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Title	Rethinking Obesity Hypoventilation Syndrome: is obesity the primary driver of hypoventilation?
Authors	Hamza, Zaineb
Publication date	2025
Original Citation	Macilwraith, Peter;Doherty, Liam;O'Boyle, Colm;O'Connor, Derbrenn (2025) 'Rethinking Obesity Hypoventilation Syndrome: is obesity the primary driver of hypoventilation?', UCC Student Medical Journal, 5, p.55. https://doi.org/10.33178/SMJ.2025.1.9
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.33178/SMJ.2025.1.9
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Download date	2026-11-06 13:28:22
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University College Cork, Ireland
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Rethinking Obesity Hypoventilation Syndrome: Is Obesity the Primary Driver of Hypoventilation?

PETER MACILWRAITH, DR. LIAM DOHERTY, MR. COLM O' BOYLE, & DERBRENN O' CONNOR

https://doi.org/10.33178/SMJ.2025.1.9

Abstract

INTRODUCTION: Obesity Hypoventilation Syndrome (OHS) is usually diagnosed following an acute admission with type 2 respiratory failure, or incidentally following overnight sleep studies in someone suspected of having Obstructive Sleep Apnoea. Obesity is widely considered to be the main causative factor in (OHS). It follows that with increasing Body Mass Index (BMI), evidence of nocturnal hypoxaemia would emerge strongly. We hypothesized that this assumption is not accurate and set out to investigate the relationship between BMI and nocturnal hypoventilation.

METHODS: We conducted a retrospective analysis of 770 bariatric patients with BMIs ranging from 35-82kg/m2..Using linear and multivariate regression analysis, we assessed the relationship between BMI and surrogate markers for nocturnal hypoventilation, including average SpO2, Lowest SpO2, Time spent with SpO2<90% (T90), AHI (Apnoea-Hypopnoea Index), and bicarbonate levels.

RESULTS: As expected, AHI increased with rising BMI, indicating a higher incidence and severity of Obstructive Sleep Apnoea as BMI increases. However, the correlation between BMI and hypoventilatory markers was weak: for instance, in BMI vs average SpO2 (r 2 =0.105, p=0). In Multivariate regression, BMI was only associated with AHI and Lowest SpO2, both of which are more characteristic of OSA rather than hypoventilation. Figure 1.

Univariate Regression Analysis				
BMI vs:	**R^2**	**Adjusted R^2**	**P value**	**Standard Error**
Age	0.0002	-0.0011	0.670	0.023
Gender	0.0001	-0.0012	0.781	0.590
Average SpO2	0.105	0.103	0.000	12.552
Lowest SpO2	0.1646	0.1626	0.000	3.636
T90	0.1022	0.0972	0.000	3.288
Log Transformed T90	0.127	0.1215	0.000	0.388
Venous Bicarbonate	0.0847	0.0657	0.040	0.259
AHI	0.114	0.1124	0.000	0.113
Supine AHI	0.061	0.0584	0.000	0.119
Anti-Depressant use	0.0012	-0.0002	0.349	0.580
Multivariate Regression Analysis				
Average SpO2	0.233	0.2227	0.137	19.90
Lowest SpO2	0.233	0.2227	**0.000**	6.134
AHI	0.233	0.2227	**0.033**	0.0297
Supine AHI	0.233	0.2227	0.106	0.022

Figure 1. Univariate and multivariate regression analyses showing that BMI was only associated with AHI and Lowest SpO2.

CONCLUSION: Our findings suggest that Obesity Hypoventilation Syndrome is not caused by obesity alone, as the name would suggest. Instead, it is likely to be due to a multitude of different factors, such as leptin resistance and variances in fat distribution. This study opens the door for further research to be done into the contributing causes of Obesity Hypoventilation Syndrome.

AFFILIATIONS: Dr. Liam Doherty, Department of Respiratory and Sleep Medicine, Bon Secours Cork, Mr. Colm O' Boyle, Department of General and Bariatric Surgery, Bon Secours Cork, UCC School of Medicine, Department of Research.