Can You Die From Obstructive Sleep Apnoea Syndrome (OSAS)?

**Abstract:**

Obstructive Sleep Apnoea Syndrome (OSAS) is a common condition with a prevalence of 2 to 4% in the adult population. It is of major public health concern owing to its diverse consequences which range from cognitive decline, daytime somnolence, cardiovascular disease and metabolic dysregulation. It is characterised by recurrent episodes of apnoea during sleep due to collapse of the pharyngeal airway. This results in swinging increases in negative intrathoracic pressure, fragmented sleep and intermittent hypoxia. A large body of evidence shows strong associations between OSAS and cardiovascular diseases, particularly hypertension. Associations are also seen with coronary artery disease, arrhythmias, heart failure and stroke. Overactivity of the sympathetic nervous system, systemic inflammation and endothelial dysfunction are thought to be the most important pathophysiological pathways involved. The prevalence of OSAS in patients with hypertension is approximately 45%. A high prevalence is also seen in myocardial infarction (65%), stroke (62%), atrial fibrillation (49%) and heart failure (30-40%) 

All cause and cardiovascular mortality are increased in patients with OSAS. In Ireland over 9000 deaths are attributed to cardiovascular causes each year. One would expect a high percentage of cardiovascular deaths also have OSAS as a contributing factor. By the CSO data from 2008-2011 reveal two deaths with OSAS documented as a direct cause and 52 deaths with OSAS as a contributory cause. We contacted the Central Statistics Office (CSO) and obtained relevant mention of OSAS on death certificates. We surveyed doctors on their view of OSAS-related deaths. CSO data from 2008-2011 reveals 185 of 286 doctors (65%) believe OSAS can be a direct cause of death and 177 (96%) believe OSAS can be an indirect cause of death. Only 22 (12%) had put down OSAS as a cause of death, OSAS is seldom recorded on death certificates. This is at odds with epidemiological forecasts and contrary to an opinion poll from a selection of doctors.

**Introduction**

Obstructive Sleep Apnoea Syndrome (OSAS) is a common condition with a prevalence of 2 to 4% in the adult population. It is of major public health concern owing to its diverse consequences which range from cognitive decline, daytime somnolence, cardiovascular disease and metabolic dysregulation. It is characterised by recurrent episodes of apnoea during sleep due to collapse of the pharyngeal airway. This results in swinging increases in negative intrathoracic pressure, fragmented sleep and intermittent hypoxia. A large body of evidence shows strong associations between OSAS and cardiovascular diseases, particularly hypertension. Associations are also seen with coronary artery disease, arrhythmias, heart failure and stroke. Overactivity of the sympathetic nervous system, systemic inflammation and endothelial dysfunction are thought to be the most important pathophysiological pathways involved. The prevalence of OSAS in patients with hypertension is approximately 45%. A high prevalence is also seen in myocardial infarction (65%), stroke (62%), atrial fibrillation (49%) and heart failure (30-40%). All cause and cardiovascular mortality are increased in patients with OSAS.

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**Methods**

We contacted the Central Statistics Office (CSO). Data was obtained with relevant mention of OSAS on national death certificates. This included data from 2008 to 2011 inclusive. The data provided us with the different sub-categories of causes of death which are divided into four sections on Irish death certificates - section 1; the disease or condition directly leading to death, section 2; significant other condition contributing to death but not related to the cause. We sent an email survey to both NCHDs (Non-Consultant Hospital Doctors) and consultant doctors. The NCHDs included 2013 graduates from National University of Ireland, Cork (NUI) and University College Cork (UCC) and Specialist Registrars (SpRs) in Cardiology. The consultant group consisted of Consultant Pathologists, Cardiologists and Respiratory Physicians. The purpose of the email survey was to examine doctors awareness of the association between OSAS and cardiovascular death. A simple questionnaire was sent comprising of three questions: A: Can OSAS be a direct cause of death? B: Can OSAS be an indirect cause of death? C: Have you ever recorded OSAS as a cause of death on a death certificate? As there is no NCHD certification on OSAS, we were interested in the data from four Irish Continuous Positive Airway Pressure (CPAP) suppliers on the numbers of deaths in patients with a diagnosis of OSAS who have been prescribed CPAP. The suppliers included ResMed Incorporated, Omega Systems Limited, Medicare and Direct Medical. This information reflects a three year period from 2011 to 2013 inclusive.

**Results**

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**Discussion**

Over the four year period, OSAS was mentioned infrequently on Irish death certification and predominantly as a significant co-morbid condition rather than as a direct cause of death. This does not appear to be due to lack of awareness of the association between OSAS and cardiovascular disease amongst doctors most used to treating patients with OSAS. CSO data from 2011 reported that 27 death certificates had mentioned OSAS. Data obtained from only four of at least eight suppliers of CPAP, suggested 29 people with OSAS died in 2011 probably a significant underestimation. Furthermore, it could be argued that those on CPAP are less likely to die because their OSAS is treated compared to those who reject CPAP. Recent data from the NCHDs at the end of 2013 revealed that 2013 graduates from National University of Ireland, Cork (NUI) and University College Cork (UCC) and Specialist Registrars (SpRs) in Cardiology SpRs were the least likely group to feel OSAS can cause death.

**CPAP Suppliers**

Information could only be obtained from four of eight Irish CPAP suppliers. This provided us with a probable underestimate of the numbers of deaths per annum in patients requiring CPAP treatment (Table 3). Over a three year period, there were 94 deaths recorded.

**Conclusion**

There are several possible explanations for this discrepancy. One argument is that OSAS is forgotten or not mentioned on a death certificate due to lack of awareness of the association between OSAS and cardiovascular disease amongst doctors. This could be the reason for the low percentage of those surveyed who have mentioned OSAS on a death certificate. On the other hand, death certificates of patients with known OSAS may not be completed by our surveyed group but by doctors unaware of the pre-death diagnosis or the known link between OSAS and cardiovascular disease. Alternatively, it could be that OSAS indeed contributes to cardiovascular death but the condition remains undiagnosed and perhaps not even suspected in the majority, and therefore cannot be documented. Least likely of all is that patients with OSAS do not die. The major question is whether OSAS is indeed capable of producing mortality. Some argue that patients who present with OSAS often have pre-existing risk factors for cardiovascular death and that OSAS is an associated phenomenon. On the other hand, there is a very reasonable hypothesis for why one might die from OSAS directly or indirectly. Anecdotally, apnoeic episodes can last over a minute in severe cases, leading to a drop in oxygen saturation to the low sixty percent range. This could easily lead to fatal outcome.
canicard ischaemia. To overcome obstructive apnoea, the sufferer has to produce huge negative intra-thoracic pressures in order to suck the airways open. This extreme negative airway pressure transmits to the heart impairing ventricular function and reducing stroke volume. The apnoea generally terminates in an arousal from sleep. Each arousal is accompanied by a significant jump in blood pressure, a tachycardia, and a surge in excreted catecholamines. The body therefore takes several hits to the cardiovascular system each capable of adversely affecting survival.

Sympathetic nervous system over activity has been well documented in OSAS and has been found to cause systemic arterial hypertension, a major risk factor for cardiovascular death. There is some evidence to suggest a causal relationship between OSAS and the development of atherosclerosis. Intermittent hypoxia has been shown to trigger activation of the transcription factor Nuclear Factor Kappa B (NF-kB) which is a master regulator of the inflammatory response with many pathophysiological consequences under its control. Clinical studies however have yet to show that coronary artery disease can be directly caused by OSAS. An interesting study by Kent et al demonstrated higher coronary plaque volume in patients with higher Apnoa-Hypnoea Indexes (AHI) suggesting that OSAS severity is a major predictor of atherosclerotic burden. Cardiac arrhythmias are common in patients with sleep-disordered breathing, their significance being highly dependent on the presence of underlying heart disease. Sleep is usually accompanied by a reduction in Premature Ventricular Contractions (PVC) indicating that a high number of nocturnal PVCs may be a marker of sleep-disorders/OSAS. In heart failure patients, OSAS and central sleep apnoea (CSA) independently increase the risk of malignant ventricular arrhythmias. A recent study by Gami et al looked at the risk of sudden cardiac death in patients with obstructive sleep apnoea. An important pathophysiological feature of OSAS is strongly predicted SCD independent of well established risk factors. OSAS is also strongly linked with obesity, type 2 diabetes mellitus, dyslipidaemia and heart failure although a causal relationship is yet to be clearly demonstrated.

In Korea, Lee et al looked at the mortality of over 2200 patients with OSAS. They found a four-fold increase in cardiovascular mortality after adjusting for known cardiovascular risk factors including hypertension, stroke, diabetes mellitus and cardiovascular disease. In an Irish study looking at the protective effect of CPAP therapy on cardiovascular outcomes in patients with severe OSAS, four of the nine patients who died and had never used CPAP therapy did so unexpectedly with no documented cardiovascular disease. Several other papers conclude that OSAS is an independent risk factor for cardiovascular death with a hazard ratio ranging from 1.6 to 6.

Other studies conclude that cardiovascular mortality is not increased in patients with OSAS. Young et al followed over 1500 patients with sleep disordered breathing and found that OSAS had no significant effect on cardiovascular mortality after adjusting for other cardiovascular risk factors. OSAS is very easily treated with continuous positive airway pressure (CPAP) therapy with strong suggestions from the literature that CPAP has a cardio-protective effect. By documenting OSAS on death certificates when appropriate, it raises awareness of the condition and its profile as a public health problem. Current death certification in Ireland rarely reflects the proven association between OSAS and cardiovascular disease and death despite an apparent awareness of this association among doctors.

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References
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