

Review Article

Sleep and coronary artery disease risk

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Abstract

Sleep deprivation has been a noticeable phenomenon on the rise. Accompaniment of the “Epidemiologic Transition” in the developing economies in Asia, it has become a matter of concern linked as it is with Coronary Artery Disease (CAD). The interrelationships are examined. Secondly, Obstructive Sleep Apnoea (OSA), a form of sleep disordered breathing, its pathology, its consequences such as proneness to CAD and treatment modalities are discussed. The preventive measures and therapeutic strategies are evaluated. Cardiovascular risk reduction in the context of either is emphasised.

Key words: Coronary artery disease; sleep deprivation; sleep disorders; life style induced illness; obstructive sleep apnea.

Cardiovascular disease remains the leading cause of death in the world and approximately 80% of all cardiovascular deaths occur in low income and middle income countries and at a younger age in comparison to high income countries [1]. Coronary artery disease has been for long considered to be multi-factorial, with an ever-increasing list of risk factors, many known and some less known risk factors [2]. The epidemiologic transition [3] indicates changes in the patterns of disease as a result of social and socioeconomic developments in different countries and the regions of the world, offset by changes in the risk factor profiles, particularly obesity and diabetes mellitus. Global nutrition transition [4] in developing countries, characterised by rapid shifts in food energy imbalance, resulting in over-nutrition and almost a pandemic of obesity is now well recognised. In fact, it has been pointed out that the developing societies are faced with a hostile cardiovascular environment characterised by changes in diet, exercise, effects of tobacco, socioeconomic stressors and economic constraints [1]. Rapid shifts in diet and activity with increase in rates of overweight and obesity are widely documented from urban and rural areas of poorest

countries in South Asia [5]. Post-industrialisation, life style has shifted from regular and consistent hours to shifts and part-time work. The present article dwells on two major sleep related problems witnessed in today's world and its link to coronary artery disease.

(A) Sleep deprivation

Distracting and sedentary lifestyle, in hand technologies have contributed to the “sleep famine”. Night shifts, 24-hour grocery stores, restaurants and business, city noise, computers, all-time television channels, urban-metropolitan night life may keep individuals awake till morning. In short, sleep deprivation is an anticipated product of non-stop twenty four hours society. In such individuals, lack of sleep has been described to cause fatigue, decreased alertness, reduced attention span, reduced reaction time, poor memory and concentration affecting decision-making and even a loss of motivation, affecting work efficiency. They tend to be accident prone on roads and can cause work injuries. Sleep modulates a major component of neuro-endocrine system- sympathovagal balance and

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hormonal balance [6]: cortisol, thyroid stimulating hormone, glucose levels, insulin sensitivity, leptin, GHrelin. It is thus apparent that recurrent sleep loss and cumulative effects of sleep loss may not only affect day to day well being and productivity, but may have far reaching consequences on life expectancy, as insufficient sleep alters established cardiovascular risk factors in a direction that is known to increase the risk of cardiac morbidity. The potential impact of recurrent sleep loss on the risk for obesity and diabetes mellitus [7] has only recently been acknowledged. The erratic life style and schedules bring long working schedules leading to acute and chronic sleep deprivation and poor quality of sleep. Sleep deprivation alters the cardiovascular reactivity to acute stressors. Long working hours [8] and shift work [9] also as pointed out subsequently increase the risk of cardiovascular disease. New insights regarding the emerging links among sleep deprivation, stress and cardiovascular risk have emerged: exaggerated cardiovascular reactivity to mental stress has been linked to increased cardiovascular disease [10]. It has been pointed out that insufficient sleep, over a prolonged period, may have an adverse effect on physical (including cardiovascular) and psychological health, as observed in Scottish men and women [11]. Long working hours and evidence of increased cardiovascular disease was reported [8] from Korea noting an association between shift work and vascular events like myocardial infarction, ischaemic stroke, any coronary event. Likelihood of hypertension in Blacks who had short sleep (less than 6 hours) or long (more than 8 hours), than white counterparts [12], have been noted. Data from non-Western population is rather limited. Both short (less than 5 hours) and long (more than 9 hours) sleep durations were found to be positively but modestly associated with coronary heart disease mortality in Chinese adults in Singapore, independent of smoking, alcohol intake and body mass index [13]. It is considered that sleep duration may be an important marker for cardiovascular disease. Stable sleep in general populations is more than 45%. Reductions in stable sleep have been reported in disorders/diseases characterised by impaired autonomic function and poor sleep quality such as (a) obstructive/central sleep apnoea, (b) medication free major depression, and (c) fibromyalgia.

Chronic sleep loss thus can arise as a consequence

of voluntary bedtime restriction or as a result of snoring and disordered breathing [14] which merits being considered at length, in view of its clinical importance and significance, since untreated sleep apnoea can increase the risk of hypertension, myocardial infarction, cerebrovascular stroke, obesity/diabetes mellitus, arrhythmias and worsening of congestive heart failure [15,16].

(B) Sleep disordered breathing: sleep apnoea

Sleep is a temporary state of unconsciousness that can be interrupted by external stimuli. The stage of sleep is defined by a combination of electroencephalographic (EEG), electromyographic (EMG) and electro-oculographic criteria. Two phases of sleep exist: 'quiet' or non-rapid eye movement sleep (non-REM) and 'active' or rapid eye movement sleep (REM). Arousals are brief neurological awakenings and are a normal feature of sleep. They may be either cortical or sub-cortical and the sleeping individual is usually not aware of them. They may happen either spontaneously or in response to various external stimuli, such as sound or internal stimuli, such as periodic leg movements or sleep apnoea.

Snoring is the low frequency sound produced by vibration of the upper airway walls during partial upper airway obstruction. These vibrations usually take place in the soft palate or tonsils, epiglottis and the base of the tongue [17]. Theoretical modelling has shown that at critical inspiratory flow rates, the upper airway becomes unstable with repetitive partial airway collapse, which generates the sound of snoring [18].

Sleep disorders are very common and up to 20 percent of the adult population have some form of sleep disorder. At least 90 different sleep disorders have been described, and these are defined in the widely used International Classification of Sleep Disorders produced by the American Sleep Disorder Association [19].

Obstructive sleep apnoea (OSA) is a condition characterised by repetitive upper airway obstruction leading to sleep fragmentation, cardiovascular stimulation and oxygen desaturation during sleep. Together, these lead to symptoms such as snoring, unrefreshing sleep, excessive daytime sleepiness

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