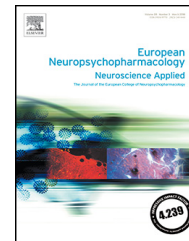




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Role of adipokines FGF21, leptin and adiponectin in self-concept of youths with obesity

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Abstract

The mechanisms by which obesity increases the risk of psychosocial disorders remain unclear. We aimed at exploring the association between obesity and self-concept in Chinese youths and the role of adipokines. Data for 559 participants (aged 14-28 years) were analyzed. Self-concept was assessed by utilizing the Self-Description Questionnaire II (SDQ-II). Subjects with obesity had higher leptin, FGF21 and lower adiponectin levels (all $p < 0.001$). They also had lower SDQ-II scores especially in the domains of general school, physical abilities, physical appearance and opposite-sex relations (all $p < 0.001$). Both elevated FGF21 and leptin were correlated with lower scores in math ($p < 0.01$), physical abilities ($p < 0.01$), and opposite-sex relations ($p < 0.05$), meanwhile FGF21 negatively correlated with the scores in general school and hon-

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esty/trustworthiness, and leptin negatively correlated with physical appearance ($p < 0.01$) but positively with verbal ($p < 0.01$). In contrast, decreased adiponectin was correlated with poorer physical abilities ($p < 0.05$), physical appearance ($p < 0.05$), and parent relations ($p < 0.01$). Moreover, these associations of leptin, FGF21 and adiponectin with certain domains remained significant after adjustment for BMI and other metabolic confounders. In conclusion, youths with obesity experienced poorly on self-concept, and these associations may be explained in part by adipokines leptin, FGF21 and adiponectin.

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1. Introduction

The increasing worldwide prevalence of obesity in youths is one of the most challenging healthcare problems (Ng et al., 2014). While the physical effects of overweight in youth have been widely documented (Schmidt, 2015), less is known about the psychosocial burden of excess weight, and what is known is largely confined to isolated aspect of psychosocial function such as low self-esteem, depression or body dissatisfaction (Pulgaron, 2013). Moreover, the mechanisms by which obesity increases risk of psychosocial disorder remain unclear (Pulgaron, 2013). It is now widely recognized that adipose tissue is hormonally active, secreting a wide range of peptides known as adipokines, which regulate important physiologic processes in target organs including not only liver, muscle, heart and immune system, but also brain (Fasshauer and Bluher, 2015). In obesity, the adipose tissue dysfunction leads to altered adipokines secretion, therefore contributes towards cardio-metabolic diseases (Bluher and Mantzoros, 2015 and Fasshauer and Bluher, 2015). However, whether adipokines could link available energy stores with psychosocial conditions has rarely been addressed.

Self-concept plays an important role in psychosocial assessment. The development of negative beliefs about self can result in maladaptive responses and mental states. The association between obesity and self-concept among youths is still being debated. While some investigations observed that the degree of overweight was significantly associated with evaluation of physical appearance (Danielsen et al., 2012), other studies have not observed a relationship with self-esteem (Young-Hyman et al., 2003). To date, few studies have been conducted to explore multiply domains of self-concept based on large samples in youths with overweight and obesity, and study of the potential mechanisms of obesity on self-concept is still lacking, especially in Chinese population (Chung et al., 2015). Recent studies showed that association between obesity and neurodegenerative diseases could be mediated by the pleiotropic effects of adipokines, particularly by those adipokines which may function through central nervous system (CNS), such as leptin (Dalamataga et al., 2013), adiponectin (Arnoldussen et al., 2014) and FGF21 (Leng et al., 2015). Additionally, Nixon Nixon Andreasson et al. (2010) found that elevated leptin correlated with poor existing self-rated health in men. Based on these recent findings, we therefore hypothesized that the effects of obesity on psychosocial disorders might also be mediated by the dysregulation of those adipokines with established CNS actions. Since the Self-Descriptive

Questionnaire II (SDQ-II) is a leading multidimensional self-concept instrument for adolescents and used widely (Hau et al., 2003 and Marsh, 1990), we aimed to determine the association between obesity and self-concept measured by SDQ-II in Chinese youths based on a large cohort of Beijing Child and Adolescent Metabolic Syndrome Study (BCAMS) (Li et al., 2009 and Wang et al., 2013). Furthermore, we sought to investigate the levels of three adipokines including leptin, adiponectin and FGF21 in obesity, as well as their roles in linking obesity with self-concept.

2. Experimental procedures

2.1. Participants

Subjects were recruited from the cohort of BCAMS study (Li et al., 2009 and Wang et al., 2013). The BCAMS study evaluated the prevalence of obesity and related metabolic abnormalities including hypertension, hyperglycemia and dyslipidemia in Beijing school-age children ($n = 19,593$, age 6-18 years, 50% male) from April to October 2004. 4,500 participants were identified as being at high risk due to having one of the followings: overweight defined by body mass index (BMI), elevated cholesterol ≥ 5.2 mmol/l, elevated triglycerides (TG) ≥ 1.7 mmol/l or elevated fasting glucose ≥ 5.6 mmol/l based on finger capillary blood tests. Follow-up study for the BCAMS cohort started in 2012 (Fu et al., 2016). Participants were recruited consecutively through various modalities and underwent medical examination at the healthcare center of Beijing Chaoyang Hospital. Informed consent was obtained from all participants and/or their parents or guardians through all the study processes. The protocol for the follow-up examination was approved by the Ethics Committee at the Beijing Chaoyang Hospital. A total of 559 subjects who completed medical examination and questionnaires were included in the current study.

2.2. Clinical measurements

Height, weight, and waist circumference (WC) were measured by trained field workers. Participants removed bulky clothing and shoes prior to measurements. Height and WC were measured to the nearest 0.1 cm using a portable stadiometer. WC was measured midway between the lowest rib and the top of the iliac crest. Weight was measured to

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