

Would Mothers Expect their Children to Grow up Sweet?

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Introduction

Nowadays, infants and children are growing up in a much sweeter world [1], with dramatic increases in the added sugar intakes [2]. Sugar-sweetened beverages (SSB) are the major liquid source of added sugars in youths' diet in North America [3,4], which comprise regular soft drinks, fruit drinks, coffee/tea, energy and vitamin water drinks that have been sweetened with caloric sweeteners [5]. Besides, over 60% of daily added sugar intake comes from solid food sources ranged from dairy desserts, grain-based desserts, candies, ready-to-eat cereals, and etc [6].

Several review articles have summarized the recent evidence of associations between SSB consumption and cardiovascular disease risk factors (adiposity, elevated blood pressure, hyperglycemia, reduced high density lipoprotein cholesterol and hypertriglyceridemia) among both youth and adult population [7-11]. The author has explored the relationship between consumption of added sugars, dietary intake and metabolic health in a sample of Canadian school children (Quebec Adiposity and Lifestyle Investigation in Youth) who were at risk of obesity [12]. It was found that higher consumption of added sugar from either solid or liquid sources was associated with lower overall diet quality [13]. The association between higher SSB consumption and MetS components is more evident in overweight/obese and glucose-intolerant children [14]. Liquid, but not solid added sugars are positively associated with adiposity indicators cross-sectionally and a higher risk of development of impaired glucose homeostasis and insulin sensitivity over 2 years [15]. The living environment for youth, including homes, schools, and the media exert influence in shaping their dietary attitudes and behaviors from infancy to adolescence [16,17]. In this short commentary, the author mainly focuses on potential influence of SSB consumption from parents (especially mothers) to their children.

The food environment at both home and schools is associated with children's overall consumption of SSB [18] and a significantly higher proportion is noticed at home [19]. On a typical school day, children consume on average 34% of kilocalories at schools, while 56% at home and another 10% at other locations [18]. Parents play an important role in establishing a model of healthy food choices for their children [20]. Parents could act as either positive or negative roles, depending on their own dietary behaviors [21]. A number of previous studies have explored such association between mothers' child-feeding practice and children's SSB consumption. Park et al. analyzed data from the Year 6 Follow-up of the Infant Feeding Practices Study II in 1350 American children aged 6 years old and found that the odds of drinking SSB at least 1 time/day were lower among children with mothers who reported setting limits on sweets/junk foods regardless of child's weight status [22]. There was another study examining whether parenthood was associated with dietary intake behaviors, of which the results showed mothers of young children (aged ≤ 5 years) reported

with greater intake of SSB and total energy compared with women without children [23]. Meanwhile, children of mothers with a low educational level were found to consume more SSB than those of mothers with a high educational level [24].

Beverage interventions aimed at parents, especially mothers, shows the influence on children's SSB purchasing behaviors and consumption at home and at fast-food restaurants [25]. In a randomized controlled trial (High Five for Kids) of behavior change among 428 overweight and obese children aged 2 to 6.9 years, strong associations were found between obesogenic behaviors (TV/video viewing, SSB intake, and fast food intake) of mothers and their preschool aged children [26]. The results of an investigation of longitudinal associations between maternal education and changes of SSB intake among 9025 children from 18 months to 7 years of age in the nation-wide Norwegian Mother and Child Cohort Study, indicated that promotion of healthy dietary behaviors by especially targeting mothers at an early age is important to prevent unfavorable dietary behaviors later in childhood [27].

Media also has a pervasive influence on children's food choices. Children are usually the marketed targets by the food industry. Evidence shows that TV hours are significantly related to children's food requests [28]. The most frequently and widely advertised foods include SSB, high-sugar breakfast cereals, frozen dinners, cookies, candy and fast food restaurant products [29]. In addition, watching TV during meals is suggested to link with reduced frequency of good food choices but increased frequency of unhealthy food [29,30]. Among 3-year-olds, more TV viewing is associated with adverse dietary practices (higher intake of SSB alone with lower intake of fruits and vegetables) [31]. The province of Quebec in Canada and several European countries now have published rules on restricting food advertisement to children and school-based marketing [32,33].

The availability of high added sugar foods and beverages at home, school and nearby environment (like corner stores etc.) all influence youths' food choices. The America on the Move Family Study demonstrates the effectiveness of preventing excess weight gain through small-changes of eliminating 100 kcal per day from their typical diet by replacing dietary sugars with a noncaloric sweetener [34]. School-based intervention programs like the HEALTHY [35] and the School Nutrition Policy Initiative [35] as well as beyond school environment program like the Health Corner Store Initiative [36] all provided messages that changing the dietary environment (cafeteria, vending machines etc.) in school and corner stores can be effective in preventing weight gain in youth. Especially, the home environment seems to be a promising setting for interventions on reducing socio-economic inequalities in children's SSB consumption [24]. Considering children's drinking habit of SSB could track from infancy throughout childhood [37,38] alone with negative health effects [10,39,40], late infancy may be an important time for mothers to establish healthy

beverage practices (parental rules and home availability of SSB, and parental intake of SSB) for their children to prevent unfavorable dietary behaviors later in childhood [27,37,40].

It is suggested that pediatricians, health care providers and policy makers may consider identifying ways to encourage healthful behaviors for parenthood, to improve parents' own health and to help them establish healthier behavior models for their children [23]. To summarize, increasing parental awareness of availability of children's palatable snacks by limiting the purchase and their potential as role models could be an effective way to improve children's healthy dietary habits [27,41]. In this way, mothers would expect their children to grow up healthily in this sweetened world

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