



香港睡眠醫學會  
THE HONG KONG SOCIETY OF SLEEP MEDICINE



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# **OSA affects people of All Ages Delaying Diagnosis and Treatment causes Serious Complications**

17<sup>th</sup> March, 2013

Press Conference



**Part 1**  
**Introduction**  
**Hong Kong Society of Sleep Medicine**

**Dr. LAM Chung Mei, Jamie**  
President  
Hong Kong Society of Sleep Medicine



香港睡眠醫學會  
THE HONG KONG SOCIETY OF SLEEP MEDICINE

- Established in year 1993
- Committee members include psychiatrists, pediatricians, respiratory physicians and ENT surgeons
- Our Society is dedicated to promoting clinical practice, knowledge and training in Sleep Medicine in Hong Kong
- For more details, please refer to:  
<http://www.hkssm.org/main.php>



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# Part 2

## OSA in Hong Kong

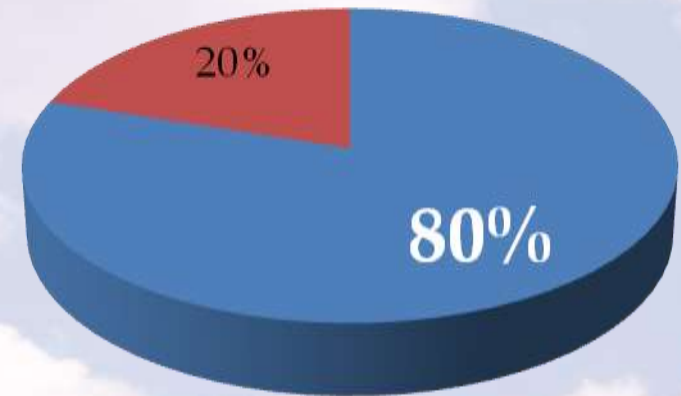
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# Obstructive Sleep Apnea(OSA)

- During sleep, patient with sleep apnea will have difficulty breathing or even apneic episodes during sleep.
- About **80%** of all patients with sleep apnea suffers from **Obstructive Sleep Apnea (OSA)**

## Sleeping Disease



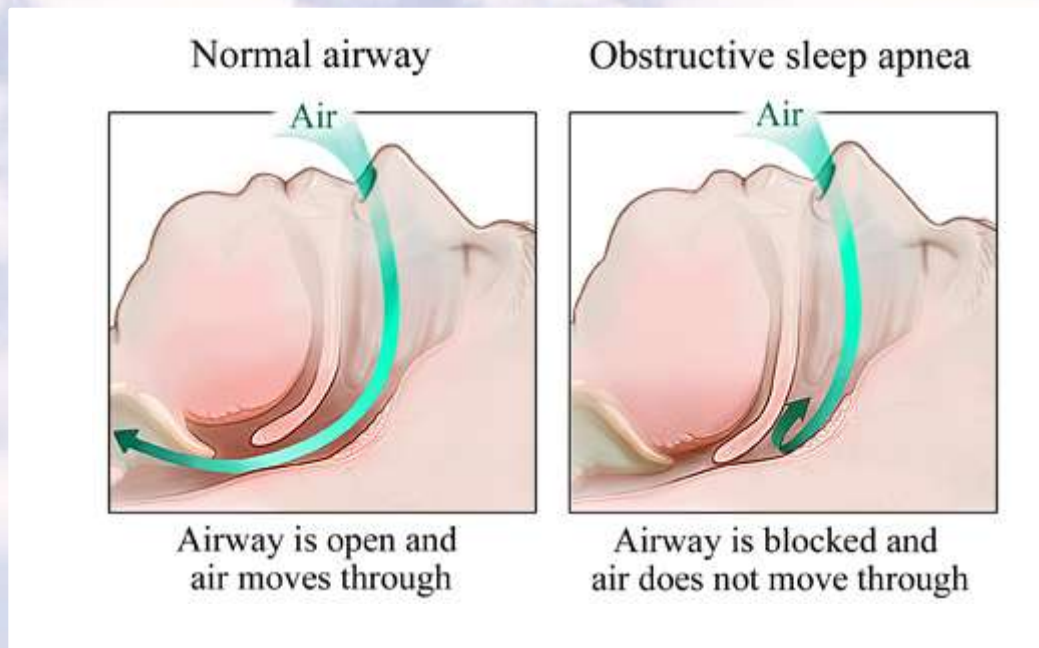
■ OSA

■ Other Sleeping Disease

# Causes of OSA



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- Apnoea is caused by the relaxation of muscles during sleep.
- **If there are too much soft tissues or patient's tongue is too big, the pharyngeal wall may collapse and compress on the airway, causing apnoea. Patients can have as much as 5-100 episodes of apnoea per hour<sup>1</sup>**

\*Online graphics



# Risk factors for OSA<sup>1</sup>

Advanced  
Age

Male

Obesity

Smoking

Drinking

Craniofacial  
Abnormality



# Symptoms of OSA

## Night Symptoms

Snoring

Waken up by  
apneic episodes

Nocturia

## Day Symptoms

Headache

Tiredness

Sleepiness



# Hong Kong Citizens are troubled by OSA

- There are respectively **4.1%**<sup>1</sup> and **2.1%**<sup>2</sup> of middle aged men and women affected by OSA in Hong Kong.
- **Obesity and advancing age** are the major risk factors.

**However, there are still lots of misunderstandings on the symptoms and consequences among the general public**



# Mistaking Snoring as Normal Sleeping Phenomenon

- **Snoring** is a common symptom among OSA patients
- Patient's body is waken up by the intermittent apnoea, causing a **dramatic decrease in sleeping quality**. This causes **daytime tiredness** and **sleepiness**





# Delaying Diagnosis is Common

- Study showed that patients seldom discuss the distress caused by symptoms during consultations

	Average Period of Delaying Diagnosis
Adult <sup>1</sup>	<b>7 years</b>
Child <sup>2</sup>	<b>3.3 years</b>

**The situation is ALARMING!!**

1. Rahaghi F, Basner RC. Sleep Breath. 1999;3(4):119-124.

2. Richards W, Ferdman RM. Clin Pediatr (Phila). 2000 Feb;39(2):103-8.



# OSA Seriously affects Quality of Life and Safety



- OSA affects efficiency at work
- For **drivers and heavy machine operators**<sup>1</sup>, OSA seriously affects **the safety of their work.**

# OSA increases Risk



## for Long Term Complications



- OSA does not just affect quality of sleep but also causes serious complications:
  - **Blood pressure, blood glucose and waist circumference** are higher than normal person.<sup>1,2</sup>
  - The risk of having **Metabolic Syndrome (hypertension, high blood glucose and lipid, obesity)** increases **five times comparing with a normal person.**<sup>3</sup>
  - **JNC (USA)** listed OSA as a cause of hypertension<sup>4</sup>

1. Marin JM, Agusti A, et al. JAMA 2012May;307(20):2169-76.

2. Aronsohn RS, Whitmore H, et al. Am J Respir Crit Care Med. 2010 Mar;181(5):507-13.

3. Lam JC, Lam B, et al. Respir med, 2006 Jun;100(6):980-7.

4. Chobanian AV, Bakris GL, et al. Hypertension. 2003 Dec;42(6):1206-52.



# Improve cognition can improve treatment outcome



- We should pay more attention to our own health and working condition, as well as knowing the health consequences of OSA.
- Go for early diagnosis and treatment.



# Severity of OSA

- According to the guideline issued by the American Academy of Sleep Medicine in 1999, Apnea Hypopnea Index (AHI) is used to determine the severity of OSA<sup>1</sup>:

Severity	AHI
Mild	5-15
Moderate	15-30
Severe	>30

1. The Report of an American Academy of Sleep Medicine Task Force, Sleep 1999; 22: 667-689



# Part 3

## Effects of OSA on Children

Dr. NG Kwok Keung, Daniel  
Council Member  
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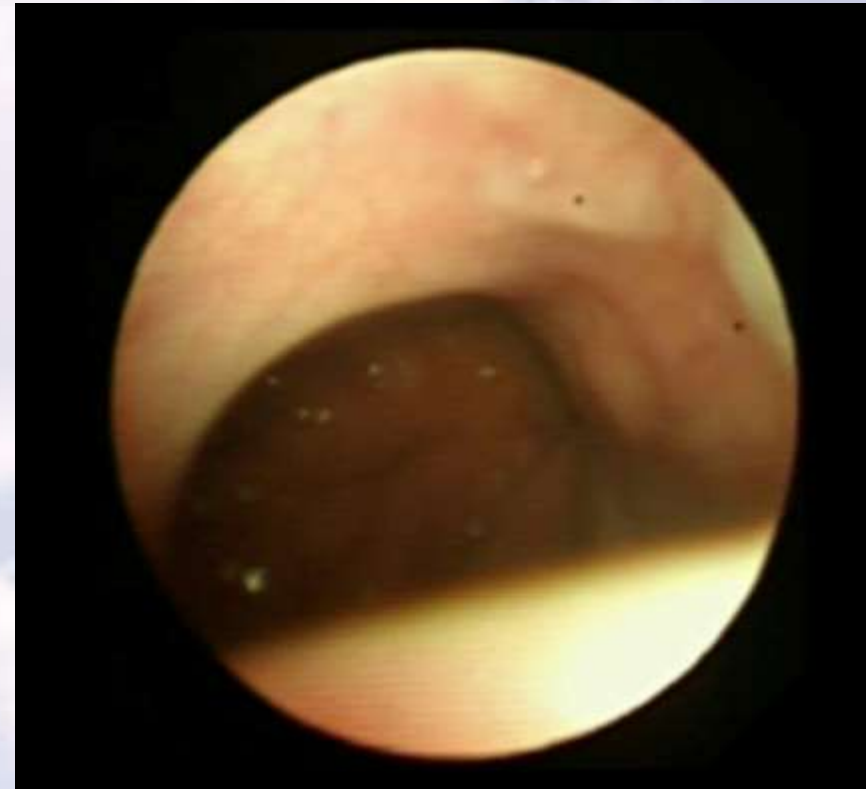




# Enlarged Adenoid



# Normal Adenoid



# Pediatric OSA



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# Clinical Risk Factors for Pediatric OSA

## Clinical Risk Factors for Obstructive Sleep Apnoea in Children

KW Chau, D K K Ng, C K L Kwok, P Y Chow, J C S Ho

### ABSTRACT

**Objective:** To identify the clinical factor(s) that identify obstructive sleep apnoea syndrome (OSAS) in children.

**Methods:** A prospective study of children referred to the sleep clinic of the paediatric department was conducted in a public non-teaching regional hospital in Hong Kong. A standard questionnaire was administered and overnight sleep polysomnography was performed in a consecutive series of patients. Logistic regression analysis was performed to obtain significant risk factors for prediction of OSAS in this series of patients.

**Results:** Sixty-two children were enrolled into the

and daytime symptoms like sleepiness, hyperactivity, behavioural and learning problems. However, previous studies showed that clinical risk factors are not well-related to OSAS<sup>(4-6)</sup>. Among the snoring children, only about 10 to 30% of them<sup>(1,7-10)</sup> were actually found to have OSAS as diagnosed by the sleep polysomnograph (PSG). Given the potentially serious sequel of untreated OSAS, e.g. cor pulmonale, respiratory failure and intellectual impairment<sup>(11)</sup>, and the expenses of performing PSG, identification of significant clinical risk factors in different population remains an important task. This study aims at identification of clinical risk factors for OSAS in Chinese children in Hong Kong.

### METHODS

Sixty-two children were referred to our sleep clinic

**Table I. Demographic data of 62 children with and without OSAS.**

	OSAS	Non-OSAS	p-value
Male: Female	12:10	24:16	0.79
Age, mean+/-S.D.	6.24 yrs +/- 3.15 yrs	6.98yrs+/- 3.45 yrs	0.35

**Table III. Logistic regression analysis of significance of various factors in relation to OSAS.**

Effect	Significance (p)
Difficult breathing	0.966
Observed apnoea	0.055
Regular snoring	<0.001
Restlessness during sleep	0.317
Obesity	0.300
Poor academic performance	0.066
Enlarged tonsils	0.722



# Habitual Snoring

- A telephone survey was conducted in the year 2002, with 3,047 primary school students (Aged 6-12) interviewed in total

## Prevalence of Sleep Problems in Hong Kong Primary School Children\*

### A Community-Based Telephone Survey

*Daniel K. Ng, FRCP; Ka-li Kwok, FHKAM(Paed);  
Josephine M. Cheung, RPSGT; Shuk-yu Leung; Pok-yu Chow, FHKAM(Paed);  
Wilfred H. Wong, MSc; Chung-hong Chan, BSc; and Jackson C. Ho, FRCR*

**Study objectives:** To estimate the prevalence of snoring, witnessed sleep apnea, teeth grinding, primary and secondary nocturnal enuresis, and sleep duration in Hong Kong primary school children.

**Design:** Cross-sectional telephone questionnaire survey in a community.

**Participants:** A total of 3,047 6- to 12-year-old apparently healthy children.

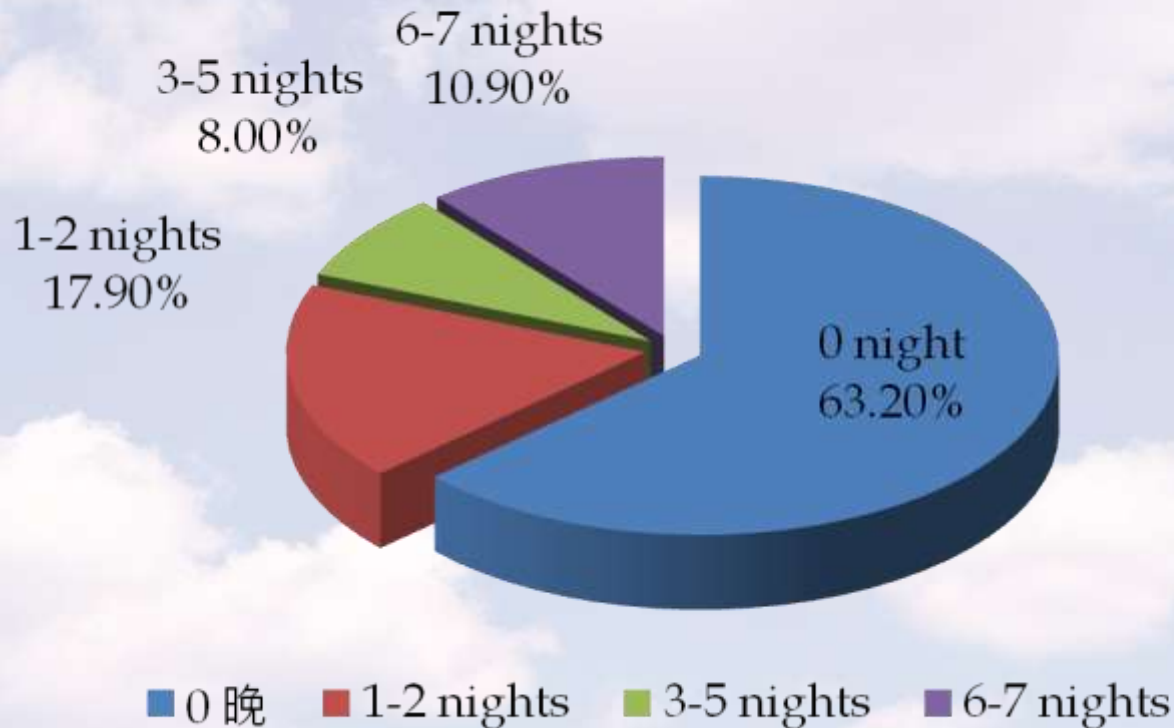
**Intervention:** Those who agreed to the study were contacted by telephone. Survey questions were asked about the symptoms of the different sleep disorders, and the frequency of each positive symptom was noted for the preceding 1 week.

**Outcome measures:** Prevalence and risk factors of sleep disorders in Hong Kong primary school children.



# Prevalence of Habitual Snoring

How many nights per week  
do you have snoring?





# Apnoea during Sleep

- Apnoea during Sleep was found in 45 children (1.5%; 95% CI, 1 to 2%)



# Risk Factors for Apnoea

Table 3—Significant Risks Factors for Witnessed Apnoea\*

Factors	$\beta$	p Value	Adjusted OR (95% CI)
Habitual snoring (打鼻鼾)	1.330	> 0.001	3.79 (2.01–7.14)
EDS (日間渴睡)	0.118	0.043	2.26 (1.03–4.97)
Allergic rhinitis (鼻敏感)	0.783	0.024	2.19 (1.11–4.32)
Tiredness on rising† (早上起床時疲倦)	0.606	0.084	1.83 (0.92–3.65)

\*Other confounding factors have been adjusted by this model but have not emerged as significant risk factors: gender, teeth grinding, mouth breathing, asthma, family history of sleep apnoea, and sleep duration.

†Approaching significance.



# OSA and Obesity

## The Correlation Among Obesity, Apnea-Hypopnea Index, and Tonsil Size in Children\*

Yuen-yu Lam, FHKAM(Paed); Eric Y.T. Chan, MRCPCH;  
Daniel K. Ng, FHKAM(Paed); Chung-hong Chan, BSc;  
Josephine M.Y. Cheung, RPSGT; Shuk-yu Leung; Pok-yu Chow, FHKAM(Paed);  
and Ka-li Kwok, FHKAM(Paed)

**Background:** The correlation between obesity and severity of obstructive sleep apnea (OSA) is well established in adults, but data are inconsistent in children. We hypothesized that there is a significant correlation between the degree of obesity and the severity of OSA in children.

**Methods:** We retrospectively reviewed records of weight, height, history, and polysomnography of all 1- to 15- year-old children referred to our sleep laboratory. Children with known anomalies and repeated polysomnography were excluded from this study. Obesity was defined as body mass index z score (BMI Z score) > 1.96. The correlation between BMI Z score and apnea-hypopnea index (AHI) was assessed. Possible confounding factors, *ie*, age, gender, and tonsil size, were adjusted by multiple linear regression.

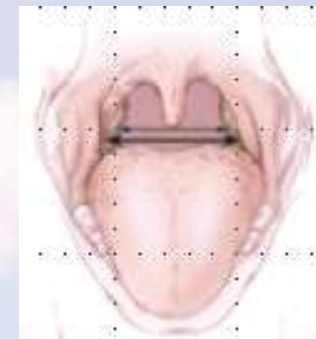
**Results:** Four hundred eighty-two children were included in this study. Obese children had a significantly higher AHI (median, 1.5; interquartile range [IQR], 0.2 to 7.0) than the AHI of nonobese children (median, 0.7; IQR, 0.0 to 2.5). BMI Z score was significantly correlated with log-transformed AHI (Ln[AHI]) [ $r = 0.156$ ,  $p = 0.003$ ]. BMI Z score and tonsil size were still correlated with Ln(AHI) even after adjusted for other confounding factors ( $p = 0.001$ ).

**Conclusion:** Degree of obesity as measured by BMI Z score and tonsil size are significantly related to severity of OSA as reflected by the AHI, although the correlation is mild.



# 14.7 Times

(95% CI = 1.8 至 120.4)





# OSA causes Daytime Sleepiness

## Modified Epworth Sleepiness Scale in Chinese children with obstructive sleep apnea: a retrospective study

Eric Y. T. Chan · Daniel K. Ng · Chung-hong Chan ·  
Ka-li Kwok · Pok-yu Chow · Josephine M. Cheung ·  
Suk-yu Leung

Received: 20 February 2008 / Revised: 24 May 2008 / Accepted: 26 May 2008  
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### Abstract

**Background and objective** The purpose of this study is to assess whether *Chinese* children with high apnea-hypopnea index (AHI) are sleepier by a modified Epworth Sleepiness Scale (ESS).

**Materials and methods** Records were retrospectively reviewed. We included children who were between 3 and 12 years old, admitted for overnight polysomnogram because of suspected obstructive sleep apnea syndrome (OSAS). A modified ESS was used to assess excessive daytime sleepiness (EDS) of the children.

**Results** One hundred ninety-two *Chinese* children were included. Children with high AHI, defined as  $AHI > 5.0$ , were sleepier than children with AHI less than or equal to

higher odds ratio of having high AHI. Increased sleepiness is a specific but not a sensitive symptom in snoring children with high AHI. Screening for EDS in snoring children may help us identify those with high AHI and prioritize the management of those children.

**Keywords** Sleep deprivation · Sleep apnea · Obstructive · Child · Epworth Sleepiness Scale · *Chinese*

### Introduction

In adults, excessive daytime sleepiness (EDS) is an important symptom in sleep disordered breathing (SDB)



# Effect of OSA in Blood Pressure

## Twenty-Four-Hour Ambulatory BP in Snoring Children With Obstructive Sleep Apnea Syndrome\*

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Michael W. Lau, FHKAM (Paed), MRCP; Chung-hong Chan, BSc;  
Ka-li Kwok, FHKAM (Paed), FRCP; Pok-yu Chow, FHKAM (Paed), MRCP;  
Josephine M.Y. Cheung, RN, RPSCT, MSc (Nurs)

**Introduction:** Obstructive sleep apnea syndrome (OSAS) is a known risk factor for hypertension in adults. This relationship is less clear in childhood OSAS.

**Objective:** This study examined the relationship between OSAS and 24-h ambulatory BP (ABP), a more accurate assessment than casual BP, in children with snoring.

**Methods:** Snoring children aged 6 to 15 years who underwent polysomnography in the sleep laboratory were recruited.

**Measurement:** Twenty-four-hour ABP monitoring was initiated a few hours before polysomnography. The children were classified into two groups: a high apnea-hypopnea index (AHI) group (obstructive AHI > 5/h), and a low-AHI group (AHI ≤ 5/h). Mean sleep, wake, and 24-h systolic BP (SBP) and diastolic BP (DBP) were recorded. A child was considered a “nondipper” if his or her mean SBP and DBP did not decrease by ≥ 10% during sleep.

**Results:** Ninety-six children (mean age ± SD, 9.4 ± 2.8 years) were recruited. Forty-one children were obese. When awake, the high-AHI group children had a significantly higher SBP. When asleep, both SBP and DBP were higher in the high-AHI group. Age, body mass index (BMI) z score, and desaturation index (DI) were significant predictors for elevated sleep DBP. BMI z score was the only significant predictor for wake and sleep SBP. Sixteen children (17%) had hypertension, and all were nondippers. Obese children in the high-AHI group had a significantly higher prevalence of hypertension than obese children in the low-AHI group. This relationship was not found in nonobese children.

**Conclusion:** The current study shows that increased DI contributed to the elevation of sleep DBP elevation.  
(CHEST 2006; 130:1009–1017)

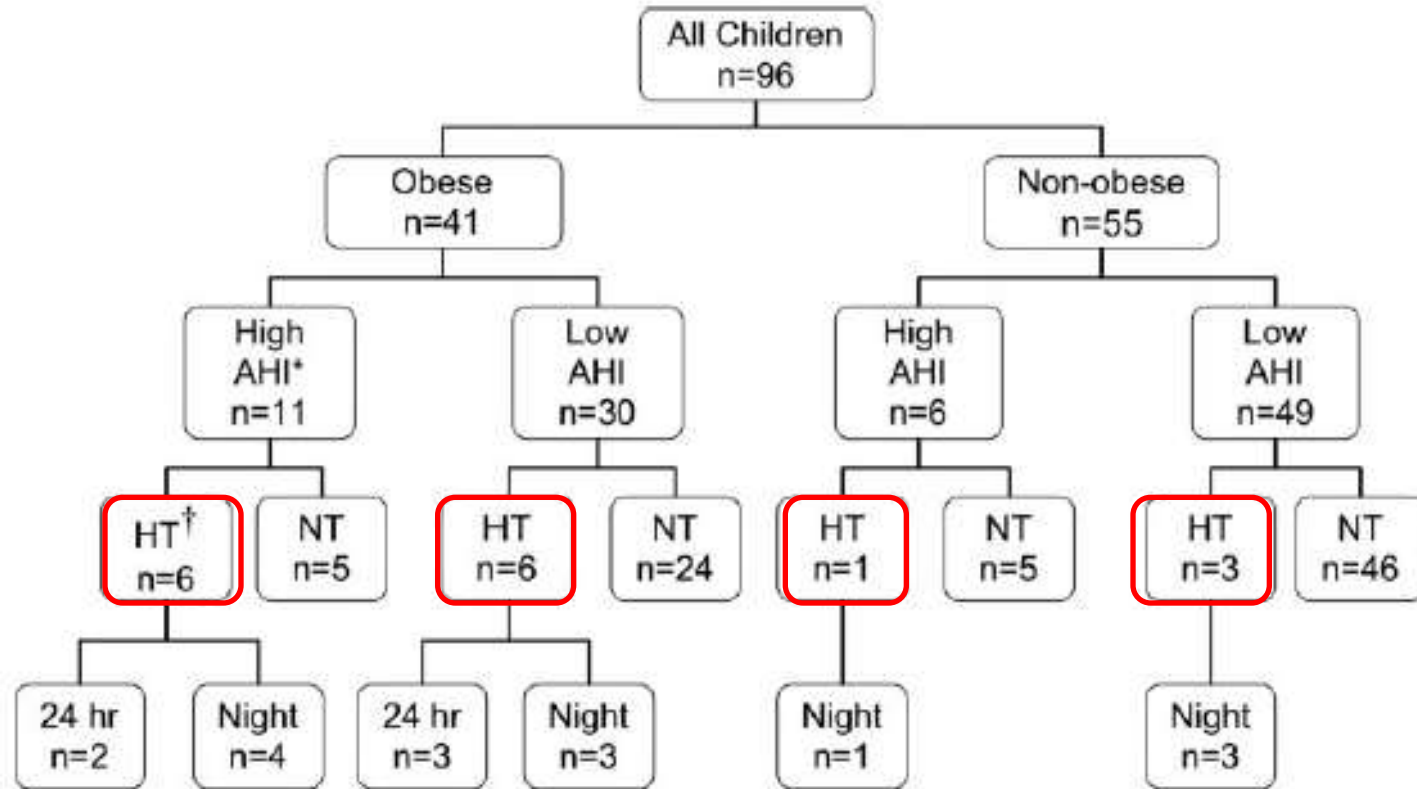


FIGURE 1. Relationship between OSAS and hypertension in 96 subjects completing 24-h ABP recording. HT = hypertension; NT = normotension; 24 hr = 24-h hypertension; Night = nocturnal hypertension. \*The proportion of obese children in the high-AHI group was significantly higher than nonobese children ( $p = 0.0003$ ; OR, 5.712; 95% CI, 1.858 to 17.554). †Among obese children, those in the high-AHI group had a higher incidence of hypertension than the low-AHI group (OR, 6.667; 95% CI, 1.004 to 44.284).

P.S. HT = Hypertension, NT = Normotension



Table 3—Predictors of ABP in 96 Children

Predictors	Wake SBP		Wake DBP		Sleep SBP		Sleep DBP	
	$\beta$ Coefficient	p Value	$\beta$ Coefficient	p Value	$\beta$ Coefficient	p Value	$\beta$ Coefficient	p Value
Log AHI	2.313	0.300	1.619	0.323	-0.053	0.981	-1.575	0.315
Log arousal index	-2.169	0.495	-0.708	0.762	-1.773	0.581	2.233	0.319
Log DI	-0.692	0.511	-0.237	0.759	1.243	0.245	1.922	0.012*
Age	0.203	0.618	-0.158	0.598	-0.508	0.220	-0.855	0.004*
BMI z score	2.431	0.020*	0.729	0.331	2.877	0.007*	1.544	0.034*
Male gender	0.117	0.963	0.486	0.794	-0.400	0.876	1.393	0.434
Intercept	-18.396	< 0.001*	-13.734	< 0.001*	-4.311	0.392	-3.453	0.325

\*Statistically significant predictor of ABP parameters.



# Effects of OSA on Secondary School Children's Academic Performance

## Sleep duration, wake/sleep symptoms, and academic performance in Hong Kong Secondary School Children

E. P. Ng · D. K. Ng · C. H. Chan

Received: 4 November 2008 / Revised: 16 March 2009 / Accepted: 20 March 2009

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### Abstract

**Background** Sleep deprivation is common among teenagers. The aim of this study was to investigate the relationship between sleep duration, wake/sleep symptoms, and academic performance among Hong Kong students.

**Materials and methods** The sleep habit questionnaires were distributed to all Year 11 students at an international school that catered to different ethnic groups in Hong Kong. Analysis of various parameters of academic performance and sleep habits and their relationships were undertaken.

during third and fourth lessons were associated with poorer grades in Mathematics and English. Excessive daytime sleepiness was reported in 25% of students. Bruxism and snoring were associated with excessive daytime sleepiness.

**Keywords** Sleep · Cognition · Adolescents · Sleep deprivation · Snoring

### Introduction



**Table 1** Basic characteristics of subjects

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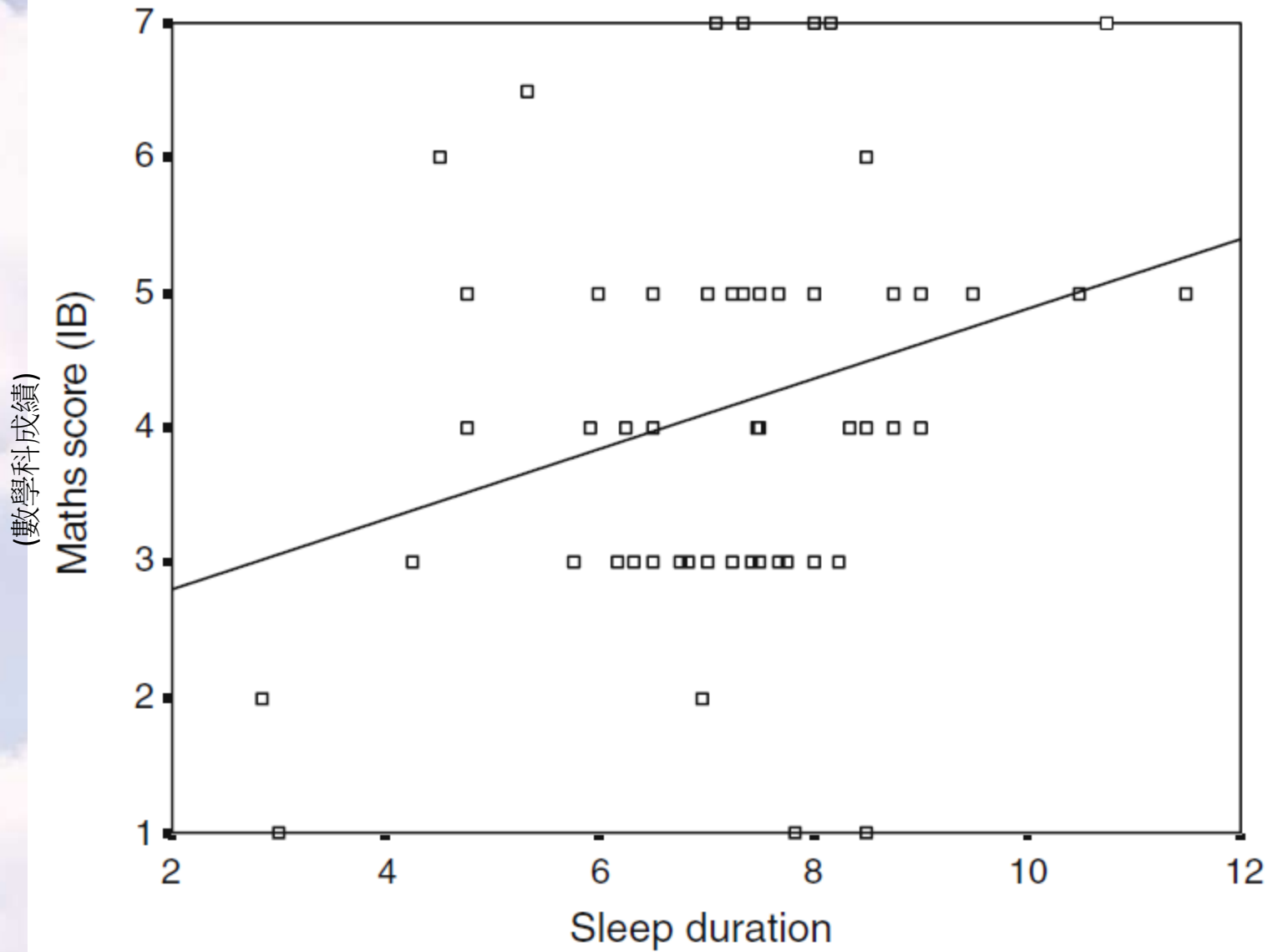
Subjects, <i>n</i>	59
Age (year) mean (SD)	16.5 (0.594)
Sex, female, <i>n</i> (%)	28 (47.5%)
Ethnicity, <i>n</i> (%)	
Chinese	30 (50.8%)
Caucasian	22 (37.3%)
South Asian	2 (3.4%)
Others	5 (8.5%)
BMI, mean (SD)	21.9 (3.6)
Sleep duration, mean (SD)	7.23 (1.62)
ESS score, mean (SD)	7.6 (4.2)
Mathematics score, mean (SD)	4.16 (1.48)
English score, mean (SD)	4.15 (1.01)

---



# Sleeping Time

- Sleep less than 7.3 hours: 48%
- Sleep less than 6 hours: 12%
- Sleep duration of Chinese students: 7 hours +/- 1.9
  - Bedtime at 23:54
- Sleep duration of non-Chinese students: 7.5 +/- 1.0
  - Bedtime at 23:08



**Fig. 1** Correlation between math score and sleep duration



# Part 4

## Current Treatment of OSA

Dr. LAM Chung Mei, Jamie  
President  
Hong Kong Society of Sleep Medicine



# Sleep Testing helps diagnose OSA



- One should seek early medical attention and has a sleep study once symptoms of OSA are noticed **or their sleep quality is unsatisfying**

# Sleep Study



- **A polysomnography** will be conducted in laboratory after a **questionnaire assessment**.
- Necessary health data will be collected during the **polysomnography** for further analysis during sleep. **E.g. electroencephalography, electrooculography, electrocardiography and electromyography**



# Treatment for OSA

Healthy Lifestyle



CPAP



Mandibular Advancement Splint



Surgery  
(Mainly for children.  
E.g. Tonsillectomy)



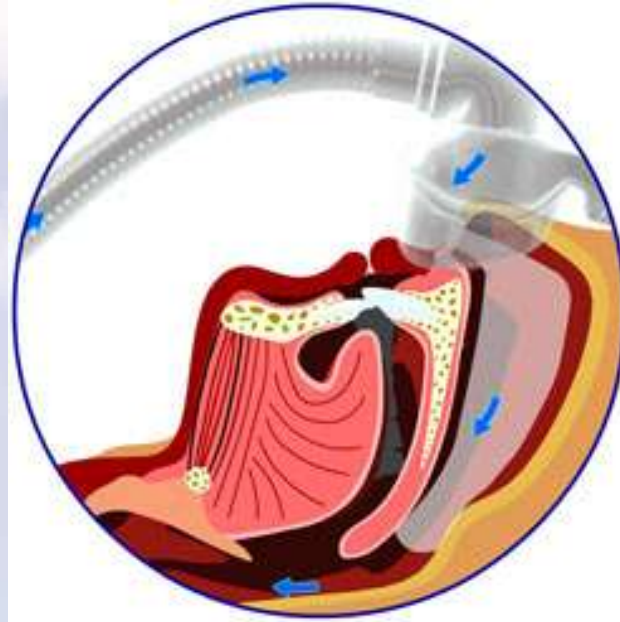
# Continuous Positive Airway Pressure, CPAP



American Academy of Sleep Medicine<sup>1</sup>  
recommends CPAP as standard treatment to  
reduce frequency of airway obstruction to  
moderate to severe OSA patients.



# Mechanism of CPAP

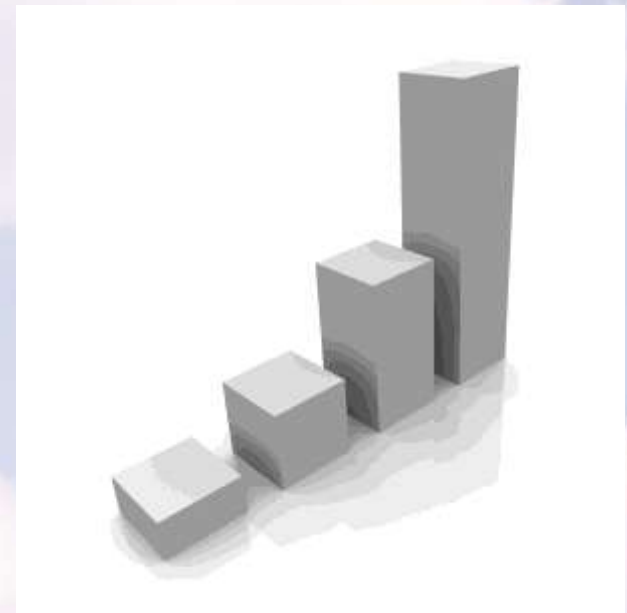


- Wear the mask **before sleep**
- Patient's airway will be opened by the **positive pressure** and symptoms will be relieved



# Treatment efficacy of CPAP

- Study showed that, after **12 weeks of CPAP treatment**, the AHI of patient was reduced by **98%**.
- **Blood Pressure, cholesterol and lipid level** are all significantly improved.





# Mandibular Advancement Splint



- Splints tailored to individuals after assessment by specialist in orthodontics
- Patients need to wear the splint during sleep in order to open up the airway
- Not all patients are suitable for this treatment



# Part 5 Recommendations and Suggestions

Dr. LAM Chung Mei, Jamie  
President  
Hong Kong Society of Sleep Medicine



# Recommendations and Suggestions (1)



- OSA affects people of all ages
- Apart from sleeping quality, OSA increases the long term health risk, including metabolic syndromes, cardiovascular diseases, diabetes and stroke



## Recommendations and Suggestions (2)

- One should seek medical consultation ASAP when the following symptoms arise:
  - Snoring
  - Reduced sleeping quality
  - Daytime tiredness
- One should have a **sleep test in laboratory** for diagnosis of OSA
- One should take the appropriate treatment:
  - A healthy lifestyle, CPAP, mandibular advancement splint or surgery



# Part 6

# Case Sharing



# Case 1 Mr. Ng

- 54 years old, businessman
- Mr. Ng travels and drives between China and Hong Kong frequently
- He was diagnosed with hypertension
- He snored for 10 years, with occasional apnoea. This affects his sleeping quality and mood. He also feel tired during daytime
- He worries that driving safety would be affected by the condition. However, he did not seek for medical consultation



# Case 1 Mr. Ng

- In 2006, Mr. Ng was admitted to the hospital because of stroke. He was then diagnosed to have OSA
- The condition was severe at the time of diagnosis, with the highest record of 75 episodes of apnoea per hour, each last for at least 10 seconds
- The doctor recommended to improve his condition
- After starting treatment, there are significant improvements in his sleeping quality, mood and vitality



# Case 2 Henry

- A 11-years-old boy studying in grade 6
- His mum noticed that he unconsciously sits up during sleep
- Henry fell asleep easily in daytime. His mum believed that it is not serious and had not paid much attention to it
- Henry's sleepiness affected his learning. He worried that his exam results will be affected



# Case 2 Henry

- Henry's mum later found it a problem and therefore seek medical attention
- After sleep test, Henry was diagnosed with severe OSA. He had over 100 apneic episodes per hour, each lasting for over 10 seconds
- Henry was on CPAP treatment now. He finds the tiredness improved after treatment started
- Surgery was arranged for Henry later this year to further improve his condition



# Part 7

# Q&A