

Poor Sleep And Adolescent Obesity Risk: Respiratory Dysfunction [Letter]

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Bruno Bordoni

Foundation Don Carlo Gnocchi IRCCS,
Department of Cardiology, Institute of
Hospitalization and Care with Scientific
Address, Milan 20100, Italy

Dear editor

I read with great interest the article by Dr Duraccio and the review on obesity and adolescence. The analysis discussed and the reflections reported are very interesting and relevant.¹

An aspect that has not been taken into consideration to find reasons for this epidemic of obesity, is the adaptation of the respiratory diaphragm muscle and its systemic relationships.

The accumulation of fat in the thoracoabdominal area causes a decline in diaphragmatic contractility, with a reduction in lung elasticity and an altered respiratory pattern; the obesity of children and adolescents will cause different respiratory problems, from rapid fatigue to dyspnea.² There is a direct relationship between the innervation of the diaphragm and the function of tongue protrusion/retrusion.

This connection serves to open the high airways during inspiration; a functional/structural alteration of the diaphragm causes a dysfunction of the lingual movement and the presence of sleep apnea.

Respiratory disorders, such as a sub-clinical picture of obstructive sleep apnea syndrome (snoring and non-constant apneic events), contribute to a decrease in sleep quality and the presence of obesity. We know that there is a relationship between respiratory weakness and the presence of obesity, in particular, a diet rich in fat stimulates the synthesis of intradiaphragmatic fibro-adipogenic progenitors, with increases in adipocytes and type I collagen fibres. This adaptation creates a circle vicious, where thrombospondin 1 (adipocytokine) maintains the negative adaptation of the diaphragm muscle.³

In patients with sleep apnea disorders (clinical and sub-clinical), there is a decrease in nesfatin-1, (neuropeptide of the hypothalamus) which is related to weight gain and increased appetite.⁴

An altered metabolic framework, as in adolescent obesity, creates a constant status of oxidative stress that would lead to insulin resistance/hyperglycemia (and further obesity) with decreased respiratory function (weakness of contractile function, depletion of troponin T).⁵

The functional alteration of the diaphragm muscle causes alterations of the emotional sphere and awareness of themselves (interoception) with respect to external stimuli (exteroception). The afferent/efferent pathways between the diaphragm, the phrenic/vagal innervation, the solitary nucleus and the limbic sphere,

Correspondence: Bruno Bordoni
Foundation Don Carlo Gnocchi IRCCS,
Department of Cardiology, Institute of
Hospitalization and Care with Scientific
Address, S Maria Nascente, Via
Capecelatro 66, Milan 20100, Italy
Tel +39 02 3496300617
Email bordonibruno@hotmail.com

with depression, anxiety and behavioural alteration. An emotional alteration with excessive consumption of food is found in obese adolescents with decreased sleep.¹

We can observe a vicious and self-feeding circle between insomnia and respiratory disorders (tongue and diaphragm), increased body weight, the presence of insulin resistance and mood disorders. Childhood is more prone to develop disturbances in the pattern of sleep and breathing, with frequent episodes of apnea (nasal breathing, face shape) and the predominance of the REM state, which decreases muscle tone with an increase in the percentage of respiratory obstruction (functional alteration of the tongue and diaphragm). This mechanism could be prolonged until adolescence and create a vicious circle between altered breathing and sleep/obesity disorders.

We do not know what is the cause capable of starting the vicious circle. We need further studies on the dia-

phragm and obesity of adolescence, but an apparent link seems to exist.

Disclosure

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