Chapter-2:
Review of Literature
REVIEW OF LITERATURE

Reviewing the literature is an integral part of any research. In this chapter, the literature is reviewed under the following heads,

1. General information
2. Lifestyle
3. Dietary patterns

The literature has been reviewed according to the above listed parameters.

1. General Information

‘Police’ is an English word and has origins both in the Greek word ‘Politeia’ meaning state administration as well as in the Latin word ‘Politia’ meaning government administration.

There are four entry levels for joining the police force (common to all cadres of Rajasthan Police):

- as Police Constable (PC) by district recruitment
- as Police Sub-Inspector (SI) by RPSC
- as Dy. SP (RPS) through RPSC
- through Indian Police Service (IPS) by UPSC

For a constable, the requirement for age at the time of recruitment is between 18-23 years. He has to appear for a written test followed by Physical
Standard Test and medical examination. Further, he has to undergo Physical Efficiency Test like running etc. (Rajasthan Police Subordinate Service Rules, 1989). After appointment they undergo vigorous training in Police Training School after which they are posted in their respective districts. Each one of them is assigned a unique belt number for easy identification.

In the district they can be placed in a police station, office, traffic, control room, guard duty or as reserve in police line. In the police line, they are expected to follow a schedule of physical training and parade (Rajasthan Police Act, 2007). With the change of place of posting this routine may get altered.

A constable has a wide range and tasks to perform including clerical and field work (Kaczmarek and Packer, 1996). A constable has maximum interface with public some of the important roles assign to him are to protect the needy, rescue people from danger, detection of crime and maintenance of law and order (Rajasthan Police Act, 2007).

The living and working conditions of policemen, which are the key to efficient and effective working, at various police stations all over India have been found to be in a very poor state (Singh, 2001) as reflected by inadequate space and furniture, lack of equipments and recreational facilities, longer work hours and improper accommodation. If these conditions are congenial, it will put the constable in a positive frame of mind while dealing with the
Review of Literature

clientele. To ensure that the policemen responded positively to the needs and demands of the community they served it is imperative that their living and working conditions are such that the conditions themselves do not become an irritant and a cause of tension for them. Needless to say that if the living and working conditions for the Constables are congenial, it will put them in a positive frame of mind while dealing with their clientele.

Shortage of vehicles, more time spent on reporting, high number of vacancies in the department and involvement in activities, which are responsibilities of other departments, make policemen ineffective. Traffic Policemen are exposed to work overload, poor work environment, lack of resources, infrastructure facilities and lesser number of traffic police proportionate to population and number of vehicles (Kumar and Mohan, 2009).

Management of sickness and promotion of health of policemen has been of a great concern. It has been reported that absence due to sickness resulted in almost 4, 00,000 police working days being lost (Bourn, 1997). Thus, reducing sickness absence by initiatives & sanctions, stress management and health promotion in the police service is an issue of great concern (Arnott and Emmerson, 2001).

An attempt was made by Suresh et al (2013) to determine which job events are perceived as significant sources of stress in police work. The Police Stress Inventory was developed based on the interviews with police
staff and experts in police administration for this study. The two job events “never off duty or round the clock duty (Mean = 53.83) and lack of time to spend with family (Mean = 52.24)” are among the most potent sources of stress. It is because of the ratio of police personnel to public is very low in India, when compared to developed countries? The police staff works for more than 12 hours a day and they can be called to duty time even during holidays.

Implementation of wellness screening programs in police department to enhance health in a cost-effective manner has also been suggested (Howard and Prater, 2000) focusing on physical fitness, stress management, psychological and mental health, nutrition and dietary issues, and lastly alcohol and chemical dependency. Lifelong wellness will prove to be an investment now and in future and will prepare officers within their own genetic potential to perform their jobs in good health for the length of their careers.

2. **Lifestyle**

Lifestyle includes a variety of non-food behaviors, which along with food habits have a direct impact on nutritional status of an individual.

Five lifestyle behaviors were termed as unhealthy viz., alcohol consumption, cigarette smoking, inadequate exercise, perception of overweight and stress symptoms (Richmond et al, 1998), and were studied on
policemen. A sizeable majority (83%) of subjects had at least one unhealthy lifestyle behavior with 19% reporting 3-5 unhealthy factors.

Following lifestyle parameters have been considered in the present study-

a. Physical activity pattern
b. Occupational stress
c. Other non-food habits.

a. **Physical Activity Pattern**

FAO/WHO/UNO (1985) has categorized physical activities into sleep; occupational activities; non-occupational/ discretionary activities including household tasks, socially desirable activities and activities for physical fitness/ exercise; and residual activities including sitting, standing and walking. Further on the basis of time spent on above activities, the individual is graded into sedentary, moderate or heavy worker (FAO/WHO/UNU, 1985).

Sleep and sleep deprivation are intimately related to both physical and psychological performance in the armed forces (Himashree et al, 2002). The detrimental effects of sleep deprivation on physical performance were manifested as decline in ability to perform maximal exercise, self-selected working pace and increase in perceived exertion. Its effects on psychological performance are indicated as increased lapsing, cognitive slowing, memory impairment, decrease in vigilance and sustained attention and shift in optimum response capability.
Sleep problems have also been reported to be significantly associated with several measures of obesity among policemen (Charles et al, 2007). While obesity can hinder a career by limiting a policemen to desk duty and create dangerous situation while on patrol, those who are not obese but become careless towards maintaining a fitness regime can just be as dangerous especially as they age (Rivera, 2001). Those policemen must realize that fitness must be maintained for optimal performance. The danger is two-fold when their duty days include long stretches of inactivity and spurs of intense exertion.

Disturbed Sleep Explains Physical Health Problems in Police Officers as chronic sleep disturbances contributed to their poor physical health (Mohr et al, 2003). A relationship between posttraumatic stress symptoms and self-reported physical health problems was explained by sleep problems. These findings were helpful to law enforcement by clarifying the types, causes and unexpectedly high rates of sleep disturbances, in an occupation placing high demands on alertness for accurate threat appraisal and rapid reaction times, and by drawing attention to the health risks of chronic sleep disturbances.

People who work in rotating shifts had disturbed sleep patterns due to significantly lower levels of serotonin, a hormone and neurotransmitter in the central nervous system believed to play an important role in sleep regulation (Sookoian et al, 2007).
Endurance and strength are needed for tasks such as chasing suspects on foot, climbing over fences, jumping across ditches or creek beds, and wrestling with individuals who resist being subdued. Being in better-than-average physical condition is vital because police personnel must often deal with perpetrators who are young and fit (Pollock et al, 1978).

Physical fitness or participation in regular exercise can lead to improvements in work outcomes both physical and non-physical such as job satisfaction and absenteeism; cognition; psychological well-being including depression and anxiety (Boni, 2004).

Smolander et al (1984) investigated the physical fitness characteristics of officer students (mean age 34 years, range 27-46 years) in the Police Academy of Finland. The results indicated that the selection of heavier and taller men for police training guaranteed a satisfactory absolute level of physical work capacity, although more than half (57%) of the students were physically inactive. The habitual work of policemen seemed to be insufficient to maintain an adequate level of physical fitness for demanding tasks.

Work activity was significantly associated with coronary heart mortality (Paffenbarger and Hale, 1975). Men who maintained or improved physical fitness were found to be less likely to die from cardiovascular disease (Blair et al, 1995).

Sedentary lifestyles and low levels of physical fitness are associated with higher rates of hypertension, coronary heart disease and cardiovascular disease (Barlow, 1990).
Apart from work, leisure-time physical activity expressed in kilocalories expended per week in walking, stair climbing and sports, was inversely related to the development of non-insulin dependent diabetes mellitus (Helmrich et al, 1991). People with low intensity of leisure-time physical activity were more prone to develop impaired glucose tolerance (Laaksonen et al, 2005).

Lehtovirta (1973) assessed the health status and physical fitness of policemen and found them physically inactive during their leisure-time, they were often heavy smokers, and many of them were overweight, especially after the age of 35 years.

It follows from above that key benefits of regular physical activity include reducing the risk of developing or dying from several conditions, including heart disease, hypertension and diabetes, and helping to promote psychological well-being.

But there is a current reported trend of police training towards overt disregard of physical performance due to financial constraints; lack of time and manpower that can be spared for training; and no incentives to the trainers (Collingwood et al, 2003). This trend affects the accountability and effectiveness of policemen to meet the infrequent but perhaps critical demands of physical performance involved in police work. To overcome such
a situation, the police department can start giving annual incentives to the physically fit officers (Krainik, 2003).

The effect of physical activity and ageing on cardiovascular responses and cardiovascular diseases has been clearly shown by many studies (Ogawa et al, 1992; Lakka et al, 1994).

Diet and exercise must go together. The combination maximizes the level of fitness and stored energy in one’s body. There is a need for police officers to stay in shape by engaging in regular exercises and maintaining a balanced nutrition and diet by having the right amounts of proteins, carbohydrates, and fats. Physical exercise and diet must be done together. These are like positive and negative on a battery. If one end is not connected, you have no power (Farmer, 2004).

During a 15-year follow-up, the Finnish police officers had experienced some changes in their life-style in terms of increased leisure-time physical activity, reduced smoking, an increased number of chronic diseases, reduced physical fitness in most of the tests and significant weight gain. Leisure-time physical activity in 1981 correlated most strongly with fitness in 1996. This result emphasizes the importance of adopting a physically active life-style early in a career. Such a life-style should be supported by the police organization and occupational health services (Sorensen et al, 2000). The
work of police officers primarily includes mentally demanding, but sedentary, tasks, with occasional periods of maximum physical exertion.

Soininen (1995) reported that approximately one-quarter of policemen aged 40-54 years must work at maximal or near maximal physical capacity at least five times a year. The most common extremely strenuous time is during an arrest that involves a struggle with a resisting subject.

Charles (1983) noticed that fitness levels of policemen diminished significantly after the academy. Therefore, police administrators should consider fitness maintenance programs. Many feel that it makes no sense to select police officers on the basis of physical fitness and abilities and then have no requirement that minimum fitness and abilities be maintained (Carter, 1982). Maintenance programs are necessary to achieve fitness goals. Serra (1984) suggests that agencies may be guilty of negligent retention or failure to train when it comes to unfit policemen. Law enforcement administrators may utilize these suggestions to successfully implement fitness maintenance programs for them.

Police work requires a functional capacity greater than that typically attained in traditional cardiac rehabilitation programs. Rehabilitation professionals should consider performing maximal stress tests and increasing the intensity of cardiac rehabilitation workouts to effectively train police officers who have had a cardiac event (Adams et al, 2010).
The decline in physical activity with age may be the most consistent finding in physical activity epidemiology (Sallis, 2000).

b. **Occupational Stress**

Policemen suffer from stress due to their occupation (Mathur, 1995). Police work involves exposure to a broad range of emotionally harrowing incidents and is often cited as one of the most stressful occupations (Carlier et al, 1997). It tends to be regarded as inherently stressful because of the personal risk of exposure to confrontation and violence, and the day-to-day involvement in a variety of traumatic incidents. As a result, high levels of stress related symptoms might be expected in this population. Nearly half of police population has been reported to suffer from organizational stress (Collins and Gibbs, 2003; Deb et al, 2005). The stress score of police personnel was found to be higher than that of other professionals like doctors and teachers (Yang et al, 2004).

Traumatic events such as shootings, severe motor vehicle accidents, and incidents involving the death of a child are all ranked as extremely stressful by law enforcement personnel (Van Hasselt et al, 2003).

Some studies also reported that Police personnel are under continuous and constant stress due to similar stressors that lead to psychiatric morbidity (Channa et al, 1996, Spraag, 1992).
Different types of problems faced by police personnel, that lead to stress, were found to be irregular working hours, leave problems, no social life, no promotion, family neglected and separation, political influence, frequent pressures of officers, risk to life etc. (Tripathi et al, 1993).

Long working hours and shift work appear to be an important factor leading to stress among police personnel threatening their health, safety, and performance (Vila, 2006). Increased stress levels associated with increased working hours indicate an area where stress awareness and management training may be able to target with good impact.

Stress at work is an ill health provoking factor. The fact was proved by giving a work stress reduction intervention to civil servants who reported considerable stress at work. A significant decline in lipoprotein level was found in them as compared to the non-intervened control group, keeping other factors like smoking, drinking, eating and exercise constant (Gomer et al, 1994). Disruptive administrative changes were found to increase stress in rural and small town patrol officers significantly (Scott, 2004).

Age and job span reportedly have a bearing on stress. Policemen with a high stress level were more than 30 years and had more than 15 years of service (Deschamps et al, 2003; Madu and Poodhun, 2006). But at the same time there are studies which support the fact that this stress is not because of
the advancing age in isolation but because of the increasing workload and responsibilities at that age (Collins and Gibbs, 2003).

Gershon et al (2002) found that the most important risk factors associated with perceived work stress among police officers in the US aged \( \geq 50 \) years were maladaptive coping behaviors (e.g. excessive drinking or problem gambling) and exposure to critical incidents (e.g. shootings). Also, perceived work stress was significantly associated with anxiety, depression, somatization, post-traumatic symptoms of stress and/or burnout, chronic back pain, alcohol abuse, and inappropriately aggressive behavior.

In Wardha city of India, 70% of police personnel studied reported stress at the workplace (Selokar et al, 2011). Different stressors that were identified among the police personnel included criticism by superiors, excess work, no rewards, inadequate value given to abilities and commitments and no satisfaction from work. A significant association of stress level among police personnel was found between age group, marital status, education and working hours. Questions about stress were based on The Professional Life Stress Test by Fontana (1989). He found that with age stress raised, divorced/separated policemen were more stressed than their married counterparts, more educated were more stressed than less educated subjects. Those with long working hours had more stress than those with lesser working hours which reflected their higher workload. Hence there is a need for resources to be
directed towards exploring effective ways of modifying the organization of workload and improving the management environment. Also introduction of periodical health examination may be required to detect any morbidity developing or existing among the police personnel.

A study to identify the most stressful job activities of women police constables in Tuticorin district of Tamilnadu explained stress due to insufficient personal time, seeing criminals going free, lack of recognition for good work, having to go to court, having to deal with the media, meeting deadlines, working overtime, dealing with crisis situations, lack of opportunity for advancement, competition for advancement, delivering a death message or bad news are the primary causes of stress among police constables. The study suggested to regularly organizing the training programs, counseling and medical checkups for stress management of women police constables (Sundaram and Kumaran, 2012).

It was also observed that job stress and irregular work hours affect the duration of sleep hours and quality of sleep. Perceived exertion was maximum when they worked as a Duty Officer in the Police Station. During duty, they were faced with different types of stressors. Heavy workload, injury during duty and irregular duty hours were more frequent stressors. Sleep debt, weight gain, gastrointestinal, cardiovascular and psychosomatic problems, mainly anxiety and tension were main health complaints among
Police personnel. It was observed that job stress directly affects the family and social life. Children’s caring, partner’s satisfaction, domestic activity and individual hobbies were affected very much (Saha et al, 2012).

Police personnel, who have meaning in their life show good mental health. Personnel, who are high on stress resilience from stressful situations, show good mental health and perform their tasks well. The findings can work as significant guidelines to the departments which offer training to Police Officers. Police receive ample training in theoretical knowledge & technical skills to do their job, but receive no training to equip themselves with skills to help them maintain their psychological and physiological equilibrium in their stressful job (Mohan and Kaur, 2013).

The major coping strategies adopted by policemen to relieve occupational stress included exercise, sharing problems with colleagues and friends, and smoking (Deb et al 2005). Substance use i.e. alcohol and drugs was also among the coping strategies (Madu and Poodmun, 2006).

Eating may also be a coping strategy as high level of field stress was shown to increase cortisol activity and associated food intake (Newman et al, 2007). Cortisol, also called the ‘stress hormone’, is released increasingly with the increased stress and affects the levels of serotonin, the ‘feel-good hormone’ (Gilbert, 2001). Both these hormones affect the Circadian rhythm, the body’s natural cycle that controls appetite, energy, mood, sleep and libido.
Stress-induced eating is significantly associated with obesity as shown by high Body Mass Index (Latinen et al, 2002). On the contrary, obese male workers were found to be in a stressful state from high job demands (Nishitani and Sakakibara, 2006).

Job strain is also associated with hypertension among adults, irrespective of BMI (Markovitz et al, 2004).

Mental and physical stress can also be a precipitating factor for diabetes as depicted by a rise in blood sugar level due to release of epinephrine, a hormone responsible for boosting blood sugar when body needs energy (Surwit et al, 2002).

When exposed to experimental stress, people showed abnormal lipid profile, especially elevated cholesterol (Steptoe and Brydon, 2005). By reducing occupational stress, serum lipid constituents were found to be decreased in civil servants experiencing stress (Gomer et al, 1994).

The effect of demographic variables such as age and level of experience on the level of stress experienced by non-gazette officers of the Central Reserve Police Force (CRPF) was assessed. The personnel were categorized into two major age groups, namely, 27-36 years and 37-57 years. The stress levels of both the groups of CRPF personnel did not differ significantly, indicating that stress levels were not affected significantly by age. Whereas the mean stress score of personnel in the age group 27-36 years
shows they had slightly higher amount of stress than their immediate elders (Balakrishnamurthy and Shankar, 2009).

The Buffalo Cardio-Metabolic Occupational Police Stress (BCOPS) pilot study on 100 police personnel is one of the first population-based studies to integrate psychological, physiological, and subclinical measures of stress, disease, and mental dysfunction. Compared to populations of similar age, police officers had elevated BMI, and higher reported rates of depression and posttraumatic stress disorder (Violanti et al, 2005). Later a larger cross-sectional study on 464 police personnel was undertaken (Violanti et al, 2006). It was found that 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 and organizational stress and lack of support was associated with the metabolic syndrome in female but not male police officers. These findings demonstrate that police work by itself can put policemen at risk for adverse health outcomes.

The frequency of job pressure and lack of support was mainly associated to physical and mental health problems. Females showed higher means on anxiety symptoms than males, while males showed higher means on depressive symptoms (Berg et al, 2006).

Deb et al (2008) found 79.4% of traffic constables of Kolkata Police to be stressed (76.5% moderately and 2.9% highly) as assessed by Occupational Stress Index developed by Srivastava and Singh (1984). Nagar (2009) studied
the level of occupational stress in 3 categories of police service: Circle Officer (or the Dy. SP), the Inspector and the Constable using Occupational Stress Index developed by Srivastava and Singh (1984). High degree of occupational stress was reported by 40% of Constables, 20% Inspectors and 10% of CSPs. Furthermore, more than 50% of police personnel reported experiencing moderate levels of occupational stress.

In a study on frequency of stress among female police constables of Tamilnadu Police Department, four or five stressed-out women police commit suicide every year (Sundaram and Kumaran, 2012). Stress-related ailments have killed more serving police personnel in the past three years. Several inspectors and constables have died of heart attacks while on duty. Constables are feeling that they work under great pressure and their job is demanding and uncertain, also, public expectations from the police are high. During festivals timings, constables often work for more than 36 hours at a stretch. This may take a heavy charge on their health. 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 their making errors while passing orders or taking important decisions. Besides the routine work, constables often face stressful situations because of harassment from superiors. The overall goal of the study is to explore the major personal and cognitive factors with occupational stress, and identifying the relationship
between amounts of stress, causes and the relations between the socio demographic factors.

The physical threats in police operational duties have been regarded as inherent causes of stress in police work, but organizational factors such as work overload, time pressure, inadequate resources, manpower shortage, lack of communication, managerial styles etc. emerge as more stressful (Brown and Campbell, 1990; Kop et al, 1999). This may indicate that police are trained for police operational duties (Hart et al, 1995), whereas their ability to cope with organizational stressors may be less adequate. The negative impact of stress in police work is manifested in different ways, such as somatic and mental health problems and burnout (Biggam et al, 1997; Kirkcaldy and Shephard, 2001) and it depends on the frequency, the intensity and how the experienced situation is perceived (Brown et al, 1999). Data on frequency is important in determining which stressors have had the greatest impact on daily police work (Anderson et al, 2002).

c. Other Non-Food Habits

These include substance use like alcohol, smoking, tobacco chewing etc. which are important determinants of life style. Alcohol intake affects nutritional status of an individual as it reduces appetite, causes mucosal blockade, decreases absorption of nutrients and has associated economic factors (Goodhart and Shils, 1980).
Police occupy an important position within the community as both enforcers of the law and as role models for appropriate behavior. Despite this interesting juxtaposition, research has shown that they may consume alcohol and tobacco at rates higher than the general population. A significant causal factor is occupational stress, and the fact that police are regularly exposed to stressors beyond the range of normal human experiences (Smith et al., 2005). Given this ongoing and unavoidable relationship, the recognition and control of stress is paramount within law enforcement. Because police stressors are usually multi-faceted, health promotion interventions should focus on stress-reduction at both the institutional and individual level.

Tobacco chewing was the most common (48%) form of addiction, followed by alcohol in 20.8% of subjects in a study on traffic police personnel of Brahmapur city of Odisha (Satpathy et al., 2009).

The excessive consumption of alcohol can cause many difficulties in both the home and work environment. It can hamper job performance, increase absenteeism and the likelihood of occupational injury, and create economic problems and marital discord. It may have serious implications for the individual officer as well as the police organization (McNeill and Wilson, 1993).

In a unique prevention project in a large US state, researchers explored how alcohol abuse and post-traumatic stress disorder (PTSD) rates influence
rates of self-reported domestic violence committed by law enforcement officers (Oehme et al, 2012). A strong association, not a cause/effect relationship, was found. Officers who had PTSD were four times more likely to report using physical violence, officers who had hazardous drinking were four times more likely to report violence, and dependent drinkers were eight times more likely to report being physically violent with an intimate partner.

Policemen reported drinking with less frequency but in far greater quantities (Davey et al, 2000). Heavy drinkers were more prone to cardiovascular risks including cardiomyopathy, hypertension, heart rhythm disturbances and hemorrhagic stroke (Klatsky, 2004).

People who were drinking alcohol mostly without food exhibited a higher risk of hypertension as compared to those who were drinking mostly with food (Stranges et al, 2004). This suggests that drinking outside meals may have a significant effect on hypertension.

Ties between alcohol consumption and risk of developing diabetes are more complex and show a bit of paradox. Lean men had a higher risk of developing type-2 diabetes if they were heavy drinkers, whereas heavier men had a greater risk of developing type-2 diabetes if they were moderate drinkers (Tsumura et al, 1999).

Smoking is one of the important exogenous factors which tend to increase the incidence of coronary heart disease (Doyle et al, 1962). It also affects the lipid profile of an individual and poses a cardiovascular threat as shown by
elevated plasma levels of total cholesterol, triglycerides and lipoprotein-cholesterol in smokers than in non-smokers (Venkatesan et al, 2006).

Tobacco chewing was shown to pose a similar risk of cardiovascular disease in terms of elevated lipid profile as by smoking (Khurana et al, 2000).

Smoking may also increase the risk of developing type-2 diabetes by making the body less able to respond to insulin, a hormone responsible for glucose uptake by cells, thereby increasing the level of glycosylated hemoglobin (Hb A1c) in blood (Khaw et al, 2004).

Smoking policemen were significantly older and had lower fitness scores than their non-smoking counterparts (Boyce et al, 2006).

Full time Mississippi officers from municipal, county, and state departments totaling 1,328, were asked to complete a 27-item questionnaire containing the World Health Organization's Alcohol Use Disorders Identification Test instrument to determine alcohol use and risk (Lindsay, 2008). The researcher found no difference in use by Mississippi officers and the general public. Moreover, the researcher identified the officers most at risk for alcohol problems.

To evaluate the effects of a brief intervention to reduce excessive drinking, smoking and stress among police, an assessment was carried out of 954 Australian police personnel at 19 stations within two matched districts in
the Sydney metropolitan area (Robyn et al, 1999). Excessive drinkers and those reporting moderate to severe stress levels reported more sick leave. A significant increase in awareness of alcohol policies in the work-place showed in both experimental and control groups over time. The percentage of smokers declined significantly in both intervention and control groups. Overall, women had significantly more symptoms of stress than men. Only 20% of police thought they would seek advice from work-place staff about alcohol consumption, 14% for smoking and 61% for stress.

The percentages of incidence of tobacco chewing, smoking and alcohol use were 13%, 16%, and 10% respectively among a sample of 1063 policemen of various districts of Rajasthan State (Kapur et al, 2011). The non-smokers yielded the greatest level of work satisfaction and psychological well-being along with lower absenteeism in contrast to ex-smokers (Kirkcaldy et al, 2006). Smoking is also shown to reduce dietary intake of adult men (Abrol and Khanna, 2002). Thayyil et al (2012) found a prevalence of smoking (10%), and alcohol use (48%) among police officers of Tamilnadu (n=900).

Rastogi (2012) found a higher prevalence of tobacco use (54.42%) and alcohol consumption (28.27%) in constables of Nagpur city and compared these figures with those given by Athawale et al (1997). The prevalence of
tobacco was 45.95% and alcohol consumption 25.6% among general employees of Nagpur Municipal Corporation (Athawale et al, 1997).

3. Dietary Patterns

Information on meal patterns, meal frequency, meal skipping, fasting, eating out, food choices etc. indicates one's dietary habits.

Working in shifts may influence appetite and food intake of policemen (Attia, 1985). Late-shift workers reported eating fewer meals than day-shift workers (Geliebter et al, 2000). Apart from these changes in eating, lesser frequency of exercise and more sleep duration were reported which contributed to increased weight gain in late-shift workers.

Nutritional knowledge influences dietary behavior of middle aged men (Dallongeville, 2000). But these two parameters were shown to be weakly associated (Axelson et al, 1985) because cultural, educational and economic factors as well as food availability influence food choices.

Uddhav et al (2012) conducted a study to observe the short term effect of residential yoga and diet program on lipid profile in Policement. The study period was two weeks. First week was self controlled period and second was experimental. The intervention consisted of asana, pranayama, meditation, kriya and yogic diet. Lipid profile on fasting blood samples revealed a significant reduction in cholesterol, triglycerides and VLDL. This suggested
that short term yoga and diet modification program can lead to improvement in lipid profile.

There is little research data available on dietary patterns of policemen. However, in general, the food is cooked twice in mess of the Reserve Police line or a police station for the police force. Apart from morning tea, the meal generally consists of *chapati*, *dal* or seasonal vegetable. Non-vegetarian meal and sweet dish is served twice a week as the special diet.

4. **Health and Nutritional Status**

Nutritional status refers to the state of health of an individual as it is affected by the intake and utilization of nutrients (Vijayraghavan, 2006).

Age, sex, education and physical activity were found to have an impact on food intake patterns and hence the risk of malnutrition in older adults (Alan et al, 2006).

The review is presented according to the parameters of nutritional status assessment which the present study intends to employ. These parameters are-

a. Anthropometric assessment
b. Food and nutrient adequacy
c. Clinical assessment and health history
d. Biochemical estimation
e. Biophysical examination.
a. **Anthropometric Assessment**

It involves measurement of human body at various ages and levels of nutritional status, which reflects any morphological variation occurring due to a significant functional physiological change (Jelliffe, 1989).

There are certain specified minimum physical standards for recruitment of police constables (male) in police (Minocha et al, 1998) as follows-

- **Height**: 165 cms minimum
- **Chest**: 78 cms minimum (with expansion of 5 cms).

Anthropometric research done on policemen and armed forces may or may not directly be linked with nutritional status assessment. For example, Defence Institute of Physiology and Allied Sciences (DIPAS) New Delhi, has undertaken studies on body measurements for establishing norms for sizes of uniform and other clothing (Zachariah et al, 2001). Similarly height and weight have been used as predictors of chest circumference (Verma et al, 2005).

But there are many studies done to assess the physical changes to predict the health of policemen. On recruitment the policemen undergo vigorous and strenuous physical fitness regime. Over the period of time, due to a decline in physical activity, obesity may prevail. 52% of policemen were found to be overweight and 13% obese with more males affected than females (Deveci et al, 2004).
Policemen and firefighters with larger BMI were found to be at an increased risk of developing type-2 diabetes, than clerical and manual workers, as determined by their serum fasting glucose levels (Nagaya et al, 2006).

Further, high BMI in obese and over-weight individuals was shown to be positively related with insulin resistance and associated cardiovascular risk factors including hypertension than in the normal-weight counterparts (McLaughlin et al, 2004).

People working in night shifts reported increased weight gain than those in day shifts (Geliebter et al, 2000) due to irregular eating and exercise patterns.

Mungreiphy et al (2011) demonstrated that body mass index is closely associated with both systolic and diastolic blood pressure among the Tangkhul Naga males. BP is also associated with rising age independently. Though the magnitude of correlation differed, there was positive and significant correlation among BMI, age, systolic and diastolic blood pressures.

Body mass index is positively and independently associated with morbidity and mortality from hypertension, cardiovascular disease, type II diabetes mellitus, and other chronic diseases (Pi-Sunyer, 1993). In Caucasian populations, a strong association has been depicted between BMI and
mortality (Stevens et al, 1998). A similar association has also been
demonstrated among Asian populations (Mhurchu et al, 2004; Weng et al,
2006).

A strong correlation has been established between a high BMI and the
development of type-2 diabetes mellitus from a study of more than 7000
British men (mean follow-up of 12 years) (Kahn, 1994).

A cohort of 1169 adults (n = 581 men; n = 588 women) was studied to
investigate individual trends in BMI (kg/m$^2$) by age, gender, and socio-
economic status over an 11-year period (Reas et al, 2007). Average BMI
increased significantly from 23.7 (SD = 3.4) to 25.4 (SD = 3.8), with
equivalent increases for both genders. Proportion of obesity (BMI ≥ 30)
increased from 4% to 11% for women and 5% to 13% for men. Of those
already classified as overweight or obese in 1990, 68% had gained additional
weight 10 years later, by an average increase of 2.6 BMI units. The greatest
amount of weight gain occurred for the youngest adults (aged 20–29 years).

Waist-to-Hip Ratio (WHR) is a simple index of body fat distribution
and provides an indication of the predominance of fat storage in the
abdominal region. A high WHR is indicative of centripetal distribution of
body fat. A number of studies have shown that an increased ratio is associated
with increased occurrence of diabetes and cardiovascular diseases,
independent of overall obesity (Kannel et al, 1991).
The anthropometric parameters of a sample of police constables (males and females) selected from various districts of Rajasthan (n=1063) shows males to be on the fatter side (Kapur et al, 2011). 50% of males being overweight and obese (BMI between 23-29.9 kg/sq. m) whereas 41% of males had raised waist circumferences (WC > 90 cm). Further 46.5% of males had high WHR (>0.9).

When WC and BMI were used as continuous variables in the same regression model, WC alone was a significant predictor of co-morbidity (Janssen, 2004). Thus WC, and not BMI, explains obesity-related health risk. Thus, for a given WC value, overweight and obese persons and normal-weight persons have comparable health risks. However, when WC is dichotomized as normal or high, BMI remains a significant predictor of health risk.

Research data on the above aspect for police population is, however, scanty.

b. Food and Nutrient Adequacy

It is a general notion that men always enjoy the advantage in the household and get the lion's share of cooking pot. Whereas dietary inadequacies among men were observed even over two decades back (Vaidyanathan, 1984).
Food and nutrient intakes are differently affected with advancing age as it was reported that the proportion of plant food to total food intake increases with age (Lee et al, 2004).

Most men failed to meet micronutrient adequacy including vitamin B6, vitamin B12 and calcium (Azadbakht et al, 2005). On the contrary, obesity has been a prevalent problem among police men (Rivera, 2001; Charles et al, 2007).

Maintaining a balanced nutrition and diet by having right amounts of proteins, carbohydrates and fat has been stressed for policemen (Farmer, 2004).

There is negligible data available on food and nutrient adequacy of policemen.

c. Clinical Assessment and Health History

Clinical examination has always been, and remains, an important practical method for assessing nutritional status of a community. The method is based on examination of changes, believed to be related to inadequate nutrition, that can be seen or felt in superficial epithelial tissues especially the skin, eyes, hair and buccal mucosa, or in organs near the surface of the body, such as parotid and thyroid glands (Jelliffe, 1989).

Kapur et al (2011) carried out a prospective cross-sectional study on 1063 police constables from different district of Rajasthan. Experienced
physicians examined the recruits and illnesses observed were jaundice and anemia. The prevalence of both jaundice and anemia was found to be just 1% among the group (Kapur et al, 2011).

Though dietary inadequacies and prevalence of micronutrient deficiencies in men have been found in NNMB surveys (Gopalan and Naidu, 1972), but specific data on presence of deficiency symptoms among policemen per se is negligible.

d. **Biochemical Estimation**

Biochemical estimation deals with measuring the level of essential dietary constituent (nutrient concentration, metabolites) in the body fluids (normally blood and urine) which is helpful in evaluating the possibility of malnutrition.

The present study focuses on estimation of hemoglobin, blood sugar and serum lipids.

Anemia cause significant morbidity and mortality in the developing countries of the world. Nutritional anemia, in particular, constitutes a public health problem in India (Shukla, 1982). High incidence of anemia among men has been reported (Rao, 1984) but until late the specific incidents of hemoglobin estimation among policemen largely went unreported. In a recent study of 1063 police personnel (males and females), only 1% showed the
prevalence of anemia (Kapur et al, 2011). However the level of methemoglobin among traffic policemen due to pollution was reported to cause reproductive incompetence (Wiwanitkit, 2007). Fasting blood glucose levels were found to be higher in policemen with higher BMI (Nagaya et al, 2006).

A cross-sectional study was conducted among police personnel (n = 1817) in Bankura District, West Bengal, India to estimate the prevalence of diabetes mellitus, impaired fasting glucose, impaired glucose tolerance, and its correlates (Kumar et al, 2013). DM was found in 15% of subjects had diabetes mellitus, 1.1% had impaired fasting glucose and 5.7% had impaired glucose tolerance. High prevalence of diabetes and pre-diabetic condition warrants early effective intervention to keep the police force healthy and agile.

The prevalence of diabetes (FBG $\geq$ 126 mg/dl) was found to be 4% in male constables and 2% in female constables with mean age for diabetes was 46.4±10.13 years (Kapur et al, 2011).

Hypercholesterolemia was shown to be significantly associated with law enforcement profession and a major reason of cardiovascular morbidity (Franke et al, 1998).

Quire and Blount (1990) studied 380 sworn police officers of the St. Petersburg, Florida Police Department and found that older officers were at greater risk of coronary heart disease than younger officers. Nevertheless, based
on Center for Disease Control standards, St. Petersburg police officers were at very low risk levels and had significantly reduced their risk level over a period of 5 years from 1981-1985. This reduction was attributed to a concentrated effort on the part of the department and, in particular completes physical examinations that contained the cholesterol screen and the resultant discussion of risk profiles, and a fitness program that contained exercise and diet recommendations.

e. Biophysical Examination

Policing is a stressful job and strain at work has been associated with increased incidence of hypertension (Markovitz et al, 2004). Further, alcohol consumption is also reported to elevate blood pressure (Klatsky, 2004).

Globally, high blood pressure is estimated to cause 7.1 million deaths, about 13% of the total. About 62% of cerebrovascular disease and 49% of ischaemic heart disease are attributable to suboptimal BP (systolic >115 mm Hg) (WHO, 2002). Overweight and obesity increase the risks of high BP, coronary heart disease, ischaemic stroke, type II diabetes mellitus, and certain cancers. Worldwide, about 58% of diabetes mellitus and 21% of ischaemic heart disease are attributable to BMI above 21kg/m².

Hypertension is a major risk factor for the development of heart disease and a leading cause of many life-threatening conditions such as stroke, heart attack and kidney failure (Sipahi et al, 2006).
Hypertension was the most common (9.97%) self reported systemic condition in police personnel of Haryana (Sohi et al, 2009).

Assessment of systolic blood pressure revealed 63% males to be pre-hypertensive (>120 mm Hg) & 21% hypertensive (>140 mg Hg) whereas that of diastolic blood pressure showed 46% males as pre-hypertensive (80-89 mm Hg) & 50% as hypertensive (>90 mm Hg) (Kapur et al, 2011).

Rate of prevalence of high blood pressure was positively correlated with advancing age (Jones et al, 2005).

Rastogi (2012) assessed hypertension prevalence on policemen from Nagpur and found the figure (22.5%) higher than the general urban population. The figures used for comparison were those estimated by Gupta (2003) as 15.52% in Mumbai, 14.08% in Ludhiana, 10.99% in Jaipur, 11.59% in Delhi and 13.11% in Chandigarh. Rastogi (2012) also found significantly higher prevalence of hypertension in policemen of 45.58 years of age. This suggests that the policemen join the department in extremely good health with athletic physique but retire with some stress related disorders (Rastogi, 2012).

f. **Metabolic Syndrome**

Metabolic syndrome (MS) refers to a cluster of features namely central obesity, insulin resistance, dyslipidemia, and hypertension. Asian Indians have long been considered to be a “high-risk population” for both MS and
CVD, which has instigated a number of studies on Indians living in India (Ramachandran et al, 1998; Misra et al, 2005) and abroad (Hughes et al, 1997; Tan et al, 2004; Shah et al, 2005).

Kapur et al (2011) found 41% of policemen having elevated plasma triglyceride levels (>150 mg/dl) over 37% of female candidates, whereas 50% of total study group (49% males and 54% females) had HDL ≤40 mg/dl. 48% of the total cohort had raised LDL levels (>100 mg/dl). All these factors put these police personnel at risk of metabolic syndrome.

Considering 5 markers for multiple metabolic syndrome (MMS), namely elevated fasting blood glucose, blood pressure (systolic/diastolic), waist circumference, waist to hip ratio and triglycerides together, 5% of the cohort had 3 elevated markers, 2.9% had 4 and 1.5% of subjects had all the 5 markers elevated (Kapur et al, 2011).

A study conducted to measure the prevalence of metabolic syndrome and other cardiovascular risk factors among police officers of Tamilnadu (n=900) diagnosed Metabolic Syndrome using the National Cholesterol Education Program—Adult Treatment Panel III (NCEP-ATP III, 2001) criteria identified police officers as a high-risk group for developing cardiovascular diseases (Thayyil et al, 2012). The Metabolic Syndrome was observed in 16.8% of the study population. High blood pressure and hypertriglyceridemia were the commonest abnormalities. The prevalence of other
cardiovascular risk factors were high body mass index (65.6%), hypertension (37.7%), diabetes (7%), smoking (10%), and alcohol use (48%).

The comparison of prevalence of various cardio metabolic risk factors in police personnel and general population is presented as follows.

**Comparison of Prevalence of Various Cardio Metabolic Risk Factors in Police Personnel and General Population**

**Police Personnel**

Kumar et al (2013) conducted a cross sectional study among 1817 police personnel in Bankura district, West Bengal aged 20-59 years. Prevalence of overweight/obesity was in 25.7% subjects, 42.2% subjects were hypertensive, diabetes mellitus was in 15% of the subjects.

Jahnavi et al (2012), studies health status of 617 police personnel in 40-58 years age group at Vijaywada. Out of 617 police personnel 42% were overweight/ obese, lack of physical activity was found in 64% of them, alcohol consumption was present in 24% and smoking in 22% of the police personnel. Diabetes was diagnosed in 37% and hypertension in 33%.

Mahajan et al (2009) studied the prevalence of non communicable diseases risk factors in 75 policemen and 75 Bhabha Atomic Research Center employees in the age group of 35-50 years. Tobacco consumption habit was reported as 22.66%, alcohol consumption in 21.33%, obesity (BMI ≥ 25.0)
28.0%, hypertension 26.66%, diabetes mellitus 12.0% and physical inactivity in 14.66 % of the population.

Satapathy et al (2009) assessed health status of traffic police personnel in Brahmapur city, Orissa in the age group of 30-50 years. Tobacco chewing was the most common (48%) practice, 20.8% had alcohol consumption habit. It was observed that 38.3% of subjects were overweight, 25% were hypertensive, 6.25 % were diabetics.

Tharkar et al (2008) estimated prevalence of metabolic syndrome and cvd risk among police personnel in 719 men aged ≥ 30 years from Chennai. It was reported that smoking was prevalent in 22.6%, tobacco chewing in 8.5%, alcohol consumption in 31.1%, overweight/obesity in 62.9%, hypertension in 58.5%, metabolic syndrome in 57.3% and diabetes mellitus in 32.1% of the subjects.

Meshram et al (2005) studied prevalence of hypertension in 520 constables of Nagpur district in the age group of 18-58 years. Tobacco use was observed in 54.4%, alcohol consumption in 28.27%, overweight/obesity in 43.08% and physical inactivity in 59.8% of the subjects.

**General Population**

Gupta et al (2012) evaluated prevalence of CVD risk factors in 739 subjects (men 451, women 288) in the age group of 20-59 years. It was observed that age adjusted prevalence of smoking was 21.1%, low physical
activity 69.6%, high fat intake >20 gm/day 73.4% , overweight/obesity 46.2%, high waist size 12.9%, hypertension 39.5% , high total cholesterol >200 mg/dl 33.0%, low HDL cholesterol <40 mg/dl 25.1%, diabetes 15.5% and metabolic syndrome 25.1%.

Thankanpan et al (2010) assessed the risk profile of chronic diseases in Kerala among 7449 subjects aged 15-64 years. It was observed that tobacco consumption habit in men was 43.0%, alcohol 26.5%, overweight 27.9%, hypertension 36.2%, diabetes mellitus 12.3% and physical inactivity in 10.4% of the subjects.

Yadav et al (2008) studied prevalence and risk factors of hypertension in 1746 adults in Lucknow city, of Uttar Pradesh. It was reported that in men prevalence of smoking was 20.3%, overweight (BMI ≥23.0) was 74.5 %, hypertension 42.9%, metabolic syndrome 75.9%, diabetes mellitus 28.4% and physical inactivity/sedentary lifestyle was in 63.1% subjects.

Latheef et al (2007) determined the prevalence of coronary heart disease and its risk factors in the urban population of Tirupati. A total of 1519 subjects (539 males and 980 females) 20 years of age formed the sample of the study. The major risk factors in male population were central obesity 320 (59.4%), low HDL cholesterol 284 (52.69%), obesity 187 (34.32%), high triglyceride levels 173 (32.09%), high cholesterol levels (≥ 200mg/dl) 127
(23.56%) and hypertension 149 (27.64%). Around a fraction of subjects had metabolic syndrome 371 (24.42%) [(males 90 (16.69%) and females 281 (28.64%)].

Mehan et al (2006) studied non-communicable disease risk factors among middle income free living population in the age group of 18-59 years. Smoking was prevalent in 28.6% men, tobacco in 44.6%, alcohol habit was found in 7.1%. Overweight/obesity was prevalent in 57.1%, history of hypertension in 8.9% and history of diabetes mellitus in 32% men.

The tabulated findings of the above mentioned studies follow on the next page.
Table 2.1: Comparison of Prevalence of Various Cardio Metabolic Risk Factors in Police Personnel and General Population

<table>
<thead>
<tr>
<th>Author</th>
<th>Smoking</th>
<th>Tobacco Chewing</th>
<th>Alcohol Intake</th>
<th>Overweight/Obesity</th>
<th>Hypertension</th>
<th>DM</th>
<th>Metabolic Syndrome</th>
<th>Physical Inactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POLICE PERSONNEL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kumar et al, 2013</td>
<td>-</td>
<td></td>
<td>-</td>
<td>57.6%</td>
<td>42.2%</td>
<td>15.0%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Jahnvi et al, 2012</td>
<td>22%</td>
<td>-</td>
<td>24%</td>
<td>35%</td>
<td>33%</td>
<td>37%</td>
<td>-</td>
<td>64%</td>
</tr>
<tr>
<td>Satapathy et al, 2009</td>
<td>-</td>
<td>48%</td>
<td>20.8%</td>
<td>38.3%</td>
<td>25%</td>
<td>6.25%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Mahajan et al, 2009</td>
<td>-</td>
<td>22.66%</td>
<td>21.33%</td>
<td>28.0%</td>
<td>26.66%</td>
<td>12.0%</td>
<td>-</td>
<td>14.66%</td>
</tr>
<tr>
<td>Tharkar et al, 2008</td>
<td>22.6%</td>
<td>8.5%</td>
<td>31.1%</td>
<td>62.9%</td>
<td>58.5%</td>
<td>32.1%</td>
<td>57.3%</td>
<td>-</td>
</tr>
<tr>
<td>Meshram et al, 2005</td>
<td>13.5%</td>
<td>54.4%</td>
<td>28.3%</td>
<td>36.4%</td>
<td>22.5%</td>
<td>-</td>
<td>-</td>
<td>59.8%</td>
</tr>
<tr>
<td><strong>GENERAL POPULATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gupta et al, 2012</td>
<td>21.1%</td>
<td>-</td>
<td>-</td>
<td>46.2%</td>
<td>39.5%</td>
<td>15.5%</td>
<td>25.1%</td>
<td>69.6%</td>
</tr>
<tr>
<td>Thankanpan et al, 2010</td>
<td>-</td>
<td>43.0%</td>
<td>26.5%</td>
<td>27.9%</td>
<td>36.2%</td>
<td>12.3%</td>
<td>-</td>
<td>10.4%</td>
</tr>
<tr>
<td>Yadav et al, 2008</td>
<td>20.3%</td>
<td>-</td>
<td>-</td>
<td>74.5% (BMI ≥ 23.0)</td>
<td>42.9%</td>
<td>28.4%</td>
<td>75.9%</td>
<td>63.1%</td>
</tr>
<tr>
<td>Latheef et al, 2007</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>34.33%</td>
<td>27.64%</td>
<td>-</td>
<td>16.69%</td>
<td>-</td>
</tr>
<tr>
<td>Mehan et al, 2006</td>
<td>28.6%</td>
<td>44.6%</td>
<td>7.1%</td>
<td>57.1%</td>
<td>8.9 (H/o)</td>
<td>32.0% (H/o)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>