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### Hormonal Contraceptive Use and Bone Accrual Rates in Adolescent Females

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Exogenous hormone exposure in adolescence may affect lifetime fracture risk, as ~30% of bone mass is accrued from menarche to peak bone mass. **PURPOSE:** We investigated associations of hormonal contraceptive (HC) use with bone accrual rates from circum-menarche (MEN) to peak bone mass (PBM) in gymnasts (GYM) and non-gymnasts (NON). **METHODS:** A 20-year prospective longitudinal study of bone accrual in GYM vs. NON yielded annual DXA data for bone mineral content (BMC) and areal bone mineral density (BMD) at key sites: 1/3 radius (1/3), ultra-distal radius (UD), lumbar spine (LS) and femoral neck (FN). A subset of data was analyzed to evaluate annualized BMC and BMD gains from MEN (-1.0 to +1.0 yrs post-menarche) to PBM (+4.0 to +6.67 yrs post-menarche). Inclusion criteria were  $\geq 1$  qualifying scan per site during each maturity stage (MEN & PBM) and self-reported data on HC use for the inter-scan interval. HC use from MEN to PBM was categorized as no HC use,  $\leq 2$  yrs HC use or  $> 2$  yrs HC use. Multiple regression analysis evaluated GYM status and HC use as factors in site-specific BMC and BMD gains; covariates were entered based on correlation matrix results. Standardized  $\beta$  (st $\beta$ ) and significance are presented (SPSS v24:  $\alpha = 0.05$ ). **RESULTS:** From a total sample of 211, eligible sample size was  $n = 78$ . Weak negative trends were observed between HC use and annualized gains in FNBMD (st $\beta = -0.156$ ,  $p = 0.157$ ), LSBMD (st $\beta = -0.172$ ,  $p = 0.102$ ) and LSBMC (st $\beta = -0.160$ ,  $p = 0.153$ ), but no clear associations were seen between HC use and UDBMC, UDBMD, 1/3BMC, 1/3BMD or FNBMC (st $\beta = -0.083$  to  $+0.114$ ,  $p = 0.330$  to  $0.865$ ). Gymnastic exposure at MEN (GYM  $n = 39$ ; NON  $n = 39$ ) was associated with weak trends for lower annualized gains in FNBMD (st $\beta = -0.156$ ,  $p = 0.157$ ), LSBMD (st $\beta = -0.172$ ,  $p = 0.102$ ) and LSBMC (st $\beta = -0.160$ ,  $p = 0.153$ ). **CONCLUSION:** Non-significant trends, with small effect sizes, suggest higher FNBMD and LSBMD accrual rates from MEN to PBM for non-users vs. HC users and for non-gymnasts vs. circum-menarcheal gymnasts. Lower accrual rates in GYM vs. NON, from MEN to PBM, may be due to potential inter-scan decreases in GYM loading, increases in NON loading, and/or to the possibility that, by MEN, GYM had already maximized bone loading gains via pre-menarcheal loading. Future studies should evaluate interactions between exercise loading doses and HC use using a larger sample size.

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