A case of fetal goiter and profound hypothyroidism due to treatment of Grave’s disease
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Objective
To present a rare case of fetal goitre and review management and care. We also aim to provide a scoping literature review available on cases of fetal goiter among mothers with varying thyroid function, and the differences in diagnosis and management of these cases.

Methods
A literature review was performed to identify all reported cases of fetal goitres and to classify them by maternal thyroid status.

Results
A 27 year old Gravida 2 Abortus 1 at 8 weeks gestational age (GA) admitted with hyperemesis gravidarium, was found to have mildly symptomatic hyperthyroidism. Thyroid Stimulating Hormone (TSH) < 0.05mU/l (Normal Range (NR) 0.34-5.60mU/l ), Free Thyroxine (FT4) 72.7pmol/l (NR 7.0-17.0pmol/l), Free Tri-iodothyronine (FT3) 28.8pmol/l (NR 3.3-6.0pmol/l). Thyroid Stimulating Hormone Receptor antibodies (TRAb) positivity 6.9U/l (NR <1.0U/l) confirmed Grave’s disease. Patient was treated with propylthiouracil (PTU) 100 mg three times daily. At 15+3 GA: TSH <0.05mU/l, FT4 7.1pmol/l, FT3 5.0pmol/l, TRAb 3.2U/l, and symptoms resolved. At 20+2, PTU decreased to 50mg twice daily. Ultrasound revealed a hypervascular, fetal goiter suggestive of fetal Grave’s disease. Fetal blood sampling at 22+5 GA diagnosed fetal hypothyroidism: TSH 178.65U/l (95% Confidence Interval (CI)~2-9), FT4 8.2pmol/l (95%CI ~2.5-10), FT3 3.5pmol/l (95%CI ~0.2-0.5), TRAb 2.4U/l. PTU was discontinued. Levothyroxine 225mcg was administered intra-amniotically. Goiter improved on subsequent ultrasounds. Female neonate was healthy, euthyroid, TSH 10.31U/l (NR 1.00-18.00U/l), FT4 23.2 (NR 13.5-57.7pmol/l), and without goiter at birth. At 4 weeks old, she remained healthy and TRAb negative. At 3 months postpartum, mother also remained euthyroid. In our scoping review of all cases in the literature, we identified 31 cases of fetal goitre in mothers with euthyroid state. 20 cases were published associated with maternal hyperthyroidism, and 5 cases were published with maternal hypothyroidism. We summarized the clinical details of these cases in a table format. We also identified 7 studies that described ultrasonographic measurements of fetal thyroid and nomograms developed by different authors.

Conclusion
In conclusion, early recognition of fetal goiters using standardized ultrasonographic approach to measurement and fetal thyroid nomograms is important in the management of obstetrical complications associated including preterm labour due to polyhydramnios, difficult deliveries due to associated fetal head hyperextension and fetal airway obstruction. Fetal goiter can be caused by passive transfer of maternal antibodies (fetal Graves' disease) or from transfer of maternal anti-thyroid medications (fetal hypothyroidism) and fetal thyroid ultrasound and assessment may be unable to distinguish between the two causes. Ultrasound may not be reliable to predict thyroid function and therefore fetal blood sampling is then required as management strategies are very different. Further research is required to establish the pattern and rate of fetal thyroid growth during gestation, in addition to standardized nomograms for diverse populations. As exhibited in our scoping review of the literature and case series, management of fetal goiters differs based on underlying etiology and maternal factors. While a standardized approach to treatment does not currently exist, an individualized approach to management based on knowledge of previous cases and outcomes, in combination with clinical judgement, is necessary to the success of these rare cases.