



Psychosocial stress and obesity among children residing in Kaunas City



Regina Grazuleviciene^{a,*}, Inga Petraviciene^a, Sandra Andrusaityte^a, Birute Balseviciene^b

^a Department of Environmental Sciences, Vytauto Didziojo Universitetas, K. Donelaicio str. 58, 44248 Kaunas, Lithuania

^b Department of Theoretical Psychology, Vytauto Didziojo Universitetas, K. Donelaicio str. 58, 44248 Kaunas, Lithuania

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ABSTRACT

Introduction: An unfavorable psychosocial environment has been associated with an increased prevalence of obesity among children. However, the available evidence on the association of low socioeconomic status and parent-child relationships with childhood obesity is scarce. The aim of our study was to conduct a simultaneous evaluation of the risks associated with pathological mother-child relationships, education level, and overweight/obesity among 4–6 year-old children.

Methods: This cross-sectional study included 1489 mother-child pairs living in Kaunas city, Lithuania. The Parenting Stress Index was measured using the Parent-Child Dysfunctional Interaction subscale. Children's overweight/obesity was defined as the body mass index $\geq 18 \text{ kg/m}^2$. Logistic regression models as well as crude and adjusted odds ratios (OR) and their 95% confidence intervals (CI) were used to indicate the strength of the associations between childhood overweight/obesity, maternal education level, and psychosocial stress.

Results: The percentage of children with overweight/obesity rose with an increasing Parenting Stress Index score. The percentage of children with overweight/obesity in the group of parents with better education and normal mother-child relations was 6.0%, while in the group of less educated parents and pathological mother-child relations, this percentage reached 13.9%. The stratified multivariable model showed that, with reference to the group of better educated parents and normal mother-child relations, lower education level and pathological mother-child relations were statistically significant risk factors for overweight/obesity in 4–6 year-old children, increasing the OR of overweight/obesity (aOR: 2.43; 95% CI: 1.31–4.51). Pathological mother-child relations and maternal smoking mediated the effect of low maternal education level on children's BMI z-scores.

Conclusion: Pathological mother-child relations, lower parental education levels, and smoking may be predictors of children's overweight/obesity. Measures oriented towards health behavior and psychosocial stress management should be encouraged among parents in order to decrease the risk of overweight/obesity in their children.

1. Introduction

The increasing prevalence of childhood obesity has become a global public health concern. In the past 30 years, childhood obesity has doubled worldwide and increased in all children's age groups, in males and females, and in various socio-economic status (SES) groups (Centers for Disease Control and Prevention). Obese children face various adverse health and psychosocial outcomes, and are at a greatly increased risk of cardiovascular diseases in adulthood (Cote et al., 2013; Ebbeling et al., 2002). Obese children more often than non-obese ones suffer from cardiovascular diseases, stroke, diabetes, and depression (Childhood Obesity, 2015). Signs of psychosocial stress – such as eating disorders and poor self-esteem – have also been recognized among obese children (Davison et al., 2001; Erickson et al., 2000).

The mechanisms of childhood obesity are complex, and are based on the disruption of the neuro-endocrinologically maintained balance

between energy intake and energy expenditure (Lustig, 2001). Stress may also indirectly contribute to childhood obesity, including behavioral pathways in early childhood (Bergmann et al., 2016; Tyrka et al., 2012) and biological processes underlying predisposition to obesity (Locke et al., 2015).

Unfavorable prenatal and early-life factors, poor dietary habits, lack of physical activity, and genetic factors are also considered potential risk factors for childhood obesity (Ebbeling et al., 2002; Xu and Xue, 2016). The causes of childhood obesity are numerous and inter-related (Brødsgaard et al., 2014). Parents play a key role in the modeling of healthy behaviors in children and influence their physical health. Some evidence of a causal link between parental education, family stressors, health-related behaviors and children's health has been reported (Bayer et al., 2006; Crnic et al., 2005; Suhrcke and Nieves, 2011; Smetanina et al., 2015). Some studies have reported that dysfunctional parent-child interaction is more often found in families with obese children

* Corresponding author.

E-mail address: regina.grazuleviciene@vdu.lt (R. Grazuleviciene).

(Cromley et al., 2010; Wu et al., 2011), and mothers of obese children report significantly greater psychological distress (Zeller et al., 2007).

However, over the past 5 years, very few qualitative studies have addressed the association between parent-child interaction and a young child's weight status (Danford et al., 2015; Vanaelst et al., 2014; Wilson and Sato, 2014). Limited research suggests that parenting style has little influence on the weight status of preschool children and children younger than 12 years of age (Olvera and Power, 2010; Taylor et al., 2011). Other studies reported no difference in mother-child relationships between overweight and non-overweight children (Brødsgaard et al., 2014). These studies used different measures to assess family functioning and parenting stress, and thus the influence of pathological mother-child interactions remains unclear in their association with childhood obesity (Halliday et al., 2013; McConley et al., 2011). There is a lack of information on the prevalence of pathological parent-child relations among parents of different SES groups. To our knowledge, the present study is the first to examine the association between psychosocial maternal stress and overweight/obesity in preschool-age children by using psychologically valid instruments to measure dysfunctional mother-child interaction. Our study also considers the mediation effects of modifying variables such as mother-child relations, smoking, and sedentary behavior.

The aim of this study was to examine whether a psychosocial factor such as parental stress strengthens the effect of lower maternal education level on an increased risk of overweight/obesity in 4–6 year-old children. The present study is one of the first to use a large population-based sample of mother-child pairs for the assessment on the influence of SES and pathological mother-child relations on overweight/obesity in 4–6 year-old children, controlling for the impact of the main risk factors for childhood obesity. We hypothesize that children in less educated families are more often exposed to dysfunctional mother-child interaction, and are more likely to be overweight/obese.

2. Material and methods

2.1. Study population

Our study is based on the cohort study of pregnant women who were recruited during 2007–2009 in Kaunas city, Lithuania. This cross-sectional study was conducted as part of the Positive Health Effects of the Natural Outdoor Environment in Typical Populations in Different Regions in Europe (PHENOTYPE) project funded by the European Commission Seventh Framework Program (Nieuwenhuijsen et al., 2014). A detailed description of the study has been provided previously (Grazuleviciene et al., 2014). During 2012–2013, we invited 3294 mothers and their 4–6 year-old children to participate in this study. We received responses to a postal questionnaire from 1489 mothers followed-up for 4–6 years. This study analyzed data on 1489 participant pairs gathered during three surveys: during the first trimester of pregnancy, after childbirth, and at the children's age of 4–6 years (Fig. 1). The inclusion criteria were the following: mother-child pairs living in Kaunas city, Lithuania; data available on the mother's and the newborn's health since birth; known residence address since pregnancy; and singleton newborns whose weight was below 4000 g. A few missing data were specified by telephone. All 1489 participants provided written informed consents, and the study protocol was approved by the Lithuanian Bioethics Committee. The study complies with the Declaration of Helsinki. This population-based study explored the relationship between SES, parenting stress, and the risk of overweight/obesity in 4–6 year-old children. Cases of overweight/obesity ($n = 111$) were identified in the studied population, and were compared with the reference group.

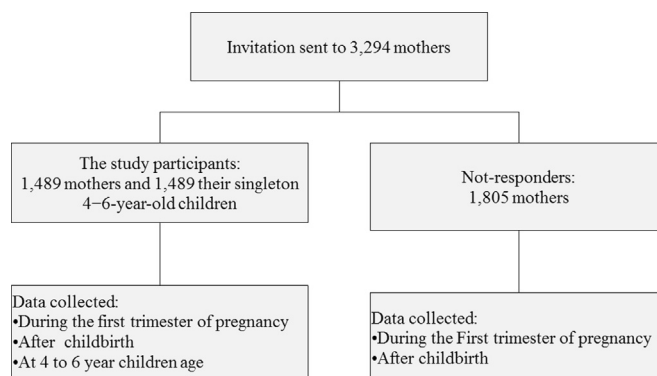


Fig. 1. A flow chart of the studied population.

2.2. Measurements

2.2.1. Baseline characteristics

We collected baseline characteristics and data on health outcomes by standardized interviews. The first questionnaire on the women was completed during their first trimester of pregnancy. The women reported their age, education level, SES, occupation, marital status, chronic diseases, health behavior, and other variables. The second interview was completed in hospital before childbirth, and residential history as well as information on employment during pregnancy, health behavior, and other variables were collected. Data on birth outcomes were drawn from birth reports. The third questionnaire was sent by post in 2013, when the children were 4–6 years of age, and comprised questions on the children's development, health behavior, family status, and parenting stress. Questionnaire responses by parents or guardians were used to categorize basic information and exposures. Children's overweight/obesity was calculated as the ratio of weight (in kg) per height (in m^2). We used age group and sex-fixed body mass index (BMI) cut-off points to assess overweight and obesity in children according to the guidelines of the Childhood Obesity Working Group of the International Obesity Taskforce (IOTF) (Cole et al., 2007). Age- and sex-specific body mass index (BMI) z-scores were calculated for the continuous analysis using multivariate linear regression models (Cole et al., 2000; Rothman et al., 2008). In the categorical analysis, because of the small number of obese children, the groups of overweight and obese children were merged, and, consequently, two BMI groups were compared – the overweight/obesity group (case group, $BMI \geq 18 \text{ kg}/m^2$) and the reference group (control, $BMI < 18 \text{ kg}/m^2$).

2.2.2. Exposure assessment

In this study, the individual-level SES predictor was the mothers' education level: poor education (10 or fewer years), non-university education, and high-university degree. In categorical analyses, maternal education level was treated as "poorer" if the education was 10 or fewer years and "better" if the education was more than 10 years. To evaluate maternal self-reported mother-child relationship dysfunction, we used the Parent-Child Dysfunctional Interaction subscale (PCDI) of the Parenting Stress Index short form (S-PSI/SF) (Abidin, 1995). The PCDI subscale measures the parent's perception of whether their child is meeting the parent's expectations and whether the interactions with the child are reinforcing to them. The typical items were "My child rarely does things for me that make me feel good" and "I expected to have closer and warmer feelings for my child than I do, and this bothers me". The participants' responses were scored using a 5-point Likert scale (from 1 = strongly agree to 5 = strongly disagree). Three categorical variables were created by using percentiles as cut-off points: normal – below the 85th percentile, borderline – the 85th to the 90th percentile, and pathological mother-child relations – above the 90th percentile. In the categorical analysis, exposure to parenting stress was defined by using the 85th percentile as a cut-off point.

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