

Teenagers born at extremely low birth weight

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Adolescence constitutes a major transition for extremely low birth weight (ELBW) teenagers. Recent studies of ELBW teenagers born in the 1980s have provided information about the growth and developmental characteristics of these individuals in adolescence and in early adulthood. ELBW teenagers are shorter and lighter than their full-term peers, and have a smaller head circumference. Cognitive and academic vulnerabilities documented during the school years, particularly difficulties with nonverbal intelligence and arithmetic, persist into late adolescence. Many ELBW children struggle in school and have lower academic achievement levels. The self-concept of ELBW teenagers is generally similar to that of their full-term peers, but their parents perceive them to be more vulnerable over a wide range of behavioural and psychosocial dimensions, particularly depression and attention. ELBW teenagers perceive themselves as needing more assistance in job seeking than do their peers. Physical activity levels and fitness in late adolescence are significantly lower in ELBW teenagers than in their full-term peers, constituting a potential additional health hazard in later life. The outcomes of ELBW teenagers are significantly influenced by socioeconomic, family and parenting factors.

Key Words: *Adolescence; Growth and development; Infant; Premature*

Adolescence is a critical stage of development, representing the transition from childhood to adulthood. It is marked by multidimensional changes in growth, sexual and emotional development, cognitive function, attitude, attachment and view of self. Parents' concerns about safety collide with teenagers' needs for independence and exploration of self. A successful transition through adolescence is necessary to emerge as an independent, contributing adult member of society. Transitions, in general, are sources of challenge and stress for children, teenagers and parents alike, and are even more so for children, teenagers and families at developmental risk. Adolescence, particularly the late teen years, is a time when formerly tiny babies may be expected to face significant difficulties, and are likely to be more in need of appropriate support to help them meet the goals of adolescence.

The focus of the present paper is on extremely low birth weight (ELBW; less than 1000 g) infants born in the 1980s who are now in late adolescence or early adulthood and available for study. Although cohorts in the literature include individuals with different ranges of birth weights (eg, less than 1000 g, or 800 g or less), it is clear that, in general, the lower the birth weight and shorter the gestation, the more likely the child is to be at developmental risk (ie, a birth weight of

Les adolescents de très petit poids à la naissance

L'adolescence constitue une transition importante pour les adolescents qui étaient de très petit poids à la naissance (TPPN). De récentes études auprès d'adolescents de TPPN nés dans les années 1980 ont fourni de l'information sur la croissance et les caractéristiques développementales de ces enfants à l'adolescence et au début de l'âge adulte. Les adolescents de TPPN sont moins lourds et de plus petite taille et ont une plus petite circonférence crânienne que leurs camarades à terme. Les vulnérabilités cognitives et scolaires documentées à l'école se poursuivent jusqu'à la fin de l'adolescence, notamment les difficultés reliées à l'intelligence non verbale et à l'arithmétique. De nombreux enfants de TPPN ont de la difficulté à l'école et réussissent moins bien. Le moi psychologique des adolescents de TPPN est généralement similaire à celui de leurs camarades à terme, mais leurs parents les perçoivent comme plus vulnérables dans toute une série de dimensions comportementales et psychosociales, notamment la dépression et l'attention. Les adolescents de TPPN se perçoivent comme ayant plus besoin d'aide pour chercher un emploi que leurs camarades. Le taux d'activité physique et de forme physique à la fin de l'adolescence est considérablement plus faible chez les adolescents de TPPN que chez leurs camarades à terme, ce qui constitue un autre danger potentiel pour leur santé future. Le sort des adolescents de TPPN est influencé de manière appréciable par des facteurs socioéconomiques, familiaux et parentaux.

500 g is very different from one of 999 g). Furthermore, it is important not to extrapolate conclusions from these data from ELBW survivors of the 1980s, who included mostly infants with birth weights of 650 g or more who were managed using the technology of 20 years ago, to current tiny babies managed with today's technology who have birth weights as low as 400 g and gestational age down to 22 weeks.

There is an extensive literature on the outcomes of ELBW children during infancy and the early school years, including comparisons between cohorts in different countries (1). A small but significant proportion (between 10% and 20%) of ELBW children have major sensory, motor or cognitive impairments resulting in severe disability. The majority (40% to 60%) have a combination of vulnerabilities, including the following, which render them 'at risk' in the school system (2,3):

- a high prevalence of borderline intelligence (2);
- learning disorders with difficulty in school, most commonly, but not confined to, nonverbal intelligence, written output and arithmetic (3);
- poor fine and gross motor coordination frequently meeting diagnostic criteria for developmental coordination disorder (4);

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- difficulties with sustained attention, working memory and executive functions (5);
- social and emotional immaturity (6); and
- vulnerability to bullying (7).

Boys are more developmentally at risk, and socioeconomic status is associated with outcome. These areas of difficulty compound the challenges of adolescence for these teenagers and their families.

GENERAL HEALTH

By the time that formerly tiny babies, free of major impairment, reach the teenage years, they show few persistent general health issues apparently related to their early birth. However, a proportion of ELBW survivors have ongoing health, social and educational needs (6,8,9). Clinically, most have some degree of persistent chest deformity as a result of diaphragmatic traction on the soft chest wall during the newborn period. All ELBW survivors have some scars from neonatal intensive care (eg, intravenous sites, surgical scars or tape marks), which grow in size with the patient but become less visible. The adolescent's detailed scrutiny of his or her body appropriately precipitates discussions about consulting a plastic surgeon about some of the more visible scars. In the adolescent environment, this can be a source of teasing and victimization at school. The disproportionately adverse effects of smoking in ELBW children have been described by Doyle et al (10).

GROWTH AND PUBERTY

Although they experience significant catch-up growth between eight years of age and mid- to late adolescence, ELBW teenagers as a group remain statistically significantly shorter, lighter and have smaller head circumferences than their peers in late adolescence (9,11,12). The adolescent growth spurt and puberty appear to occur at the normal time (8).

In late adolescence, the difference between ELBW teenagers and control teenagers in weight and height is approximately 0.8 SDs (9). At 17.5 years of age, boys in the control group were 9.1 kg heavier and 10.2 cm taller than their ELBW peers, while girls in the control group were 5.3 kg heavier and 7.9 cm taller than their ELBW peers, and body mass index was similar for boys and girls (12). However, when trying to predict the ultimate height of an ELBW teen, family growth characteristics are important to take into account.

COGNITIVE AND ACADEMIC ABILITIES

In general, the cognitive strengths and educational vulnerabilities identified in the elementary school years have been shown to persist into late adolescence; ELBW teenagers scored significantly lower than control teenagers on cognitive tests and measures of academic ability, exhibiting more difficulties achieving academic goals in school (6,13-16). However, the majority of ELBW children in Canadian samples do graduate from high school (16). Among children without major impairment, overall IQ for the majority of ELBW children born at less than 1000 g is within the normal range, with the mean approximately 0.5 to 1 SDs lower than that of term-born control teenagers. Considering the full range of outcomes, however, a 21-point difference has been reported in children born at

750 g or less. While ELBW children and adolescents frequently show poorer verbal and reading abilities, relatively greater deficits are often found in visual-spatial performance and arithmetic. Importantly, abilities that are crucial to school success (above and beyond IQ), such as working memory, higher order planning, problem solving and organizational skills, present significant challenge to preterm children, even after 'adjusting' for prematurity and sociodemographic factors (5).

MENTAL HEALTH, SELF-PERCEPTION AND PARENTAL PERCEPTION

Depression, anxiety, conduct disorders and attention problems are common in the adolescent age group, but have been reported to be more prevalent in premature adolescents. Although ELBW teenagers rated themselves similarly to control teenagers in relation to mental health, self-esteem and behavioural characteristics, their parents perceived them to be more at risk: the ratings of parents of ELBW teenagers produced higher scores for attention deficit hyperactivity disorder and depression (17). Parents of ELBW teenagers gave significantly higher ratings for 'internalizing', 'externalizing' and 'total scores' on the Child Behavior Checklist than did parents rating their own term-born teen control subjects (13). On the Child Behavior Checklist, 30% of the ELBW group scored above the clinical cutoff for internalizing – four times higher than the control group. Parents of ELBW teenagers rated their children as having lower social and school competence; more withdrawal; more social, thought and attention problems; and more delinquent and aggressive behaviour than did the parents of the control teenagers (13). Although ELBW teenagers reported more complex limitations in cognition, sensation and self-care, and had school difficulties that did not ameliorate with age, they possessed a high self-assessed quality of life (18) and a high global self-worth (19), similar to the control teenagers.

Using the Self-Perception Profile for Adolescents, ELBW teenagers rated themselves lower in scholastic competence, athletic competence, job competence and romantic competence than control teenagers (13). Perhaps not surprisingly, the ELBW teenagers rated these characteristics as less important to them than did the control teenagers. There were no differences in self ratings between the ELBW and control groups in social competence, appearance, self-conduct, close friendships or global self-worth. In another, smaller study (20) of 13- to 15-year olds with birth weights less than 800 g, the ELBW group had more academic problems, a lower functional health status and an increased need for specialized services compared with the term-born control group. This cohort did rate themselves differently from the control group on a subset of the Self-Perception Profile for Adolescents.

Job seeking is one of the important activities that occur during late adolescence. Anecdotally, we have observed considerable reluctance on the part of ELBW adolescents to engage in volunteering and acquiring experience in the workplace, despite encouragement to do so. On the Job Search Attitude Inventory, ELBW teenagers perceived themselves as being more in need of help from others in job searching (13). This is perhaps an expression of the persisting tendency to distrust their own abilities that was described in this cohort at 8.5 years of age (2).

PHYSICAL ACTIVITY AND FITNESS

In infancy, motor difficulties are common in ELBW infants, and much of the focus of developmental stimulation in the first few years of life targets gross and fine motor skills. One study (12) evaluated fitness, strength and flexibility in ELBW teenagers at 17.5 years of age, and compared them with those of term-born control teenagers (12). The study used the Canadian Physical Activity, Fitness, and Lifestyle Appraisal, and an activity questionnaire. ELBW teenagers had significantly lower aerobic fitness, upper and lower limb strength, and dynamic muscle endurance (eg, push-ups and curl-ups), and were less flexible in the trunk and legs than control teenagers. ELBW teenagers participated much less in sports and physical activity than did control teenagers, despite reporting equal enjoyment of physical activity to the control peers. Among control teenagers, 74% reported that they participated in physical activity more than three times per week, compared with 25% among ELBW teenagers. Twenty-five per cent of ELBW teenagers reported participating in physical activity less than once per month compared with 3% of control teenagers. It is difficult to know whether the low levels of fitness, muscular strength and flexibility in the ELBW teenagers in that study were a consequence of their mostly inactive lifestyle, or whether there is a primary cause resulting from ELBW. None of the teenagers appeared to have clinically significant cardiorespiratory compromise to explain their inactivity.

Inactivity in children and teenagers in our society is acknowledged as a major health problem. Encouraging and reinforcing an active lifestyle early on appears to be a particularly high priority for those born with an ELBW.

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ARE THERE LATER HEALTH RISKS IN ADULTHOOD FOR ELBW CHILDREN? THE BARKER HYPOTHESIS

There is some concern that the perinatal adjustments that allow survival of low birth weight children, particularly those who are small for gestational age, may predispose them to an early onset of adult diseases, particularly the 'metabolic syndrome', including hypertension, type II diabetes, obesity and occlusive vascular disease (for review, see reference 21). At the present time, it is not clear whether this may be of relevance to ELBW individuals because the index population studies included mostly small-for-gestational-age term or near-term babies. There is no convincing evidence that there is any difference in blood pressure or body mass index in follow-up studies of ELBW or very low birth weight teenagers or adults and control teenagers (11,12). One study (22) found marginal differences in blood pressure in a very low birth weight population in the early 1920s.

CONCLUSION

In general, during late adolescence, ELBW teenagers (born in the mid-1980s) tended to be a bit smaller than their peers, did not have a major impairment and had struggled with some aspects of schooling, but, by determination and application and support of their families, had or would likely achieve high school graduation. They were tentative in seeking work, were averse to physical activity, and seemed less mature socially and emotionally, and more connected to the family than were peers. Although this generalization may be true, the predominant impression of an ELBW teen is that he or she is very much the product of his or her family, reflecting the great importance of genetic, sociodemographic and parenting factors on the ultimate outcome of the highest risk survivors.