

# Volumetric Analysis of Incidental Pelvic Free Fluid in Healthy Pubescent Children Using Magnetic Resonance Imaging

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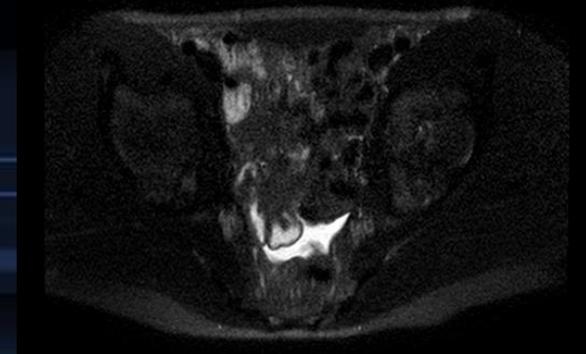
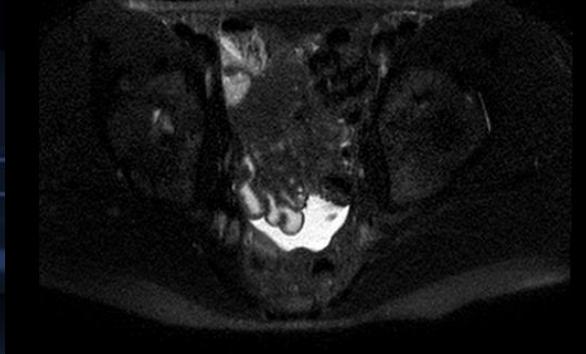
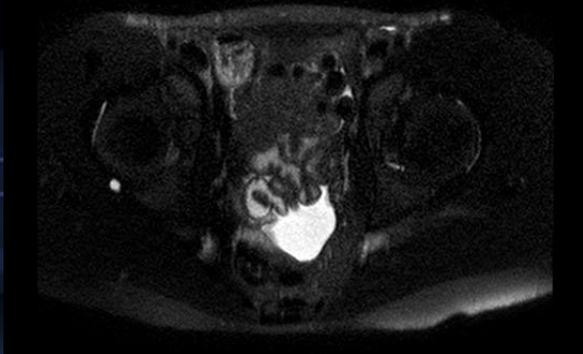
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The authors declare no conflict of interest

# Purpose

- Presence of fluid in the pelvis can be a sign of a systematic or focal disease processes. However, detecting minimal pelvic free fluid (PFF) is not uncommon in healthy children. The purpose of this study was to determine the significance and prevalence of PFF in normal children during puberty detected by magnetic resonance imaging (MRI).



# Materials and Methods

- This prospective study was performed on 32 healthy volunteer children (12 females, 20 males) between the ages of 8 to 13 years, with consecutive follow-ups every 8-10 months for an average of 3 years. Health and menstrual statuses were evaluated before imaging. All cycling females underwent MRI during the follicular phase of the menstrual cycle.

- Total of 120 pelvic MRI studies (59 females, 61 males) on axial T2-weighted fat-suppressed sequence were reviewed by two experienced radiologists, and the quantity of fluid was measured on Vitrea software version 6.8.0. Statistical analysis was performed using Chi-square, Pearson correlation and t-test.

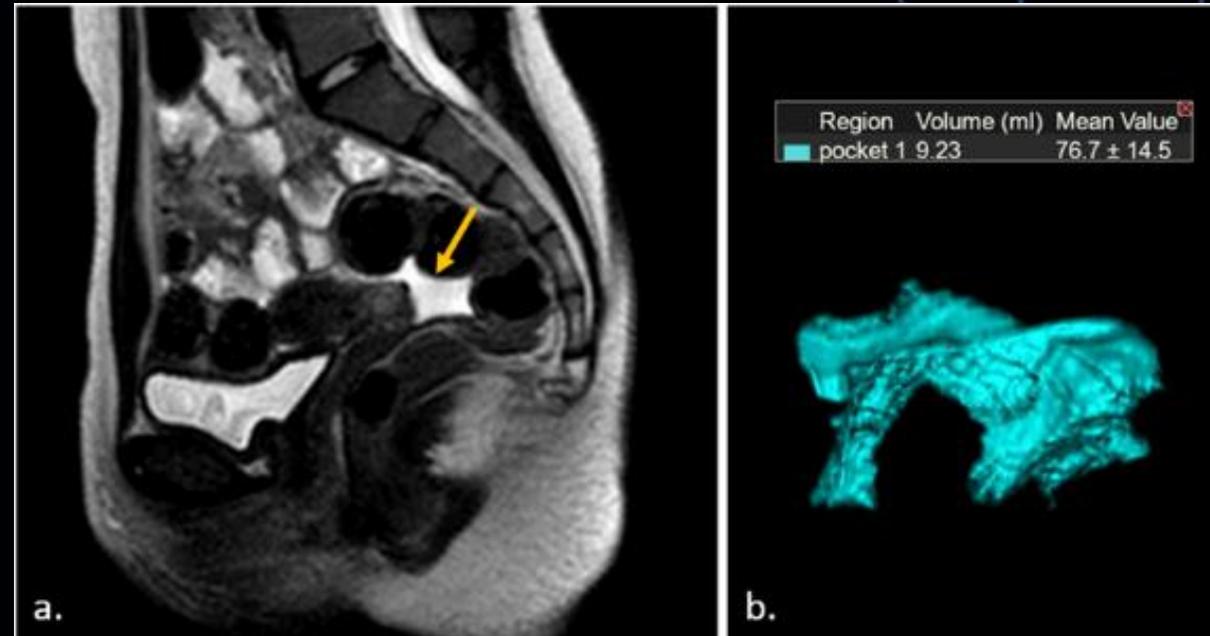


Figure 1. (a) Sagittal T2-weighted MRI shows free fluid in a 15-year-old female (arrow). (b) Corresponding 3 dimensional image shows a 9.23 mL pocket of fluid in a same individual.

# Results

- The mean  $\pm$  standard deviation volume of PFF was  $4.7 \pm 5.65$  mL in females and  $1.9 \pm 3.11$  mL in males with a maximum volume of 25 mL and 17 mL, respectively. The prevalence of PFF was significantly higher in females (91%) compared to males (67%) ( $P = 0.0035$ ).

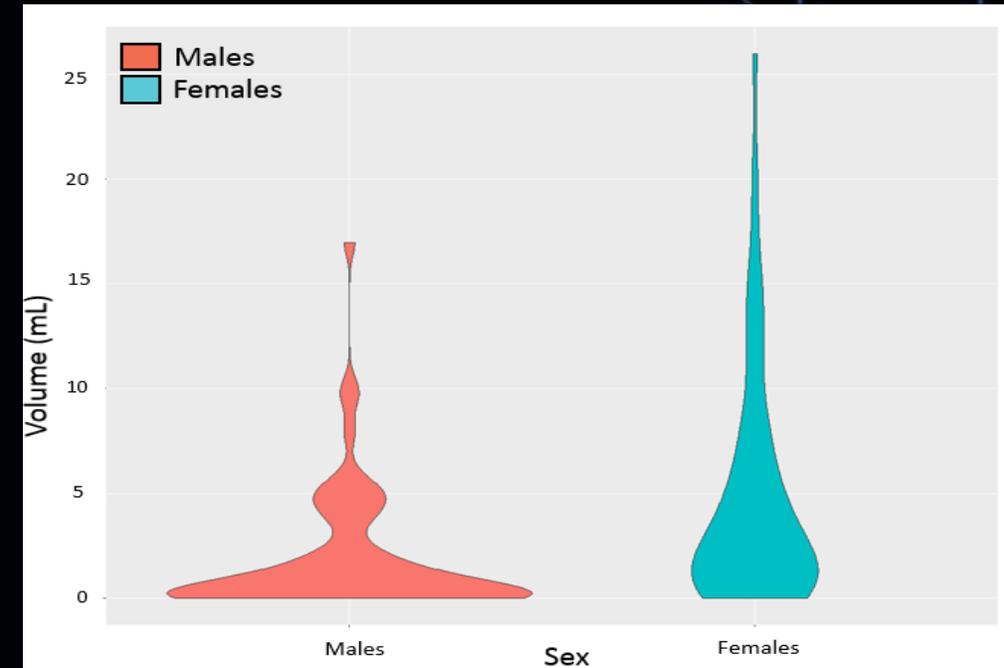
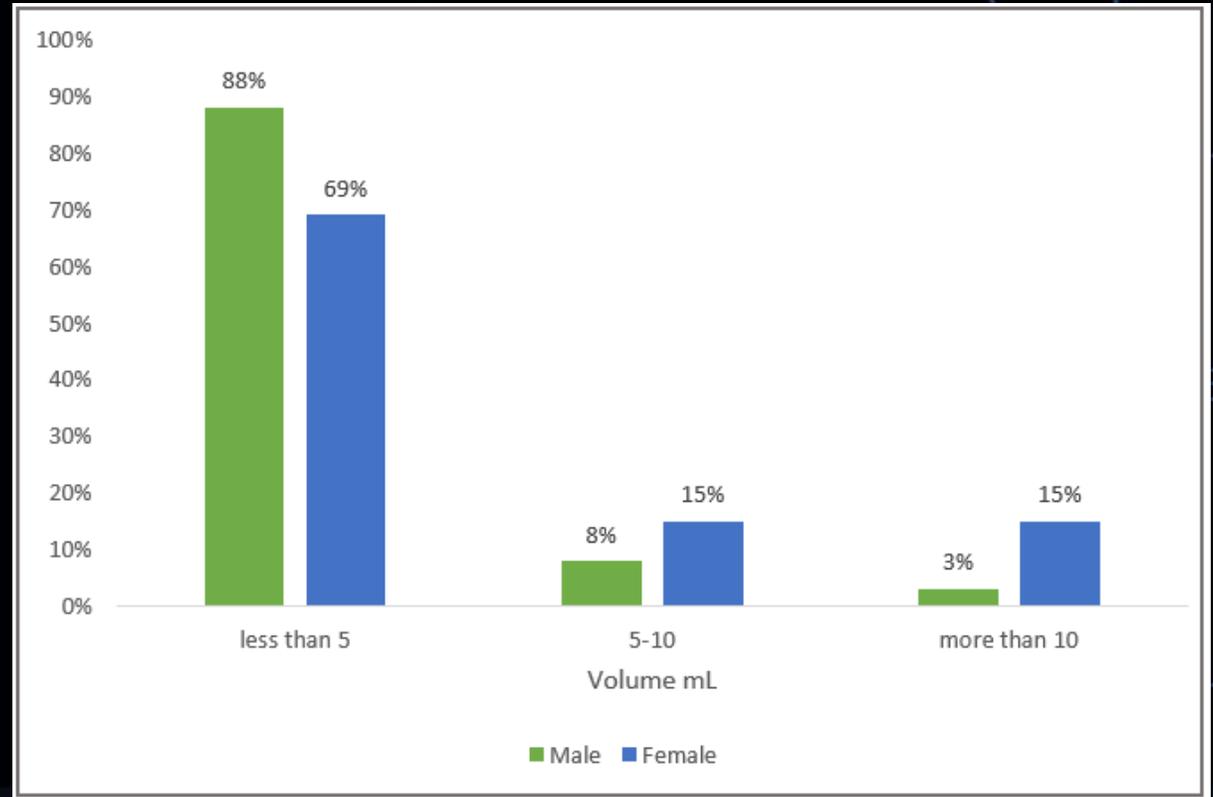


Figure 2. Violin plot shows the distribution of free fluid volume amongst the study population by sex. The number of cases with fluid greater than 5 cc in the pelvis was considerable within the study population (11% of males and 30% of females).

- Figure 3. In 15% of the females and 3% of the males the fluid was greater than 10 mL.



- There was a positive linear correlation between age and volume in the female group ( $r = 0.44$ ,  $P = 0.0004$ ). Within the male group, the mean age of volunteers with (10.7 years old) and without (13.7 years old) fluid was significantly different ( $P = 0.0001$ ).

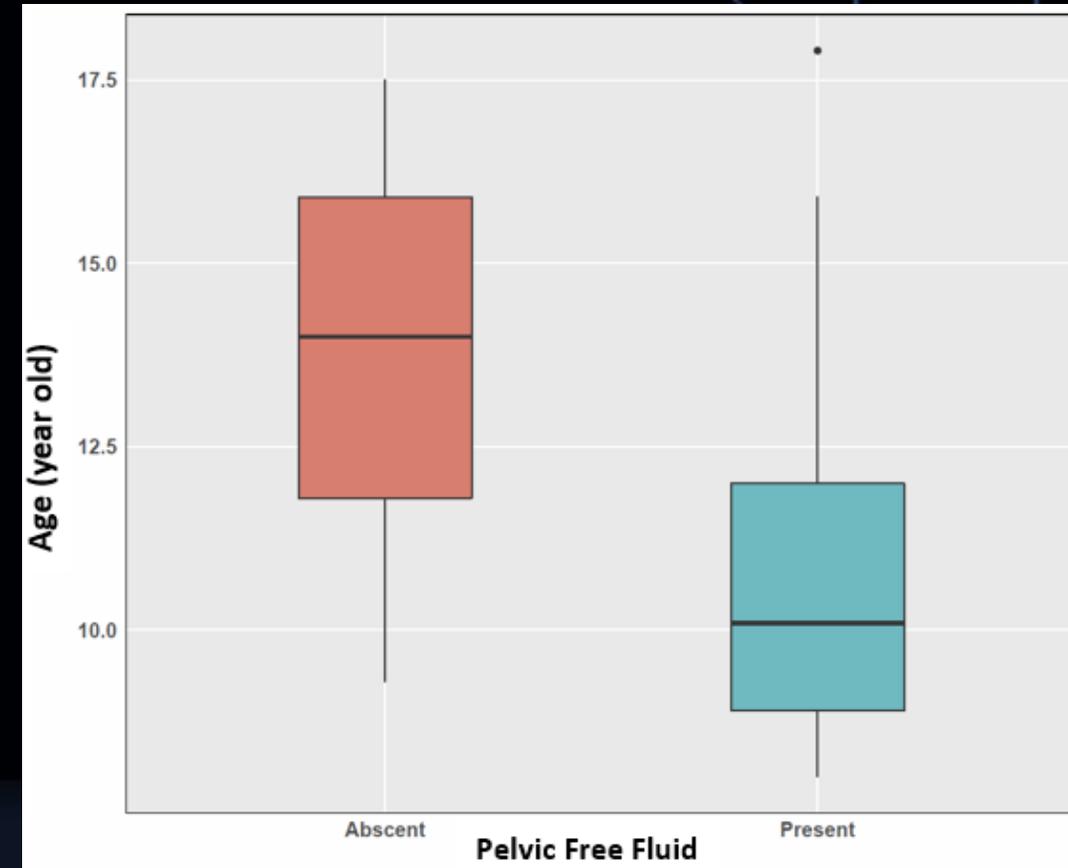


Figure 3. Box plot shows the difference of mean age in presence and absence of fluid in males.

# Conclusion

- Amongst healthy pubescent children, the prevalence of PFF is significantly higher in females. The volume of PFF may reach volumes greater than 10 mL during normal puberty and can be assumed normal in the absence of active disease. Within the female population, the volume of PFF increases with age, while, the majority of males with PFF were 10 to 11 years old.