Exploring the Relationship between Sleep Duration & Overweight & Obesity in Infants

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Introduction

- **Overweight/obesity in all age groups worldwide is**
  - **→ rising sharply**
  - **→ growing concern**

- **Prevalence has doubled in the last 30 years worldwide (WHO, 2010).**

- **43 million children are overweight/obese worldwide (WHO, 2010).**

Introduction

- **Infant obesity:**

  > 60% increase - over the past 30y in US

  (Ogden et al., 2002).

- **61% of adults & 22% of children are overweight/obese in Ireland (Oireachtas Report, 2011).**

Childhood Obesity

- **An obese/overweight child is likely to be an overweight/obese adult (e.g. Guo et al., 2002).**

- **Obesity in adulthood – poorer quality of life, high health care costs, higher morbidity & mortality etc. (Cappuccio et al., 2008).**

Sleep duration & Obesity

The Observation:

- **Increasing overweight/obesity has coincided with decreasing sleep duration (SD)**

(e.g. Patel & Hu, 2008).

Sleep duration & Obesity

The Research:

- **Short sleep duration (SSD) is predictive of adiposity in children at 3y** **(Taveras et al., 2008).**

- **1 hour decrease in SD at 10y**

  → doubled the risk of being obese at 13y

  (Seegers et al.,2011).

- **SSD in childhood**

  → predictive of adult BMI

  → increases risk of adult obesity

  (Landhuis et al., 2008).

Paradox?

- **Paradoxical association between sleep duration & obesity?**

  Sleep is linked to low energy expenditure thus it should surely confer a greater risk of obesity?

- **In fact, lack of sleep is associated with overweight/obesity**

  (Nielsen, Danielsen & Sorensen, 2011).

Mechanism

- **The Proposed Mechanism:**
  - **SSD linked to reciprocal changes in leptin & ghrelin levels**
  - **↑ ghrelin (hunger stimulating hormone)**
  - **↓ leptin (appetite suppressing hormone)**
  - **↑ appetite**

(Vgontzas et al., 2003)

- **Essentially, SSD can indirectly ↑ appetite thus leading to overweight/obesity.**

Aim

- **SSD confers greater risk of overweight & obesity in adults, adolescents & children.**
- **Little attempt to investigate this phenomenon in infants.**
- **Aim: investigate whether SSD is linked to overweight/obesity in infants at 9 months.**

Method

- **The first wave of the GUI infant cohort (*n* = 11,134) was analysed.**

- **Parent-report questionnaires:**
  - **health**
  - **sleeping habits**
  - **objective measures of height & weight etc.**

- **Exclusion criteria:**
  - **poor health status**
  - **sleeping problems etc.**
  - ***n* = 8,895.**

Method

- **Multivariate regression analysis of:**
  - **infant body mass index (BMI; measured)**
  - **weight-to-length ratio (WTLR)**
  - **weight gain at 9 months**

- **The regression model adjusted for known covariates of sleep and weight including;**
  - **breastfeeding**
  - **mother's BMI & ethnicity**
  - **infants' tea consumption, sleep disturbances etc.**

Results

Table 1. Descriptive statistics for Infants

Variables:	Mean (SD) [Range]
Sex – Girls	4,371 (49.14%)
Sex – Boys	4,524 (50.86%)
Day Sleep – hours	2.45 (0.98) [0.00 – 6.00]
Night Sleep – hours	10.6 (1.37) [4.00 – 12.00]
Total Sleep – hours	13.05 (1.64) [4.00 – 18.00]
BMI	18.11 (1.78) [10.39 – 34.47]
WTLR	0.13 (0.01) [0.07 – 0.26]
Weight at 9 months – kilos	9.23 (1.13) [4.00 – 16.66]
Weight Gain – kilos	6.3 (1.06) [2.35 – 13.16]

Results

Infant classification according to UK-WHO growth charts

Weight Category	Centile	% of Infants
Normal	< 85th	59.43%
Overweight	>85th but < 90th	24.84%
Obese	> 90th	15.73%

(HSE, 2013)

Results – "Normal" vs Overweight & Obese

- **Each hour less of <u>day-sleep</u> → 9% more likely to be overweight/obese**
- **Each hour less of <u>total-sleep</u> → 4% more likely to be overweight/obese**
- **Not significant association between night-sleep & overweight/obesity**

Results - BMI

- **Regression results:**
  - **Day-sleep is predictive of infant's BMI**
  - **(beta coefficient= -0.05, p= 0.02).**

- **However, total & night sleep were not associated with infant's BMI.**

- **Day, night & total-sleep did not significantly explain the variance in weight gain or WTLR**

Discussion

- **SSD → significantly predictive of BMI in infants**
- **Each hour less of day-sleep & total-sleep → 9% & 4% increased risk of overweight/obesity**
- **Findings are in line with previous studies which also used BMI (in different age groups)**

  (e.g. Cappuccio et al., 2010).
- **SSD was not significantly related to WTLR & weight gain**

Strengths & Weaknesses

Weaknesses:

- **Cross-sectional nature**
- **BMI → difficult to correctly establish in infants (Wickramasinghe et al., 2013).**
- **Triceps skinfold thickness (Taveras et al, 2008).**

Strengths & Weaknesses

Strengths:

- **Large sample size → 8,895. vs. 915**

  (see Taveras et al., 2008)

- **Multiple measures of overweight/obesity (i.e. WTLR, BMI & weight gain).**

- **Breadth of confounding variables available for the regression analysis (e.g. breastfeeding, ethnicity, caffeine consumption etc.).**

Conclusion

“Prevention is better than cure”

- **SSD → significantly predictive of BMI in infants.**
- **SSD → greater risk of overweight/obesity in infants.**

- **Overweight/obese child is likely to be an overweight/obese adult! (Guo, et al., 2002).**

- **Educational interventions for parents.**
- **Focusing on regular, enforced bedtimes may mitigate this obesity risk factor (Liu, Zhang & Li, 2012).**

Conclusion

Thank you for listening!