Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Prevalence of metabolic syndrome in commercial truck drivers: A review

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ARTICLE INFO

Keywords:
Metabolic syndrome
Commercial driver
Truck driver
Occupational health
Obesity

ABSTRACT

Introduction: The lifestyle of commercial truck drivers may increase this occupational groups' susceptibility to health disparities, including obesity, cardiovascular and metabolic disorders. Identification of Metabolic Syndrome (MetSyn) in commercial truck drivers may aid in early recognition of risk for cardiovascular disease to support primary intervention techniques. Epidemiological studies have yet to evaluate MetSyn among commercial drivers; however, studies have examined the prevalence of the individual components.

Objective: To examine the prevalence of components of the MetSyn among commercial truck drivers, compare to those of the general U.S. adult population, and identify the most prevalent components to prioritize initiatives for health interventions.

Methods: A review of the literature was conducted that evaluated one or more MetSyn component in commercial truck drivers. Articles were collected from a Pub Med MEDLINE search that was limited to research conducted on commercial truck drivers published within the previous 10 years (2005–2015). Twenty-seven articles met the criteria for inclusion in this systematic review.

Results: All studies were original reports with sample sizes ranging from 30 to 88,246 subjects, all of which were commercial truck drivers. The mean driver age range in the studies reviewed was 38–48 years of age. Studies included cross-sectional investigations, longitudinal, cohort, naturalistic, descriptive, and case-control studies. Abdominal obesity may affect 19–74% of commercial truck drivers; overweight and obesity, 23–53% and 15–70% of drivers, respectively; hypertension, 5–48% of drivers; dyslipidemia may affect 7–46% of drivers; and diabetes, and 1–22% of commercial truck drivers.

Conclusions: Abdominal obesity is the most prevalent MetSyn component and risk factor for CVD among commercial truck drivers. Additional, research is necessary to evaluate large, representative groups of drivers and to collect measured indices of MetSyn to more accurately predict MetSyn prevalence among this group. Future health intervention studies for commercial truck drivers should focus on obesity prevention, management and treatment.

1. Introduction

1.1. Commercial truck drivers

Commercial truck drivers play a crucial role in the flow of commerce and goods across America. In 2008, the trucking industry hauled 68.8% of all the tons of freight transported in the U.S., equating to 10.2 billion tons of freight hauled by over 29 million trucks and

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http://dx.doi.org/10.1016/j.jth.2016.06.012
2214-1405/

3.4 million truck drivers (Trucking Trends, 2008–2009). The trucking industry is an astounding $660 billion industry; representing 83.1% of the nation's freight bill (U.S. Freight Transportation Forecast to…2020). The typical lifestyle of a commercial motor vehicle (CMV) truck driver may include irregular work and sleep hours, physical inactivity, poor eating habits and nutrition, and mental and physical stress. Since the update to the Hours of Service regulations in 2011, a long-haul driver may spend up to 11 h of driving and 14 h on-duty per day, and up to 60 total driving hours in a 7-day period or 70 driving hours in an 8-day period (Hours of Service Regulations, 2011). Truck drivers typically work irregular schedules and must frequently invert their sleep-wake cycle, sleeping during the day and remaining awake at night. Their day to night work schedule can also change frequently, depending on work demand. In order to cope with these schedule demands, professional drivers may be unable to obtain enough sleep and thus suffer partial sleep deprivation (Kecklund and Akerstedt, 2000). Long hours spent driving and inadequate sleep can limit motivation and opportunities for exercise, in addition to encouraging unhealthy eating habits. Drivers may spend the majority of their day in their truck cab and sleeper berth, further constraining their daily physical activity. To maximize their federally-restricted driving hours, truck drivers may snack all day to keep their energy up and consume one large meal at the end of their shift. This group is also restricted to eating at the restaurants they are able to access with their large trucks, which primarily includes truck stop diners and fast food restaurants. The limited cab space inside the truck also makes it difficult to store and prepare healthier meals on the road. CMV truck drivers are subjected to a number of physical and psychological stresses inherent in their occupation, including work overload, high mileage exposure, and irregular work/rest schedules. They are also commonly isolated at work and may be exposed to daily frustrations while driving (da Silva-Junior et al., 2009). These combined circumstances have major implications for the truck driving industry and the result can compromise roadway safety and the drivers' long-term health (Dinges, 1995; Lyznicki et al., 1998).

1.2. Commercial truck drivers and health risks

The unique demands of CMV truck driving result in elevated levels of occupational fatalities, injuries, and lifestyle-related illnesses. Truck drivers account for 12% of all work-place fatalities in the Unites States and consistently rank among the top three occupations in total nonfatal injuries and illnesses (Burea of Labor Statistics, 2009a, 2009b). Additionally, these unique lifestyle characteristics may increase their susceptibility to many health risks, including obesity, cardiovascular disease (CVD), and metabolic disorders. Existing evidence suggests that commercial truck drivers may have overweight and obesity rates (body mass index [BMI] ≥ 25 kg/m^2 and ≥ 30 kg/m^2, respectively) that far exceed that of the general American population (Thiese et al., 2015a; Harshman et al., 2008; Flegal et al., 2010). Obesity is linked to heart disease, the number-one killer of Americans, in addition to increased prevalence of hypertension (HTN), dyslipidemia, type II insulin dependent diabetes mellitus (DM), stroke, osteoarthritis, sleep apnea, and several major cancers (Anon.,1998). According to the World Health Organization (2016), approximately 90% of people living with type II insulin dependent DM are overweight or obese (WHO Fact Sheet); obesity puts pressure on the body's ability to use insulin to properly control blood sugar levels, resulting in insulin resistance. The health consequences of obesity and associated disorders may be causing CMV truck drivers to live shortened lives; evidence suggests that drivers may have a 12–19 year reduced life expectancy compared to the general U.S. male population (Saltzman and Belzer, 2007).

In addition to the lifestyle and environmental factors that influence CMV drivers' risk for obesity and cardiometabolic disorders, genetics and disease interactions may also play a role, as well as complex interactions between factors. There is substantial evidence for the heritability of obesity, and research has identified genes with significant roles in the etiology of obesity; although little is known regarding the specific mechanisms that lead to the obesity phenotype (Albuquerque et al., 2015). Additionally, other diseases, such as hypothyroidism, and treatments such as steroids and antidepressants may also cause weight gain.

1.3. Metabolic syndrome

Many definitions of metabolic syndrome (MetSyn) with slightly different characterizations, have been proposed; however, the most commonly used clinical definition in the U.S. is that of the National Cholesterol Education Program Adult Treatment Panel (NCEP ATP) III that includes any three component combination of the following 5 risk factors: elevated fasting glucose (≥ 110 mg/dL), elevated waist circumference (>102 cm for men, >88 cm for women), hypertension ($\geq 130/\geq 85$ mm Hg), elevated triglycerides (TG) (≥ 150 mg/dL), and low high density lipoprotein-cholesterol (HDL-C) (<40 mg/dL for men, <50 mg/dL for women) (Grundy et al., 2004). This review paper will focus on the NCEP ATP III markers that define the MetSyn to evaluate the prevalence of MetSyn components in the CMV truck driver population.

Based on the NCEP ATP III guidelines, more than one-third of American adults may be characterized as having MetSyn (Ervin, 2009). The National Health Statistics Reports examined the prevalence of the individual risk factors for MetSyn as well as the prevalence of MetSyn using the National Health and Nutrition Examination Survey (NHANES) 2003–2006. NHANES is a cross-sectional nationally representative health and nutrition examination survey conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics (Ervin, 2009). Age-adjusted estimates indicate that 34% of the U.S. population 20 years of age and over meets the NCEP ATP III criteria for MetSyn. This survey also found that abdominal obesity, HTN, and hyperglycemia are the most frequently occurring risk factors for MetSyn, with prevalence rates of 53%, 40%, and 39%, respectively. Elevated TG and low HDL-C were noted less frequently in NHANES, with U.S. prevalence rates of 31% and 25%, respectively. These findings indicate that MetSyn increases with age and BMI. Considering the average age of truck drivers is older than the U.S. labor force (49–52 years vs. 40.2 years, respectively) (American Trucking Association 2014 Driver Compensation Study), the majority of commercial truck drivers are male (95.1%) (Trucking Trends, 2008–2009) and overweight or obese (Harshman et al., 2008; Thiese et al., 2015a), it is hypothesized that the prevalence of MetSyn in this group may be higher than that of the U.S. population, but has yet to be elucidated.

The pathogenesis of the MetSyn is complex and not yet fully elucidated but appears to have two primary points of origin that include obesity and insulin resistance. Other factors that have been implicated as contributors to the development of MetSyn include age, pro-inflammatory state, and abnormalities in hormones such as C-reactive protein, and growth hormone. The NCEP ATP III considers obesity the main contributing factor for the development of MetSyn. Obesity contributes to HTN, dyslipidemia, hyperglycemia, and is associated with risk for CVD. Abdominal obesity, specifically, is associated with metabolic dysregulation, as excess adipose tissue in the abdominal

Please cite this article as: Erin Mabry, J., et al., Prevalence of metabolic syndrome in commercial truck drivers: A review. Journal of Transport & Health (2016), http://dx.doi.org/10.1016/j.jth.2016.06.012