and allowed to recover for 2 months. Both bone density measurements by DXA and biomechanical testing were performed on excised bones from nonnormatremic control rats (NN, [Na$^+$]=145±5.6 mmol/L, n=9), chronically hyponatremic rats (HN, [Na$^+$]=114±4.7 mmol/L, n=9) and hyponatremic corrected rats (HC, [Na$^+$]=139±4.1 mmol/L, n=9). The results confirm that chronic hyponatremia caused significant decreases in bone mineral density (BMD, g/cm$^2$) in the L4 vertebra (NN=0.166±0.003, HN=0.151±0.002, P=0.002) and femur (NN=0.229±0.004, HN=0.213±0.005, P=0.024). Bone fragility as measured by ultimate load to fracture (UL, Newtons) was also increased in the L5 vertebra (NN=369.8±51.1, HN=262.9±29.4, P=0.0001), but only slightly in the femur (NN=295.4±57.5, HN=286.0±35.4, P=0.682). Following correction of hyponatremia, both BMD and UL recovered after 2 months to levels not significantly different than the nonnormatremic controls: L4 BMD (NN=0.166±0.003, HN=0.167±0.002, NS); femur bone density (NN=0.229±0.004, HN=0.226±0.003, NS); UL in the L5 vertebra (NN=369.8±51.1, HN=384.1±63.5, NS). These results show that bone fragility parameters are adversely affected by chronic hyponatremia in addition to the previously reported decreases in BMD in rats. Consistent with the BMD results, the trabecular bone in the spine was more severely affected than the cortical bone in the femur. Our results show that much of the bone pathology of hyponatremia-induced osteoporosis can be reversed following correction of the hyponatremia without using specific antiresorptive therapy. Our findings therefore raise the possibility that correction of hyponatremia may be effective as a therapy for treatment of hyponatremia-induced osteoporosis in selected patients.

Objective
The aim of this study is to determine if there is an association between how and by whom a thyroid nodule is detected and the risk of malignancy in the pediatric population.

Study Design and Methodology
We retrospectively reviewed the medical records of pediatric patients (≤21 years of age) who had a thyroid nodule with definitive cytologic or pathologic diagnosis from January 2010 to June 2019. Patients were categorized into 3 groups based on how and by whom the nodule was detected: (1) patient or parent, (2) provider, or (3) imaging obtained for non-thyroid indications (incidental). Characteristics that were evaluated included rate of malignancy, size of the nodule, location of the nodule, and size of the cancer (if present).

Results
A total of 78 patients with concerning thyroid nodules were analyzed. Within the study, the cancer rate was 27% (21/78), which is comparable to the reported malignancy rate of pediatric thyroid nodules in the literature (22-26%) (4), suggesting that our sample population may be representative of the general pediatric thyroid nodule population. In our study, though the absolute numbers were small, there was a higher rate of malignancy in the incidental group (3/5, 60%) compared to the patient/parent (9/34, 26%) and provider (9/39, 23%) groups. The average size of the thyroid nodule was similar in all 3 groups. The strength of this study was the inclusion of only patients with definitive diagnosis of the thyroid nodule and the possibility of the findings being applicable to the general pediatric population.

Conclusions
In our sample study, incidentally discovered pediatric thyroid nodules had a higher rate of malignancy as compared to those discovered by patients/parents or providers.

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Bone and Mineral Metabolism

BONE AND MINERAL CASE REPORTS I

First Case in Saudi Arabia Revealing Fahr Syndrome Secondary to Hypoparathyroidism: A Case Report
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SAT-357
First Case in Saudi Arabia Revealing Fahr Syndrome Secondary to Hypoparathyroidism: A Case Report

Abstract
Introduction
Fahr Syndrome is a rare inherited or sporadic neurological disorder. It is characterized as in abnormal calcium deposition or in other words, calcification in the brain which almost always occurs bilaterally. Patients with Fahr...
syndrome usually presents with neurological symptoms such as seizures, tetany, speech impairment, dementia, deterioration of intelligence, involuntary movements. The etiology of Fahr syndrome is mostly associated with endocrine disorders especially hypoparathyroidism either primary or secondary or pseudo hyperparathyroidism; including adult onset neurodegenerative conditions, infectious disease like intrathecal and perinatal infections or inherited congenital causes are also considered.

**Clinical Case**
The authors report a 33-year-old Ethiopian female not known to any medical illness presented with abnormal involuntary left-hand movement, headache and dizziness. Further examination shows positive Chvostek's and Trousseau's signs. In addition, laboratory findings reveal decreased levels of serum calcium (1.227 mmol/L, normal range of 2.2-2.65 mmol/L), serum albumin (33.53 mg/dL, normal range of 35-52 g/L) and parathyroid hormone (0.3pmol/L, normal range of 1.1-8.43 pmol/L), decreased vitamin D serum level (14.52 ng/ml, normal range of 35-75 ng/ml). Interestingly, brain imaging shows bilateral symmetrical subcortical white matter, basal ganglia, cerebellar dentate nuclei calcifications. Thus, Fahr syndrome diagnosis was made. She was promptly treated with calcium gluconate was given intravenously with oral calcium carbonate and oral cholecalciferol. The patient recovered with this treatment leading to positive results without any recurring symptoms.

**Pediatric Endocrinology**

**PEDIATRIC SEXUAL DIFFERENTIATION, PUBERTY, AND BONE BIOLOGY**

**Clinical and Hormonal Features of 37 Families with Central Precocious Puberty Due to MKRN3 Loss-Of-Function Mutations**

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**SUN-085**

**Context:** Loss-of-function mutations in the maternally imprinted Makorin RING-finger 3 (MKRN3) gene (15q11.2) are the most prevalent cause of familial central precocious puberty (CPP). **Objectives:** To analyze the phenotypes of a large cohort of children with CPP due to MKRN3 mutations and to compare them with the phenotypes of idiopathic CPP.

**Setting and Participants:** We studied 73 individuals from 37 families with mutations in MKRN3 originating from nine different countries. The phenotypes of these patients at initial diagnosis were compared to a cohort of 124 patients with idiopathic CPP. Additionally, expression of nine different genes implicated with pubertal timing, including MKRN3, was performed in the hypothalamus of female mice in different phases of sexual maturation. **Results:** Nineteen different heterozygous, paternally inherited mutations in MKRN3 were identified in 73 patients with CPP (48 girls and 25 boys). Six MKRN3 mutations were frameshifts, one introduced a premature stop codon, 11 were missense mutations predicted to be pathogenic, and one was a deletion in the promoter region. A frameshift mutation affecting codon 161 in the amino terminal region of the protein was the most frequent MKRN3 defect (46%), representing a hotspot region. Among the cohort with MKRN3 mutations, first pubertal signs occurred at 6.2 ± 1.2 years in girls and 7.6 ± 1.4 years in boys. Patients harboring severe frameshift/ nonsense mutations did not differ significantly in any clinical or hormonal parameters compared to the 20 patients with missense variants. However, when the 48 girls with MKRN3 mutations were compared to 124 idiopathic CPP girls, some parameters could be considered as possible predictors of the genetic cause: a lower age at first medical appointment (7.1 ± 1.1 in the MKRN3 group vs. 8.0 ± 2 years in the idiopathic group; p <0.001) and a shorter time interval between puberty onset and medical assistance (0.8 ± 0.8 vs 2.2 ± 2.1 years; p < 0.001). Interestingly, the other predictor of MKRN3 mutations was a higher basal FSH level (5.1 ± 2.3 vs 3.9 ± 2.7 IU/L; p = 0.017) at first evaluation, although no cutoff value yielded good accuracy. Patients originating from European/Mediterranean countries were more likely to have missense variants (56% of all mutations) than North American and South American (23%) counterparts (p <0.001). Mouse Mkrn3 mRNA levels in the arcuate nucleus were highest in the prepubertal phase when compared...