NUTRITIONAL STATUS AND FOOD BEHAVIOUR OF WOMEN POLICE OF HUBBALLI-DHARWAD

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CERTIFICATE

This is to certify that the thesis entitled "NUTRITIONAL STATUS AND FOOD BEHAVIOUR OF WOMEN POLICE OF HUBBALLI-DHARWAD" submitted by Ms. PHAKEERAMMA P. MURGOD, for the degree of MASTER OF HOME SCIENCE in FOOD SCIENCE AND NUTRITION to the University of Agricultural Sciences, Dharwad is a record of research work done by her during the period of her study in this University under my guidance and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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1. INTRODUCTION

Indian civilization is one of the most ancient civilizations of the world, and so are its diverse systems and sub systems. The Indian police has a long past and has reached its present state passing through various social, political and cultural changes. The industrial revolution and the processes of liberalization and globalization have changed the position of women in India. As a result, women are actively participating in different economic activities, and simultaneously managing their families and professions. In the Indian traditional society where women are brought up in a patriarchy culture, it is important to note that women are also getting enrolled in police departments. The traditional role of woman as a home-maker has been transformed into the new role of a professional woman.

Policing is considered to be one of the most masculinized occupations of the world. It is a demanding job, which involves long and uncertain hours of duty. Police system in any society has difficult roles to play. Police generally have to deal with complex problems like murder, assault and robbery. In dealing with these issues, police comes across many children and women involved in these activities both as victims and as offenders. With the lapse of time, the need for more tolerant and understanding employees was recognized. To fulfill these requirements women police personal were recruited in police department (Rizvi, 2015).

Until quite recently careers in law enforcement were not open to women, but today a new world of opportunities has opened up. However, policing is still portrayed as a masculine job. Natarjan (2012) who has worked over 20 years on women police in changing societies opines that policing serves not only law enforcement but also maintenance of order and service to the public which women can perform well. However, reported that that many qualities that women possess to a considerable degree viz., patience, compromise, empathy and diplomacy have been over looked.

According to Ghosh (1979), the idea of introducing women into the police force in independent India was first contemplated after the Partition of India and Pakistan in 1947 to deal with offenses that victimized women, as in kidnapping, abduction, and rape cases, and in relief camps that housed unattached women and children. The

induction of women in the Indian police system is of recent origin. The need for women police in British India was felt during the labor strike in Kanpur, in 1938 and later in 1939 women police were appointed in Kanpur to control the women (Mahajan, 1982).

It is reported that the number of police women was practically negligible until 1960s. Section 51 (2) of the Code of Criminal Procedure stipulated that whenever it was necessary to cause a female to be, regard to decency. With noticeable increase in the number of inverse against women, as well as by women the recruitment of women police was started Chande

(1997). Women were inducted into the police in large members in 1970s, as a result of the women's movement and accompanying social changes. The recruitment of women in police was increased in 1980's to deal with marked increases in women and juvenile offenders. In response to National Police Commission (1977), many women's cells and all women police stations were created.

Highlighting the growing importance of women police, the National Police Commission (1980) pointed out that their role was crucial in rehabilitating delinquent girls and in areas where the police came in direct contact with women. Aleem (1991) presented information on the numbers and current status of women police in India, and reported that women entered India's police force in 1938, but the number was negligible, until 1980's when it increased to 500. Women on the police force had positive effects on society as a whole. It was reported that women are more trust worthy and take their oath of office more seriously, they did not ask for or take bribes, more honest, disciplined and trust worthy than male counterparts. This reflected that women police make vital contribution in developing countries in criminal justice system (Anon., 1998; Jones, 2000 and Grey, 2013)

Development of women police in India with emphasis on Tamil Nadu has been detailed by Natarajan (2012). He reported that with establishment of all women units in Tamil Nadu was highly successful in enhancing the confidence and professionalism of women police officers, ensuring effectiveness and efficiency of the police.

An international review on status of women police officers explains that data on the proportion of female officers ranged between 5.1 to 28.88 per cent in different countries such as England and Wales, Scotland, Northern Ireland, Eire, the United States, Canada, Australia, New Zealand, South Africa, Ghana, Nigeria, India, *Pakistan,*

Hong Kong, Papua New Guinea and Fiji (Prenzler and Sinclair, 2013). Female police were reported to be first appointed in sprinkling of locations in the early decades of the twentieth century including Portland Oregon in 1908, Los Angeles in 1910 and Toronto in 1913.

Further expansion occurred during the First World War. Further appointments continued as the century progressed as in Eire the first women police were appointed in 1959, four decades later than the UK (Claney, 2009). The women police entered the juvenile aid units and school traffic squads, eventually joining mixed patrol teams in the 1970s (Brown and Heidensohn, 2000 and Jackson, 2006). Women remain grossly underrepresented in most developed and developing democracies (Natarajan, 2008; Gultekin *et al.,* 2010; Moses, 2010; Cordner and Cordner, 2011 and Stroshine and Brandl, 2011). In an unusual recruitment effort in Peru, women were preferred in traffic maintenance and currently 90 per cent of traffic police is women (Jones, 2000). Opinion of recruiting more women in traffic police in Mexico were expressed by Brown (2013).

Policing is considered to be one of the most masculinized occupations of the world. It has been described as one of the most “gendered” professions. It is a demanding job, which involves long and uncertain hours of duty. However, over the past few decades, the police workforce has grown much more diverse with regard to gender and race (Butler and associates, 2003; Sklansky, 2006 and Sahgal, 2007).

In India as on first January 2011, according to the Bureau of Police Research and Development (Anon., 2012), the actual strength of the women police personnel in the total state police force was only 4.59 per cent. The ratio of women personnel to men personnel works out to 1:21. Police are a multi-faceted organization, which consists of various chief, subsidiary, ancillary and support units. Woman police unit is one of the units that assists the main units and police headquarter and field formations in a number of ways in the discharge of their various functions.

Model police manual published by Bureau of Police Research and Development, Ministry of Home Affairs, India (Anon., 2009) specifies the code of conduct of police department regarding the allocation of duties of its personnel. It is clearly indicated that all the postings and ranks in the police department are common both to women and men police officers. They can be posted to any position and are liable to serve wherever posted. Where exclusive women police stations are established for specific purpose on problems of women most often the chief person is also a woman police officer. They are eligible to be posted to Sub-divisions, crime investigation detectives, intelligence, law and order, traffic, detective or railway police stations. There shall be no separate list of seniority and promotion panels of all ranks for men or women of all cadres. However, the physical measurements and physical efficiency tests are separately prescribed for women, but the recruitment procedures, qualifications, age are the same for all.

It is opined that certain duties can be better performed by women police officers than men. In situations where special protection are to be given to women and children and the gender that denies these groups their rights women police are deployed for such police duties. It is indicated that the women victims of crime communicate more confidently and substantially better if women police officers handle their problems than male police officers. It is in this context that definition of functions and duties of women police officers are indicated (Anon., 2009).

The functions to be exclusively entrusted, ordinarily to women police officers are to arrest, search, guard and escort of women accused and convicts and work relating to women passengers, including security checks at airports, railway stations and bus stations; conduct of enquiries in connection with passport applications of women who observe "*purdah*" and family investigations and keeping order in women meetings, processions and women enclosures in public meetings; looking after the arrangements to help women and children in fairs, festivals, places of pilgrimage etc. and guidance and help to women passengers at

railway/bus stations along with evacuation of and assistance to women and children during natural calamities and in troubled areas; interrogation of female juveniles, women offenders, under trials, witnesses and victims of sexual offences, cruelty and dowry harassment along with Interrogation of male offenders, suspects and witnesses in cases of cruelty, assaults, outraging modesty and other offences committed against women and security duties to protected persons *viz*., women. Women police stations and women protection cell are special arrangements that are made for effective investigation of crimes against women and protection of women. Women police stations are established to focus on this aspect and to inspire confidence.

Numerous research studies have been conducted in India relating to different aspects of women in the police for instance, growth and development of women in the police; their career aspirations, motivations and gender discrimination; their job expectations and adjustments; their role in police and administration; and how they deal with domestic violence and disputes; employment status and the challenges faced by them in the police (Mahajan, 1982; Natarajan, 2006; Sahgal, 2007; Surender, 2010; George, 2011 and Pattanaik and Worley, 2011 and Randhwa and Narang, 2013).

It would seem self evident that an occupation such as policing would demand that police officers stay fit as a part of job requirements. Police personnel need to stay in shape by engaging in regular exercises and maintaining a balanced nutrition and diet by having the right amounts of dietary nutrients. Optimum knowledge regarding planning and preparation of healthy food to stay fit and healthy is important for the police women.

In India, as a police recruit, emphasis laid on both physical and mental fitness. The initial recruitment processes make it compulsory for the candidates to attain certain level of physical fitness and endurance besides requirements of mental abilities. Paradoxically the assessment of well being of its staff through their career is not carried out. There is no mandatory scheduled health and nutrition status assessment further in the career for the police staff.

In literature there is hardly any study which focuses on nutritional status of police personnel, dietary, nutrient intake and nutritional knowledge of women police personnel in North Karnataka. The present investigation is an attempt to bridge the critical gap in research about the status of women police with the following objectives

a. To evaluate nutritional status of urban and rural women police of Hubballi- Dharwad

b. To assess the nutritional knowledge of urban and rural women police

c. To examine food and nutrition behaviour of urban and rural women police.

2. REVIEW OF LITERATURE

Policing is a hard work requiring physical fitness, endurance and mental alertness. For women police it is further more important because they shoulder the double burdens of profession along with family. Policing is a demanding and strenuous job for women because of nature of duties in police job. Besides physical training and lifestyle, dietary habits also influence physical fitness and nutritional status of women police. To maintain physical fitness good knowledge of nutrition is necessary. It is associated with dietary nutrient intake, nutritional status and physical fitness. Nutrition knowledge transforms into dietary behaviour and nutrient intake which may vary among populations. Literature pertaining to nutritional status, nutrition knowledge and relation between food and nutrition behaviour of women police and related populations are detailed in the following subtitles.

2.1 Nutritional status of police personnel

Good nutritional status is the most important factor which influences endurance and agility that is necessary in police job. In many countries the police personnel deviating from the optimum nutritional status are sent on compulsory leave to attain the recommended physique and physical fitness. Studies on nutrition status of police personnel are limited.

Gu *et al.* (2012) evaluated adiposity among police officers in a US Northeast city. The study sample included 408 police officers (300-men, 108-women) with an average age of 42.18 years. It was found that adiposity measures were significantly higher in men than women. Mean waist circumference was 99.30 cm for men and 80.30 cm for women. Abdominal height measured using Sagittometer recorded 21.70 cm for men and 18.10 cm for women. It was reported that prevalence of overall obesity (BMI $\geq$ 30 kg/m^2) was 40.00 per cent, 48.30 per cent in male officers and 16.70 per cent in female officers. Body fat was 24.00 per cent for men 30.90 per cent for women. Authors further indicated that age was positively correlated with waist circumference, abdominal height and BMI. Results for years of service and energy intake were similar to those for age, waist circumference, abdominal height and BMI were strongly correlated with each other and each of these parameter was less strongly correlated with per cent body fat.

A cross sectional study was conducted to assess the health problems of 617 police personnel (32 were females and 585 were males) by Jahnavi *et al.* (2012) at the city police parade ground dispensary in Vijayawada. The age ranged from 40-50 years with a mean age of 48.80 years. It was reported that 58.00 per cent were normal, 35.00 per cent were overweight and 7.00 per cent were obese. Further, it was recorded that 25.00 per cent of police personnel were anaemic.

Kayapinar and Savas (2012) assessed the nutritional status of 12 female and 84 male police officers in Turkey. The results of the BMI assessment of selected police officers revealed that 52.10 per cent of the subjects were overweight, 32.20 per cent were normal, 12.50 per cent were I grade obese, 2.10 per cent were thin and 1.00 per cent was in II degree obese.

Nutritional status of 53 military police officers was evaluated by Santana and co-workers (2012) in a Southeast city of Brazil. The study population consisted of 49 males and four females with mean age of 34.39 years (73.60%). Anthropometric measurements data combined for both the genders indicated that the sample typically was overweight (64.10%) with 45.30 per cent pre obese, 11.30 per cent class I obese and 7.50 per cent class II obese. Although waist circumference did not indicate any risk in 67.90 per cent of police officers, increased risk was 20.80 and substantially increased risk in 11.30 per cent police officers was recorded. Excess fat was recorded in 52.00 per cent police officers and total cholesterol was high in 33.30 per cent police officers. There was a significant positive association between BMI and waist circumference and BMI and body fat percentage.

Violanti *et al.* (2014) reported relation between health and personal risks of 837 (75 male, 162 female) police officers of Buffalo, New York police department. It was reported that 30.60 per cent of police officers recorded elevated waist circumference (more than or equal to 102 cm in men, more than or equal to 88 cm in women). Elevated triglycerides (more than or equal to 150 mg/dl) were recorded among 15.30 per cent police officers besides reduced HDL cholesterol (less than 40 mg/dl in men, less than 50 mg/dl in women) among 38.80 per cent police officers. Glucose intolerance was recorded in 21.40 per cent of police officers.

Assessment of nutritional status of women soldiers serving in the Polish army revealed that out of 161 young women, (mean age 22.05 years) indicated that underweight was recorded in 3.40 per cent subjects (BMI 17.00 to 18.40 kg/m^2), while overweight was found among 12.80 per cent of examined subjects (BMI 24.25 to 29.90 kg/ m^2), whereas 1.70 per cent were obese (BMI 30 to 39.90 kg/ m^2). Normal BMI was reported among 82.10 per cent of the respondents (Bertrandt and Klos, 2011). Disturbances in bone mineralization of different intensity were recorded in 72.70 per cent of subjects, disturbances typical to osteopenia were revealed among 46.00 per cent and osteoporosis in 26.70 per cent of subjects.

A study conducted in US among 173 male and 44 female officers by Guffey *et al*. (2015) revealed that the mean height of male police officers was 5'10.1 inches and the mean weight was 202.60 pounds. The mean height of the female police officers was 5' 5.3 inches and the mean weight was 139.5 pounds against the Centre for Disease Control's National Centre for Health Statistics mean height and weight for men and women, respectively were 5' 9.5 inches and 191 pounds ; 5' 4 inches and 164.3 pounds. Thus the men officers exceeded

national averages in both weight and height, while women police officers were below the national female weight average.

Thus, the studies indicated that the most of the police personnel were centrally obese or overweight, with higher ranges of body fat compared to women police.

2.1.1 Nutritional status of working women

Poor health has repercussions not only for women but also their families. Women are vulnerable to malnutrition for social and biological reasons, throughout their life-cycle as children, teenagers, mothers and senior citizens. Imbalanced nutritional status of adult working women has detrimental effects on both family and job. While malnutrition is prevalent among all segments of the population, poor nutrition among women begins in infancy and continues throughout their lifetime.

Sharan and Puttaraj (2003) conducted a study on 553 executive and non executive employees of Bharat Electronics Ltd. located in urban Bangalore district. It was reported that mean body weight and body mass index (BMI) of canteen food consumers ranged from 56.30 ± 5.30 kg to 57.80 ± 11.90 kg and 22.290 to 27.30, respectively for majority of canteen food consumers and home food consumers, respectively. Further, it was indicated that among the executives 43.00 per cent women eating canteen foods were normal when compared to 18.00 per cent of women consuming home foods. Similar trend was reported among non-executives. However, obese grade I women were relatively more in canteen food consumers both in executive (17%) non-executive groups (35%) compared to the same groups as home food consumers 4.00 and 11.00 per cent, respectively. Body fat was higher in canteen food consumers than home food consumers both in executive and non executive groups.

Joseph *et al*. (2005) assessed the nutritional status of 111 garment factory workers of Bengaluru. It was reported that 21.60 per cent of workers were classified under nutrition, 59.40 per cent were normal, 9.90 per cent were overweight and 9.01 per cent were obese.

Nutritional anthropometry of 414 workers of Indal of Hirakud was evaluated by Mishra and Mohanty (2009). It was reported that majority of subjects (64.01%) were normal (BMI 20 to 25 kg/m^2), followed by 16.42 per cent in obese grade I (BMI 25 to 30 kg/m^2) subjects. However, 11.36 per cent were low weight normal (BMI 18.5 to 20 kg/m^2), and 5.56 per cent were under grade I under nutrition (BMI 17.00 to 18.50 kg/m^2). The group also consisted of 1.69 per cent obese grade II subjects (BMI more than 30 kg/m^2), 0.72 per cent grade II under nutrition (BMI 16 to 17 kg/m^2) and 0.24 per cent grade III under nourished subjects (BMI less than16 kg/m^2).

Nutritional status of 20 women workers in cashew industry of Kollam district of Kerala was evaluated by Divakar and Prema (2009) by dietary survey and 24 hour recall method and

computation of nutrition status index using the parameter including haemoglobin status. It was revealed that a majority of (80%) women could be categorized under medium category with nutrition status index scores ranging from 25.97-32.30 and 15.00 per cent exhibited high nutrition index with scores more than 32.31. Analysis of haemoglobin level revealed that all the women were anaemic exhibiting the haemoglobin level below the range of 13.00-15.00 g per cent.

Assessment of nutritional status of day and shift workers (total of 70) of software industry in Orissa revealed that weight, BMI, waist circumference, hip circumference and waist to hip ratio of shift workers were significantly higher than day workers (Devadarshini and co-workers, 2010). The proportion workers in the ideal BMI was more among day workers (41.70%), while, obese grade I workers were more (55.90%) among shift workers. Shift workers recorded significantly higher fasting blood sugar (97.10 mg/dl) compared to day workers (91.84 mg/dl). Similar trend was also reported for ratio of cholesterol and HDL cholesterol.

Nutritional status indices of 50 female workers in information technology (IT) and non IT respondents in Thiruvananthapuram district, Tamil Nadu were assessed, using parameters such as height, weight, WHR, energy and protein intake by Renjini and Divakar (2010). It was reported that 20.00 per cent of IT respondents exhibited high nutritional status index and 16.00 per cent recorded low nutritional status index. However 12.00 per cent of non IT respondents recorded high nutritional status index and 16.00 per cent low, although the differences were non-significant. It was observed that a majority of the IT and non IT respondents were normal (78.00 and 72.00%, respectively) with BMI of less than 25. Further, women in equal proportions (24%) in the two groups were normal, however one woman (4.00%) was reported to be suffering from grade II obesity.

Nutritional status of 100 women working in tea gardens of Darjeeling, age ranging from 18-35 years was reported by Manna and co-workers (2012). It was observed that among the tribal women, a majority of about 39.00 per cent were under CED grade I with BMI of 17 to 18.50, followed by 20.00 per cent under low weight normal with BMI of 18.50 to 20.00. The women also could be categorized under chronic energy deficiency grade I and grade II (16.00% and 5.00%, respectively with BMI of 16.00 to 17.00 and 16.00, respectively). Among the group, only 13.00 per cent could be categorized as normal. With regard to health status of the women, it was reported that 52.00 per cent were moderately anaemic with haemoglobin level ranging from 8.00 to 9.90 g/dl. Only 10.00 per cent were recorded to be normal (haemoglobin level more than 12 g/dl). It is important to note that 7.00 per cent of women were severely anaemic (haemoglobin level less than 8.00 g/dl).

Nutritional assessment of 56 women sweepers, in the age group of 25 to 60 years, belonging to Midnapore Municipality of West Bengal were reported by Pradhan *et al.* (2012). It was revealed that 41.07 per cent women were under nourished (BMI less than18.5 kg/m^2),

followed by 37.50 per cent normal women (BMI 18.5 to 25 kg/m^2) and 21.42 per cent were over nourished (BMI more than 25 kg/m^2).

Barma and Sil (2013) conducted a comparative study of health and nutritional status among housewives and working women of North Bengal. A total 225 housewives and 225 working women from different regions of Cooch Behar, Jalpaiguri and Darjeeling districts of North Bengal were examined. It was reported that the mean weight, body mass index and body fat were significantly higher in housewives than working women (59.17 kg, 42.33 kg; 25.94 kg/m^2, 19.41 kg/m^2; 30.33%, 21.74%, respectively for weight, BMI and body fat for housewives and working women, respectively).

A nutritional census was conducted by Santos *et al.* (2013) among 174 (100 females, 74 males) individuals to ascertain excess weight in employees of food and nutrition units at a University in Sao Paulo State. The sample consisted of employees with an age range of 21-65 years. The mean age of the women was 45.7 years, whereas for men it was 37.90 years. The nutritional anthropometry indicated that 60.90 per cent of individuals were predominantly in excess of their body weights and most of them were non white women aged over 50 years and had less than nine years of education. The variables such as gender, smoking habits, physical activity, income and marital status were not significant at 20.00 per cent however; age variable was associated with overweight/obesity. Individuals, aged 50 years had a greater chance of being overweight compared with the younger individuals.

Health and nutritional status of 300 workers of knitting industry located at Kanpur India was reported by Tiwari and Babel (2013). Results indicated that 22.00 per cent of the respondents were suffering from chronic energy deficiency grade IV (BMI less than16 kg/m^2), followed by 17.00 per cent of respondents being normal (BMI 16 to 17 kg/m^2), 14.00 per cent were low weight normal respondents (BMI 18.50 to 20 kg/ m^2), 12.00 pr cent were chronic energy deficiency grade I mild malnutrition (BMI 17.00 to 18.50 kg/ m^2), 11.00 per cent obese grade I (BMI 25 to 30 kg/ m^2) and 10.00 per cent were obese grade II subjects (BMI more than 30 kg/m^2). The authors reported that one fourth of the workers were at risk. This was attributed to lack of education and general backwardness of respondents in sanitation and nutrition.

Nutritional status of 120 lady teachers from school and colleges of Akola city of Maharashtra was assessed by Yelen (2014). The mean age of selected subjects was 39 years and they belonged to the families earning ` 37,103 per month and were highly qualified educationally. It was indicated that the mean BMI of the selected respondents was 22.13. An inverse significant relationship between BMI and nutritional knowledge was recorded for the respondents.

Nutritional status of 120 healthy female clinical nurses with the mean age of 37 years (ranged from 23 to 52 years old) employed in educational University hospitals in Ahvaz city,

Iran was assessed by Naghashpour and co-workers (2013). Nutritional status in terms of BMI revealed that 32.4 per cent of nurses working in shift was much less than those of day time working nurses (48.90%). However, obese nurses were more (5.55%) among shift workers compared to day time workers (2.10%). Further, body fat was 29.80 per cent in shift workers compared to 32.27 per cent in day time workers.

A cross sectional study was conducted among 828 randomly selected employees, age ranging between 18-64 years in Ireland by Geaney and co-workers (2015). Nutritional status in terms of BMI revealed that 23.20 per cent and 44.00 per cent of men and women respectively were normal or under weight. Further, it was also indicated that 54.10 per cent and 36.30 per cent of men and women, respectively were overweight. The group also comprised of obese individuals with 22.70 per cent and 19.70 per cent for male and female subjects, respectively. With regard to central obesity, more number of men (54.60%) was normal whereas more number of women (59.10%) was centrally obese.

Thus, variation in nutritional status of working women was recorded by different researchers. More women were malnourished than men either due to ignorance or lack of sanitary knowledge, or poor education.

2.2 Nutritional knowledge of police officers and working women

Sound nutrition is an essential component of good health. Good nutrition knowledge helps in acquisition of good health. A number of health professionals, including nurses, provide nutritional information to the community. Nutritional care is an important part of medical care of patients and plays a key role in improvement, prevention and control of malnutrition in hospitals. Empowerment with adequate knowledge of nutrition is important for women, more so for working women.

Nutritional knowledge level of police officers using 17 questions was assessed in Turkey by Kayapinar and Savas (2012). The sample consisted of 12 female and 84 male subjects with age ranging from 31-51 years. It was indicated that nearly 75.00 per cent of the police officers answered the nutritional knowledge questionnaire correctly.

A total of randomly selected 68 family nurse practionners in New England were assessed for general nutritional knowledge by Warber *et al.* (2000). The test questionnaire consisted of 55 multiple choice questions to assess basic applied nutritional knowledge. The major nutritional knowledge concept areas were role of nutrition in prevention of CVD, food labelling information and nutritious food selections. Scoring was done on 100 point scale. It was reported that the overall mean test score was 66.00 per cent correct answers from the nurses. Further, 30.00 per cent of respondents scored between 70-80 per cent correct answers. It was also recorded that 68.00 per cent of the respondents had less than 70.00 per

cent correct scores. Only one person (1.47%) scored 80 per cent correctly, reflecting the score at the traditionally expected level of graduation school performance for pass/fail.

Nutritional knowledge of coaches and athletic trainers (N=53) at a U.S University, using a nutritional knowledge questionnaire consisting of nine multiple choice questions, 11 true or false questions was evaluated. Questions in the first section included the categories of macronutrients, vitamins and mineral nutrition supplements, weight control etc. Second section included 10 multiple choice questions and eight open ended questions. It was revealed that overall correct responses were offered by 62.00 per cent of coaches and 66.00 per cent of trainers on the topics such as macronutrients, micronutrients, weight control and nutrition supplements. As a group, participants responded correctly to 67.00 per cent nutritional knowledge questions. There was a tendency to give more correct responses among the participants who coached or trained female athletes compared to those who worked with male athletes (Rockwell *et al.,* 2001).

Schaller and James (2005) assessed nutrition knowledge of nurses in Regional Victoria, Australia. A descriptive cross-sectional study design was used with 103 nurses among whom 81 per cent were currently practicing in an acute regional hospital. The nurses answered 48 multiple choice general knowledge questions using a valid and reliable questionnaire and provided educational and demographic details. Each multiple choice question was scored as correct or incorrect and given one point (maximum possible was 48 points). It was reported that the mean knowledge score for all nurses was 60.20 per cent. Older nurses, those with more years of experience and nurses with general training (rather than a degree) scored higher average knowledge scores. It was indicated that the most frequently used nutrition information sources were dieticians, other nurses, professional journals, books and literature from the National Heart Foundation.

Ozcelik *et al.* (2007) determined the nutritional knowledge of 137 male and 73 female physicians (210) working in various hospitals in Ankar Turkey. A multiple choice questionnaire consisting of 20 questions on nutrition was used. It was reported that a majority of physicians recorded mediocre scores (59.90 and 60.30% for male and female physicians, respectively), followed by poor performers (32.80 and 35.60% for male and female physicians, respectively). Further, only few physicians (7.30 and 4.10% for male and female physicians, respectively) recorded of good nutritional knowledge. Further analysis indicated a trend that with increase in age of physicians nutritional knowledge also increased in the all three categories of nutritional knowledge classification. The authors opined that nutritional knowledge level of physicians was inadequate.

Nutritional knowledge of 128 male and 23 female physicians was assessed by Uddin and co-workers (2008) in Bangladesh. The questionnaire consisted of 26 multiple choice questions. The results indicated the mean score for correctly answered questions was 5.20 per cent. About two third of physicians scored between 45-60 per cent and more than 50 per

cent rated their nutritional knowledge as poor. Only 10 per cent of physicians exhibited good knowledge of nutrition and 35.00 per cent possessed mediocre knowledge of nutrition.

Nutritional knowledge of sports people (men-293, women-217) belonging to women colleges of Hyderabad was evaluated by Jose and Chandrasekhar (2010). It was reported that mean scores for nutritional knowledge were 54.52 per cent for men and 51.29 per cent for women. Classification of sports men and women based on scores for knowledge revealed that 37.65 per cent sports subjects scored low, 47.45 per cent obtained medium score and only 14.95 subjects scored high. Thus the knowledge scores were unsatisfactory.

Chen and associates (2012) assessed the nutritional knowledge among 210 teachers in community based rehabilitation centres for persons with disabilities located in Northern region of Peninsular Malaysia, Perlis, Palan Pinang, Perak and Kelantan through a questionnaire. The questionnaire consisted 29 multiple choice questions for five components such as nutrients and source; nutrients and functions; food pyramid; healthy eating and food preparations. The results revealed that the average knowledge scores of teachers was 13.80 ± 3.73 that was below 50^{th} percentile. It was also reported that 48.60 per cent of teachers expressed that they did not have knowledge to teach nutrition to the persons with disabilities.

A cross sectional study conducted by Singh and co-workers (2012) on food safety knowledge among 255 females working in North Indian University. It was reported that on overall basis, the staff members exhibited highest knowledge regarding causes of food poisoning and food safety.

A cross sectional descriptive study of 121 female school teachers with diabetes working in Jeddah in South Arabia was conducted to know dietary knowledge (Al-Amoudi and Alrasheedi., 2013). It was reported that the diabetic women teachers were aware that vegetables, grains, legumes and proteins could help to decrease hyperglycemia (85.50, 70.10, 27.10 and 10.30%, respectively). A high percentage of participants (85%) thought that sugary foods helped to reduce blood sugar levels. The dietary knowledge of 15.00 per cent of the subjects was poor and 84.10 per cent fair, whereas 0.90 per cent were good.

Abdollahi and associates (2013) evaluated nutritional knowledge of 89 physicians, 81 nurses and 28 nutritionists (a total of 198 subjects) in nine educational hospitals in Tehran through cross-sectional study. Data was gathered through a self-administered multiple choice questionnaire about different aspects of basic and clinical nutrition. The nutrition knowledge level of each individual was determined by calculating correct knowledge, perceived knowledge and accuracy of knowledge scores. The median knowledge score of the nutritionists, physicians, and nurses was 85.00, 77.00 and 75.00 per cent, respectively. The median perceived knowledge of all the groups was above 90 per cent. The mean accuracy score in the three groups comprised of nutritionists, physicians and nurses was 87.00 per cent, 79.00 per cent, and 76.00 per cent, respectively. The results indicated that all the

groups recorded poor knowledge, especially in clinical nutrition topics. It was suggested that enhancing awareness level of all the groups especially physicians and nutritionists in clinical division played an important role in enhancing clinical nutrition care and treatment regime.

Shwaiyat *et al*. (2013) determined the nutritional knowledge of 200 nurses in Jordan, using a self structured questionnaire that included therapeutic nutritional knowledge questions. Findings of the study indicated that, scores of nurses' therapeutic nutritional knowledge related to diabetes was 71.60 per cent, obesity 59.00 per cent and of cardiovascular disease was 56.60 per cent.

Nutritional knowledge level of 302 nurses working in hospitals of Zonguldak, Turkey was assessed by Yalcin and co-workers (2013). The average age was 27.90 years and 34.00 per cent of nurses were graduates. It was revealed that the mean nutritional knowledge of all the participants was 9.44 per cent over 100 points. A majority of the nurses (59.30%) expressed that they had their knowledge from their experience and others (34.40%) had no knowledge in the field. Only one nurse had passed nutrition certified course, 6.00 per cent explained that gain the nutritional knowledge by reading the academic publications.

Nutritional knowledge of 120 lady teachers from school and colleges of Akola city of Maharashtra was assessed by Yelen (2014). The mean age of subjects was 39 years and belonged to the families earning ` 37,103 per month and were educationally highly qualified. It was indicated that the teachers exhibited good nutritional knowledge index score of 95.22 per.

A cross sectional study was conducted among 828 randomly selected employees age ranging between 18-64 years in Ireland by Geaney and co-workers (2015). The nutritional knowledge questionnaire included four domains, to give a maximum potential score of 116. The overall nutritional score was divided into quintiles. Participants in quintile five scored highest for nutritional knowledge. The mean nutritional knowledge score of all employees scored better in one of the domains 'advice from the health experts'. The nutritional knowledge scores were lower for other domains such as food groups and food sources.

2.3 Food behaviour of working women

Food behaviour indirectly indicates the nutritional status and health of populations. Food behaviour of working women is influenced by various socioeconomic factors. Education, gender, marital status, occupation, income status, family size, religion, family status and many other variables in general influence food behaviour. Several studies are conducted to know the food behaviour of working women.

Sharan and Puttaraj (2003) conducted a study on 553 executives and non executive employees of Bharat Electronics Ltd. located in urban Bengaluru district. The mean food intake indicate that cereals and millets including refined food products formed sizeable portion

in the dietaries of women availing food from the canteen and these were found to be significantly higher compared to home food consumers. The mean intake of all food items except pulses and green leafy vegetables in both the groups was found to higher when compared to desirable dietary pattern. Further, it was found to be higher among those availing canteen foods. Breakfast among those consuming canteen foods comprised of bakery foods. Meal frequency of home food consumers was less at three to four per day.

Food consumption pattern of 20 women workers of cashew industry of Kollam district of Kerala were evaluated by Divakar and Prema (2009). Food intake pattern of women revealed that cereals (87.71%), followed by sugar and jaggery (59.10%) were the main food constituents as compared to suggested balanced diet. The protective foods such as fruits, vegetables were consumed in very less proportions. Only 12.50 per cent consumed breakfast, while 99.00 per cent consumed lunch regularly, predominated with fish and rice. However, 41.00 per cent consumed same combination even in dinner. Cereals, pulses and vegetable combinations could be afforded by only 2.00 per cent of subjects. Whereas, cereals, vegetables and fish combinations were afforded by 16.00 per cent for lunch and 53.00 per cent for dinner.

Pattern of food intake was assessed in shift and day workers (70) in Orissa by Devadarshini *et al.* (2010). It was revealed that adequacy of leafy vegetables was more than 300 per cent, fish and fish foods 500-600 per cent, fats and oils by about 280 per cent in both groups, sugar and jaggery 128 per cent in both groups, indicating much higher consumption of some of the foods. However, adequacy of cereals, and pulses ranged around 80 per cent in both the groups.

Food pattern of 50 employees in information technology field (IT) and non IT female respondents in Thiruvananthapuram district was assessed by Renjini and Divakar (2010). It was observed that 9.00 per cent of IT and 14.00 per cent non IT respondents recorded the habit of skipping meals. Most of the IT respondents (33%) and non IT respondents (26%) consumed most of the foods during night.

Food intake pattern in 541 urban working women in Klang Valley region in Malaysia was reported by Ortega and co-workers (2013). Most of the participants were single (61.40%) and Muslims (67.80%) and were between the ages of 17 and 36 years (87.20%), worked in private sectors (91.90%). It was reported that 88.17 per cent of the respondents said ‘I eat such a quantity of food, I end up feeling very stuffed’, followed by 64.14 per cent said ‘Food will help me when facing a problem’, 63.69 per cent said ‘eager to snack when feel pressurized’. Such trend of unhealthy eating pattern of women was reported in more than 50 per cent subjects. The factors included eating makes them felt better when lonely, ate favourable snacks when happy, feel like happy when bored etc.

Researchers from the school of Criminology and Criminal Justice at the University of the Fraser Valley examined minute by minute activities of 171 general duty Constables of the Survey Detachment of the Royal Canadian Mounted Police during 441 full shift ride to know their food and nutrition behaviour (McCormick and co-workers, 2014). It was reported that collectively, the constables consumed a wide range of beverages during work but officers drank on an average less than one glass of water per shift. Older officers were much more likely than younger officers to drink coffee, and much less likely to drink water. With regard to eating pattern, most common foods consumed were unhealthy snacks (20%), followed by fruits (21%) and sandwiches (21%). On overall basis the officers who ate a mix of healthy and unhealthy food were 43.00 per cent those who ate only healthy foods were 32 per cent and those who ate unhealthy food were 22.00 per cent. It was also indicated that the oldest group of police officers were mostly likely to eat exclusively healthy foods (50.00%) compared to exclusively unhealthy foods (7.00%).

Yadav and Singh (2014) assessed the food intake of 60 female teachers in Hissar district of Haryana state. Results indicated that, only 13.30 per cent teachers drank green tea habitually, 60.00 per cent consumed balanced diets, included high fibre foods and limited the saturated fat in their daily diet, whereas, 56.60 per cent controlled refined sugar and salt in their diet, 66.60 per cent teachers drank required amount of fluid in a day.

Food pattern of 822 working population, age ranging from 18 to 64 years was assessed by Geaney *et al*. (2015). It was revealed that those persons with highest nutrition knowledge consumed the recommended servings for vegetables but did not meet the recommendations for whole grains, fruits, legumes and low fat dairy foods. Nevertheless, employees in this group also consumed lowest proportion of red processed meat, sweets and snacks, beverages and salty snacks. It was further reported that 39.20 per cent and 49.40 per cent of the men and women, respectively consumed food supplements. Diet quality was investigated using the DASH score, which was constructed based on standard food groups (whole grains, fruits, vegetables, legumes, low fat dairy food, reprocessed meat, sweetened snacks and beverages, salty snacks and sodium consumption). It was reported that 52.90 per cent recorded highest diet quality, 3.10 per cent lowest diet quality and 44.00 per cent consumed a diet of medium quality. Thus the literature indicated that a wide variation in food behaviour of working women was recorded. Several factors such as nature of job age influenced the food behaviour.

2.4 Nutrient intake of police officers

Adequate nutrition is important for police women, because nutrition and health are related. Body needs the right fuel (food) and regular maintenance (exercise, lifestyle and mental attitude) to achieve its true health potential. Hence healthy eating is more important to provide all essential nutrients to the body for healthy functioning.

A 12-month nutrition program was developed and implemented as a project of the Wellness Department of the Austin Police Department for 24 employees. A comparison of 7 day dietary intakes recorded before and after the program indicated a decrease in energy intake from a mean of 2,273 ± 694 kcal/day to 1,379 ± 364 kcal/day. Percentage of energy from protein increased from 16.00 per cent to 21.00 per cent, and energy from fat decreased from 42.00 per cent to 36.00 per cent. Energy from carbohydrate and alcohol were not influenced by the wellness program. Daily intakes of cholesterol decreased from 405 ± 188 mg/day to 295 ± 132 mg/day. Phosphorus and iron intakes decreased significantly, while intakes of calcium remained constant. Mean consumption of thiamine, riboflavin, and niacin decreased significantly. Results indicated that a nutrition education program could affect positive changes toward better food choices. The authors suggested that dieticians working with similar populations should stress on eating patterns that include foods dense in micronutrients (Briley *et al.,* 1992).

Nutrient intake of 117 Polish women soldiers demonstrated that average energy intake was 3,556 kcal per day. Protein, fats and carbohydrates contributed 14.60 per cent, 28.10 per cent and 57.30 per cent, respectively for total energy. The average food ration weighed 3.10 to 3.30 kg and usually women often skipped some meals (Bertrandt and Klos, 2011).

Nutrient intake of 408 police officers (300 men and 108 women) was evaluated by Gu *et al.* (2012) in US Northeast city. Energy intake was reported to be 1896 kcal for men and 1583 kcal for women police officers.

Guffey and co-workers (2015) studied the diet of 173 male officers and 44 female officers (227) among U.S. police officers. The study group comprised of highly educated people with mean years of education almost 50 years. It was reported that only 26.30 per cent of the subjects maintained a strict diet of 2,500 kcal per day for males, 2,200 kcal per day for females. However, some police officers did not maintain strict diets. Fast foods were consumed too often, with saturated fats and calories without enough nutrients. Thus the literature indicated excess or inadequacies of nutrient intakes among police officers.

2.4.1 Nutrient intake of working population

Working women are subjected to additional physical and mental pressures both in job and households. Adequate nourishment is very important to maintain optimum health several studies on nutrient intake of working women are conducted.

Sharan and Puttaraj (2003) conducted study on 553 (22.171%) executive and non executive employees of Bharat Electronics Ltd. located in urban Bengaluru district. It was revealed that mean nutrient intake in terms of energy was found to be 2,210 kcal among home food eaters executive group where as it was 2,490 kcal among canteen food

consumers. Among the non executive group of women the energy intake of 2657 kcal was recorded in home food consumers as against 2,988 kcal in canteen food consumers.

Joseph *et al.* (2005) studied nutrient intake among 111 women working in garment industry. It was reported that 79.31 and 44.26 per cent of workers consumed less calories and protein respectively than the recommended allowances. But it was evident that 86.48 per cent of women consumed excess fat. Further, it was indicated that none of the women consumed adequate amount of iron and 31.53 exhibited clinical signs of anaemia.

Divakar and Prema (2009) evaluated the nutrient intake of 20 women workers in cashew industry of Kollam district of Kerala. Mean intake of calories was 1,238 kcal/day indicating inadequacy of 39.4 per cent compared to recommended dietary allowances. Mean protein intake was 23.26 which was also inadequate by 5.21 per cent. The diet supplied thiamine (0.67 mg) and riboflavin (6.48 mg) meeting the RDA specifications. However, niacin was inadequate by 0.36 per cent.

Nutrient intake was assessed in shift and day workers (70) in Orissa by Devadarshini *et al.* (2010). It was reported that mean energy intake of day workers was 2190 kcal. In contrast saturated fat intake was significantly higher (24.66 g) compared to day workers (19.07 g). Adequacy of energy, iron, β carotene and vitamin A were less than the recommended dietary allowances for both the groups. The adequacy of fat was more than 300 per cent for both the groups which the authors attributed to consumption of fats and junk foods.

Nutrient intake of 50 IT and non IT female respondents in Thiruvananthapuram district were assessed by Renjini and Divakar (2010). The results of the study revealed that the intake of all major nutrients were much above RDA and authors suggested to educate the software professionals about not skipping meals avoiding junk foods and processed foods.

Energy intake among 56 women sweepers of Midnapore, West Bengal, aged 25-60 years revealed that sweepers in the age groups of 41 to 50 years and 51 to 60 years were suffering from energy deficiency (Pradhan *et al.,* 2012). The authors attributed this to lack of awareness by the older sweepers. Further, it was also recorded that protein, calcium and iron intake were deficient in 55.35, 64.28 and 60.07 per cent of sweepers, respectively. Only 33.92, 28.51 and 21.42 per cent recorded normal protein, calcium and iron was intakes, respectively. The intakes of vitamin A, B complex, vitamin C, D and E were normal intakes among 71.42, 25.00, 62.5, 31.50 and 57.14, per cent, of women sweepers respectively.

Dietary nutrient intake of 120 healthy female clinical nurses with the mean age of 37 years (23 to 52 years old) employed in educational University hospitals in Ahvaz city, Iran was assessed by Naghashpour and co-workers (2013). It was reported that dietary intake of thiamine (1.2 mg/day), riboflavin (1.60 mg/day), niacin (16 mg/day), folate (284.70 μg/day)

and magnesium (251.70 mg/day) were recorded in shift workers computed to day time nurses (1.60 mg/day, 2.10 mg/day, 21.10 mg/day, 3860 µg/day and 317.40 mg/day, respectively. No significant differences were recorded for other micronutrients and energy intake between the two groups. Deficiency of vitamin D was severe among both the groups in about 40 per cent of the nurses. The per cent of risk measurements was high in shift workers 20.90 per cent compared to day workers 17.30 per cent.

Thus, the review of literature indicate variation in nutritional status, food behaviour, nutrient intake and nutrition knowledge of working population, including police women. Reports of both under nutrition and over nutrition, unhealthy and healthy food behaviour, inadequate nutrition knowledge and some nutrient intake were recorded by several investigations in the field.

3. MATERIAL AND METHODS

In pursuit of better livelihood women have entered all types of occupations in the modern world, including those demanding vigorous physical work and large duration of staying away from homes. Double burden of job and household management demand immense energy and time of women at the cost of her health and nutrition. In India too women are recruited in protection forces in different cadres in armed forces, police departments and other allied sections. Induction of women in police department is of recent origin and calls for frequent assessment of performance and addressing their needs. An investigation was planned to evaluate the nutritional, food and nutrition behaviour, diet quality and nutrition knowledge of women working in police department of Hubballi-dharwad. The details of the materials and methods adopted in the present study are described under the fallowing headings.

3.1 Location and selection of subjects

The present study was conducted in all the 22 rural and urban police stations of Hubballi-Dharwad, including a women police station in Hubballi. Women working in police departments were purposively selected from rural and urban police stations of Hubballi-Dharwad. Women staff of police departments working in technical cadres *viz*., Police Sub Inspectors, Assistant Sub-Inspectors, Head Constables and Constables were included in the study.

3.2 Background information of subjects

The study was initiated after taking consent from Commissioner of police Hubballi-Dharwad was obtained for Hubballi division and from Superintendent of Police, for Dharwad division.

Information about subjects was elicited through a personal interview method using a self structured questionnaire. The information was gathered by prior consent and in more than two sessions during the leisure hours of the police women.

The subjects were informed about the goals of the study clearly and those willing to participate were included in the investigation. Care was taken to ensure establishment of rapport with subjects for successful collection of authentic information for the investigation. All the respondents were interviewed twice or thrice on different days to collect the information.

In the first sessions, rapport was established and general information about the respondents was collected. In the subsequent session information regarding the dietary pattern and diet quality were collected.

3.3 Nutritional Status of police women

Nutritional status of an individual influences his/her performance in professional field. Evaluation of nutritional status is an important step in the field of community nutrition suggested by Jelliffe (1966). Height was measured using an anthropometer nearest to 0.1cm. A portable platform balance was used to measure weight in kilogram nearest to 0.5 kg. Subjects stood without support, with casual clothing and without shoes while taking weight. Waist and hip circumference was measured using non stretchable measuring tape in centimetres (Plate 1 and 2).

The anthropometric data was further used for computing body mass index (BMI) BMI is a good index to assess the current status of nutrition (over nutrition or under nutrition) and abdominal obesity. The ratio of weight in kg to height in square meters is referred as BMI

$$BMI = \frac{\text{Weight (Kg)}}{(\text{Height})^2 \text{ m}}$$

Further, the individuals were classified into different classes based on BMI as described by WHO (Anon, 2000) classification is as follows

BMI Classification	Presumptive diagnosis
<18.50	Underweight
18.50 – 22.90	Normal
23.00-24.90	Pre obese
25.00-29.90	Obese grade I
>30	Obese grade II

3.4 Food intake and nutrient adequacy

The intake of food was assessed by 24 hour recall method using a set of pre standardized vessels. Information on the actual ingredients used for preparation and quantity of cooked food consumed by each subject were recorded with the help of standard vessels (Plate 3). The raw weight of ingredients used for each measure of each cooked food was ascertained by cooking the food in the laboratory.

Plate1: Traffic woman police during nutritional anthropometry

Plate 2: Interiew with woman head constable in woman police cell, Hubballi

Plate 3: Standard cups used in diet survey

The raw food equivalents were computed from the standardized cups. The nutrient composition of foods was computed using Annapurna VAR.3 software developed by M. R. Chandrashekar of Bengaluru. The adequacy (%) of nutrient for each subjects was computed using the formula.

$$\text{Nutrient adequacy (\%)} = \frac{\text{Nutrient intake}}{\text{RDA of the nutrient}} \times 100$$

3.5 Diet quality of foods consumed by police women

Diet quality of respondents was determined with the help of pretested scoring pattern suggested by Jirlimath (1983). The total marks allotted for diet quality pattern questionnaire was 10 marks. Based on the scores of respondents, diet quality was determined and classified as poor, fair, good or very good diet.

3.6 Nutritional knowledge of police women

A self structured questionnaire was used to assess the nutritional knowledge of women police. Questions were from the main areas of basic nutrition and health aspects, comprising sub areas of the nutrient source, cooking methods, deficiency diseases and child nutrition. The questionnaire was administered to the police women in their leisure time through personal interview.

The nutritional knowledge questionnaire consisted of 25 true or false questions, which could be answered in true, false or do not know alternatives. Every correct answer carried one mark and no marks were allotted for incorrect answers or do not know responses. The total marks allotted for whole questionnaire was 25 marks.

The nutrition knowledge scores of subjects were further classified into low moderate and high knowledge scores based on the formula given below.

High knowledge = Mean score + (SD*0.425) = X category

Low knowledge = Mean score - (SD*0.425) = Y category

The scores higher than Y and less than X were considered as moderate knowledge category.

3.7 Statistical analysis

The responses were classified tabulated and expressed in frequencies and percentages. Frequency and percentages were computed to interpret the demographic profile

of the subjects. Mean and standard deviations were calculated for anthropometric, dietary and nutritional adequacy of subjects.

The results obtained were analyzed employing following statistical methods (SPSS statistical package, version 16.0).

Chi-square analysis was carried out to know the association between variables, using the formula

$$\chi^2 = \frac{\sum (O_i - E_i)^2}{E_i}$$

Where,

O_i = Observed frequency

E_i = Expected frequency

4. EXPERIMENTAL RESULTS

Policing in India has traditionally been considered a male domain because this profession requires physical strength and endurance. Job in police department is relatively new field for women in India. Government of India although has reserved 35 per cent jobs for women in police department, only few women have entered the department. For women the policing job is hard and demands 24 hrs services, these facts deter women from seeking the job in police department.

4.1 Profile of police women of Hubballi-Dharwad

Induction of women in police department is of recent origin in India. Women in India (also all over the world) have responsibilities of looking after the family, children, household chores and the stressful work nature of job of policing. All these responsibilities may influence the health of police women. The results of the study conducted to assess nutritional status, nutritional knowledge, food and nutrition behaviour of urban and rural police women of Hubballi Dharwad are detailed in this chapter under different subtitles on the following paragraphs. Directorate of Police of Hubballi-Dharwad is catering both to urban and rural population both in Hubballi and Dharwad with 22 police stations for maintenance of law and order in urban areas and 2 exclusively meant for rural areas of Hubballi and Dharwad. Among these offices one Police Station was operated by all women staff and was called as women cell. Women police were recruited in majority of police stations and such women police comprised the subjects for this investigation. Job location of women police selected for the investigation is depicted in Table 1. It was observed that, a total of 115 women police were appointed in various cadres of women police *viz*., Constables, Head Constables, Police Sub Inspectors and Assistant Sub Inspectors in police department of Hubballi and Dharwad. It was observed that out of 115 police women 90 (78.26%) on duty during the research programme and all these were purposively selected for the study. Rest of the women police were either on leave or were transferred.

With respect to women police working in urban areas of Hubballi-Dharwad, it was observed that a total 95 women police (82.60%) were working in urban police departments. Among them, maximum number of police women (57.39%) were working in Hubballi urban jurisdiction. Within this group, maximum number of women police (23.47%) were from Women Police Cell, followed by Town Police Station (8.69%) and Ghantikeri Police Station (6.95%). Equal proportion of women police were on roll in Vidyanagar and Keshwapur police stations (3.47% in each). Lowest number of women police were working in Kamaripet and Sub Urban Police Station (1.73% in each) followed by Commissioner's Office and Navanagar Police Station (2.60% in each). Whereas 49 women police (54.44%) were working in Hubballi urban jurisdiction were included in the investigation. It was observed that maximum number

Table 1: Job location of women police selected for the investigation

N=90

Location of Police Stations	On roll (%)	Included in study (%)
District Office		
Office of Police Superintendent	05 (4.35)	04 (4.44)
Hubballi Urban		
Commissioner's Office	03 (2.66)	02 (2.22)
Vidyanagar	04 (3.47)	04 (4.44)
Women Cell	27 (23.47)	20 (22.22)
Ghantikeri	08 (6.95)	05 (5.55)
Bendigeri	03 (2.60)	01 (1.11)
Town	10 (8.69)	09 (10.00)
Kamaripet	02 (1.73)	01 (1.11)
Suburban	02 (1.73)	01 (1.11)
Keshwapur	04 (3.47)	04 (4.44)
Navanagar	03 (2.60)	02 (2.22)
Sub total	66 (57.39)	49 (54.44)
Dharwad Urban		
Town	17 (14.78)	14 (14.44)
Traffic	05 (4.35)	05 (5.55)
Vidyagiri	04 (3.47)	03 (3.33)
Suburban	03 (2.60)	02 (2.22)
Sub total	29 (25.22)	24 (26.67)
Total Urban	**95 (82.60)**	**73 (81.11)**
Hubballi Rural	01 (0.86)	01 (1.11)
Dharwad Rural	14 (12.17)	12 (13.33)
Total Rural	**15 (13.05)**	**13 (14.44)**
Total Hubballi	**67 (58.26)**	**50 (55.56)**
Total Dharwad	**48 (41.74)**	**40 (44.44)**
Grand total	**115**	**90 (78.26)**

Values in parentheses indicate percentages

of police women included for the investigation belonged to Women Police Cell (22.22%). Correspondingly, the police women were included for the investigation from each Police Station, Vidyanagar and Keshwapur (4.44% in each), Commissioner's Office and Navanagar Police Station (2.22% in each), Kamaripet and Sub Urban Police Station (1.11% in each).

A total of 29 women police (25.22%) were working in jurisdiction of Dharwad urban area. Maximum number of women police were observed under Town Police Station (14.78 %) followed by Traffic police (4.35%) Vidhyagiri (3.47%) and Sub Urban Police Station (2.60%) also appointed women police. For the investigation, 24 women police (26.66%) were included from Dharwad urban jurisdiction. Highest number of women police belonged to Town Police Station (14.44%), followed by Traffic Police Station (5.55%), Vidhyagiri (3.33%) and Sub urban Police Station (2.22%). District police administration is headed by Superintendent's office located in Dharwad. Office of the Police Superintendent being administrative office five women were on roll among whom four subjects (4.44%) were included for the investigation.

With respect to women police working in rural areas of Hubballi-Dharwad, it was observed that a total 15 women police (13.04%) were working in police department. Among them 13 women police (14.44%) were included from Dharwad rural jurisdiction. Highest proportion of women police (13.33%) belonged to Rural Police Station Dharwad. In case of Hubballi Rural Police Station, only one women police (0.86%) was working (1.11%) and she was included for the investigation.

Socio demographic factors such as age, race, ethnicity and socioeconomic status factors such as income, education and occupation influence health outcomes. It is imperative to know the socio demographic details women police included in the investigation. The results of assessment of general information about women police is depicted in Table 2. A wide variation in the socio demographic parameters among police women was recorded. It was observed that most of the respondents belonged to 21-31 years of age (41.11%) followed by those under 32-42 years (35.55%). Further 15 women police were in the age group of 43-53 years (16.67%) and 6 women police (6.67%) were more than 54 years of age.

The selected police women worked in different ranks. Among the police personnel included for the investigation, a majority of them were working as Constables (86.67%), Head Constables (7.78%), and Police Sub Inspectors (3.33%) or two as Assistant Sub Inspectors (2.22%).

It was observed that a majority of women police (47.78%) earned a basic salary ranging from ` 10,000 to 15,999/- per month. However 31.11 per cent of women police earned monthly basic salary ranging from ` 16,000 to 20,999/-, where as 15.55 per cent of police women earned a basic monthly emoluments ranging from ` 21,000 to 25,999/-. Highest basic salary earned by a women police officer was more than ` 30,999/- followed by ` 26,000 to 30,999/- by four women police officers.

Table 2: General information about women police

N=90

Characteristics	Category	Frequency (%)
Age (years)	21-31	37 (41.11)
	32-42	32 (35.55)
	43-53	15 (16.67)
	More than 54	06 (06.67)
Cadre	Constable	78 (86.67)
	Head Constable	07 (07.78)
	Police Sub Inspector	03 (03.33)
	Assistant Sub Inspector	02 (02.22)
Basic salary (`/month)	10,000-15,999	43 (47.78)
	16,000-20,999	28 (31.11)
	21,000-25,999	14 (15.55)
	26,000-30,999	04 (04.44)
	More than 30,999	01 (01.11)
Educational qualification	Less than matriculate	01 (1.11)
	Matriculate	28 (31.11)
	PUC	27 (30.00)
	Graduate	31 (34.45)
	Post graduate	03 (03.33)
Work experience (years)	Less than 1	05 (05.55)
	1-5	18 (20.00)
	6-10	34 (37.78)
	More than 10	33 (36.67)
Duty hours	6-8	67 (74.44)
	9-12	20 (22.22)
	13-15	01 (01.11)
	More than 15	02 (02.22)
Distance of work place from home (km)	Less than 1	06 (06.67)
	1-5	44 (48.89)
	6-10	30 (33.33)
	12-15	03 (03.33)
	16-30	06 (06.67)
	More than 30	01 (01.11)
Marital status	Married	71 (78.89)
	Unmarried	19 (21.11)
Type of family	Nuclear	75 (83.33)
	Joint	09 (10.00)
	Extended	06 (06.67)
Family size	Up to 4	80 (88.89)
	5-7	08 (08.89)
	More than 8	02 (02.22)

Values in parentheses indicate percentages

With regard to educational qualification of women police, it could be seen that 31 women police (34.45%) were graduates, followed by 28 matriculates (31.11%), 27 women police attained Pre-University Certificate (30.00%) and only 3 women police were post graduates (3.33%).

Women police selected for the study had varied years of experience of working in the police department. A majority of police women (37.78%) were working since 6-10 years, followed by those who were working for more than 10 years (36.67%). It was observed that there was a wide range of duty hours by women police. A majority of women police (74.44%) worked for 6-8 hours while few were working for more than 13 hours (1.11 to 2.22 %). However, 22.22 per cent of women police worked for 9-12 hours.

Police women like any other working individual had to travel long distances to reach their working places. In this survey it was observed that a majority of women police had to travel 1 to 5 km (48.89%) or 6 to 10 km to reach their working place (33.33%). However some police women had to travel more than 12-15 km (3.33%). It was astonishing to find that about 7.00 per cent of women police travelled from 16 to 30 km to reach the places of work.

Regarding marital status of women police 71 women police (78.89%) were married and 19 (21.11%) were unmarried.

With regard to type of family of police women, it was observed that maximum number of women police were from nuclear families (83.33%). However about 6-10 per cent of police women lived in joint or extended families (9 and 6, respectively). It was interesting to notice that family size of a majority of the police women constituted of 4 members (80 or 88.89%). Very few police women lived in a family with more than 5 to 8 members.

Thus variation in socio demographic profile of women police working in different police stations of rural and urban Hubballi- Dharwad was observed.

4.2 Nutritional status of police women

Assessment of nutritional status is an important indicator of health status of individuals. Good nutritional status is an indicator of good health and vice versa. Good health is of paramount importance for police women because their job demands physical endurance and mental alertness.

Table 3: Age wise distribution of nutritional status of women police

(N=90)

Age (years)	Height (cm)	Weight (kg)	Ideal body weight (kg)	Ideal body weight (%)	Body Mass Index	Waist circumference (cm)	Hip circumference (cm)	Waist to hip ratio
21-31 n=37	158.66±2.78 (152.3-161.70)	57.86±7.32 (44.70 -78.30)	58.67±5.29 (52.30-61.70	99.00±14.87 (74.70-149.30)	23.03±3.27 (17.58-33.75)	77.80±8.47 (63.50-104.14)	91.80±10.85 (73.66-121.92)	0.85±0.07 (0.68-0.94)
32-42 n=32	157.53±3.98 (151.30-168.50)	67.00±8.74 (54.70-84.30)	57.53±8.25 (51.30-68.50)	116.69±14.87 (94.20-141.82)	27.00±3.38 (22.30-33.20)	87.09±11.09 (60.96-111.76)	105.82±12.40 (81.28-121.12)	0.82±0.02 (0.67-0.92)
43-53 n=15	155.18±8.16 (147.70-162.70)	65.32±11.80 (51.30-85.50)	55.18±9.56 (47.70-62.70	123.02±38.98 (82.54-240.74)	27.45±6.29 (19.50-40.30)	88.97±13.11 (60.96-104.14)	107.28±15.80 (76.20-132.08)	0.83±0.05 (0.75-0.93)
More than 54 n= 06	157.83±2.93 (153.70-161.30)	61.33±7.09 (55.50-71.50)	57.83±8.96 (53.70-61.30)	106.46±16.26 (91.67-130.19)	24.67±3.33 (21.48-29.97)	90.96±7.21 (81.28-99.06)	107.95±9.75 (93.98-121.92)	0.85±0.07 (0.52-0.94)
Mean ± SD	157.54±4.75	62.75±9.60	57.30±6.35	110.32±23.33	24.55±4.45	84.09±11.43	100.78±14.18	0.84±0.06

Values in parentheses indicate range of observations

4.2.1 Nutritional status of police women of different age groups

Both under nutrition and over nutrition might undermine the job performance of police women. Detailed age wise distribution of nutritional status of women police is shown in Table 3. It was noticed that a majority of women police (41.11%) were in the age range of 21-31 years, followed by 32-42 years (35.55%), 43-53 years (16.67%) and more than 54 years (6.67%).

Nutritional anthropometry indicated varied nutritional status of women police. Highest mean height was 158.66 cm with a range of 152.30 to 161.70 which was recorded in the women police who were aged between 21-31 years. This was followed by the women who recorded a mean height of 157.83 cm with a range of 153.70 to 161.30 cm and were more than 54 years old. Lowest mean height of 155.18 cm which ranged widely from 147.30 to 162.70 cm was recorded among women who were aged between 43-53 years. Lowest height of 147.30 cm was recorded in single woman who was appointed on compassionate grounds. This was followed by women who recorded a mean height of 157.53 cm with a range of 151.30 to 168.50 cm, who were in the age group of 32-42 years. The mean height excluding the woman appointed on compassionate grounds was 156.94 cm, however, overall height of all women police was 157.54 cm.

With respect to weight, it was observed that, maximum weight was 67.00 kg recorded by women police who were in the age range of 32-42 years and the range was 54.70 to 84.30 kg. This was followed by women police in the age range of 43-53 years who recorded a mean weight of 65.32 kg, with a range of 51.50 to 85.50 kg. The mean weight of women police among those who were more than 54 years was 61.33 kg, with a range of 55.50 to 71.50 kg. Further, the mean weight of women police in the age range of 21-31 years was 57.86 kg, with a range of 44.70 to 78.30 kg. The overall mean weight of women police was 62.75 kg.

Ideal body weight as measured by Broka's index (height in cm - 100) is a good indicator of health status. While considering the ideal body weight (%) of women police it was noticed that, maximum number of women police were in the higher ranges of ideal body weight (%), which was recorded in the age group of 43-53 years. The mean ideal body weight (%) recorded in this group of women police was 123.02 per cent, with a range of 82.54 to 240.74 per cent followed by those women police in the age range of 32-42 years (116.69%), with a range of 94.20 to 141.82 per cent. It was recorded that the mean per cent of ideal body weight among those women police aged more than 54 years was 106.46 per cent, with a range of 91.67 to 130.91 per cent. Minimum recorded was 99.00 per cent among women police aged of 21-31 years, with a range of 74.70 to 149.30 per cent. The overall mean ideal body weight (%) of women police was 110.32 per cent.

The BMI has been used to assess body fat for almost 200 years. BMI is known to be of limited accuracy, and is different for males and females with similar body adiposity. With regard to body mass index of women police it was observed that, maximum mean body mass index of women police in the age range of 43-53 years was 27.45, with a range of 19.50 to 40.30 followed by those women police in the age range of 32-42 years, (27.00), with a range of 22.30 to 33.20. The mean body mass index of women police among more than 54 years was 24.67, with a range of 21.48 to 29.97. It was noticed that the mean body mass index of women police among 21-31 years age was 23.03, which varied from 17.58 to 33.75. The overall mean body mass index of 90 women police was 24.55.

Waist circumference is another indicator of nutritional status and obesity. Maximum mean waist circumference was observed in the women police aged more than 54 years, which measured 90.96 cm, with a range of 81.28 to 99.06 cm, followed by those in the age range of 43-53 years (88.97 cm), with a range of 60.96 to 104.14 cm. The mean waist circumference of women police in the age range of 32-42 years was 87.09 cm, which ranged from 60.96 to 111.76 cm. The lowest mean waist circumference among was recorded in the age range of 21-31 years (77.80 cm), with a range of 63.50-104.14 cm. The overall mean waist circumference of women police was 84.09 cm.

It was observed that mean hip circumference was maximum (107.95 cm), with a range of 93.98 to 121.92 cm among women police aged more than 54 years age, followed by those in the age range of 43-53 years 107.28 cm, with a range of 76.20 to 132.08 cm. The mean hip circumference of women police in the age range of 32-42 years was 105.82 cm, with a range of 81.28 to 121.12 cm and among the age range of 21-31 years it was 91.80 cm, with a range of 73.66 to 121.92. The overall mean hip circumference of women police was 100.78 cm.

With regard to waist to hip ratio of women police it was observed that, mean waist to hip ratio was on par among the women police aged 21-31and more than 54 years. It was 0.85, with a range of 0.68 to 0.94, followed by these women police in the age range of 43-53 years (0.83) with a range of 0.75 to 0.93. The lowest mean waist to hip ratio 0.82 with a range of 0.67 to 0.92 was recorded among women police in the age range of 32-42 years. The overall mean waist to hip ratio of women police was 0.84.

Classification of BMI of women police is depicted in Table 4. It was observed that, 3.33 per cent of police women were underweight and 31.11 per cent were normal remaining about 66 per cent were obese. Specifically 23.33 per cent were pre obese with BMI ranging between 23 to 25.90, 26.67 per cent were in obese grade I category with BMI of 25 to 29.90 and 15.56 per cent of police personnel were obese grade III category with BMI of greater than 30.

Table 4: Classification of women police based on BMI

N=90

BMI classification	Presumptive diagnosis	Frequency (n)	Percentage
<18.50	Underweight	3	3.33
18.50-22.90	Normal	28	31.11
23.00-24.90	Pre obese	21	23.33
25.00-29.90	Obese grade I	24	26.67
>30	Obese grade II	14	15.56

Table 5: Risk of metabolic complications among women police

N=90

Age (years)	Total (%)	Waist circumference (cm)			Waist to hip ratio	
		<80	80.10 - 88.00	>88	<0.85	≥0.85
21-31	37 (41.11)	20 (54.05)	10 (27.03)	07 (18.92)	19 (51.35)	18 (48.65)
32-42	32 (35.55)	05 (15.63)	13 (40.63)	14 (43.75)	18 (56.25)	14 (43.75)
43-54	15 (16.67)	02 (13.33)	02 (13.33)	11 (73.33)	08 (53.33)	07 (46.67)
More than 54	06 (6.67)	01 (16.67)	02 (33.33)	03 (50.00)	02 (33.33)	04 (66.67)
Total	90	28 (31.11)	27 (30.00)	35 (38.89)	47 (52.22)	43 (47.78)
Risk of metabolic complications		Nil	Increased	Substantially increased	Nil	Substantially increased

Values in parentheses indicate percentages

Source: Anon (2008)

re are many indicators which predict the potential risk of metabolic complications, waist to hip ratio (WHR) is one among them. Table 5 depicts the age wise categorization of waist circumference, waist to hip ratio and metabolic complications of women police. It was observed that a majority of women police (41.11%) were in the age range of 21-31 years, followed by 32-42 years (35.55%) and 43-53 years (16.67%). However, only 6.67 per cent of women police fell in the age group of more than 54 years of age.

It was observed that maximum proportion of women exhibited no risk of metabolic complications in the age range of 21-31 years (54.03%), followed by about 13-16 per cent of women in rest of the age groups with waist circumference of less than 80 cm. Increased risk of metabolic complications were recorded among women in the age group of 32-42 years (48.63%), followed by women aged more than 54 years (33.33%). Interestingly, 27.03 per cent of police women in the age group of 21-31 years were prone to increased risk of metabolic disorders. Least proportion of women (13.33%) in the age group of 43-54 years were noticed for increased risk with waist circumference measuring between 80.10 to 88.00 cm. Further, highest proportion of women with age group of 43-54 years (73.33%) exhibited substantially increased risk of metabolic complications, with waist circumference of more than 88 cm. Risk of metabolic complications was substantially increased among women more than 54 years (50.00%), followed by women in the age group of 32-42 years (43.75%). However, lower proportion of women in the group of 21-31 years (18.92%) was observed.

On overall basis, it was observed that the police women were almost equally distributed across the age groups for risk of metabolic complications based on waist circumference. Although highest proportion on overall basis were categorised under substantially increased risk (38.89%), or at increased risk (30.00%), one third proportion of selected police women could be classified on no risk group (31.11%).

Waist to hip ratio is another indicator of possible metabolic complications. A WHR more than or equal to 0.85 indicates risk of metabolic complications for women. In the present investigation it was revealed that about 51-56 per cent of police women exhibited risk of metabolic complications across the age groups. Further highest proportion of women among more than 54 years (66.67%) exhibited substantially increased risk of metabolic complications with WHR of more than or equal to 0.85. The proportions of women with increased risk of metabolic complications were almost distributed uniformly in the range of 44 to 49.

Analysis was carried out to find association between age and BMI of women police and results are depicted in Table 6. It was observed that among the women police in the age range of 21-31 years (41.11%), highest proportion of women were normal (45.95%), with BMI ranging between 18.50 to 22.90 followed by women in pre obese category (8.88%), with BMI ranging from 23.00 to 24.90 and women in grade I obesity (16.22%) with BMI of 25.00 to 29.90. The group was also represented by underweight and grade II obese women (3.33% in

each category) with BMI less than 18.50 and more than 30.00, respectively for the two groups. Among the police women aged 32-42 years (35.55%), a majority were obese grade I (40.63%), followed by pre-obese women (28.13%). The group also was represented by obese grade II (18.75%) and normal (12.50%) women police. Among the police women who were aged between 43-53 years (16.67%), a majority of women could be observed in normal and obese grade II category (33.33% in each category), followed by obese grade I women (20.00%) and pre obese women (13.33%). Among the police women aged more than 54 years (6.67%) equal proportion of women police belonged to either normal, pre obese or obese grade I categories (33.34% in each category). On over all basis, among the total 90 women police, included for the investigation most of them were normal (31.11%) followed by obese grade I. However, pre-obese (23.33%) obese grade II (15.56%) and underweight (3.33%) police women were documented. On overall, a strong positive association was recorded at 0.05 per cent level of significance for age and BMI of women police.

4.2.2 Comparison of nutritional status of rural and urban police women

Maintenance of normal health of individuals is closely related to the status of nutrition. Proper nutrition keeps man healthy and fit. The categorization of nutritional status of women police based on location of police stations is presented in Table 7. It was observed that, among the selected 90 women police, a majority (81.11%) of them were working in urban police stations and 18.88 per cent were working in rural police stations. Highest mean height of 158.33 cm with a range of 151.50 to 163.50 cm was recorded in the women who were working in rural police stations. Lowest mean height of 157.47 cm was recorded among police women, which ranged widely from 127.70 to 168.50 working in urban police stations. Lowest height of 147.70 cm was recorded in single woman who was appointed on compassionate grounds. The mean height excluding this exceptional woman was 156.94 cm, however, overall height of all women police was 157.54 cm.

With regard to weight of women police based on location of police stations, highest mean weight was 63.13 kg with a range of 45.00 to 85.30 kg was recorded in the women who were working in urban police stations. Lowest mean weight of 59.50 kg was recorded among police women, which ranged widely from 52.50 to 70.80 kg. The overall weight was 62.75 kg.

While considering the ideal body weight of women police based on location of police stations, highest mean ideal body weight was 111.19 per cent with a range of 75.83 to 234.66 per cent was recorded in the women who were working in urban police stations. Lowest mean ideal body weight of 102.78 per cent which ranged widely from 82.68 to 133.58 per cent. The overall mean ideal body weight was 110.32 per cent.

With respect to body mass index of women police based on location of police stations, highest mean body mass index was 25.55 with a range of 17.58 to 30.30 was recorded in the women who were working in urban police stations. Lowest mean body mass index of 23.71 which ranged from 19.57 to 29.90. The overall mean body mass index was 24.55.

Table 6: Association between age and BMI of women police

N=90

Age (years)	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
21-31	03 (8.11)	17 (45.95)	08 (21.62)	06 (16.22)	03 (8.11)	37 (41.11)	35.75*
32-42	-	04 (12.50)	09 (28.13)	13 (40.63)	06 (18.75)	32 (35.55)	
43-53	-	05 (33.33)	02 (13.33)	03 (20.00)	05 (33.33)	15 (16.67)	
More than 54	-	02 (33.34)	02 (33.33)	02 (33.34)	-	06 (6.67)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90 (100.00)	

Values in parentheses indicate percentages

*Significant at $p \leq 0.05$

Table 7: Categorization of nutritional status of women police based on location of police stations

N=90

Location of Police Station	Height (cm)	Weight (kg)	Ideal body weight (kg)	Ideal body weight (%)	Body Mass Index	Waist circumference (cm)	Hip circumference (cm)	Waist to hip ratio
Urban n=77	157.47 ± 4.76 (147.70-168.50)	63.13 ±9.86 (45.00-85.30)	57.47±5.26 (47.70-68.50	111.19±23.51 (75.83-234.66)	25.55±4.54 (17.58-30.30)	83.89±11.86 (60.96-111.76)	100.08±14.35 (73.66-132.68)	0.84±0.06 (0.67-0.94)
Rural n=13	158.33±4.07 (151.50-163.50)	59.50±5.61 (52.50-70.80)	58.33±4.32 (51.50-63.50)	102.78±15.18 (82.68-133.58)	23.71±3.02 (19.57-29.90)	86.20±5.10 (80.01-96.52)	107.95±10.43 (96.52-124.46)	0.82±0.04 (0.71-0.88)
Mean ±SD	157.54±4.75	62.75±9.60	57.90±6.53	110.32±23.33	24.55±4.45	84.09±11.43	100.78±14.18	0.84±0.06

Values in parentheses indicate range of observations

Table 8: Categorization of nutritional status of women police based on years of work experience

N=90

Numbers of years of experience (years)	Height (cm)	Weight (kg)	Ideal body weight (kg)	Ideal body weight (%)	Body Mass Index	Waist circumference (cm)	Hip circumference (cm)	Waist to hip ratio
Less than 1 n=05	157.60±2.51 (155.30-160.20)	60.20±7.29 (54.90-70.00)	57.60±3.25 (55.30-60.20)	104.77±14.58 (91.67-127.22)	24.27±+3.23 (21.48-29.14)	81.79±12.75 (66.04-96.52)	96.50±14.69 (76.20-114.30)	0.85±0.07 (0.76-0.94)
1-5 n=18	157.72±3.48 (152.80-162.00)	56.33±7.78 (45.00-75.50)	57.72±2.56 (52.80-62.00	98.19±17.23 (75.00-141.51)	22.72±3.71 (17.58-32.04)	76.49±9.29 (63.50-88.90)	91.30±14.19 (73.66-114.30)	0.84±0.06 (0.68-0.93)
6-10 n=03	157.68±3.37 (151.90-162.30)	62.21±7.59 (48.00-80.30)	57.68±4.56 (51.90-62.30)	108.21±14.44 (80.40-138.89)	25.05±3.21 (18.75-32.05)	82.19±6.06 (60.90-96.52)	98.32±12.07 (78.74-121.92)	0.84±0.06 (0.71-0.92)
More than 10 n=33	157.30±6.67 (147.70-162.30)	67.20±10.66 (52.60-85.80)	57.30±5.26 (47.70-62.30	119.96±30.45 (82.54-240.74)	27.34±8.03 (19.57-40.30)	90.55±12.07 (60.96-111.76)	109.15±11.95 (88.90-132.08)	0.83±0.05 (0.67 -0.91)
Mean ± SD	157.54±4.74	62.75±9.60	57.57±4.62	110.32±23.33	25.38±4.45	84.09±11.43	100.78±14.18	0.84±0.06

Values in parentheses indicate range of observations

With regard to waist circumference of women police based on location of police stations, highest mean waist circumference was 86.20 cm with a range of 80.01 to 96.52 cm was recorded in the women who were working in rural police stations. Lowest mean waist circumference of 83.89 cm which ranged widely from 60.96 to 111.76. The overall waist circumference was 84.09 cm. It was observed that hip circumference of women police based on location of police stations, highest mean hip circumference was 107.95 cm with a range of 96.52 to 124.46 cm was recorded in the women who were working in rural police stations. Lowest mean hip circumference of 100.08 cm which ranged widely from 73.66 to 132.68. The overall hip circumference was 100.78 cm.

It was noticed that, waist to hip ratio of women police based on location of police stations, highest mean waist to hip ratio was 0.84 with a range of 0.67 to 0.94 was recorded in the women who were working in urban police stations. Lowest mean waist to hip ratio of 0.82 which ranged from 0.71 to 0.88. The overall mean waist to hip ratio was 0.84.

4.2.3 Nutritional status of police women based on years of experience

Nutritional status is influenced by food consumption and life style over the years. Generally women tend to become more sedentary due to several social reasons. This could influence the body dimensions and hence the nutritional status. Sedentary working pattern of women police would also influence the nutritional status. Table 8 shows the categorization of nutritional status of women police based on years of experience. It was observed that a majority of women police (37.78 %) had 6-10 years of experience, followed by those who were with more than 10 years of work experience (36.67%) and with 1-5 years (20.00%). Lowest proportion of women revealed less than one year of experience (5.56%).

Anthropometric measurements of police women varied (Table 8). Not much variation in height of women police was observed across the group. However one police woman recorded a height of only 147.00 cm who was appointed on compassionate grounds. The mean height excluding this exceptional woman was 156.94 cm, however, overall height all women police was 157.54 cm.

With regard to weight of women police, based on years of experience, highest mean weight was 67.20 kg with a range of 52.60 to 85.80 kg which was recorded in the women who had work experience of more than 10 years. This was followed by the women who had an experience of 6-10 years, with mean weight of 62.21 kg which ranged widely from 48.00 to 80.30 kg. Women who had an experience of 1-5 years recorded lowest weight of 56.33 kg with a range of 45.00 to 75.50 kg. This was followed by women who had less than one year experience with weight of 60.20 kg which ranged from 54.90 to 70.00 kg. The overall mean weight was 62.75 kg, irrespective of years of experience.

With respect to ideal body weight of women police based on years of experience, highest mean ideal body weight was 119.96 per cent with a range of 82.54 to 240.74 per cent which was recorded in the women who had work experience of more than 10 years. This was followed by women who had an experience of 6-10 years, with mean ideal body weight of 108.21 per cent which ranged widely from 80.40 to 138.89 per cent. Women who had an experience of 1-5 years recorded lowest ideal body weight of 98.19 per cent with a range of 75.00 to 141.51 per cent. This was followed by women who had less than one year experience with ideal body weight of 104.77 per cent which ranged from 91.67 to 127.22 per cent. The overall mean ideal body weight was 110.32 per cent, irrespective of years of experience.

It was observed that mean body mass index of women police based on years of experience, highest mean body mass index was 27.34 with a wide range of 11.57 to 40.30 which was recorded in the women police who had work experience of more than 10 years. This was followed by the women who had put in an experience of 6-10 years, with mean body mass index of 25.05 which ranged from 18.75 to 32.05. Women who had put an experience of 1-5 years recorded lowest mean body mass index of 22.72 with a range of 17.58 to 32.04. This was followed by women who had less than one year experience with mean body mass index of 24.27 which ranged from 21.48 to 29.14. The overall mean body mass index was 25.38, irrespective of years of experience.

With regard to waist circumference of women police based on years of experience, highest mean waist circumference was 90.55 cm with a range of 60.96 to 111.76 cm was recorded among the women who had work experience of more than 10 years. This was followed by the women who had put in an experience of 6-10 years, with mean waist circumference of 82.19 cm which ranged widely from 60.90 to 96.52 cm. Women who had an experience of 1-5 years recorded lowest waist circumference of 76.49 cm with a range of 63.50 to 88.90 cm. This was followed by women who had less than one year experience with waist circumference of 81.79 cm which ranged from 66.04 to 96.52 cm. The overall mean waist circumference was 84.09 cm, irrespective of years of experience.

With regard to hip circumference of women police based on years of experience, highest mean hip circumference was 109.15 cm with a range of 88.90 to 132.08 cm which was recorded among the women who had work experience of more than 10 years. This was followed by the women who had put an experience of 6-10 years, with mean hip circumference of 98.32 cm which ranged widely from 78.74 to 121.92 cm. Women who had put an experience of 1-5 years recorded lowest hip circumference of 91.30 cm with a range of 73.66 to 114.30 cm. This was followed by women who had less than one year experience with hip circumference of 96.50 cm which ranged from 76.20 to 114.30 cm. The overall mean hip circumference was 100.78 cm, irrespective of years of experience.

While considering the waist to hip ratio of women police based on years of experience, highest mean waist to hip ratio was 0.85 with a range of 0.76 to 0.94 was recorded in the women police who had work experience of less than one year. This was followed by the women who had an experience of 1-5 years and 6-10 years, with equal mean waist to hip ratio of 0.84, each with range of values 0.68 to 0.93 and 0.71 to 0.92, respectively. Women who had an experience of more than 10 years recorded lowest waist to hip ratio of 0.83 with a range of 0.67 to 0.91. The overall waist to hip ratio was 0.84, irrespective of years of experience.

Anthropometry is widely used as a tool to estimate the nutritional status of populations and to monitor the growth and health of individuals. Association between experience and BMI of women police is shown in Table 9. It was observed that among the experience range of 6-10 years (37.78%), a majority (32.40%) of them were pre obese with BMI ranging between 23.00-24.90. The group also was represented by normal and obese grade I women police (29.41% in each group), with BMI of 18.50-22.90 and BMI of 25.00-29.90 respectively for the two groups. Whereas, three women police (8.82%) were obese grade II with BMI of more than 30.00.

Among the police women who had experience of more than 10 years (36.67%), a majority were obese grade II (30.30%), followed by obese grade I women (27.28%). The group also was represented by normal (24.24%) and pre obese (18.18%) women police. Among the police women experience range of 1-5 years (20.00%), a majority of women police (44.44%) were normal. The group was also represented by obese grade I, pre obese and underweight women police (16.67% in each group). However, single woman was noticed under obese grade II category. It was observed that among less than one year experience police women (5.56%), equal proportion of women police (40.00% in each group) belonged to either normal or obese grade I categories. The group also was represented by single woman fell in pre obese category. On over all basis, among total 90 women police, most of them were normal (31.11%) followed by obese grade I (26.67%). However, 21 women police (23.33%) were pre obese, 14 women police (15.56%) were obese grade II and three women police (3.33%) were belonged to underweight category. On overall, non significant association was recorded for experience and BMI of women police.

4.2.4 Association between post held and BMI of women police

Association between post held and BMI of women police (Table 10) revealed that among total Constables (86.67%), highest proportion of Constables belonged normal (32.05%) category with BMI of 18.50-22.90, followed by women in obese grade I category (26.92%), with BMI ranging from 25.00 to 29.90. The group also was represented by pre obese women (24.36%) and obese grade II women police (12.82%) with BMI ranging from 23.00 to 24.90 and more than 30.00 respectively for the two groups. Whereas, 3.85 per cent of women police belonged to underweight category with BMI of less than 18.50.

Table 9: Association between years of experience and BMI of women police

N=90

Experience (years)	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
Less than 1	-	02 (40.00)	01 (20.00)	02 (40.00)	-	05 (5.56)	24.26^{NS}
1-5	03 (16.67)	08 (44.44)	03 (16.67)	03 (16.67)	01 (5.56)	18 (20.00)	
6-10	-	10 (29.41)	11 (32.40)	10 (29.41)	03 (8.82)	34 (37.78)	
More than 10	-	08 (24.24)	06 (18.18)	09 (27.28)	10 (30.30)	33 (36.67)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 10: Association between cadre and BMI of women police

N=90

Post held	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	>30.00		
Constables	03 (3.85)	25 (32.05)	19 (24.36)	21 (26.92)	10 (12.82)	78 (86.67)	27.59^{NS}
Head Constables	-	02 (28.60)	01 (14.28)	02 (28.57)	02 (28.57)	07 (7.78)	
Police Sub Inspectors	-	01 (33.33)	01 (33.33)	01 (33.33)	-	03 (3.33)	
Assistant Sub Inspectors	-	-	-	-	02 (100)	02 (2.22)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS-Non significant

Among seven Head Constables (7.78%), equal proportion of women belonged to either obese grade I, obese grade II or normal range (28.57% in each category).

Whereas, single Head Constable belonged to pre obese category. Among three Police Sub Inspectors (3.33%) equal proportion of police women belonged to either normal, pre obese or obese grade I category (1.11% in each category). However, two Assistant Sub Inspectors were belonged to obese grade II category. On over all basis among the total of 90 women police, a majority of them were normal (31.11%), followed by obese grade I (26.67%). However, 21 women police (23.33%) were pre obese, 15.56 per cent were obese grade II and three women police (3.33%) were belonged to underweight category. On overall, non significant association was recorded for post held and BMI of women police.

4.2.5 Association between income and BMI of women police

Socio-economic status of individuals directly or indirectly influences the health status and subjective well being. Higher socio-economic status leads to better health care, comfortable living conditions and better diets among individuals. Such life quality influences the nutritional status and the BMI.

In the present investigation attempts were made to know the association between income and nutritional status in terms of BMI. Results of the association between income and BMI of women police are depicted in Table 11. It was revealed that among women police (47.78%) whose monthly salary ranged between ` 10,000-15,999/-, a majority of women police (32.56%) were obese grade I with BMI of 25.00 to 29.90, followed by normal women (27.90%), with BMI ranging from 18.50 to 22.90. The group also was represented by pre obese women (23.30%), with BMI ranging from 23.00 to 24.90 and obese grade II (9.30%) with BMI of more than 30.00. Whereas, 6.98 per cent of women police belonged to underweight category with BMI of less than 18.50.

Among women police whose monthly salary ranged between ` 16,000 to 20,999/-, a majority of women police (35.71%) were normal. The group also was represented by pre obese (32.15%) and obese grade I women (25.00%). However, two women police (7.14%) were observed under obese grade II category. Among women police (15.56%) whose monthly income ranged between ` 21,000 to 25,999/-, a majority of women (42.86%) were obese grade II. The group also was represented by normal women police (35.72%), followed by two women police (14.28%) who were pre obese and a single woman fell in obese grade I category. Among women police (4.44%) who earned ` 26,000 to 30,999/- per month, two women police belonged to obese grade II category. The group also was represented by normal and obese grade I women police (25.00% in each category). Whereas single obese grade I woman police earned more than ` 30,999/- per month. On over all basis, among the total 90 women police, most of them were normal (31.11%) followed by obese grade I (26.67%). However, 21 women police (23.33%) were pre obese, 15.56 per cent were obese

grade II and three women police (3.33%) were observed in underweight category. On overall, non significant association was recorded for income and BMI of women police.

4.2.6 Association between educational qualification and BMI of women police

Education is an important factor which empowers to choose healthy food within available resources and helps in healthy practices and well being. Association between educational qualification and BMI of women police was carried out and results are presented in Table 12. It was observed that among the 90 police women selected for the investigation, maximum percentage of women were graduates (34.45%), among whom 38.71 per cent were normal with BMI ranging between 18.50 to 22.90, followed by women in pre obese category (29.03%) with BMI ranging from 23.00 to 24.90. Within this group women in obese grade II category (12.90%) and equal proportion in obese grade I and underweight (9.68%) were recorded with BMI of more than 30.00 for grade II obese, 25.00 to 29.00 for grade I obese and less than 18.50 for underweight categories. It was seen that among the group of matriculate (31.11%) police women, highest percentage (39.29%) were obese grade I, followed by pre obese women (32.14%) and obese grade II women (17.86%). The group also was represented by normal range (10.71%) women police. It was observed that 30.00 per cent women police attained Pre-University certificate, a majority were normal (37.04%), followed by obese grade I women (33.33%). The group also was represented by obese grade II (18.52%) and pre obese (11.11%) women police. Among post graduate police women (3.33%), a majority (66.67%) police women belonged to normal range, single women police observed under obese grade I category. Single woman who was appointed on compassionate grounds educational qualification was less than matriculate with a normal range. On over all basis, among total 90 women police, most of them were normal (31.11%) followed by obese grade I (26.67). However, 23.33 per cent women police were pre obese, 15.56 per cent were obese grade II and few women police (3.33%) were fell in underweight category. On overall, non significant association was recorded.

4.2.7 Association between duty hours and BMI of women police

Long working hours and difficult shift work schedules influence working individual's health and nutritional status such influences may pose a negative impact on the communities they serve. Results of the analysis for finding out association between duty hours and BMI of women police is depicted in Table 13. It was noticed that among police women who worked between 6-8 hours (74.45%), highest proportion of women police were obese grade I (28.36%) with BMI ranging between 25.00-29.90, followed by pre obese category (25.37%) with BMI ranging between 23.00-24.90. Within this group of women's working hours, women in normal (22.39%) and obese grade II (19.40%) were recorded with BMI of 18.50- 22.90 for normal and more than 30.00 for obese grade II categories. However, 4.48 per cent of women police belonged to underweight category with BMI of less than 18.50.

Table 11: Association between income and BMI of women police

N=90

Basic salary (`/ month)	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
10,000-15,999	03 (6.98)	12 (27.90)	10 (23.30)	14 (32.56)	04 (9.30)	43 (47.78)	23.53^{NS}
16,000-20,999	-	10 (35.71)	09 (32.15)	07 (25.00)	02 (7.14)	28 (31.11)	
21,000-25,999	-	05 (35.72)	02 (14.28)	01 (7.14)	06 (42.86)	14 (15.56)	
26,000-30,999	-	01 (25.00)	-	01 (25.00)	02 (50.00)	04 (4.44)	
More than 30,999	-	-	-	01 (100)	-	01 (1.11)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 12: Association between educational qualification and BMI of women police

N=90

Educational qualification	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00 - 24.90	25.00-29.90	> 30.00		
Less than matriculate	-	01 (100)	-	-	-	01 (1.11)	25.48 ^{NS}
Matriculate	-	03 (10.71)	09 (32.14)	11 (39.29)	05 (17.86)	28 (31.11)	
Pre-University Certificate	-	10 (37.04)	03 (11.11)	09 (33.33)	05 (18.52)	27 (30.00)	
Graduate	03 (9.68)	12 (38.71)	09 (29.03)	03 (9.68)	04 (12.90)	31 (34.45)	
Post graduate	-	02 (66.67)	-	01 (33.34)	-	03 (3.33)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 13: Association between duty hours and BMI of women police

N=90

Duty hours	Body Mass Index					Total (%)	Modified χ^2
	Under Weight	Normal	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
6-8	03 (4.48)	15 (22.39)	17 (25.37)	19 (28.36)	13 (19.40)	67 (74.45)	19.21 NS
9-12	-	12 (60.00)	04 (20.00)	04 (20.00)	-	20 (22.22)	
13-15	-	-	-	-	01 (100.00)	01 (1.11)	
More than 15	-	01 (50.00)	-	01 (50.00)	-	02 (2.22)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS-Non significant

Among the police women who were working between 9-12 hours (22.22%), a majority of women police were normal (60.00%). The group also was represented by equal proportion of pre obese and grade I obese women police (20.00% in each category). Among women police who were working more than 15 hours (2.22%), equal proportion of police women belonged to normal and obese grade I category (1.11% in each category). Single police women working between 13-15 hours belonged to obese grade II category. On over all basis, among the total of 90 women police, a majority of them were normal (31.11%) followed by obese grade I (26.67%). However, 23.33 per cent of women police were pre obese, 15.56 per cent were obese grade II and 3.33 per cent of women police were belonged to underweight category. On overall, non significant association was recorded for duty hours and BMI of women police.

4.3 Food and nutrition behaviour of women police

Nutrition is one of the key factors which help an individual to attain one's full potential as an adult and it depends to a great extent on the quantity and quality of food. Proper nutrition is important in improving the community health in general and of the risk groups in particular. Balanced nutrition can protect against many diseases/disorders resulting from nutrient deficiencies or excess. Good nutrition is of at most important to women and more so for police women.

4.3.1 Dietary pattern of women police

Detailed dietary pattern of women police is presented in Table 14. It was observed that maximum number of women police (68.89%) were vegetarians and 31.11 per cent of women police were non vegetarians. Among 90 respondents 86.67 per cent of women police consumed three meals (breakfast, lunch and dinner) in a day, 7.78 per cent of women police consumed four meals in a day and surprisingly 5.55 per cent of women police consumed only surprisingly breakfast and dinner in a day.

While considering the habit of skipping meals by women police, results indicated that a majority of women police (77.78%) did not skip the meals. Whereas 22.22 per cent women police skipped meals, among them 14 women police skipped breakfast due to lack of time for food preparation and three of women police skipped lunch, tea or snacks in order to attend emergency cases or due to extra duty lack of staff

4.3.2 Diet quality of women police

Mean food intake and adequacy of diets of police women in relation to suggested balanced diets is presented in Table 15. The results indicated a wide variation in consumption of different foods among the police women, thereby indicating a wide range of adequacies. Noticeable among the foods was the intake of fats which was exceptionally more than adequate (170.90) with a range of values between 146.00 to 299.45 per cent by the police women. The mean intake of fats was 34.18 (29.20 to 59.89 g) even the lower value were higher than the suggested balanced diet for women.

Table 14: Dietary pattern of women police

N=90

Details	Frequency (%)	
Type of diet		
Vegetarian	62 (68.89)	
Non vegetarian	28 (31.11)	
Number of meals consumed in a day		
Two (Breakfast and Dinner)	05 (05.55)	
Three (Breakfast and Lunch and Dinner)	78 (86.67)	
Four (Breakfast and Lunch and snack and Dinner)	07 (07.78)	
Habit of skipping meals		
Yes	20 (22.22)	
No	70 (77.78)	
Number of meals skipped in a day and reason		
Breakfast	14 (70.00)	Lack of time for food preparation
Lunch	03 (15.00)	Attend emergency cases.
Tea and snack	03 (15.00)	Extra work

Values in parentheses indicate percentages

Table 15: Mean food intake and adequacy of diets of women police in relation to suggested balanced diets

N=90

Food (g/day)	Suggested balanced diet (g)	Mean intake	Adequacy (%)
Cereals	270	315.00 (193-410)	116.67 (71.48-151.85)
Pulses	60	43.34 (21.40-56.20)	72.23 (35.67-93.67)
Roots and tubers	200	45.26 (22.50-63.20)	22.63 (11.25-31.60)
Green leafy vegetables	100	42.77 (19.20-55.63)	42.77 (19.20-55.63)
Other vegetables	200	65.63 (37.82-76.50)	32.81 (18.91-38.25)
Fruits	100	49.09 (23.16-58.63)	49.09 (23.16-58.63)
Meat and meat products	60	37.34 (15.30-55.60)	62.23 (25.50-92.67)
Milk and milk products (ml)	300	180.92 (75.00-250.00)	40.07 (25.00-69.44)
Fats	20	34.18 (29.20-59.89)	170.90 (146.00-299.45)
Sugars	20	18.92 (15.60-25.89)	94.60 (78.00-129.45)

Values in parentheses indicate ranges
Suggested balanced diet (Anon, 2011) for sedentary women

Table 16: Nutrient intake and adequacy of diet consumed by women police

Nutrients (per day)	Recommended dietary allowances	Intake Mean ± SD	Adequacy (%)
Energy (kcal)	1900	2037 ± 570.30 (1537-2987)	107.21 (80.89-157.24)
Protein (g)	55.0	41.01 ± 13.11 (30.60-52.60)	74.56 (55.64-95.64)
Fat (g)	20	52.81 ± 16.83 (21.97-75.92)	264.05 (109.85-379.60)
Calcium (mg)	600	416.21 ± 142.90 (278.00-567.20)	69.36 (46.33-94.53)
Iron (mg)	21	17.12 ± 7.60 (7.40-19.90)	81.52 (35.24-94.76)
β-carotene (µg)	4800	743.48 ± 557.90 (193.73-1081.08)	15.49 (4.03-22.52)
Thiamine (mg)	1.0	1.52 ± 0.42 (0.96-2.11)	152.00 (96.00-211.00)
Riboflavin (mg)	1.1	0.94 ± 0.62 (0.12-1.11)	94.00 (10.90-100.90)
Niacin (mg)	12	12.14 ± 3.63 (7.01-19.43)	101.16 (58.42-161.92)
Vitamin B_6 (mg)	2.0	0.23 ± 0.21 (0.05-0.27)	11.50 (2.50-13.50)
Vitamin C (mg)	40	24.00 ± 9.38 (14.91-41.58)	60.00 (37.28-103.95)
Folate (µg)	200	136.87 ± 55.81 (96.26-280.91)	68.43 (48.13-140.46)
Vitamin B_{12} (µg)	1.0	0.83 ± 0.39 (0.14-1.22)	83.00 (14.00-122.00)
Magnesium (mg)	310	410.00 ± 262.11 (96.75-925.32)	132.25 (31.20-298.49)
Zinc (mg)	10	7.26 ± 1.57 (4.00-12.60)	72.60 (40.00-126.00)

Values in parentheses indicate ranges
RDA: Recommended dietary allowance (Anon., 2010)

Next to fats, cereals were the next most adequate food (116.67% with a range of 71.48 to 151.85%) with mean consumption of 315 g (193 to 410 g), indicating inadequate consumption level by some women police.

The data indicated that consumption sugar was near to adequate amounts as suggested for sedentary women with mean intake of 18.92 g (15.60 to 25.89 g) and mean adequacy of 94.60 per cent (78.00 to 129.45%). Although the mean values indicated optimum consumption, it is noteworthy that some women consumed more than suggested.

Mean intake of pulses, meat and meat products and milk and milk products were less than the suggested balanced diet. The intake of protective foods such as roots and tubers green leafy vegetables and other vegetables was less than 50 per cent of suggested balanced diet for sedentary women. Lowest intake of 45.26 g (22.50 to 63.20) as compared to suggested intake of 200 g for women. The maximum adequacy was as low as 22.63 per cent, with a range of 11.25 to 31.60 per cent. Further mean consumption of green leafy vegetables and fruits were 42.77 and 49.09 g respectively revealing the mean adequacies of 42.77 and 49.09 per cent, respectively. The range of adequacies for the two foods were 19.20 to 55.63 and 23.16 to 58.63, respectively for green leafy vegetables and fruits. Similar levels of consumption for roots and tubers were observed in the dietary of police women. The mean intake was 45.26 g as against 200 g suggested balanced diets for women. The range of intake varied from as low as 22.50 g to 63.20 g, revealing adequacy levels ranging from 11.25 to 31.60 per cent, with a mean of 22.63 per cent, indicating lowest adequacy among the foods. Further, it was revealed that although the mean consumption of other vegetables was 65.63 g (37.82 to 76.50 g), it was lower than the suggested amount in balanced diet of 200 g. The mean adequacy was 32.81 per cent (18.91 to 38.25%). Thus, it was evident that the consumption of all protective foods was lower than the suggested amounts in the balanced diet for sedentary women.

Information on food consumed in daily diet helps to assess indirectly the nutritional status of individuals. Computation of nutrient composition and comparison with RDA revealed salient aspects of nutrition behaviour of women police. It was observed that the nutrient adequacy of women police varied widely. Energy, fat, thiamine and magnesium content of diets were more than the RDA. Mean niacin intake of adequate. Rest of all the nutrient contents were lower than the RDA for women.

Table 16 depicts nutrient adequacy of diet consumed by women police. It was observed that among women police, the mean energy (2037 kcal) intake was in the range of 1537-2987 kcal with adequacy of 107.23 per cent the adequacy ranging approximately between 81 to 157 per cent. Fat intake (52.81 g) was in the range of 21.97-75.92 g with an adequacy 264.05 per cent (109.85 to 379.60%), thiamine intake (1.52 mg) was in the range of 0.96-2.11 mg with an adequacy of 152.00 per cent (96.00 to 211.00%). Niacin intake (12.14 mg) was in the range of 7.01-19.3 mg with an adequacy of 101.16 per cent (58.42 to

161.92%). Although the mean intake of these nutrients were more than the recommended dietary allowances, it could be observed that the diets of some women police contained the same nutrients in lower proportion. The lower range of adequacy of these nutrients need to be considered carefully for women police.

The data on nutrient composition of diets of women police revealed inadequacies with respect to several important nutrients such as protein, calcium, iron, β carotene, riboflavin, vitamins B_6, vitamin C, folate, vitamin B_{12} and zinc. Protein intake (41.01 g) was in the range of 30.60-52.60 g (74.56% adequate with a range of about 56 to 94%), calcium intake (416.21 mg) was in the range of 278-567 g (69.36% adequate ranging between 46 to 94%), iron intake (17.12 mg) was in the range of 7.40-19.90 mg (81.52% adequate ranging between about 35 to 95%), β-carotene intake (743.48 µg) was in the range of 193.73-1081.08 µg (only 15.49% adequate ranging between 4 to 22%), riboflavin intake (0.94 mg) was in the range of 0.60-1.11 mg (94% adequate ranging between 54 to 100%), vitamin B_6 intake (0.23 mg) was in the range of 0.05-0.27 mg (11.50% adequate ranging between 2 to 13%), vitamin C intake (24 mg) was in the range of 14.91-41.58 mg (60.00% adequate ranging between 37 to 103%), folate intake (136.87 µg) was in the range of 96.26-280.91 µg (68.43% adequate ranging between 48 to 140%), vitamin B_{12} intake (0.83 µg) was in the range of 0.42-1.22 µg (83.00% adequate ranging between 4 to 122%) magnesium intake (310.00 mg) was in the range of 96.75-925.32 mg (132.25% adequate ranging between 31 to 298%) and zinc intake (7.26 mg) was in the range of 4.00-12.60 mg (72.60% adequate ranging between 40 to 126%), and were less than the recommended dietary allowances. Further it is noteworthy that the mean values gave a buffered level of inadequacies, because the lower range of values for inadequacies were very low as in case of calcium (46%) and iron (35%). β carotene and vitamin B_6 of the diets of women police was very low even the upper range of values were lower than 25 per cent adequate for women police. .

4.3.2.1 Diet quality of women police of different cadres

Working efficiency output are dependent on the health and physical fitness of individuals. Adequate diets are essential for optimum work output.

Detailed information of diet quality of women police according to the cadre of police woman is shown in the Table 17. It was observed that among a total of 90 women police, a majority of were Constables (78), followed by seven Head Constables, whereas, three of the respondents were Police Sub Inspectors, two were Assistant Sub Inspectors.

A perusal of the data indicated that at least one cereal formed the diets of police women irrespective of cadre they held, (97.4 to 100.00%), although almost three fourth of the subjects consumed more than two types of cereals in any two meals of the day. Similar trend was observed with consumption of milk and milk products. More than about 90 per cent of police women had milk or milk products in their meals daily.

Table 17: Diet quality of women police of different cadres

N=90

Sl. No.	Diet quality	Constables n=78	Head Constables n=7	Police Sub Inspectors n=3	Assistant Sub Inspectors n=2	'Yes' answers (Total)
1	Cereals present in three meals	76 (97.44)	07 (100)	03 (100)	02 (100)	88 (97.78)
2	More than one type of cereal in any two meals in a day	50 (64.10)	04 (57.14)	02 (66.67)	02 (100)	58 (64.44)
3	Contains pulses twice a day	58 (74.36)	06 (85.71)	02 (66.67)	01 (50.00)	67 (74.44)
4	More than one type of pulse in a day	40 (51.28)	04 (57.14)	02 (66.67)	01 (50.00)	47 (52.22)
5	Presence of milk/ milk products in a day	69 (88.46)	07 (100)	03 (100)	02 (100)	81 (90.00)
6	Presence of milk/ milk products in lunch and dinner	70 (89.74)	07 (100)	03 (100)	02 (100)	82 (91.11)
7	Presence of green leafy vegetables/ fruits in a day	31 (39.74)	02 (28.57)	01 (33.33)	01 (50.00)	34 (37.78)
8	Presence of germinated pulse/citrus fruit in a day	49 (62.82)	03 (42.86)	03 (100)	01 (50.00)	56 (62.22)
9	Presence of other vegetables in a day	26 (33.33)	04 (57.14)	-	02 (100)	32 (35.55)
10	Presence of oilseed in a day	47 (60.26)	02 (28.57)	03 (100)	01 (50.00)	53 (58.89)

Values in parentheses indicate percentage

It was observed that a diet contained pulses twice a day for 74.44 per cent of women police. Among which a majority were Head Constables (85.71%), followed by constables (74.36%), and Police Sub Inspectors (66.67%). Single Assistant Sub Inspector di*et al* so contained pulses twice a day. It was found that, 64.44 per cent of the women police consumed more than one type of cereals in any two meals in a day. Among which, cent per cent were Assistant Sub Inspectors, followed by 66.67 per cent of Police Sub Inspectors, 64.10 per cent of Constables and 57.14 per cent of Head Constables. It was observed that, a diet of 62.22 per cent of women police contained germinated pulse/citrus fruits in a day. Among them, 100 per cent were Police Sub Inspectors, followed by 50 per cent of Assistant Sub Inspectors. This group were also represented by 62.82 per cent of Constables and 42.86 per cent of Head Constables. It was noticed that, 58.89 per cent of women police consumed oilseed in their daily diet, among them 100 per cent were Police Sub Inspectors and 50.00 per cent were Assistant Sub Inspectors, 60.26 per cent of Constables and 28.57 per cent of Head Constables. It was revealed that, 52.22 per cent of women police's diet contained more than one type of pulse in a day. Among them, 66.67 per cent of women police were Police Sub Inspectors, followed by 57.14 per cent Constables, 51.28 per cent Constables and 50.00 per cent Assistant Sub Inspectors. It was noticed that, the diet of 37.78 per cent women police included green leafy vegetables/fruits in a day. Among which a majority of them were Assistant Sub Inspector (50.00%), followed by Constables (39.74%), Police Sub Inspectors (33.33%) and Head Constables (28.57%). It was found that a few proportion of women police (35.55%) consumed other vegetables in a day. Among them, 100 per cent were Assistant Sub Inspectors followed by 57.14 per cent Head Constables and 33.33 per cent Constables. Thus the data indicated that the women police consumed foods such as cereals, milk and milk products in sufficient quantities but the foods providing micronutrients were consumed by a lesser proportion of women, more so among the Constables.

A nutritious well balanced diet along with good life style is the foundation for good health. Healthy eating includes consumption of high quality protein, carbohydrates, heart friendly fats, sufficient micronutrient providing foods such as fruits and vegetables and water A perusal of Table 18 reveals that among 90 women police, about 50.00 per cent of women consumed a diet that could be categorized as fair, followed by those who consumed a diet of good (22.22%) and poor (18.89%) qualities. It is important to note that very few women police consumed a diet of very good (4.44%) quality

Association between cadre and diet quality of women police is presented in Table 19. It was observed that among a total of 78 Constables, a majority (55.12%) consumed a diet of fair quality, with scores ranging from 5.6-7.00, followed by equal proportion of Constables (20.51% in each category) consuming a diet of good or poor quality with score ranging from 5.6-7.00 for good and below 5.55 for poor diet quality. However, (3.84%) Constables consumed a diet of very good quality with quality scores of more than 8.6.

Table 18: Categorization of diet quality of women police

N=90

Diet quality	Scores	Frequency (%)
Very good	8.6 and above	04 (4.44)
Good	7.1-8.5	20 (22.22)
Fair	5.6-7.00	49 (54.45)
Poor	5.5 below	17 (18.89)
Total		90

Values in parentheses indicate percentage
Maximum possible score: 10

Table 19: Association between cadre and diet quality of women police

N=90

Post held	Diet quality				Total (%)	Modified χ^2
	Very good (8.6 and above)	Good (7.1-8.5)	Fair (5.6-7.00)	Poor (below 5.5)		
Constables	03 (3.85)	16 (20.51)	43 (55.13)	16 (20.51)	78 (86.67)	23.00^{NS}
Head Constables	-	01 (14.28)	05 (71.43)	01 (14.29)	07 (7.78)	
Police Sub Inspectors	-	02 (66.67)	01 (33.34)	-	03 (3.33)	
Assistant Sub Inspectors	-	02 (100)	-	-	02 (2.22)	
Total	03 (3.33)	21 (23.33)	49 (54.44)	17 (18.90)	90	

Values in parentheses indicate percentages
NS-Non significant

It was observed that, among seven Head Constables 57.14 per cent consumed a diet of fair quality, followed by 28.57 per cent of Head Constables consuming a diet of good quality. Further it was evident that a majority of Police Sub Inspectors (66.67%) consumed a diet of good quality.

Among Assistant Sub Inspectors only two women consumed a diet of good quality. On over all basis, a majority of the respondents (53.33%) consumed a diet that could be categorized as fair, followed by those consuming a diet of good quality (24.45%). But a segment of selected respondents consumed poor quality diet (18.89%), and only few police consumed a diet of very good quality (3.33%). However, it was observed that there was no significant association between cadre held and their diet quality.

A large body of epidemiologic data show that diet quality is influenced by several factors. Affluence, economic status, age, educational level, occupation etc may high population impact on diet quality.

Association between age and diet quality is presented in Table 20. It was observed that, among a majority of women police (62.16%) aged 21-31 years (41.11%) were found to consume a diet that could be categorized as fair quality, with scores ranging between 5.6-7.00 against a maximum possible score of 10. Whereas, women police consumed a diet of good or poor quality (18.92% in each category), with scores ranging between 7.1-8.5 for diet of good quality and below 5.5 for poor type of diet.

It was observed that among women police in the age range of 32-42 years (35.55%), a majority of women police (59.37%) were found to consume a diet fair quality. The group was also represented by women police (21.87%) consuming diet of poor quality, followed by women police who consumed diet of good (12.50%) and very good (6.25%) quality. Among the women police in the age range of 43-53 years (16.67%), equal proportion of women police consumed diet of either good or fair quality (40.00% in each), while, 13.34 per cent and 6.67 per cent of women police consumed a diet of poor and very good quality, respectively. Among six women police who were in the age of more than 54 years, four women (66.67%) consumed a diet of good quality, and remaining women either consumed a diet of fair or poor quality. On overall basis, a majority (54.45%) of women consumed a diet that could be categorized as fair, followed by 23.33 per cent women police who consumed diet of good quality. It was observed that, 18.89 per cent of women police consumed diet of poor quality and few women police (3.33%) were found to consume diet of very good quality. It was revealed that association between age and diet quality of women police was statistically not significant.

In recent years, the lifestyle has rapidly been changed. These changes appeared in diet, types of food, cooking time and unhealthy food practices. Continuation of eating an unhealthy diet can lead to many health problems including obesity, malnutrition,

cardiovascular disease and diabetes. Association between diet quality and nutritional status of women police is presented in Table 21. It was observed that the diet quality of the majority of women police (54.44%) was fair with diet quality scores ranging between 5.6 to 7.00, among which an equal proportion of women police belonged to normal or pre obese category (30.61% in each category) with BMI of 18.50 to 22.90 for normal and 23.00 to 24.90 for pre obese police women, respectively. Further, it was indicated that 24.49 per cent of police women belonged to grade I obesity with BMI ranging between 25.00 to 29.90, followed by 8.17 per cent of women police under grade II obese category with BMI more than 30, 6.12 per cent of women in underweight category with BMI less than 18.50.

Further, it was found that the diet of 23.33 per cent of women police was good with a range of 7.1 to 8.5, among which an equal proportion of women police belonged to normal or grade I obese (3.33%, in each category). The group was also represented by 19.05 per cent grade II obese women, followed by 14.29 per cent pre obese category. It was also observed that 18.90 per cent of women police consumed a diet that could be categorised as poor, among which 35.29 per cent of women police belonged to normal category, followed by equal proportion of obese grade I and obese grade II (23.53% in each category). However, 17.65 per cent of women police belonged to pre obese category. Further, it was found that 3.33 per cent of women police consumed a diet that could be categorised as very good, in which 66.67 per cent of women police belonged to grade II obesity and single woman belonged to grade I obesity. On over all basis, among a total of 90 women police, a majority of them belonged to normal BMI (31.11%) followed by obese grade I (26.67). However, 23.33 per cent women police belonged to pre obese category of BMI and 15.56 per cent belonged to obese grade II while few women police (3.33%) belonged to underweight category of BMI. On overall, non significant association was recorded.

4.3.2.2 Diet quality of police women according to educational qualification

Association between educational qualification and diet quality of women police is presented in Table 22. It was observed that maximum percentage of women were graduates (34.44%), among whom 38.71 per cent consumed diet of fair quality, which ranged from 5.6 to 7.00, followed by 35.48 per cent of the subjects consuming a diet that could be categorized with score ranging as good, ranged from 7.1-8.5. However, an equal proportion of women police (12.90% in each category) consumed diet of very good or poor quality.

Second highest group with respect to educational qualification was of matriculate police woman (31.11%) among whom, maximum percentage of police women consumed diet of fair quality (53.61%), followed by 32.14 per cent consumed a diet that could be categorized as poor. Further it was evident that 10.71 per cent of women police consumed a diet of good quality, followed by single matriculate woman police consumed a diet that could be categorized as very good. Among the police women who completed Pre University Certificate (30.00%), a majority of women police (51.86%) consumed a diet that could be considered

fair, followed by 37.03 and 11.11 per cent consuming a diet that could be categorized as good or poor, respectively, whereas, three post graduate women police consumed a diet of fair quality. It was observed that single woman who was appointed on compassionate grounds was only a primary school attended woman and she consumed diet of poor quality. On over all basis, among a total of 90 women police, a majority (48.89%) consumed a diet that could be categorized as fair, followed by 26.67 per cent women police who consumed diet of good quality. It was observed that, 18.89 per cent of women police consumed diet of poor quality and few women police (5.55%) were found to consume diet of very good quality. It was revealed that association between educational qualification and diet quality of women police was statistically not significant.

4.3.2.3 Association between income and diet quality of women police

Association between monthly income and diet quality of women police is shown in Table 23. It was observed that among 43 women police (47.78%) who were getting a basic salary of ` 10,000 to 15,999/pm, a majority of respondents (55.81%) were found to consume a diet that could be categorized as fair quality, with diet quality scores ranging from 5.6-7.00. But 23.26 per cent of women police of this salary group consumed a diet of poor quality. Further, it was evident that 13.95 and 6.98 per cent of women police consumed a diet of good and very good quality, respectively with diet quality scores ranging from 7.1-8.5 for diet of good and more than 8.6 for very good quality diet.

It was observed that among 28 women police (31.11%), who earned a monthly basic salary of ` 16,000 to 20,999/-, a majority of the respondents (57.14%) were found to consume a diet that could be categorized as fair quality, followed by 25.00 per cent of women police consumed a diet of good quality. Further it was evident that 17.86 per cent of women police consumed a diet of poor quality. Among 14 women police (15.56%), earning a monthly salary of ` 21,000 to 25,999 a majority of subjects (57.14%) were found to consume a diet that could be categorized as fair quality, followed by 28.57 per cent who consumed a diet of good quality. Further it was evident that, 14.28 per cent of women police consumed a diet of poor quality.

It was observed that, among the police women who were earning a basic monthly salary of ` 26,000 to 30,999, 75.00 per cent women police were found to consume a diet that could be categorized as good quality, followed by single woman police who consumed a diet of fair quality. However, single women police earning a basic monthly salary of more than ` 30,999 consumed a diet of good quality. On over all basis, it was observed that a majority (54.45%) of subjects consumed a diet that could be categorized as fair, followed by 23.33 per cent of women police consumed a diet of good quality. It was observed that, 18.89 per cent of women police consumed a diet of poor quality and few women police (3.33%) were found to consume a diet of very good quality. It was revealed that association between monthly income and diet quality of women police was statistically not significant.

Table 20: Association between age and diet quality of women police

N=90

Age (years)	Diet quality				Total (%)	Modified χ^2
	Very good (8.6 and above)	Good (7.1 - 8.5)	Fair (5.6 - 7.00)	Poor (below 5.5)		
21-31	-	07 (18.92)	23 (62.16)	07 (18.92)	37 (41.11)	14.39^{NS}
32-42	02 (6.25)	04 (12.50)	19 (59.37)	07 (21.88)	32 (35.55)	
43-53	01 (6.67)	06 (40.00)	06 (40.00)	02 (13.34)	15 (16.67)	
More than 54	-	04 (66.67)	01 (16.67)	01 (16.67)	06 (6.67)	
Total	03 (3.33)	21 (23.33)	49 (54.45)	17 (18.89)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 21: Association between diet quality and nutritional status of women police

N=90

Diet quality	Nutritional status					Total	Modified χ^2
	Under Weight	Normal range	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
Very good (8.6 and above)	-	-	-	01 (33.33)	02 (66.67)	03 (3.33)	0.26^{NS}
Good (7.1-8.5)	-	07 (33.33)	03 (14.29)	07 (33.33)	04 (19.05)	21 (23.33)	
Fair (5.6-7.0)	03 (6.12)	15 (30.16)	15 (30.61)	12 (24.49)	04 (8.17)	49 (54.44)	
Poor (Below 5.55)	-	06 (35.29)	03 (17.65)	04 (23.53)	04 (23.53)	17 (18.90)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS –Non significant

Table 22: Association between educational qualification and diet quality of women police

N=90

Educational qualification	Diet quality				Total (%)	Modified χ^2
	Very good (8.6 and above)	Good (7.1 - 8.5)	Fair (5.6 - 7.00)	Poor (below 5.5)		
Less than matriculate	-	-	-	01 (100)	01 (1.11)	16.87^{NS}
Matriculate	01 (3.67)	03 (10.71)	15 (53.60)	09 (32.14)	28 (31.11)	
Pre University	-	10 (37.03)	14 (51.86)	03 (11.11)	27 (30.00)	
Graduate	02 (6.45)	08 (25.81)	17 (54.84)	04 (12.90)	31 (34.45)	
Post graduate	-	-	03 (100)	-	03 (3.33)	
Total	03 (3.33)	21 (23.33)	49 (54.44)	17 (18.90)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 23: Association between monthly basic salary and diet quality of women police

N=90

Basic salary (`/month)	Diet quality				Total (%)	Modified χ^2
	Very good (8.6 and above)	Good (7.1-8.5)	Fair (5.6 - 7.00)	Poor (below 5.5)		
10,000-15,999	03 (6.98)	06 (13.95)	24 (55.81)	10 (23.26)	43 (47.78)	14.99^{NS}
16,000-20,999	-	07 (25.00)	16 (57.14)	05 (17.86)	28 (31.11)	
21,000-25,999	-	04 (28.57)	08 (57.14)	02 (14.29)	14 (15.56)	
26,000-30,999	-	03 (75.00)	01 (25.00)	-	04 (4.44)	
More than 30,999	-	01 (100)	-	-	01 (1.11)	
Total	03 (3.33)	21 (23.33)	49 (54.44)	17 (18.90)	90	

Values in parentheses indicate percentages
NS-Non significant

Table 24: Performance of police women in different areas of nutrition knowledge

N=90

Area	Correct responses	
	Mean	Range
Nutrient source	76.11	53.00-89.00
Child nutrition	79.00	74.00-84.00
Nutrition and health	79.07	49.00-90.00
Overall	78.06	49.00-90.00

Table 25: Nutrition knowledge of police women

N=90

Women police	Category			Total (%)
	Low (15.00-20.55)	Medium (20.56-22.41)	High (22.42-25.00)	
Constables	01 (1.28)	21 (26.93)	56 (71.79)	78 (86.67)
Head Constables	-	01 (14.29)	06 (85.71)	07 (7.78)
Police Sub Inspectors	-	01 (33.33)	02 (66.67)	03 (3.33)
Assistant Sub Inspectors	-	02 (100)		02 (2.22)
Total	01 (1.11)	25 (27.78)	64 (71.11)	90

Values in parentheses indicate percentages

Table 26: Association between educational qualification and nutritional knowledge of women police

N=90

Education qualification	Nutritional knowledge			Total (%)	Modified χ^2
	Low (15.00 - 20.55)	Medium (20.56 - 22.41)	High (22.42 - 25.00)		
Less than matriculate	01 (100)	-	-	01 (1.11)	95.30**
Matriculate	-	10 (35.71)	18 (64.29)	28 (31.11)	
Pre University	-	08 (29.63)	19 (70.37)	27 (30.00)	
Graduate	-	05 (16.13)	26 (83.87)	31 (34.45)	
Post graduate	-	02 (66.67)	01 (33.33)	03 (3.33)	
Total	01 (1.11)	25 (27.78)	64 (71.11)	90	

Values in parentheses indicate percentages
**Significant at P≤0.01

Table 27: Association between nutritional knowledge and nutritional status of women police

N=90

Nutritional knowledge	Nutritional status					Total (%)	Modified χ^2
	Under Weight	Normal range	Pre obese	Obese Grade I	Obese Grade II		
	< 18.50	18.50 – 22.90	23.00-24.90	25.00-29.90	> 30.00		
Low (15.00-20.55)	-	01 (100)	-	-	-	01 (1.11)	4.70^{NS}
Medium (20.56-22.41)	-	09 (36.00)	07 (28.00)	05 (20.00)	04 (16.00)	25 (27.78)	
High (22.42-25.00)	03 (4.68)	18 (28.12)	14 (21.88)	19 (29.70)	10 (15.62)	64 (71.11)	
Total	03 (3.33)	28 (31.11)	21 (23.33)	24 (26.67)	14 (15.56)	90	

Values in parentheses indicate percentages
NS –Non significant

4.4 Nutrition knowledge of women police

Nutrition knowledge is one of the factors that affect the food habits of the individuals, families and communities

4.4.1 Performance of women police in areas of nutrition

Good nutrition knowledge is first step in attaining good health and fitness. Assessment of nutrition knowledge in different areas of nutrition police personnel revealed interesting results (Table 24). The overall nutrition knowledge score attained by respondents 78.06, which ranged widely from 49.00 to 90.00. The data deduced that the mean scores in all the three areas of nutrition knowledge were similar among police personnel. Number correct responses in the area of nutrient source was 76.11, with a range of 53.00 to 89.00. The mean or correct responses regarding child nutrition was 79.00, which ranged between 74.00 to 84.00. Similarly, the mean number of correct responses in the area of nutrition and health was 79.01, however, a wide range for the number of correct responses for the different areas of nutrition. Evaluation of nutrition knowledge of selected police personnel using a standard questionnaire (Appendix I) revealed that a majority of police Constables faired high in their nutrition knowledge (Table 25). It could be observed that among 78 women police Constables, 56 (71.79%) scored high on nutrition knowledge questionnaire scoring between 22.42 to 25.00 points, followed by 21 (26.93%) women police Constables scoring medium scores ranging between 20.56 to 22.41 points. Among seven women Head Constables a majority (6 or 85.71%) scored high scores for nutritional knowledge and one officer scored medium scores. Among the three Police Sub Inspectors, two officers scored high whereas one officer was mediocre in nutritional knowledge. The Assistant Sub Inspectors in the present investigation recorded medium scores for the nutritional knowledge test.

On overall basis 71.11 per cent of the police personnel recorded high nutritional knowledge scores and 27.78 per cent recorded medium scores and only 1.11 per cent exhibited low scores.

4.4.2 Association between educational qualification and nutritional knowledge of women police

Adequate knowledge of nutrition is very important to be able to make appropriate dietary decisions with respect to food selection and consumption. Association between educational qualification and nutritional knowledge of women police is presented in Table 26. It was observed that among a total of 90 police women selected for the investigation, maximum percentage of women were graduates (34.45%), among whom 83.87 per cent scored high for nutritional knowledge, with scores ranging between 22.42 to 25.00, followed by 16.13 per cent personnel scored medium nutritional knowledge ranging from 20.56 to

22.41. It was revealed that among the group of matriculate women police (31.11%), a majority of them scored high scored for nutritional knowledge (64.29%). The group was also represented by women police who scored medium scores for nutritional knowledge (35.71%). It was also observed that, among police women with Pre University Certificate (30.00%), a majority of them (70.37%) scored high scores for nutritional knowledge, followed by medium (29.63%) nutritional knowledge scores. Among post graduate police women (3.33%), a majority of them (66.67%) scored medium scores for nutritional knowledge, followed by single woman police who scored high for nutritional knowledge. Further, it was observed that one woman who was appointed on compassionate grounds and scored low nutritional knowledge. On over all basis, among a total of 90 police women, a majority of them belonged to high nutritional knowledge category (71.11%). Followed by 27.78 per cent of women police scored medium nutritional knowledge. However, single women police scored low for nutritional knowledge. On overall, strong significant association between educational qualification and nutritional knowledge was recorded.

4.4.3 Association between nutritional knowledge and nutritional status of women police

In order to remain healthy and physically fit and to lead healthier life style it is necessary to possess good nutritional knowledge and practices. Association between nutritional knowledge and nutritional status of women police is shown in Table 27. It was observed that nutrition knowledge of 71.11 per cent of respondents was high with scores ranging between of 22.42 to 25.00, among which a majority of women police (29.70%) belonged to obese grade I category with BMI ranging between 25.00 to 29.90, followed by 28.12 per cent of respondents belonging to normal category and BMI ranging between 18.50 to 22.90. Whereas, 21.88 per cent belonged to pre obese category with BMI ranging from 23.00 to 24.90. The group was also represented by obese grade II (15.62%) and underweight (4.68%) category with BMI of more than 30 and less than 18.50, respectively for the two groups.

It was revealed that a total of 27.78 per cent of women police scored medium nutritional knowledge among which a majority of police women belonged to normal category of BMI (36.00%). The group was also represented by 28 per cent pre obese women police, followed by 20 per cent grade I obese police personnel, while, 16 per cent of women police belonged to grade II obesity. Further, it was found that single woman police scored low for nutritional knowledge and belonged to normal BMI category. On over all basis, among a total of 90 women police, most of them were in normal BMI (31.11%) followed by obese grade I (26.67%). However, 23.33 per cent women police were grouped under pre obese category, 15.56 per cent were considered as obese grade II and few women police (3.33%) were considered as underweight category. On overall, non significant association was recorded.

5. DISCUSSION

The physical well being and maintenance of normal health of police woman is closely related to the status of nutrition. Adequate nutrition keeps them healthy and fit whereas inadequate nutrition reduces fitness, physical endurance and causes susceptibility to diseases. Police women have double burden of their strenuous job and also have to manage their family chores and children. At recruitment physical fitness is considered, but later there are no performance analysis for police personnel irrespective of gender. A question about fitness of police personnel has been raised very often (Anon., 2015).

Optimum nutrition promotes growth and development, builds immunity to diseases, and leads to long healthy life by keeping the mind and body work at the highest level (Baysal, 1989 and Teko, 1999). Long work hours and difficult work schedules may impair the health of women police. A report (Anon., 2015) indicated that majority of police suffer from diabetes, hypertension and heart related disorders. It is a common sight to see obese police personnel in India. However in developed countries like US, the staff is suggested to be physically fit lest they would be fired or sent on compulsory leave. For instance in California, at entry level test, the aspirant is expected to perform 27 sit ups and 15 push ups in one minute. It is also mandatory that the aspirant has to run 1.5 miles in 15.54 minutes or 300 m in 71 sec. Further, the police aged 30 to 39 years has to perform 24 sit ups and 12 push ups in one minute. The police is expected also to run 1.5 miles in 18 min. Such as strict role or maintenance of physical fitness is observed. Even in Karnataka, during state police enrolment the aspirant is expected to cover 1600 m in 6.3 minutes and jump a height of 1.2 m from a distance of 3.8 m. But after enrolment there is no compulsion of being fit (Anon., 2015).

Policing being a multifaceted demanding profession, involves long and uncertain hours of duty. But women police often neglect their diet and health. Police women face greater challenges in striving for balance between work and family responsibilities and it is reported to be one of the biggest challenges for police women in India (Ghosh, 1981)

The present investigation has evaluated nutritional status, nutrition and food behaviour and nutritional knowledge of the women police in terms of anthropometric measurements, nutrient intake, diet quality and nutritional knowledge. The salient results of the investigation are discussed in this chapter.

In the present investigation, a majority of the women police were in the age range of 21-31 years. Maximum number of subjects were graduates. It was also revealed that 86.00 per cent of women police were constables with a monthly income ranging from `10,000 to 15,999/-. Most of the respondents were found to be graduates, with a work experience ranging from 6 to 10 years, 83 per cent of women police were from nuclear families (Table 2).

5.1 Nutritional status of women police

Nutritional anthropometry is concerned with the measurements of physical dimensions and gross composition of human body at different levels and degrees of nutrition. In the present investigation it was observed that obesity among women police was distributed across the cadres in all age groups. The mean values for BMI and WHR give a blurred picture of the nutritional status of police women. Because the range of values clearly indicate a wider status for malnutrition both under and over nutrition among the subjects. Age wise categorization of police women clearly indicated this phenomenon (Table 3). However no significant association between BMI and years of work experience, cadre, income, and education and duty hours (Tables 9 to 13) was recognized in the present investigation. Kong *et al.* (2012) indicated overweight and obesity during assessment of self monitoring and eating related behaviours among post menopausal overweight obese women who skipped meals very often. Skipping of meals especially breakfast was reported in more than 75.00 per cent in the present investigation (Table 14). This could have contributed to the nutritional status of the subjects.

Schmeiser (2007) indicated that in the US among men and women, the expanding wallets increased the waist lines. It was reported that an additional $ 1000 increased the BMI by 0.50 pounds in men and 1.45 pounds in women. It was also indicated that high levels of sedentary behaviour were associated with poorer weight-loss maintenance among African American women even for those with high levels of physical activity. The authors implied that physical activity and sedentary behaviour, independently and combined, were associated with BMI and weight-loss maintenance (Taylor *et al.,* 2015). Determining the presence or absence of metabolic syndrome components in a high risk occupational cohort of police officers provided beneficial information on a work force that was self selected into their occupation based on good overall physical and mental health. The risks of metabolic complications were substantially increased in about 39.00 per cent of women police as indicated by waist circumference of more than 88.00 cm. When waist to hip ratio was considered, still higher percentage of women were at risk with 47.78 per cent women who were at substantially increased risk of metabolic complication with WHR of more than or equal to 0.85 (Table 5). Thus the study indicates the necessity of bringing awareness about the nutritional being of the subjects in the present investigation. The policing requires physical fitness agility and endurance in the job. But the current state of affairs is discouraging for the job needs.

Higher waist circumference (90.96 cm), 81.28 to 99.06 were also recorded in police women in the present study (Table 3). The prevalence of an elevated waist circumference for women and men in NHANES III 2014 was nearly 50 per cent and 30 per cent, respectively (Violanti *et al.,* 2014). It was indicated that 30.60 per cent of New York police officers (both women and men combined) were obese as measured by waist circumference of 102 cm in

men, more than or equal to 88 cm in women. Similar high BMI and larger waist circumference was reported by Gu *et al.* (2012) among male police officers who worked the mid night shift, worked longer hours in US North east city. However a lesser percentage of women police officers (16.70%) were reported to be obese.

Classification of police personnel clearly indicated that less than one third of the police women were although normal, more than 65 per cent of the police women were obese either in pre obese state obese grade I or grade II state (Table 4). The report (Anon., 2015) supports the present data that at entry the aspirants are fit physically but later there is no monitoring. The results were on par with the study of McArdl *et al.* (1991) who mentioned that after age 30-40, years there was a decrease in lean body weight but fat weight increased. In the present investigation a strong significant association was recorded between age and body mass index of women police (Table 6).

This observation of police women being overweight or obese could be due to sedentary life style and lack of physical activity of police women. In the present investigation police women were often given sedentary job charts such as patrolling, office works, record maintenances, computer operated traffic control works, etc. The sample although comprised of different cadres of police personnel, a majority were constables who were given physically less strenuous works and this could have reflected in the findings of the investigation.

The study indicated that the mean BMI and per cent ideal body weight of both urban and rural exceeded 100 per cent, indicating higher body weight among police personnel of both locations. However, there was a wide range in ideal body weight in both the locations. Similar trend was observed with respect to BMI reflecting that both the groups were obese. Thus malnutrition either obesity or under nutrition were common among women police of both location.

As per waist circumference, although mean values although did not indicate risk of metabolic complications, there was a wide variation of 60.96 to 111.76 cm among urban police women and 80.01 to 96.52 among rural police women (Table 7). This indicated a substantially increased risk of metabolic complications among police women of both the groups. Similar trend was observed with respect to waist to hip ratio. However, contrasting results of undernourished women workers of tea garden and women sweepers were reported by Manna *et al.* and Pradhan *et al*. (2012). This variation could be due to the type and nature of women engaged in. In the current investigations, women police were engaged in sedentary works of the police department and hence the women tended to be obese.

5.2 Food and nutrition behaviour of women police

Health status is indicated by food behaviour and life style. Positive energy balance leads to obesity. Lack of exercise and physical training results in poor physical fitness and

endurance. Balanced diet and good life style assure physical fitness. In the present investigation, a majority of women police were vegetarians and consumed three meals per day, but a total of 22.22 per cent of women skipped their meals, which was attributed to lack of time either to prepare meals or to attend emergency services as demanded by police job. It was observed that 70.00 per cent of police women skipped breakfast as it was difficult to eat breakfast amidst household chores of the family. Few police women missed lunch (15%) or snacks (15%) to attend emergency calls. The findings were in conformity with the results of Kong *et al .* (2012), who reported that skipping one or two meals daily contributed to overweight and obesity. The authors also reported that the skipping of meals or fasting could cause an individual to respond more favourably to high caloric foods and therefore could result in consumption of more calories on overall basis. Skipping of meals in the present investigation could be due to several reasons. It could be due to travelling distance from home to office, or burden of cooking all meals single handedly in nuclear families. Working women in India usually shoulder responsibility of preparing family food, and when the family size increases after marriage women find it difficult to cook all meals within available time in the mornings. In the present investigation it was also observed computation of nutrient composition revealed that diet of police women contained more energy than the recommended dietary allowances (Table 16). This could be due to consumption of more cereals and fats than the suggested balanced diet (Table 15). Excess of energy intake in comparison with the expenditure leads to positive energy balance thus obesity among women police.

It is established that food intake varies according to age, gender, economic status, food availability, purchasing capacity, likes and dislikes. Adequate nutrition should be ensured to meet the recommended dietary values. However, consumption of processed foods, fast foods, long hours of working and stress lead to erraneous food intake specially among working populations, more so among the police force who work outdoors. Such a phenomenon was reported among various working population groups. In the present investigation it was observed that the intake of all foods (except cereals and fats was lower than the suggested balanced diet (Table 15). The intake of cereals and fats was higher than the suggested balanced diet, which may be due to the fat that cereals are staple foods. Fat content of the diet consumed was also high, which might be because of cooking practices employed by the police women. Excessive use of fat enhances taste of food and this is common practice in North Karnataka. The increased energy and fat could also be due to consumption of foods. The results of the present investigation were on par with the results of Sharan and Purttaraj (2003) who revealed that cereal consumption was high among canteen food consumers compared to home food consumers in a study on food consumption pattern of executives and non executives employees of Bharat Electronics Ltd., Bengaluru. Devadarsini *et al.* (2012) also reported that adequacy of cereals and pulses ranged around 80 per cent among shift and day workers of Bhuvaneshawar, Orisssa.

With regard to nutrition knowledge, in the present investigation it was revealed that the police women (71.11%) had high nutrition knowledge (Table 25) but, very few police (22.22%) consumed diet of good quality (Table 18), indicating the inadequate execution of nutritional knowledge in their practice. However, a majority of police women consumed a diet of fair quality indicating poor practices. As a consequence of poor dietary habits accompanied by sedentary lifestyle could have lead to increased weight of police women in the present investigation. Kayapinar and Savas (2012) indicated that there were differences between knowledge acquired and actual practice among 96 police personnel of Turkey. It was indicated that the personnel became overweight due to lack of physical activity. It was also evident from the present research that nutritional status of women police was not associated with either the nutritional knowledge or diet quality (Table 21 and 27).

The computation of nutritive value of diets consumed by police women revealed that the adequacy of macro nutrients such as energy and fat and micronutrients like magnesium exceeded the recommended dietary allowances (Table 16). Higher intake and adequacy of fat and energy could be due to consumption of food in commercial eateries which the women police often practiced. This was revealed during oral discussion with the police personnel. The police personnel often ate their food in restaurants during job hours of patrolling or traffic control. Further it was also observed that the women police did not have fixed time for food consumption during the day. Similar results were observed by Joseph *et al*. (2005), Devadarshini *et al*. (2010), Renjini and Divakar (2010) Gu *et al.* (2012) and Guffey and co-workers (2015), who reported that excess energy and fat intake were observed among working populations, across different job ventures.

In the present investigation, it was recorded that, protein, calcium, iron, β carotene, riboflavin, vitamin B_6, vitamin C, folate, vitamin B_{12} and zinc content of diets consumed by police women were below the recommended dietary allowances (Table 16). This could be became of low consumption of protective foods such as fruits and vegetables (Table 19). It was interesting to note that pulses, milk and milk products were widely consumed by about 70 per cent police women. This could be due to availability of variety of pulses, and they being most common food ingredient only next to cereals in North Karnataka. Further, the satisfactory consumption of milk could be attributed to frequent consumption of tea which is again very common feature among working populations in North Karnataka. Further, typical to the regional food pattern curds and buttermilk are important food components either during lunch and or dinner or in both meals. Thus, there was a large percentage of police women recording satisfactory scores for these food groups. Results of Sharan and Puttaraj (2003) indicated that consumption of milk and milk products was significantly higher among women who consumed canteen foods. A strong significant association was found between educational qualification and nutritional knowledge of women police (Table 26). These results were on par with those of Yelen (2014) who revealed that nutritional knowledge index score of 95.22 per cent among educated women, *viz.,* lady teachers who were either graduates or

postgraduates reflected good nutritional knowledge. Thus the results of the study indicated that although nutritional knowledge was good, the dietary intake was fair indicating nutritional status. Malnutrition was distributed across the cadres and age groups.

Future line of work

1. Nutrition status and physical fitness of male police officers.

2. Assessment of male police personnel

6. SUMMARY AND CONCLUSIONS

A study entitled 'the nutritional status and food behaviour of women police of Hubballi-Dharwad' was carried out during 2013-2014 at UAS Dharwad, Karnataka. The purpose of the present study was to assess the nutritional status, food and nutrition behaviour, nutritional knowledge and diet quality of women police working in technical cadres of police department.

A total of 90 women police who were available on roll during the period of investigation were included for the investigation. The sample constituted of 78.28 per cent of police women working in 17 different urban and rural police stations of Hubballi and Dharwad. General information such as age, cadre, basic salary, educational qualification, work experience, duty hours, distance of working place from residence, marital status, type of family and family size of police women were collected by self structured questionnaire.

Information on dietary pattern was collected by diet survey and nutrient composition of diet consumed by women police was computed using 24 hour recall method. A set of pre standardized vessels was used to assess the food intake. Food intake was compared with suggested balanced diet for women and discrepancy recorded. The adequacy of nutrient intake was assessed in comparison with recommended dietary allowances. Diet quality of women police was evaluated using a questionnaire based on inclusion of different food groups in the diet. Knowledge related to nutrient source, child nutrition and nutrition and health of police women was assessed using a questionnaire. Nutritional anthropometry was carried out to elicit nutritional status in terms of BMI and risk of metabolic complications in terms of WHR. The salient findings of the study are summarized below.

In the present investigation it was observed that a highest percentage of the women police (41.11%) were in the age group of 21-31 years, and 86.67 per cent of the police women were constables. Monthly basic salary of 47.78 per cent police personnel ranged between ` 10,000-15,999/-. Most of the subjects were graduates (34.45%) or matriculates (31.11%) a woman who was appointed on compassionate grounds had attended primary school. The work experience of 37.78 per cent women police ranged from six to ten years and 74.44 per cent worked for six to eight hour per day. Distance to reach the job place from home ranged from one to five km among 48.89 per cent of police women, although some travelled even more than 30 km. A majority (78.89%) were married and lived in nuclear families (83.33%).

Nutritional anthropometry revealed that with increase in age of police women there was an increase in body weight and BMI, in a majority of police women. The categorization of nutritional status of women police as per WHO classification revealed that a majority of women police (65.56%) belonged to either pre obese, obese grade I or obese grade II

category. A statistically significant association was found between age and BMI of women police. Waist to hip ratio assessment to know the risk of metabolic complications indicated that the risks of complications were substantially increased in 47.78 per cent of women. Non significant association was recorded between body mass index and age, years of experience, post held, income status, educational qualification and duty hours of women police. The dietary pattern of women police indicated that a majority of the women police were vegetarians (68.89%) and most of them (86.67%) consumed three meals daily. It was noticed that 22.22 per cent of women police skipped one or the other meals, breakfast was the most common skipped meal in a day.

It was recorded that all foods were consumed in lesser proportions as compared to suggested balanced diet. But cereals and fats were consumed in excessive quantities, 116.67 per cent for cereals and 170.90 per cent more than the suggested balanced diet for fat. Computation of mean nutrient intake indicated that energy, fat and magnesium content were consumed above the recommended dietary allowances. Rest of the nutrients such as protein, calcium, iron, β carotene, riboflavin, vitamin B_6, vitamin C, folate, vitamin B_{12} and zinc content were below the recommended dietary allowances in the diets of police women. However, thiamine and niacin content were on par with the recommended dietary allowances. More than half of the women police consumed diet of fair quality (54.45%), with diet scores ranging from 5.6 to 7.00 on a scale of 10 points. It was also recorded that although 22.22 per cent of police women consumed a diet of good quality (scores 7.1 to 8.5) 18.89 per cent of police women consumed a poor quality diet (scores below 5.5). Cereals, pulses, milk and milk products were present almost in every meal of the police women. Non significant association was recorded between age, educational qualification, cadre and basic salary with diet quality of women police.

With regard to nutrition knowledge of police women, it was revealed that a majority (71.11%) had high nutritional knowledge. Further, most of the women police gave correct answers in the areas of child nutrition and nutrition and health. A strong significant association was recorded between educational qualification and nutritional knowledge of women police. Nutritional status of women police was not associated with either the nutritional knowledge or diet quality.

Optimum nutrition is important for health and maintenance of function of the body. Discrepancies in food behaviour, nutrient intake lead to malnutrition among police women. Empowerment of women with appropriate nutritional knowledge would help police women to followed balanced diet for maintenance of good health. But in the present investigation although the police women exhibited good knowledge scores, the diet quality was poor, indicating poor practices, resulting in malnutrition.

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Appendix I: Categorization of nutritional knowledge of women police

(N= 90)

SL. No	Nutritional knowledge aspect	Frequency (Yes %)
	Nutrient source	
1.	Water is a nutrient	89 (98.88)
2.	The cheapest source of vitamin-'C' is amla	89 (98.88)
3.	Protein is required only during growth promoting period	88 (97.77)
4.	Whole grain cereals are rich sources of 'B' complex vitamins	77 (85.55)
5.	Fats and oils gives maximum energy	53 (58.88)
6.	Carbohydrates yield energy	60 (66.66)
7.	Meat, fish and dhal are rich in protein	74 (82.22)
8.	Green leafy vegetables are good sources of iron	83 (92.22)
9.	Night blindness is caused due to deficiency of vitamin –A	72 (80.00)
	Child nutrition	
10.	Colostrums (the fluid secreted in the first few days after delivery) should not be given to the new born infant, because it is impure	84 (93.33)
11.	As long as the child is breast fed, there is no need to give other foods	74 (82.22)
	Nutrition and health	
12.	Balanced food is the one which contains all foods in equal amounts	80 (88.88)
13.	Milk is rich in iron	77 (85.55)
14.	Sunflower oil is better than dalda	90 (100.0)
15.	A mixed cereal diet is more nutritious than a single cereal diet	88 (97.77)

16.	Papaya is good for eye	84 (93.33)
17.	Balanced diet and daily exercise will keeps the individual healthy	89 (98.88)
18.	Fluids should be consumed more in vomiting and diarrhea	79 (87.77)
19.	Polished rice is better than unpolished rice nutritionally	83 (92.22)
20.	Pressure cooking reduces nutrient loss	67 (74.44)
21.	Calcium is essential for the development of strong bones and teeth	88 (97.77)
22.	Fortified salt prevents goiter	67 (74.44)
23.	Low fiber in diet causes constipation	49 (54.44)
24.	Lack of iron in the diet, leads to anemia	66 (73.33)
25.	Judicious consumption of fruits and vegetables in the diet improves health	90 (100.00)

NUTRITIONAL STATUS AND FOOD BEHAVIOUR OF WOMEN POLICE OF HUBBALLI-DHARWAD

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ABSTRACT

An investigation was conducted to assess the nutritional status, food behaviour, nutritional knowledge and diet quality of 90 women police working in technical cadres of police department of Hubballi-Dharwad. A majority of police women were working as Constables (86.67%), had 6-10 years of experience (37.78%) and belonged to 21-31 years (41.11%). Assessment of nutritional status indicated that 31.11 per cent were normal and obesity was distributed across all the age groups among all the cadres. It was observed that 26.67 per cent of police women were in obese grade I category. Strong positive association was recorded between age and BMI. The risks of metabolic complications were substantially increased in 47.78 per cent of women police as indicated by WHR of more than or equal to 0.85. It was observed that the nutrient adequacy of women police varied widely for energy (81 to 157%), protein (55.64-95.64), fat (109.85 to 379.60%), thiamine (96.00 to 211.00%) and magnesium (31.20-298.49%) contents of diets. Rest of the nutrient contents were lower than the RDA. Police women consumed a diet that of fair quality (54.45%), followed by good (22.22%) and poor (18.89%) qualities. Only 4.44 per cent women police consumed a diet of very good quality. Nutritional knowledge of 71.11 per cent was high and 27.78 per cent recorded medium knowledge scores. Strong positive association was recorded for educational qualification and nutritional knowledge of women police but not with nutritional status.