Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/6797
DOI URL: http://dx.doi.org/10.21474/IJAR01/6797

RESEARCH ARTICLE

CONTRIBUTION OF STRESS AND DURATION OF YEARS OF SERVICE ON METABOLIC SYNDROME AMONG OCCUPATIONAL DRIVERS.

Dr. S. Sarumathy and Dr. L. Santhanalakshmi.

Manuscript Info

Manuscript History

Received: 20 January 2018
Final Accepted: 22 February 2018
Published: March 2018

Abstract

Introduction:-

The metabolic syndrome has received a great deal of attention in the last few decades. Metabolic syndrome is a group of anthropological and biochemical abnormalities that predispose a person to cardiovascular disease, Type 2 Diabetes Mellitus and stroke. It is a group of interrelated abnormalities namely central obesity, raised blood pressure, high triglycerides, decreased levels of high-density lipoprotein (HDL) cholesterol and elevated fasting glucose levels. This is a common metabolic disorder which increases in prevalence as the population becomes more obese.

The prevalence of metabolic syndrome in developing countries is also promptly increasing. A study by **Misra A and Khurana L** in 2008 showed that the situation is similar in India with the recent data suggesting that upto one fourth and one third Indian adult population suffer from metabolic syndrome.

It is obvious that occupational drivers are associated with considerable changes in lifestyle habits. The aim of the present study is to evaluate the contribution of stress and duration of years of service on metabolic syndrome among occupational drivers in Madurai district.

Ncep:Atpiii 2001-Criteria:-

According to it, metabolic syndrome is present if three or more of the following five criteria are met:
Blood pressure: systolic ≥ 130 or diastolic ≥ 85 mmHg .
Fasting triglyceride (TG) level : Triglycerides ≥150mg/dl.

Waist circumference :>40 inches (male), >35 inches (female)

Fasting plasma glucose: ≥ 110mg/dl.

Fasting HDL level: <50 mg/dl (male), < 40 mg/dl (female)

Modified ncep atpiii-criteria for the metabolic Syndrome:-

In 2005, the American Heart Association and the National Heart, Lung and Blood Institute (AHA / NHLBI) conducted a revision of the metabolic syndrome diagnostic criteria - modified NCEP ATPIII criteria.
The important changes in the modified AHA/NHLBI definition, ATPIII

Corresponding Author:- S. Sarumathy.

2005Grundy et al., 2005 include:-

1. Addressing the ethnic-specific variation in central obesity by using the WHO recommendations for waist circumference: 90 cm in Asian men, 80 cm in Asian women.
2. Decreasing the threshold for impaired fasting glucose to ≥ 100mg/dl, in accordance with the American Diabetes Association (ADA) revised definition **Genuth et al., 2003**.
3. Permitting individual components to be counted abnormal if patients are receiving drug treatment for these conditions.

Signs And Symptoms:-

1. Central obesity .
2. Elevated blood pressure.
3. Fasting hyperglycemia- impaired fasting glucose or impaired glucosetolerance, Type 2 Diabetes Mellitus.
4. Elevated triglycerides.
5. Reduced High-density lipoprotein cholesterol.

Pathophysiology:-

Metabolic Syndrome is the result of complex interplay between genetic and environmental factors. Understanding in detail about the pathophysiology of this syndrome is important in order to identify people at risk of developing cardiovascular disease which will help in early intervention for prevention **Lann D, LeRoith D 2007**.

Functional aberrations seen in metabolic Syndrome are:

1. Insulin resistance
2. Dyslipidemia
3. Central obesity
4. Hypertension
5. Proinflammatory state
6. Prothrombotic state

Stress:-

Stress is defined as a state in which harmony or homeostasis is actually threatened or perceived to be so evoked by various cognitive (e.g., anxiety, fear, depression) and/or somatic stressors (e.g., pain, lipid accumulation, inflammation) when the hazard to homeostasis exceeds the threshold.

Psychosocial stress also plays a role in the pathogenesis of the metabolic syndrome. Continuous exposure to work-related stress can alter autonomic nervous system and neuroendocrine systems that control the reactions to stress. The neuroendocrine responses from the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic nervous system stimulate stress-related cortisol secretion. Stress-related cortisol secretion has been linked with individual components of the metabolic syndrome. Hence, chronic stress at work is a major risk factor for the metabolic syndrome.

This contributes to the development ofchronic diseases such as dyslipidemia, abdominal obesity, hypertension and insulin resistance.

There are reports indicating that despite regular exercise and a proper diet, subjects under prolonged stress developed metabolic alterations including distinctive central obesity, biochemical changes and a slight hypertension towards the metabolic syndrome **Branth S et al., 2007**.

Occupational Drivers:-

Epidemiological studies have been done extensively to determine the prevalence and associated risk factors of the metabolic syndrome in the general population, yet less attention has been paid to its prevalence and risk factors for specific occupational groups such as in occupational drivers.

The reasons for excess risk of metabolic syndrome in occupational drivers are,

Lots of work and little pay:-
Drivers are expected to drive up to fourteen hours per day, receiving roughly ten hours off prior to the beginning of the next shift. Even though law regulating the amount of driving over the course of a day and week exist, these rules are usually bent and broken.

Drivers rarely receive more than one day of work off a week. The chance of death on the job is extremely high.
The work shift is also a risk factor for chronic diseases, like cardiovascular disease and metabolic disorders, because of altered circadian rhythm, lifestyle change and stress at work **Frost P et al., 2009.**

Unhealthy food habits:-
In addition to long hours, drivers rarely eat healthy food preparation. They often take high calorie diet. High carbohydrate meal consumption is related to hyperinsulinaemia, hyperglycaemia and hypertriglycemia that are well known to predict an increase of body fat in working individuals .The hours spent in sitting along with poor food choices make them obese.

Lack of regular exercise:-
Most drivers are poorly educated and they are not aware of the importance of doing regular exercises. They hardly find time to do regular exercise which in turn increases the chance of obesity.

Smoking & alcohol intake:-
In order to overcome the stress in their work place, drivers are prone to develop the habit of smoking and alcohol intake.

Hence it is essential to initiate early detection of metabolic syndrome in this high risk population groups so that preventive measures can minimize the consequences. The aim of this study was to estimate the occurrence of metabolic syndrome among occupational drivers and studying the contribution of stress and duration of years of service on metabolic syndrome among them.

Materials and Methods:-

Design of the study:-
It is a cross sectional study.

Place of study:-
The study was conducted in Jeyavilas bus depot, Madurai.

Collaborating Department:-
Department of Biochemistry, Madurai Medical College, Madurai.

Study subjects:-
A total of 100 subjects in the age group of 25 to 60 years were selected from Jeyavilas bus depot, Madurai.

Inclusion criteria:-
Men who were drivers by occupation for > 5 years with minimum 8 hours of driving per day.
Age group 25-60 years.

Exclusion criteria:-
Females.
Endocrine disorders like – Hypothyroidism, Cushing‟s disease.
Chronic renal disease.
On medication – Steroid, Beta blokers, Thiazides etc.
Ascites.

Materials used for study:-
1. Proforma – to record the anthropometric measurements of the subjects and the clinical findings.
2. Perceived stress scale 10 (PSS 10) questionnaire in Tamil – to assess the stress level.
3. Portable weighing machine – to record the body weight in kilograms.

4. Stadiometer – to measure the standing height in centimeters.
5. On elastic inch tape - to measure Waist circumference and Hip circumference in centimeters.
6. Standardized mercury sphygmomanometer – to record the Blood Pressure in mm of Hg.
7. EM 360 Fully Automated analyzer - for estimating plasma glucose and lipid profile.

Methodology:-

The study was initiated with the approval of Institutional ethical committee, Madurai Medical College, Madurai. The study was carried out after explaining the procedures in detail and getting written informed consent from the subjects.

The experimental protocol includes,

1. Recording of a detailed history including family history of Cardiovascular disease, Hypertension, Diabetes Mellitus, history of smoking, alcohol consumption, physical activity and number of years spent in driving as an occupation.
2. Perceived stress level was assessed using a standard questionnaire-Perceived stress scale 10 (PSS 10). Subjects were asked to fill up the PSS 10 questionnaire.

Waist circumference was measured to the nearest 0.5 cm with an inch tape at the point midpoint between the lower rib margin and the iliac crest at the end of normal expiration with the subject in standing position. According to the National Cholesterol Education Programme Adult Treatment Panel III (2001)Waist circumference ≥ 90 cm in males, ≥ 80 cm in females is considered as central obesity.

Measurement of Blood pressure:-

Documentation of blood pressure was done using the standard sphygmomanometer with cuff size 25×12.5cms. Before taking measurement the subject was seated quietly for 15 minutes in a quiet room with a comfortable room temperature. For final analysis, the mean value of the two blood pressure recordings obtained at 5 minutes interval from the left arm of the subjects in the sitting posture is taken.

Blood investigations:-

After an overnight fasting for 8-10 hours blood sample was collected.
The following investigations were done :

For venous blood collection antecubital vein of front of forearm was selected. Skin is sterilized over the vein with a spirit cotton swab. A disposable sterile needle fixed to a disposable syringe of 10ml capacity and the desired amount of blood was collected.

1. Fasting Plasma Glucose.
2. For separation of serum, blood taken into a plain vial is first allowed to clot and then centrifuged at 3000 rpm for 5 minutes. This separated serum was used to estimate:
3. HDL cholesterol
4. Triglycerides
5. Fasting plasma sugar was estimatedbyglucoseperoxidase (GOD-POD) method.

Serum HDL-cholesterol and Triglycerides were measured enzymatic method using an auto-analyser (ERBA-XL-300). By oxidase direct method

Estimation Of Triglycerides:-
Method:-
GPO-PAP method, endpoint

Methodology:-
Colorimetric, enzymatic method with glycerol phosphate oxidase.

Estimation Of Hdl Cholesterol:-
Method:-
Phosphotungstic acid method, endpoint

Estimation Of Glucose:-
Method:-
Glucose oxidase- peroxidase method, end point/fixed time.

Results And Observation Statistical Analysis:-

The association between the risk factors and the outcome variables was analysed using Pearson‟s Chi Square test. The statistical analysis was done using **SPSS (Statistical Package for Social Sciences) softwareversion 21.** The **statistical significance** was drawn at **p' value < 0.05.** p'value**<0.05** was considered as **statistically significant.**

Table-1:- Association of influence of stress with the occurrence of metabolic syndrome among occupational drivers

			Presence of MetS		
S.No	PSS 10 score	No		Yes	„p‟ value
1	≤ 12	26		8	
2	13-23	33		10	0.001
3	24-29	8		15	

When comparing the occurrence of metabolic syndrome with stress level using Perceived Stress Scale (PSS 10), there was a significant increase in the occurrence of metabolic syndrome as the stress level increases.

Results analysed using Pearson's Chi Square test revealed a statistically **very significant p' value (p 0.001).**

Table-2:- Association of influence of duration of service with the occurrence of metabolic syndrome among occupational drivers

	Duration of service		Presence of MetS		
S.No	(yrs)	No		Yes	„p‟ value
1	5-9	29		4	
2	10-19	20		6	<0.001
3	20-29	13		10	
4	≥30	5		13	

When comparing the occurrence of metabolic syndrome with duration of service, there was a significant increase in the occurrence of metabolic syndrome as the duration of service increases.

Results analysed using Pearson's Chi Square test revealed a statistically **very significant p' value (p <0.001).**

Discussion:-

In the past few years growing attention has been paid to the metabolic syndrome since early reorganization can prevent from its complications. However to date, data on its occurrence and the underlying risk factors are very limited among occupational drivers. Therefore the purpose of this study is to evaluate the occurrence of metabolic syndrome and to assess its risk factors among this special occupational group.

The present study shows the occurrence of metabolic syndrome to about 33% of the study population, which reveals higher prevalence of metabolic syndrome than that of the general population. In a cross sectional study, among drivers in the central part of Iran, 35.9% of the participants suffered metabolic syndrome based on ATP III criteria **SaberiHR et al., 2011**.

Perceived stress, which measures the degree to which a person appraises situations in his or her life as stressful is one of several psychosocial factors related to work-related stress **Cohen S et al., 1983**.

Conclusion:-

Drivers sit for long hours and walk less compared to the general public. In addition, physical activity involvement and physical demands during the driving are usually limited and insufficient to maintain physical fitness.

Studies in recent decades have demonstrated that workers in the transportation industry are at greater risk of an incorrect diet and sedentary behaviour **Bigert C et al., 2003**.

Our study showed influences of stress on duration of years of service on the occurrence of metabolic syndrome in occupational drivers.

The most effective measures to improve insulin sensitivity in metabolic syndrome affected individuals are exercise and weight loss. Both modalities are effective and can be additive in their ability to improve insulin action.
"Regular exercise" is required for healthy aging!!

Hence a motivation a minimum of three exercise training sessions a week to maintain the benefit of regular physical activity is needed.

Various public health policies should be implemented in India, in order to control the alarming rise of cardiovascular risks and metabolic syndrome.

Change in the lifestyle is the best way in the prevention of metabolic syndrome.

Disrupted Chronobiology/Sleep:-
Circadian rhythms are such an innate part of our lives. Recently, some studies have suggested that the disruption of the circadian system may be causal for the manifestations of metabolic syndrome. Shift work, sleep deprivation and bright light exposure at night are related to increased adiposity and prevalence of metabolic syndrome. Surprisingly, circadian system impairment is not only the result of obligatory shift work schedules but is also an emerging issue in adolescent and young adults because their leisure activities result in voluntary sleep curtailment.

Epidemiological studies show that shift work is associated with obesity, hypertriglyceridemia, low HDL, abdominal obesity, diabetes and cardiovascular diseases.

Postprandial response are observed in shift workers with chrono-disruption of the melatonin profile. One of the most interesting recent findings is that shift work is an independent risk factor in the development of metabolic syndrome.

A study performed in day workers and shift workers indicated that shift workers had higher BMI even though the diet quality was even better in shift workers and the level of physical activity was similar between day and shift workers.

Interesting results come from the studies relating sleep duration and metabolic risk. The amount of sleep has declined by 1.5 hours over the past century with an important increase in obesity. Moreover, one-third of adults sleep, less than 6 hours during night. Clinical studies show that healthy individuals restricted to 4 hours of sleep for six consecutive nights exhibit impaired glucose tolerance and reduced insulin responsiveness following a glucose challenge.

Weight (in kilograms) was recorded using a portable standard weighingmachine. Weight was measured to the nearest 0.5 kg in subjects wearing inner clothing and without shoes after they had emptied their pockets.

Height (in centimeters) was measured to the nearest 0.5 cm byasking the patient to stand erect without shoes and the vertical height was measured using a stadiometer.

Body Mass Index (BMI) was computed as the weight in kilograms divided by the square of the height in meters using Quetelet"s Index.

BMI = Weight (Kg)/ Height (m^2).

Measurement of Anthropometric Indices:-
The subjects were asked to stand erect, with their arms relaxed at their side and with feet together.

References:-

1. Bigert C, Gustavsson P, Hallqvist J, et al. Myocardial infarction among professional drivers. Epidemiology.2003;14(3):333–339.
2. Branth S, Ronquist G, Stridsberg M, Hambraeus L, Kindgren E, et al. Development of abdominal fat and incipient MetS in young healthy men exposed to long-term stress. NutrMetabCardiovasc Dis. 2007; 17: 427–435.
3. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health SocBehav. 1983;24(4):385-96.
4. Frost P, Kolstad HA, Bonde JP. Shift work and the risk of ischaemic heart disease – a systematic review of the epidemiologic evidence. Scand J Work Environ Health. 2009;35(3):163–79.
5. Genuth S, Alberti KG, Bennett P, et al. Follow-up report on the diagnosis of Diabetes Mellitus. The Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2003;26:3160–7.
6. Grundy SM, Brewer Jr HB, Cleeman JI, et al. Definition of metabolic syndrome. Report of the National Heart, Lung, and Blood Institute/American Heart Association Conference on Scientific Issues Related to Definition. Circulation. 2004;109:433–8.
7. Lann D, LeRoithD. Insulin resistance as the underlying cause for the metabolic syndrome. Med Clin North Am. 2007 Nov;91(6):1063-77.
8. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. J ClinEndocrinolMetab. 2008;93(11 Suppl 1):9-30.
9. Saberi HR, Moravveji AR, Fakharian E, Kashani MM, Dehdashti AR. Prevalence of metabolic syndrome in bus and truck drivers in Kashan, Iran. DiabetolMetab Syndr.2011; 19: 3:8.