

Obesity is not associated with delayed pubertal onset in boys

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BACKGROUND:

Body mass index (BMI) is associated with pubertal timing in boys. Studies in both girls and boys consistently report an inverse correlation of BMI and pubertal timing within the normal BMI range. However, observations in obese boys are conflicting with studies reporting either early or delayed pubertal onset in obese boys.

OBJECTIVE:

To assess the association of male puberty timing with age-specific BMI (zBMI) in obese boys.

PARTICIPANTS & METHODS:

Obesity was defined as age-specific BMI (zBMI) >2. 219 obese boys (median [range] zBMI: 2.79 [2.01 - 5.00], median age at baseline 10.8 [4.2 - 17.0]) were enrolled as part of a prospective outpatient childhood obesity intervention program at Nordsjællands Hospital, Hillerød, Denmark between 2009 and 2017. As controls, we included 660 healthy boys (-2SD < zBMI ≤ +2SD) from the population-based COPENHAGEN Puberty Study (2006 - 2014). Subanalyses were performed on overweight controls (+1SD < zBMI ≤ +2SD). Clinical assessment in both groups included evaluation of pubertal development, i.e. genital stage (G1-5) and pubic hair (PH1-5). In addition, testicular volume was measured using a Prader orchidometer to the nearest mL. Timing of pubertal milestones was estimated by probit analyses.

RESULTS:

Mean (95% CI) age of onset in obese (zBMI >2) boys was; Testicular volume ≥4mL: 11.3 yrs (11.0-11.6), genital stage ≥2: 11.6 yrs (11.3-11.9), and pubarche: 11.9 yrs (11.5-12.3). Timing of zBMI subgroups is depicted in **Figure 1**. Pubertal milestones in obese boys occurred at the same age or earlier compared to population-based controls. We observed a significant earlier timing of testicular enlargement in the obese study cohort compared to controls (p = 0.01), but not of genital stage ≥2 (p = 0.94) nor pubarche (p = 0.06). Further, comparing overweight controls (+1SD < zBMI ≤ +2SD) to obese boys, we did not observe a significant difference in timing of neither genital stage ≥2 (0.62), testicular enlargement (p = 0.54) nor pubarche (p = 0.78). Visualizing the entire dataset, we plotted timing of pubertal events into puberty nomograms of a previously published Danish population reference (**Figure 2**) indicating normal progression of puberty in obese boys.

CONCLUSION:

In conclusion, comparing two thoroughly clinical characterized cohorts of obese boys and a population reference, we demonstrate that obesity is not associated with delayed pubertal onset but rather with equal or earlier timing of pubertal milestones.

Figure 1. Timing of pubertal milestones in obese boys compared to population-based reference cohort.

Timing of testicular enlargement ≥ 4mL (diamond ♦), genital stage ≥2 (triangle ▲) and pubarche (square ■) stratified by zBMI score. Left panel: **COPENHAGEN puberty study**. Right panel: Hillerød obesity cohort (red: +2SD < zBMI ≤ +3SD; black: zBMI >+3SD).

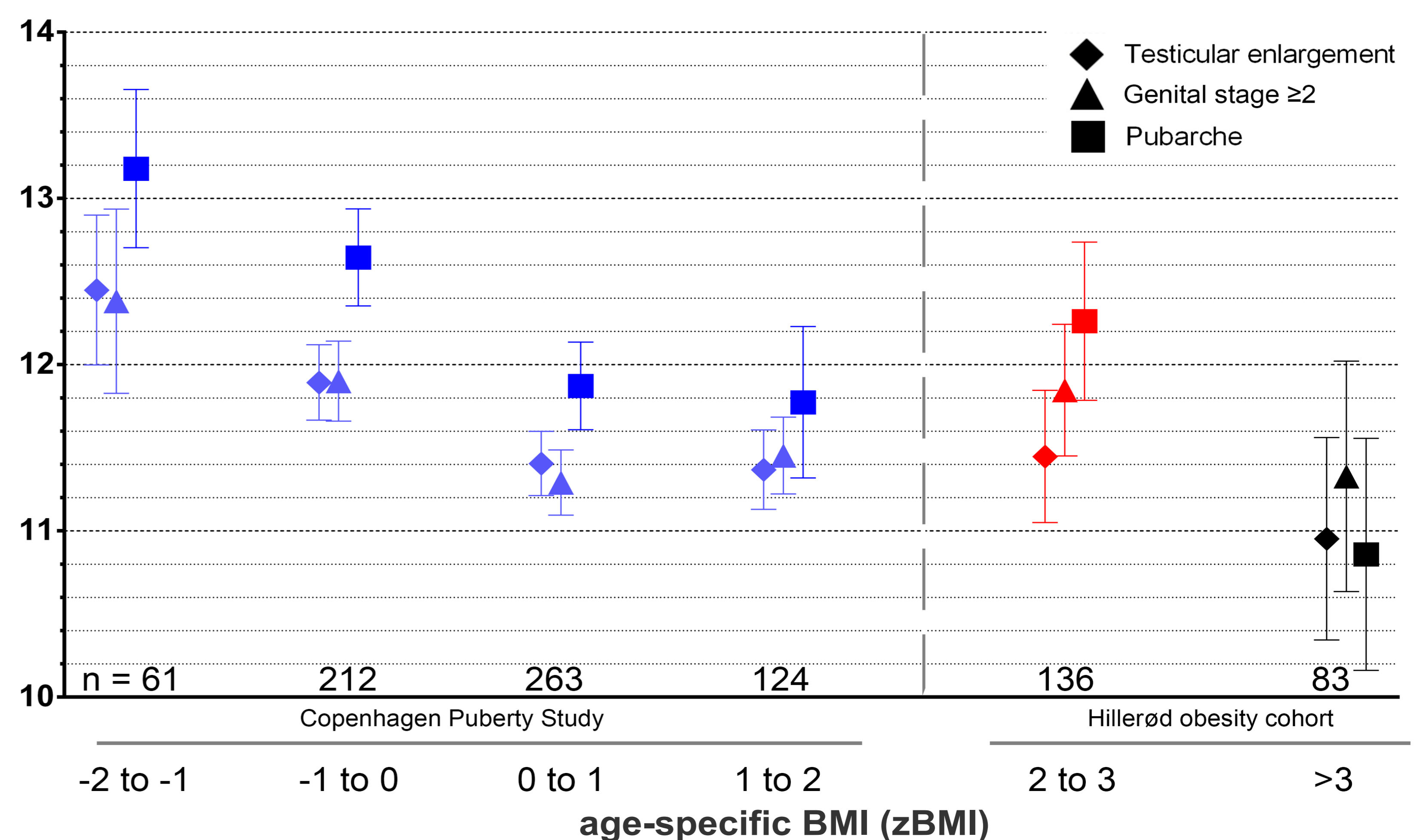


Figure 2. Pubertal development in obese boys compared to population-based reference puberty nomograms.

Upper panel: genital stage (G1-5), lower left panel: testicular volume (in mL), lower right panel: pubic hair (PH1-5). **Red** and **black** symbols represent pubertal development in subjects with +2SD < zBMI ≤ +3SD or zBMI > +3SD, respectively. Figures include all measurements. Marks above the white area indicated a delay of pubertal development. (based on Lawaetz et al., 2015)

