-trimester spontaneous abortion enrolled in this study, with a mean age of 26.42(±5.35) years. The majority were

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aged 20-34 (80.1%), were above 7 weeks of gestation (82.9%), and 18 (12.3%) had recurrent abortion. The Prevalence of thyroid dysfunction at MRRH was 12.3% (95% CI: 7.9-18.8). The commonest thyroid disorders were subclinical hypothyroidism (44.4%) and subclinical hyperthyroidism (38.9%). In multivariable analysis, gestation age less than 7 weeks (aPR 3.05, 95% CI: 1.40-6.62) and the presence of thyroid swelling (aPR 3.46, 95% CI: 1.45-8.26) were significantly associated with thyroid dysfunction.

**Conclusion:** At least one in every 10 women with a trimester spontaneous abortion at MRRH has thyroid dysfunction, with the commonest disorder being subclinical hypothyroidism. Women with spontaneous abortion at less than 7weeks of gestation and those with a thyroid swelling are likely to have thyroid dysfunction. We recommend routine surveillance for thyroid dysfunction among women with first-trimester spontaneous abortions at Mbarara Regional Referral Hospital

## KEYWORDS

Thyroid dysfunction, First trimester, spontaneous Pregnancy loss

## ABBREVIATIONS

aPR: adjusted Prevalence Ratios; ACOG: American College of Obstetricians and Gynaecologists; CI: Confidence interval; MRRH: Mbarara Regional Referral Hospital; MUST: Mbarara University of Science and Technology; TSH: Thyroid Stimulating Hormone; WOA: Weeks of Amenorrhea; WHO: World Health Organization

## INTRODUCTION

Thyroid dysfunction is the second most common endocrine condition (after diabetes mellitus) affecting women of reproductive age. Thyroid dysfunction is defined as presence of either hyperthyroidism or hypothyroidism [1-3]. Thyroid dysfunction is a public health problem whose burden is increased in pregnancy and leading to adverse pregnancy outcomes including abortion, among others [4]. Thyroid hormones have been shown to promote the growth of trophoblasts by stimulating the secretion of progesterone, estradiol (E2), human chorionic gonadotropin (hCG), and human placental lactogen (hPL), and by inducing epidermal growth factor (EGF) in trophoblasts [5]. Maternal thyroid dysfunction, when it occurs, is a serious condition associated with an increased risk of obstetrical complications including spontaneous abortion, stillbirth, prematurity, gestational hypertension, and placental abruption [6,7].

Thyroid dysfunction in pregnancy often results from a pre-existing condition but may arise during pregnancy [8]. Thyroid dysfunction involves either over or underactivity of the thyroid gland [3]. Hyperthyroidism is commonly caused by Graves' disease, an autoimmune disorder [9], but may also be induced by excessive exposure to iodine [10]. Hypothyroidism is a thyroid hormone deficiency, which may be overt (with symptoms including cold sensitivity, fatigue, and dry skin) [11] or subclinical, with few or no symptoms but abnormal levels of thyroid hormones. It is most commonly caused by endemic iodine deficiency [12]. Other factors, such as immunological factors, medications like lithium, tricyclic

antidepressants, anti-epileptics, rifampin, metformin, and amiodarone, and other endocrinological disorders like high levels of prolactin, have been shown to cause thyroid dysfunction [13].

Due to increased metabolic demands in pregnancy, there are changes in the thyroid physiology characterized by increased thyroid binding globulin (TBG) and the thyroid hormones (T4 and T3). The raised human chorionic gonadotropin (hCG) and TSH have a common alpha subunit and therefore hCG can bind to TSH receptors, leading to a change in thyroid function and thus thyroid function parameters [14,15].

Globally, thyroid dysfunction is responsible for 8-12% of all abortions. The prevalence of thyroid dysfunction among pregnant women in India was found to be 13.2% [16], 4.8% in the United Kingdom [17], and 16% in Denmark [8]. The associated factors for thyroid dysfunction in these studies were fetal loss, placental abruptions, preeclampsia, overweight, obesity, age, parity, origin, iodine intake, smoking, alcohol, and Body Mass Index [8,18-19]. In Africa, the prevalence of thyroid dysfunction among women with spontaneous abortion in the first trimester of thyroid dysfunction is not documented owing to a lack of comprehensive population-based studies. The prevalence rate of thyroid disease was 0.08% among women in the 2nd trimester attending the general antenatal clinic at Chris Hani Baragwanath Academic Hospital, Soweto, South Africa, and 0.35% at Wari Delta State in Nigeria among hypertensive pregnant women [20,21]. Many women of reproductive age experience pregnancy losses, and some of them continue getting recurrent abortions despite receiving treatment [22]. Due to limited investigations and diagnostic tools in resource-limited settings, most women presenting with abortion related complications, management is instituted without finding out the cause of the abortions occurring in the 1st trimester, yet thyroid dysfunction is a common endocrine disorder that contributes to spontaneous first-trimester abortions [23,24]. At Mbarara Regional Referral Hospital, abortion was the leading cause of admission on the gynecology ward, contributing to 80% of all admissions. During January and February 2022, first-trimester pregnancy losses accounted for 90% of all abortions. However, no further documented investigations were conducted to determine the likely causes. Our study aimed to document the burden of thyroid dysfunction among women with first Figure ster abortions and to identify which women are more likely to have thyroid dysfunction.

## METHODS

### Study setting, study design, and study population

A hospital-based cross-sectional study was conducted from August 2023 to January 2024 at Mbarara Regional Referral Hospital, a public tertiary hospital in south western Uganda. The hospital has a bed capacity of 350 and is a referral center as well as the teaching hospital for Mbarara University of Science and Technology. MRRH records for the 2022/23 financial years how abortions as the leading cause of admissions at the Gynaecology ward, with the first-trimester abortions accounting for 90% of all the abortions.

Our study population was women with a first-trimester spontaneous abortion. First trimester refers to a gestation age that is less than or equal to 12weeks and 6days of amenorrhea calculated from the Last Normal Menstrual Period (LNMP) or ultrasound scan report. All women admitted with first first-trimester abortion were included in the study. We excluded women with a known history of thyroid disease treatment.

**Sample size and sampling**

Sample size was calculated by using a single proportion formula by considering the assumptions: P = 9.50% the prevalence of thyroid dysfunction among women with pregnancy loss at Mulago hospital [25]. D = 5% the margin of error, Zα/2 = 1.96 at 95% confidence of certainty. Thus, n = ((Zα/2)2 * p (1−p))/d2 = 132. An extra 10% non-response rate was added to obtain 146 participants. We did consecutive sampling for all eligible participants until the required sample size was attained.

**Data collection procedures and study variables**

Data were collected by research assistants using interviewer-administered structured questionnaires that were developed and pretested for this study. The questionnaire included socio-demographic factors, medical, and obstetric factors. After administration of the questionnaire, 4mls of blood sample was taken from a non-dominant hand by a trained research assistant for assessment of thyroid function (T4 and TSH) using Access II Plus immunoassay system.

The outcome variable was thyroid dysfunction. This was defined as the presence of either hyperthyroidism (low TSH <0.1mIU/ml) or hypothyroidism (high TSH>4.0mIU/ml) and further sub-classified as being overt or subclinical [1-3], Appendix 1.

The independent variables were classified into Socio-demographic factors, including age, level of income, residence, level of education and marital status. Obstetric factors included gestational age which was based on the last normal menstrual period or Ultrasound scan, parity, history of prior first-trimester abortion, preterm birth, stillbirth, or hypertensive disorders of pregnancy. Medical factors included obesity, family history of thyroid disease, known diabetes mellitus or hypertension, and presence of goiter, which was the presence of an anterior neck swelling (palpable thyroid swelling on clinical examination according to WHO examination technique [26].

**Data management and analysis**

We used a coded questionnaire to collect data. All raw data was cross-checked for completeness or discrepancies. Data from the questionnaires were entered into Research Electronic Data Capture (REDCap®) software by the PI, after which it was exported to STATA software version 17 (Stata Statistical Software: Release 17. College Station, TX: StataCorp LLC USA) for cleaning and analysis. Continuous variables that are normally distributed are presented as mean ± Standard Deviation, while categorical variables are presented as frequencies and percentages. The proportion of women with thyroid dysfunction among women with first-trimester abortions was computed as the sum of those with

hypothyroidism and hyperthyroidism divided by the total number of study participants. The corresponding 95% confidence interval was also determined. To determine factors associated with thyroid dysfunction, variables with a p-value < 0.2 at bivariable modified Poisson regression were entered into a multivariable regression model. Variables at this level with a p-value <0.05 were considered statistically significant.

## RESULTS

We screened 158 women admitted to the Gynaecology ward with abortion during the study period and excluded 12 women, whose gestation age was 13 weeks or more. We enrolled 146 women into the study and assessed them for thyroid dysfunction and the associated factors (Figure 1).

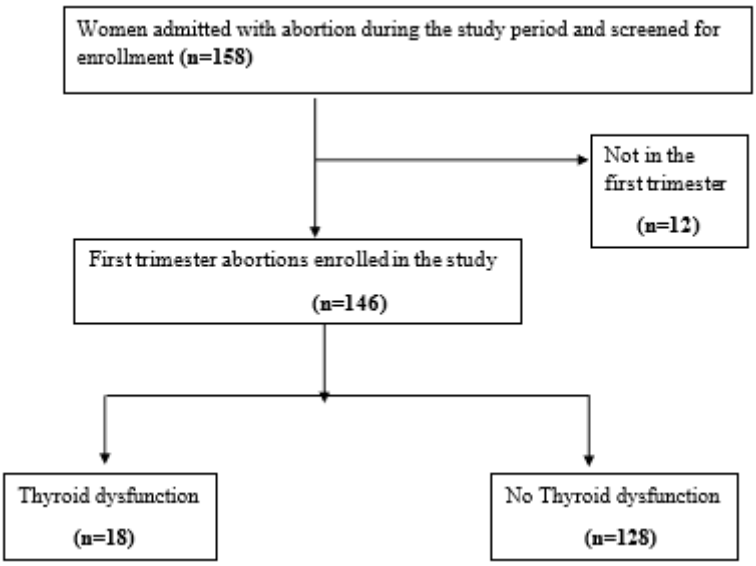


**Figure 1:** Study flow chart.

### Baseline characteristics of study participants

The mean age of the participants was 26.42±5.35 years, with the majority being between 20-34years (80.1%) and no history of smoking 142 (97.3%). More than half of the participants were staying in rural areas (65.8%) and had no formal education (52.7%). There was no difference in the socio-demographic characteristics between those with and without thyroid dysfunction, as shown in Table 1.

| | Total | Thyroid dysfunction | | p-value* |
|---|---|---|---|---|
| **Variable** | **N=146** n (%) | **Yes (N=18)** n (%) | **No (N=128)** n (%) | |
| **Age** | | | | 0.866 |
| Less than 20 years | 5 (3.4) | 1 (5.6) | 4 (3.1) | |
| 20-34 years | 117 (80.1) | 14 (77.8) | 103 (80.5) | |
| 35years and above | 24 (16.4) | 3(16.7) | 21 (16.4) | |
| **Place of residence** | | | | 0.251 |
| Rural | 96 (65.8) | 14 (77.8) | 82 (64.1) | |
| Urban | 50 (34.2) | 4 (22.2) | 46 (35.9) | |
| **Highest education level** | | | | 0.183 |
| None | 77 (52.7) | 13 (72.2) | 64 (50.0) | |
| Primary level | 23 (15.8) | 1 (5.6) | 22 (17.2) | |
| Secondary or Higher | 46 (31.5) | 4 (22.2) | 42 (32.8) | |
| **Marital status** | | | | 0.736 |
| Single | 41 (28.1) | 5 (27.8) | 36 (28.1) | |
| Married | 101 (69.2) | 12 (66.7) | 89 (69.5) | |
| Widow/Separated | 4 (2.7) | 1 (5.6) | 3 (2.3) | |
| **History of smoking** | | | | 0.413 |
| No | 142 (97.3) | 17 (94.4) | 125 (97.7) | |
| Yes | 4 (2.3) | 1 (5.6) | 3 (2.3) | |
| **Income level** | | | | 0.546 |
| Below Poverty Line | 40 (27.4) | 6 (33.3) | 34 (26.6) | |
| Above Poverty line (>30,611 UGx/month) | 106 (72.6) | 12 (66.7) | 94 (73.4) | |
| ***p<0.05*** | | | | |

**Table 1:** Baseline characteristics of the participants (n=146).

## Medical and obstetric factors among participants

The majority of the women were HIV seronegative 131(89.7%), 132 (90.4%) had no thyroid swelling, 112(76.7%) had no history of anemia, and 121 (82.9%) were more than 7 weeks of gestation. The proportion of women who had a thyroid

swelling and who got an abortion at 7 weeks of amenorrhea or less was higher among women with thyroid dysfunction, as shown in Table 2.

| Variable | Total | Thyroid dysfunction | | p-value |
|---|---|---|---|---|
| | N=146 | Yes (N=18) | No (N=128) | |
| | n (%) | n (%) | n (%) | |
| **Body mass index (kg/m$^2$)** | | | | 0.531 |
| < 18.5 | 3 (2.0) | 1 (5.6) | 2 (1.6) | |
| 18.5-24.9 | 82 (56.2) | 10 (55.6) | 72 (56.2) | |
| ≥ 25 | 61 (41.8) | 7 (38.9) | 54 (42.2) | |
| **Presence of thyroid swelling** | | | | <0.001* |
| No | 132 (90.4) | 12 (66.7) | 120 (93.8) | |
| Yes | 14 (9.6) | 6 (33.7) | 8 (6.3) | |
| **HIV status** | | | | 0.481 |
| Negative | 131 (89.7) | 17 (94.4) | 114 (89.1) | |
| Positive | 15 (10.3) | 1 (5.6) | 14 (10.9) | |
| **History of chronic hypertension** | | | | 0.413 |
| No | 142 (97.3) | 17 (94.4) | 125 (97.7) | |
| Yes | 4 (2.7) | 1 (5.6) | 3 (2.3) | |
| **History of Anemia** | | | | 0.909 |
| No | 112 (76.7) | 14 (77.8) | 98 (76.6)6. | |
| Yes | 34 (23.3) | 4 (22.2) | 30 (23.4) | |
| **Gestational age** | | | | 0.009* |
| Less than or equal to 7WOA | 25 (17.1) | 7 (38.9) | 18 (14.1) | |
| More than 7WOA | 121 (82.9) | 11 (61.1) | 110 (85.9) | |
| **Parity** | | | | 0.547 |
| Nulliparous | 68 (46.6) | 8 (44.4) | 60 (46.9) | |
| Multiparous | 64 (43.8) | 7 (38.9) | 57 (44.5) | |
| Grand multiparous (>4) | 14 (9.6) | 3 (16.7) | 11 (8.6) | |
| **Prior abortion** | | | | 0.102 |
| No | 75 (51.4) | 6 (33.3) | 69 (53.9) | |
| Yes | 71 (48.6) | 12 (66.7) | 59 (46.1) | |
| **History of preterm birth** | | | | 0.135 |
| No | 110 (75.3) | 11 (61.1) | 99 (77.3) | |
| Yes | 36 (24.7) | 7 (38.9) | 29 (22.7) | |
| **History of recurrent 1st trimester abortion** | | | | 0.135 |
| No | 123 (84.3) | 13 (72.2) | 110 (85.9) | |
| Yes | 23 (15.7) | 5 (27.8) | 18 (14.1) | |
| **History Preeclampsia** | | | | 0.158 |
| No | 102 (69.9) | 10 (55.6) | 92 (71.9) | |
| Yes | 44 (30.1) | 8 (44.4) | 36 (28.1) | |
| **History of stillbirth** | | | | 0.479 |
| No | 122 (83.6) | 14 (77.8) | 102 (84.4) | |

| | | | | |
|---|---|---|---|---|
| Yes | 24 (16.4) | 4 (22.2) | 20 (15.6) | |
| **History of gestational DM** | | | | 0.078 |
| No | 136 (93.2) | 15 (83.3) | 121 (94.5) | |
| Yes | 10 (6.9) | 3 (16.7) | 7 (5.5) | |
| **History of PPH in previous pregnancy** | | | | 0.405 |
| No | 109 (74.7) | 12 (66.7) | 97 (75.8) | |
| Yes | 37 (25.3) | 6 (33.3) | 31 (24.2) | |
| ***HIV: Human immunodeficiency virus; DM: diabetes mellitus; PPH: Post-partum hemorrhage; *p<0.05*** | | | | |

**Table 2:** Medical and Obstetric factors of the participants (n=146).

## Proportion of women with thyroid dysfunction

Out of the 146 participants recruited in the study, 18 participants had thyroid dysfunction, hence the proportion of thyroid dysfunction at MRRH was (95% CI: 7.9-18.8) percent. The commonest thyroid dysfunction disorder was subclinical hypothyroidism, which was present in 8 participants (44.4%), followed by subclinical hyperthyroidism (38.9%), overt hypothyroidism in 2 participants (11.1%), and lastly, 1 participant had overt hyperthyroidism (5.6%) as shown in Figure 2.

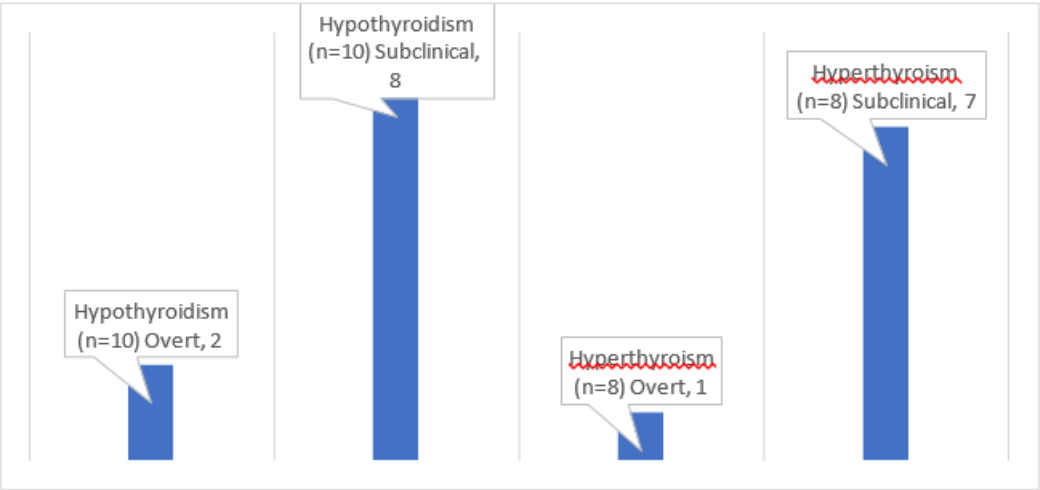


**Figure 2:** Thyroid disorders among women with thyroid dysfunction at MRRH

## Factors associated with Thyroid dysfunction among women with first trimester abortions

The factors associated with thyroid dysfunction among women with 1st trimester abortion at MRRH were presence of thyroid swelling and gestation age at the time abortion. Women who had a thyroid swelling were about 3.5 times more likely to have thyroid dysfunction compared to those who did not have a thyroid swelling while women who had an abortion at 7weeks of gestation or less were about 3.1 times more likely to have thyroid dysfunction compared to those who had an abortion at more than 7weeks shown in Table 3.

| Variable | Bivariate Analysis cPR (95% CI) | p-value | Multivariate Analysis aPR (95% CI) | p-value |
|---|---|---|---|---|
| **Highest education level** | | | | |
| None | Ref | | Ref | |
| Primary level | 0.26 (0.04-1.88) | 0.249 | 0.31 (0.03-2.73) | 0.290 |
| Secondary or Higher | 0.52 (0.18-1.49) | 0.233 | 0.61 (.22-1.64) | 0.327 |
| **Presence of thyroid swelling** | | | | |
| No | Ref | | Ref | |
| Yes | 4.71 (2.09-10.63) | <0.001 | 3.46 (1.45-8.26) | 0.005* |
| **Gestational age** | | | | |
| ≤ 7WOA | 3.08 (1.32-7.18) | 0.009 | 3.05 (1.40-6.62) | 0.005* |
| > 7WOA | Ref | | Ref | |
| **Prior abortion** | | | | |
| No | Ref | | Ref | |
| Yes | 2.11 (0.84-5.34) | 0.114 | 1.66 (0.56-4.75) | 0.347 |
| **History of preterm birth** | | | | |
| No | Ref | | Ref | |
| Yes | 1.94 (0.81-4.65) | 0.135 | 1.28 (0.51-3.16) | 0.600 |
| **History of recurrent 1st trimester abortion** | | | | |
| No | Ref | | Ref | |
| Yes | 2.06 (0.81-5.23) | 0.130 | 0.70 (0.25-1.99) | 0.510 |
| **History Preeclampsia** | | | | |
| No | Ref | | Ref | |
| Yes | 1.85 (0.78-4.39) | 0.161 | 0.83 (0.30-2.28) | 0.718 |
| **History of gestational DM** | | | | |
| No | Ref | | Ref | |
| Yes | 2.72 (0.94-7.88) | 0.065 | 2.01 (0.70-5.78) | 0.196 |

*cPR: Crude Prevalence ratio, aPR: Adjusted Prevalence ratio, DM: Diabetes mellitus, WOA: Weeks of amenorrhea*

**Table 3:** Bivariable and multivariable modified Poisson regression analysis for factors associated with thyroid dysfunction among women with first trimester abortion.

| Category | Definitions |
|---|---|
| Thyroid dysfunction | Presence of either hyperthyroidism or hypothyroidism. These were defined as follows [1-3]. |
| Hyperthyroidism | Referred to low thyroid-stimulating hormone (TSH) less than 0.1mIU/ml and was sub-classified as;<br>a) Subclinical hyperthyroidism in case of normal Thyroxine (T4).<br>b) Overt hyperthyroidism in case of high T4 (more than 195nmol/l). |
| Hypothyroidism | Referred to high Thyroid-stimulating hormone (TSH) more than 4.0mIU/ml and was sub-classified as;<br>a) Subclinical hypothyroidism: High TSH (more than 4.0miu/ml) and normal T4.<br>b) Overt hypothyroidism: High TSH (more than 4.0miu/ml) and low T4 (less than 75nmol/l). |

**Supplement 1:** Definition of thyroid dysfunction according to ACOG 2020 guidelines.

## DISCUSSION

Thyroid function disorder is the second most common endocrinological disorder diagnosed in pregnancy after gestational diabetes and leads to adverse pregnancy outcomes, including abortion, among others [4]. The study determined the prevalence and factors associated with thyroid dysfunction among women with first-trimester abortion admitted at MRRH, in southwestern Uganda. The prevalence of thyroid dysfunction among women with first- trimester spontaneous abortion is high at 12.3%. Women who have abortions at or less than 7 weeks of gestation and those with a thyroid swelling were more likely to have thyroid dysfunction. This prevalence is quite high compared to the prevalence of thyroid dysfunction in the general population of Ugandan young adults, which was 3.6% [27]. Given the already demonstrated positive association between thyroid dysfunction and first-trimester pregnancy loss [28,29], the high thyroid dysfunction may be a contributory factor to the many first- trimester abortions in pregnant women in our setting. This high prevalence could be attributed to micronutrient deficiencies as well as a lack of prenatal screening for thyroid disorders. Therefore, no early detection and management of this disorder.

Our study findings are comparable to a cross-sectional study in India and China among women in the first trimester that reports a prevalence of thyroid dysfunction of 10%, and 10.9% respectively [30,31]. All these studies found subclinical hypothyroidism as the most common form of thyroid dysfunction. This similarity could be because all these studies were conducted in tertiary hospitals, which tend to get comparable populations. However, we believe that the prevalence in these studies would probably be higher if they had studied only women with abortions. Furthermore, the study in China enrolled women who were staying in known iodine-adequate areas.

This prevalence of 12.3% is higher than the prevalence of thyroid dysfunction found in a study among women with first-trimester abortion at the University Hospital of Messina, Italy, which was 3.8%. The study in Italy has a low prevalence because it studied patients at low risk of thyroid dysfunction, as it excluded women with chronic hypertension, diabetes mellitus, habitual abortion, metabolic disorders, extra thyroid autoimmune disease, as well as those who were identified to have subclinical hypothyroidism and positive anti-thyroid antibodies [33].

The prevalence found in this study is also higher than a large cross-sectional study conducted in the UK involving over 19,000 women with a history of subfertility or miscarriage, which was 4.5% [17]. This difference could be explained by the nutritional deficiencies in sub- Saharan Africa and the high burden of goiters in our setting [34]. There were no comparable studies with a higher prevalence of thyroid dysfunction among women with spontaneous first- trimester abortion. However, some studies done among asymptomatic women in the first trimester have shown a higher burden of the disorder; a study done at a tertiary care hospital in Haryana, India, reported a prevalence of 26.5% [19]. Similarly, a study done at a tertiary hospital in Nepal reported a much higher prevalence of 39.48% [35]. This difference may be explained by the different upper cut-off for TSH level in these studies (2.5mIU/ml) compared to our study, which used 4.0 mIU/ml. Furthermore, Nepal and India are in what was once called the "Himalayan Goitre Belt," which was known for having the highest prevalence of iodine deficiency, goiter, and thyroid dysfunction in the world due to their soil types [36,37]. Women with early pregnancy loss (≤7WOA) were 3.05 times more likely to have thyroid dysfunction compared to those with abortion above 7weeks of gestation. This is in agreement with a cross-sectional study conducted in Italy, where women with subclinical hypothyroidism were likely to have precocious abortions compared to those who are euthyroid. This same study in Italy found that TSH levels were generally higher in women with very early pregnancy losses defined as CRL≤10mm, which corresponds to less than 7weeks of gestation [33]. Women with thyroid dysfunction have inappropriate thyroid hormones, which are important for maintaining pregnancy, and therefore tend to lose their pregnancies early [18,37]. Women with a thyroid swelling (goiter) in this study were 3.46 times more likely to have thyroid dysfunction. Goitre often occurs as a result of iodine deficiency, and thus, there is excessive stimulation of the gland to synthesize thyroid hormones by TSH [38,39]. Thyroid hormones have been shown to promote the growth of trophoblasts by stimulating the secretion of progesterone-estradiol (E2), uman chorionic gonadotropin (hCG), and human placental lactogen (hPL), and by inducing pidermal growth factor (EGF) in trophoblasts [5]. Presence of a goiter during pregnancy has been highlighted by the American Thyroid Association as one of the risk factors for thyroid dysfunction during pregnancy [3].

**Study limitations**

Spontaneous abortion was self-reported, and we may have enrolled some patients with induced abortion due to social desirability bias. The diagnosis of thyroid swelling was based on clinical examination. This may be associated with intra-observer bias and inter-observer bias. This was minimized through prior training of research assistants on WHO guidelines for examination of anterior neck swellings.

## CONCLUSION

The prevalence of thyroid dysfunction among women with first-trimester abortion at MRRH is high compared to the general population. In every 10 women with a first-trimester abortion, at least one has thyroid dysfunction. Women with first first-trimester abortion at a gestational age less than 7 WOA and those a thyroid swelling are likely to have thyroid dysfunction. Routine investigation for thyroid dysfunction during prenatal counselling and antenatal contacts, as well as prioritizing women with a history of first-trimester abortion at a gestational age less than 7WOA and those with a thyroid swelling. A study to establish the cause of thyroid dysfunction, either autoimmune or iodine deficiency.

### Declarations

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

### Ethics approval and consent to participate

This study was approved by the Faculty of Medicine Research Committee, Mbarara University of Science and Technology Research Ethics Committee under reference number MUST-2023-801 and Uganda National Council for Science and Technology reference number HS4349ES. Administrative clearance was obtained from the office of the Hospital Director, Mbarara Regional Referral Hospital, before conducting the study. Written informed consent was obtained from each study participant before recruitment and participation in the study. Confidentiality of the study participants was ensured by using unique identifiers. Participants were free to withdraw from the study at any time during the study. Recruitment into the study was voluntary and free. At the end of the interview, each participant was given health education and counselling and linked to the post-abortion care pathway. We respected the guidelines of Helsinki and CIOMS-2002 (Council for International Organizations of Medical Sciences) regarding research with humans, avoiding any type of physical or moral harm.

### Availability of data and materials

The datasets generated and analysed for this study are available from the corresponding author upon reasonable request.

### Consent for publication

Not applicable

### Competing interests

The authors declare that they have no competing interests.

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**Authors' contributions**

SHM, JB, JN, and BSM contributed to the conceptualization and design of the study. SH contributed to study implementation and data acquisition. SHM and ST performed formal data analysis. SH, JB, HO, SY, MK, and JN contributed to drafting the manuscript. JB, SHM, CK, ST, MAA, MK, HO, SY, BSM, and JN critically reviewed and revised the manuscript for key content. SHM and JB prepared the final manuscript. All authors read and approved the final manuscript.

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