Variability in Pubertal Timing Among Asian American, Native Hawaiian, and Pacific Islander Subgroups

Catherine T. Pinnaro, MD, MS; Vanessa A. Curtis, MD

Puberty represents the transition from childhood to adulthood and the attainment of reproductive capacity. The onset and tempo of puberty are impacted by genetic background, epigenetics, race and ethnicity, nutritional status, maternal conditions, and environmental factors. Age at puberty has implications for health throughout the lifespan, and both early and delayed puberty are associated with adverse physical and mental health outcomes. The large, retrospective cohort study by Kubo et al included almost 110,000 children and is, to our knowledge, the first population-based US study that describes the timing of pubertal onset among Asian American, Native Hawaiian, and Pacific Islander ethnic subgroups. Using a comprehensive data set from Kaiser Permanente Northern California, the authors evaluated 11 ethnic subgroups with almost equal representation of females and males in each subgroup. Disaggregating the subgroups demonstrated differences in pubertal timing that were obscured when the groups were analyzed together. The subgroup differences were more pronounced in females, with the difference in median age at thelarche varying by 8 months among subgroups and the difference in pubarche varying by 14 months among subgroups. In males, the differences between earliest and latest subgroups in the median age of gonadarche and pubarche were 4 months and 8 months, respectively.

Puberty marks the reactivation of the previously quiescent hypothalamic-pituitary-gonadal axis. The most important initial physical signs of true central puberty are thelarche in females and testicular enlargement (gonadarche) in males. These physical findings are not always practical to document for population-based studies of puberty, particularly male testicular enlargement, but are important to distinguish central puberty from adrenarche, the maturational rise in adrenal androgens, which occurs independently of central puberty but contributes to pubarche. A strength of the study by Kubo et al is the inclusion of thelarche, gonadarche, and pubarche as outcomes of interest.

Notably, the study found greater variability in the timing of pubarche in both females and males, implying that genetic background contributes to differences in timing of androgen-mediated hair growth and/or adrenal gland activity. Furthermore, there was more variability in female thelarche than in male gonadarche. This aligns with data suggesting that there is a secular trend toward earlier thelarche in females without concurrent solid evidence for earlier male gonadarche and that there are likely distinct factors affecting male and female central puberty. It has been shown that while age of thelarche is decreasing, the age at menarche is relatively preserved. Kubo et al did not report on age at menarche because of the availability of pediatrician-assessed sexual maturity rating findings. However, it would be interesting to investigate whether the same variations in age at menarche exist; this could shed light on pubertal tempo, which might not be uniform among subgroups. Additionally, considering that thelarche and menarche may be influenced to varying degrees by factors such as environmental exposure and nutrition, understanding their individual timing among subgroups is relevant.

Obesity is associated with earlier pubertal timing in girls and possibly boys. The average body mass index (BMI) of each subgroup throughout the study was not reported, but Kubo et al addressed obesity as a potential confounder by performing a sensitivity analysis including only those individuals who had a prepubertal BMI between the 5th and 85th percentiles. The differences in pubertal timing among subgroups persisted after removing individuals with a BMI that fell outside...
this range, suggesting that the differences are not solely explained by obesity. The authors did not present these raw data, but given the rise in pediatric overweight and obesity broadly, it would be informative to see how many individuals were removed in total and from each subgroup due to a BMI outside the 5th to 85th percentiles.

Asian children are reported to have the lowest prevalence of obesity in the US, but little is known about the ethnic subgroups, which are not likely homogeneously at risk for obesity and, more importantly, its sequelae. Kubo et al comment that early pubarche has been found to be associated with risks for cardiometabolic diseases, including type 2 diabetes and gestational diabetes, and that the disparities in pubertal timing described in their study may correspond to disparities in these cardiometabolic outcomes among ethnic subgroups in adults. While many factors affect both pubertal timing and cardiometabolic outcomes, it is important to bear in mind that further research is needed to better define the correlation between these factors within each ethnic subgroup.

Additionally, the association between BMI and adiposity varies based on genetic background. As such, it is becoming more recognized that proxy measures for cardiometabolic risk stratification may have lower specificity in different populations; for example, Asian adolescents with overweight may be at higher risk for insulin resistance than non-Asian adolescents with the same weight, with marked variation among subpopulations of Asian Americans. Kubo et al appropriately used the 2000 Centers for Disease Control and Prevention growth charts to define BMI categories. However, it is important to keep in mind that these growth charts were derived from nationally representative data available at the time but are not designed to provide separate reliable growth estimates for each of the racial and ethnic groups and subgroups in the US. This highlights an ongoing challenge in conducting growth- and puberty-related research in minority populations and subgroups—the paucity of granular growth data and related health outcomes data.

The study by Kubo et al provides important data to better define the timing of pubertal onset in both female and male US adolescents of Asian, Native Hawaiian, and Pacific Islander descent, which contributes to the knowledge of pubertal norms. Their study illustrates the diversity within populations that could easily and erroneously be grouped together and emphasizes the necessity for precision and the pitfalls encountered when using race and ethnicity as a proxy for genetic background. These data should stimulate further evaluation of pubertal timing and tempo across the US population and the physical and mental health consequences of variations in pubertal timing.

**REFERENCES**


