Reduced Body Size and Shape-Related Symptoms in Young Adults Born Preterm with Very Low Birth Weight: Helsinki Study of Very Low Birth Weight Adults

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Objective To test the hypothesis that being born prematurely with very low birth weight (VLBW) (birth weight ≤1500 g) is associated with subphenotypes of eating disorders (dissatisfaction with body shape and pursuit of thinness) in young adulthood.

Study design Preterm-born VLBW subjects (n = 163) and controls (n= 189) born at term completed 3 subscales of Eating Disorder Inventory-2 questionnaire (EDI): Drive for Thinness, Body Dissatisfaction, and Bulimia. Data were analyzed with multiple linear regression adjusted for confounders.

Results Among both sexes, EDI total scores were lower in VLBW subjects than in controls. The fully adjusted difference was −11.0% (95% CI, −18.4%, −2.2%) for women and −11.2% (95% CI, −20.2%, −1.3%) for men. Among women the lower scores in VLBW adults were observed in each EDI subscale. Results were similar when adjusted also for fat percentage, measured by dual-energy x-ray absorptiometry. Of the covariates, higher body mass index and higher score in Beck Depression Inventory contributed significantly to a higher EDI total score.

Conclusions Young adults, particularly women, born prematurely with VLBW have fewer body size and shape-related symptoms and possibly lower risk for eating disorders than their term-born peers. *(J Pediatr 2010;157:421-7)*.

Eating disorders (EDs) are psychiatric diseases characterized by disordered eating habits and excessive focus on body weight. They are relatively common; in women, the lifetime prevalence of anorexia nervosa is 0.3% to 1.2%, and of bulimia nervosa, 1% to 5%.[1] Their prognosis is often unfavorable and mortality is high,[2,3] and therefore early identification of risk factors is important. Case-control studies have shown that patients with anorexia and bulimia nervosa are more likely to have a history of obstetric complications[4-6] and prematurity,[4,5,7] but the underlying ED risk factors in subjects born preterm are incompletely known. Weight and shape concerns and body dissatisfaction currently lie at the center of the clinical diagnosis of both anorexia and bulimia nervosa[8,9] and represent important subthreshold symptoms of EDs. People born preterm at very low birth weight differ in body size compared with their peers born at term.[10] Thus, body size and shape-related symptoms could link EDs to preterm birth. We hypothesized that premature birth with very low birth weight (VLBW) (birth weight ≤1500 g) is associated with body dissatisfaction, drive for thinness, and bulimia symptoms.

Methods

In conjunction with the Helsinki Study of Very Low Birth Weight Adults, 255 VLBW prematurely born infants who were born between 1978 and 1985 and treated in the NICU of Children's Hospital of Helsinki University Hospital, Finland, and a comparison group of 314 term-born (gestational age ≥37 weeks) adults not small for gestational age (birth weight more than −2 SD)[11] matched for sex, age, and birth hospital were invited to participate. Recruitment of the study population is explained in detail elsewhere.[10,12,13] The study included questionnaires on medical history

AGA	Appropriate for gestational age
BD	Body Dissatisfaction
BDI	Beck Depression Inventory
BMI	Body mass index
DT	Drive for Thinness
DXA	Dual-energy x-ray absorptiometry
ED	Eating disorder
EDI	Eating Disorder Inventory
SDS	Standard deviation score
SGA	Small for gestational age
VLBW	Very low birth weight

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Financial support and conflicts of interest information available at www.jpeds.com (Appendix).

 10.1016/j.jpeds.2010.02.045

and education and 3 subscales (22 items) of the Eating Disorder Inventory (EDI)-2.[14] A total of 186 (72.9%) VLBW and 191 (60.8%) comparison individuals completed the questionnaires including EDI (**Figure**; available at www.jpeds.com). The nonparticipants in the VLBW group more often had cerebral palsy than those of controls (data not shown). We excluded 25 individuals who reported a diagnosis of cerebral palsy, developmental delay, and/or other severe illness, such as blindness or hearing deficit because body size and shape-related symptoms in subjects with these conditions may be different from that of those that are unimpaired. The analysis finally included 163 VLBW individuals born preterm and 189 term-born controls. Of these, 143 and 170 VLBW and control subjects, respectively, also had a clinical examination including anthropometric measurements and Beck Depression Inventory (BDI).[15] In a subgroup (134 VLBW and 138 control subjects) a dual-energy x-ray absorptiometry (DXA) (Discovery A; Hologic, Bedford, Massachusetts) to measure body composition was performed. DXA scan required a separate visit and 9 VLBW and 32 control subjects attending the clinical examination did not have the DXA scan because of pregnancy or unwillingness, and some did not come just for the examination.

Study Outcomes

We used 3 subscales of the Eating Disorder Inventory-2[14]: Drive for Thinness (DT, 7 items), Body Dissatisfaction (BD, 8 items), and Bulimia (7 items) with Cronbach α ranging from 0.83 to 0.97 for women and from 0.65 to 0.86 for men. These are widely used self-report measures for dissatisfaction with body shape, pursuit of thinness, excessive concern with dieting, and tendencies to think about and to engage in binge eating and mark subphenotypes of EDs.[2,16] These subscales have been validated in patient and general populations elsewhere[17-19] and against DSM-IV diagnostic criteria in Finnish females.[20] The responses to items were scored from 1 to 6 (low scores: fewer symptoms). To emphasize male-specific body dissatisfaction, we added 2 questions regarding muscle and height dissatisfaction.[21] The subjects also answered single-item questions assessing whether the subject had ever had anorexia or bulimia (yes, no, or cannot say) or whether others had suspected that the respondent had an ED (yes or no). Because the study outcomes may have different implications for women and men,[22] we analyzed the data separately for both sexes.

Data Analysis

The main outcome variables were DT, BD, and Bulimia subscale scores, EDI total score (sum of subscales), and scores for questions on height and muscle dissatisfaction. Mean imputations were carried out in 3 women and 3 men with missing data on 1 to 3 EDI items (altogether 8 values imputed). The distributions of the scales were skewed especially among men. For linear regression, we log-transformed the EDI scores to attain normality. We present the data as difference (%) and 95% confidence intervals between mean scores of VLBW and term subjects. We performed adjustment for age, body mass index (BMI), height, and BDI score in models 1 through 4, because high BMI and low mood are known to increase body dissatisfaction,[23-25] and VLBW subjects are leaner and shorter than their term-born counterparts.[10] Missing values in BDI scores (**Table I**) were replaced by means (6.0 in

Table I. Characteristics of the study participants

Characteristic	VLBW (n = 163)	Term (n = 189)	P*	Missing values, VLBW/term
Birth				
Gestational age, mean (SD), wk	29.3 (2.3)	40.2 (1.2)	<.0001	0/0
Birth weight, mean (SD), g	1141 (213)	3579 (467)	<.0001	0/0
Birth weight SDS, mean (SD)	-1.2 (1.53)	0.0 (1.0)	<.0001	0/0
Women, n (%)	94 (57.7)	114 (60.3)	.8	0/0
Men, n (%)	69 (42.3)	75 (39.7)	.7	0/0
SGA, n (%)†	50 (30.7)	0		0/0
Preeclampsia, n (%)	35 (21.5)	13 (6.9)	.0005	0/0
Twin, n (%)	23 (14.1)	0		0/0
Triplet, n (%)	5 (3.1)	0		0/0
Parental				
Maternal smoking during pregnancy, n (%)	29 (17.8)	33 (17.5)	.9	9/5
Maternal age at birth, mean (SD), y	29.4 (4.8)	29.9 (4.9)	.4	0/0
Paternal age at birth, mean (SD), y	31.6 (5.7)	31.9 (5.7)	.6	0/0
Mother's current BMI, mean (SD), kg/m^2	25.5 (4.4)	24.9 (4.1)	.2	38/41
Father's current BMI, mean (SD), kg/m^2	26.9 (3.7)	26.5 (4.0)	.4	37/41
Highest education of either parent, n (%)				0/0
Elementary	15 (9.2)	13 (6.9)	.5	
High school	43 (26.4)	36 (19.0)	.2	
Intermediate	60 (36.8)	59 (31.2)	.4	
University	45 (27.6)	81 (42.9)	.04	
Childhood				
Timing of puberty				
Women; age at menarche, mean (SD), y	12.7 (1.5)	12.4 (1.4)	.2	2/0
Men; age at voice break, mean (SD), y	13.7 (1.3)	13.9 (1.2)	.5	6/10
School grade point average, mean (SD)‡	7.96 (0.76)	8.20 (0.89)	.007	16/4
Current				
Age, mean (SD), y	22.3 (2.1)	22.3 (2.2)	1.0	0/0
Height, mean (SD), cm				
Women	162.6 (7.3)	167.6 (6.8)	<.0001	0/0
Men	174.7 (7.1)	180.2 (6.6)	<.0001	0/0
BMI, mean (SD) kg/m^2				
Women	22.2 (4.0)	22.6 (3.8)	.4	0/1
Men	22.3 (3.8)	23.2 (3.2)	.1	0/0
Lean mass, mean (SD), kg				
Women	39.4 (5.6)	43.0 (5.6)	<.0001	14/30
Men	54.6 (7.8)	61.5 (7.9)	<.0001	15/21
Fat mass, mean (SD), kg				
Women	17.8 (7.3)	19.8 (6.6)	.07	14/30
Men	12.9 (6.3)	14.8 (6.3)	.1	15/25
Beck Depression Inventory (BDI) score, mean (SD)				
Men	2.0 (2.8)	3.9 (6.0)	.1	10/7
Women	6.1 (6.2)	5.9 (8.1)	.4	9/12

*The t test for continuous and χ^2 test for categorical variables (BDI log-transformed).
†SGA, small for gestational age, birth weight <-2 SD.
‡On finishing comprehensive school at 15 to 16 years (range, 4 to 10).