Is childhood obstructive sleep apnoea an independent risk factor of hypertension in adulthood?

Rosemary S C Horne,¹ Montida Veeravigrom²

Over a third of children snore when they are asleep and until the last decade this has been considered benign by both parents and health professionals. Snoring was considered something that children would simply grow out of. Snoring is the hallmark symptom of sleep-disordered breathing (SDB), which ranges in severity from simple or primary snoring to obstructive sleep apnoea (OSA) which affects up to 6% of children.¹ The incidence of SDB peaks in the preschool years when the size of the adenoids and tonsils-the primary cause of paediatric SDB-peaks in relation to the bony skeleton. In addition, childhood obesity increases the risk of OSA, particularly in older children.

In adults, OSA is recognised as an independent risk factor for hypertension and reduced nocturnal dipping of blood pressure, both of which are associated with cardiovascular, cerebrovascular and end-stage renal disease.² Recent studies in children have shown that blood pressure is elevated in primary school aged children with all severities of SDB, including primary snoring,³ and the beginnings of elevated blood pressure are evident in children with OSA as young as 3-5 years of age.⁴ Obesity compounds the adverse effects of OSA on the cardiovascular system.⁵

What has been lacking in the paediatric literature is knowledge of the long-term effects of SDB on blood pressure and whether childhood SDB is a determinant of adult blood pressure. The study by Chan *et al* addressed this important issue—following up 243 children recruited from the community at age 6–13 years over a 10-year period, into adolescence and

adulthood. The study used the gold standard of polysomnography for determining SDB severity, in conjunction with 24-hour ambulatory blood pressure monitoring at both time points. The study found that those children with moderate-to-severe OSA at baseline had higher systolic blood pressure (average 6.5 mm Hg) and reduced nocturnal dipping (average 4%), when adjusted for age, sex, body mass index (BMI) and height at baseline, and the presence of OSA at follow-up. Overall, the study found that primary school aged children with moderate-to-severe OSA had a 2.5-fold increased risk of hypertension and 1.3-fold risk of reduced nocturnal dipping. These findings suggest that there is a threshold effect between childhood OSA and adult blood pressure, as only moderate-to-severe OSA was associated with adverse cardiovascular outcomes.

There is now evidence that any improvement in SDB severity lowers blood pressure, and this is more marked in children with a higher BMI.67 The study by Chan et al noted that many parents were reluctant for their child to undergo any treatment, as they perceived their child to be asymptomatic. Only 20% of children with OSA received surgical treatment and 14% medical treatment. A second paper from the same cohort of children reported that in 30% of children with OSA spontaneously resolved (obstructive apnoea-hypopnoea index <1 event/h).8 The 22% who continued to have OSA were predominantly male and had a higher BMI z-score at baseline. Furthermore, the study showed that more severe OSA in children older than 10 years of age tended to persist, while OSA diagnosed in younger children was less likely to correlate with persistence of OSA. The study highlights the urgent need to screen and treat all children for SDB as young as possible and importantly that older children and those who are

overweight or obese require particular attention and follow-up to reduce the chances of OSA persisting into adulthood and increasing the risk of hypertension, cardiovascular, cerebrovascular disease and end-stage renal disease.

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REFERENCES

- Marcus CL, Brooks LJ, Draper KA, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. *Pediatrics* 2012;130:576–84.
- 2 Crinion SJ, Ryan S, McNicholas WT. Obstructive sleep apnoea as a cause of nocturnal nondipping blood pressure: recent evidence regarding clinical importance and underlying mechanisms. *Eur Respir J* 2017;49. doi:10.1183/13993003.01818-2016
- 3 Horne RSC, Yang JSC, Walter LM, et al. Elevated blood pressure during sleep and wake in children with sleepdisordered breathing. *Pediatrics* 2011;128:e85–92.
- 4 Nisbet LC, Yiallourou SR, Biggs SN, et al. Preschool children with obstructive sleep apnea: the beginnings of elevated blood pressure? *Sleep* 2013;36:1219–26.
- 5 Horne RSC, Shandler G, Tamanyan K, et al. The impact of sleep disordered breathing on cardiovascular health in overweight children. *Sleep Med* 2018;41:58–68.
- 6 Vlahandonis A, Nixon GM, Davey MJ, et al. Improvement of sleep-disordered breathing in children is associated with a reduction in overnight blood pressure. Sleep Med 2013;14:1295–303.
- 7 DelRosso LM, King J, Ferri R. Systolic blood pressure elevation in children with obstructive sleep apnea is improved with positive airway pressure use. J Pediatr 2018;195:102–7.
- 8 Chan KC, Au CT, Hui LL, et al. How OSA evolves from childhood to young adulthood: natural history from a 10-year follow-up study. Chest 2019;156:120–30.



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¹Paediatrics, Monash University, Melbourne, Victoria, Australia

²Pediatrics, Chulalongkorn University Faculty of Medicine, Bangkok, Thailand

Correspondence to Professor Rosemary S C Horne; rosemary.horne@monash.edu