Diet and Nutrient Intake in Young Adults Born Preterm at Very Low Birth Weight

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Objective To assess dietary intake in young adults born preterm at very low birth weight (VLBW) (≤1500 g).

Study design We studied 151 young adults aged 19-27 years who were born at VLBW and 156 term-born controls, group-matched for age, sex, and birth hospital. Participants completed a 3-day food record, which was checked by a nutritionist. Food and nutrient intakes were calculated with use of a dietary analysis program. Data were analyzed by multiple linear regression, adjusted for age, sex, body mass index, height, living at parental home, daily smoking, and highest parental education.

Results Compared with controls, VLBW subjects had lower mean (SD) daily intake of vegetables, fruits, and berries (183 [150] g vs 241 [168] g, $P = .002$] and milk products (343 [242] g vs 427 [316] g, $P = .003$). Energy intake from carbohydrates, protein, and fat was similar, as was salt intake. VLBW participants had lower daily intake of calcium (858 [389] mg vs 1080 [514] mg, $P < .0001$), vitamin D (3.7 [2.6] μg vs 4.4 [3.6] μg, $P = .02$), and cholesterol (189 [74] mg vs 227 [105] mg, $P = .002$], whereas intake of essential fatty acids was higher (4.3 [1.5] mg vs 4.0 [1.5] mg, $P = .01$).

Conclusions Lower consumption of vegetables, fruits, berries, and milk products combined with lower calcium and vitamin D intake in VLBW participants offers a target for reducing the risk of osteoporosis and cardiovascular diseases in persons of VLBW. *(J Pediatr 2013;163:43-8)*.

People born preterm at very low birth weight (VLBW) (≤1500 g) have higher levels of risk factors for several chronic noncommunicable diseases than their peers born at term. These risk factors include impaired glucose regulation,[1,2] higher blood pressure,[3-8] diminished lung function,[9] and lower bone mineral density.[10] Regarding disease outcomes, evidence for increased risk for people born preterm exists at least for type 2 diabetes[11-13] and stroke.[14] Differences in food and nutrient intake could offer one explanation for the higher levels of risk factors for noncommunicable diseases, including type 2 diabetes and osteoporosis, in subjects born preterm at VLBW. During the prenatal and early postnatal life, these subjects often experience adverse environmental conditions, such as inadequate nutrition and growth. Such conditions predict dietary habits in later life.[15-17] However, the dietary habits and nutrient intake in VLBW adults have not been reported. Our aim was to assess dietary intake in young adults born preterm at VLBW compared with term-born controls with a 3-day food record.

Methods

The participants come from the Helsinki Study of Very Low Birth Weight Adults. The original follow-up cohort consists of 335 subjects, born preterm at VLBW between 1978 and 1985 and discharged alive from the neonatal intensive care unit of the Children's Hospital at Helsinki University Central Hospital. For each VLBW participant, we selected a sex- and birth hospital–matched term-born control who was not born small for gestational age (SGA) (birth weight <−2 SDs).[18] In 2004-2005, we invited those 255 VLBW subjects and 314 controls residing in the greater Helsinki area for a clinical examination: 166 VLBW and 172 control subjects participated.[1,10] The clinical visit included collection of a 3-day food record. This was completed by 155 VLBW and 156 control participants. We excluded 4 VLBW participants due to incomplete food record data. Thus, the final study included 151 VLBW participants (59% of those invited) and 156 controls (50%) born at term.

AGA	Appropriate for gestational age
BMI	Body mass index
SGA	Small for gestational age
VLBW	Very low birth weight

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Supported by grants from the Academy of Finland, the Finnish Foundation for Pediatric Research, the Finnish Special Governmental Subsidy for Health Sciences, the Jalmari and Rauha Ahokas Foundation, the Juho Vainio Foundation, the Novo Nordisk Foundation, the Päivikki and Sakari Sohlberg Foundation, the University of Helsinki, the Perklén Foundation, the Research Foundation for the Orion Corporation, the Signe and Ane Gyllenberg Foundation, the Sigrid Jusélius Foundation, the Waldemar von Frenckell Foundation, the Yrjö Jahnsson Foundation, the Finnish Medical Foundation, Otto A. Malm Donation Fund, the Medical Society of Finland (Finska Läkaresällskapet), Victoriastiftelsen, the Emil Aaltonen Foundation, the Finnish Medical Society Duodecim, and the Maud Kuistila Memorial Foundation. The authors declare no conflicts of interest.

Portions of this study were presented as a poster at the International Society for Developmental Origins of Health and Disease World Congress, September 18-21, 2011, Portland, OR.

 http://dx.doi.org/10.1016/j.jpeds.2012.12.076

Instructed by a study nurse, the participants completed a 3-day food record. They were instructed to report everything they ate and drank during 3 consecutive days, including 2 workdays and 1 day off. A picture booklet of portion sizes was used to estimate amounts of food consumed.[19] A trained nutritionist interviewed the participants to ensure completeness of food records.

During the clinical visit, the weight and height of each participant were measured, and body mass index (BMI) was calculated (weight [kg]/height squared [m^2]). All participants completed a questionnaire inquiring about smoking habits, medical history, and use of medications. Highest educational attainment of either parent was used to describe childhood socioeconomic status. Perinatal data were collected from hospital and well-baby clinic records.

The study was performed according to the Declaration of Helsinki. The study protocol was approved by the Ethics Committee at the Helsinki and Uusimaa Hospital District. Written informed consent was obtained from each participant.

From the 3-day food records, we collected the amounts of foods consumed (eg, meat; fish; milk products; vegetables, fruits, and berries). We also collected information on consumed amounts of low-fat (≤2%) and high-fat (>2%) dairy products, sugar-containing beverages, and salty snacks; on the type of fat spreads used (animal fat or fat blend containing ≥60% fat vs fat spread containing only vegetable fat), and on the consumed amounts of sugar and sweets.

Macronutrient (ie, carbohydrate, protein, fat) intake was calculated based on reported food record data. In addition, we report intake of fiber, sucrose, saturated fatty acids, trans-fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids. Intakes of essential fatty acids and α-linolenic fatty acid are also separately reported. Of micronutrients, we report intake of calcium, salt, iron, zinc, iodide, magnesium, vitamin D, vitamin A, vitamin C, thiamin, and folate. Daily intake of cholesterol and alcohol was also calculated.

Mean daily energy intake, amount of foods consumed, and macronutrient and micronutrient intakes were calculated using a dietary analysis program based on the national FINELI database (Finnish Food Composition Database, Helsinki, Finland), developed at the National Public Health Institute.[20] The FINELI database includes 987 food items and 1622 composite dishes. Total daily energy intake is reported in units of kilocalories per day (kcal/d), total amount of different foods consumed is reported in grams per day (g/d), and intake of macronutrients and alcohol is reported as proportions of total energy intake per day (E% = energy from macronutrient [kcal]/total daily energy intake [kcal] × 100). Daily fiber intake is reported as g/d and as intake of fiber per calorie intake (g/1000 kcal). Intake of micronutrients is reported as the total daily amount (units per day: g/d, mg/d, or μg/d).

Statistical tests were carried out using IBM SPSS Statistics 19 (SPSS Inc, Chicago, Illinois). Baseline characteristics between VLBW and control participants were compared using t test for continuous and χ^2 test for categorical variables.

Linear regression was used to compare differences in daily food and nutrient intakes between VLBW and control participants. We adjusted for age and sex in model 1; for age, sex, BMI, and height in model 2; and for age, sex, BMI, height, living at parental home, daily smoking, and highest educational attainment of either parent in model 3. We performed additional analyses with further adjustment for maternal smoking during pregnancy.

The results are presented as mean daily food and nutrient intakes for VLBW and control groups with SDs and P values indicating the significance of the difference between the groups; a value of $P < .05$ was considered significant.

We compared perinatal characteristics for the participants of the present study (151 VLBW and 156 control subjects) with the remaining original cohort who were invited to the clinical examination but who had no food record data available (104 VLBW and 158 control subjects). Perinatal characteristics were separately compared for the VLBW and control groups. There were no differences in gestational age, birth weight, type of birth, preeclampsia, or multiple pregnancy between the participants who were included in the current study and those who were not (all P values ≥.1). In both groups, there were more men among the nonparticipants (VLBW 54% vs 40%, controls 52% vs 45%, P values for difference .03 and .01, respectively). Maternal smoking during pregnancy was more common among VLBW nonparticipants (32% vs 17%, $P = .004$).

Results

Gestational age at birth of VLBW participants ranged between 24.0 and 35.6 weeks (mean 29.2 weeks), and that of term-born controls was 37.0-42.9 weeks (mean 40.1 weeks) (Table I). Birth weights ranged between 600 and 1500 g (mean 1111 g) and between 2560 and 4930 g (mean 3595 g), respectively. As young adults, VLBW participants were shorter than controls and BMI was significantly lower in VLBW men. Living at parental home was more common among VLBW participants.

Food Intake in VLBW versus Control Participants

Use of vegetables, fruits and berries, all milk products, and low-fat dairy products was significantly lower in the VLBW group compared with controls (Table II). Adjusting for BMI, height, living at parental home, daily smoking, and highest parental education did not affect the results. Adjusting for maternal smoking during pregnancy also did not affect our results (data not shown).

Macronutrient and Micronutrient Intake in VLBW versus Control Participants

Table III shows the mean (SD) daily macronutrient and micronutrient intakes in VLBW and control participants. For comparison, recommended daily intakes of nutrients for the adult Finnish population are shown.[21] Total daily energy intake was lower in VLBW participants when adjusted for age and sex (1800 [563] kcal vs 1994 [613] kcal, $P = .001$), but after further adjustments for BMI and height, the