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Original article

Childhood body size and midlife mammographic breast density in foreign-born and U.S.-born women in New York City

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ABSTRACT

Purpose: We investigated whether childhood body size is associated with midlife mammographic density, a strong risk factor for breast cancer.
Methods: We collected interview data, including body size at age 10 years using a pictogram, and measured height and weight from 518 women, recruited at the time of screening mammography in New York City (ages 40–64 years, 71% Hispanic, 68% foreign-born). We used linear regression models to examine childhood body size in relation to percent density and areas of dense and nondense tissue, measured using a computer-assisted method from digital mammograms.
Results: In models that adjusted for race/ethnicity, and age and body mass index at mammogram, the heaviest relative to leanest childhood body size was associated with 5.94% lower percent density (95% confidence interval [CI]: −9.20, −2.29), 7.69 cm^2 smaller dense area (95% CI: −13.94, −0.63), and 26.17 cm^2 larger nondense area (95% CI: 9.42, 43.58). In stratified analysis by menopausal status and nativity, the observed associations were stronger for postmenopausal and U.S.-born women although these differences did not reach statistical significance.
Conclusions: Heavy childhood body size is associated with lower mammographic density, consistent with its associations with breast cancer risk. Suggestive findings by nativity require confirmation in larger samples.

Introduction

Mammographic breast density (MBD) refers to the amount of fibroglandular (dense) breast tissue, which, due to X-ray absorption, appears lighter than fat (nondense) tissue in the breast on mammograms. Despite a variety of methods for assessing MBD, high MBD has been consistently shown to be a prevalent and strong risk factor for breast cancer [1–4]. Specifically, women with mostly dense breasts have four to six times higher risk of breast cancer than women with mostly fatty breasts [2], and higher MBD may be responsible for up to 30% of breast cancer cases [5,6]. Given the magnitude of this potentially modifiable risk factor [7–10], there is great interest in understanding the distribution and predictors of MBD in diverse populations [11].

Most reproductive and menstrual risk factors for breast cancer show similar associations with MBD, suggesting that these factors may influence risk through changes in MBD. Childhood and adolescent body size, which have been associated with lower premenopausal and postmenopausal breast cancer [12–14], may influence breast cancer risk by leaving their mark on breast tissue development and composition [15]. The growing research on early-life body size influences on adult MBD is characterized by an abundance of measurement methods for MBD and for early-life body size as well as variation for the age at which body size is assessed [16–21]. While collectively the evidence to date points to an inverse association between childhood body size and MBD in postmenopausal women, less is known about whether childhood body size and MBD associations are seen in premenopausal women, particularly across women who may have had different childhood environments. New evidence suggests nativity and migration patterns in adult MBD consistent with their associations with breast cancer risk [22,23]. Differences in the social and physical early life environments of U.S.- and foreign-born women

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may plausibly modify the associations between childhood body size and mammographic density, but this question has not been previously investigated.

Here, we examined the effect of childhood body size on absolute and relative quantitative measures of MBD in a sample of midlife U.S. women of predominately racial/ethnic minority and immigrant backgrounds.

Material and methods

Study population

We used data from the first two waves of the New York Mammographic Density Study, an ongoing study of breast cancer screening and prevention in women, recruited during screening mammography visits at a community clinic in New York City [22,24,25]; women presenting for diagnostic mammograms attended a different mammography site. We followed the same standard protocol for recruitment and data collection in both study waves, yielding a study sample representative of the racial/ethnic and sociodemographic distribution of the community, although our sample had a higher proportion of foreign-born women than in the community due to the older age range in our sample [26]. Between 2012 and 2016, we interviewed 534 women, ages 40–64 years, in English (49%) or Spanish (51%), to collect sociodemographic and risk factor data, obtained their anthropometric measures, and asked for permission to collect copies of their digital mammogram obtained on the same day as the enrollment. We were unable to obtain or use mammograms for 14 women and two women had missing data on childhood body size, leaving a final sample of 518 women.

The Columbia University Institutional Review Board has approved this study; all women provided written informed consent.

Measures

Childhood body size

During in-person interviews, we presented women with previously validated somatotype pictogram of nine figures of increasing body size and asked them to select the figure that best represented their body size at age 10 years (hereafter referred to as childhood body size) (Fig. 1) [27–29].

Mammographic density measures

Following a standard protocol for computer-assisted MBD assessment, a trained reader outlined the total breast area and dense breast area, using Cumulus software (University of Toronto). We measured the amount of dense tissue (dense area, in cm^2), the percent of dense tissue relative to total breast area (percent density), and the amount of nondense tissue (nondense area in cm^2, calculated as total breast area-dense area). We used craniocaudal views of the left breasts, and read images in batches of about 50 mammograms, duplicating readings for five mammograms within each batch and five mammograms between batches to calculate reliability. The within-batch reliability coefficients were 0.98 for percent density, 0.97 for dense area, and 0.99 for breast area. The between-batch reliability coefficients were 0.94 for percent density, 0.92 for dense area, and 0.99 for breast area for the first study wave and were 0.96 for percent density, 0.94 for dense area, and 0.99 for breast area for the second study wave.

Covariate data

We considered race/ethnicity (non-Hispanic white, non-Hispanic black, non-Hispanic Asian, Hispanic of any race), body mass index (BMI) (in kg/m^2, weight and height were, respectively, measured using a digital scale and a wall stadiometer), and age at mammography as a priori covariates. Race/ethnicity may be a common determinant of childhood body size and adult mammographic density [30–34]. Age and adult BMI are strongly inversely associated with MBD, and from an etiologic perspective, MBD for women across a range of age and BMI do not represent equivalent amount of dense and nondense breast tissue; thus, analyses of mammographic density in relation to breast cancer risk and related risk factors are conventionally evaluated with adjustment for these two factors. We considered nativity (U.S.- or foreign-born) and menopausal status (premenopausal or postmenopausal status, respectively, defined as menstruating within the last 12 months and no menstrual period in the last 12 months) as effect modifiers based on prior research showing differences in the associations between childhood body size and mammographic density by these factors [16,35,36].

In secondary analysis, we considered the following breast cancer risk factors that have been associated with childhood body size and MBD in prior studies to investigate whether the association of childhood body size with MBD was independent of established risk factors: age at menarche, parity (nulliparous, 1–2 children, 3 or more), age at first birth, family history of breast cancer (any first degree relative), hormonal contraceptive use (ever, never), hormone replacement therapy (ever, never), and educational attainment (less than high school, high school graduate, some college, bachelor's degree or more). Only parity, family history of breast cancer, and educational attainment were associated with both childhood body size and MBD in our sample.

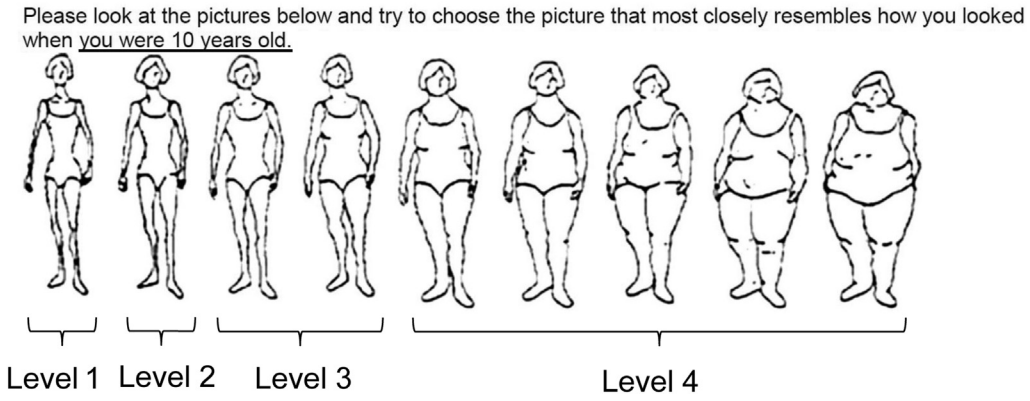

Fig. 1. Stunkard et al. 9-figure somatotype for body size at age 10 years. Reprinted with permission.