

**A STUDY OF HEALTH STATUS AMONG POLICE PERSONNEL IN  
KOLAR, KARNATAKA**

By

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IN

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Under the guidance of

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## **LIST OF ABBREVIATIONS**

**PC - POLICE CONSTABLE**

**HG - HOME GUARD**

**HC - HEAD CONSTABLE**

**SI - SUB INSPECTOR**

**ASI - ASSISTANT SUB INSPECTOR**

**WASI - WOMEN ASSISTANT SUB INSPECTOR**

**LEO - LAW ENFORCEMENT OFFICER**

**DM - DIABETES MELLITUS**

**HTN - HYPERTENSION**

**IHD - ISCHAEMIC HEART DISEASE**

**CVD - CARDIOVASCULAR DISEASE**

**MSD - MUSCULOSKELETAL DISORDER**

**WC - WAIST CIRCUMFERENCE**

**WHR - WAIST HIP RATIO**

**BMI - BODY MASS INDEX**

**HbA1C - GLYCATED HEMOGLOBIN**

**TC - TOTAL CHOLESTEROL**

**LDL - LOW DENSITY LIPOPROTEINS**

**VLDL - VERY LOW DENSITY LIPOPROTEINS**

**HDL - HIGH DENSITY LIPOPROTEINS**

**WHO - WORLD HEALTH ORGANISATION**

**NCEP-ATPIII - NATIONAL CHOLESTEROL  
EDUCATION PROGRAMME ADULT TRETMENT  
PLAN III**

**IDF - INTERNATIONAL DIABETIC FEDERATION**

**NHLBI - NATIONAL HEART, LUNG AND BLOOD  
INSTITUTE**

**OR - ODDS RATIO**

**SPSS - STATISTICAL PACKAGE FOR SOCIAL  
SCIENCE**

**Sig - SIGNIFICANCE**

## **ABSTRACT**

### **INTRODUCTION AND OBJECTIVES**

Personnel working in police department are vulnerable as they have to serve the civilians continuously round the clock. Police station is a primary institution of social security for any civilized country. It plays an important role in maintaining law and order.

Health and safety is a fundamental right under the constitution of India. Unfortunately low wages, long working hours, non-availability of basic needs, unnecessary pressure and intervention from politicians, superiors, family security strain and loneliness affect the lives of police personnel. Police suffer from health problems due to improper scheduling of shifts. They suffer from various occupational health problems, heart diseases, high blood pressure and depression.

Police Personnel suffer from a wide spectrum of diseases. Police from Pondicherry had prevalence of diabetes - 33.6%, hypertension-30.5%, obesity-51.6% and overweight-25.4%. Around 45.7% had history of alcohol consumption and 23% had history of tobacco smoking during last one month. Police officers from Calicut had prevalence of high BMI in 65.6%, hypertension in 37.7%, diabetes-7%, smoking-10% and alcohol-48% whereas hypertension in 26.66% and abdominal obesity-53.3% among Trombay police officers, 48% of Hooghly police had overweight.

Hence the present study was taken up in the Kolar with the objectives of

1. To assess the nutritional health status of the police personnel in Kolar taluk.
2. To identify the prevalence of various morbidities in police personnel.
3. To find out influence of various risk factors on the morbidities.

## **METHODOLOGY**

### **STUDY AREA**

The study was undertaken in Kolar taluk of Kolar district.

### **STUDY POPULATION**

All the police personnel who were working on Regular basis in the five police stations in Kolar viz. District Armed Reserve police, Traffic, Gulpet, Town and Rural police stations and who fulfilled inclusion criteria and gave written consent were enrolled.

### **STUDY DESIGN**

Descriptive cross-sectional study design.

### **STUDY TOOL**

Proforma and interview questionnaire

### **STUDY DURATION**

December 2013 to May 2015.

## RESULTS AND INFERENCES

About half of the police personnel felt that their work was strenuous. Half of the study subjects did not have any physical activity during leisure time. 31% had one of the chronic diseases. Prevalence of Tobacco usage was 23.5%, Alcohol Consumption was 28% and Musculoskeletal Problems was 46%. 16% were Overweight and 68% were Obese. 91.5% of the police had abnormal Lipid Profile.

24% of the police were Diabetic out of which 40% were Newly Diagnosed to have Diabetes. 26% were diagnosed to have Hypertension of which 38% police were Known Hypertensives. Prevalence of Metabolic syndrome was seen in 64.5%. Metabolic syndrome was common among those who were Diabetic and Hypertensive.

Metabolic syndrome, Diabetes and Hypertension were commonly seen in higher age group, those who had longer duration of service and higher BMI which was Statistically Significant. Metabolic syndrome was common in those who had Waist Circumference more than 80 cms for Females, 90 cms for Males and who had abnormal Lipid Profile which was Statistically Significant.

Duration of service, night shifts, physical inactivity, positive family history of chronic diseases, Waist circumference, Diabetes and abnormal Lipid profile were significant predictors of Metabolic Syndrome.

## **CONCLUSION**

Police personnel as a group selected for remarkable physical fitness at the entry stage fail to maintain it and succumb to lifestyle diseases that are very much preventable. Similar results from other parts of India and the world calls for attention from policy makers to introduce effective policies for taking care of this issue. Workplace programs to promote the health and fitness of police officers are commonly lacking, but can be an effective means for reducing morbidities. Regular screening and health education programs needs to be implemented. Counselling related to lifestyle modification, addiction control and stress management should be an integral component of these health-related activities

**KEY WORDS:** Health status, Police personnel, Morbidities, Kolar

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# INTRODUCTION

Work is considered as a basic part of our life. Most adults spend approximately one fourth to one third of their time at work and often perceive work as part of their self-identity.

Occupational medicine is an important branch of preventive medicine and is assuming greater importance in today's world. However it is not a recent concept, with the first great student of industrial medicine dating back to 17<sup>th</sup> century. He was none other than Ramazzani, popularly known as “father of occupational medicine”. He advised the physicians of Italy, not only about their patients' symptoms but also to delve into the details of their occupation.

In 1950 , the WHO defined occupational health as : “Occupational health should aim at the promotion and maintenance of the highest degree of physical , mental and social wellbeing of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health ; the placing and maintenance of the workers in an occupational environment adapted to his physiological and psychological equipment ; and to summarize the adaptation of work to man and of each man to his job”.<sup>1</sup>

The police are the law enforcement personnel. They deal on a regular basis with an assortment of unique situations and stressors. The shock of each tragedy and violent event takes a cumulative physical and mental toll on police officers in some way or the other. Increased demands of work impinging upon home life, lack of consultation and communication with the higher authorities in the organization, lack of control over workload and inadequate support have been identified as the potential factors responsible for stress among the policemen. For the longest time in law enforcement, the police are trained in policing, but not about how to maintain their mental and physical wellbeing.<sup>2</sup>

In the Occupational Disease Intelligence Network (ODIN) system for Surveillance of Occupational Stress and Mental Illness (SOSMI) in Manchester, policing features among the top three occupations most commonly associated with workplace stress by both occupational physicians and psychiatrists.<sup>3</sup>

Stress can be defined as a physiological response to physical and mental demands or “an interaction between environmental forces and events called stress precipitators, which appear threatening to the person’s reaction to the threat”.<sup>4</sup>

Police officers suffer from different types of psychological stressors. Lack of force, killing someone in the line duty, shooting incident and shift work were most stressful stressors of the police officers. They remain exposed to traumatic stressors, including physical injury, witnessing death or injuries to other officers and civilians in duty hours. The impact of this high rate of exposure on health has long been a significant public health concern.<sup>5</sup>

It has been found from some researches that, police officers lead a physically inactive life, have irregular and hotel made diet and take spicy and limited choice of food while on duty, perform overtime and shift work, suffer from sleeplessness, high rate of alcohol and tobacco consumption than the general people. They have been found to have an increased prevalence of cardiovascular risk factors than the general population.<sup>6</sup>

Police officers often are overly fatigued because of shift work, insufficient sleep and long and erratic work hours. Long work hours and shift work severely stress health and performance of police officers. These factors likely contribute to the elevated levels of morbidity and mortality, psychological distress and family disharmony observed among police.<sup>7</sup>

Police officers are stressed by many things including their supervisors, shift-work resulting in the loss of time spent with their families, fellow officers and the citizens at large.

Police officers are strained by numerous other factors such as low pay, irregular sleep schedules, and conflict with family and friends. From all of this we can conclude that police officers need training and education to help deal with the many challenges they face daily.

With proper support, education and counseling the officers will be able to perform their job much more efficiently and safely.<sup>8</sup>

On an average police officers work twelve hours every day and sometimes even put in 36 hours at a stretch during VIP bandobasts and festivals. Unlike other jobs, the police officers start the day with bad news. There is only negative feedback in terms of how many murders, robberies and rapes have taken place the previous night. Working throughout the day in such an atmosphere produces adverse psychological effects. Moreover long working hours, irregular eating habits, sleepless nights, shift duties and disturbed personnel life produces stress in the police officer's life and they become vulnerable to various disorders.<sup>9</sup>

## **NEED FOR THE STUDY**

Police personnel as an occupation group, endure long working hours, dealing with criminals, VIP duties, irregular work timings, inadequate personal time, and duties on festive days and staying away from family. They are stressed by job responsibilities, fulfilling demands of senior officers, low pay, irregular sleep schedule, shift work and citizens at large.

Research in the past 20 years among police officers, has shown that organizational stressors such as conflicts, work load and lack of support mechanism are more likely to be adverse sources of stress than operational stressors. In other words, although police officers are more frequently confronted with critical incidents when compared with other occupations like employees of banks or supermarkets, organizational stressors which are not specific for the police appear to have more impact on health and well-being than (daily) operational stressors.

Society views the police not only as a law enforcing agency but also as an instrument of social service, an agent of social change and the protector of the rights and duties of the people. The complex nature of the policeman's job needs attention to tackle the health problems that they encounter.

Measures to protect and improve the health status of police personnel should be pursued in a way that maximizes gains to all sectors at large and individual and family in particular.

Studies have shown that certain morbidities like hypertension, diabetes, obesity and low back ache are more prevalent among police personnel.

So far, very few studies have been conducted in India and information about the morbidities among police personnel in Kolar district are not available. In view of these, the present study was planned, to conduct a study to assess morbidity pattern among police personnel and also to evaluate the determinants associated with these morbidities, with the intention of providing inputs to the policy makers to bring about changes to address these issues of the police force.

# **AIMS AND OBJECTIVES**

**AIM:** To evaluate socio-demographic and morbidity profile of Police personnel.

## **OBJECTIVES:**

1. To study the socio-demographic profile of police personnel.
2. To assess the morbidity pattern among police personnel.
3. To find out the epidemiological determinants associated with the morbidities.
4. To find out occupational factors associated with the morbidities.

# **REVIEW OF LITERATURE**

## **HISTORY OF POLICE IN INDIA**

There is a long and glorious history of police system in India in the form of Vedas. The Law enforcement agencies such as Arthashashtra of Kautilya (310 B.C.) addressed various cadres of police as Nagarka (city chief), Dhanpad, Durgpal, Aanantpal, Subedar, and Foujdar and later were called as Kotwal in Aine-a-akabari. During the British period they were called as inspectors at different levels.<sup>10</sup>

An important role of police was recognized in 1857 when British government created a regular police system in India under the Police Act 1861 and assigned them the role of a strict disciplinarian and the custodians of law.<sup>11</sup>

“Indian Police” is an umbrella term, which denotes not only state police force but also various central police organizations, such as Central Reserve Police Force (CRPF), Border Security Force (BSF), Indo Tibetan Border Police (ITBP), Central Bureau of Investigation (CBI), Rapid Police Force (RPF) and various other law enforcing agencies. Indian police completed more than 50 years of policing of democratic, secular, and pluralistic society.<sup>12</sup>

Indian police personnel can be broadly categorized into constables, inspectors, and officers. The constables belong to the lowest strata; they obey commands of inspectors/ sub-inspectors and impart assigned duties as part of police work. The inspectors are placed at the intermediate level; they are expected to investigate cases and register first information report. They are also responsible for the law and order situation in their area of jurisdiction and the supervision of work at the police station. The officers [e.g., Circle Officers (Cos), Superintendent of Police (SP), Assistant Superintendent of Police (ASP) and Senior Superintendent of Police (SSP)] entertain administrative control over crime and law and order situation of the town. They also take care of public complaints and grievances and supervise the work of policemen subordinate to them.<sup>13</sup>

## **ROLE OF POLICE**

Police always being a tool of social security and community development, is not only an important protective arm of the state but also creates a sense of safety and confidence among members of the society.<sup>11</sup>

Police work involves protection of life, safeguarding property through vital patrolling, enforcement of laws and ordinances. Policemen every day during their duty, having public welfare as their primary concern, offer protection against the criminals.

Society views the police not only as a law enforcing agency but also as an instrument of social service, an agent of social change and the protector of the rights and duties of the people. The general public views police as an organization which uses excessive physical violence and verbal abuse which creates a negative image to them but no one understands the underlying strain that exists. The highly paradoxical nature of the policeman's job makes it like tightrope walking and deserves a closer scrutiny than is accorded to it so far in our country.<sup>14</sup>

The tasks and duties of the police listed originally in 1861 have expanded and slightly changed since then and list of duties would be

1. Maintaining law and order
2. Riot control
3. Crime investigation
4. Protection of state assets
5. VIP protection
6. Traffic control.<sup>15</sup>

Police personnel as an occupation group, endure long working hours, dealing with criminals, VIP duties, inadequate personal time, and duties on festive days and staying away from family and children. They are also stressed by job responsibilities, supervisors, low pay, irregular sleep schedule and shift work.<sup>16</sup>

When individuals are overwhelmed by occupational stress they suffer from increased chronic stress, depression, heart disease, gastrointestinal disorders, tobacco, alcohol and drug use and abuse, chronic insomnia, psychological disorders, family conflicts, divorce, and even suicide attempts.<sup>17, 18</sup>

In the Occupational Disease Intelligence Network (ODIN) system for Surveillance of Occupational Stress and Mental Illness (SOSMI) in Manchester, policing features among the top three occupations most commonly associated with workplace stress. In the United Kingdom, levels of suicide, several times higher than in age-matched populations, are being reported among police officers. Certain job-related factors among Indian police personnel act as specific stressors, for example working conditions, work overload, lack of recognition, fear of severe injury or being killed on duty, inadequate equipment, shooting someone in the line of duty, anti-terrorist operations, confrontation with the public, lack of job satisfaction and police hierarchy.

A study done by Vila has reported that police officers often are overly fatigued because of shift work, insufficient sleep and long and erratic work hours. Long work hours and shift work severely stresses on the health and performance of police officers. These factors likely contribute to the elevated levels of morbidity and mortality, psychological distress and family disharmony observed among police.<sup>19</sup>

Researchers have shown that the police officers are also exposed to chronic non-traumatic stress arising from the demands of their work environment. For example, police officers face pressures from supervisors, court, media, and the public that can increase the stress-related problem like insomnia.<sup>5</sup>

Section 22 of the Police Act says that every police person could be employed in any part of district. Every police officer shall, for all purposes in this Act contained, be considered always on duty, and may at any time be employed as a police-officer in any part of the general police district. Police Act, 1861 states that police are expected to serve round the clock which has led to exploitation of them leading to stress among police personnel. United Kingdom, who framed Indian Police Act, 1861, has done numerous changes in their own law but still we are following it as it was and due to our archaic laws, police personnel are suffering with various psychological, physical and social problems which hamper their health status thus hindering the quality of services provided by them.

Police are at high risk of developing cardiovascular diseases due to work-related stress. With the increase in burden of non-communicable disease risk factors in many countries, there is a need to identify the burden of stress and its associated factors among the police personnel. A recent study showed that majority of policemen (88.89%) had moderate level of stress. Stress score was significantly high among overweight, diabetes, hypertensive, and depressed policemen.<sup>20</sup>

Police are backbone for maintaining law and order in the society, but they are at a high risk of developing chronic lifestyle diseases. They suffer from stress problems due to day and night work; their life style is hampered due to uncertain timings of duty. They go through a lot of stress due to their work in shifts, transferable jobs, inadequate sleep and addiction to alcohol and tobacco. High blood pressure, diabetes and obesity are result of the stress they encounter and needs to be tackled for their sound health. Apart from diseases of the body, frustration and dejection pave way for increased stress. During festivals which last for more than a week, constables often work for more than stipulated hours at a stretch. This may take a heavy toll on their health. <sup>21</sup>

Due to workload and uncertainty in job practices with respect to the duration of work and constant change of place and role of work, most of the police officers are neither able to spend time with families nor for themselves which has led to improper care of family which has resulted in divorce, family breakup, bad effects on children, alcoholism among police personnel, suicide etc. which affects the society directly because society comes from families.

M.P. Singh in his study, “Police Problems and Dilemmas in India” observed that the working condition of police and role of politics in lives of police community, have led to failure of fulfillment of the constitutional goal of social justice. The reasons quoted for the failure are stressful job and socio-political pressure on police personnel.<sup>10</sup>

India is slowly and steadily acquiring the status of global chronic disease capital. By 2025, India will have the dubious distinction of having 70 million diabetics, 213 million hypertensives and 60 million people with arthritis. The cost of these including welfare losses is estimated to be Rs.1, 50,200 crores by 2015. According to the WHO report; Preventing Chronic Diseases - A vital investment, 388,000,000 people will die in the next 10 years of a chronic disease. A significant proportion of this will be in India. A combination of the “thrifty gene hypothesis” (i.e. our genetic predisposition towards obesity and diabetes) and frantic lifestyle has brought us on the brink of a healthcare catastrophe.<sup>22</sup>

Almost all sectors have their welfare unions to fight against exploitation. But the police don't have any union to fight against political and departmental exploitation and so has resulted in stressful lifestyle, which leads to depression and heart ailments.<sup>23</sup>

## **STRESS**

Stress is a complex phenomenon. An individual's experience of stress depends upon numerous aspects related to personality, environment, sociocultural situation, and several contextual factors. Occupational stress is a matter of concern in the current scenario. Occupational stress results in disruption of the psychological as well as physiological homeostasis of the individual, leading to deviant functioning in the working environment.<sup>24</sup>

Police services have always been one of the most challenging and stressful services in India and with changing times it is becoming even more so. The major brunt of this job is borne by constables as they are the foot soldiers of police in India. They have to deal with angry mobs, counter insurgency operations, traffic control, VIP security, political rallies, religious festival crowd control, and various other law and order duties without losing their composure and sensitivity. They have to face potentially hazardous situations that can result in physical or mental trauma or even death in the line of duty. Their work stress can be further aggravated because of their personality traits or wrong coping methods. A majority of Indian and international studies have found high stress levels in police, which is disturbing, as psychiatric morbidity in police can have many direct and indirect negative consequences on society. Therefore, apart from physical fitness, they have to be mentally fit to do justice to their duties.<sup>15</sup>

Human service professions such as medicine, social work, nursing, teaching, public safety and child care are viewed as high stress occupations. Individuals in these professions work intensively, intimately and continuously with people who have serious physical, mental, emotional and social problems. Every person is subjected to stress in this modern world but the police staff are at greater risk than the other people.<sup>25</sup>

Some of the stress factors identified were work overload, poor working environment, lack of recreation and canteen facilities, infrastructure facilities and disproportionate distribution of traffic police person to population and increased number of vehicles.<sup>26</sup>

Stress can cause hypertension, joint pains, high blood pressure, diabetes as well as paralytic strokes and heart attacks. They also experience lack of concentration, resulting in errors while passing orders or taking important decisions. Stress-related ailments have killed more serving policemen. Several inspectors and constables have died of heart attacks while on duty. Age, sex, religion, number of years of service, marital status, income and the place of residence have significant association with stress level among police constables.<sup>27</sup>

Stress is an important factor of poor health of police persons. The stressful nature of the police work affects the health and family lives of many officers which makes them consume alcohol to overcome the pressure. More than 80 percent constables were suffering with various problems such as high blood pressure, heart disease, diabetes, mental stress but on other hand, countries like U.K and U.S.A provide brief training programs, which are successful to remove stress of the police personnel in these countries.<sup>28</sup>

## **SHIFT WORK**

As military is to defend the country from external threats, so is police for maintenance of internal peace of the community. The mission of police of a state is to help the common man, to provide him security and to create a peaceful and law abiding community with his cooperation. But on the other hand, police personnel are a group of professionals who have all together a different working environment with round the clock busy work schedule. The irregular shifts in their work schedule leads

to neglecting or skipping of their regular food and indulging into adverse habits. The work shifts also deprive their routine sleep pattern and social activities. This complicates their life and deteriorates their level of living.<sup>29</sup>

Chronic fatigue often follows shiftwork with extended hours; this is especially common amongst detectives. Like many essential service workers, police can be rostered at almost any time over a 24-hour, seven-day roster. The ill effects of shiftwork have been well documented, including gastrointestinal upsets, psychosomatic disorders, weight gain and serious long-term disorders such as coronary heart disease. Night work involves disruption to the normal body circadian rhythm and results in decreased capacities at low biological points; that is, between 2am and 4am.<sup>30</sup>

Shift work is a contributing factor to an increase in metabolic syndrome because of the organizational stress and lack of support among police personnel.<sup>31</sup>

## **SMOKING AND ALCOHOL CONSUMPTION**

The different drug abuse surveys have shown the prevalence of alcoholism as 5-20%.The short term effects of alcohol are slurred speech, drowsiness, vomiting, diarrhea, upset stomach, headaches, breathing difficulties, distorted vision and hearing, impaired judgment, decreased perception and coordination, unconsciousness, anemia, coma, blackouts (memory lapses, where the drinker

cannot remember events that occurred while under the influence). The long-term effects of alcohol are unintended injuries such as car crash, falls, burns, drowning. Intentional injuries such as firearm injuries, sexual assault, and domestic violence become regular. Periodically, police should be made aware of these ill effects of alcohol.

A study done by Jahnavi G on Vijayawada Police, revealed that 148(24%) of the police were consuming alcohol, which was much higher than the general public. Smoking was present in 136(22%) of the police personnel.<sup>32</sup>

Police officers are significantly affected by alcohol abuse due to the nature of their work and frequently use alcohol in an attempt to cope with stress, boredom, loneliness, and lack of other recreational activities. It is exciting and boring, challenging and tiresome, rewarding and frustrating, unpredictable and regular; and organizationally officers may have to contend with rigid command structures, unreasonable policies and procedures and inequitable treatment by superiors. With a job description such as this, it is understandable that police officers often experience a great deal of job related stress. Some researchers consider police work to be one of the most stressful occupations. While there are numerous ways in which individual officers may deal with job related stress, many turn to hazardous alcohol consumption as a coping mechanism.<sup>33</sup>

The effects of alcohol abuse among police officers include: reduced work performance endangering safety and welfare of the public, higher rates of absenteeism; late for work; register more sick leave; increase the cost of health care benefits; lack of motivation; increased need for supervision; and setting a poor role model.<sup>34</sup>

The excessive alcohol consumption among police can impede reaction time; impair thinking and co-ordination to become sluggish and may lead to aggressive behavior particularly in the presence of threat.<sup>35</sup>

Franke, Collins and Hinz found that smoking, weight, and inactivity were not better predictors of Cardiovascular Diseases among Law Enforcement Officers than for the general population. This finding was contrary to the findings of Williams and Petrallis that "in combination, smoking, or hypertension and sedentary life style resulted in the highest relative risk of premature death" from Cardiovascular Diseases.<sup>36</sup>

Williams and Petrallis found that Law Enforcement Officers had increased blood lipids, were smokers and were overweight, with the risk from these factors increasing proportionately with increased age.<sup>37</sup>

Richmond et al. in their study in Sydney, Australia found that of the total number of male officers surveyed, 27% smoked of which 67% smoked 1-19 cigarettes per day and noted that the percentage of LEOs found to be smokers was higher than the rate in the general population.<sup>38</sup>

## **OBESITY AND OVERWEIGHT**

The police personnel have to pass through various physical (athletic) tests and medical examination and only absolutely fit candidates are appointed as policemen. This suggests that the policemen join the police department in extremely good health with athletic physique but become unfit later on in service. The risk of many diseases including cardiovascular diseases, hypertension, hyperlipidemia, diabetes mellitus, and certain cancers increases many folds in association with obesity. The police personnel should be educated about avoiding fast food, juice, sweets, coffee and tea when they are hungry. Alternatives to fast foods such as energy bars, cheese and vegetable sandwiches should be encouraged. Green tea can replace tea and coffee, fresh fruits can replace sweets. Unknowingly the police may be consuming tea or coffee many times in a day to keep themselves alert, but they may not know that each cup of tea constitutes 75 Calories and coffee 110 Calories. Prevalence of overweight and obesity was 42% among police personnel.<sup>32</sup>

Irregular life-style and work-related stress are responsible for the increased vulnerability of police personnel to many non-communicable diseases. Kumar P et al in his study on policemen found that 57.6% of police personnel were obese.<sup>39</sup> Tsismenakis et al. showed that 43.8% were overweight and 33% were obese among police, and had an increased risk of developing cardiovascular disease.<sup>40</sup>

Tharkar, Kumpatla, Muthukumaran and Viswanathan found that police officers had higher BMI's and waist circumference than individuals in the general public.<sup>6</sup>

Nabeel, Baker and McGrail also found that a significant amount of police officers were obese. The overweight and obese sample had higher total cholesterol, LDL, triglycerides, random glucose, blood pressure, and lower HDL.<sup>41</sup>

Morioka and Brown examined the prevalence of obesity within Hawaiian police officers and firefighters. The results showed that all ethnic groups within policing had larger skinfold measurements and were heavier than similar groups within firefighting. Morioka and Brown compared BMIs to desirable measurements for the general population. The authors also took the samples skinfolds and compared them to desirable measurements. Almost all police officers (89.2%) were considered overweight or obese while 70.3% of firefighters were considered overweight or obese. Results also found that police officers' weight increased since they were hired and over the years. Firefighters had a greater ability to maintain their weight when compared to police officers.<sup>42</sup>

Mokdad et al. and Brown et al. found that there was strong correlation of obesity with cholesterol, hypertension, dyslipidemia and the risk of cardiovascular disease and cardiovascular risk factors.<sup>43, 44</sup>

Franke and colleagues found that, when comparing the age-associated change in risk for CVD in the LEO cohort, the LEOs became "fatter quicker".<sup>36</sup>

## **CARDIOVASCULAR DISEASE**

Police officers lead a physically inactive life, have irregular eating habits, taking spicy and limited choice of food while on duty, perform overtime and shift work, suffer from sleeplessness, high rate of alcohol and tobacco consumption and experience more stress than the general people. They have been found to have an increased prevalence of cardiovascular risk factors than the general population.<sup>6</sup>

Heart rate of the police officers varies after getting some unavoidable or crucial news. Cardiovascular and hematological stresses are very acute in officers engaged in highway patrolling.<sup>45</sup>

Police officers suffer from increased rates of cardiovascular and metabolic disorders, divorce rates and suicide than the general population. These work stresses lead to heart attacks, headaches, and high blood pressure in police officers.<sup>46</sup>

Policemen have increased prevalence of CVD risk factors and type 2 diabetes than any other occupational group and the general population in many countries.<sup>47</sup>

Evidence indicates that the prevalence of traditional risk factors for cardiovascular disease among the police is high (often higher than the general population). Moreover, law enforcement work involves various acute physical and psychological stressors. It is therefore notable that certain law enforcement tasks could serve as an

occupational trigger in susceptible police officers, leading to an increased frequency of sudden cardiac death during stressful duties.<sup>48</sup>

Police officers are more likely to develop heart disease and die from heart disease. They have a higher risk of developing specific health problems that are linked to cardiovascular disease.<sup>49</sup>

The police officers are found to have an increased risk of cardiovascular disease when compared to the general population.<sup>50</sup>

Ruiz and Morrow expressed that unhealthy lifestyles, caused by the job may lead to cardiovascular disease. The law enforcement officers are found to work abnormal hours and they may work double shifts that require them to work sixteen hours continuously throughout the night and early morning.<sup>51</sup>

## **CVD INCIDENCE**

The relationship between the change in risk factors in the LEO group and that observed in the general population suggested that the 10-year probability of development of CVD in the Iowa LEO population was similar to that found in the Framingham population.<sup>52</sup>

Employment as a LEO is a factor in the increased incidence of disease, although it is uncertain what specific aspects of the occupation contributed to the higher incidence of CVD. The authors suggest that the association may be attributable to shift-work and occupational stressors.<sup>36</sup>

## **METABOLIC SYNDROME**

The metabolic syndrome has received a great deal of attention in the last few years. It is characterized by a cluster of specific cardiovascular disease (CVD) risk factors comprised of central obesity, elevated blood pressure, high triglycerides, reduced levels of high-density lipoprotein (HDL) cholesterol and elevated fasting glucose levels. The metabolic syndrome has increased over the last few decades.

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 law enforcement officers (LEOs).<sup>54</sup>

Although the term ‘metabolic syndrome’ was coined and defined in the 1980s, the criteria for diagnosis of the metabolic syndrome have not been accepted universally.

Its definition and diagnostic criteria are slightly different depending on which organization's definition is used. Definitions of the metabolic syndrome have been provided by the World Health Organization (WHO) in 1999, the European Group for the Study of Insulin Resistance in 1999, the National Heart, Lung, and Blood Institute acting through the National Cholesterol Education Program Adults Treatment Panel III (NCEP-ATP III) in 2001, and the International Diabetes Federation (IDF) in 2006. The American Heart Association (AHA) in conjunction with the National Heart, Lung and Blood Institute (NHLBI) revised the NCEP-ATP III definition in 2006.

The NCEP-ATP III, IDF and AHA/NHLBI statements are three major definitions commonly used in the literature. Based on the NCEP-ATP III definition, adult metabolic syndrome is defined as the presence of three or more of the following five abnormalities:

- (1) Abdominal obesity (waist circumference >102 cm for men and >88 cm for women)
- (2) Raised triglycerides ( $\geq 150$  mg/dL (1.69 mmol/L))
- (3) Reduced HDL cholesterol (<40 mg/dL (1.04 mmol/L) for men and <50 mg/dL (1.29 mmol/L) for women);
- (4) Raised blood pressure (a systolic blood pressure  $\geq 130$  mmHg or a diastolic blood pressure  $\geq 85$  mmHg); and
- (5) Raised fasting glucose ( $\geq 110$  mg/dL (6.1 mmol/L) or previous diagnosis with type 2 diabetes).<sup>55</sup>

In 2006, the IDF proposed a new worldwide definition of the metabolic syndrome. According to the IDF definition, a person with the metabolic syndrome must have central obesity (defined as waist circumference with ethnicity specific values) in addition to any two of the following:

- (1) Elevated blood pressure (a systolic blood pressure  $\geq 130$  mmHg or a diastolic blood pressure  $\geq 85$  mmHg or treatment of previously diagnosed hypertension;
- (2) Elevated fasting plasma glucose ( $\geq 100$  mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes);
- (3) Elevated triglycerides ( $\geq 150$  mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality); and
- (4) Reduced HDL cholesterol (men:  $< 40$  mg/dL (1.03 mmol/L); women :  $< 50$  mg/dL (1.29 mmol/L), or specific treatment for this lipid abnormality).<sup>56</sup>

Changes in the AHA/NHLBI statement are only minor to the NCEP-ATP III definition. The AHA/NHLBI definition uses the lower threshold for elevated fasting glucose as used by in the IDF definition. The AHA/NHLBI criteria for the definition of the metabolic syndrome includes the presence of at least three of the following abnormalities:

- (1) Elevated central obesity (waist circumference  $\geq 102$  cm for men and  $\geq 88$  cm for females);
- (2) Elevated blood pressure ( $\geq 130$  mmHg in systolic or  $\geq 85$  mmHg in diastolic blood pressure, or taking medication for hypertension);

- (3) Elevated fasting glucose:  $\geq 100$  mg/dL (5.6 mmol/L) or taking medication for hyperglycemia;
- (4) Elevated triglycerides ( $\geq 150$  mg/dL); and
- (5) Reduced HDL cholesterol ( $< 40$  mg/dL for men and  $< 50$  mg/dL for women).<sup>57</sup>

All three definitions used by the NCEP-ATP III, IDF and AHA/NHLBI have similar criteria to identify the metabolic syndrome and it can be expected that the majority of people identified as having the metabolic syndrome based on one definition will also be identified as having the metabolic syndrome based on other definitions.

Several studies have suggested that LEOs experience an increased risk for CVD morbidity and mortality compared with the general population. Since the metabolic syndrome is associated with an increased risk for CVD, one might expect LEOs to have an increased risk for developing the metabolic syndrome.

LEOs have a higher prevalence of several cardio metabolic risk factors such as hypertension, hypercholesterolemia, obesity, and diabetes which increase the risk of the metabolic syndrome. Conventional CVD risk factors include hypertension, hypercholesterolemia, hyperglycemia, obesity, advancing age, tobacco use, and physical inactivity.

Employment as a law enforcement officer was an independent risk factor for CVD with an odds ratio (OR) of 2.34. Retired LEOs had a significantly higher incidence of CVD than the general public even after controlling for conventional CVD risk factors.<sup>36</sup>

The metabolic syndrome also has multiple acquired underlying risk factors such as obesity, weight gain, physical inactivity, and unhealthy diet. Obesity is closely associated with an increased risk for the metabolic syndrome. Effective weight reduction is known to improve individual components of the metabolic syndrome, whereas weight gain during adulthood is known to exacerbate individual components of the metabolic syndrome. Regular and sustained physical activity positively influences individual components of the metabolic syndrome, such as decreased body weight and visceral fat accumulation, decreased blood pressure, increased HDL cholesterol and decreased triglyceride levels, and improved insulin sensitivity.<sup>58, 59, 60</sup>

Psychosocial stress may also play a role in the pathogenesis of the metabolic syndrome. Continuous exposure to work-related stress can alter autonomic nervous and neuroendocrine systems that control reactions to stress. The neuroendocrine responses from the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system stimulate stress-related cortisol secretion that contributes to the development of chronic diseases such as dyslipidemia, abdominal obesity, hypertension, and insulin resistance and further escalates CVD and the metabolic syndrome.<sup>61</sup>

The metabolic syndrome is now a widely diagnosed medical disorder characterized by a cluster of abnormalities that come together in a single individual levels. The presence of the metabolic syndrome is recognized as a significant predictor of coronary heart disease, stroke and Type 2 diabetes mellitus.<sup>62</sup>

25 percent of the officers had metabolic syndrome which was higher when compared to 18.7 percent of the general employed population. Female and male officers experiencing the highest level of self-reported stress were four and six times more likely to have poor sleep quality respectively. Organizational stress and lack of support were significant factors for the risk of metabolic syndrome, Hodgkin's lymphoma and brain cancer and was significantly increased with 30 years or more of police service.<sup>31</sup>

The Atherosclerosis Risk in Communities study examined the association between the metabolic syndrome and CVD morbidity over a mean of 11 years. This study found that men and women with the metabolic syndrome were approximately 1.5 to 2 times more likely to develop coronary heart disease than those without the metabolic syndrome after controlling for age, smoking, low-density lipoprotein (LDL) cholesterol, and race.<sup>63</sup>

Sedentary occupations with high levels of sitting time and lower demand for physical activity have been associated with weight gain and obesity. Work environment in the police occupation may greatly influence the growing problem of weight gain and obesity. Weight gain is an important risk factor for the metabolic syndrome.<sup>64</sup>

Physical activity has been defined as any bodily movement produced by skeletal muscles that result in energy expenditure beyond resting expenditure. Many previous studies have demonstrated that physical activity is associated with reduced risk of the metabolic syndrome and physical inactivity may be an important modifiable risk factor in the etiology of the metabolic syndrome. While the metabolic syndrome has increased in the past few decades, the amount of physical activity energy expenditure has declined during this time. Thus, individuals with a lack of physical activity may be at risk of the metabolic syndrome.

Physical inactivity and sedentary behavior are each associated with an increased risk for the metabolic syndrome. Individuals who do not engage in any moderate or vigorous leisure-time physical activity are almost twice as likely to have the metabolic syndrome OR = 1.90 than those who engage in  $\geq 150$  minutes per week of such activity.<sup>65</sup>

Therefore, physical inactivity is an important risk factor for the metabolic syndrome, and physical activity even without improvement in aerobic fitness is protective of the metabolic syndrome.

Few studies have examined the metabolic syndrome in LEOs. Indeed, the risk of the metabolic syndrome in the law enforcement profession has been debated. Evidence suggests that LEOs have higher prevalence of the metabolic syndrome compared to the general population.

The prevalence of the metabolic syndrome among police officers was 27.4%, higher than the predicted prevalence for the U.S. adult males which was 24.6%.<sup>66</sup>

The prevalence of the metabolic syndrome among Indian male police officers was significantly higher than their age-matched general Indian male population.<sup>6</sup>

The prevalence of the metabolic syndrome among 874 Netherland policemen was 22.5%, higher than that of the national average among Netherlander men (16%). These results suggest that LEOs may be at higher risk of developing the metabolic syndrome.<sup>67</sup>

## **MUSCULOSKELETAL DISORDERS**

Musculoskeletal disorders (MSDs) are important causes of work incapacity and sickness absenteeism which leads to socio-economic burden. MSDs are major problems in almost all countries. Musculoskeletal disorders (MSDs) are the most common work-related health problem in India. MSDs are caused mainly by manual handling, heavy physical work, awkward and static postures, repetition of movements and vibration. The risk of MSDs can increase with the pace of work, low job satisfaction, high job demands, job stress and working in cold environments. MSDs are the biggest cause of absence from work.

Work-related musculoskeletal disorders (MSDs) are impairments of the bodily structures, such as muscles, joints, tendons, ligaments, nerves or the localized blood circulation system, which are caused or aggravated primarily by the performance of work and by the effects of the immediate environment in which work is carried out. These disorders are not typically the result of a distinctive, singular event, but are more gradual in their development. Thus, MSDs are cumulative-type injuries. Most work-related MSDs are cumulative disorders, resulting from repeated exposure to high- or low-intensity loads over a long period of time. The symptoms may vary from discomfort and pain to decreased body function.

Although it is not clear to what extent MSDs are caused by work, their impact on working life is huge. MSDs can interfere with activities at work, and can cause a reduction in productivity, an increase in sickness absence, and chronic occupational disability.<sup>68</sup>

## **LOWER BACK PROBLEMS**

Back pain can greatly affect a police officer on the job, especially those who drive a significant amount. 54.9% of the police officers experienced chronic lower back pain among Canadian police officers and a significant amount (76.3%) of them reported that they experience lower back pain within a year of working. It has been shown that police officers have a high rate of lower back problems .<sup>69</sup>

Police spend a significant amount of time during their shift in a patrol car. The lower back problems experienced were caused by acute pain, ligament strain and sprains. Majority of the police officers do not experience lower back pain before joining the force, which also confirms that some aspect of policing caused the lower back pain.

Lower back pain cause police officers to have problems sitting and standing for an extended period of time. The pain even disrupt police officers sleep. Police officers who are employed the longest report higher levels of lower back pain.<sup>70</sup>

Lower back problems are also caused by sitting or driving for long periods of time, inflammation caused by an unhealthy diet, structural imbalance, wearing a duty belt and stress. Vitamin D3 is believed to help relieve lower back pain, but police officers who lack sleep are deficient in vitamin D3.<sup>71</sup>

Police officers with higher amounts of driving have higher prevalence of lower back pain and take more sick time because of their pain. Higher amounts of driving also results in a higher prevalence and severity of hand and wrist pain. Along with lower back pain, high rates of pain in the hips, buttocks, thighs, and shoulders are reported. When driving was compared to standing for extended periods of time and lifting heavy objects, police officers report that driving causes lower back pain more often.

A significant and positive relationship is found between police officers' exposure to car driving and low back trouble. The prevalence of wrist/hand trouble is more frequently reported with high exposure to driving cars. Police motorcyclists appear

to be at risk from shoulder trouble, which is thought likely to be due to lifting the heavy bikes on/off their stands.<sup>72</sup>

Most common musculoskeletal symptoms among police officers are cervicobrachial pain, low back pain and sciatica. Low-back pain is due to uncomfortable posture of the spine and cervical and upper extremity disorders are related to the exposure to vibrations from motorcycle.<sup>73</sup>

## **SLEEP DISORDERS**

40.4% of police were positive for at least 1 sleep disorder, 33.6% had obstructive sleep apnea, 6.5% had moderate to severe insomnia and 5.4% had shift work disorder. 28.5% reported excessive sleepiness and 26.1% reported falling asleep while driving at least 1 time a month. Obstructive sleep apnea (OSA) is associated with hypertension, cardiovascular disease, cognitive impairment, and increased risk of motor vehicle crashes.<sup>74</sup>

# MATERIALS AND METHODS

1. **Study Setting:** The Police stations of Kolar Town, Kolar District, Karnataka

2. **Study Design:** A Descriptive Cross Sectional Study.

3. **Study population:** Police personnel working on permanent appointment in police stations in Kolar. There were total 5 police stations in Kolar.

4. **Sample size:** 200

- Hypothesized percentage frequency of outcome factor (overall morbidity) in the population (P) =50
- Confidence interval(95%)as z alpha =1.96
- Absolute error (d) =15%
- Estimated sample size =178  
[Using the formula  $n=4pq/d^2$ ]
- Expecting 10% of Noncompliance = 18
- Total sample size =196  $\approx$  200

**5. Sampling Method:** There are 5 police stations in Kolar viz. Rural, Town, Gulpet, Traffic and District Armed Reserve police. The police personnel whom we could contact at each visit in these Individual police stations on prior intimation (fulfilling the inclusion criteria) were included in the study till the sample size was attained after taking written consent.

**6. Inclusion criteria:**

- a) Police personnel working on permanent basis.
- b) Willing to participate in the study.

**7. Exclusion Criteria:**

- a) Not willing to participate in the study.
- b) Not accessible during the study period.

**8. Methodology:**

Administrative approvals were obtained from the following authorities to carry out the study.

- i) The Dean of Sri Devaraj Urs Medical College.
- ii) Ethics Committee of Sri Devaraj Urs Medical College.
- iii) Sub Inspectors of all the five police stations of Kolar.

## **9. Tool Construction for data collection:**

Semi open, Semi structured questionnaire was framed to collect the sociodemographic information. (**Annexure no. I**)

## **10. Pilot Study:**

Total 20 police personnel fulfilling the inclusion and exclusion criteria were interviewed and examined during 1 month of pilot study (Feb 2015) to test predesigned questionnaire and to make any changes if necessary.

## **11. FINAL DATA COLLECTION:**

### **a) Written consent :**

Informed written consent explaining the purpose of the study was taken from all participants after assuring confidentiality of information in the language they were familiar and comfortable in understanding. (**Annexure no II**)

### **b) Data collection process :**

After building the rapport, participants were requested to spare 30 minutes for interview and examination. The socio-demographic data was collected using pretested and semi-structured questionnaire. Complete information regarding socio-economic-demographic and occupational history was collected from police personnel. A complete history including any past and present history of Non communicable diseases like diabetes, hypertension, cancer, stroke and

musculoskeletal morbidities, family history of Non Communicable disease, personal history including habits were also recorded.

General examination including anthropometric measurements and vitals with special reference to Non Communicable diseases like diabetes, hypertension, Ischemic heart disease, cancer, stroke and bronchial asthma including musculoskeletal disorders was conducted for every study subject.

## **12. The tools and techniques used in study.**

### **A) TOOLS :**

- i) Pretested semi structured questionnaire.
- ii) Portable Weighing machine.
- iii) Measuring tape.
- iv) Plastic ruler.
- v) Stethoscope and sphygmomanometer.
- vi) Accucheck (glucometer) for blood glucose levels estimation.

### **B) TECHNIQUE :**

1. **History:** All the information regarding existing morbidities was collected verbally as said by police personnel. An attempt was made to check their health cards or personal records for the information on the past morbidities to gather information about treatment or hospital admission.

## 2. Anthropometric Measurements.

a) **Weight:** The weighing machine was regularly standardized with a known weight. The study subjects were instructed about the procedure. Subjects were informed to wear light clothing and to stand barefoot on Berkeley bathroom dial type weighing scale. The scale was readjusted to zero after weighing each police. Every police was supervised for posture while standing on the weighing machine. They were made to stand erect with the both feet together without any support, looking straight with vision fixed on a point on the opposite wall such that the plain of vision was perpendicular to their body and parallel to the ground. The weight of the police were taken only after the machine was found to be accurate. The measurements were recorded to the nearest 100gm.<sup>75, 76</sup>

b) **Height:** Measurements were plotted on the wall using on a non-elastic measuring tape for recording the height of the police. Erect heights were obtained with the subjects standing barefoot on the flat surface, against the vertical wall with occiput, buttocks and heel touching the wall and arms hanging freely on the sides. They were instructed to fix their vision on a point of opposite wall/a distant object in Frankfurt plane. A none-elastic ruler was used to localize the upper limit of height measurements. Height measurements were recorded to the nearest 1cm.<sup>75, 76</sup>

### c) **WAIST CIRCUMFERENCE:**

It was measured on unclothed abdomen, by asking the participant to stand in erect posture and placing tape horizontally around the waist at the mid-point between lower border of rib cage and iliac crest.<sup>75, 76</sup>

#### **d) HIP CIRCUMFERENCE:**

It was measured with the participants standing erect with both thigh and feet touching to each other and the tape was placed horizontally at the level of greater trochanter.

For both Waist circumference and Hip Circumference the individual was made to stand with feet close together, arms at the side and body weight evenly distributed, and wearing little clothing. The subject was made to relax, and the measurements were taken at the end of a normal expiration. Each measurement was repeated twice; if the measurements were within 1 cm of one another, the average will be calculated. If the difference between the two measurements exceeds 1 cm, the two measurements were repeated.<sup>75, 76</sup>

### **3. INDICES**

#### **1) Calculation of BMI**

The calculation of BMI for Asians are same to the European or any other. It is the division of weight (in Kg) by the Height (in m<sup>2</sup>)

$$\text{BMI} = \text{Weight (in Kg)} / \text{Height (in m}^2\text{)}^{75, 76}$$

Those Participants who have BMI>25 were considered as Obese.

Asian Indian tends to have more visceral adipose tissue, causing higher insulin resistance, despite lean body mass. Health risk associated with obesity occurs at lower body mass index in Asian population, so proposed BMI Classification for adult Asian were used.<sup>98</sup>

| Classification | BMI For<br>Europoids | Classification | BMI For<br>Asians |
|----------------|----------------------|----------------|-------------------|
| Underweight    | >18.5                | Underweight    | >18.5             |
| Normal Weight  | 18.5-24.99           | Normal Weight  | 18.5-22.99        |
| Over Weight    | >25                  | Over Weight    | >23               |
| Pre Obese      | 25-29.99             | At Risk        | 23-24.99          |
| Obese I        | 30-34.99             | Obese          | 25-29.99          |
| Obese II       | 35-39.99             | Obese II       | >30               |
| Obese III      | >40                  |                |                   |

**2) Waist Hip Ratio:** was calculated by using the formula

$$\text{WHR} = \text{Waist circumference} / \text{Hip circumference}$$

A WHR of more than 1 for men and more than 0.85 for women indicates abdominal fat accumulation and was considered as increased risk for metabolic complications.<sup>1</sup>

**3. Clinical examination:** Pulse and Blood Pressure was measured for all the police personnel. Clinical examination of cardiovascular system, respiratory system, per abdomen and musculoskeletal problems was done.

**a) Pulse:**

The radial pulse in the right hand was measured for complete one minute and the reading was entered.

**b) Blood Pressure Measurement :**

At first every effort was made to relax the police personnel. BP was measured using sphygmomanometer with patient in sitting position. Subject was made to sit comfortably for few minutes before the measurement was taken. The forearm was supported with the cubital fossa at heart level (fourth intercostal space). The subject was asked to avoid wearing anything with tight sleeves. A Standard adult size cuff was applied to the exposed arm and was inflated till the manometer reading was 30 mm Hg above the level at which the pulse disappeared and then slowly deflated at approximately 2mm Hg/sec. During this time, Kortokoff sounds were monitored using a stethoscope placed over brachial artery on right side. The first perception of Kortokoff sound was taken as “systolic BP” and the disappearance of sounds (phase V) was taken as “Diastolic BP”. Three such readings were recorded at an interval of at least 3 minutes and the least value was taken.<sup>77</sup>

| <b>Classification</b> | <b>Systolic BP(mmHg)</b> | <b>Diastolic BP (mm Hg)</b> |
|-----------------------|--------------------------|-----------------------------|
| Normal                | <120                     | <80                         |
| Pre Hypertension      | 120-139                  | 80 - 89                     |
| Stage 1 Hypertension  | 140 - 159                | 90 - 99                     |
| Stage 2 Hypertension  | $\geq 160$               | $\geq 100$                  |

Source: Joint National Commission on Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)<sup>78</sup>

#### 4. Investigations:

All the police personnel were briefed and instructed about the procedure. They were asked to abstain from any kind of food after overnight meals. (To ensure minimum 8hrs of overnight fasting). All study subjects were divided into small batches of 25 each and on a prefixed day early morning fasting blood samples were drawn which were sent for biochemical analysis.

**a) Fasting blood Sugar:** Blood sample was taken from finger prick after 8 hrs. of overnights fasting and blood sugar level was assessed using Accucheck blood monitoring system.

**b) Lipid Profile:** Venous blood sample was collected after overnight fasting and total cholesterol, triglycerides, LDL, HDL and VLDL were estimated by Vitros 250 autoanalyser of Johnson and Johnson Company based on dry slide technology which utilizes reflectance photometry technique.

**c) Glycated Hemoglobin (HbA1C):** Bio rad D-10 method was used to estimate the HbA1c levels. Bio-Rad D-10 Hemoglobin A1C program is intended for the percent determination of hemoglobin A1C in human whole blood using ion-exchange high performance liquid chromatography (HPLC). Quality assurance was done periodically to check for errors.

### **13. DEFINITIONS OF VARIABLES (Annexure no: III)**

#### **14. Phase of analysis:**

The collected data was numerically coded and entered in Microsoft Excel and then transferred to the SPSS data sheet (version 22). Data was analyzed by applying appropriate statistical tests.

#### **15. Documentation phase:**

The analyzed data was presented in the form of text, tables and graphs. The results were interpreted and compared with various studies.

# RESULTS

**Table 1: Socio-Economic-Demographic Profile of the Police Personnel**

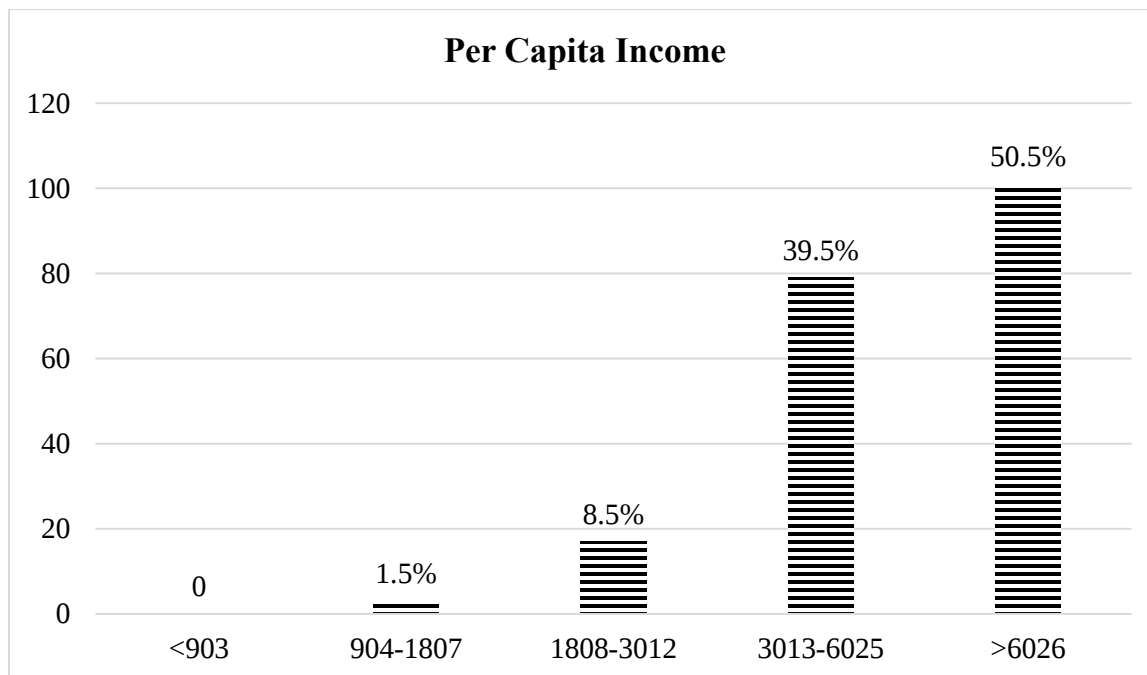
| <b>Variable</b>                                                            |                                    | <b>N=200</b> | <b>%</b>   |
|----------------------------------------------------------------------------|------------------------------------|--------------|------------|
| <b>Age</b>                                                                 | <30                                | 25           | 12.5       |
|                                                                            | 31-40                              | 58           | 29         |
|                                                                            | 41-50                              | 71           | 35.5       |
|                                                                            | >50                                | 46           | 23         |
|                                                                            | <b>Mean age: 41.94 ± 9.7 years</b> |              |            |
| <b>Religion</b>                                                            | Hindu                              | 182          | 91         |
|                                                                            | Muslim                             | 17           | 8.5        |
|                                                                            | Christian                          | 1            | 0.5        |
| <b>Sex</b>                                                                 | Male                               | 195          | 97.5       |
|                                                                            | Female                             | 5            | 2.5        |
| <b>Residence</b>                                                           | Urban                              | 159          | 79.5       |
|                                                                            | Rural                              | 41           | 20.5       |
| <b>Education</b>                                                           | Secondary                          | 57           | 28.5       |
|                                                                            | Higher secondary                   | 63           | 31.5       |
|                                                                            | Diploma                            | 13           | 6.5        |
|                                                                            | Graduate                           | 55           | 27.5       |
|                                                                            | Post graduate                      | 12           | 6          |
| <b>Marital status</b>                                                      | Married                            | 176          | 88         |
|                                                                            | Unmarried                          | 23           | 11.5       |
|                                                                            | Widow                              | 1            | 0.5        |
| <b>Type of family</b>                                                      | Nuclear                            | 129          | 64.5       |
|                                                                            | Joint                              | 25           | 12.5       |
|                                                                            | Three generation                   | 46           | 23         |
| <b>Socio-economic class<br/>(Modified B G Prasad's<br/>classification)</b> | Upper                              | 101          | 50.5       |
|                                                                            | Upper middle                       | 79           | 39.5       |
|                                                                            | Lower middle                       | 17           | 8.5        |
|                                                                            | Upper lower                        | 3            | 1.5        |
|                                                                            | <b>Total</b>                       | <b>200</b>   | <b>100</b> |

Table no.1 shows that most of the police were from the age group 41-50 years followed by 31-40 years. Mean age of the police was  $41.94 \pm 9.7$  years. Majority 182(91%) were Hindus and others were Muslims and Christians. 195(97.5%) out of 200 police personnel were males and 5(2.5%) were females. 159(79.5%) police were residing in the urban areas while remaining 41(20.5%) resided in the rural areas.

Majority of the police personnel 63(31.5%) had studied up to PUC (higher secondary), 57(28.5%) had completed SSLC (secondary) followed by 55(27.5%) of them who had done graduation 13(6.5%) had done diploma and 12(6%) had finished their post-graduation.

176 (88%) of the police were married, as the others were unmarried and 1(0.5%) was widow. Out of 200 police personal, 129(64.5%) belonged to Nuclear family, 71(35.5%) belonged to Three generation family and Joint family. Out of 200 police personnel, 101(50.5%) belonged to class I, 3(1.5%) belonged to class IV while none belonged to class V as per Modified B G Prasad's classification for the month of Aug 2015.

**Figure 1: Distribution of Police Personnel according to Modified B G Prasad's Classification**



**Table 2: Occupational Profile of Police Personnel**

| <b>Variable</b>                                    |                               | <b>N=200</b> | <b>%</b>   |
|----------------------------------------------------|-------------------------------|--------------|------------|
| <b>Designation</b>                                 | Police constable, home guards | 122          | 61         |
|                                                    | Head constables               | 65           | 32.5       |
|                                                    | Inspectors                    | 13           | 6.5        |
| <b>Station</b>                                     | DAR                           | 67           | 33.5       |
|                                                    | Traffic                       | 28           | 14         |
|                                                    | Gulpet                        | 35           | 17.5       |
|                                                    | Town                          | 36           | 18         |
|                                                    | Rural                         | 34           | 17         |
| <b>Type of work</b>                                | Field                         | 115          | 57.5       |
|                                                    | Desk                          | 34           | 17         |
|                                                    | Others*                       | 51           | 25.5       |
| <b>Experience<br/>(in no of years)</b>             | <10                           | 53           | 26.5       |
|                                                    | 11-20                         | 73           | 36.5       |
|                                                    | >20                           | 74           | 37         |
| <b>Night shifts</b>                                | Yes                           | 79           | 39.5       |
|                                                    | No                            | 121          | 60.5       |
| <b>Severity of work<br/>(as expressed)</b>         | Strenuous                     | 87           | 43.5       |
|                                                    | Sedentary                     | 113          | 56.5       |
| <b>Physical activity<br/>(during leisure time)</b> | Yes                           | 91           | 45.5       |
|                                                    | No                            | 109          | 54.5       |
|                                                    | <b>Total</b>                  | <b>200</b>   | <b>100</b> |

\*OTHERS - COURT, BOMB SQUAD, DOG SQUAD, DRIVER, ARMOURER

Table no.2 shows that most of the police 122(61%) were Police constables and Home guards, followed by 65(32.5%) who were Head constables and 13(6.5%) were inspectors viz. Sub Inspectors, Assistant Sub Inspectors and Women Assistant Sub Inspectors.

67(33.5%) of 200 police were working in District Armed Reserve Police station, 36(18%) were from Kolar Town police station, 35 (17.5%) were from Gulpet station, 34(17%) were from Rural station and 28(14%) were Traffic police.

115(57.5%) out of 200 police were working in the field, 34(17%) were doing desk work which included writer and computer operator and 51(25.5%) were working at Court, Bomb squad, Dog squad, Driver, Armorer.

74(37%) had worked in the police department for more than 20 years, 73(36.5%) of the police had worked between 11 and 20 years and 53(26.5%) had experience of less than 10 years.

79(39.5%) of the police personnel had worked in the night shifts and 121(60.5%) had worked in the day shift in the previous month.

87(43.5%) police personnel opined that their work was strenuous and 113 (56.5%) felt that their work was sedentary.

91(45.5%) of the police were involved in physical activity like Walking, Jogging, Yoga and Sports. for a duration of more than 30min per day for at least 5 days in a week .109(54.5%) police did not have any physical activity during leisure time.

**Table 3: Distribution of Police Based on Number of Hours of Work per Day**

| <b>Working Hours</b>             | <b>N=200</b> | <b>%</b>     |
|----------------------------------|--------------|--------------|
| <b><math>\leq 8</math> hours</b> | 61           | 30.5         |
| <b><math>&gt; 8</math> hours</b> | 139          | 69.5         |
| <b>Total</b>                     | <b>200</b>   | <b>100.0</b> |

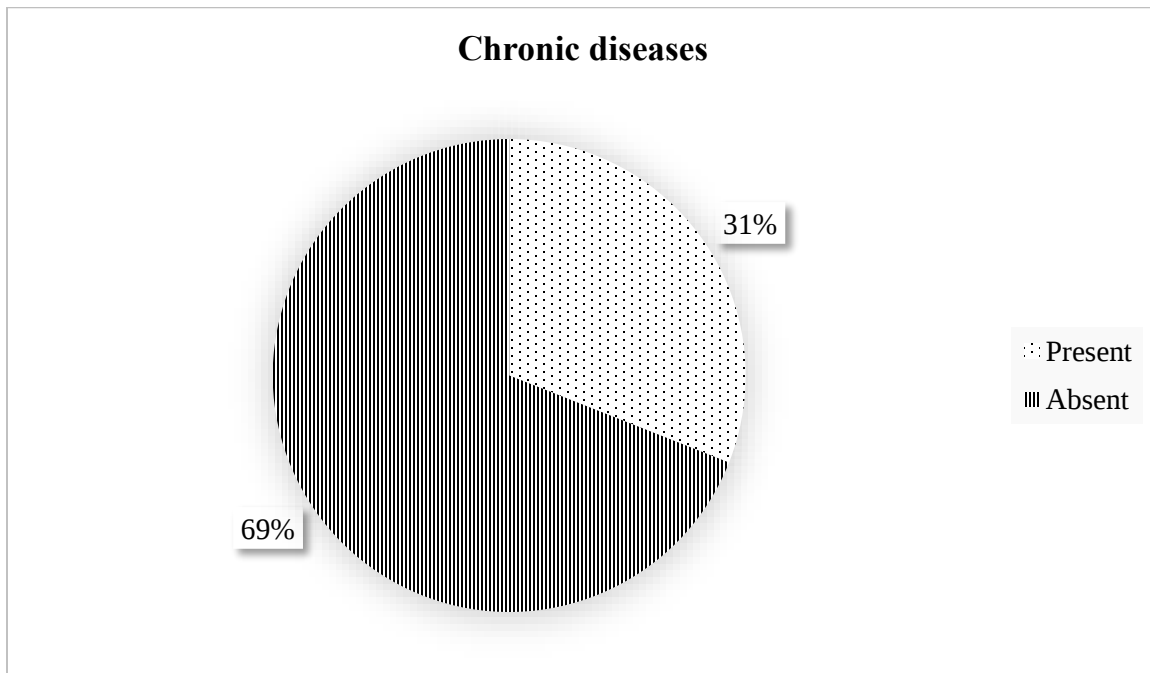
Above table shows that 139 (69.5%) of the police personnel were working for more than 8 hours a day whereas only 61 (30.5%) were working for 8 hours a day.

**Table 4: Distribution Based on History of Chronic Diseases**

| <b>Chronic Diseases</b> | <b>N=200</b> | <b>%</b>     |
|-------------------------|--------------|--------------|
| <b>Present</b>          | 62           | 31.0         |
| <b>Absent</b>           | 138          | 69.0         |
| <b>Total</b>            | <b>200</b>   | <b>100.0</b> |

The above table shows that 62(31%) of 200 police personnel had history of one or more of the chronic diseases like DM (40%), HTN (28%), IHD (7%), asthma (6%) and others (19%).

**Figure 2: Distribution of Chronic Diseases among Police Personnel**

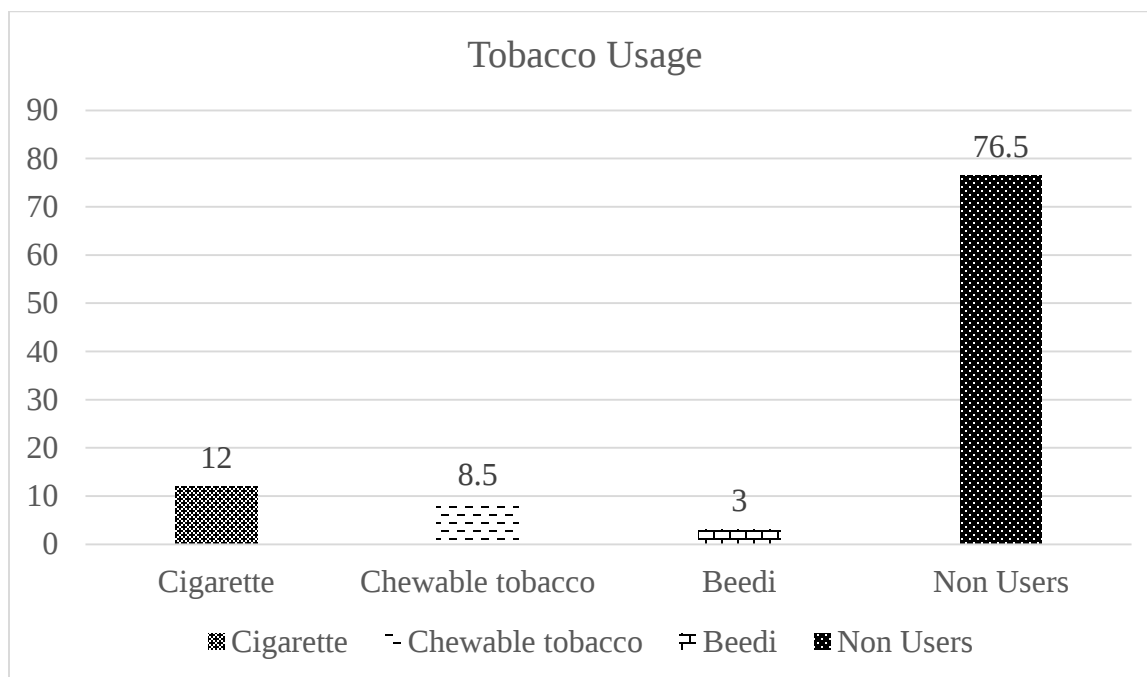


**Table 5: Distribution Status of Tobacco Usage**

| <b>Tobacco usage</b> |                  | <b>N=200</b> | <b>%</b>     |
|----------------------|------------------|--------------|--------------|
| <b>Yes</b>           | Cigarette        | 24           | 12           |
|                      | Chewable tobacco | 17           | 8.5          |
|                      | Beedi            | 6            | 3            |
| <b>No</b>            |                  | 153          | 76.5         |
| <b>Total</b>         |                  | <b>200</b>   | <b>100.0</b> |

Above table shows that 47 (23.5%) out of 200 police had history of tobacco usage. The commonest form of tobacco used was Cigarette (50%), followed by chewable form of tobacco (37%) and Beedi (13%).

**Figure 3: Various forms of tobacco usage among police personnel**

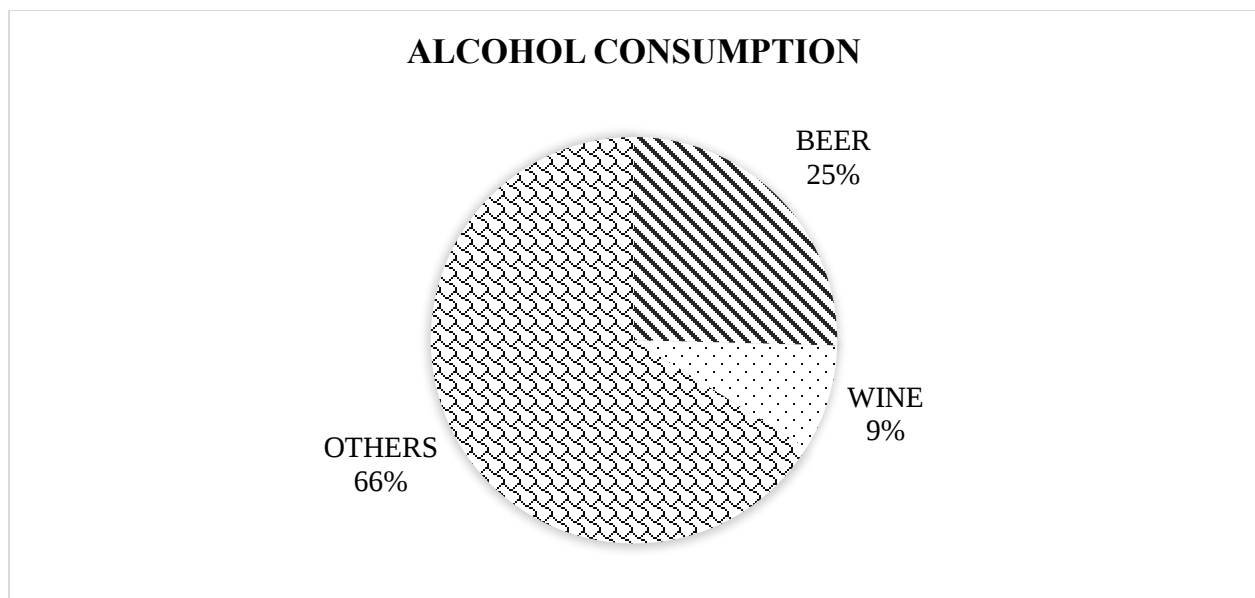


**Table 6: Distribution of police personnel based on habit of alcohol consumption**

| <b>Alcohol Consumption</b> | <b>N=200</b> | <b>%</b>     |
|----------------------------|--------------|--------------|
| <b>Yes</b>                 | 56           | 28.0         |
| <b>No</b>                  | 144          | 72.0         |
| <b>Total</b>               | <b>200</b>   | <b>100.0</b> |

Above table shows that 56 (28%) had habit of alcohol consumption.

**Figure 4: Distribution of Police Personnel with Respect to Modes of Alcohol Consumed.**



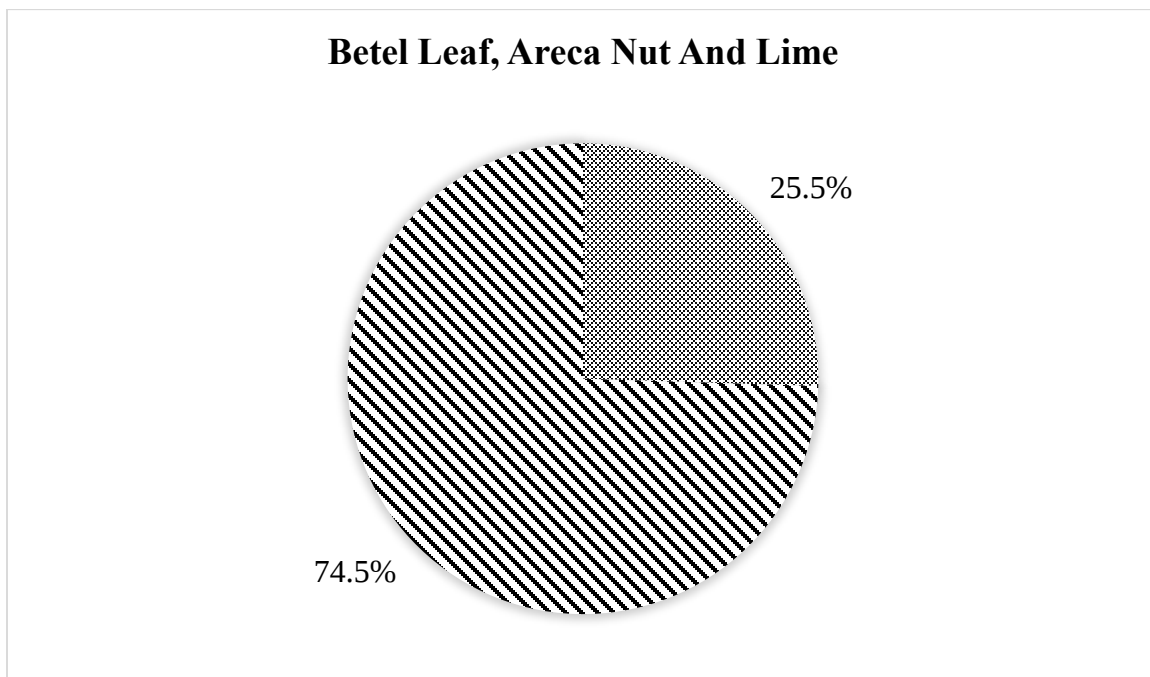
66% of the police in the present study were consuming brandy, whisky, rum and vodka followed by beer (25%) and wine (9%).

**Table 7: Distribution of habit of betel leaf, areca nut and lime usage among police**

| <b>Areca Nut, Betel Leaf</b> | <b>N</b>   | <b>%</b>     |
|------------------------------|------------|--------------|
| <b>Yes</b>                   | 51         | 25.5         |
| <b>No</b>                    | 149        | 74.5         |
| <b>Total</b>                 | <b>200</b> | <b>100.0</b> |

Above table shows that 51(25.5%) police personnel had history of betel leaf Chewing.

**Figure 5: Betel leaf usage among police personnel**



**Table 8: Descriptive Statistics of Quantitative Variables**

| <b>Variable</b>     | <b>Mean <math>\pm</math> SD</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Range</b> |
|---------------------|---------------------------------|----------------|----------------|--------------|
| <b>Pulse</b>        | 79.41 $\pm$ 10.45               | 54             | 112            | 58           |
| <b>SBP</b>          | 130.99 $\pm$ 12.66              | 102            | 195            | 93           |
| <b>DBP</b>          | 80.90 $\pm$ 8.40                | 53             | 110            | 57           |
| <b>Weight (Kgs)</b> | 78.4 $\pm$ 9.38                 | 59.5           | 110.5          | 51           |
| <b>Height (cms)</b> | 172.07 $\pm$ 4.95               | 148            | 189            | 41           |
| <b>BMI</b>          | 26.51 $\pm$ 3.26                | 19.7           | 36.8           | 17.1         |
| <b>WC (cms)</b>     | 91.04 $\pm$ 8.33                | 72             | 121            | 49           |
| <b>HC (cms)</b>     | 97.38 $\pm$ 7.91                | 64             | 124            | 60           |
| <b>WHR</b>          | 0.93 $\pm$ 0.047                | 0.76           | 1.18           | 0.42         |

The mean Pulse rate observed was 79.41 $\pm$ 10.45 beats per minute, mean SBP was 130.99 $\pm$ 12.66 mm Hg, mean DBP was 80.90 $\pm$ 8.40 mm Hg, mean Weight in Kgs was 78.4 $\pm$ 9.38, mean Height in cms was 172.07 $\pm$ 4.95, mean BMI in Kg/ (mt)<sup>2</sup> was 26.51 $\pm$ 3.26, mean Waist Circumference in cms was 91.04 $\pm$ 8.33, mean Hip Circumference was 97.38 $\pm$ 7.91 and mean Waist Hip Ratio was 0.93 $\pm$ .047 in the present study.

**Table 9: Descriptive Statistics of Glycemic and Lipid Profile**

| <b>Variable</b> | <b>Mean <math>\pm</math> SD</b> | <b>Minimum</b> | <b>Maximum</b> | <b>Range</b> |
|-----------------|---------------------------------|----------------|----------------|--------------|
| <b>FBS</b>      | 113.12 $\pm$ 35.9               | 67             | 256            | 189          |
| <b>HbA1C</b>    | 5.84 $\pm$ 1.37                 | 4.1            | 11.5           | 7.4          |
| <b>TC</b>       | 165.8 $\pm$ 32.6                | 100            | 305            | 205          |
| <b>TG</b>       | 208.8 $\pm$ 100.7               | 66             | 575            | 509          |
| <b>HDL</b>      | 36.1 $\pm$ 9.9                  | 17             | 95             | 78           |
| <b>LDL</b>      | 87.5 $\pm$ 28.7                 | 6              | 199            | 193          |
| <b>VLDL</b>     | 43.08 $\pm$ 20.0                | 14             | 113            | 99           |

The mean Fasting Blood Sugar level in mg/dl observed was 113.12 $\pm$ 35.9, mean HbA1C was 5.84 $\pm$ 1.37, mean Total Cholesterol in mg/dl was 165.8 $\pm$ 32.6, mean Triglycerides in mg/dl was 208.8 $\pm$ 100.7, mean HDL in mg/dl was 36.1 $\pm$ 9.9, mean LDL in mg/dl was 87.5 $\pm$ 28.7 and mean VLDL in mg/dl was 43.08 $\pm$ 20.0 in the present study.

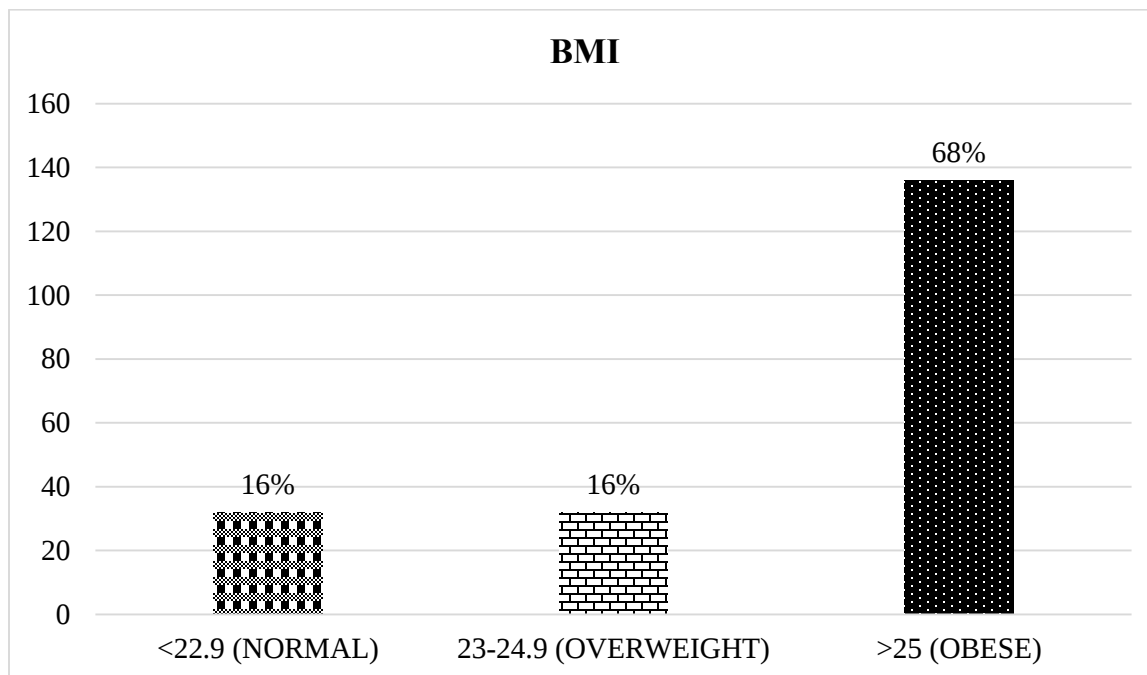
**Table 10: Distribution Based on Nutritional Status of Police**

| <b>BMI</b>        | <b>N</b>   | <b>%</b>     |
|-------------------|------------|--------------|
| <b>Normal</b>     | 32         | 16.0         |
| <b>Overweight</b> | 32         | 16.0         |
| <b>Obese</b>      | 136        | 68.0         |
| <b>Total</b>      | <b>200</b> | <b>100.0</b> |

Health risk associated with obesity occurs at lower body mass index in Asian population, so proposed BMI Classification for adult Asian was used.<sup>98</sup>

Above table shows that 32(16%) out of 200 had normal BMI, 32(16%) were overweight and 136(68%) were obese.

**Figure 6: Distribution of Police Based On BMI**

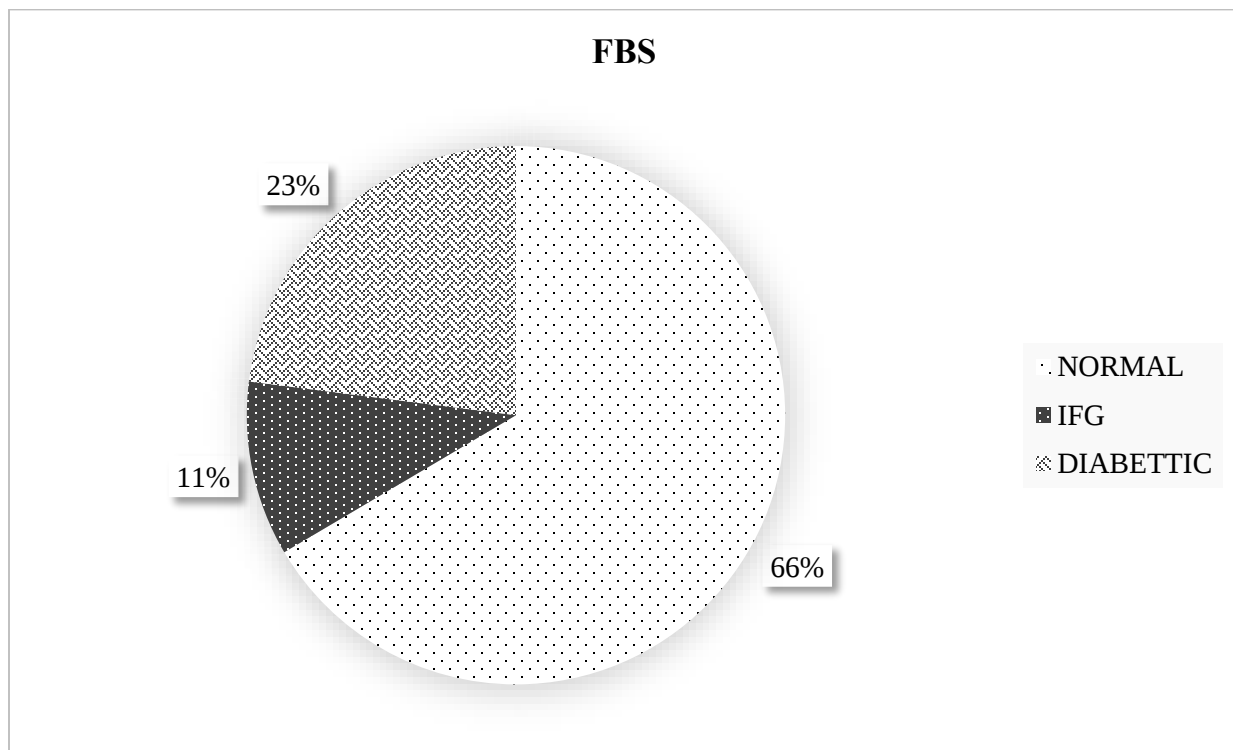


**Table 11: Classification of Diabetic Status among Police (Based on FBS Values)**

| <b>FBS</b>      | <b>N</b>   | <b>%</b>     |
|-----------------|------------|--------------|
| <b>Normal</b>   | 133        | 66.5         |
| <b>IFG</b>      | 21         | 10.5         |
| <b>Diabetes</b> | 46         | 23.0         |
| <b>Total</b>    | <b>200</b> | <b>100.0</b> |

Diagnosis of diabetes was done based on American Diabetic Association Criteria for diabetes detection.<sup>96</sup> Above table shows that, 46 (23%) police were diabetic, 21 (10.5%) were having impaired fasting glucose and 133 (66.5%) were normal by fasting blood glucose estimation.

**Figure 7: Distribution of Diabetic Status among Police (Based on FBS Values)**

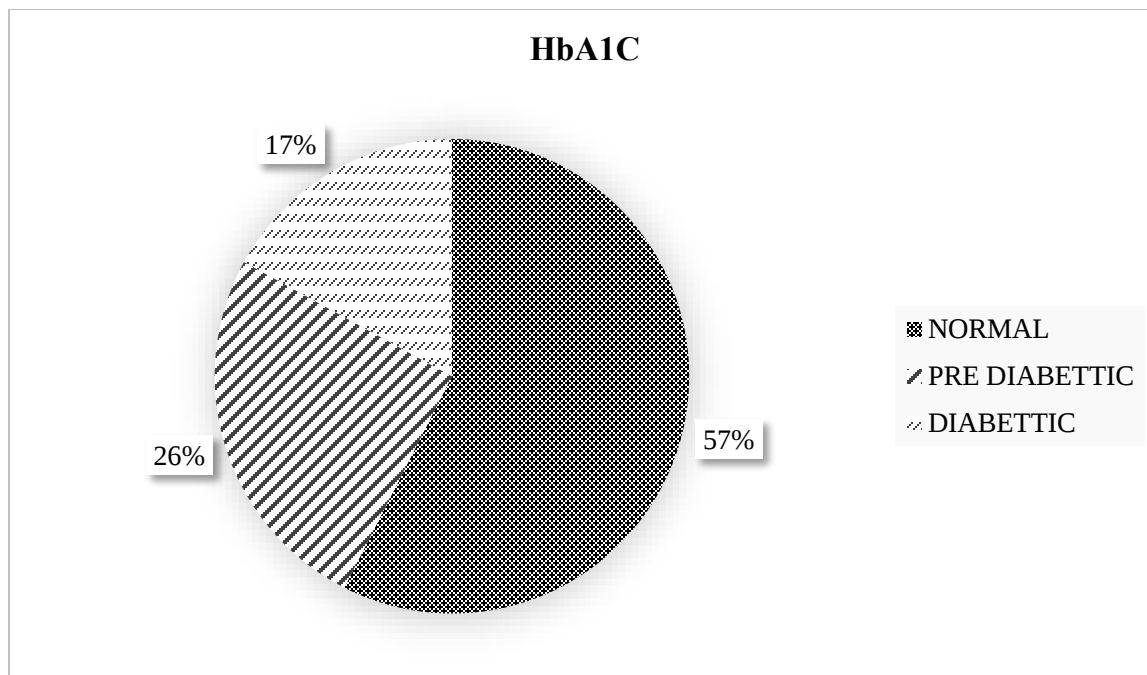


**Table 12: Distribution of Diabetic Status among Police (Based On HbA1c Values)**

| HbA1C        | N=200 | %     |
|--------------|-------|-------|
| Normal       | 115   | 57.5  |
| Pre diabetes | 51    | 25.5  |
| Diabetes     | 34    | 17.0  |
| Total        | 200   | 100.0 |

Diagnosis of diabetes was made by American Diabetes Association Clinical Practice Recommendations.<sup>97</sup> Above table shows that 34(17%) of the police personnel were diabetic, 51(25.5%) were pre diabetic and 115(57.5%) were normal based on the HbA1C levels.

**Figure 8: Distribution of Diabetic Status of Police (Based on HbA1c Levels)**



**Table 13: Distribution of Police Personnel Based on Diabetic Status**

| <b>Diabetic Status</b>                | <b>N (%)</b> |
|---------------------------------------|--------------|
| <b>Known Diabetic</b>                 | 29(60)       |
| <b>Newly Diagnosed to be Diabetic</b> | 19(40)       |
| <b>Total</b>                          | <b>48</b>    |

Out of 48 police (46 who had FBS Values >126mg/dl and 2 who had Values <109 but was a known Diabetic) who were diagnosed to have Diabetes, 29 were already known diabetics and 19 were newly diagnosed to have diabetes.

**Table 14: Association between Fasting Blood Sugar and Glycated Hemoglobin (HbA1c) Values with Known Diabetic Status among Police**

|       |             | Known Diabetic |       |       |       | P value |
|-------|-------------|----------------|-------|-------|-------|---------|
|       |             | Yes            |       | No    |       |         |
|       |             | N=29           | %     | N=171 | %     |         |
| FBS   | Normal      | 2              | 6.9%  | 131   | 76.6% | <0.001* |
|       | Prediabetes | 0              | 0.0%  | 21    | 12.3% |         |
|       | Diabetes    | 27             | 93.1% | 19    | 11.1% |         |
| HbA1C | Normal      | 2              | 6.9%  | 113   | 66.1% | <0.001* |
|       | Prediabetes | 6              | 20.7% | 45    | 26.3% |         |
|       | Diabetes    | 21             | 72.4% | 13    | 7.6%  |         |

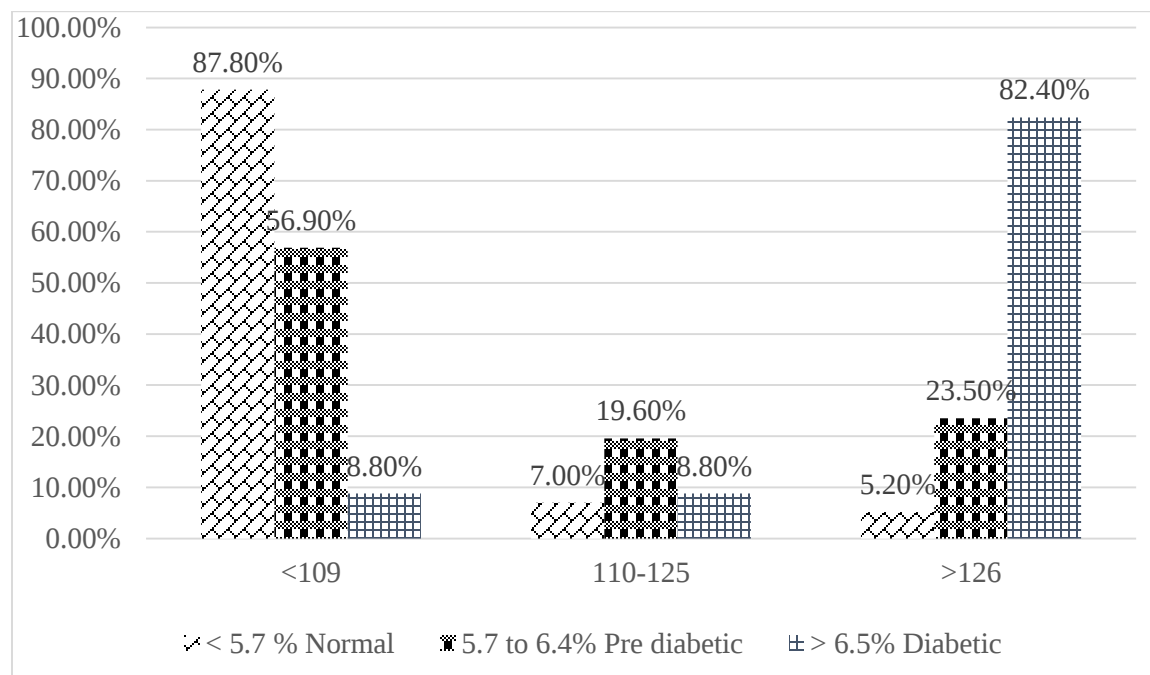
Above table shows that 27 out of 29 Known diabetic police were having FBS levels >126mg/dl which is cut off for diagnosis of Diabetes and 21 out of 29 Known diabetic police had HbA1C levels > 6.5% which indicate Diabetic status and 6 police were Pre-Diabetic and the observed difference was statistically significant which indicate most Known Diabetic police had poor Glycemic Control.

**Table 15: Association between FBS and HbA1c Values among Police**

| FBS         | HbA1c  |       |              |       |          |       | P value |
|-------------|--------|-------|--------------|-------|----------|-------|---------|
|             | Normal |       | Pre diabetes |       | Diabetes |       |         |
|             | N      | %     | N            | %     | N        | %     |         |
| Normal      | 101    | 87.8% | 29           | 56.9% | 3        | 8.8%  | <0.001* |
| Prediabetes | 8      | 7.0%  | 10           | 19.6% | 3        | 8.8%  |         |
| Diabetes    | 6      | 5.2%  | 12           | 23.5% | 28       | 82.4% |         |

Above table shows that most of the police who were diabetic as per FBS levels had HbA1C values above 6.5% which indicates poor glycemic control which was statistically significant.

**Figure 9: Association between FBS and HbA1c Values among Police**



**Table 16: Association between Diabetic Status and Age among Police**

| AGE   | FBS  |         |      | Total | P value |
|-------|------|---------|------|-------|---------|
|       | <109 | 110-125 | >126 |       |         |
| <30   | 23   | 1       | 1    | 25    | <0.001* |
| 31-40 | 49   | 3       | 6    | 58    |         |
| 41-50 | 41   | 13      | 17   | 71    |         |
| >51   | 20   | 4       | 22   | 46    |         |
| Total | 133  | 21      | 46   | 200   |         |

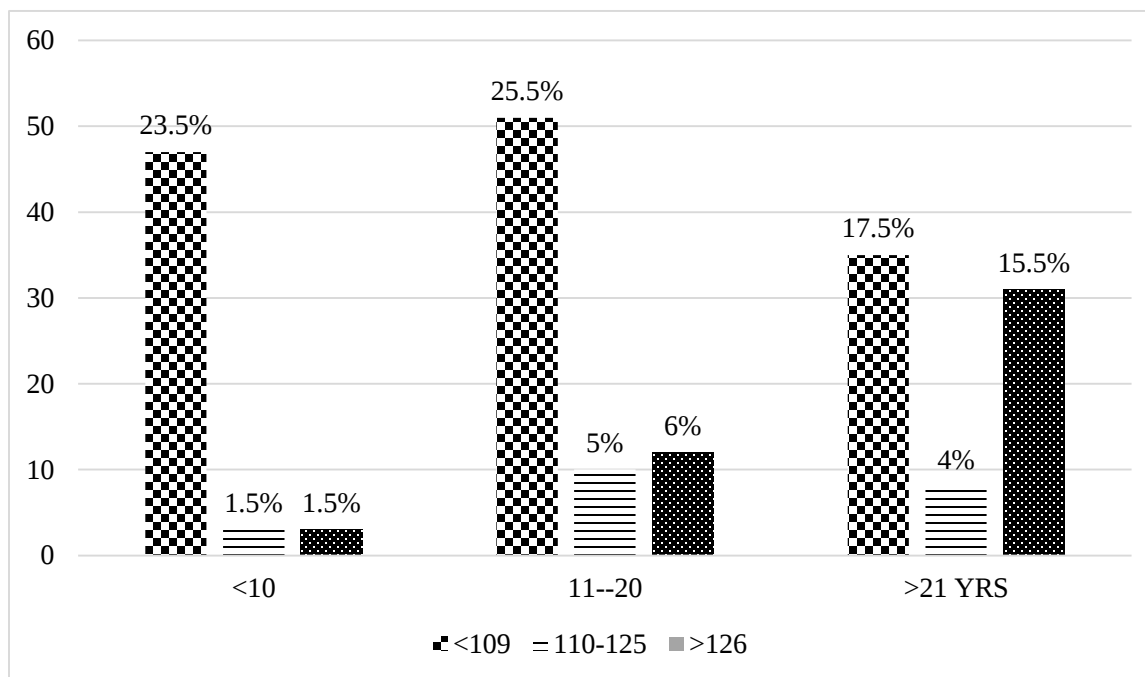
Above table shows that high proportion of police who belonged to higher age group had IFG and Diabetes when compared to lower age group which was statistically significant

**Table 17: Association Between Duration of Service and Diabetic Status (Based On FBS Values) among Police**

| Duration of service | FBS        |           |           | Total      | P value |
|---------------------|------------|-----------|-----------|------------|---------|
|                     | <109       | 110-125   | >126      |            |         |
| <10 yrs             | 47         | 3         | 3         | 53         | <0.001* |
| 11-20 yrs           | 51         | 10        | 12        | 73         |         |
| >21 yrs             | 35         | 8         | 31        | 74         |         |
| <b>Total</b>        | <b>133</b> | <b>21</b> | <b>46</b> | <b>200</b> |         |

IFG and Diabetes was seen more among those with more work experience and this was statistically significant.

**Figure 10: Association Between Duration of Service and Diabetic Status (Based On FBS Values) among Police**

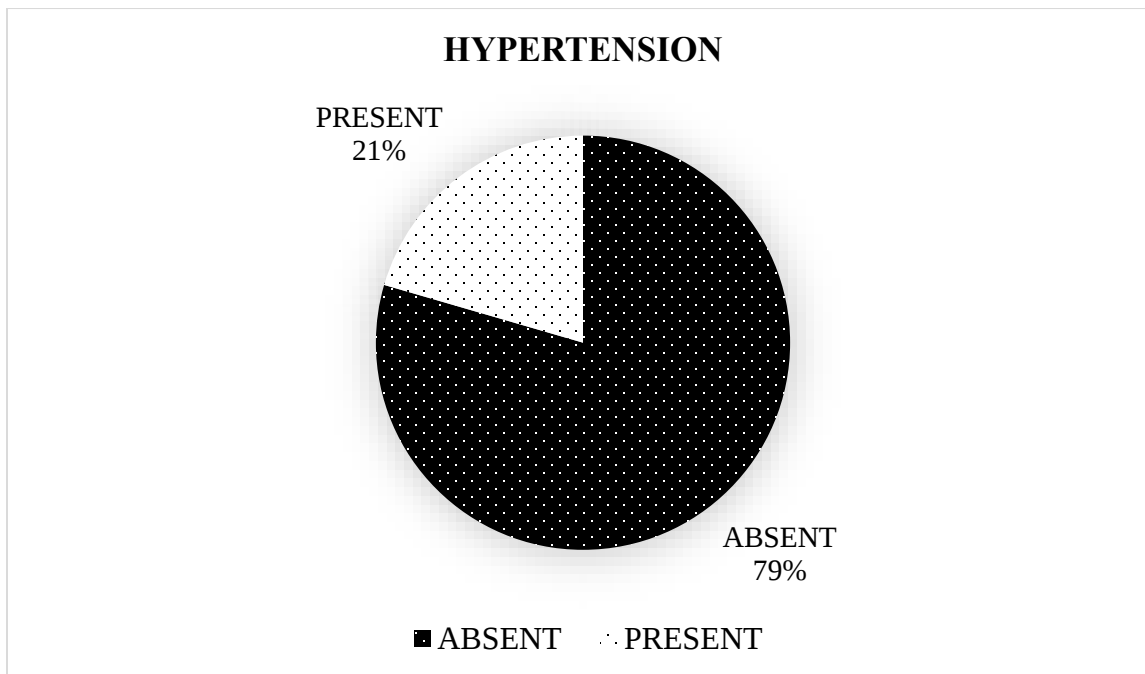


**Table 18: Hypertension Status among Study Subjects**

| <b>Hypertension</b> | <b>N</b>   | <b>%</b>   |
|---------------------|------------|------------|
| <b>Present</b>      | 41         | 20.5       |
| <b>Absent</b>       | 159        | 79.5       |
| <b>Total</b>        | <b>200</b> | <b>100</b> |

Hypertension was diagnosed as per guidelines of Joint National Commission on Detection, Evaluation and Treatment of High Blood Pressure (JNC 7).<sup>78</sup> Hypertension was seen in 41 (20.5%) and 159 (79.5%) were normotensives among study subjects.

**Figure 11: Hypertension Status among Study Subjects**



**Table 19: Distribution of Police Personnel Based on Hypertensive Status**

| <b>Hypertension</b>       | <b>N (%)</b> |
|---------------------------|--------------|
| <b>Known Hypertensive</b> | 20 (38%)     |
| <b>Newly Diagnosed</b>    | 32 (62%)     |
| <b>Total</b>              | <b>52</b>    |

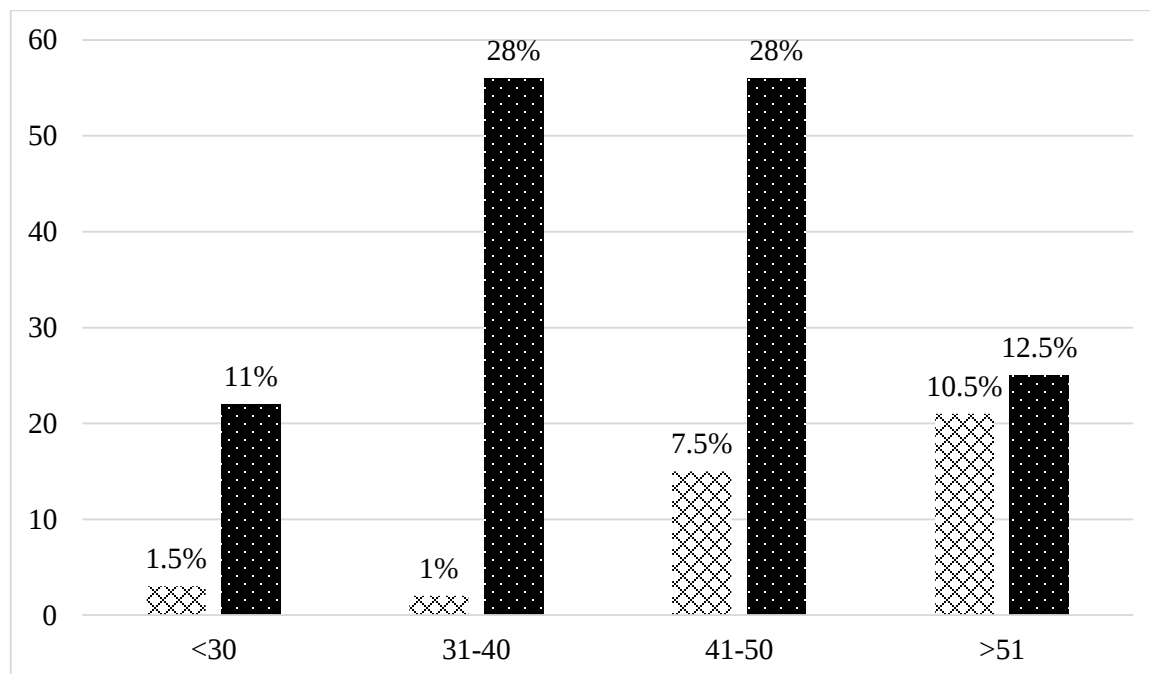
Out of 200 police, 52 police were diagnosed to have hypertension among whom 32 were newly diagnosed to have Hypertension.

**Table 20: Association between Hypertensive Status and Age Group**

| Age   | HTN    |         | Total | P Value |
|-------|--------|---------|-------|---------|
|       | Absent | Present |       |         |
| <30   | 22     | 3       | 25    | <0.001* |
| 31-40 | 56     | 2       | 58    |         |
| 41-50 | 56     | 15      | 71    |         |
| >51   | 25     | 21      | 46    |         |
| Total | 159    | 41      | 200   |         |

Above table shows that high proportion of police who belonged to higher age group had hypertension when compared to lower age group which was statistically significant.

**Figure 12: Association between Hypertensive Status and Age Group**

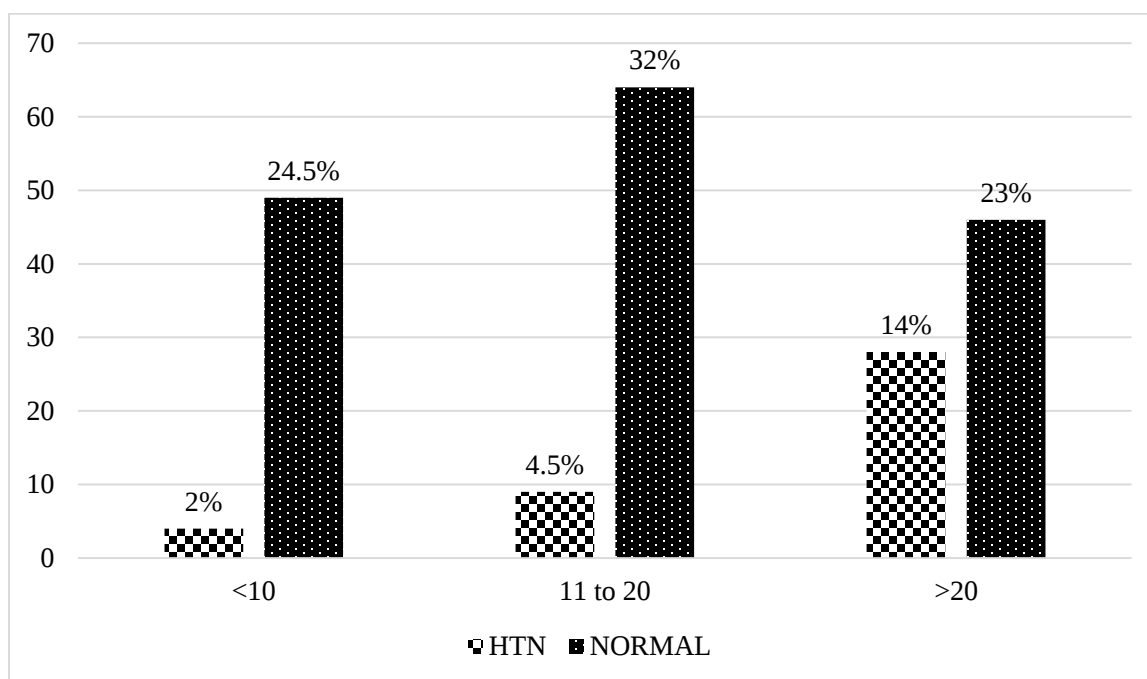


**Table 21: Association between Hypertensive Status and Duration of Service**

| Duration of service | Hypertension |        | Total | P value |
|---------------------|--------------|--------|-------|---------|
|                     | Present      | Absent |       |         |
| <10 yrs             | 4            | 49     | 53    | <0.001* |
| 11-20 yrs           | 9            | 64     | 73    |         |
| >20 yrs             | 28           | 46     | 74    |         |
| Total               | 41           | 159    | 200   |         |

Above table shows that police who had served police department for a longer duration had hypertension than police with less no of years of service which was statistically significant.

**Figure 13: Association between Hypertensive Status and Duration of Service**

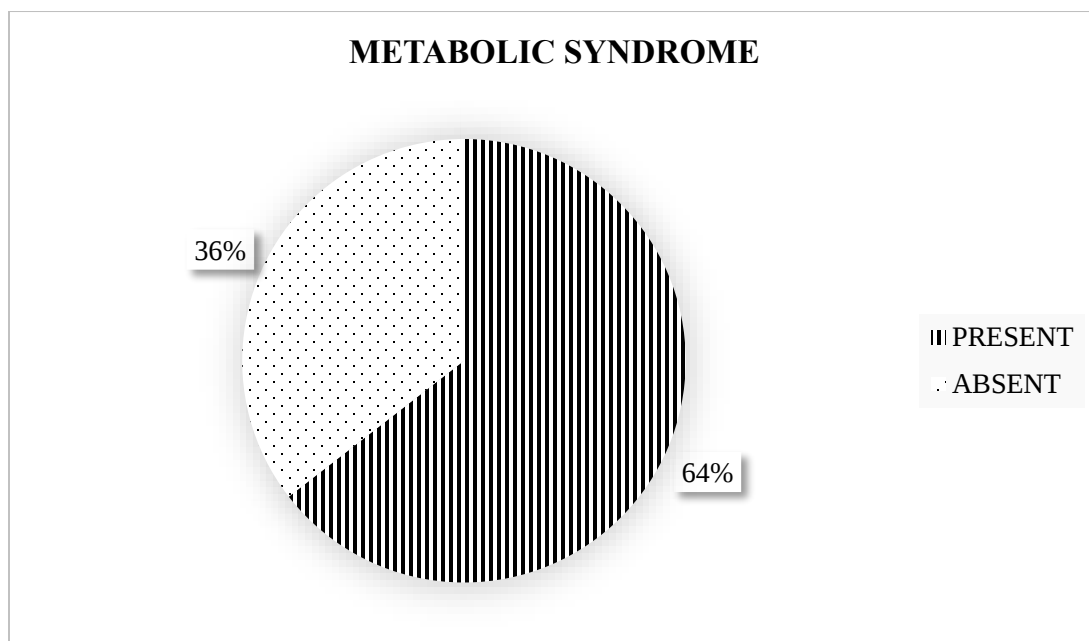


**Table 22: Distribution of Police Based on Presence of Metabolic Syndrome**

| Metabolic syndrome | N   | Percentage |
|--------------------|-----|------------|
| Present            | 129 | 64.5       |
| Absent             | 71  | 35.5       |
| Total              | 200 | 100.0      |

Above table shows that 129 (64.5%) police personnel had metabolic syndrome.

**Figure 14: Distribution of Police Based on Presence of Metabolic Syndrome**

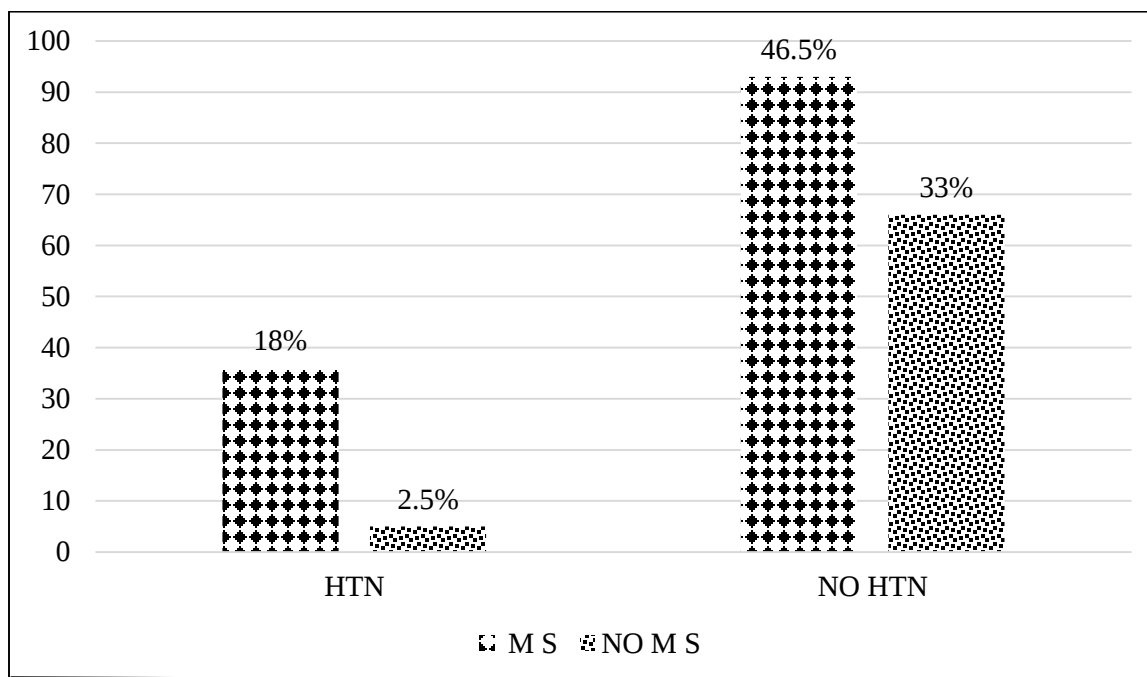


**Table 23: Association between Hypertension and Metabolic Syndrome**

| HTN     | Metabolic Syndrome |        | Total | P Value |
|---------|--------------------|--------|-------|---------|
|         | Present            | Absent |       |         |
| Present | 36                 | 5      | 41    | <0.001* |
| Absent  | 93                 | 66     | 159   |         |
| Total   | 129                | 71     | 200   |         |

Above table shows that metabolic syndrome was more common in those police who had their BP readings >140/90 than those who had BP readings <140/90 and this was statistically significant.

**Figure 15: Association between Hypertension and Metabolic Syndrome**

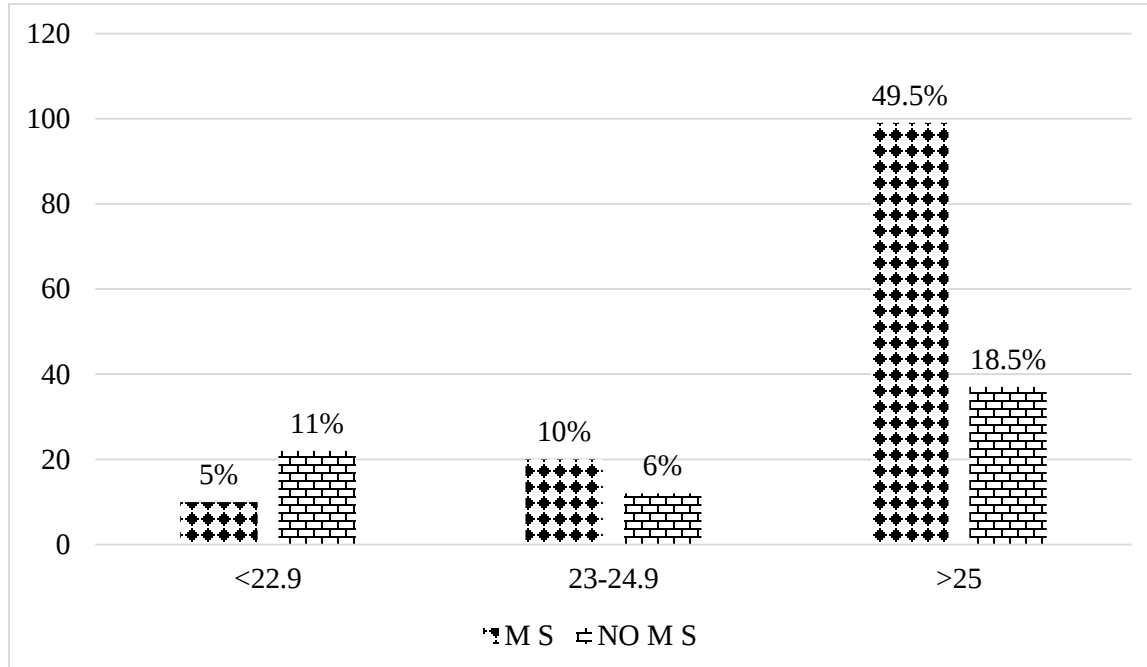


**Table 24: Association between Body Mass Index and Metabolic Syndrome**

| BMI          | Metabolic Syndrome |             | Total      | P Value |
|--------------|--------------------|-------------|------------|---------|
|              | Present (%)        | Absent (%)  |            |         |
| <22.9        | 10 (31.25%)        | 22 (68.75%) | 32         | <0.001* |
| 23-24.9      | 20 (62.5%)         | 12 (37.5%)  | 32         |         |
| >25          | 99 (72.7%)         | 37 (27.3%)  | 136        |         |
| <b>Total</b> | <b>129</b>         | <b>71</b>   | <b>200</b> |         |

Above table shows that metabolic syndrome was more common among those who were Obese and Overweight when compared to Normal BMI and this difference was statistically significant.

**Figure 16: Association between Body Mass Index and Metabolic Syndrome**

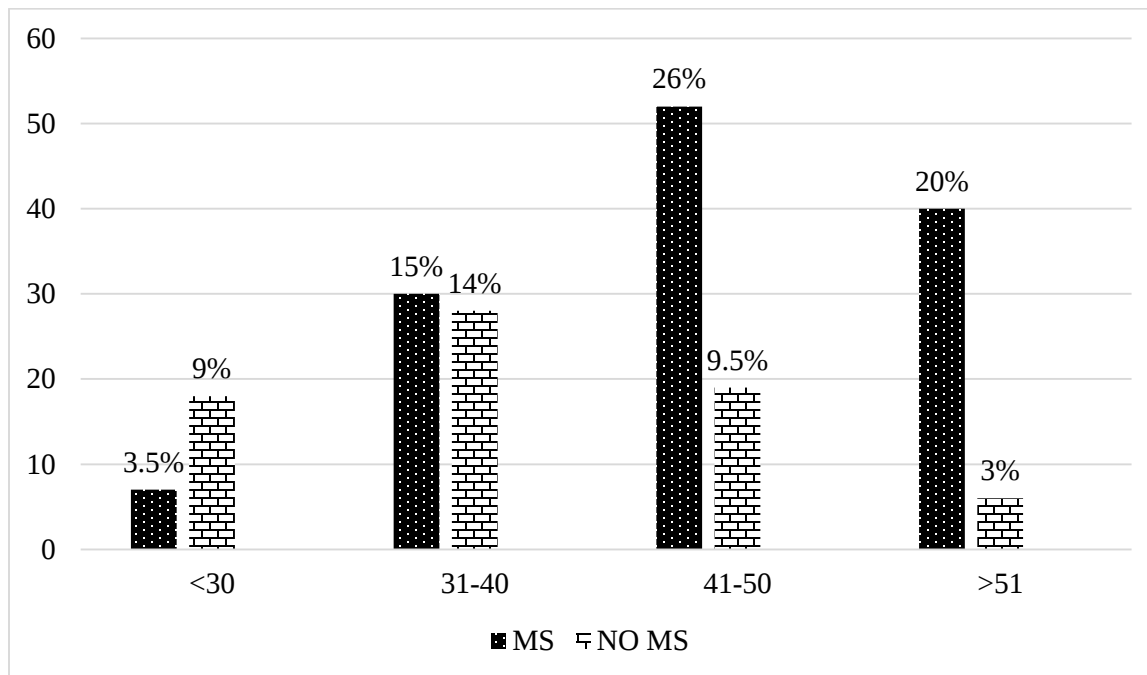


**Table 25: Association between Age and Metabolic Syndrome**

| Age   | Metabolic Syndrome |            | Total | P Value |
|-------|--------------------|------------|-------|---------|
|       | Present (%)        | Absent (%) |       |         |
| < 30  | 7 (28%)            | 18 (72%)   | 25    | <0.001* |
| 31-40 | 30 (51.7%)         | 28 (48.3%) | 58    |         |
| 41-50 | 52 (73.2%)         | 19 (26.8%) | 71    |         |
| > 51  | 40 (86.9%)         | 6 (13.1%)  | 46    |         |
| Total | 129                | 71         | 200   |         |

Above table shows that higher proportion of police who belonged to higher age group had metabolic syndrome when compared to lower age group and this was statistically significant.

**Figure 17: Association between Age and Metabolic Syndrome**

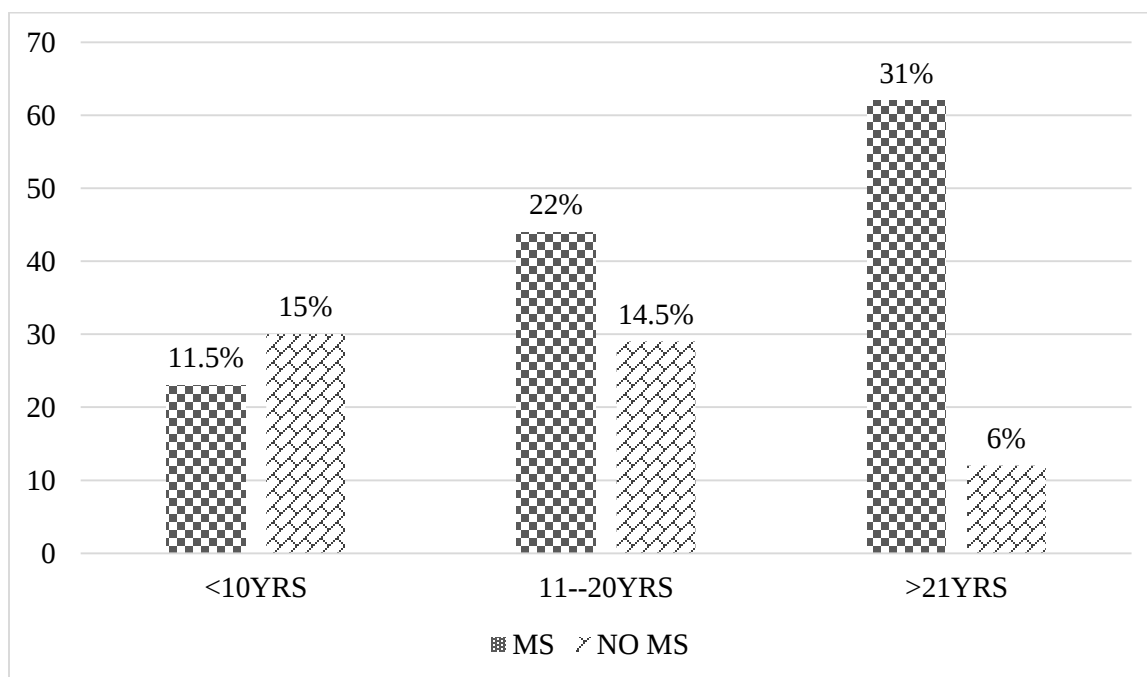


**Table 26: Association between Duration of Service and Metabolic Syndrome**

| Duration of service | Metabolic syndrome |            | Total      | P value |
|---------------------|--------------------|------------|------------|---------|
|                     | Present (%)        | Absent (%) |            |         |
| <10 yrs             | 23 (43.3%)         | 30 (56.7%) | 53         | <0.001* |
| 11-20 yrs           | 44 (60.2%)         | 29 (39.8%) | 73         |         |
| >21 yrs             | 62 (83.7%)         | 12 (16.3%) | 74         |         |
| <b>Total</b>        | <b>129</b>         | <b>71</b>  | <b>200</b> |         |

Above table shows that higher proportion of police who had more no of years of experience had metabolic syndrome and this was statistically significant

**Figure 18: Association between Duration of Service and Metabolic Syndrome**

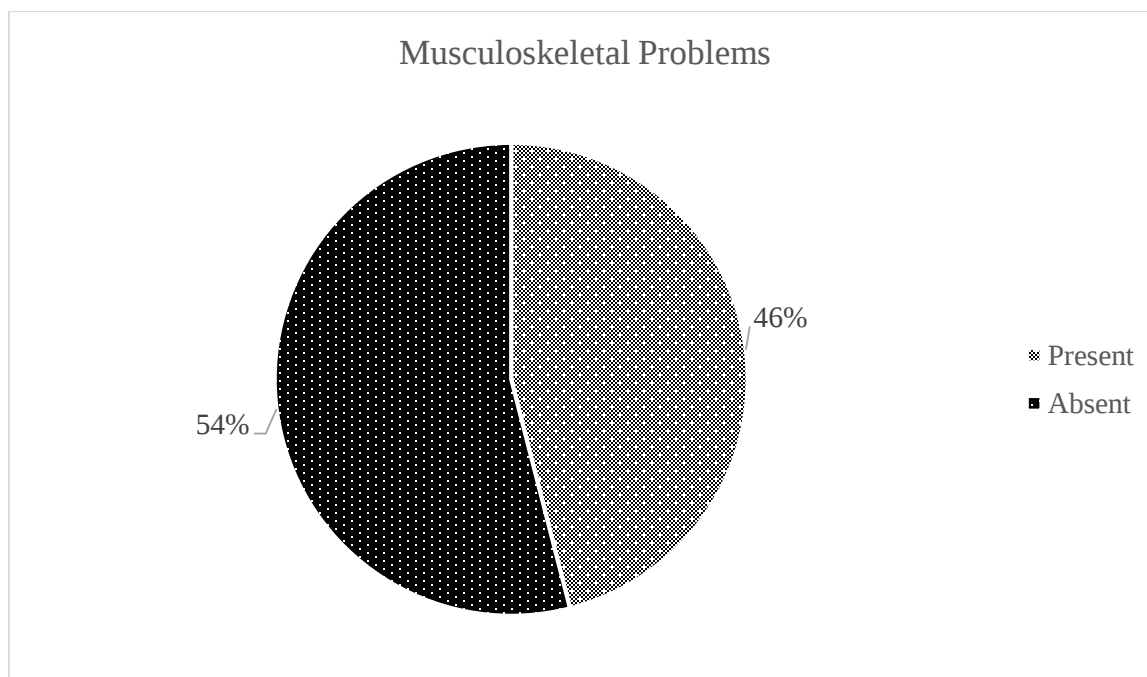


**Table 27: Distribution of Musculoskeletal Problems among Police Personnel**

| <b>Musculoskeletal Problems</b> | <b>N</b>   | <b>%</b>     |
|---------------------------------|------------|--------------|
| <b>Present</b>                  | 92         | 46.0         |
| <b>Absent</b>                   | 108        | 54.0         |
| <b>Total</b>                    | <b>200</b> | <b>100.0</b> |

Above table shows that 92 (46%) police had one or more of the musculoskeletal problems. 41% of the police experienced Lower Back Ache, 31% Knee pain, 19% Neck pain and 6% had Shoulder pain.

**Figure 19: Distribution of Musculoskeletal Problems in the Police Personnel**



**Table 28: Independent Risk Factors for Diabetes Mellitus by Logistic Regression**

|                          |                                     | Diabetes Mellitus<br>(Yes and No) |                |         |        |
|--------------------------|-------------------------------------|-----------------------------------|----------------|---------|--------|
|                          |                                     | P value                           | Adjusted<br>OR | 95% C.I |        |
|                          |                                     |                                   |                | Lower   | Upper  |
| Experience               | 1 to 10 yrs<br>(Reference Category) |                                   |                |         |        |
|                          | 11 to 20 yrs                        | 0.475                             | 0.380          | 0.027   | 5.412  |
|                          | >20 yrs                             | 0.752                             | 0.799          | 0.200   | 3.200  |
| Age Group                | < 30 yrs<br>(Reference Category)    |                                   |                |         |        |
|                          | 31 to 40 yrs                        | 0.076                             | 0.023          | 0.000   | 1.478  |
|                          | 41 to 50 yrs                        | 0.356                             | 0.372          | 0.045   | 3.044  |
|                          | >50 yrs                             | 0.742                             | 0.811          | 0.233   | 2.823  |
| BMI                      | Normal<br>(Reference Category)      |                                   |                |         |        |
|                          | Overweight                          | 0.239                             | <b>2.512</b>   | 0.542   | 11.631 |
|                          | Obese                               | 0.080                             | <b>3.121</b>   | 0.874   | 11.144 |
| Family History           | Present                             | 0.771                             | 0.870          | 0.340   | 2.227  |
| Musculoskeletal Problems | Present                             | 0.744                             | 0.865          | 0.362   | 2.067  |
| Alcohol Consumption      | Present                             | 0.788                             | <b>1.153</b>   | 0.408   | 3.257  |
| Tobacco Consumption      | Present                             | 0.312                             | 0.574          | 0.196   | 1.683  |
| Chronic Diseases         | Present                             | <b>&lt;0.001*</b>                 | 0.128          | 0.050   | 0.330  |
| Physical Activity        | Absent                              | 0.852                             | 0.917          | 0.370   | 2.272  |
| Gender                   | Female                              | 0.117                             | 0.095          | 0.005   | 1.795  |
| Area of Residence        | Rural                               | 0.885                             | <b>1.103</b>   | 0.291   | 4.183  |
| Type of Risk             | Field<br>(Reference Category)       |                                   |                |         |        |
|                          | Desk                                | 0.154                             | <b>2.274</b>   | 0.735   | 7.037  |
|                          | Others                              | 0.552                             | <b>1.616</b>   | 0.332   | 7.858  |

Above table shows that police personnel who were Obese (BMI > 25) had OR of 3.121 and those who were Overweight (BMI 23-24.9) had OR of 2.512 when compared to Normal Police (BMI < 23) which indicate that Obese police were 3.121 times at higher risk and overweight police were 2.512 times at higher risk of developing Diabetes Mellitus when compared with Normal BMI police. Police who were working at Desk (Writer and Computer operator) had an OR of 2.274 which indicates that police who were doing desk work were at 2.274 times higher risk of developing Diabetes Mellitus when compared with Police who were working at Field. OR of 1.153 and 1.103 were observed for Alcohol consumption and for the police who were residing in urban locality respectively when compared with Non alcoholics and police who were residing in rural locality which indicates that they had marginal risk of developing Diabetes mellitus. All these observations were not statistically significant.

**Table 29: Independent Risk Factors for Hypertension by Logistic Regression**

|                           |                                     | Hypertension (Yes and No) |              |          |        |
|---------------------------|-------------------------------------|---------------------------|--------------|----------|--------|
|                           |                                     | P value                   | Adjusted OR  | 95% C.I. |        |
|                           |                                     |                           |              | Lower    | Upper  |
| Experience                | 1 to 10 Yrs<br>(Reference Category) |                           |              |          |        |
|                           | 11 to 20 Yrs                        | 0.476                     | 0.297        | 0.010    | 8.406  |
|                           | >20 Yrs                             | 0.372                     | 0.555        | 0.153    | 2.020  |
| Age Group                 | < 30 Yrs<br>(Reference Category)    |                           |              |          |        |
|                           | 31 to 40 Yrs                        | 0.464                     | 0.194        | 0.002    | 15.560 |
|                           | 41 to 50 Yrs                        | 0.060                     | 0.084        | 0.006    | 1.114  |
|                           | >50 Yrs                             | 0.259                     | 0.516        | 0.164    | 1.627  |
| BMI                       | Normal<br>(Reference Category)      |                           |              |          |        |
|                           | Overweight                          | 0.504                     | 0.550        | 0.095    | 3.181  |
|                           | Obese                               | 0.679                     | <b>1.304</b> | 0.371    | 4.588  |
| Family History            | Present                             | 1.000                     | 1.000        | 0.405    | 2.471  |
| Musculo Skeletal Problems | Present                             | 0.831                     | 0.908        | 0.373    | 2.207  |
| Alcohol Consumption       | Present                             | 0.145                     | <b>2.268</b> | 0.754    | 6.827  |
| Tobacco Consumption       | Present                             | 0.166                     | 0.465        | 0.157    | 1.376  |
| Chronic Diseases          | Present                             | 0.657                     | 0.806        | 0.312    | 2.084  |
| Physical Activity         | Absent                              | 0.770                     | <b>1.135</b> | 0.485    | 2.657  |
| Gender                    | Female                              | 0.994                     | 0.988        | 0.042    | 22.988 |
| Area of Residence         | Rural                               | 0.611                     | 0.705        | 0.183    | 2.718  |
| Type of Work              | Field<br>(Reference Category)       |                           |              |          |        |
|                           | Desk                                | 0.951                     | <b>1.033</b> | 0.370    | 2.885  |
|                           | Others                              | 0.414                     | <b>1.847</b> | 0.424    | 8.046  |

Above table shows that police personnel who were alcoholics had an OR of 2.268 which indicates that the alcoholic police were at a higher risk of 2.268 times for developing Hypertension when compared with Nonalcoholic police. An OR of 1.304 was observed for Obese police (BMI>25) when compared to Normal Police (BMI<23) which indicate those police had 1.304 times increased risk of acquiring Hypertension. Police who were working at Desk(Writer and Computer operator) and Others (Court, Driver, Armorers and Bomb Squad) had an OR of 1.847 which indicates that police who were doing desk and other police work were 1.847 times at higher risk of developing Hypertension when compared with Police who were working at Field. OR of 1.135 was noted for police who were physically inactive which indicates that physically inactive police had a marginal risk (1.135) of developing Hypertension. All the observations were not statistically significant.

**Table 30: Independent Risk factors for Metabolic Syndrome by Logistic Regression**

|                          |                                     | Metabolic Syndrome (Yes and No) |              |          |       |
|--------------------------|-------------------------------------|---------------------------------|--------------|----------|-------|
|                          |                                     | Sig.                            | Adjusted OR  | 95% C.I. |       |
|                          |                                     |                                 |              | Lower    | Upper |
| Experience               | 1 to 10 Yrs<br>(Reference Category) |                                 |              |          |       |
|                          | 11 to 20 Yrs                        | 0.976                           | <b>1.028</b> | 0.168    | 6.278 |
|                          | > 20 Yrs                            | 0.343                           | 0.535        | 0.146    | 1.952 |
| Age Group                | < 30 Yrs<br>(Reference Category)    |                                 |              |          |       |
|                          | 31 to 40 Yrs                        | 0.120                           | 0.114        | 0.007    | 1.768 |
|                          | 41 to 50 Yrs                        | 0.118                           | 0.216        | 0.032    | 1.475 |
|                          | > 50 Yrs                            | 0.495                           | 0.606        | 0.143    | 2.558 |
| BMI                      | Normal<br>(Reference Category)      |                                 |              |          |       |
|                          | Overweight                          | <b>0.033</b>                    | 0.283        | 0.089    | 0.906 |
|                          | Obese                               | 0.531                           | 0.701        | 0.231    | 2.131 |
| Family History           | Present                             | 0.295                           | <b>1.534</b> | 0.689    | 3.414 |
| Musculoskeletal Problems | Present                             | 0.806                           | <b>1.106</b> | 0.494    | 2.477 |
| Alcohol Consumption      | Present                             | 0.699                           | 0.834        | 0.333    | 2.089 |
| Tobacco Consumption      | Present                             | 0.293                           | <b>1.705</b> | 0.630    | 4.613 |
| Chronic Diseases         | Present                             | <b>0.022</b>                    | 0.319        | 0.120    | 0.847 |
| Physical Activity        | Absent                              | 0.405                           | <b>1.408</b> | 0.630    | 3.149 |
| Gender                   | Female                              | 0.437                           | 0.301        | 0.015    | 6.199 |
| Area of Residence        | Rural                               | 0.220                           | 0.527        | 0.189    | 1.468 |
| Type of Work             | Field<br>(Reference Category)       |                                 |              |          |       |
|                          | Desk                                | 0.320                           | 0.626        | 0.249    | 1.576 |
|                          | Others                              | 0.026                           | 0.228        | 0.062    | .840  |

Above table shows that Police personnel who were Tobacco consumers had an OR of 1.705 which indicate that Police who were consuming Tobacco were at a higher risk of 1.705 times for developing Metabolic Syndrome when compared with Non Tobacco Consuming Police. An OR of 1.534 was observed for police who had positive Family History which infers that Police with Positive Family History for One of the chronic diseases were at a higher risk of 1.534 times for developing Metabolic Syndrome when compared to the police who did not have any Positive Family History for Chronic Diseases. OR of 1.408 was observed for the police who were Physically inactive when compared to Physically Active police during Leisure time which increased their chance of developing Metabolic Syndrome by 1.408 times. Marginal increased risk (1.106) of developing Metabolic Syndrome was observed with the police who had Musculoskeletal Problems when compared with police who did not have any Musculoskeletal Problems with OR of 1.106. All these observations were not significant statistically.

## DISCUSSION

### SOCIO DEMOGRAPHIC DETAILS

In the present study most of the police were from the age group 41-50 years followed by 31-40 years. Mean age of the police was  $41.94 \pm 9.7$  years.

The mean age of the police was  $41.61 \pm 5.2$  years in a study done by Saha A et al (2010) at Hooghly. Similar observation of mean age among the police was observed in various studies across India.<sup>79, 80, 81, 82, 6</sup>

24.5% of police were in the age group of 41-50 and 34.3% of the police belonged to 31-40 age group in a study by Selokar D et al (2009) in Wardha and 34.2% of police belonged to 30-39 years and 24.6% of police belonged to 40-49 years age group in a study at Navi Mumbai by More Set al (2015).<sup>81</sup>

182(91%) were Hindus, 17(8.5%) were Muslims and 1(0.5%) belonged to Christianity. A similar observation where majority of the police belonged to Hindu religion (74%) was made by Almale et al (2015) in Mumbai.

195(97.5%) out of 200 police personnel were males and 5(2.5%) were females in the present study. Similar observation was made in studies on police personnel in India.<sup>84, 85</sup>

Majority of the police personnel 63(31.5%) had studied up to PUC (higher secondary) followed by 57(28.5%) who had completed SSLC (secondary) in the present study. 36% had education up to secondary and 49% had studied up to higher secondary in a study by Almale et al (2015) among Mumbai police where as 74.5% of the police had studied up to secondary and higher secondary in a study done by Tharkar S et al (2008) in Chennai which was similar to the present study .

176(88%) of the police were married, 23(11.5%) were unmarried and 1(.5%) was widow in the present study. 91% of the police were married and 8% were unmarried in a study done by Almale et al (2015) in Mumbai and 85% of the police were married and remaining 15% were unmarried in a study done by More S et al (2015) at Navi Mumbai, 86% of them were married and 14% were unmarried in a study done on traffic police in Puducherry by Ranganadin P et al (2013) which was similar to the present study.

129(64.5%) belonged to Nuclear family, 46(23%) belonged to Three generation family and 25(12.5%) belonged to Joint family in the present study. Similar observation (76%) of the Mumbai police belonged to Nuclear family in a study by Almale et al (2015) and 72.5% of the police belonged to Nuclear family in a study done by Selokar D et al (2009) in Wardha.

In the present study majority 101(50.5%) belonged to Socio-economic status of class I followed by 79(39.5%) to class II as per Modified B G Prasad's classification for the month of Aug 2015 whereas (53%) police belonged to the class III by Almale et al (2015) among Mumbai police which was contrasting to the present study.

74(37%) had worked in the police department for more than 20 years, 73(36.5%) had worked between 11 and 20 years and 53(26.5%) had experience of less than 10 years. 47% of the police had experience of 15-25 years and 33% had experience of 25 -35 years as observed in a study by Almale et al (2015) at Mumbai.<sup>84</sup>

## **PAST HISTORY OF MORBIDITIES**

62(31%) of 200 police personnel had history of one or more of the chronic diseases like DM, HTN, IHD, asthma, cancer and stroke in the present study. The most common chronic disease observed in the police in the present study was Diabetes (40%) followed by Hypertension (28%).

58% police had positive family history for chronic diseases like DM, HTN, IHD, Asthma, Cancer and Stroke. The commonest positive family history for the police personnel was for DM(45%), followed by HTN(23%), IHD(10%), Asthma(9%), Cancer(6%) , Stroke(4%) and Others (3%) which included Hypothyroidism, Renal failure and osteoarthritis. This was comparatively very high to the observation made by D C Mahajan (2008) at Trombay police station which was 21.3% who had positive family history for the cardiovascular risk factors.<sup>82</sup>

**Table 1: Comparison of Tobacco and Alcohol Consumption with Other Studies**

| <b>Tobacco Consumption</b> |                   | <b>Alcohol Consumption</b> |                   |
|----------------------------|-------------------|----------------------------|-------------------|
|                            | <b>Prevalence</b> |                            | <b>Prevalence</b> |
| Present study              | 23.5%             | Present Study              | 28%               |
| Tharkar S et al            | 22.6%             | Tambe N et al              | 28.4%             |
| Mahajan DC et al           | 22.6%             | Almale et al               | 26%               |
| Ramakrishna J et al        | 23%               | Jahnavi G et al            | 24%               |
| Jahnavi G et al            | 22%               | Mahajan DC et al           | 21.3%             |
| Almale BD et al            | 55%               | Thayyil J et al            | 48%               |
| Mary E et al               | 14%               | Patel PG et al             | 12%               |

In the present study 23.5% police had history of tobacco Consumption. The commonest form of tobacco consumed was Cigarette (50%), followed by chewable form of tobacco (37%) and Beedi which was used by 13% of the police.

Prevalence of smoking was ranging from 20.2% to 27.99% in various studies done on police personnel in India which was similar to the present study finding. The possible factors which would have contributed to this prevalence were job stress, low levels of job satisfaction and influenced by police who were smokers.<sup>6, 21, 32, 80,82,87,90</sup> A higher prevalence of smoking of 34.7%, 48% and 55% was observed in various studies in India.<sup>85, 88, 89</sup> Ms. Elsa Mary (2013) at Kochi city revealed 14% had history of smoking which was less when compared with the present study.<sup>86</sup>

28% police had history of alcohol consumption. 66% of them were consuming hot drinks (brandy, whisky, rum and vodka) followed by beer (25%) and wine (9%). Prevalence of alcohol consumption was ranging from 20.8% to 31.9% in various studies done on police personnel in India which was similar to the present study.<sup>6,21,32,82,85,87,</sup> A higher prevalence of alcohol consumption of 45.7%, 35.7% and 48% was observed which was higher than the present study.<sup>81,89,90</sup>

The possible factors for high alcohol consumption observed in the present study as expressed were prolonged working hours, lack of recreational facilities at work place and pressure from the higher ups in the department which lead them to stress and most police tackled this stress by consuming alcohol.

**Table 2: Comparison of Nutritional Status of Police with Other Studies**

| <b>BMI</b>         | <b>Present Study</b> | Tharkar S et al | Thayyil J et al | Jahnavi G et al | Ramakrishna J et al | Satapathy DM et al | Almale BD et al |
|--------------------|----------------------|-----------------|-----------------|-----------------|---------------------|--------------------|-----------------|
| <b>Normal</b>      | 16%                  | 44%             |                 | 58%             |                     |                    | 31.5%           |
| <b>Over Weight</b> | 16%                  | 52%             | 65.6%           | 35%             | 25.4%               | 38.3%              | 48.2%           |
| <b>Obese</b>       | 68%                  | 4%              |                 | 7%              | 51.6%               | 8.5%               | 20.3%           |

Proposed BMI Classification for adult Asian were used.<sup>98</sup>

Majority of police (68%) were obese in the present study.

A lower prevalence of overweight and obesity was observed in various studies done in India .<sup>32, 88</sup> The prevalence of obesity in our study was similar to various studies done.<sup>6,81,82,90.</sup> The possible factors identified for this increased prevalence of obesity were lack of physical exercise, consumption of food at odd times and food consumption at the road side.

**Table 3: Comparison of Prevalence of Diabetes Mellitus, Hypertension and Metabolic Syndrome with Other Studies**

| DIABETES             |            | HYPERTENSION         |            | METABOLIC SYNDROME   |            |
|----------------------|------------|----------------------|------------|----------------------|------------|
|                      | Prevalence |                      | Prevalence |                      | Prevalence |
| <b>Present study</b> | 24%        | <b>Present Study</b> | 26%        | <b>Present Study</b> | 64.5%      |
| Mahajan DC et al     | 12%        | Satapathy DM et al   | 25%        | Tharkar S et al      | 57.3%      |
| Kumar et al          | 15%        | Mahajan DC et al     | 26%        | Thayyil J et al      | 16.8%      |
| Mary E et al         | 14%        | Mary E et al         | 21%        | —                    | —          |
| Jahnavi G et al      | 37%        | Ramakrishna J et al  | 30.5%      | —                    | —          |
| Ramakrishna J et al  | 33.6%      | Tharkar S et al      | 58.5%      | —                    | —          |
| Thayyil J et al      | 7%         | Sohi R et al         | 9.97%      | —                    | —          |

In the present study 23% police were diabetic, 10.5% were having impaired fasting glucose and 66.5% were normal (by Fasting Blood Glucose level)

In comparison lower prevalence of Diabetes Mellitus was observed ranging from 4.45% to 15% in various studies done on police personnel in India.<sup>89,83,88,81,80,21,82,85,86,39</sup> Prevalence of Diabetes Mellitus was 33.6% and 37% in various studies in India among police personnel which was higher than the present study.<sup>6, 90, 32</sup> The possible reasons for this increased prevalence in previous studies identified by them were lack of physical activity during leisure time, obesity, stress, positive family history of diabetes and lack of awareness about the risk factors for diabetes. Similar observations were made in the present study.

26% police were diagnosed to have hypertension. Prevalence of Hypertension was 17.6%,20.7%,21%,25% and 26.6% in various studies conducted across India which was close to the observation made in the present study.<sup>83,21,86,88,82</sup>

In comparison lower prevalence of hypertension ranging from 9 to 15% was noted in few studies.<sup>89,80,84</sup> Prevalence of Hypertension was ranging from 30.5% to 58.5% which was higher than the present study.<sup>90,32,81,85,6</sup> High fatty food consumption, irregular dietary habits, obesity, stressful environment, lack of physical exercise were risk factors identified for high prevalence.

Prevalence of metabolic syndrome was 16.8% in a study by Thayyil et al. A higher prevalence of metabolic syndrome of 64.5% was observed in the present study which was similar to the observation done by Tharkar S et al (2008) in Chennai<sup>6</sup> which was 57.3%.The probable reasons for increased metabolic syndrome in Kolar police could be due to poor life style choices, job stress, low level of Job satisfaction, drinking and smoking habits.

**Table 4: Comparison of Prevalence of Musculoskeletal Disorders with Other Studies**

| <b>Musculoskeletal Disorders</b> | <b>Prevalence</b>     |
|----------------------------------|-----------------------|
| <b>Present study</b>             | 46%                   |
| Saha A et al                     | 24.8%                 |
| Satapathy DM et al               | 27.08%                |
| More S et al                     | 29.16%                |
| Almale BD et al                  | 62.3%                 |
| Mary E et al                     | 50% for Low Back ache |

Prevalence of MSDs was 24.8% and 29.16% respectively in other studies conducted in India which was less when compared to the present study prevalence of 46%. The increase in the prevalence of MSDs in the present study could be due to prolonged standing during working hours, unusual duty hours, bad posture and frequent travel while patrolling.

A higher prevalence of 62.3% for MSDs was observed among Mumbai police in a study done by Almale BD et al.

## **SUMMARY AND CONCLUSION**

The cross sectional study was carried out at 5 Police Stations of Kolar taluk of Kolar District for a period of 18 months from Dec 2013 to May 2015, with the objective to study morbidity pattern and their determinants among police personnel. All the police from each police station who fulfilled the inclusion criteria were included in the study till the sample size of 200 was met after taking prior informed written consent.

About half of the police personnel felt that their work was strenuous. Half of the study subjects did not indulge in physical activity during leisure time. 31% had one or more of the chronic diseases. Prevalence of musculoskeletal problems was 46%. Prevalence of tobacco usage was 23.5% and alcohol consumption was 28%. 68% of police were obese and 16% were overweight.

Notably 91.5% of the police had abnormal Lipid Profile.

24% of the police were Diabetic among whom 40% were newly diagnosed to have Diabetes. 26% were diagnosed to have Hypertension of whom 62% police were newly diagnosed to have Hypertension. Prevalence of Metabolic syndrome was seen in 64.5%. Metabolic syndrome was common among those who were Diabetic and Hypertensive.

Metabolic syndrome, Diabetes and Hypertension were seen more among higher age group, those who had longer duration of service and higher BMI which was statistically significant. Metabolic syndrome was common in those who had waist circumference more than 80cms for females, 90cms for males and who had abnormal lipid profile which was statistically significant.

Duration of service, night shifts, physical inactivity, positive family history of chronic diseases, waist circumference, diabetes and abnormal lipid profile were significant predictors of Metabolic Syndrome.

## **CONCLUSION**

Police personnel as a group selected for remarkable physical fitness at the entry stage fail to maintain and succumb to lifestyle diseases that are very much preventable. Similar results from other parts of India and the world calls for attention from policy makers to introduce effective policies for taking care of this issue. Workplace programs to promote the health and fitness of police officers are commonly lacking, but can be an effective means for reducing morbidities. Regular screening and health education programs needs to be implemented. Counseling related to lifestyle modification, addiction control and stress management should be an integral component of these health-related activities.

## **RECOMMENDATIONS**

1. As the proportion of morbid police personnel were high, regular health check-ups need to be organized ideally once in 3 months or at least once in 6 months.
2. Health education should be given to police regarding risk factors of non-communicable disease and life style modifications to prevent them.
3. Recommendation for working hours as per the declaration in the constitution of the ILO that all the establishments should endeavor to adopt ,so far as their special circumstances will permit, “an eight hours day or a forty-eight hours week” as the standard to be aimed at where it has not already been attained.
4. Implementation of interventional measures including stress management by Yoga are recommended.
5. As musculoskeletal morbidities were observed in the present study in many police, following measures can be recommended at working place as well as home.
  - Stretching exercise before starting work

6. Irregular dietary patterns, eating junk foods and fast foods on the road side should be avoided. As a remedial measure canteen facility can be provided in each police station.
7. Soft skill training need to be incorporated during the training period.
8. Separate study can be conducted to assess “STRESS” at working place by applying various scoring systems.

## **LIMITATIONS**

1. Psychological morbidities were not included in the study as it is difficult to assess them without assistance of specialist.
2. Stress could not be measured and quantified and thereby exact correlation with morbidities could not be assessed.
3. Few variables analyzed in the present study were based on the information given by the study participant. Hence an element of unavoidable recall bias could be present in the study.

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# ANNEXURE I

## A Study of Health Status among Police Personnel in Kolar

Investigator:

Place:

Date:

| S<br>N | INFORMA<br>TION                     | RESPONSE                                                        | CODE |
|--------|-------------------------------------|-----------------------------------------------------------------|------|
| 1      | Name                                |                                                                 |      |
| 2      | Age                                 |                                                                 |      |
| 3      | Gender                              | M / F                                                           |      |
| 4      | Address                             |                                                                 |      |
| 5      | Religion                            | Hindu / Muslim / Christian / Others                             |      |
| 6      | Designation<br>and Place of<br>work |                                                                 |      |
| 7      | Date of<br>Joining<br>Police force  |                                                                 |      |
| 8      | Education                           |                                                                 |      |
| 9      | Marital<br>Status                   | Married / Unmarried / Separated / Divorced /<br>Widower / Widow |      |
| 10     | Gross<br>income                     |                                                                 |      |
| 11     | No of<br>Family<br>members          |                                                                 |      |
| 12     | Type of<br>Family                   | Nuclear / Joint / Three Generation                              |      |

|    |                                                            |                      |                    |                              |                       |         |       |  |
|----|------------------------------------------------------------|----------------------|--------------------|------------------------------|-----------------------|---------|-------|--|
| 13 | Total Income of Family                                     |                      |                    |                              |                       |         |       |  |
| 14 | Details of Work                                            | Type of Work         | No of Hrs. per day | No of Night Shifts per month | Strenuous / Sedentary |         |       |  |
|    |                                                            |                      |                    |                              |                       |         |       |  |
| 15 | Occupational Physical activity in previous day (Mins/Hrs.) | Walking              | Standing           | Sitting                      |                       |         |       |  |
|    |                                                            |                      |                    |                              |                       |         |       |  |
| 16 | Physical activity in Leisure time                          | Activity             | Walking            | Brisk Walking                | Jogging               | Cycling | Other |  |
|    |                                                            | Frequency in a week  |                    |                              |                       |         |       |  |
|    |                                                            | Duration (Min /hrs.) |                    |                              |                       |         |       |  |

|    |                             |                                                           |          |          |                            |                                   |                                                            |                        |  |  |
|----|-----------------------------|-----------------------------------------------------------|----------|----------|----------------------------|-----------------------------------|------------------------------------------------------------|------------------------|--|--|
| 17 | History of Chronic Diseases | Chronic Disease                                           | Duration |          | Follow up in last 6 months |                                   | Advice :<br>Reg/Irreg<br>Diet<br>Exercise<br>Yoga<br>Other |                        |  |  |
|    |                             | Diabetes                                                  |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | High BP                                                   |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | CHD                                                       |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | Asthma                                                    |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | Cancer                                                    |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | Convulsion                                                |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | TB                                                        |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | Accidents                                                 |          |          |                            |                                   |                                                            |                        |  |  |
|    |                             | Others                                                    |          |          |                            |                                   |                                                            |                        |  |  |
| 18 | Tobacco Consumption         | Type<br><br>Cigarette<br>Beedi<br>Ghutka<br>Hoge<br>Soppu | Freq     | Quantity | No of yrs. Consumed        | Any attempt made to quit<br>Y / N |                                                            | Wants to quit<br>Y / N |  |  |



|    |                                       |                                          |              |  |  |  |  |  |
|----|---------------------------------------|------------------------------------------|--------------|--|--|--|--|--|
| 20 | Betel leaf ,<br>Betel nut<br>and Lime |                                          |              |  |  |  |  |  |
| 21 | Family<br>History                     | Disease                                  | Relationship |  |  |  |  |  |
|    |                                       | Diabetes                                 |              |  |  |  |  |  |
|    |                                       | Hypertension                             |              |  |  |  |  |  |
|    |                                       | IHD                                      |              |  |  |  |  |  |
|    |                                       | Stroke                                   |              |  |  |  |  |  |
|    |                                       | Cancer                                   |              |  |  |  |  |  |
|    |                                       | Asthma                                   |              |  |  |  |  |  |
| 22 | Musculoske<br>letal<br>problems       | Problem                                  | Duration     |  |  |  |  |  |
|    |                                       | Low Back Ache                            |              |  |  |  |  |  |
|    |                                       | Neck Pain                                |              |  |  |  |  |  |
|    |                                       | Knee Pain                                |              |  |  |  |  |  |
|    |                                       | Hand        Arm<br>Vibration<br>Syndrome |              |  |  |  |  |  |
|    |                                       | Shoulder pain                            |              |  |  |  |  |  |
|    |                                       |                                          |              |  |  |  |  |  |
| 23 | Examination                           |                                          |              |  |  |  |  |  |
| A  | Pulse                                 |                                          |              |  |  |  |  |  |
| B  | B P                                   |                                          |              |  |  |  |  |  |
| C  | Weight(kg )                           |                                          |              |  |  |  |  |  |
| D  | Height (cm)                           |                                          |              |  |  |  |  |  |

|    |                                          |  |  |
|----|------------------------------------------|--|--|
| E  | BMI                                      |  |  |
| F  | Waist<br>circumferen<br>ce ( cm )        |  |  |
| G  | HIP<br>circumferen<br>ce ( cm )          |  |  |
| H  | W H R                                    |  |  |
| E  | Local<br>Examinatio<br>n                 |  |  |
| 24 | INVESTIG<br>ATIONS                       |  |  |
| A  | F B S                                    |  |  |
| B  | HbA1C                                    |  |  |
| C  | LIPID<br>PROFILE<br>Total<br>Cholesterol |  |  |
| D  | T G                                      |  |  |
| E  | LDL                                      |  |  |
| F  | VLDL                                     |  |  |
| G  | HDL                                      |  |  |

# **ANNEXURE II**

## **CONSENT FORM**

### **A STUDY OF HEALTH STATUS AMONG POLICE PERSONNEL IN KOLAR**

#### **INVESTIGATOR – DR SUNIL B N**

I have been informed by investigator that the study is going to be done to find out the health status of police personnel. This study will help the health care professionals to improve quality of life in police personnel and this study will also be helpful for research.

All the data recorded will be kept confidential. If data is used for publication in the medical literature or for teaching purpose, no name will be used. Investigator has explained that photographs are required in order to illustrate various aspects of the study for thesis and publication, and at presentation and conference.

I confirm that investigator has explained me the purpose of this research, the study procedure and the possible risks and benefits associated that I may experience. I have read and understood this consent form to let myself participate as a subject in this research project and I am giving the consent willfully.

NAME –

SIGNATURE –

DATE -

POLICE STATION -

# **ANNEXURE III**

## **DEFINITIONS OF VARIABLES**

### **1. AGE:**

The age was recorded as stated by the subject to the nearest completed year.

### **2. Address:**

The permanent Residential Address in which subject was staying in the past one year.

### **3. Education:**

Formal education was recorded as stated by the subject.

**Primary:** Subject with education up to VIIth standard.

**Secondary:** Subject with education between VIIIth and Xth standard.

**Higher secondary:** People with education up to Pre-University (up to XII standard).

**Diploma:** People above higher secondary education with a certified education of at least 6 months duration.

**Graduate:** People with university level of education (minimum 3 years)

**Post Graduate:** People with additional degree after Graduation.

#### 4. TYPE OF FAMILY<sup>1</sup>:

- a) **Nuclear:** a family consisting of a married couple and their children, while they are still regarded as dependents.
- b) **Joint:** A number of married couple and their children who lives in same household.
- c) **Three generation:** Family consisting of grandparents, parents and children.

#### 5. Per capita income:

Per capita income is total family income divided by family size.

$$\text{PCI} = \text{Total family income} / \text{Family members.}^{91}$$

#### 6. Family Size:

It is defined as total family members, adults and children under one roof and sharing the same kitchen. For calculating family size, children under 12 years of age are considered as half and above 12 years as one. Infants are not considered.

## **7. Socio-Economic status:** <sup>92, 93</sup>

Modified B.G. Prasad's classification was used for socioeconomic status for rural and urban families according to per capita income for month of Aug 2015(Consumer Price Index for Month of August- 264) latest updated.

| <b>SOCIO ECONOMIC CLASS</b>     | <b>PER CAPITA INCOME</b> |
|---------------------------------|--------------------------|
| <b>Class I (Upper)</b>          | <b>6026 and Above</b>    |
| <b>Class II (Upper Middle)</b>  | <b>3013-6025</b>         |
| <b>Class III (Lower Middle)</b> | <b>1808-3012</b>         |
| <b>Class IV (Upper Lower)</b>   | <b>904-1807</b>          |
| <b>Class V (Lower)</b>          | <b>&lt;904</b>           |

## **8. Presenting complaints:**

Complaints suggestive of any non-communicable disease and musculoskeletal disease were recorded. History regarding the quality of work and severity was recorded as per their opinion.

## **9. Family history:**

Family history suggestive of hypertension, diabetes mellitus, ischemic heart disease, bronchial asthma, stroke and cancer were taken in the 1<sup>st</sup> degree relatives which include parents and siblings.

## 10. Habits:<sup>94</sup>

A) **Smoking:** Individuals were classified as

- i) **Current smokers:** Those who either were smoking at the time of interview or had stopped less than 12 months earlier.
- ii) **Ex-smokers:** Previous smokers who had not smoked during the previous year.
- iii) **Non-smokers:** Those who had ever smoked at least once a day for one year. The duration of smoking was also recorded.

B) **Smokeless tobacco:**

Person who consumed ghutka, tobacco –lime and tobacco in any other form were considered and the duration of consuming was noted.

C) **Alcohol consumption:**<sup>95</sup>

- i) **Current user:** Person who was consuming alcohol at the time of study.
- ii) **Ex-alcoholic:** A person who used to consume alcohol before one year and is not consuming alcohol at present.
- iii) **Non-Alcoholic:** A person who had never consumed alcohol.

The duration of consumption was also recorded.

11. **Morbidity:** Presence of the any of following one or more conditions with reference to Non Communicable disease (HTN, DM, IHD, Obesity, Asthma etc) and musculoskeletal morbidities were included in it.

a) **Hypertension:** Blood pressure of >140 Systolic and >90 Diastolic, as well as isolated systolic blood pressure of >140 was considered as hypertensive.<sup>77, 78</sup>

b) **Diabetes Mellitus:** Blood sample was taken from finger prick and blood sugar level was assessed using Accu-chek blood glucose monitoring systems. If his Fasting blood sugar level was >126mg% or he is a diagnosed case of DM on medications were considered as having DM and if FBS is between 110-125mg/dl the patient will considered as having Impaired Fasting Glucose.<sup>96</sup>

c) **Glycated hemoglobin:** By means of WHO and ADA guidelines, an HbA1c cut off value of more than or equal to 6.5% will be considered for diagnosis of diabetes. HbA1C value from 5.7% to 6.4% will be considered as at risk for Diabetes and less than 5.7% will be considered normal.<sup>97</sup>

d) **Obesity:** Those Participants who have BMI>25 were considered as Obese.

Asian Indian tends to have more visceral adipose tissue, causing higher insulin resistance, despite lean body mass. Health risk associated with obesity occurs at lower body mass index in Asian population, so proposed BMI Classification for adult Asian were used.<sup>98</sup>

| CLASSIFICATION | BMI for<br>EUROPIODS | CLASSIFICATION | BMI for<br>ASIANS |
|----------------|----------------------|----------------|-------------------|
| UNDERWEIGHT    | >18.5                | UNDERWEIGHT    | >18.5             |
| NORMAL WEIGHT  | 18.5-24.99           | NORMAL WEIGHT  | 18.5-22.99        |
| OVER WEIGHT    | >25                  | OVER WEIGHT    | >23               |
| PRE OBESE      | 25-29.99             | AT RISK        | 23-24.99          |
| OBESE I        | 30-34.99             | OBESE          | 25-29.99          |
| OBESE II       | 35-39.99             | OBESE II       | >30               |
| OBESE III      | >40                  |                |                   |

e) **Ischemic Heart Disease:** Is defined as by joint international society and federation cardiology and WHO task force, as myocardial impairment due to imbalance between coronary blood and myocardial requirements caused by changes in coronary circulation. Those participants who have already diagnosed for IHD and are currently on treatment were considered as IHD patients.<sup>99</sup>

d) **Asthma:** Chronic inflammatory disease of air ways characterized by variable symptoms, reversible air flow obstruction and bronchospasms. Common symptoms include breathlessness, wheezing, coughing, chest tightness, shortness of breath were considered as asthma.

e) **Musculoskeletal Problems:**

The term musculoskeletal problems includes a diversity of complaints and diseases localized in joints , bones , cartilage, ligaments, tendons, tendon sheaths , bursae and muscles .

1. **Low Back Pain (LBP) :** Low back pain is defined as any report of pain that occurs between the gluteal folds inferiorly and the line of the 12<sup>th</sup> rib superiorly , plus sciatica even if there are no concurrent symptoms in the back .

2. **Neck Pain:** Subjective pain experience in the neck/cervical region. Subject are frequently asked to mark pain drawings to show the areas where they experience pain, stiffness, numbness, or other symptoms.

3. **Joint pain:** Pain arising from disease in the joint itself or problems in the soft tissues adjacent to the joint. All major joints i.e Hip, Knee, Ankle, Shoulder and elbow were included.<sup>100</sup>

## **12)METABOLIC SYNDROME<sup>55,57</sup>**

**Modified national cholesterol education program:**

**Adult treatment panel III criterion for diagnosing MS.**

MS is diagnosed if at least three of the following five factors are positive  
Variable Condition

- Waist circumference >102 cm in males, >88 cm in females( cut-off for waist circumference was lowered from 102 cm to 90 cm in males and from 88 cm to 80 cm for Asians based on the ethnic differences for central obesity)<sup>101,102</sup>
- Blood pressure SBP $\geq$ 130 and/or DBP $\geq$ 85 or treatment for previously diagnosed hypertension
- Triglycerides  $\geq$ 150 mg/dl or drug treatment for elevated triglycerides
- HDL <40 mg/dl in males, < 50 mg/dl in females or drug treatment for low HDL
- Glucose >110 mg/dl or treatment for previously diagnosed diabetes.

**13)Physical activity<sup>103</sup>** – WHO recommended value for moderate physical activity in adult aged 18-64 year old is > 30min/day for five days in a week.

## **14)Cut off values for Abnormal lipid profile<sup>55</sup>**

- Total Cholesterol - >200mg/dl
- Triglycerides - >150mg/dl
- LDL - >130mg/dl
- HDL - <40mg/dl for males , <50mg/dl for females

Any subject having at least one of the above values more than cut off values were considered to have abnormal lipid profile.

# INTRODUCTION



# NEED FOR THE STUDY



# **AIMS & OBJECTIVES**



# **REVIEW OF LITERATURE**



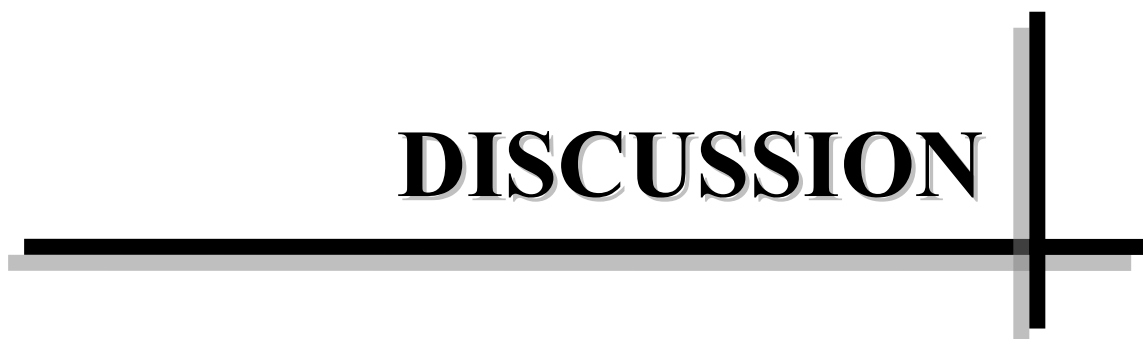
# **MATERIALS & METHODS**



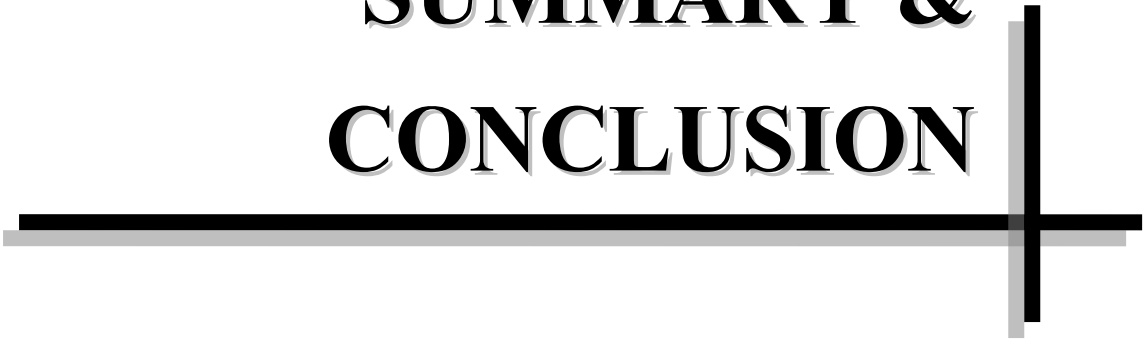
# RESULTS

A decorative graphic consisting of a thick horizontal line and a thick vertical line intersecting at a right angle. The intersection point is located to the right of the word 'RESULTS'. The horizontal line extends to the left of the word, and the vertical line extends upwards and downwards from the intersection point.

# DISCUSSION



# **SUMMARY & CONCLUSION**



# RECOMMENDATIONS



# **LIMITATIONS**



# **BIBLIOGRAPHY**

A decorative graphic consisting of a thick horizontal black line and a thick vertical black line intersecting at a right angle. The horizontal line is positioned below the word 'BIBLIOGRAPHY' and extends across the width of the text. The vertical line is positioned to the right of the text and extends from above the horizontal line to below it, creating a crosshair effect.

**ANNEXURE**

