CREATING AWARENESS FOR IMPROVEMENT OF FOOD BEHAVIOUR AMONG RURAL WOMEN OF NORTH KARNATAKA

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JULY, 2016

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Thesis submitted to the
University of Agricultural Sciences, Dharwad
in partial fulfillment of the requirements for the
Degree of

MASTER OF HOME SCIENCE

IN

FOOD SCIENCE AND NUTRITION

BY
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CERTIFICATE

This is to certify that the thesis entitled "CREATING AWARENESS FOR IMPROVEMENT OF FOOD BEHAVIOUR AMONG RURAL WOMEN OF NORTH KARNATAKA" submitted by Miss. CHAITRA R. ASUNDI 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 carried out by her during the period of her study in this University under my guidance and supervision and thesis has not previously formed the basis of award of any degree, diploma, associateship, fellowship or other similar titles.

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ACKNOWLEDGEMENT

First of all, I would like to acknowledge the greatness and power of almighty God in granting me good health and knowledge towards the completion of this study.

I express my profound and deep sense of gratitude with utmost sincerity and heartfelt respect to my guide, Dr. (Mrs.) BHARATI CHIMMAD, Professor, Department of Food Science and Nutrition, College of Rural Home Science, UAS, Dharwad for her valuable suggestions, constant encouragement and cooperation during the course of investigation and completion of thesis. She had been a source of constant inspiration and support. Her encouraging words and moral support throughout the study period has enabled me to go through the ups and downs and complete my research successfully.

I avail this opportunity to express my heartfelt thanks and gratitude to the members of my advisory Committee, Dr. (Mrs.) Usha Malagi, Professor and Head, Department of Food Science and Nutrition, RHSc, UAS, Dharwad, Dr. (Mrs.) Sunanda Itagi, Associate Professor, Department of Human Development and Family Studies, RHSc, UAS, Dharwad.

With immense pleasure I record my sincere thanks to my teachers Dr. Pushpa Bharati, Professor , Dr. Nirmala B. Yenagi, Professor, Dr. Kasturiba B., Professor and Dr. Uma Kulkarni, Professor, Department of Food Science and Nutrition.

I feel the inadequacy of diction in expressing my sincere heartfelt gratitude and affectionate regards to my beloved parents, Mr. Rajashekhar Asundi and Mrs. Vinoda Asundi, cousin Sagar Kanchanalli and sister Medha Asundi and my grandmother whose unceasing prayer and unfailing affection has always been a source of inspiration to me.

My heart is joyous to express my gratitude to all my friends for their moral support and encouragement throughout the course of investigation and for their open hearted suggestion without which I could not have successfully completed my thesis.

I am very thankful to non-teaching faculty of Department of Food Science and Nutrition for their kind co-operation and encouragement during my study and research.

Lastly, I thank Arjun Computers, Dharwad who neatly binds this thesis in short time, deserves all my praise for moving his finger with caution and concentration.

……. any omission in this brief acknowledgement doesn't mean lack of gratitude.

DHARWAD

JULY, 2016 **(CHAITRA R. ASUNDI)**

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1. INTRODUCTION

Diet and nutrition are important factors in promotion and maintenance of good health throughout life cycle. The availability of good quality food served in adequate quantity can nourish the body adequately. There are many food choices available in the current era for people belonging to different socio-economic status. All the food that one eats need not be safe and healthy. Some foods are good and helpful for maintaining health, while some are hazardous beyond one's imagination. It is in the hands of the home maker to supply healthy food to family members through selection of better foods, besides following better cooking practices. Nutrition is one of the major environmental factors responsible for maintenance of health and physical fitness. The socio-economic status, food costs, individual preferences, beliefs, culture and geographical locations interact in a complex manner to shape dietary habits and affect the morbidity and clinical status of women and their families.

Through the centuries, woman has been at the heart of the family, providing care for the family. In rural India women is often the last to be cared for and severe malnutrition in a family is often most apparent in women than children of the family. Usually man is best fed as he is the bread-winner, the children would come next in the mother's efforts to feed the family - leaving very little for her. This often leads towards under nutrition of women. The health of Indian women is intrinsically linked to their socio-economic status in society, especially for those living in rural areas.

Women are responsible for family health, but are also victims of poor nutritional status. Poor health has repercussions not only on women, but also on their families. Women in poor health are more likely to give birth to low birth weight and preterm infants. Poor nutrition during reproductive ages can lead to reduced immunity and impaired physical and mental development among children. Therefore women should be adequately nourished to be healthy and should be empowered for healthy food selection and preparation.

According to National Family Health Survey-IV data (Anon., 2016), nearly one fourth (24.30 %) of rural women (15- 49 years) in Karnataka recorded a BMI below normal and 46.10 per cent were anemic indicating a high prevalence of nutritional deficiency. Thus there is a need to create awareness about importance of healthy diet among rural women. Women in reproductive group are most vulnerable and susceptible to various nutritional disorders and deficiencies. There is a need to improvise their health as they are the core of the family and it is in their hands to build a healthy family through selection of better food consumption pattern. Family decision in making the purchase of food items consolidates the role of women in rural household (Amir and Ghufran, 2015). The health status of women is related to their food behaviour (both quality and quantity) and reproductive activities (Kumari, 2013). All these clearly suggest a condition of emergency for improving the nutritional status of women in rural areas (Rout, 2009).

Nutrition transition is witnessed in the current era in the rural settings also and this in turn has an impact on the nutritional status of women and also her family members. It is even more important in case of women, since an undernourished woman gives birth to an undernourished child, contributing to a vicious circle of under nutrition. Arresting the problem of undernourishment at different stages of the lifecycle is essential to reduce the huge burden of under nutrition (Vishwanathan *et al.,* 2015).

A study conducted in rural population of south India indicated dietary transition in terms of purchase of processed foods, thus nutritional transition (Puttaratnamma *et al.,* 2015). Nutrition transition is said to be one of the major causes of rising incidences of non-communicable diseases in Indian population. One of the major changes observed in dietary patterns is consumption of processed foods/junk foods and eating away from home. The primary driving forces for purchase of processed foods are suggested to be mother's willingness to procure such foods, followed by media influence. Price and quality of foods are reported to be influencing factors for purchase whereas saving of time is indicated to be another major reason for selection of such foods.

Of late, with advancement in technological development of food industries, food habits are changing rapidly all over the world. Junk foods have become part and parcel of rural households also. Junk food is an empty calorie food which is high in calories and deficient in fibre, protein and micronutrients such as vitamins and minerals. These foods lack the vital nutrients and cannot promote health and in turn lead to many non communicable diseases which further influence health of the individuals adversely. The term "Junk food" was coined as a slang word in terms of the public interest in 1972 by Michael Jacobson, Director of the Center for Science, Washington D.C. (Ashakiran and Deepti, 2012).

Centre for Science and Environment of India (Anon., 2012) defines junk food as "any food, which is low in essential nutrients and high in everything else-in particular calories and sodium. Junk foods contain little or no proteins, vitamins or minerals but are rich in salt, sugar, fats and are high in energy.

These junk foods may contain several harmful additives which pose risk of cancer, attention deficit hyperactivity disorder, hyperactivity, caries *etc.* Junk foods besides being harmful may provide empty calories without protective nutrients and are addictive leading to imbalanced nutritional status. Many non-permitted additives are being used. Hence caution is required during consumption of foods containing food additives.

There arises a need to spread awareness about the health hazards of consumption of junk foods among the women in rural areas. These actions can all be considered part of the process of "nutrition education" when defined broadly as "any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoption of food choices and other food- and nutrition-related behaviours conducive to health and wellbeing" (Contento, 2008).

Women's education is recognized as an important aspect for improving health of family by many major international development agencies and crucial for developing countries. Nutrition education is an essential component to improve the nutritional status of people. Reports by Rustad and Smith (2013) indicated that nutrition education intervention for women of low-income favorably changed attitudes regarding the ability to purchase nutritious foods, which suggested that adult education, could be an important tool to increase favorable nutrition and health behaviors in the population. Recognizing the significant role women play in food selection and preparation thereby family health, Government of India has emphasized on educational empowerment regarding nutrition in National Nutrition Policy for India (Anon., 1993). It is one of the several mandates of Food and Nutrition Board of Government of India, to improve the nutritional status of Indian population.

The nutrition education plays an important role in improving the nutrition knowledge and food behaviour of rural women. The findings of the study of Nagamani, (2014) revealed that there is an urgent need to initiate nutrition education programmes to improve the health and nutritional status of women from deprived communities. The studies reviewed by Singh *et al*. (2014) also concluded that nutrition education is an effective tool in increasing the level of nutrition knowledge as well as nutrient intake among adolescent girls and rural women. So it is important to conduct awareness programmes on food choices and nutritional requirements on a regular basis especially among low income groups (Renjini, 2014). It was also concluded by Kumari (2013) that rural women need to be educated about balanced diet and healthy food habits. Limited studies are available on junk food consumption pattern; assessment of nutritional status, sensitization for formulation of healthy diets and harmful effects of junk foods and assessment of impact of nutrition education on nutrition knowledge and food behaviour of rural women in different agro-climatic zones of north Karnataka falling under the jurisdiction of University of Agricultural Sciences, Dharwad. Hence the present investigation was planned with the following objectives.

i. To know the food habits and extent of consumption of junk foods in rural families
ii. To assess nutritional status and nutritional lacunae among women in reproductive age
iii. To sensitize rural women about planning healthy diets and effect of junk food consumption through innovative learning objects
iv. To assess the impact of learning objects on nutritional knowledge and family food behavior.

2. REVIEW OF LITERATURE

Woman faces vulnerable phase four times in life time *viz*., childhood, pregnancy, lactation and at old age. Woman bears the burden of life more than men both at work and home. She has manifold activities in home front and at job. Her role is important in creating healthier families because home is the first environment where food habits of life time are determined and refined. A well educated woman is expected to build a healthy family and vice-versa. Because of the technological advancement in India and abroad, a big revolution in food industry has resulted there by influencing food behaviour and nutritional status of families even in rural areas. Many investigations are conducted on food behaviour of rural families with special reference to women, nutritional status, nutrient adequacy and nutrition knowledge. Results of these investigations are reviewed in this chapter.

2.1 Nutritional status of women in reproductive age

Women of child bearing age constitute a vulnerable segment of population because of their special needs in connection with the reproductive function. The nutritional status of women in child bearing age plays a vital role on growth and development of foetus. Several studies are conducted in India and abroad to know the nutritional status of women in reproductive age is reviewed on the following paragraphs.

Rout (2009) studied nutritional status of 4,425 women (15-49 years) in rural Orissa by nutritional anthropometry. The results revealed that a profound variation in nutritional status among rural women. As far as height was concerned 15.20 per cent of the rural women were below 145 cm which could lead to complications during child birth. On the other hand, 19.80 per cent were above standard and possessed a height more than 155 cm. About 34.60 per cent of rural women fell in the category of below 40 kg and only 12.70 per cent of the rural women weighed more than 50 kg. It was observed that according to national family health survey 48.60 per cent of rural women were found to be in the low body mass index group (< 18.50 kg/ m^2). As far as obesity was concerned among rural women only 3.30 per cent of them were obese (>25.00 kg/ m^2).

Nutritional status of 224 non-pregnant, non-lactating women of reproductive age (15-49 years) was assessed in Erute internally displaced persons' camp-Lira district of Uganda (Komakech, 2010). Nutritional anthropometry of women revealed that 48.70 per cent were underweight with a mean body mass index of 16.10 and 47.80 per cent were of normal weight. About 3.50 per cent of the women were overweight while 1.00 per cent was obese. The overall mean mid-upper arm circumference (MUAC) among the women was 25.50 ± 6.30 cm. The younger women below 25 years (22.20 ± 2.80 cm) had a lower mean MUAC compared to older women with age of 25 or above (27.6 ± 4.2 cm).

Nutritional anthropometry of 462 rural women in reproductive age group (15-49 years) of Azamgarh district, Uttar Pradesh revealed that the mean body mass index (BMI) of women was 19.60 ± 3.00 kg/ m^2 (Mishra *et al.,* 2011). About 31.20 per cent were normal (20.00-25.00 BMI), 38.90 per cent were chronic energy deficient (<18.50 BMI), 24.30 per cent were undernourished (18.50-20.00 BMI) and 5.60 per cent were obese (≥25.00). The chronic energy deficiency was significant among

the SC/ST categories (60.90 %) and obesity was prevalent among upper caste (13.80 %) category. As much as 63.20 per cent women suffered from under nutrition as judged by BMI less than 20 kg/ m^2 and 8.80 per cent were severely undernourished with BMI less than 16 kg/ m^2.

Assessment of nutritional status by anthropometry revealed that 100 per cent of 45 rural adolescent girls (12-19 years) residing at hills of Garhwal region in India were chronic energy deficient with BMI <18.50 kg/ m^2 (Saxena and Saxena, 2011). The results showed that, the mean height was 151.33 ± 6.45 cm and mean weight was 39.63 ± 6.25 kg. The mean BMI (kg/ m^2) was 17.24 ± 1.91. The study also revealed that 34.61 per cent of adolescents' girls were found to be stunted. The overall prevalence of thinness was 43.47 per cent. Under nutrition was prevalent in more than 50.00 per cent of the rural adolescent girls having less than 3rd percentile of weight for age by National Center for Health Statistics standards. The prevalence of stunting, thinness and underweight was high among adolescent girls living at high altitudes.

Dobhal and Raghuvanshi (2012) studied the nutritional status of 90 non-pregnant, non-lactating randomly selected rural women (18-60 years) of Uttarkashi of Uttarakhand, revealed average body mass index to be 20.73 ± 2.10 kg/ m^2. Body density of the women ranged from 1.01 to 1.06 with an average of 1.04. It was reported that, 13.26 per cent, 29.96 per cent of subjects were at the risk of malnutrition as they had mid-upper arm circumference and triceps skin fold thickness respectively less than 5th percentile. Body fat ranged from 6.42 to 23.10 kg with mean of 13.75 ± 2.20 kg. The average body fat of women was reported to be 27.50 and the lean body mass ranged from 26.07 kg to 43.50 kg. Among study population, 63.30 per cent women belonged to the normal category, 26.60 per cent rural were low weight normal and 2.20 per cent were obese of grade I.

Nutritional status of 218 adolescent girls aged 13-19 years in rural Dharwad, northern Karnataka, India, was evaluated by Rajaretnam and Hallad (2012). It was reported that the mean height of girls was 148.70 ± 5.40 cm and ranged from 145.40 and 151.30 cm. The mean weight was 39.80 ± 6.10 kg and ranged from 35.40-43.30 kg. The mean waist circumference was 64.90 ± 6.40 cm which ranged between 62.90-67.40 cm and the mean haemoglobin level was 12.10 ± 1.70 g/ dl which ranged between 11.90-12.30 g/dl. Evaluation of height for age revealed that a majority of the girls were stunted (45.20 %) and body mass index for age revealed that 19.40 per cent were energy deficient. According to waist to height ratio 9.70 per cent were observed with cardio vascular risk and a majority of girls were mildly anaemic (48.30 %).

Prabhat and Begum (2012) studied the nutritional status of 120 women (25-45 years) from coastal regions of Karnataka and revealed that 68.50 per cent daily wagers (DW) and 72.00 per cent of monthly paid (MP) were normal. However, 14.70 per cent of DW recorded chronic energy deficiency (CED) while 24.00 per cent MP were overweight. Conversely, 22.50 per cent of non vegetarian women recorded CED and 57.20 per cent women were normal, BMI against 81.80 per cent of vegetarian women. Occurrence of obesity was less; however, 84 per cent of all the participants regardless of payment and diet type had waist to hip ratio > 0.91 indicating prevalence of central obesity. Nutritional status of women laborers was influenced by the type of payment. Central obesity was found to be a common feature among the study group.

Nutritional anthropometry of 650 adolescent girls (15-19 years) of rural Varanasi was conducted by Singh *et al.* (2012) and revealed that about 26.60 per cent of adolescent girls were undernourished with body mass index (BMI) less than 18.50. Further, 16.30 per cent adolescent girls were at high risk of developing obesity in near future due to increased (BMI > 25.90). More than 50 per cent were having BMI between18.50-24.90 and 27 per cent were below 18.50, only 16 per cent were above 24.90 and at higher risk of developing obesity.

Upadhyay *et al.* (2011) conducted nutritional anthropometry of 223 randomly selected rural hill women (18-45 years) in three villages of Nainital District, Uttarakhand. It was reported that all the women were shorter when compared with 50^{th} percentile of National Center for Health Statistics (NCHS) value, with a mean height of 151.21 cm. The mean weight of subjects was 48.76 kg with a range of 37.25-63.80 kg. Body weight of women less than Indian standards was recorded in 10.37 per cent and those having body weight less than NCHS standard was 49.28 per cent. The mean body mass index (BMI) of the subjects was 21.13 kg/ m^2. Based on BMI, 58.29 per cent subjects were normal and rest was suffering from various degrees of malnutrition. None of the subjects fell in chronic energy grade III and obese grade II. Subjects in low weight normal category were 18.83 per cent and obese grade I were 8.95 per cent.

Mittal (2013) assessed the nutritional status and morbidity patterns among 100 non- pregnant, non-lactating rural women of reproductive age group (18-40 years) in village Bashapur of Gurgaon, India. The results revealed that the mean height, weight and BMI were 152.50 cm, 49.30 kg and 21.12 kg/ m^2, respectively. About that 59.00 per cent of women were normal, while 25.00 per cent were underweight, 13.00 per cent were overweight and 3.00 per cent were obese. The data showed that the mean waist circumference, hip circumference and waist to hip ratio (WHR) were 27.00 inches, 33.80 inches and 0.79, respectively. According to waist to hip ratio (less than 0.80) 55.00 per cent of women were normal, while 37.00 per cent recorded increased health risks (WHR>0.80).

A cross sectional survey of 210 women aged between 17-45 years in rural areas of north eastern and central Tanzania revealed that prevalence of overweight and obesity were three times higher than that of underweight (Keding *et al.,* 2013). It was reported that the BMI of women ranged between 14.90-37.70 kg/ m^2 with mean of 21.70 kg/ m^2. A majority of women (71.00 %) were recorded to be normal followed by over weight (15.70 %), underweight (7.10 %) and obese (6.20 %).

Prakruthi and Prakash (2013) assessed the nutritional status of 300 women (20-40 years) from agricultural families from a village under Mandya district of south India. The results indicated that 18.70 per cent of women were suffering with chronic energy deficiency, 42.30 per cent were normal, 27.00 per cent were overweight and 12.00 per cent were obese. The body mass index increased in women with increasing age with an increase in triceps skin fold thickness and waist to hip ratio.

Gaiki and Wagh (2014) evaluated nutritional status by anthropometry of adolescent girls (15-19 years) from rural Wardha, Maharashtra and revealed that a majority of adolescents were normal (51.95 %) by weight for age and 48.05 per cent were found to be wasted. But, based on height for age 69.61 per cent were normal and 30.39 per cent of girls were stunted.

Anthropometry of 60 rural women (20-45 years) from Guntur, A.P. showed that the mean height was 153 cm and mean weight of the subjects was 53.50 kg (Lakshmi and Babita, 2014). The mean body mass index (BMI) of the subjects was 22.49. The- women with normal BMI (18.00-20.00) were 9 (15.00 %) and 19 (31.50 %) were overweight (25.00-30.00) and 4 (6.50 %) were below normal (<18.00). It was seen that about 16.70 per cent of women had normal weight for height while those above normal (43.30 %) and below normal (40.00 %) were almost equal.

Nagamani (2014) assessed the nutritional status by anthropometry of 40 rural young women (19-21 years) and 20 were from rural forward caste (FC) and 20 from rural scheduled caste (SC) in Thirupati, Chittor. The results revealed that the mean height and weight of rural SC women was very low *i.e.*149.75 cm, 34.95 kg compared to rural FC women *i.e.,* 153.50 cm, and 42.50 kg and significantly below the standard value of 156.00 cm (height), 50.00 kg (weight), respectively. The mean body mass indices (BMI) for rural SC women indicated severe chronic energy deficiency (16.04 BMI). The mean mid-upper arm circumference measurements of both the groups of women were also low as against standard values where rural SC women recorded 19.50 cm and rural FC women recorded 21.90 cm. From the results, it was seen that the rural FC women fared better in all the anthropometric measurements compared to rural SC women, but both were deficient compared to ICMR standard reference values.

Nutritional status of 100 adult tribal women (19-34 years) in Sholayur village of Attappady, Palakkad District, revealed that mean height and weight were below the standard values weight was normal (Devi and Sindhuja, 2015). The body mass index (BMI) of the subjects found that, 55.00 per cent of the subjects had normal BMI and 8.00 per cent of the subjects had BMI of < 16.00 and it categorized as severe malnutrition. It was recorded that 9.00 per cent of the subjects had BMI in the range of 16.00-16.99 and it was categorized as moderate malnutrition. Waist hip ratio showed that 44.00 per cent of the selected subjects had the low risk of obesity and 24.00 per cent of the subjects had high risk of obesity.

Thus, it was observed from that a majority of rural women recorded normal nutritional status, although underweight and chronic energy deficiency were also present to a noticeable extent. There was a rise in the proportion of women in overweight and obesity too, but to a lesser extent.

2.2 Food behaviour of rural families with special reference to women

With the globalization of the world, food habits intrinsically linked to traditions are vanishing and there is geometric progression in the consumption trend of calorie dense processed foods laden with, various harmful food additives. The food behavior is changing even at grass root levels *i.e.*, at village levels. This is an issue of concern because not only the health and nutrition of rural households are affected, but also the healthy traditional food patterns are adversely affected. Review pertaining to food habits of rural families with special reference to women is discussed in the following paragraphs.

A cross-sectional study was conducted by Savy *et al.* (2005) to assess the overall dietary quality of 691 rural mothers from 30 villages of north-east Burkina Faso, west Africa, by 24 hr. recall qualitative methods. It was reported that over all diet quality was poor with mean food variety score of 8.30 and mean dietary score of 5.10. Among 116 identified food items, only 38 were consumed.

Women with low diet diversity scores had a very basic diet and consumed only three food groups at most. In most cases, these groups were cereals, leafy vegetables and condiments, which were the basic ingredients of the traditional dish. Women with medium scores often consumed fish, and vegetables in addition to these groups, and also a little more meat, pulses or nuts, fat and sugar. The women who had higher scores often ate more meat, pulses or nuts, fat, sugar as well as some fruits.

Food consumption pattern of 3,937 rural women (15-49 years) of rural Orissa was studied. The results revealed that, 94.60 per cent of women were non-vegetarians. It was recorded that the daily consumption of milk or curd (8.10 %), fruits (2.20 %), eggs (0.60 %) and chicken or meat or fish (1.60 %) were less compared to the consumption of pulses/ beans (37.50 %), green leafy vegetables (55.70 %) and other vegetables (77.70 %). The foods consumed highly on occasional basis included milk/curd (62.50 %), fruits (82.30 %), eggs (58.10 %), chicken or meat or fish (65.30 %). However, the daily consumption of green leafy vegetables (55.70 %) and other vegetables (77.70 %) was high and weekly consumption of pulses/ beans (42.00 %) was high (Rout, 2009).

The dietary behaviour of 61 adolescent boys and girls aged 15-17 years living in rural areas were studied by Hoffmann *et al.* (2012) in the district of Szamotuły, Poland. The results showed that a majority of rural adolescents consumed three meals a day (45.90 %). Maximum of about 41.00 per cent subjects admitted that they ate fresh fruit and vegetables every day. The consumption of fish was higher on once a week basis (32.80 %), followed by twice a month (21.30 %). More than a half of the young rural dwellers preferred more salty meals (50.80 %) and admitted that they usually added salt to an average meal. The rural adolescents most often declared that they consumed sweets and salty snacks daily (44.30 %) followed by three to four times a week (11.50 %).

Kobati *et al.* (2012) conducted a study on 72 non-pregnant and non –lactating women of children aged 2-5 years from both coastal zone and guinea savannah zone of Ghana (36 women from each) by 24 hr. recall method. It was reported that all the women consumed cereal-based foods. Significantly ($p \leq 0.05$) more women from the guinea savannah zone consumed legumes/nuts (100.00 %) and green leafy vegetables (83.00 %) than those from the coastal zone (64.00 % and 19.00 % respectively). However, the consumption of foods from the starchy roots/tubers and fats/oils food groups was high among women from the coastal zone (81.00 % and 78.00 % respectively; $p \leq 0.05$), compared to consumption of these same food groups among women in the guinea savannah zone (19.00 % and 42.00 %). Fish was predominantly consumed by both groups of women, whereas meat, poultry, eggs, milk and milk products were consumed much less when compared to fish. Thus, a regional variation in dietary diversity was reported.

Prabhat and Begum (2012) investigated food consumption pattern of 120 women (25-45 years) daily wage and monthly paid women labourers from coastal regions of Karnataka It was reported that cereals and pulses were consumed daily. The consumption of pulses (76.00 %), green leaves (64.00 %), and sea foods (84.00 %) were high among the monthly paid women where as consumption of fruits (69.50 %) and eggs (68.40 %) were noted high among daily waged women.

Bargiota *et al.* (2013) studied the eating habits and food choices of 382 adolescents (12-18 years) of high school living in rural areas of Greece. The results revealed that adherence to the Mediterranean diet were low. Regular family meals at home were frequent in this group and 99.00 per

cent of the adolescents ate lunch daily at home. Significantly fewer girls ate dinner and snacks (71.00 %) than boys (84.00 %). Eating out with peers and eating from the school canteen was related with higher consumption of 'junk type of food'. Boys ate out significantly more frequently than girls. For takeaways, pizza was first preference, followed by kebabs and burgers. Very rarely the takeaway was a cooked meal and salad. It was indicated that 83.00 per cent of the adolescents bought food from the school canteen: 42.00 per cent did so daily, 13.00 per cent three times a week and 12.00 per cent twice a week. Foods most frequently consumed from the canteen were toast with cheese and ham (36.00 %), soft drinks and beverages (32.00 %) and sweets (20.00 %). Girls and younger adolescents ate a home prepared snack at school more often than boys and the older adolescents.

Kumari (2013) studied food habits of 120 married women of reproductive age group (15-49 years) in rural Haryana and results revealed that an overwhelming majority of respondents consumed milk (96.70 %), ghee (100.00 %), curd/butter milk (95.00 %), pulses (98.30 %) and other vegetables (100.00 %) daily. The fruits on daily basis were consumed by more than half of women (58.30 %) and a majority of women consumed green leafy vegetables on weekly (71.70 %) basis and only 10.00 per cent on daily basis. The consumption of egg/meat was not common among rural women as few consumed on weekly (13.30 %) or monthly (21.70 %) intervals. The main sources of animal protein were milk and milk products.

A study was conducted on food frequency and dietary intake of 300 rural women (20-40 years) in village of Mandya district, Karnataka. Frequency of consumption of raw foods per month was collected with the help of a questionnaire and computed as daily intake of foods by average number of respondents. The results revealed that the major cereal consumed was rice (100.00 %), followed by ragi (48.67 %). Wheat (15.67 %) was consumed to a lesser extent and other cereals were rarely used. Among legumes use of red gram dhal (61.00 %) was very common; other legumes were used only once or twice a week. Among vegetables only few seasonal vegetables were used, the use of green leafy vegetables was only once or twice a week. Milk (100.00 %) and curd (64.33 %) were commonly used by most of the respondents daily but butter milk and ghee were rarely consumed. Non-vegetarian foods and fruits were rarely used on daily basis. Over all food frequency indicated that the varieties of foods used were very limited and subjects depended mostly on locally grown produce. Food frequency indicated that the diets were cereal based with less of vegetables and fruits, low in diversity (Prakruthi and Prakash, 2013).

Campbell *et al.* (2014) studied year-round and seasonal dietary intake patterns among 15,899 women (30-39 years) in Sarlahi district in Terai of Nepal by food frequency questionnaire. Most of the women were aged between 30-39 years. It was reported that among the year-round foods, cereal and cereal products were consumed a median of 14 times per week and among individual items, rice was most frequently consumed, followed by wheat. Potatoes and pulses, legumes and nuts were often consumed with median intakes of 10 and 6 times, respectively per week. On the other hand, foods of animal source, such as milk and milk products, were far less consumed 3 times a week, with one-fourth of the study population reporting eating none. Meat, egg, and fish products were rarely consumed, 1 (0-2) times per week, with median intake of individual meats being zero. Year-round vegetables were reportedly eaten 4 times per week, with green leafy vegetables accounting for 2 times a week. Consumption of most seasonal fruits and vegetables was low, even in season. It was suggested that diets of rural women in the Terai, of Nepal lacked diversity.

Food consumption pattern of 209 randomly selected rural women (18-77 years) in Fars Province, Iran revealed that only 49.00 per cent of the participants consumed recommended amount of fruits and the remaining 40.50 per cent consumed inadequate amounts (Darvish and Hadi, 2014). Adequate consumption of vegetables was reported in 54.30 per cent subjects and 40.50 per cent consumed less than three servings. The consumption of less than one serving of eggs, beans and meat was reported in 28.60 per cent of the subjects. Only 5.70 per cent of women consumed appropriate amounts of bread and cereals and 94.30 per cent of people used more than 11 servings. Dairy products, 2 to 3 servings per day, were consumed by 57.60 per cent of the subjects.

Amir and Ghufran (2015) studied food consumption behavior with special reference to homemade v/s junk food of 200 urban households from rural back ground by convenience random sampling from Lucknow, Uttar Pradesh. It was reported that there was higher preference for readymade snacks (56.00 %) than the homemade snacks (44.00 %). A majority of respondents (76.00 %) agreed that quality, followed by price (26.00 %) were major factors to buy particular foods. It was further indicated that the confectionary were most preferred, followed by cold drinks and fruits. Biscuits and *namkeen* were very commonly consumed.

A cross – sectional descriptive study was carried out among 200 respondents (both men and women) aged between 18-49 years. The subjects were selected through simple random sampling in rural areas of Faizabad district, Uttar Pradesh. Two eligible participants of both sexes in each of the selected household were interviewed to obtain information on food consumption patterns. The results indicated that 78.50 per cent of rural respondents were vegetarians. Most frequently consumed cereal were wheat and rice, while consumption of coarse grains was very low (1-6 days in a month). Red gram and green gram dhal were consumed about 15-20 days in a month. Only seasonal and low cost fruits were consumed, but were below 5 serving in a day. Milk was consumed for 22 days in a month and other milk products were consumed 3-5 days in a month. Potatoes and onion were frequently consumed than carrots. Consumption of leafy vegetables was 5-10 days in a month. Cereals, pulses and mustard oil were consumed by more than about 90.00 per cent of respondents and milk by 55.00 per cent and nuts and oil seeds by 53.00 per cent. The study revealed that low cost, easily available and staple foods were frequently consumed by rural population. On other hand consumption of foods considered as less healthy such as fast foods/pastries, sweets, chocolates, soft-drinks were less frequently consumed by rural population (Pandey and Neerubala, 2016).

Thus, a review of studies indicated that food habits of women varied regionally and the consumption of locally grown and easily available foods were practiced by most of the rural residents. Consumption of junk foods was recorded in some segments of rural groups of women.

2.3 Nutrient adequacy of the diets consumed by rural women

Nutritional status of an individual is function of nutrient intake and nutrient adequacy. A balanced diet with adequate nutrients nourishes the body and thus the well being. The nutritional adequacy of women is reviewed below.

Komakech (2010) studied the dietary intake of 224 non-pregnant and non-lactating women of reproductive age (15-49 years) in Erute internally displaced persons' camp-Lira district of Uganda and revealed that energy (60.20 %), protein and fat (76.00 %) intake were inadequate among the

subjects. With regard to micro nutrients only vitamin A (144.50 %) was adequate due to consumption of corn soy blend and vegetable oil fortified with vitamin A. The adequacy of folic acid (52.40 %), vitamin C (52.00 %), calcium (81.80 %), iron (50.30 %) and zinc (58.60 %) were reported to be poor.

Nutrient adequacy of 462 rural women (15-49 years) from Azamgarh of Uttar Pradesh was assessed by Mishra *et al.* (2011). It was suggested that a majority of women (79.80 %) in reproductive age were in negative energy balance. This was most common among SC/ST categories (93.00 %) and it was low among upper caste groups (65.20 %). Only about 20.20 per cent were in the positive energy balance which was high among upper caste groups (34.80 %).

Nutrient adequacy of 90 non-pregnant, non-lactating women (18-60 years) was assessed in villages of Uttarakhand by Dobhal and Raghuvanshi (2012). It was reported that the intake of protein, fat, calcium, thiamine, riboflavin, niacin and ascorbic acid were adequate by more than 100 per cent. However, the intake of energy and iron were 86.80 and 80.50 per cent.

A total of 50 farm women aged 30-35 were assessed for nutrient adequacy by Chandra *et al.* (2013) among farm families in adopted and non-adopted villages of Uttarakhand hill region. The results showed that average energy consumption per capita per day in adopted and non-adopted village was 2,054 Kcal and 1,739 Kcal, respectively which was 7.70 and 21.80 per cent less than recommended level (2,225 Kcal). The average protein consumption by women in non-adopted village (45 g) was less than recommended level (50 g). The intake of calcium, thiamine and vitamin C were found to be adequate in both villages. There was inadequate consumption of riboflavin and niacin noted in both villages. The average iron consumption by respondents in adopted and non-adopted village was inadequate by 40.00 and 46.60 per cent. A majority of respondents of adopted village (65.80 %) were adequate in protein but inadequate in calorie and 11.40 per cent were inadequate in both protein and calorie. In non-adopted village 82.90 per cent respondents were inadequate in both protein and calorie.

Dietary intake among 100 non-pregnant non-lactating rural women of reproductive age group (18-40 years) in the village Bashahpur, Gurgaon was reported to be low both for macronutrients and micronutrients (Mittal, 2013). It was reported that the mean energy and protein intake was found to be meeting only 50.00 per cent of the nutrient requirements for both the nutrients. Similarly, the intake of micronutrients was also found to be inadequate particularly of iron and folic acid which met only 37.80 per cent and 11.00 per cent of the RDAs, respectively. The intake of B-complex vitamins including thiamine, riboflavin, niacin and folic acid was found to be 63.00 per cent, 40.90 per cent, 47.90 per cent and 11.00 per cent of the RDAs, respectively. The intake of vitamin A, vitamin C and crude fibre was also reported to be low.

Nutrient adequacy of 300 rural women (20-40 years) from agricultural families of Mandya district in south India revealed that the diets were adequate in energy (102.30 %) and protein (104.20 %) but high in fat (171.50 %). Among micro-nutrients calcium (108.50 %) and thiamine (118.00 %) were adequate where as iron (70.90 %), vitamin A (21.20 %), riboflavin (79.00 %), niacin (88.90 %) and vitamin C (64.80 %) were inadequate (Prakruthi and Prakash, 2013).

Adequacy of micro nutrients among women of reproductive age (15-49 years) group in rural Varanasi district of Uttar Pradesh was reported by Khanam *et al.* (2014). It was concluded that, adequacy of iron was 70.48 per cent. Intake of vitamin A and C were 35.39 per cent and 171.13 per cent, respectively; with respect to RDA values. Average micro nutrients intake of women of reproductive age group was not adequate.

Nutrient adequacy of 60 rural agricultural workers aged 20-45 years of Guntur, A.P. was assessed by Lakshmi and Babita (2014). It was indicated that the intake of calories was 94.30 per cent and protein was 89.09 per cent but was low for micronutrients. While intake of vitamin C (64.40 %) and the B vitamins like thiamine (68.20 %), riboflavin (51.50 %), niacin (77.60 %) calcium (61.61%) were poor. Iron (47.47 %) and vitamin A (36.00 %) were grossly deficient in the diet. It was suggested that the micro nutrient malnutrition or "hidden hunger" was common with all micro nutrients especially iron, vitamin A, vitamin C and to some extent the B-complex vitamins being grossly deficient. Intake of all the nutrients was lower than the RDA.

Nagamani (2014) assessed the nutritional status of 40 rural young women (19-21 years) and 20 were from rural forward caste (FC) and 20 from rural scheduled caste (SC) in Thirupati, A.P. The results concluded that the nutrient intakes by rural young women for all the nutrients were far below the ICMR recommended dietary allowances. Among rural SC women there was high deficiency of nutrients like energy (33.65 %), protein (45.50 %), calcium (50.52 %), iron (59.00 %), vitamin A (67.17 %) and vitamin C (35.75 %) when compared with rural FC women. The deficiency of energy (28.60 %), protein (38.84 %), calcium (40.70 %), iron (55.00 %) vitamin A (66.54 %) and vitamin C (24.00 %) were also noticeable in rural FC women.

Another similar study on nutrient adequacy of 67 women (25-75 years) in five villages in rural Kandal province, Cambodia was carried out by Wallace *et al.* (2014). It was reported that average consumption of iron and vitamin A was below recommended allowances. Most women (70.00 %) did not meet their recommendation of vitamin A. The range of participants' intake if vitamin A was 17.40-2,119 □g/ day, while the median intake was 249 □g/ day. Intakes of energy were also low, where only 17.00 per cent of participants met energy recommendation. In general, women did not meet daily-recommended nutrient intakes for energy, vitamin A and iron.

Devi and Sindhuja (2015) conducted a research to assess the nutrient adequacy of 100 adult tribal women (19-34 years) in Sholayur village of Kerala and reported that all the nutrients were inadequate except for vitamin C. The energy intake was 1,652 Kcal which was 25.90 per cent less than recommended. The protein (45 g) intake was less than 18.18 per cent and that of fat (19 g) was less than 24 per cent. With respect to minerals, iron (17.20 mg) and calcium (536 mg) were inadequate and accounted less than 10.60 per cent and 3.80 per cent, respectively. Among the vitamins carotene (3,985 □g) recorded less than 18.00 per cent. The intake of B-complex vitamins like thiamine (0.90 mg), riboflavin (1.10 mg) and niacin (11 mg), were less than 18.18 per cent, 15.30 per cent and 21.40 per cent, respectively.

Dietary intake of 610 women (15-49 years) of rural Varanasi was assessed by 24 hour oral recall questionnaire method (Khanam *et al.,* 2016). The results of the study revealed that average energy, protein and fat intakes were 1,657.81 ± 461.91 Kcal/ day, 45.05 ± 18.79 gm/ day, and 37.52 ±

31.16 gm/ day, respectively. Nutrient adequacy ratio of energy, protein and fat were 84.40, 81.82 and 55.54 per cent, respectively. It was reported that 14.60 per cent less than 50.00 per cent of recommended dietary allowance (RDA) whereas 37.40 per cent subjects recorded calorie consumption more than or equal to RDA. In all, 42.13 per cent subjects recorded protein intake more than or equal to 80.00 per cent of RDA. Protein consumption was less than 50 per cent of RDA in 12.50 per cent subjects. It was also reported that 23.93 per cent recorded less than 50.00 per cent of RDA for fat, whereas 58.70 per cent subjects had fat consumption more than or equal to RDA.

Thus, it was observed that a majority of rural women recorded adequate nutrient intake for macro-nutrient but less adequate for micro-nutrient.

2.4 Nutritional knowledge of rural women

Nutritional knowledge of women has an impact of the family's health and food consumption pattern. Women with appreciable nutrition knowledge help in satisfying nutritional needs of the family. It is therefore relevant to assess nutritional knowledge of women. Following studies relate the status of nutrition knowledge of women.

Nutrition related knowledge of 270 adolescent girls aged 10 to 19 years of Chiraigain of Varanasi was reported to be poor and majority of them were not aware about their nutritional needs. Ignorance about micronutrients and protective foods prevailed in adolescent girls (Choudhary *et al.,* 2010).

A cross sectional study of 223 women (18-45 years) from villages of hilly region of Nainital, Uttarakhand revealed that the mean knowledge score of subjects was 23.28 per cent, indicating low knowledge score. As high as 66.32 per cent subjects recorded low knowledge scores and only 4.56 per cent were in high knowledge category, rest recorded scores of medium knowledge category (Upadhyay *et al.,* 2011). The knowledge of rural women was found to be very poor with regard of nutritional anemia.

A descriptive cross-sectional study was conducted in Jeddah, western Saudi Arabia (SA) to study nutrition knowledge of 151 women by Bakhotmah (2012). Results indicated that a majority of respondents (81.50 %) agreed that they knew about food groups. However, only 32.40 per cent were able to list most items within each food group, as defined earlier and only 36.00 per cent could partially list items in all groups. The difference between perceived and actual knowledge about food groups was found to be statistically significant ($p \leq 0.05$). Nearly half of the participants with university-level education (45.00 %) could list all of the different items in the food groups.

Dobhal and Raghuvanshi (2012) assessed the nutrition knowledge of 90 non-pregnant, non-lactating randomly selected women (18-60 years) from villages of Uttarkashi of Uttarakhand. It was reported that a majority of women were recorded with low nutrition knowledge (46.60 %), followed by 34.40 per cent of women with high nutrition knowledge. About 20.00 per cent of women were recorded with moderate nutrition knowledge.

Mittal (2013) assessed the nutrition knowledge of 100 non- pregnant, non-lactating rural women of reproductive age group (18-40 years) in Bashapur village of Gurgaon, India. It was reported that the awareness about the symptoms of anaemia was 34.00 per cent. Most of the women (83.00 %) knew that calcium provided strength to the bones and also were aware of its sources. While 60.00

per cent of the subjects were aware about the ill-effects of high saturated fatty acids intake, only 16.00 per cent knew that vegetable oil prevented heart diseases. About 75.00 per cent of the subjects were aware about the role of fruits and salads in relieving constipation. However, 97.00 per cent of the study group knew vitamin A rich sources, only 50.00 per cent of them were aware about the role of vitamin A in preventing night-blindness.

Ahadi (2014) assessed knowledge of 4,987 rural households towards principles of nutrition in rural Iran. It was reported that, 49.50 per cent of rural households were aware of food groups. About 39.70 per cent recorded knowledge toward role of food groups. Most of the respondents declared that they consumed food for improvement of health and prevention of diseases. The results showed that 79.60 per cent of households had favorable attitude towards basic principles of nutrition. Most of the households recorded moderate knowledge and good attitudes.

Gebreegziabher and Stoecker (2014) assessed knowledge of 193 randomly selected rural women in Ethiopia. It was reported that 93.80 per cent of the participants, didn't use iodized salt and 87.60 per cent didn't know the benefits of iodized salt. Of the 24 women who reported knowing the benefits of iodized salt, 23 said it prevented goiter but none mentioned cognitive effects. The women suggested causes of goiter to be drinking dirty water, drinking tap water, drinking rain water, but only two women made a mention of lack of iodine. Although prevalence of goiter is high and visible in the community, knowledge of causes and prevention of iodine deficiency disorders was minimal.

A group of 160 women aged 25-40 years from four villages of Allahabad, U.P. was evaluated for knowledge about nutritional aspects of underutilized green leafy vegetables (Singh *et al.,* 2015). It was reported that 58.75 per cent women could identify the underutilized green leafy vegetables, 51.25 per cent consumed them, but 58.75 per cent were ignorant about the nutritional benefits of underutilized green leafy vegetables. However, 38.75 per cent of women opined that underutilized green leafy vegetables were suitable as fodder but, not fit for humans.

A descriptive survey was conducted among 120 women of reproductive age using cluster sampling technique by Tashara *et al.* (2015) in selected villages of Udupi taluk. The results reported that a majority of participants recorded inadequate knowledge (55.80 %) and unfavorable practices (58.30 %) with regard to iron deficiency anemia and its prevention.

Thus, it was noticed that rural women in general recorded poor knowledge scores on nutritional aspects of healthy diets.

2.5 Impact of nutrition education

The principal aim of nutrition education is to provide people with adequate information, skills and motivation to procure and consume appropriate foods which in turn would improve family food supplies and more efficient utilization of available/local food resources to provide nutritious diets. Several studies are conducted to assess the impact of nutrition education on knowledge and food behaviour of participants.

2.5.1 Impact of educational modules

The Kalèdo board game was provided to improve nutrition knowledge and dietary behaviour in a pilot study conducted in three middle schools in Naples, Italy (Amaro *et al.,* 2006). A simple two group design (treatment and control) with pre and post assessment was employed. Data analysis was

performed on 241 subjects. During 24 weeks, a group of 153 children from 8 classrooms were involved in 15–30 minute long play sessions once a week. A questionnaire was given to the participants at the beginning and end of the study to evaluate nutrition knowledge (31 questions) and food intake (34 questions). A second group of 88 children from 5 classrooms were investigated at the same time with the same questionnaire but they did not receive any play sessions with Kalèdo. Children playing Kalèdo showed a significant increase in nutrition knowledge ($p \leq 0.05$) and in weekly vegetable intake ($p \leq 0.01$) with respect to the control. It was suggested that Kalèdo could be an effective instrument to teach children about healthy diet.

Effectiveness of card game to teach significance of fruits and vegetables among preschool children 53 boys and 57 girls of Slovenia, Russia was evaluated by Torkar *et al.* (2010). It was reported that after the intervention more children understood why the human body needed dietary fibre, water, and vitamins. The children learnt which fruits and vegetables contained highest vitamin A, C and E, dietary fibre, and water contents. It was demonstrated that the fruit and vegetable playing cards helped to teach children about the nutrients in fruits and vegetables and importance of fruits and vegetables and their importance in a healthy diet.

Shet and Chimmad (2014) assessed the impact of nutrition education in creating awareness about significance of omega 3 fatty acids in health among 103 urban women (20-80 years). The mode of education included lectures, interactive discussions, expert counseling, demonstration and exhibitions. The results indicated a significant positive impact in terms of gain in knowledge from a basal score of 2.11 ± 1.16 to 15.70 ± 3.81 indicating quantum improvement of 7.44 times. Awareness about health benefits of omega 3 fatty acids increased from 5.82 to 100 per cent among respondents after nutrition education. Educational intervention resulted in a change in diet pattern of beneficiaries.

Kaledo, a board game for nutrition education of children and adolescents at school was designed for healthy lifestyle promotion, healthy eating habits, promote nutrition education and to improve dietary behavior (Viggiano *et al.,* 2015). A two group design with one pre treatment assessment and two post treatment assessments was employed. A total of 3,110 subjects (9-19 years old) from 20 schools in Campania, Italy, were included for the study. In the treated group, the game was introduced each week over 20 consecutive weeks. Control group did not receive any intervention. At post assessment after 6 months, the treated group obtained significantly higher scores than the control group on food habits checklist, nutrition knowledge, and healthy diet and food habits. It was suggested that the Kaledo game improved nutrition knowledge and dietary behavior over six months.

Thus, the lectures, games, interactive discussion and demonstrations can be effective educational tools in disseminating the nutrition knowledge and improving healthy food behaviour.

2.5.2 Impact on nutrition knowledge

Effective nutrition education should bring about a positive change in knowledge level and thus food behaviour.

Kaur and Singh (2005) assessed the effect of health education on knowledge about anaemia among 60 rural women of reproductive age group (20-45 years) from peri-urban village of Chandigarh. Intervention group received educational information through interpersonal and group communication approaches in four sessions over one month period. After three months, gain in

knowledge about anaemia among intervention group was compared with control group which received no education. The results showed that all women (100.00 %) in the intervention group could specify at least one correct cause of anaemia and identified a sign or symptom of anaemia, whereas, 73.30 per cent and 46.60 per cent of women in the control group did not know the cause and signs and symptoms of anaemia, respectively. The knowledge about methods of anaemia prevention was significantly higher in intervention group compared to control group ($p \leq 0.001$). Anaemia as a health problem was known to all the 30 women in the intervention group compared to 14 (46.70 %) women in the control group ($p \leq 0.001$). The knowledge about methods of anaemia prevention was significantly higher in intervention group compared to control group ($p \leq 0.001$).

A study was carried out to assess the impact of nutrition education on nutritional awareness regarding healthy nutrition and dietary habits of 50 school going adolescent girls (13-16 years) in rural areas of Kurukshetra, Haryana. The nutrition education was imparted through lectures, audiovisual aids and demonstrations for three months. Results indicated that the mean scores of 12.41 ± 1.56, obtained in pretest were increased to 19.92 ± 1.40 after giving nutrition education. The gain in knowledge of was 7.51 and the quantum of improvement was 1.605 times. Imparting nutrition education was found to be effective for improving the level of knowledge among the adolescent girls (Gupta and Kochar, 2008).

Extent of gain in nutrition knowledge among 75 rural farm women through nutrition training programme was ascertained in Samastipur district of Bihar state (Kumari, 2010). The results revealed that a majority (77.33 %) of the respondents had low level of knowledge about nutrition practices followed by medium that is only 22.66 per cent while none of the respondent obtained high level of knowledge score related to nutritional practices before participating in nutrition training programme. After exposure of nutrition training package a majority of the respondents (53.33 %) recorded high level of knowledge score, followed by (45.66 %) medium level, while none of the respondents obtained lower level of knowledge score related to nutrition practices. The retention in knowledge was low in respect of 34.66 per cent of the respondents, medium in 57.33 per cent, while 8.00 per cent of respondent retained high level of knowledge.

Aruna *et al.* (2013) studied the impact of educational intervention on knowledge regarding iodine deficiency disorder. It was reported that the mean awareness score before education was 8.35, it increased significantly ($p \leq 0.01$) to 10.16. Regarding the causes of IDD also, the increase was significant ($p \leq 0.05$) with the initial score 4.90 and final score 5.21. The mean scores of prevention and treatment of IDD before education was 10.23, it increased to 12.31 and the increase was significant ($p \leq 0.01$). Similar change ($p \leq 0.01$) was observed regarding use of salt with the initial score 8.20 and final score 9.36.

A total of 156 girls in the age group of 18 to 25 were assessed for nutrition knowledge on iron deficiency anaemia in Bangalore, Karnataka (Savita *et al.,* 2013). It was reported that 30 per cent of the subjects scored low (<17), 42.31 per cent scored medium (17-23) and 27.56 per cent scored high (>23) before the education. Assessment of the knowledge after the education programme revealed that 97.44 per cent of subjects scored high (>23) where as 2.56 per cent scored medium (17-23). The percentage of correct response ranged from 39.00 to 69.00 per cent, whereas after education intervention it ranged from 71.00 to 90.00 per cent.

Singh *et al.* (2013) investigated the impact of nutrition education on 90 farm women from villages of Unnao district of Uttar Pradesh. The results of the study revealed that a majority (92.22 %) of the respondents exhibited low level of knowledge about nutrition practices. After exposure of nutrition training package majority of the respondents (76.66 %) had medium level of knowledge score, followed by high level of knowledge score (23.33 %) while none of the respondents obtained lower level of knowledge score related to nutrition practices. The mean knowledge score of the respondents, increased from 10.36 to 36.42 after exposure of training. Range of knowledge score increased from 6-23 to 28-51 after exposure to training.

A comparative study was conducted to assess impact of nutrition education on dietary fibre knowledge among 50 rural women aged 20-55 years of Nainital district in Uttarakhand (Kaur and Virk, 2014). The results revealed that exposure to booket on nutrition significantly changed the awareness scores from 68.10 to 70.84. It was reported that the gain in knowledge after 15 days was 26.80 per cent.

A study was conducted to assess the nutrition knowledge of the 30 adolescent girls (12 to 16 years) participating in the nutritional awareness programme in Anganwadis of Changanacherry Taluk of Kottayam, Kerala. The results revealed that a majority of the subjects recorded either poor or fair levels of awareness about the importance of nutrition (Renjini *et al.,* 2014). Nutrition education using pamphlets and charts significantly improved the awareness scores of participants.

Nutrition knowledge before and after educational intervention was studied among 100 adult tribal women (19-34 years) in Sholayur village of Attappady, Palakkad District of Kerala (Devi and Sindhuja, 2015). The results of the research reported that before imparting education 50.00 per cent, 43.00 per cent, 7.00 per cent of the selected subjects secured the scores in the level of low, medium and high respectively. After nutrition education the scores revealed that significant improvement ($p \leq 0.01$) and a majority of women recorded moderate knowledge (60.00 %), followed by high knowledge (23.00 %) and a lower proportion were with low knowledge (17.00 %).

A descriptive cross-sectional design was used to assess the nutritional knowledge of 100 adolescent girl students (16-19 years) with respect to healthy diets before and after a nutrition education program in Makkah, Saudi Arabia (Elmadbouly, 2015). The results concluded that overall students' knowledge had improved significantly ($p \leq 0.001$) after educational intervention. Significant awareness about importance of healthy diet on physical and mental activities; significance of breakfast on concentration, importance of food groups and sources of nutrients was recorded.

Thus, the reports of various investigations revealed significant improvement in nutrition knowledge after educational intervention of rural women.

2.5.3 Impact of nutrition education on food behaviour

Walsh *et al.* (2003) determined the impact of a nutrition education programme, implemented using local nutrition advisors, on dietary practices in low-income communities (608 respondents) in the Free State and northern Cape provinces. Two rural control areas were taken and three rural areas and one urban area in experimental group were included to whom nutrition education was given. Dietary practices were measured using a structured questionnaire before and after education intervention. The percentage of rural households that included three food groups (protective foods,

energy foods and building foods) in their cooked meal improved by 32.60 to 38.80 per cent. The using of more than two cups of milk per day improved significantly, by between 14.00 per cent and 100.00 per cent. A significant improvement in vegetable and fruit intake was also observed.

Impact of nutrition education on food behaviour and nutrient adequacy of 60 adolescent girls (13-19 years) of Shousha village, Solan district, of Himachal Pradesh was studied (Kaur *et al.,* 2007). Nutrient adequacy was determined by 24 hr. recall method for three consecutive days using standardized containers. It was reported that after imparting nutrition education, practice of meal skipping was reduced (from 43 to 24). Similarly, skipping of breakfast and lunch by the respondents also reduced from 29 and 12 to 16 and 8, respectively. Although there was a significant change ($p \leq 0.01$) in adequacy for energy (from 51.30 % to 59.50 %) and protein (43.60 % to 51.90 %) the two nutrients were not meeting the RDA requirements. The fat intake was almost adequate meeting 92.27 per cent of RDA and it was increased to 130.00 per cent after educational intervention. Inadequate nutrient intake for beta carotene (31.59 %) thiamine (70.00 %), folic acid (85.60 %), vitamin B_{12} (85.00 %), iron (33.96 %) and calcium (74.60 %) were recorded. Vitamin C intake was high (201.25 %). However, the educational intervention increased the adequacy of beta carotene (106.00 %), thiamine (106.00 %), folic acid (104.60 %), vitamin B_{12} (90.00 %), iron (47.25 %) and calcium (84.22 %) significantly ($p \leq 0.01$). Though the average daily intake of all the nutrients increased after nutrition education but could not meet the RDA requirements.

Kaur and Nagi (2007) assessed the impact of nutrition education on dietary behaviour of 60 young anaemic women (18-22 years) from Ludhiana, Punjab. It was indicated that there was a significant ($p \leq 0.01$) increase in mean energy intake from 1,416 Kcal to 1,635 Kcal among anaemic vegetarian (AV) and from 1,510 Kcal to 1,725 Kcal among non-vegetarian anaemic women (AVN). Mean iron intake increased significantly ($p \leq 0.01$) from 14.90 ± 4.13 to 16.80 ± 4.03 g among AV and from 18.l0 ± 5.01 to 20.40 ± 4.43 g among ANV group. It was observed that before intervention the mean daily intake of energy, iron, niacin and vitamin B_{l2} was below the RDA given by ICMR (1990) in both the groups whereas the intake of protein, folacin and ascorbic acid was adequate in both the groups. After nutrition education intervention, a significant increase was observed in the energy, protein, iron and folacin intake, while non significant increase was observed in niacin and vitamin B_{l2} intake of the subjects in both the groups.

Rustad and Smith (2013) revealed that the short term nutrition intervention using comprehensive nutrition and health education through experiential and interactive lessons, activities and demonstrations increased the nutritional knowledge among 118 women of low income group of Minneapolis, St. Paul metropolitan area, U.S. Favorable nutritional behavioral changes were observed among the women after intervention. Women increased their vegetable consumption, use of herbs and spices in cooking, reading nutrition labels and preparing healthy meals. Further, the women also decreased consumption of fast foods, processed snacks with high sugar, salt and fat and fatty cuts of meat. Addition of sugar, salt and butter to foods were lowered.

Ambre and Sengupta (2015) assessed the effect of nutrition education program on dietary eating patterns of 300 adolescent girl college students (16-19 years) of Mumbai. No significant changes in energy intake (2,165 Kcal to 2,105 Kcal) and total fat (43.42 g to 43.27 g) were observed, but protein (47.27 g to 53.67 g) and iron (21.44 mg to 24.81 mg) increased significantly after education ($p \leq 0.05$).

Baldasso *et al.* (2016) assessed the impact of food and nutrition education program among 54 adolescents (16-19years) of low socio-economic level, São Paulo, U.S. It was reported that the dietary patterns on weekdays and weekends improved by 33.00 per cent and 37.00 per cent, respectively where the intake of legumes, milk, dairy products, fruits, and vegetables were increased. However, the intakes of nuts and whole grains were low. After the intervention, 9.30 per cent and 7.40 per cent of the students no longer added salt to food or sugar to juice, respectively. The intervention increased the number of students who consumed milk from 70.40 per cent to 90.70 per cent, and 6.40 per cent of the students substituted whole milk by either semi-skimmed (4.30 %) or skimmed (2.10 %) milk. The students with low quality diet decreased by 16.60 per cent during the week and by 11.10 per cent during the weekend. It was observed that nutrition education intervention could improve the dietary behaviour and nutrient adequacy among women.

Thus, the review of literature on the topics of present investigation revealed varied reports, indicating normal nutritional status of women; variation in food behaviour of rural families, often indicating low adequacy of micronutrients for rural women; and nutrition education influenced the knowledge gain and food behaviour of rural women.

3. MATERIAL AND METHODS

Availability of unbranded junk foods has increased tremendously in rural areas. Judicious use of unsafe and non permitted ingredients and additives accompanied by poor manufacturing practices may result in health hazards to consumers of such foods. In view of the increased availability of such low cost junk foods in the rural areas, an investigation was planned to assess the extent of consumption of junk foods in rural families of four agro-climatic zones of University of Agricultural Sciences (UAS), Dharwad; to evaluate the awareness among rural women about health hazards due to consumption of junk foods; to measure nutritional status and nutritional knowledge of rural women aged 15-35 years; and to assess nutritional lacunae among rural women. The details of the materials used and methodology employed during the course of investigation are described in this chapter.

3.1 Location and target group

Investigation was conducted in four agro-climatic zones of UAS, Dharwad *i.e.*, zones 3, 8, 9 and 10. Non pregnant non lactating rural women, 30 from each village (15 to 35 years old) were randomly selected from four villages situated in four directions from 10 per cent of talukas in each zone. Thus two talukas each from zone 3 and 8; one each from zone 9 and 10 were randomly selected for the investigation. From each taluka, four villages situated in four directions were selected for data collection. A total of six talukas and 24 villages were covered (Fig. 1).

Talukas and villages of different agro-climatic zones selected for the investigation are indicated as follows

Location	Total number	Zone 3		Zone 8		Zone 9	Zone 10
Talukas	6	Vijayapur	Gadag	Dharwad	Haveri	Khanapur	Ankola
Villages selected	24	Hitnalli	Hulkoti	Navlur	Aaladakatti	Beedi	Bhavikeri
		Arkeri	Chikkoppa	Chikkamalligwad	Devagiri	Halkarni	Vandige
		Aliyabad	Lakkundi	Karadigudda	Yettinhalli	Rumewadi	Baleguli
		Atalatti	Hombal	Mangundi	Nelogal	Bargaon	Bobruwada

3.2 General information

The general information about the target group was elicited through personal interview using a structured questionnaire. The respondent's name, age, occupation, education, marital status, family size, family composition and religion were recorded (Appendix I).

3.3 Socio-economic status assessment

Socio-economic status of rural families was assessed using the modified and pretested scale of Aggarwal *et al.,* (2005).

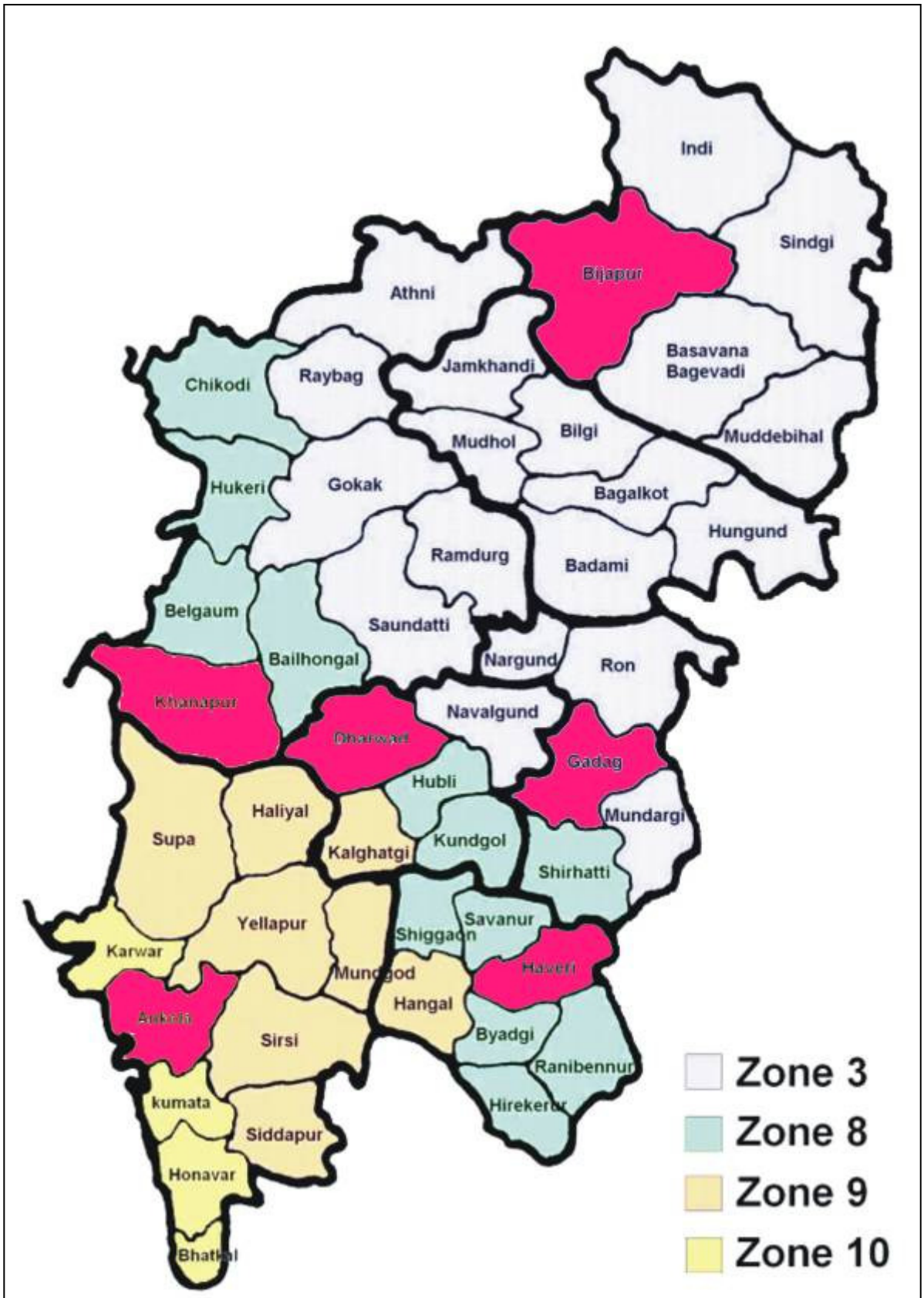


Fig. 1. Talukas selected from different agro-climatic zones of UAS, Dharwad

3.4 Dietary information

Information about habitual diets was collected through personal interview. Information on foods consumed during early morning, breakfast, lunch, snacks and dinner were elicited from rural women from 10 households of each village. Thus a total of 120 women were covered among whom 40 women each belonging to zone 3 and 8 and 20 women each belonging to zone 9 and 10 (Appendix I-A).

3.4.1 Food consumption pattern of rural women

Food consumption pattern of rural women was recorded using 24 hr recall method (Appendix I-B). A total of 36 women i.e., 12 each from zone 3 and 8; and 6 each from zone 9 and 10 were randomly selected for dietary assessment. The foods consumed by women during the 24 hours of previous day were taken into account. Food items consumed during early morning, breakfast, lunch, snacks and dinner were recorded using a set of 12 standard cups and measures. Further, the different foods consumed by rural women were prepared in the laboratory to know the actual quantity of foods consumed by women to ascertain the raw weight of the food ingredients used in preparation of such foods.

3.4.2 Nutrient composition of foods consumed by rural women

An account of the raw ingredients used for each of the foods consumed was used for nutrient computation. All the food items consumed were converted to nutrients, with the help of 'ANNAPURNA' version 3, designed by Dr. M. R. Chandrashekhar, Bengaluru. The total nutrient composition of diets were thus computed and tabulated.

3.4.3 Mean food intake and nutrient adequacy of foods consumed by rural women

The mean food intake of women was computed and compared with recommended dietary intake suggested by ICMR for Indian women according to activity levels (Anon, 2011). The nutrient adequacies of foods consumed by rural women were compared with the recommended dietary allowances suggested by ICMR for Indians (Anon., 2010) for different age groups and activity levels.

Women were classified as sedentary, moderate and heavy worker following the classification suggested by Gopalan, *et al.* (2010) as follows

Sedentary worker- Teachers, tailors, executives, house wives, nurses, *etc.*

Moderate worker- Servant-maid, cooli, basket maker, weaver, agricultural labourer, beedi-maker, *etc.*

Heavy worker- Stone-cutter

Adequacy of nutrients was computed for each individual, using the following formula

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

3.5 Documentation of junk foods of rural areas of north Karnataka

Participatory rural appraisal (PRA) techniques were followed to collect the information on junk foods consumed by rural families. Interactive group discussions with learned members of village were conducted. PRA were conducted in 24 villages to elicit information on low cost, unbranded and simulated junk foods commonly consumed in rural areas. The petty shops situated in villages and around school premises selling junk foods were visited by the investigating team to document the different junk foods sold in villages. Samples of all such junk foods sold in the petty shops were collected for documentation.

3.6 Frequency of junk food consumption in rural families

Among the 24 villages of six talukas 12 villages (two from each taluka) were selected for assessment of frequency of junk food consumption in rural families (Appendix II-A). The frequency of junk foods consumed in rural families was elicited by food frequency questionnaire. Randomly selected rural women (10 from each village) were interviewed personally to know the frequency of consumption of junk foods in the family. A total of 120 women across four agro-climatic zones were interviewed to know the scenario of junk food consumption.

3.6.1 Consumption frequency score for junk foods

Frequency of consumption of junk foods was quantified by allocating scores as follows- daily=7; thrice a week= 6; twice a week= 5; weekly=4; fortnightly=3; monthly =2; rarely=1 and never=0. The total scores were summed up for each junk food as per its frequency of consumption, thus arriving at total consumption frequency score for each junk food. The level of consumption of junk foods was categorized into highly, moderately and less popular levels as follows

Highly popular: Mean score + (SD x 0.425) =X

Less popular: Mean score - (SD x 0.425) =Y

Moderately popular level was considered as those values less than X but more than Y.

3.7 Assessment of nutrition knowledge of rural women

Randomly selected 30 women (discussed under 3.1) were selected for assessment of knowledge about junk foods (Appendix III). A structured and pre-tested schedule was used to assess the awareness about the different aspects of foods covering general aspects, food additives and health implications of such additives. A total of 360 rural women from four agro-climatic zones were evaluated for nutritional awareness. The awareness scores were categorized into high, moderate and low awareness levels as follows

High awareness: Mean knowledge score + (SD x 0.425) =X

Low awareness: Mean knowledge score - (SD x 0.425) =Y

Moderate awareness level was considered as those values less than X but more than Y.

3.8 Assessment of nutritional status

Nutritional status is one of the key factors which reveal the health status of individuals. Randomly selected 30 women described under 3.1 were selected for assessment of nutritional status. A total of 360 women were assessed for nutritional status.

3.8.1 Nutritional anthropometry

Nutritional status of rural women was assessed through anthropometric measurements following standard procedures described by Jelliffe (1966). Height, weight, waist circumference and hip circumference were measured using standard instruments and techniques. Height of an individual is made up of the sum of four components-legs, pelvis, spine and skull. Height was measured by using improvised anthropometric rod nearest to 0.1 cm. Body weight is the simplest reproducible anthropometric measurements for the evaluation of nutritional status. It is composed of constituents like, water, minerals, fat and protein *etc.* Body weight was measured to the nearest 0.5 kg using well calibrated electronic weighing balance. The rural women were weighed on ordinary casual clothing and without wearing slippers. Waist circumference was measured at around the smallest area below the rib cage and above the umbilicus, with non-stretchable flexible measuring tape nearest to 0.1 cm. Hip circumference was measured at the maximum circumference of the buttocks with non-stretchable flexible measuring tape nearest to 0.1 cm.

3.8.1.1 Body mass index (BMI)

Body mass index assesses the current nutritional status which was calculated using the following formula

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

Based on BMI, the rural women were classified into different categories of nutritional status as defined by WHO for Asian adults (Anon., 2004) as follows

Nutritional status classification	BMI (kg/ m^2)
Underweight	<18.50
Normal	18.50-22.99
Pre-obese	23-24.99
Obese class I	25-29.99
Obese class II	≥30.00

3.8.1.2 Ideal body weight

Ideal body weight was calculated according to Broca's index

Ideal body weight (kg) = Height (cm) -100

$$\text{Ideal body weight (\%)} = \frac{\text{Actual Weight (kg) x 100}}{\text{Ideal body weight (kg)}}$$

3.8.1.3 Risk of metabolic complications

Risks of metabolic complications are predicted by waist to hip ratio (WHR). WHR was calculated as follows using the measurements of waist and hip circumference.

$$WHR = \frac{\text{Waist circumference (cm)}}{\text{Hip circumference (cm)}}$$

Risk of metabolic complication was categorized as suggested by WHO (Anon., 2008) which is as follows

Indicator	Cut-off points for women	Predicted risk of metabolic complications
Waist circumference	>80 cm	Increased
Waist circumference	>88 cm	Substantially increased
Waist-hip ratio	≥0.85	Substantially increased

3.9 Educational intervention of rural women about junk foods and formulation of healthy diets

Randomly selected women from a hamlet situated 5 km from headquarters were imparted nutrition education to create awareness about health hazards of junk foods and formulation of healthy diets. Educational intervention was taken up to create awareness about planning healthy diets using indigenous foods and to sensitize about health hazards of junk foods. Nutrition education was given thrice at monthly intervals. A total of 43 randomly selected rural women (15-35 y) were enrolled for the educational intervention, 30 women completed all sessions.

3.9.1 Background information of rural women selected for educational intervention

General information of subjects such as age, level of education, type of family, family size, occupation and socio-economic status were collected through personal interview method following the methods described under 3.2 and 3.3.

3.9.2 Dietary information of intervention group

Women selected for educational intervention were personally interviewed to know the food consumption pattern as described under 3.4.1.

Nutrient composition and nutrient adequacy of diets consumed by intervention group were calculated following the methods detailed under 3.4.2 and 3.4.3, respectively.

Frequency of junk food and healthy consumption by families of intervention group before and after educational intervention were gathered by procedures detailed under 3.6.

3.9.3 Educational intervention of rural women

Nutrition education regarding health hazards of junk foods and formulation of healthy diet was conducted at monthly intervals in three sessions. The information was disseminated in the form of game play through card games and board games and in the form of lectures using flash cards, pamphlets, demonstration and exhibition.

In the first session the junk foods consumed commonly in the households of rural women were discussed. The women were made to know why they are called as junk foods. The harmful effects of junk foods and their additives were explained to them through flash cards. Women were made to play two card and two board games by instructing them the rules of the games. The four games were distributed among the rural women at the end of the session.

The second session comprised of recapitulation of information covered during the first session. The beneficiaries were explained about healthy foods through flash cards. The formulation of healthy diet was taught using the two pamphlets and live food samples. The pamphlets were distributed among the women.

The third session comprised of summing up of information covered during the first and second session. The differences between healthy foods and junk foods were explained. The need of healthy foods for good health was explained. Not only the taste, color and flavor of food are important but also other health components such as nutrients present in food are also very important was explained. By considering these health components how to prepare a wholesome healthy foods was emphasized.

3.9.3.1 Educational modules for creating awareness to rural women

The four educational modules developed in the Department of Food Science and Nutrition were used.

3.9.3.1.1 Board games

i. Snake and ladder game: *'Uttama aahara sevisi aarogya rakshisi'* - to know the ill effects of junk foods (Plate 1a).

ii. Snake and ladder game: *'Aahara mattu aarogya'* - to know about healthy foods (Plate 1b).

3.9.3.1.2 Card games

i) Card game: Foods and nutrients (*Aahara mattu poshakanshagalu*) - indicated functions and nutrient composition of 72 indigenous foods (Plate 1c).

ii) Card game: *Aahara aarogya chakka* game - consisted of 80 cards with positive and negative aspects of food habits, food hygiene and junk foods (Plate 1d).

3.9.3.1.3 Pamphlets for nutrition education

The pamphlets included information on formulation of healthy diet. '*Aarogya sirige kirudhanyagalu'* and '*Aarogya poorna aahara'* in local language were distributed to the participants.

3.9.3.1.4 Flashcards

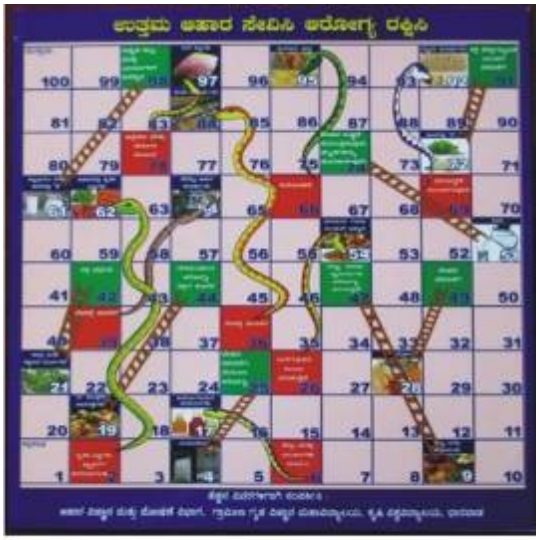
Detailed information on harmful effects of junk foods and tips for formulation of healthy diets were disseminated using flash cards ' *Aarogya poorna aahara'* (Plate 2).

3.9.4 Impact of educational intervention on rural women

Nutritional knowledge on aspects of junk foods of intervention group was assessed pre and post educational intervention, following the tools and methods described under 3.7.

Frequency of healthy foods consumed by intervention group before and after education was collected using food frequency questionnaire (Appendix II-B). Quantification for healthy foods consumption was carried out following the procedures detailed under 3.6.1 for junk foods.

Nutritional knowledge on aspects of healthy food behaviour of intervention group was assessed pre and post educational intervention, following the methods described under 3.7 for junk foods (Appendix IV).



1a. Board game to educate about ill effects of junk foods

1b. Board game on formulation of healthy foods

1c. Card game to know nutrient composition of foods

1d. Card game to create awareness on healthy food behaviour

Plate 1. Modules used in educational intervention

Plate 2. Flash cards to sensitize rural women about ill effects of junk foods and healthy food behaviour

3.10 Statistical analysis

Appropriate statistical tools were adopted to interpret the results and draw the inferences. The data was analyzed using SPSS 16.0 version. Statistical tools such as mean, frequency and percentage were employed to analyze the data collected from four agro-climatic zones. Data of nutritional status and nutrient adequacy were expressed as mean ± SD. Chi-square was used to observe the association between independent and dependent variables. Pearson's correlation coefficient was used to estimate the co-relation between age, education, socio-economic status and awareness about health hazards of junk foods. Paired-t test was employed to know the impact of nutrition education intervention on awareness about health hazards of junk foods, nutritional knowledge, junk food consumption, healthy food consumption and nutrient adequacy.

4. EXPERIMENTAL RESULTS

Women play prominent role in health of the family. Women decide food selection and intern the family's food consumption pattern which has further implications on nutritional status of family. Hence women's nutrition knowledge plays a vital role in the well being of family members.

In the current era of technological advancements in food industry, the processed foods have reached the nooks and corners of all sectors of society including rural communities. Easy accessibility and low cost of such processed junk foods creates enhanced affordability to people in rural areas and for even of lower economic strata. Utilization of cheap and simulated ingredients further lowers the cost of products besides compromising the quality adversely. The results of the investigation undertaken to know the scenario of junk foods sold in different agro-climatic zones of north Karnataka; assess nutritional status; to evaluate awareness about junk foods among rural women and to elicit consumption pattern of junk foods in the rural families are detailed in this chapter.

4.1 Socio-demographic profile of rural women

Demographic profile forms the base line information of the respondents. Table 1 depicts the demographic profile of rural women aged 15-35 years selected randomly from four different agro-climatic zones of UAS, Dharwad. With regard to zone 3, it was found that a majority of women were in the age range of 21-25 years (35.83 %), followed by those in the range of 15-20 years (25.00 %), 26-30 years (24.17 %) and lowest were recorded between the ages of 31-35 years (15.00 %).

With respect to zone 8, it was observed that a majority of women belonged to age group of 15-20 years (30.84 %), followed by those between 26-30 years (25.83 %), 21-25 years (22.50 %) and lowest were recorded in the range of 31-35 years (20.83 %).

With regard to zone 9, highest percentage of women were recorded in the age range of 21-25 years (30.00 %), followed by those in the range of 15-20 years (31.67 %), 26-30 years (21.67 %) and lowest were noted from 31-35 years (16.66 %).

It was viewed from zone 10, that a majority of women were in the age range of 31-35 years (35.00 %), followed by those between ranges of 21-25 years (26.67 %), 26-30 years (20.00 %) and lowest proportion were recorded between 15-20 years (18.33 %).

On overall basis, it was observed that a majority of the selected women were in the age range of 21-25 years (28.89 %), followed by 15-20 years (26.94 %), 26-30 years (23.61 %) and lowest were recorded between 31-35 years (20.56 %). There was a fair distribution of women selected for the investigation across the different age categories in all the zones.

With regard to distribution of women based on marital status, it was observed that highest proportion of selected women were married in zone 3 (81.67%), followed by those from zone 9 (73.33 %) and zone 8 (68.33 %). Lowest proportions of married women were recorded in zone 10 (66.67 %). Accordingly, highest proportion of unmarried women were recorded in zone 10 (33.33 %), followed by zone 8 (31.67 %), zone 9 (26.67 %) and lowest were recorded from zone 3 (18.33 %). On overall basis, it was observed that 73.33 per cent of selected women were married and 26.67 per cent were unmarried.

Table 1. Demographic profile of rural women selected from different agro-climatic zones

N=360

Parameters	Criteria	Zone 3 (n=120)	Zone 8 (n=120)	Zone 9 (n=60)	Zone 10 (n=60)	Total
Age (years)	15-20	30 (25.00)#	37 (30.84)	19 (31.67)	11 (18.33)	97 (26.94)
	21-25	43 (35.83)	27 (22.50)	18 (30.00)	16 (26.67)	104 (28.89)
	26-30	29 (24.17)	31 (25.83)	13 (21.67)	12 (20.00)	85 (23.61)
	31-35	18 (15.00)	25 (20.83)	10 (16.66)	21 (35.00)	74 (20.56)
Marital status	Married	98 (81.67)	82 (68.33)	44 (73.33)	40 (66.67)	264 (73.33)
	Unmarried	22 (18.33)	38 (31.67)	16 (26.67)	20 (33.33)	96 (26.67)
Type of family	Nuclear	46 (38.33)	55 (45.83)	29 (48.33)	33 (55.00)	163 (45.28)
	Joint	64 (53.34)	58 (48.33)	31 (51.67)	26 (43.33)	179 (49.72)
	Extended	10 (8.33)	7 (5.84)	-	1 (1.67)	18 (5.00)
Family composition (mean ± SD)	Males	2.80 ± 1.21	3.00 ± 1.91	2.50 ± 1.37	2.22 ± 0.76	2.72 ± 1.48
	Females	2.63 ± 1.15	3.35 ± 2.31	2.88 ± 1.34	2.40 ± 1.09	2.88 ± 1.69
	Adults	3.68 ± 1.60	4.73 ± 3.05	4.03 ± 1.98	3.15 ± 1.19	3.99 ± 2.27
	Children (≤15 years)	1.76 ± 0.99	1.63 ± 1.51	1.35 ± 1.05	1.48 ± 0.85	1.60 ± 1.18
Family size (mean ± SD)	Total	5.44 ± 1.85	6.31 ± 3.81	5.38 ± 2.29	4.62 ± 1.38	5.58 ± 2.73
Religion	Hindus	105 (87.50)	112 (93.33)	55 (91.67)	56 (93.33)	328 (91.11)
	Muslims	11 (9.17)	8 (6.67)	2 (3.33)	1 (1.67)	22 (6.11)
	Christians	3 (2.50)	-	2 (3.33)	3 (5.00)	8 (2.22)
	Jains	1 (0.83)	-	1 (1.67)	-	2 (0.56)
Education level	No schooling	18 (15.00)	20 (16.67)	8 (13.33)	6 (10.00)	52 (14.44)
	Primary	16 (13.33)	12 (10.00)	6 (10.00)	9 (15.00)	43 (11.95)
	Higher primary	30 (25.00)	17 (14.17)	10 (16.67)	15 (25.00)	72 (20.00)
	SSLC	40 (33.33)	38 (31.67)	19 (31.67)	10 (16.67)	107 (29.72)
	PUC / Diploma	9 (7.50)	23 (19.17)	12 (20.00)	13 (21.66)	57 (15.83)
	Graduate	7 (5.84)	9 (7.50)	5 (8.33)	6 (10.00)	27 (7.50)
	Post graduate	-	1 (0.83)	-	1 (1.67)	2 (0.56)
Occupational status	Not engaged in gainful employment	56 (46.67)	73 (60.83)	46 (76.67)	32 (53.33)	207 (57.5)
	Agriculture	15 (12.50)	5 (4.17)	1 (1.67)	4 (6.67)	25 (6.94)
	Agricultural labourer	36 (30.00)	19 (15.83)	8 (13.33)	6 (10.00)	68 (18.89)
	Other labourer	3 (2.50)	8 (6.67)	2 (3.33)	5 (8.33)	22 (6.11)
	Business	8 (6.67)	12 (10.00)	2 (3.33)	7 (11.67)	28 (7.78)
	White collar / Govt. / private job	2 (1.67)	3 (2.50)	1 (1.67)	6 (10.00)	10 (2.78)

Figures in parentheses indicate per cent values

The classification of rural women based on type of family they belonged, revealed that, in zone 3 a majority of women belonged to joint families (53.34 %), followed by those from nuclear families (38.33 %) and lowest hailed from extended families (8.33 %). In zone 8, highest number of women belonged to joint families (48.33 %), followed by nuclear families (45.33 %) and lowest were noted from extended families (5.84 %). Interestingly, it was observed that in zone 9, a majority of women belonged to joint families (51.67 %) and lowest to nuclear families (48.33 %) and none belonged to extended in families. In zone 10, the number of women were highest from nuclear families (55.00 %) followed by joint families (43.33 %) and lowest were found from extended families (1.67 %).

On overall basis a majority of women belonged to joint families (49.72 %) followed by nuclear families (45.28 %) and lowest were recorded from extended families (5.00 %). It was noteworthy to record that a majority of selected women hailed from joint families in zone 3 (53.34 %), zone 8 (48.33 %) and zone 9 (51.67 %), but in zone 10 a majority belonged to nuclear families (55.00 %).

With regard to family size and composition, women in zone 3 recorded mean total family size of 5.44 ± 1.85 members and it consisted of 2.80 ± 1.21 males, 2.63 ± 1.15 females, 3.68 ± 1.60 total adults and 1.76 ± 0.99 children. In zone 8 the mean total family size was 6.31 ± 3.81 and it composed of 3.00 ± 1.91 males, 3.35 ± 2.31 female members, 4.73 ± 3.05 total adults and 1.63 ± 1.51 children. The total family size in zone 9 was 5.38 ± 2.29 which consisted of 2.50 ± 1.37 males, 2.88 ± 1.34 females, 4.03 ± 1.98 total adults and 1.35 ± 1.05 children. In zone 10, the total family size was 4.62 ± 1.38 which composed of 2.22 ± 0.76 males, 2.40 ± 1.09 females, 3.15 ± 1.19 total adults and 1.48 ± 0.85 children. The mean total family size on overall basis was 5.58 ± 2.73 members which composed of 2.72 ± 1.48 males, 2.88 ± 1.69 females, 3.99 ± 2.27 total adults and 1.60 ± 1.18 children.

It was also observed that on over all basis highest number of adults were recorded in zone 8 (4.73 ± 3.05), followed by zone 9 (4.03 ± 1.98), zone 3 (3.68 ± 1.60), and lowest were recorded in zone 10 (3.15 ± 1.19). With respect to children it was observed that highest proportion were recorded in zone 3 (1.76 ± 0.99), followed by zone 8 (1.63 ± 1.51), zone 10 (1.48 ± 0.85) and lowest were recorded in zone 9 (1.35 ± 1.05).

With regard to religion of women selected for the investigation, it was found that a majority of them belonged to Hindu religion in all the zones. Highest proportion was recorded in zones 8 and 10 (93.33 % in each), followed by zone 9 (91.67 %) and lowest in zone 3 (87.50 %). Among the selected women, those belonging to Islamic religion were also observed, maximum in zone 3 (9.17 %) followed by zone 8 (6.67 %), zone 9 (3.33 %) and lowest were recorded from zone 10 (1.67 %). Similarly, there were Christians among the group, highest being in zone 10 (5.00 %), followed by zone 9 (3.33 %) and lowest were from zone 3 (2.50 %) however none were recorded from zone 8. There were women from Jainism too. Highest proportion of Jain women were recorded in zone 9 (1.67 %), followed by zone 3 (0.83 %) and none from zones 3 and 10. On overall basis, it was seen that a majority of respondents were Hindus (91.11 %), followed by Muslims (6.11 %), Christians (2.22 %) and lowest were Jains (0.56 %).

With regard to educational qualification of the selected women, it was observed that in zone 3 maximum proportion of women were matriculate (33.33 %), followed by those who attended higher primary schooling. However, 5.84 per cent of women were graduates, but 15.00 per cent of women had no formal education and none possessed post graduate degree. From zone 8, it was noted that a majority of women were matriculate (31.67 %), followed by those who secured PUC/diploma certificates (20.00 %) or post graduation (0.83 %). But, 16.67 per cent of women had no formal education. It was observed from zone 9, that a majority of women were matriculate (31.69 %), followed by PUC/diploma (20.00 %) holders and graduates (8.33 %). It was also recorded that 13.33 per cent of women had no formal education and none possessed post graduate degrees. With respect to zone 10 it was seen that a majority of women had completed higher primary (25.00 %), followed by PUC/diploma (21.66 %) and post graduation (1.67 %). However 10.00 per cent of women had no formal education. On overall basis, it was observed that a majority of women were matriculates (29.72 %), followed by higher primary (20.00 %), PUC/diploma (15.83 %), primary (11.45 %), graduation (7.50 %), post graduation (0.56 %) and 14.44 per cent had no formal education.

With regard to occupational status of selected rural women, it was observed that a majority of were not engaged in gainful employment, highest were recorded in zone 9 (76.67 %), followed by zone 8 (60.83 %), zone 10 (53.33 %) and lowest in zone 3 (46.67 %).With regard to those who were working or engaged in gainful employment a majority of women worked as agricultural labourers, highest recorded in zone 3 (30.00 %), followed by zone 8 (15.83 %), and zone 9 (13.33 %), and lowest in zone 10 (10.00 %). A perusal of data indicated that a section of women were engaged in business also. A proportion of women were engaged under self employment activities/business like petty shops/ grocery shops owners, milk vendors, tailors and commercial *roti* makers and grain millers. It was observed that maximum proportion of self employed/business women were recorded in zone 10 (11.67 %), followed by zone 8 (10.00 %), zone 3 (6.67 %) and lowest were recorded in zone 9 (3.33 %). A section of women were engaged as other labourers *viz*., maids/servants, factory workers or construction workers. It was observed that maximum proportion were recorded in zone 10 (8.33 %), followed by zone 8 (6.67 %), zone 9 (3.33 %), and lowest were observed in zone 3 (2.50 %). Among the women in white collar jobs/ Govt./ private jobs, it was seen that a majority were recorded in zone 10 (10.00 %), followed by zone 8 (2.50 %), and lowest were recorded in zones 3 and 9 (1.67 % each). The taluka wise distribution of demographic profile of rural women is depicted in Appendix V.

The socio-economic status of rural families depicts the level of empowerment of families. The results of socio-economic statuses of rural families are presented in Table 2. It was witnessed that in zone 3 maximum proportion of women belonged to lower middle socio-economic status (56.67 %), followed by upper middle class (23.33 %), poor class (16.67 %) or high class (2.50 %) and lowest belonged to very poor (0.83 %) socio-economic status. It was observed from zone 8, that a majority of women belonged to lower middle socio-economic status (53.33 %), followed by upper middle (31.67 %) and poor class (14.17 %). Lowest proportion was recorded from high socio-economic status (0.83 %). With respect to zone 9, maximum proportion of women belonged to lower middle socio-economic status (65.00 %), followed by upper middle (21.67 %), poor (8.33%) and high status (3.33 %). Lowest

proportion was recorded in very poor socio-economic status (1.67 %). It was seen that in zone 10, a majority of women belonged to lower middle socio-economic status (71.67 %) followed by upper middle class (16.67 %) and lowest proportion were noted in poor socio-economic status (11.66 %).

On the whole, it was observed that maximum proportion of women were in lower middle socio-economic status (59.44 %), followed upper middle class (24.72 %), poor class (13.61 %), high class (1.67 %) and lowest proportion were recorded in very poor socio-economic status (0.56 %). It was observed that there was no significant association between agro-climatic zones and socio-economic status of rural families. The taluka wise distribution of socio-economic status of rural women is depicted in Appendix VI.

Thus, it was revealed that, the women belonged to different socio-economic statuses in all the zones, but a majority was from lower middle and upper middle socio-economic status. A very few were recorded from high and very poor socio-economic status and none from upper high socio-economic status. Thus, variation in socio-demographic profile of women selected for investigation was observed.

4.2 Scenario of junk food consumption in rural families of north Karnataka

Junk food availability has expanded its horizon by reaching the rural settings also. Consumption of unbranded and low cost junk foods containing harmful food additives may lead to various health hazards.

4.2.1 Junk foods of rural north Karnataka

Survey of rural areas of north Karnataka revealed that a variety of junk foods were available cheaply and many were consumed at varied frequency. There was a wide category of attractive junk foods with varied shapes and colours provoking children to fall prey for consumption. These junk foods sold in the petty shops of the villages may not only harmful but may be hazardous to health of the individuals which when consumed frequently (Plate 3). Consuming the low cost products made out of substandard ingredients with added harmful food additives will not only be dangerous but a large compromise with the health of the rural residents.

The popular junk foods recorded in rural areas included sweet and savoury products. Sweet products which included *khava* (a small square shaped sweet made of either *besan* or refined flour), *rasgulla* (a round red/brown coloured sweet made of refined flour and dipped in sugar syrup and dried), artificial ice-cream (made out of fat) and *Mysorepak* (a yellow coloured, rectangle shaped sweet with small pores on surface, made out of *besan* flour). These products *viz*., *khava, rasgulla*, and *Mysorepak* were fake products nowhere resembling the original products.

The extruded foods like *kurkure* and also popularly called so in rural areas were varied in shape colour and size. For convenience these foods are called as kurkure although are not branded. The fried products like *kurkuri*, *papadi* (an yellow/orange coloured cylindrical fried product), *khardani* (a *sev* like product made of corn flour), *ghate* (a flat yellow extruded fried product made of besan), *vatani* (green/red coloured fried peas), *chakkali* and *kodbale* were also consumed by rural families.

Table 2. Socio-economic status of selected rural women from different agro-climatic zones

N=360

Socio-economic status	Zone 3	Zone 8	Zone 9	Zone 10	Total	χ^2
	n (%)	n (%)	n (%)	n (%)		
High	3 (2.50)	1 (0.83)	2 (3.33)	-	6 (1.67)	13.54^{NS}
Upper middle	28 (23.33)	38 (31.67)	13 (21.67)	10 (16.67)	89 (24.72)	
Lower middle	68 (56.67)	64 (53.33)	39 (65.00)	43 (71.67)	214 (59.44)	
Poor	20 (16.67)	17 (14.17)	5 (8.33)	7 (11.66)	49 (13.61)	
Very poor	1 (0.83)	-	1 (1.67)	-	2 (0.56)	
Total	120 (33.33)	120 (33.33)	60 (16.67)	60 (16.67)	360 (100.00)	

NS-Non significant

Plate 3. Sales of junk foods in rural areas of north Karnataka

Roasted products recorded were *hurakadli* (roasted bengal gram sprinkled with yellow colour/turmeric) and only puffed product was *badang* (a product made of puffed rice with seasoning). The baked products such as *khari* (a baked puffy product with crispy texture), *dil khush*/*dil pasand* (a baked product filled in with red coloured tutti-fruity and coconut) were also consumed by rural families.

4.2.1.1 Scenario of junk food consumption in zone 3

Table 3 shows the rank wise distribution of junk foods consumed in zone 3. Most popular junk foods consumed by rural families on daily basis were chocolates/candies (47.50 %), biscuits (47.50 %) and *kurkuri* (37.50 %) were recorded with consumption frequency scores of 133, 133 and 105 respectively. The green/red *vatani* (27.50 %), *khava* (22.50 %) and *badang* (17.50 %), were consumed on thrice a week basis with consumption frequency scores of 66, 54 and 42, respectively. The foods consumed popularly on twice a week basis were *rasgulla* (35.00 %), bread (35.00 %) and jelly (35.00 %) with consumption frequency scores of 70 each. The weekly consumption of potato chips (40.00 %), *kharadani* (57.50 %) and *batar*/toast/rusk (37.50 %) was popular with consumption frequency scores of 92, 64 and 60, respectively. The foods consumed by rural families on fortnightly basis were chat foods (30.00 %), *and chakkali/kodbale* (30.00 %), puffed sago (25.00 %) with consumption frequency scores of 36, 36 and 30, respectively. The foods consumed on monthly basis were *manchurian* (37.50 %) *and samosa/kachori* (40.00 %) with consumption frequency scores of 30 and 32 respectively. The foods consumed popularly on rarely basis were ice-creams / ice candy (62.50 %), soft drinks (60.00 %) and noodles (52.50 %) with consumption frequency scores of 25, 24 and 21 respectively. Majority of the families never consumed pop corn.

4.2.1.2 Scenario of junk food consumption in zone 8

The rank wise distribution of junk foods consumed by rural families in zone 8 is depicted in Table 4. It was observed that biscuits (52.50 %), chocolates/candies (45.00 %) and *kurkuri* (35.00 %) were consumed on daily basis by rural families in zone 8 with consumption frequency scores of 147, 126 and 98, respectively and *rasgulla* (20.00 %) was consumed on thrice a week basis with consumption frequency scores of 48. It was observed that potato chips (30.00 %), *papadi* (27.50 %) and *badang* (15.00 %), *chigli* (20.00 %) were consumed on twice a week basis with consumption frequency scores of 60, 55 30 and 40, respectively. The weekly consumed popular foods were bread (45.00 %), *khardani* (42.50 %), green/red *vatani* (42.50 %), cake (46.00 %) and jelly (40.00 %) with consumption frequency scores of 72, 68, 68, 64 and 64 respectively. It was observed that *batar*/toast/rusk (45.00 %), *khava peda* (45.00 %), and cream chocolate (27.50 %) were consumed popularly on fortnightly basis with consumption frequency scores of 54, 54 and 33, respectively. Chat foods (55.00 %), *manchurian* (47.50 %), *dilkhush/dilpasand* (37.50 %) were consumed popularly on monthly basis with consumption frequency scores of 44, 38 and 30, respectively. The rarely consumed foods by rural families were soft drinks (65.00 %), ice cream/ice candy (57.50 %) *samosa/kachori* (42.50 %) and pop corn (40.00 %), with consumption frequency scores of 26, 23, 17 and 16 respectively. Majority of the families never consumed noodles.

Table 3. Scenario of junk food consumption in rural families of zone 3

N=40

Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
1.	Chocolates / candies	19 (47.50)	133	9 (22.50)	54	7 (17.50)	35	5 (12.50)	20	-	0	-	0	-	0	-	0	242
2.	*Kurkuri*	15 (37.50)	105	11 (27.50)	66	9 (22.50)	45	5 (12.50)	20	-	0	-	0	-	0	-	0	236
3.	Biscuits	19 (47.50)	133	6 (15.00)	36	7 (17.50)	35	5 (12.50)	20	1 (2.50)	3	2 (5.00)	4	-	0	-	0	231
4.	*Papadi*	9 (22.50)	63	8 (20.00)	48	9 (22.50)	45	8 (20.00)	32	1 (2.50)	3	1 (2.50)	2	3 (7.50)	3	1 (2.50)	0	196
5.	Green / red *vatani*	7 (17.50)	49	11 (27.50)	66	6 (15.00)	30	7 (17.50)	28	5 (12.50)	15	1 (2.50)	2	2 (5.00)	2	1 (2.50)	0	192
6.	Potato chips	7 (17.50)	49	6 (15.00)	36	7 (17.50)	35	16 (40.00)	64	2 (5.00)	6	-	0	1 (2.50)	1	1 (2.50)	0	191
7.	*Rasgulla*	6 (15.00)	42	8 (20.00)	48	14 (35.00)	70	5 (12.50)	20	-	0	-	0	4 (10.00)	4	3 (7.50)	0	184
8.	*Khava*	6 (15.00)	42	9 (22.50)	54	10 (25.00)	50	6 (15.00)	24	1 (2.50)	3	-	0	5 (12.50)	5	3 (7.50)	0	178
9.	*Hurakadli*	7 (17.50)	49	8 (20.00)	48	6 (15.00)	30	8 (20.00)	32	3 (7.50)	9	2 (5.00)	4	4 (10.00)	4	2 (5.00)	0	176
10.	Coconut chocolate	-	-	8 (20.00)	48	12 (30.00)	60	9 (22.50)	36	7 (17.50)	21	4 (10.00)	8	-	-	-	-	173
11.	Bread	2 (5.00)	14	1 (2.50)	6	14 (35.00)	70	14 (35.00)	56	7 (17.50)	21	2 (5.00)	4	-	0	-	0	171
12.	Jelly	-	-	5 (12.50)	30	14 (35.00)	70	12 (30.00)	48	6 (15.00)	18	2 (5.00)	4	-	-	1 (2.50)	0	170

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
13.	*Batar* / toast / rusk	-	0	-	0	10 (25.00)	50	15 (37.50)	60	10 (25.00)	30	5 (12.50)	10	-	0	-	0	150
14.	*Kharadani*	-	0	2 (5.00)	12	1 (2.50)	5	23 (57.50)	92	10 (25.00)	30	1 (2.50)	2	1 (2.50)	1	2 (5.00)	0	142
15.	Cake	-	0	4 (10.00)	24	5 (12.50)	25	14 (35.00)	56	9 (22.50)	27	4 (10.00)	8	1 (2.50)	1	3 (7.50)	0	141
16.	*Badang*	-	0	7 (17.50)	42	7 (17.50)	35	8 (20.00)	32	4 (10.00)	12	4 (10.00)	8	10 (25.00)	10	-	0	139
17.	*Ghate*	2 (5.00)	14	3 (7.50)	18	7 (17.50)	35	8 (20.00)	32	8 (20.00)	24	4 (10.00)	8	6 (15.00)	6	2 (5.00)	0	137
18.	*Shankar pale*	-	-	-	-	9 (22.50)	45	15 (37.50)	60	6 (15.00)	18	4 (10.00)	8	-	-	6 (15.00)	0	131
19.	*Dhoodh peda*	-	-	1 (2.50)	6	8 (20.00)	40	5 (12.50)	20	12 (30.00)	36	6 (15.00)	12	5 (12.50)	5	3 (7.50)	0	119
20.	*Badampuri/Balusha*	-	0	-	0	4 (10.00)	20	13 (32.50)	52	8 (20.00)	24	6 (15.00)	12	2 (5.00)	1	7 (17.50)	0	109
21.	Bun:cream / jam / *khara*	-	0	-	0	1 (2.50)	5	14 (35.00)	56	10 (25.00)	30	6 (15.00)	12	4 (10.00)	4	5 (12.50)	0	107
22.	*Khari /* puffs	-	0	-	0	1 (2.50)	5	11 (27.50)	44	9 (22.50)	27	15 (37.50)	30	1 (2.50)	1	3 (7.50)	0	107
23.	Chat foods:*pani puri* etc.	-	0	-	0	-	0	7 (17.50)	28	12 (30.00)	36	14 (35.00)	28	7 (17.50)	7	-	0	99
24.	*Dil Khush / dil pasand*	-	0	-	0	-	0	10 (25.00)	40	10 (25.00)	30	9 (22.50)	18	5 (12.50)	5	6 (15.00)	0	93
25.	*Kharadani laddu*	-	-	2 (5.00)	12	5 (12.50)	25	4 (10.00)	16	7 (17.50)	21	7 (17.50)	14	3 (7.50)	3	12 (30.00)	0	91

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
26.	*Putani laddu*	-	-	-	-	6 (15.00)	30	3 (7.50)	12	8 (20.00)	24	9 (22.50)	18	5 (12.50)	5	9 (22.50)	0	89
27.	*Manchurian*	-	0	-	0	-	0	4 (10.00)	16	10 (25.00)	30	15 (37.50)	30	11 (27.50)	11	-	0	87
28.	*Chigli*	2 (5.00)	14	8 (20.00)	48	13 (32.50)	65	9 (22.50)	36	3 (7.50)	9	5 (12.50)	10	-	-	-	-	82
29.	Puffed sago	-	-	-	-	3 (7.50)	15	7 (17.50)	28	10 (25.00)	30	3 (7.50)	6	1 (2.50)	1	16 (40.00)	0	80
30.	*Chakkali / kodbale*	-	0	-	0	1 (2.50)	5	5 (12.50)	20	12 (30.00)	36	5 (12.50)	10	3 (7.50)	3	4 (10.00)	0	74
31.	Popcorn	2 (5.00)	14	2 (5.00)	12	1 (2.50)	5	2 (5.00)	8	1 (2.50)	3	5 (12.50)	10	21 (52.50)	21	6 (15.00)	0	73
32.	*Mysorepak*	2 (5.00)	14	-	0	-	0	4 (10.00)	16	4 (10.00)	12	5 (12.50)	10	20 (50.00)	20	5 (12.50)	0	72
33.	Chewing gum	-	0	-	0	1 (2.50)	5	6 (15.00)	24	4 (10.00)	12	5 (12.50)	10	18 (45.00)	18	6 (15.00)	0	69
34.	Noodles	-	0	-	0	1 (2.50)	5	4 (10.00)	16	4 (10.00)	12	6 (15.00)	12	21 (52.50)	21	4 (10.00)	0	66
35.	Soft drinks	-	0	-	0	-	0	2 (5.00)	8	3 (7.50)	9	11 (32.50)	22	24 (57.50)	24	-	0	63
36.	*Samosa / kachori*	-	0	-	0	-	0	1 (2.50)	4	3 (7.50)	9	16 (40.00)	32	16 (40.00)	16	4 (10.00)	0	61
37.	Ice-cream / ice candy	-	0	-	0	-	0	-	0	-	0	12 (30.00)	24	25 (62.50)	25	3 (7.50)	0	49

CFS-Consumption frequency score

Table 4. Scenario of junk food consumption in rural families of zone 8

N=40

Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
1.	Biscuits	21 (52.50)	147	5 (12.50)	30	4 (10.00)	20	5 (12.50)	20	2 (5.00)	6	1 (2.50)	2	-	0	2 (5.00)	0	225
2.	Chocolates / candies	18 (45.00)	126	5 (12.50)	30	7 (17.50)	35	6 (15.00)	24	2 (5.00)	6	-	0	1 (2.50)	1	1 (2.50)	0	222
3.	*Kurkuri*	14 (35.00)	98	7 (17.50)	42	10 (25.00)	50	6 (15.00)	24	1 (2.50)	3	1 (2.50)	2	1 (2.50)	1	-	0	220
4.	Bread	3 (7.50)	21	3 (7.50)	18	5 (12.50)	25	18 (45.00)	72	7 (17.50)	21	3 (7.50)	6	1 (2.50)	1	-	0	164
5.	Potato chips	3 (7.50)	21	2 (5.00)	12	12 (30.00)	60	14 (35.00)	56	2 (5.00)	6	3 (7.50)	6	2 (5.00)	2	2 (5.00)	0	163
6.	*Rasgulla*	2 (5.00)	14	8 (20.00)	48	8 (20.00)	40	10 (25.00)	40	2 (5.00)	6	-	0	6 (15.00)	6	4 (10.00)	0	154
7.	*Khava*	3 (7.50)	21	7 (17.50)	42	3 (7.50)	15	14 (35.00)	56	1 (2.50)	3	1 (2.50)	2	5 (12.50)	5	6 (15.00)	0	144
8.	Cake	3 (7.50)	21	-	0	4 (10.00)	20	16 (40.00)	64	8 (20.00)	24	5 (12.50)	10	3 (7.50)	3	1 (2.50)	0	142
9.	*Papadi*	1 (2.50)	7	3 (7.50)	18	11 (27.50)	55	10 (25.00)	40	4 (10.00)	12	2 (5.00)	4	4 (10.00)	4	5 (12.50)	0	140
10.	Jelly	-	-	2 (5.00)	12	9 (2.50)	45	16 (40.00)	64	5 (12.50)	15	3 (7.50)	9	-	-	5 (12.50)	0	136
11.	*Kharadani*	1 (2.50)	7	2 (5.00)	12	-	0	17 (42.50)	68	9 (22.50)	27	10 (25.00)	20	-	0	1 (2.50)	0	134
12.	*Chigli*	-	-	5 (12.50)	30	8 (20.00)	40	12 (30.00)	36	6 (15.00)	18	2 (5.00)	6	5 (12.50)	5	2 (5.00)	0	127

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
13.	*Batar* / toast / rusk	-	0	-	0	2 (5.00)	10	11 (27.50)	44	18 (45.00)	54	7 (17.50)	14	1 (2.50)	1	1 (2.50)	0	123
14.	Green / red *vatani*	2 (5.00)	14	1 (2.50)	6	4 (10.00)	20	17 (42.50)	68	2 (5.00)	6	3 (7.50)	6	3 (7.50)	3	8 (20.00)	0	123
15.	*Khava peda*	-	-	1 (2.50)	6	7 (17.50)	35	4 (10.00)	16	18 (45.00)	54	2 (5.00)	4	6 (15.00)	6	2 (5.00)	0	121
16.	Bun:cream / jam / *khara*	3 (7.50)	21	-	0	1 (2.50)	5	8 (20.00)	32	7 (17.50)	21	16 (40.00)	32	2 (5.00)	2	3 (7.50)	0	113
17.	Cream chocolate	3 (7.50)	21	2 (5.00)	12	1 (2.50)	5	8 (20.00)	32	11 (27.50)	33	3 (7.50)	6	4 (10.00)	4	8 (20.00)	0	113
18.	*Nippattu*	-	-	-	-	4 (10.00)	20	11 (27.50)	44	14 (35.00)	42	3 (7.50)	6	3 (7.50)	1	5 (12.50)	0	113
19.	*Hurakadli*	-	0	2 (5.00)	12	4 (10.00)	20	14 (35.00)	56	2 (5.00)	6	3 (7.50)	6	4 (10.00)	4	11 (27.50)	0	104
20.	*Ghate*	-	0	-	0	4 (10.00)	20	10 (25.00)	40	7 (17.50)	21	5 (12.50)	10	6 (15.00)	6	8 (20.00)	0	97
21.	*Khari* / puffs	-	0	-	0	1 (2.50)	5	5 (12.50)	20	9 (22.50)	27	20 (50.00)	40	3 (7.50)	3	2 (5.00)	0	95
22.	Chat foods:*pani puri* etc.	-	0	1 (2.50)	6	-	0	8 (20.00)	32	2 (5.00)	6	22 (55.00)	44	4 (10.00)	4	3 (7.50)	0	92
23.	*Manchurian*	-	0	-	0	-	0	3 (7.50)	12	10 (25.00)	30	19 (47.50)	38	4 (10.00)	4	4 (10.00)	0	84
24.	*Badang*	-	0	-	0	6 (15.00)	30	6 (15.00)	24	3 (7.50)	9	4 (10.00)	8	9 (22.50)	9	12 (30.00)	0	80

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
25.	*Dil Khush / dil pasand*	-	0	-	0	-	0	3 (7.50)	12	7 (17.50)	21	15 (37.50)	30	8 (20.00)	8	7 (17.50)	0	71
26.	*Mysorepak*	-	0	-	0	2 (5.00)	10	3 (7.50)	12	7 (17.50)	21	4 (10.00)	8	15 (37.50)	15	9 (22.50)	0	66
27.	*Chakkali / kodbale*	-	0	-	0	1 (2.50)	5	3 (7.50)	12	1 (2.50)	3	15 (37.50)	30	14 (35.00)	14	6 (15.00)	0	64
28.	*Besan laddu*	-	-	-	-	3 (7.50)	15	2 (5.00)	8	9 (22.50)	27	5 (12.50)	10	4 (10.00)	4	17 (42.50)	0	64
29.	Chewing gum	-	0	1 (2.50)	6	-	0	6 (15.00)	24	3 (7.50)	9	3 (7.50)	6	18 (45.00)	18	9 (22.50	0	63
30.	Noodles	-	0	-	0	1 (2.50)	5	3 (7.50)	12	4 (10.00)	12	11 (27.50)	22	9 (22.50)	9	12 (30.00)	0	60
31.	Soft drinks	-	0	-	0	-	0	1 (2.50)	4	5 (12.50)	15	3 (7.50)	6	26 (65.00)	26	5 (12.50)	0	51
32.	Ice-cream / ice candy	-	0	-	0	1 (2.50)	5	-	0	1 (2.50)	3	8 (20.00)	16	23 (57.50)	23	7 (17.50)	0	47
33.	Popcorn	-	-	-	0	1 (2.50)	5	-	0	3 (7.50)	9	3 (7.50)	6	16 (40.00)	16	17 (42.50)	0	36
34.	*Samosa / kachori*	-	0	-	0	1 (2.50)	5	-	0	1 (2.50)	3	4 (10.00)	8	17 (42.50)	17	17 (42.50)	0	33
35.	*Halwa*	-	-	-	-	2 (5.00)	10	-	-	5 (12.50)	15	3 (7.50)	6	1 (2.50)	1	29 (72.50)	0	32

CFS-Consumption frequency score

4.2.1.3 Scenario of junk food consumption in zone 9

The junk foods popularly consumed by rural families in zone 9 (Table 5) on daily basis were *kurkuri* (55.00 %), biscuits (55.00 %), chocolates/candies (45.00 %), *rasgulla* (45.00 %) and *khava* (40.00 %) with consumption frequency scores of 77, 77, 63, 63 and 56 respectively. *Papadi* (40.00 %) and *chigli* (20.00 %) were consumed on thrice a week basis with consumption frequency scores of 48 and 24. Green/ red *vatani* were consumed on twice a week basis with consumption frequency scores of 25. The weekly consumed foods by rural families were potato chips (45.00 %), *khardani* (40.00 %) and bread (35.00 %) with consumption frequency scores of 36, 32 and 28, respectively. Cake (45.00 %), buns (40.00 %) and chewing gum (40.00 %) were consumed on fortnightly basis with consumption frequency scores of 27, 24 and 24 respectively. The foods consumed on monthly basis were chat foods (30.00 %) and *samosa/kachori* (25.00 %) with consumption frequency scores of 12 and 10 respectively. The rarely consumed foods by rural families were *balusha* (35.00 %), ice cream/ice candy (55.00 %) and soft drinks (40.00 %) with consumption frequency scores of 14, 11 and 8, respectively. Majority of families never consumed pop corn.

4.2.1.4 Scenario of junk food consumption in zone 10

The rank wise distribution of junk foods consumed by rural families in zone 10 is depicted in Table 6. It was found that on daily basis chocolates/candies (55.00 %), biscuits (50.00 %) and *kurkuri* (50.00 %) were popularly consumed by rural families in zone 10 with consumption frequency scores of 77, 70 and 70, respectively. It was observed that potato chips (20.00 %), *badang* (20.00 %) and green/red *vatani* (15.00 %) were consumed on thrice a week basis with consumption frequency scores of 24, 24 and 18 respectively. Cream chocolate (40.00 %), jelly (35.00 %), chewing gum (5.00 %) and *ghate* (20.00 %), were consumed on twice a week basis with consumption frequency scores of 40, 35, 20 and 5, respectively. It was observed that bread (50.00 %), *khardani* (45.00 %), *batar*/toast/rusk (15.00 %) were consumed popularly on weekly basis with consumption frequency scores of 40, 28 and 20, respectively. Cake (35.00 %) buns (35.00 %), *chigli* (35.00 %) and *dil khush/ dil pasand* (25.00 %) were consumed on fortnightly basis with consumption frequency scores of 21, 21, 21 and 15, respectively. The foods consumed on monthly basis were chat foods (30.00 %) and *khari*/puffs (30.00 %) with consumption frequency scores of 12 each. The most rarely consumed foods by rural families were ice cream/ice candy (60.00 %), soft drinks (25.00 %) and *samosa/kachori* (20.00 %) with consumption frequency scores of 12, 4 and 5, respectively. Majority of families never consumed pop corn and noodles.

The consumption of levels different junk foods in different zones of UAS, Dharwad is depicted in Table 7. Highest number of junk foods (37) were recorded in zone 3, followed by zone 8 (35), zone 9 and 10 (32 in each). Among the 37 different junk foods revealed in zone 3, the foods scoring consumption frequency scores between 170-242 could be categorized as highly popular. The foods in the first three positions of popularity were chocolates/candies, *kurkuri* and biscuits. The moderately consumed junk foods were those foods with consumption frequency score ranging from 107-150. Among them batar/toast/rusk, *khardani* and cakes were recorded. The less popular junk foods raged between the consumption frequency scores between 49-99 and foods such as chat foods, *dil khush/dil pasand* and *khardani laddu* and many other foods were included.

Table 5. Scenario of junk food consumption in rural families of zone 9

N=20

Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
1.	*Kurkuri*	11 (55.00)	77	6 (30.00)	36	1 (5.00)	5	2 (10.00)	8	-	0	-	0	-	0	-	0	126
2.	Biscuits	11 (55.00)	77	4 (20.00)	24	3 (15.00)	15	2 (10.00)	8	-	0	-	0	-	0	-	0	124
3.	Chocolates / candies	9 (45.00)	63	7 (35.00)	42	1 (5.00)	5	3 (15.00)	12	-	0	-	0	-	0	-	0	122
4.	*Rasgulla*	9 (45.00)	63	5 (25.00)	30	2 (10.00)	10	2 (10.00)	8	-	0	-	0	-	0	2 (10.00)	0	111
5.	*Papadi*	4 (20.00)	28	8 (40.00)	48	3 (15.00)	15	1 (5.00)	4	1 (5.00)	3	1 (5.00)	2	-	0	2 (10.00)	0	100
6.	*Khava*	8 (40.00)	56	2 (10.00)	12	3 (15.00)	15	1 (5.00)	4	-	0	-	0	-	0	6 (30.00)	0	87
7.	Bread	2 (10.00)	14	1 (5.00)	6	4 (20.00)	20	7 (35.00)	28	6 (30.00)	18	-	0	-	0	-	0	86
8.	Potato chips	2 (10.00)	14	3 (15.00)	18	2 (10.00)	10	9 (45.00)	36	2 (10.00)	6	-	0	1 (5.00)	1	1 (5.00)	0	85
9.	*Kharadani*	-	0	2 (10.00)	12	3 (15.00)	15	8 (40.00)	32	6 (30.00)	18	1 (5.00)	2	-	0	-	0	79
10.	*Batar* / toast / Rusk	-	0	3 (15.00)	18	2 (10.00)	10	6 (30.00)	24	6 (30.00)	18	1 (5.00)	2	2 (10.00)	2	-	0	74
11.	*Chigli*	-	-	4 (20.00)	24	2 (10.00)	10	1 (5.00)	4	5 (25.00)	15	6 (30.00)	12	2 (10.00)	1	-	-	66

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
12.	*Badang*	-	0	4 (20.00)	24	2 (10.00)	10	7 (35.00)	28	1 (5.00)	3	-	0	-	0	6 (30.00)	0	65
13.	Green / red *vatani*	1 (5.00)	7	-	0	5 (25.00)	25	6 (30.00)	24	1 (5.00)	3	-	0	-	0	7 (35.00)	0	59
14.	Cake	-	0	-	0	-	0	5 (25.00)	20	9 (45.00)	27	4 (20.00)	8	2 (10.00)	2	-	0	57
15.	Jelly	-	-	2 (10.00)	12	1 (5.00)	5	2 (10.00)	8	6 (30.00)	18	4 (20.00)	8	2 (10.00)	4	3 (15.00)	1	56
16.	Bun:cream / jam / *khara*	-	0	-	0	-	0	4 (20.00)	16	8 (40.00)	24	5 (25.00)	10	1 (5.00)	1	2 (10.00)	0	51
17.	*Khari* / puffs	-	0	1 (5.00)	6	-	0	1 (5.00)	4	5 (25.00)	15	6 (30.00)	12	4 (20.00)	4	3 (15.00)	0	41
18.	*Ghate*	-	0	-	0	2 (10.00)	10	6 (30.00)	24	2 (10.00)	6	-	0	1 (5.00)	1	9 (45.00)	0	41
19.	*Balusha*	-	-	-	-	1 (5.00)	5	3 (15.00)	12	2 (10.00)	6	1 (5.00)	2	7 (35.00)	14	6 (30.00)	0	39
20.	Chat foods:*pani puri* etc.	-	0	-	0	-	0	3 (15.00)	12	3 (15.00)	9	6 (30.00)	12	5 (25.00)	5	3 (15.00)	0	38
21.	*Mysorepak*	-	0	-	0	2 (10.00)	10	5 (25.00)	20	2 (10.00)	6	-	0	1 (5.00)	1	10 (50.00)	0	37
22.	*Dil Khush /dil pasand*	-	0	-	0	-	0	4 (20.00)	16	2 (10.00)	6	6 (30.00)	12	2 (10.00)	2	6 (30.00)	0	36
23.	Chewing gum	-	0	-	0	-	0	2 (10.00)	8	8 (40.00)	24	1 (5.00)	2	1 (5.00)	1	8 (40.00)	0	35

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
24	*Chakkali / kodbale*	-	0	-	0	1 (5.00)	5	5 (25.00)	20	2 (10.00)	6	-	0	-	0	12 (60.00)	0	31
25.	*Manchurian*	-	0	-	0	-	0	1 (5.00)	4	3 (15.00)	9	4 (20.00)	8	6 (30.00)	6	6 (30.00)	0	27
26.	*Hurakadli*	-	0	-	0	2 (10.00)	10	1 (5.00)	4	2 (10.00)	6	1 (5.00)	2	3 (15.00)	3	11 (55.00)	0	25
27.	Ice-cream / ice candy	-	0	-	0	-	0	-	0	-	0	6 (30.00)	12	11 (55.00)	11	3 (15.00)	0	23
28.	*Samosa / kachori*	-	0	-	0	-	0	-	0	3 (15.00)	9	5 (25.00)	10	4 (20.00)	4	8 (40.00)	0	23
29.	Soft drinks	-	0	-	0	-	0	-	0	1 (5.00)	3	2 (10.00)	4	8 (40.00)	8	9 (45.00)	0	15
30.	Flavour sticks	-	-	-	-	-	-	2 (5.00)	8	-	-	-	-	3 (15.00)	1	15 (75.00)	0	9
31.	Noodles	-	0	-	0	-	0	-	0	-	0	-	0	3 (15.00)	3	17 (85.00)	0	3
32.	Popcorn	-	0	-	0	-	0	-	0	-	0	-	-	2 (10.00)	2	18 (90.00)	0	2

CFS-Consumption frequency score

Table 6. Scenario of junk food consumption in rural families of zone 10

N=20

Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
1.	Biscuits	10 (50.00)	70	5 (25.00)	30	3 (15.00)	15	2 (10.00)	8	-	0	-	0	-	0	-	0	123
2.	Chocolates / candies	11 (55.00)	77	4 (20.00)	24	1 (5.00)	5	2 (10.00)	8	-	0	-	0	1 (5.00)	1	1 (5.00)	0	115
3.	*Kurkuri*	10 (50.00)	70	3 (15.00)	18	1 (5.00)	5	2 (10.00)	8	-	0	-	0	2 (10.00)	2	2 (10.00)	0	103
4.	*Rasgulla*	7 (35.00)	49	6 (30.00)	36	2 (10.00)	10	1 (5.00)	4	-	0	-	0	-	0	4 (20.00)	0	99
5.	Cream chocolate	-	-	2 (10.00)	12	8 (40.00)	40	3 (15.00)	12	7 (35.00)	21	1 (5.00)	2	-	-	-	0	87
6.	Potato chips	3 (15.00)	21	4 (20.00)	24	5 (25.00)	25	2 (10.00)	8	2 (10.00)	6	-	0	1 (5.00)	1	3 (15.00)	0	85
7.	Jelly	-	-	4 (20.00)	24	7 (35.00)	35	3 (15.00)	12	2 (10.00)	6	2 (10.00)	4	1 (5.00)	1	1 (5.00)	0	82
8.	*Khava*	9 (45.00)	63	2 (10.00)	12	-	0	-	0	1 (5.00)	3	-	0	-	0	8 (40.00)	0	78
9.	Bread	-	0	-	0	4 (20.00)	20	10 (50.00)	40	5 (25.00)	15	1 (5.00)	2	-	0	-	0	77
10.	*Kharadani*	-	-	1 (5.00)	6	4 (20.00)	20	9 (45.00)	36	3 (15.00)	9	1 (5.00)	2	-	0	2 (10.00)	0	73
11.	*Papadi*	8 (40.00)	56	-	0	2 (10.00)	10	-	0	1 (5.00)	3	1 (5.00)	2	1 (5.00)	1	7 (35.00)	0	72

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
12.	*Batar*/ toast / Rusk	-	0	4 (20.00)	24	2 (10.00)	10	3 (15.00)	12	6 (30.00)	18	1 (5.00)	2	-	0	4 (20.00)	0	66
13.	*Chigli*	1 (5.00)	7	1 (5.00)	6	3 (15.00)	15	1 (5.00)	4	7 (35.00)	21	3 (15.00)	6	4 (20.00)	4	-	-	63
14.	*Badang*	1 (5.00)	7	4 (20.00)	24	2 (10.00)	10	4 (20.00)	16	-	0	-	0	-	0	9 (45.00)	0	57
15.	Cake	-	0	-	0	-	0	3 (15.00)	12	7 (35.00)	21	7 (35.00)	14	-	0	3 (15.00)	0	47
16.	Green / red *vatani*	1 (5.00)	7	3 (15.00)	18	2 (10.00)	10	2 (10.00)	8	-	0	-	0	-	0	12 (60.00)	0	43
17.	Bun:cream / jam / *khara*	-	0	-	0	-	0	2 (10.00)	8	7 (35.00)	21	6 (30.00)	12	1 (5.00)	1	4 (20.00)	0	42
18.	*Til laddu*	-	-	-	-	1 (5.00)	5	5 (25.00)	20	2 (10.00)	6	3 (15.00)	6	5 (25.00)	5	4 (20.00)	0	42
19.	*Ghate*	1 (5.00)	7	2 (10.00)	12	4 (20.00)	20	-	0	-	0	-	0	1 (5.00)	1	12 (60.00)	0	40
20.	*Mysore pak*	2 (10.00)	14	1 (5.00)	6	-	0	4 (20.00)	16	-	0	-	0	-	0	13 (65.00)	0	36
21.	*Hurakadli*	-	0	-	-	4 (20.00)	20	3 (15.00)	12	-	0	-	0	-	0	13 (65.00)	0	32
22.	Chat foods: *pani puri etc.*	-	0	-	0	-	0	3 (15.00)	12	1 (5.00)	3	6 (30.00)	12	5 (25.00)	5	5 (25.00)	0	32
23.	*Khari* / puffs	-	0	1 (5.00)	6	-	0	2 (10.00)	8	-	0	6 (30.00)	12	3 (15.00)	3	8 (40.00)	0	29

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Rank	Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never		Total CFS
		n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	n (%)	CFS	
24.	*Manchurian*	-	0	-	0	-	0	1 (5.00)	4	3 (15.00)	9	6 (30.00)	12	2 (10.00)	2	8 (40.00)	0	27
25.	*Chakkali / kodbale*	-	0	-	0	2 (10.00)	10	4 (20.00)	16	-	0	-	0	-	0	14 (70.00)	0	26
26.	*Dil Khush / dil pasand*	-	0	-	0	-	0	2 (10.00)	8	5 (25.00)	15	1 (5.00)	2	-	0	12 (60.00)	0	25
27.	Soft drinks	-	0	-	0	-	0	-	0	2 (10.00)	6	3 (15.00)	6	5 (25.00)	5	10 (50.00)	0	17
28.	Ice-cream / ice candy	-	0	-	0	-	0	-	0	-	0	1 (5.00)	2	12 (60.00)	12	7 (35.00)	0	14
29.	Chewing gum	-	0	-	0	1 (5.00)	5	-	0	-	0	-	0	-	0	19 (95.00)	0	5
30.	*Samosa / kachori*	-	0	-	0	-	0	-	0	-	0	-	0	4 (20.00)	4	16 (80.00)	0	4
31.	Popcorn	-	0	-	0	-	0	-	-	-	0	-	0	3 (15.00)	3	17 (85.00)	0	3
32.	Noodles	-	0	-	0	-	0	-	0	-	0	-	0	1 (5.00)	1	19 (95.00)	0	1

CFS-Consumption frequency score

Table 7. Classification of junk foods according to levels of consumption in different zones

Rank	Zone 3	Scores	Rank	Zone 8	Scores	Rank	Zone 9	Scores	Rank	Zone 10	Scores
Highly popular											
1	Chocolates / candies	242	1	Biscuits	225	1	*Kurkuri*	126	1	Biscuits	123
2	*Kurkuri*	236	2	Chocolates / candies	222	2	Biscuits	124	2	Chocolates / candies	115
3	Biscuits	231	3	*Kurkuri*	220	3	Chocolates / candies	122	3	*Kurkuri*	103
4	*Papadi*	196	4	Bread	164	4	*Rasgulla*	111	4	*Rasgulla*	99
5	Green / red *vatani*	192	5	Potato chips	163	5	*Papadi*	100	5	Cream chocolate	87
6	Potato chips	191	6	*Rasgulla*	154	6	*Khava*	87	6	Potato chips	85
7	*Rasgulla*	184	7	*Khava*	144	7	Bread	86	7	Jelly	82
8	*Khava*	178	8	Cake	142	8	Potato chips	85	8	*Khava*	78
9	*Hurakadli*	176	9	*Papadi*	140	9	*Kharadani*	79	9	Bread	77
10	Coconut chocolate	173	10	Jelly	136	10	*Batar* / toast / rusk	74	10	*Kharadani*	73
11	Bread	171	11	*Kharadani*	134	**Moderately popular**			11	*Papadi*	72
12	Jelly	170	**Moderately popular**			11	*Chigli*	66	12	*Batar*/ toast / rusk	66
Moderately popular			12	*Chigli*	127	12	*Badang*	65	**Moderately popular**		
13	*Batar* / toast / rusk	150	13	*Batar* / toast / rusk	123	13	Green / red *vatani*	59	13	*Chigli*	63
14	*Kharadani*	142	14	Green / red *vatani*	123	14	Cake	57	14	*Badang*	57
15	Cake	141	15	*Khava peda*	121	15	Jelly	56	15	Cake	47
16	*Badang*	139	16	Bun:cream / jam / *khara*	113	16	Bun:cream / jam */ khara*	51	16	Green / red *vatani*	43
17	*Ghate*	137	17	Cream chocolate	113	17	*Khari* / puffs	41	17	Bun:cream / jam / *khara*	42
18	*Shankar pale*	131	18	*Nippattu*	113	18	*Ghate*	41	18	*Til laddu*	42
19	*Dhoodh peda*	119	19	*Hurakadli*	104	**Less popular**			19	*Ghate*	40
20	*Badampuri/ Balusha*	109	20	*Ghate*	97	19	*Balusha*	39	**Less popular**		
21	Bun:cream / jam / *khara*	107	21	*Khari* / puffs	95	20	Chat foods:*pani puri* etc.	38	20	*Mysorepak*	36
22	*Khari* / puffs	107	22	Chat foods:*pani puri* etc.	92	21	*Mysorepak*	37	21	*Hurakadli*	32

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Rank	zone 3	scores	Rank	zone 8	scores	Rank	zone 9	scores	Rank	zone 10	scores
Less popular			**Less popular**			22	*Dil Khush / dil pasand*	36	22	Chat foods: pani puri etc.	32
23	Chat foods:*pani puri* etc.	99	23	*Manchurian*	84	23	Chewing gum	35	23	*Khari* / puffs	29
24	*Dil Khush / dil pasand*	93	24	*Badang*	80	24	*Chakkali / kodbale*	31	24	*Manchurian*	27
25	*Kharadani laddu*	91	25	*Dil Khush / dil pasand*	71	25	*Manchurian*	27	25	*Chakkali / kodbale*	26
26	*Putani laddu*	89	26	*Mysorepak*	66	26	*Hurakadli*	25	26	*Dil Khush / dil pasand*	25
27	*Manchurian*	87	27	*Chakkali / kodbale*	64	27	Ice-cream / ice candy	23	27	Soft drinks	17
28	*Chigli*	82	28	*Besan laddu*	64	28	*Samosa / kachori*	23	28	Ice-cream / ice candy	14
29	Puffed sago	80	29	Chewing gum	63	29	Soft drinks	15	29	Chewing gum	5
30	*Chakkali / kodbale*	74	30	Noodles	60	30	Flavour sticks	9	30	*Samosa / kachori*	4
31	Popcorn	73	31	Soft drinks	51	31	Noodles	3	31	Popcorn	3
32	*Mysorepak*	72	32	Ice-cream / ice candy	47	32	Popcorn	2	32	Noodles	1
33	Chewing gum	69	33	Popcorn	36		-			-	
34	Noodles	66	34	*Samosa / kachori*	33		-			-	
35	Soft drinks	63	35	*Halwa*	32		-			-	
36	*Samosa / kachori*	61		-			-			-	
37	Ice-cream / ice candy	49		-			-			-	

Among the 35 different junk foods recorded in zone 8, the foods scoring consumption frequency scores between134-225 could be categorized as highly popular. The foods in the first three places were biscuits, chocolates/candies and *kurkuri.* The moderately consumed junk foods ranged between the consumption frequency scores between 92-127 and among them *chigli, batar*/toast/rusk, and green/red *vatani* were recorded. The less popular junk foods, were those which scored consumption frequency scores between 32-84 and foods such as *manchurian, badang* and *dil khush/dil pasand* and many other foods were recorded.

Among the 32 different junk foods of zone 9, the foods scoring consumption frequency scores between 74-126 could be categorized as highly popular. The foods in the first three positions were *kurkuri,* biscuits and chocolates/candies. The moderately consumed junk foods ranged from 41-66 and among them *chigli, badang* and green/red *vatani* were ranked recorded. The less popular junk foods ranged between the consumption frequency scores of 2-39 and foods such as *balusha*, chat foods and *Mysorepak* were recorded.

Among the 32 different junk foods of zone 10, the foods scoring consumption frequency scores between 66-123 could be categorized as highly popular. The foods in the first three positions were biscuits, chocolates/candies and *kurkuri.* The consumption frequency scores of moderately consumed junk foods ranged between 40-63 and among them *chigli, badang* and cake were included. The less popular junk foods ranged between those foods scoring consumption frequency scores between 1-36 and foods such as *Mysorepak, hurakadli* and chat foods were recorded.

Thus, the different junk foods at varied levels of consumption frequencies were observed in different agro-climatic zones.

The cost wise categorization of junk foods available in the rural settings is depicted in Table 8 and Plate 4, 5. It was observed that *papadi*, *kodbale* and peppermint were sold at 0.25 rupee per unit. The foods like *batar, shankarpale*, *chigli,* coconut chocolate, *rasgulla* were available at 0.50 rupee per unit. There were many foods available at one rupee cost like *khava,* cookies, *halwa*, red colour *chikki,* cake, cream cone, *khardani laddu*, *putani laddu,* lolly pop, cream biscuit, *nippattu*, coloured green/red coloured fried peas, *hurakadli*, *badang*, *khardani chakkali*, normal *chakkali* and bun. The junk foods like *balusha, Mysorepak*, *peda* and *dhoodh peda* were available at two rupees per unit. Cream roll, cream cup, *khava peda* and jelly were sold at five rupees per unit.

4.3 Awareness about junk foods among rural women in different agro-climatic zones

An evaluation of level of awareness about general aspects of junk foods, their health implications and harmful additives like synthetic colourants, artificial sweeteners and flavour enhancers and preservatives used in junk foods among rural women is influenced by age, educational status and socio-economic status.

The awareness about health hazards of junk foods among rural women in different agro-climatic zones (Fig. 2) showed that there was low awareness prevailing among the rural women in all zones. The maximum proportion of women in zone 3 (60.00 %) were recorded with low awareness. The maximum proportion of women with high awareness was recorded in zone 10 and the moderately aware women were recorded highest in zone 8 (28.33 %). The taluka wise distribution of rural women on awareness about health hazards of junk is depicted in Appendix VII.

Table 8. Categorization of junk foods as per cost

Cost (Rs.)	Per unit/packet
0.25	*Papadi, kurbani, kodbale, peppermint*
0.50	*Batar, shankar pale, chilgli,* coconut chocolate, *rasgulla*
1.00	*Khava,* cookies*, halwa,* red colour *chikki,* cake, cream cone*, khardani laddu, putani laddu,* lolli pop, cream biscuit*,* ice candy*, nippattu,* green/red coloured fried peas*, hurakadli, badang, khardani chakkali,* normal *chakkali,* bun
2.00	*Balusha, Mysorepak, peda, dhoodh peda,*
5.00	Cream roll, cream cup*, khava peda*, jelly

Plate 4. Junk foods sold at Re 1/- per unit in different zones

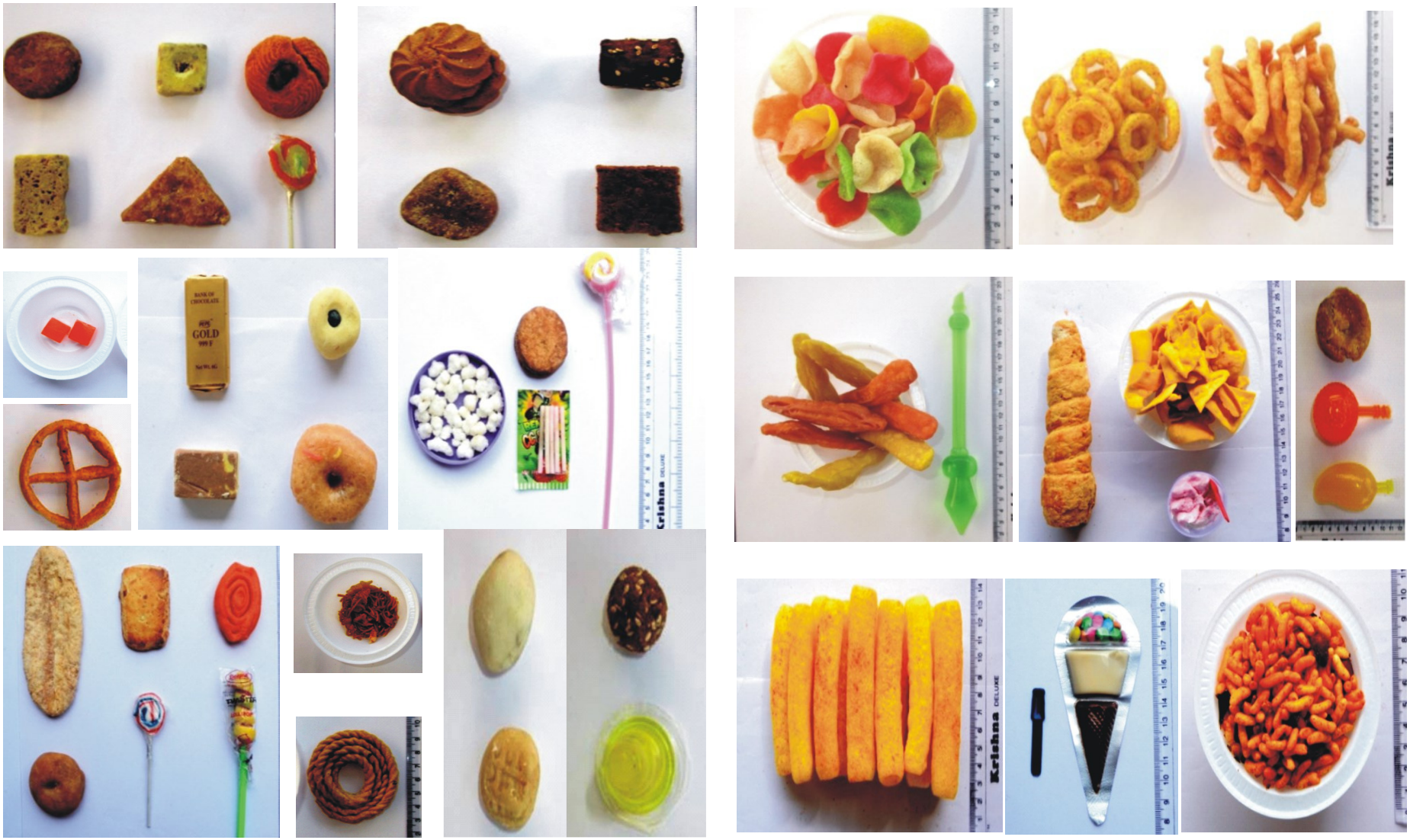


Plate 5. Junk foods sold at Rs. 2/- and 5/- per unit

4.3.1 Awareness about health hazards of junk foods v/s age of respondents

Awareness about junk foods plays prominent role with regard to its consumption. The composition of junk foods *viz.*, the ingredients, additives and hygiene and safety aspects are important aspects that influence health and nutrition of consumers. Assessment of awareness about these factors among rural women yielded a dismal picture of their status.

The results of awareness about junk foods according to the age of respondents are presented in Table 9. It was observed that in zone 3, a majority of women in the age range of 31-35 years (88.89 %) recorded low awareness followed by those in 26-30 years (79.31 %). About 33.33 per cent of women were moderately aware and were in the age range of 15-20 years, followed by 25.38 per cent women aged between 21-25 years. Similarly, the maximum per cent of high awareness was observed among women in the age range of 15-20 years (43.34 %) followed by those in 21-25 years (13.95 %).

With respect to zone 8, about 76.00 per cent of women aged between 31-35 years exhibited maximum proportion of low awareness about health hazards of junk foods, followed by those with 64.52 per cent in age range of 26-30 years. A majority of women in age range of 21-25 years (40.74 %) were moderately aware followed by those in 26-30 years (25.80 %).Among the women aged between 15-20 years (54.05%) maximum proportion were highly aware followed by those in the age range of 21-25 years (22.22 %).None of the women in the age range of 31-35 years were highly aware.

A maximum proportion of women with low awareness about junk foods in zone 9 were recorded in the age group of 31-35 years (100.00 %), followed by those in age group of 26-30 years (76.92 %). About 38.89 per cent were moderately aware and these women belonged to the age group of 21-25 years, followed by those in 15-20 years (31.58 %) and none of the women aged between 31-35 years were moderately aware. Women in the age range of 15-20 years (52.63 %) were highly aware followed by those aged between 21-25 years (16.67 %) and none belonged to the age range of 26-30 years and 31-35 years.

Women aged between 26-30 years (75.00 %) were observed with maximum proportion of low awareness in zone 10, followed by those in the age group of 31-35 years (66.67 %). A majority of women in the age range of 15-20 years (27.27 %) were moderately aware, followed by those aged between 31-35 years. About 54.55 per cent of women in the age range of 15-20 years were highly aware, followed by 37.50 per cent of women aged between 21-25 years.

On consideration of all zones, a highest proportion of women were recorded with low awareness (53.89 %) and lowest proportion with high awareness (21.94 %). A majority of women in the age range of 31-35 years (79.73 %) were recorded with low awareness, followed by those aged between 26-30 years (72.94 %). Women aged between 15-20 years (28.87 %) and 21-25 years (28.85 %) were moderately aware followed by those in age range of 26-30 years (21.18 %). A maximum proportion of highly aware women were recorded in the age group of 15-20 years (50.51 %), followed by those aged between 21-25 years (20.19 %). On overall basis about 53.89 per cent women were recorded with low awareness, followed by 24.17 per cent with moderate awareness and 21.94 per cent with high awareness. There was significant relationship between age of the respondent and awareness level about the junk foods. Higher knowledge was observed in young adults belonging to 15-20 years age group, younger the age better the knowledge.

Table 9. Awareness levels of rural women about health hazards of junk foods in different agro-climatic zones

N=360

Age (years)	Zone 3 (n=120)			Zone 8 (n=120)			Zone 9 (n=60)			Zone 10 (n=60)			Total			χ^2
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
15-20	7 (23.33)	10 (33.33)	13 (43.34)	8 (21.62)	9 (24.33)	20 (54.05)	3 (15.79)	6 (31.58)	10 (52.63)	2 (18.18)	3 (27.27)	6 (54.55)	20 (20.62)	28 (28.87)	49 (50.51)	95.85**
21-25	26 (60.47)	11 (25.58)	6 (13.95)	10 (37.04)	11 (40.74)	6 (22.22)	8 (44.44)	7 (38.89)	3 (16.67)	9 (56.25)	1 (6.25)	6 (37.50)	53 (50.96)	30 (28.85)	21 (20.19)	
26-30	23 (79.31)	5 (17.24)	1 (3.45)	20 (64.52)	8 (25.80)	3 (9.68)	10 (76.92)	3 (23.08)	-	9 (75.00)	2 (16.67)	1 (8.33)	62 (72.94)	18 (21.18)	5 (5.88)	
31-35	16 (88.89)	-	2 (11.11)	19 (76.00)	6 (24.00)	-	10 (100.00)	-	-	14 (66.67)	5 (23.81)	2 (9.52)	59 (79.73)	11 (14.86)	4 (5.41)	
Total	72 (60.00)	26 (21.67)	22 (18.33)	57 (47.50)	34 (28.33)	29 (24.17)	31 (51.66)	16 (26.67)	13 (21.67)	34 (56.67)	11 (18.33)	15 (25.00)	194 (53.89)	87 (24.17)	79 (21.94)	

L- Low awareness M- Moderate awareness H- High awareness

**Significant at $p \leq 0.01$

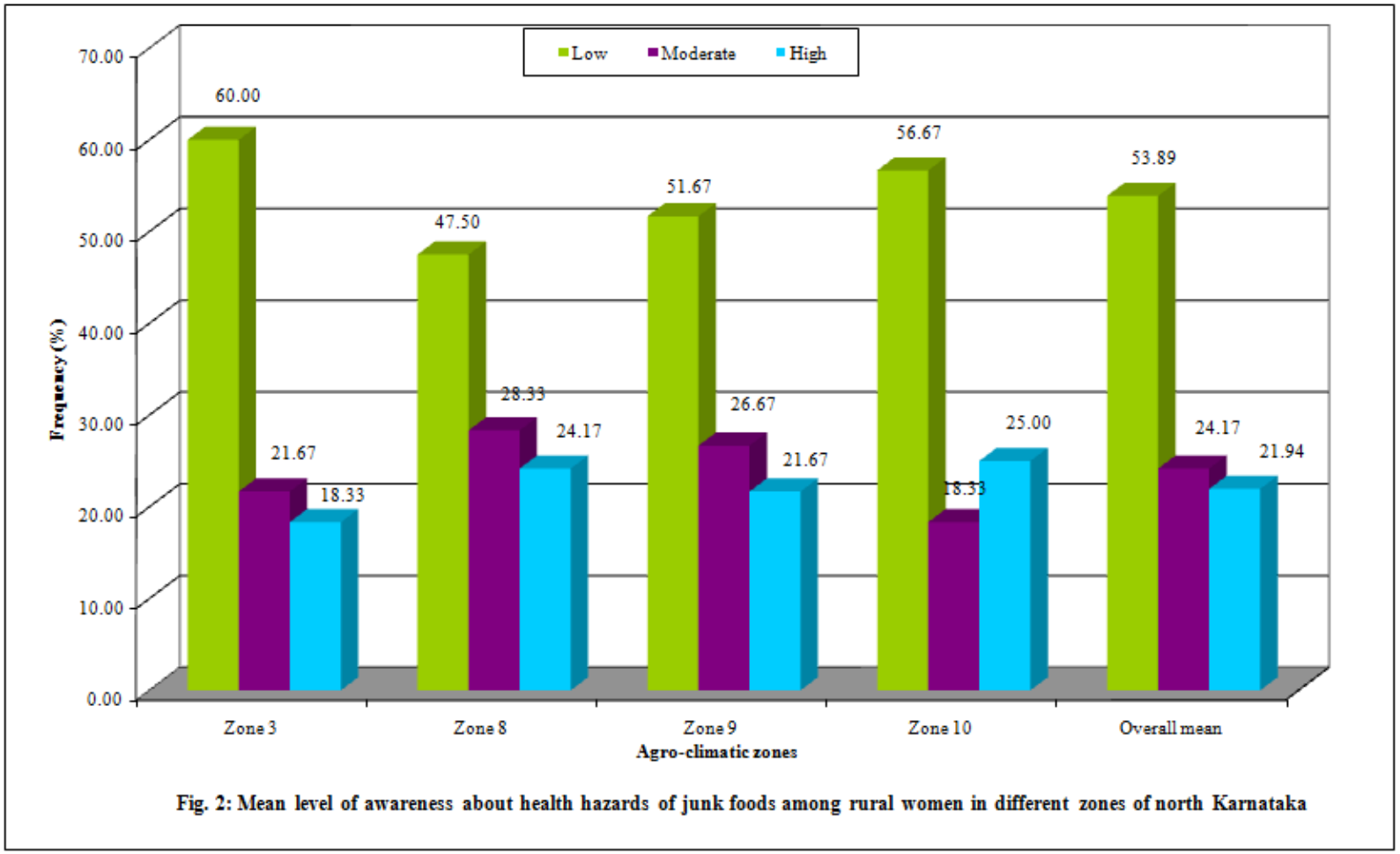


Fig. 2: Mean level of awareness about health hazards of junk foods among rural women in different zones of north Karnataka

Fig. 2: Mean level of awareness about health hazards of junk foods among rural women in different zones of north Karnataka

It was interesting to note that awareness level about junk foods was influenced by age of the respondents.

4.3.2 Awareness about junk foods v/s educational qualification among rural women

Awareness level about the junk foods is more often enhanced with educational exposure of the respondent. Education brings a change in knowledge, attitude and practices.

Zone wise distribution of women according to their awareness about health hazards is depicted in Table 10. It was evident that those women who had no schooling recorded low awareness in all the zones studied. Similar trend was observed with the women who had attended primary or higher primary schools, although, the latter group recorded few moderately aware women in zone 3 (26.67 %), zone 8 (29.41 %), zone 9 (10.00 %) and zone 10 (13.33 %). It was interesting to note that, among the matriculates, the distribution of level of awareness was in all the three categories. This group of women although recorded high and moderate awareness, there were women who were less aware of the hazards of junk foods. Similar trend was recorded among PUC/diploma certificate holders, in all the three zones investigated. The group of graduates recorded moderate or high awareness in all the zones and all the post graduates were recorded with high awareness.

On overall basis, it was noted that low awareness was evident more commonly among the women who had no formal schooling (100.00 %), followed by women pursued with primary schooling (93.02 %) and lowest proportion was noted among PUC/diploma certificate holders (10.53 %). About 42.11 per cent of women with PUC/diploma certificates were moderately aware followed matriculates (38.32 %) and lowest proportion of women who had completed primary schooling (6.98 %) were moderately aware and none of the women belonged to graduates and post graduates. A majority of women who completed post graduation (100.00 %) were highly aware, followed by those with graduation (88.89 %) and none of the women were highly aware from no formal schooling, primary schooling and higher primary schooling. There was significant co-relation ($p \leq 0.01$) and association ($p \leq 0.01$) between the educational level and the awareness about junk foods among the rural women.

Thus, it was observed that education played a vital role with regard to the awareness about junk foods among the selected respondents.

4.3.3 Awareness about junk foods v/s socio-economic status of women

Socio-economic status forms a baseline to some extent in offering better facilities to lead a comfortable life by quenching more of social difficulties or economic hurdles. Socio-economic status also determines way of life of an individual, thus influencing food habits also.

Awareness about health hazards of junk foods according to the socio-economic status is depicted in Table 11. It was observed from zone 3 that cent per cent of women in very poor category were recorded with low awareness followed by those in poor socio-economic status (80.00 %). A maximum proportion of moderately aware (33.33 %) and highly aware (33.34 %) women belonged to the high socio-economic status. With regard to zone 8, it was surprising to note that all the women belonging to high socio-economic status (100.00 %) were recorded with low awareness. A maximum proportion of moderately aware women belonged to lower middle socio-economic status (39.06 %) where as women of upper middle socio-economic status were highly aware about junk foods (28.95 %). It was recorded from zone 9 that all the women in very poor category (100.00 %) were recorded

with low awareness where as in high socio-economic status all the women were highly aware (100.00 %). A majority of women from upper middle socio-economic status (46.15 %) were moderately aware. A maximum proportion of women in zone 10 were recorded with low awareness from poor socio-economic status (85.71 %) where as a majority of women in upper middle socio-economic status were both moderately aware and highly aware (40.00 % each).

On over all basis, it was observed that high proportion of women with low awareness were from either very poor (100.00 %) or poor (75.51 %) socio economic status. Although around 50.00 per cent of women in lower middle and upper middle socio-economic status had low awareness, around 25.00 per cent were recorded with both moderate and high awareness. It was observed that a majority of women were recorded with high awareness (50.00 %) from high socio-economic status. A significant positive co-relation ($p \leq 0.01$) and association ($p \leq 0.01$) was observed between awareness level of the respondents and socio- economic status of women.

Thus it was viewed that awareness level about junk foods was influenced by socio-economic status.

The level of awareness about different aspects of junk foods (Fig. 3) revealed that the women were highly aware about general aspects of junk foods in all the agro-climatic zones. The women in all the zones were recorded with lowest awareness about the food additives used in junk foods. The awareness about health implications of junk foods was found to be moderate.

4.4 Nutritional status of rural women from different agro-climatic zones

Nutritional anthropometry is an important tool in assessment of nutritional status of individuals. Data regarding nutritional status anthropometry of rural women in different agro-climatic zones is depicted in Table 12. A perusal of data indicates that there was no much variation in mean height of selected women, which ranged from 144.90 cm to 167.60 cm. Highest height was recorded among women in zone 8 (156.42 ± 3.91) and lowest in zone 3 (154.72 ± 3.32). Similar trend was observed with weight also. Weight ranged from 31.60 kg - 80.20 kg and highest weight was recorded among women in zone 9 (50.74 ± 7.57) and lowest in zone 3 (48.08 ± 7.44). The body mass index of women ranged from 15.01 to 32.13 which was noted highest in zone 9 (20.95 ± 3.23) and lowest in zone 3 (19.51 ± 3.10). The per cent of ideal body weight of women ranged from 63.64 per cent to 135.79 per cent, which was recorded highest in zone 9 (91.48 ± 14.79) and lowest in zone 3 (88.89 ± 13.89). Waist circumference of women ranged from 60.40 cm to 93.30 cm. The highest was observed in zone 8 (76.02 ± 6.37) and lowest in zone 10 (74.47 ± 4.29). Hip circumference women ranged from 75.00 cm to 106.50 cm which was recorded highest in zone 9 (93.41 ± 5.66) and lowest in zone 10 (90.75 ± 4.27). The waist to hip ratio of women ranged from 0.72 to 0.96. The highest waist to hip ratio was observed in zone 3 and 8 *i.e.*, 0.83 ± 0.03 and 0.83 ± 0.04 and lowest was in zone 9 and zone 10 *i.e.*, 0.82 ± 0.04 and 0.82 ± 0.02, respectively. On the whole it was seen that the mean height of women was 155.24 ± 4.06, mean weight was 49.82 ± 7.79 and the mean body mass index was 20.68 ± 3.31. The mean ideal body weight per cent of women was 90.35 ± 14.77. With regard to waist and hip circumferences, the mean waist circumference and hip circumference were 75.75 ± 5.52 and 91.76 ± 4.83 respectively and mean waist to hip ratio was 0.83 ± 0.04.

Table 10. Awareness levels of rural women about health hazards of junk foods according to their educational qualification

N=360

Education level	Zone 3 (n=120)			Zone 8 (n=120)			Zone 9 (n=60)			Zone 10 (n=60)			Total		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
No schooling	18 (100.00)	-	-	20 (100.00)	-	-	8 (100.00)	-	-	6 (100.00)	-	-	52 (100.00)	-	-
Primary	16 (100.00)	-	-	9 (75.00)	3 (25.00)	-	6 (100.00)	-	-	9 (100.00)	-	-	40 (93.02)	3 (6.98)	-
Higher primary	22 (73.33)	8 (26.67)	-	12 (70.59)	5 (29.41)	-	9 (90.00)	1 (10.00)	-	13 (86.67)	2 (13.33)	-	56 (77.78)	16 (22.22)	-
SSLC	16 (40.00)	16 (40.00)	8 (20.00)	11 (28.95)	15 (39.47)	12 (31.58)	7 (36.84)	8 (42.11)	4 (21.05)	6 (60.00)	2 (20.00)	2 (20.00)	40 (37.38)	41 (38.32)	26 (24.30)
PUC / diploma	-	2 (22.22)	7 (77.78)	5 (21.74)	10 (43.48)	8 (34.78)	1 (8.33)	6 (50.00)	5 (41.67)	-	6 (46.15)	7 (53.85)	6 (10.53)	24 (42.11)	27 (47.37)
Graduation	-	-	7 (100.00)	-	1 (11.11)	8 (88.89)	-	1 (20.00)	4 (80.00)	-	1 (16.67)	5 (83.33)	-	3 (11.11)	24 (88.89)
Post graduation	-	-	-	-	-	1 (100.00)	-	-	-	-	-	1 (100.00)	-	-	2 (100.00)
Total	72 (60.00)	26 (21.67)	22 (18.33)	57 (47.50)	34 (28.33)	29 (24.17)	31 (51.66)	16 (26.67)	13 (21.67)	34 (56.67)	11 (18.33)	15 (25.00)	194 (53.89)	87 (24.17)	79 (21.94)
Pearson's correlation co-efficient (r)													0.76**		
χ^2													228.69**		

L-Low awareness M-Moderate awareness H-High awareness

**Significant at p≤0.01

Table 11. Awareness levels of rural women about health hazards of junk foods according to their socio-economic status

N=360

Status	Zone 3 (n=120)			Zone 8 (n=120)			Zone 9 (n=60)			Zone 10 (n=60)			Total		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
High	1 (33.33)	1 (33.33)	1 (33.34)	1 (100.00)	-	-	-	-	2 (100.00)	-	-	-	2 (33.33)	1 (16.67)	3 (50.00)
Upper middle	17 (60.71)	5 (17.86)	6 (21.43)	20 (52.63)	7 (18.42)	11 (28.95)	4 (30.77)	6 (46.15)	4 (23.08)	2 (20.00)	4 (40.00)	4 (40.00)	43 (48.31)	22 (24.72)	24 (26.97)
Lower middle	37 (54.41)	17 (25.00)	14 (20.59)	24 (37.50)	25 (39.06)	15 (23.44)	23 (58.97)	9 (23.08)	7 (17.95)	26 (60.47)	6 (13.95)	11 (25.58)	110 (51.40)	57 (26.64)	47 (21.96)
Poor	16 (80.00)	3 (15.00)	1 (5.00)	12 (70.59)	2 (11.76)	3 (17.65)	3 (60.00)	1 (20.00)	1 (20.00)	6 (85.71)	1 (14.29)	-	37 (75.51)	7 (14.29)	5 (10.20)
Very poor	1 (100.00)	-	-	-	-	-	1 (100.00)	-	-	-	-	-	2 (100.00)	-	-
Total	72 (60.00)	26 (21.67)	22 (18.33)	57 (47.50)	34 (28.33)	29 (24.17)	31 (51.66)	16 (26.67)	13 (21.67)	34 (56.67)	11 (18.33)	15 (25.00)	194 (53.89)	87 (24.17)	79 (21.94)
Pearson's co-relation co-efficient (r)													0.22**		
χ^2													17.33**		

L-Low awareness M-Moderate awareness H-High awareness

**Significant at p≤0.01

Table 12. Mean anthropometric measurements of rural women from different agro-climatic zones

N=360

Parameters	Zone 3 (n=120)	Zone8 (n=120)	Zone 9 (n=60)	Zone 10 (n=60)	Mean
Height (cm)	154.72 ± 3.32 (147.30-165.70) #	156.42 ± 3.91 (144.90-166.30)	155.74 ± 4.52 (145.90-167.60)	155.41 ± 5.08 (145.70-166.60)	155.24 ± 4.06 (144.90-167.60)
Weight (kg)	48.08 ± 7.44 (33.50-73.10)	50.22 ± 8.91 (31.60-72.40)	50.74 ± 7.57 (38.60-70.40)	49.55 ± 7.41 (35.00-80.20)	49.82 ± 7.97 (31.60-80.20)
Body mass index	19.51 ± 3.10 (15.44-29.58)	20.77 ± 3.60 (15.01-30.53)	20.95 ± 3.23 (15.29-30.27)	20.56 ± 3.21 (15.41-32.13)	20.68 ± 3.31 (15.01-32.13)
Ideal body weight	54.72 ± 3.32 (47.30-65.70)	56.42 ± 3.91 (44.90-66.30)	55.74 ± 4.52 (45.90-67.60)	55.41 ± 5.07 (45.70-66.60)	55.24 ± 4.06 (44.90-67.60)
Ideal body weight (%)	88.89 ± 13.89 (70.82-129.51)	90.72 ± 15.91 (67.96-134.07)	91.48 ± 14.79 (63.64-135.79)	89.43 ± 14.35 (69.03-135.00)	90.35 ± 14.77 (63.64-135.79)
Waist circumference (cm)	75.98 ± 4.78 (66.20-90.00)	76.02 ± 6.37 (60.40-93.30)	76.00 ± 6.07 (62.50-88.50)	74.47 ± 4.29 (67.50-85.70)	75.75 ± 5.52 (60.40-93.30)
Hip circumference (cm)	91.83 ± 4.50 (82.50-105.00)	91.15 ± 5.05 (75.00-106.50)	93.41 ± 5.66 (80.30-106.20)	90.75 ± 4.27 (81.10-98.80)	91.76 ± 4.83 (75.00-106.50)
Waist to hip ratio	0.83 ± 0.03 (0.76-0.96)	0.83 ± 0.04 (0.75-0.96)	0.82 ± 0.04 (0.72-0.90)	0.82 ± 0.02 (0.75-0.89)	0.83 ± 0.04 (0.72-0.96)

Figures in parentheses indicate range of values

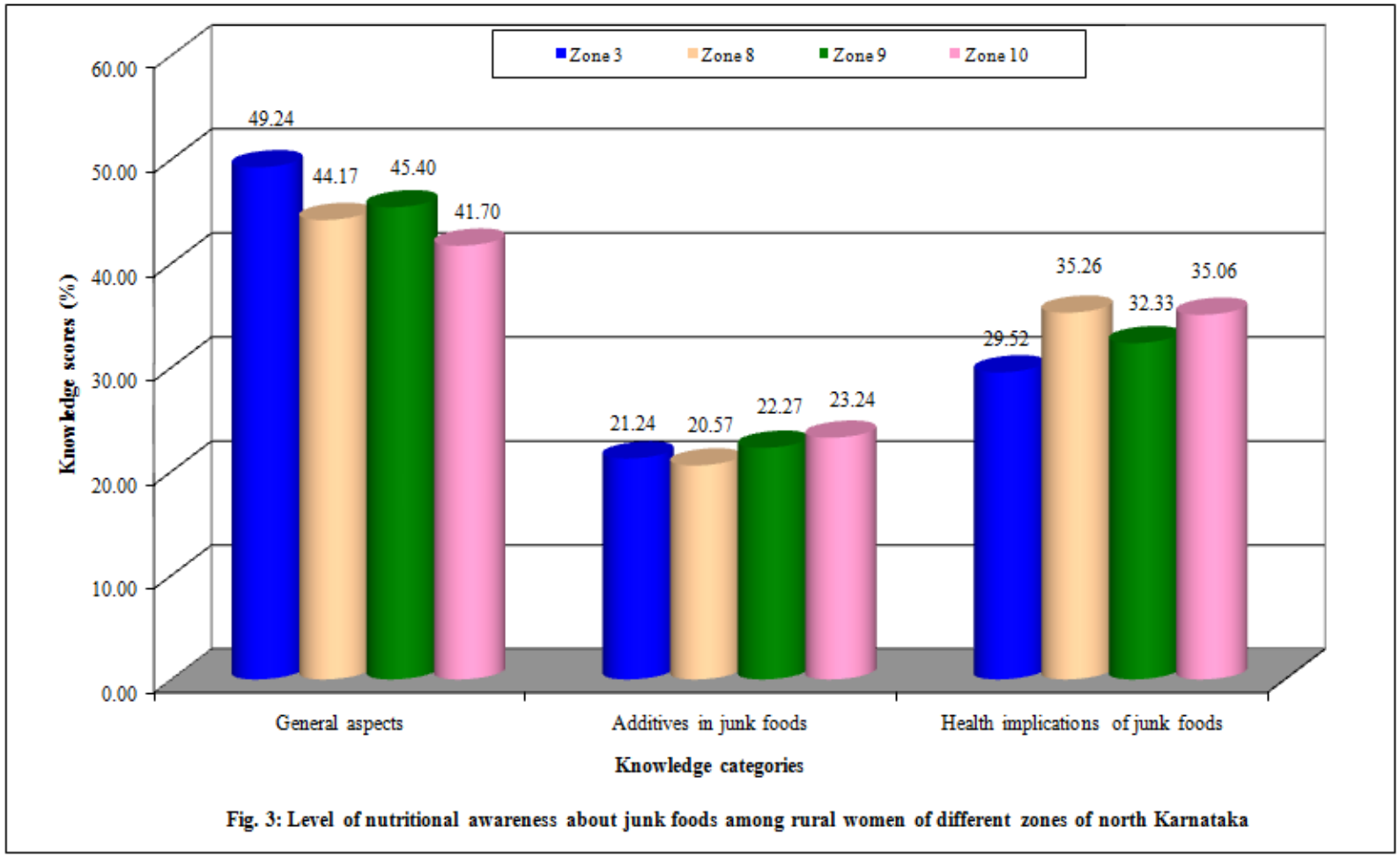


Fig. 3: Level of nutritional awareness about junk foods among rural women of different zones of north Karnataka

Fig. 3: Level of nutritional awareness about junk foods among rural women of different zones of north Karnataka

Thus, women in different zones recorded not much variation in anthropometric measurements.

4.5 Body mass indices (BMI) of rural women according agro-climatic to zones

Body mass indices directly depict the health status of individuals. It acts as basic guide in judging the well –being of the population.

Body mass indices of women of different agro-climatic zones is depicted in Table 13. An observation of data revealed that around 50.00 per cent of the women were normal in all the agro-climatic zones studied, followed by those who were underweight as per BMI classification for south Asians. Highest underweight women were recorded in zone 10 (35.00 %), followed by those in zone 3 (30.84 %), zone 8 (27.50 %) and lowest number of women were recorded in zone 9 (23.33 %). Further, the women were recorded in obese class I category in which a majority of women belonged to zone 8 (17.50 %), followed by zone 3 (10.00 %), zone 9 (8.33 %) and lowest were recorded in zone 10 (5.00 %). The next class of women were observed from pre-obese category in which a majority belonged to zone 9 (11.67 %), followed by those in zone 3 and zone 10 (8.33 % each) and lowest were from zone 8 (4.17 %). A very few number of women were recorded in obese class II category, among them a maximum proportion of women belonged to zone 9 (3.33 %), followed by zone 10 (1.67 %), zone 8 (0.83 %) and none of the women were recorded in zone 3.

On over all basis, it was observed that a maximum proportion of women were recorded in normal category (50.83 %), followed by underweight (29.17 %), obese class I (11.39 %), pre-obese (7.50 %) and lowest proportion were observed in obese class II (1.11 %).

It was observed that the association between body mass indices and the agro-climatic zones was non-significant.

4.5.1 BMI classification of rural women according to age

Women record various biological changes in different age categories. As there is increment in age some of the body functions are altered which are then depicted in the form of physical change or appearance. Classifying the women's BMI according to age gives the details of the influence of age on BMI of women.

The distribution of women based on BMI as per age (Table 14) revealed that a majority of women in normal category were observed highest in the age range of 21-25 years (56.73 %), followed by those in 15-20 years (50.52 %), 26-30 years (49.41 %) and lowest per cent of women were between the age range of 31-35 years (44.59 %). Further, the women were recorded in underweight category, in which a majority of women were underweight in age group of 15-20 years (42.47 %), followed by those in 21-25 years (32.69 %), 26-30 years (21.18 %) and lowest proportion of women were recorded in the age range of 31-35 years (16.22 %). The next category recorded by women was obese class I and a majority of women in this class were aged between 31-35 years (28.38 %), followed by those in 26-30 years (16.47 %), 15-20 years (4.12 %) and lowest proportion were aged between 21-25 years (1.92 %). With regard to pre-obese women a maximum proportion belonged to the age range of 26-30 years (10.59 %) followed by those aged 21-25 years (8.66 %) and lowest proportion were recorded in age group of 15-20 years (3.09 %). A majority of women in obese class II category belonged to the age group of 31-35 years (2.70 %), followed by those in 26-30 years (2.35 %) and none of women in 15-20 years and 21-25 years age group were observed in obese class II category.

Table 13. Body Mass Indices of rural women in different agro-climatic zones

N=360

Body mass indices	Zone 3	Zone 8	Zone 9	Zone 10	Total	χ^2
	n (%)	n (%)	n (%)	n (%)		
Underweight (<18.5)	37 (30.84)	33 (27.50)	14 (23.33)	21 (35.00)	105 (29.17)	12.48 NS
Normal (18.5-22.99)	61 (50.83)	60 (50.00)	32 (53.34)	30 (50.00)	183 (50.83)	
Pre-obese (23-24.99)	10 (8.33)	5 (4.17)	7 (11.67)	5 (8.33)	27 (7.50)	
Obese class I (25-29.99)	12 (10.00)	21 (17.50)	5 (8.33)	3 (5.00)	41 (11.39)	
Obese class II (≥30)	-	1 (0.83)	2 (3.33)	1 (1.67)	4 (1.11)	
Total	120	120	60	60	360	

NS-Non significant

On overall basis it was observed that a majority of women in 15-20 years were under weight compared to other age categories and women in the age range of 21-25 years were normal. Women in both age groups of 26-30 years and 31-35 years were more in obese classes compared to other age groups. There was significant association between body mass indices and age of the respondents ($p \leq 0.01$).

Thus it was observed that age influenced the nutritional status of women.

4.5.2 BMI classification of rural women according to socio-economic status

High socio-economic standards often result in good nutrition and health of individuals. The classification of BMI of rural women as per socio-economic status is recorded in Table 15. It was observed that a majority of women with normal BMI belonged to high socio-economic status (66.67 %), followed by poor socio-economic status (53.06 %) and lowest proportion were recorded from upper middle socio-economic status (46.07 %). The next class of women recorded were underweight, who were proportioned maximum in very poor socio-economic status (50.00 %), followed by poor socio-economic status (42.00 %) and lowest were recorded from upper middle socio-economic status (21.35 %). It was quite obvious to note that none of the women in underweight category were from high socio-economic status. The next category of women were recorded under pre obese in which a majority of women belonged to upper middle socio-economic status (10.11 %), followed by those in lower middle class (8.41 %). With regard to obese class I category a majority of women belonged to high socio-economic status (33.33 %), followed by those in upper middle socio-economic status (19.10 %) and lowest in poor socio-economic status (2.04 %). A majority of women belonged to upper middle socio-economic status (3.37 %), followed by lower middle (0.47 %) in obsess class II category. It was observed that there was no significant co-relation between body mass indices and socio-economic status of women, however there was significant association ($p \leq 0.05$).

On overall basis it was seen that although women recorded varied socio-economic status a majority of women belonged to lower middle or upper middle socio-economic status, but in all the categories a majority of women were normal.

4.5.3 Classification of women's nutritional status as per educational level

Formal education may influence health and nutrition of individuals. The distribution of women's nutritional status as per age is presented in Table 16. It was observed that a majority of women who were normal pursued primary schooling (67.44 %), followed by those who were graduated (62.96 %), matriculate (53.27 %) and lowest proportion was recorded among primary schooling (37.50 %) women. Among the underweight women a majority were accomplished with higher primary school education (40.28 %), followed by matriculate (28.97 %), illiterates (28.85 %) and lowest proportion of women had studied up to primary school level (18.60 %). Further, in pre-obese category a majority of women were post graduates (50.00 %), followed by those who studied up to higher primary school (12.50 %), PUC/ diploma holders (12.28 %) and lowest were found to be done with primary schooling (2.33 %). A majority of women belonging to obese class I had no formal schooling (15.38 %), followed by those with PUC/diploma holders (14.03 %), matriculates (11.22 %) and lowest proportion were graduates (7.41 %). A maximum proportion of women were post graduates (50.00 %), followed by those with primary schooling (2.33 %) in obese class II category. Women recorded varied nutritional statuses at different educational levels and there was no significant co-relation and association observed between body mass indices and educational level of women.

Table 14. Age wise categorization of nutritional status of rural women as per BMI

N=360

Body mass indices	Age (years)				Total	χ^2
	15-20	21-25	26-30	31-35		
	n (%)	n (%)	n (%)	n (%)		
Underweight (<18.5)	41 (42.27)	34 (32.69)	18 (21.18)	12 (16.22)	105 (29.17)	58.89**
Normal (18.5-22.99)	49 (50.52)	59 (56.73)	42 (49.41)	33 (44.59)	183 (50.83)	
Pre-obese (23-24.99)	3 (3.09)	9 (8.66)	9 (10.59)	6 (8.11)	27 (7.50)	
Obese class I (25-29.99)	4 (4.12)	2 (1.92)	14 (16.47)	21 (28.38)	41 (11.39)	
Obese class II (≥30)	-	-	2 (2.35)	2 (2.70)	4 (1.11)	
Total	97	104	85	74	360	

**Significant at p≤0.01

Table 15. Nutritional status of rural women as per socio-economic status

N=360

Body mass indices	Socio-economic status					Total	Pearson's co-relation coefficient (r)	χ^2
	High	Upper middle	Lower middle	Poor	Very poor			
	n (%)	n (%)	n (%)	n (%)	n (%)			
Underweight (<18.5)	-	19 (21.35)	64 (29.91)	21 (42.86)	1 (50.00)	105 (29.17)	0.09^{NS}	31.85*
Normal (18.5-22.99)	4 (66.67)	41 (46.07)	110 (51.40)	27 (55.10)	1 (50.00)	183 (50.83)		
Pre-Obese (23-24.99)	-	9 (10.11)	18 (8.41)	-	-	27 (7.50)		
Obese class I (25-29.99)	2 (33.33)	17 (19.10)	21 (9.81)	1 (2.04)	-	41 (11.39)		
Obese class II (≥30)	-	3 (3.37)	1 (0.47)	-	-	4 (1.11)		
Total	6	89	214	49	2	360		

NS- Non significant *Significant at $p \leq 0.05$

Table 16. Nutritional status of rural women as per education level

N=360

Body mass indices	Education level							Total	Pearson's co-relation coefficient (r)	χ^2
	No schooling	Primary	Higher primary	SSLC	PUC / Diploma	Graduate	Post graduate			
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)			
Underweight (<18.5)	15 (28.85)	8 (18.60)	29 (40.28)	31 (28.97)	15 (26.32)	7 (25.93)	-	105 (29.17)	0.03^{NS}	23.04^{NS}
Normal (18.5-22.99)	26 (50.00)	29 (67.44)	27 (37.50)	57 (53.27)	27 (47.37)	17 (62.96)	-	183 (50.83)		
Pre-obese (23-24.99)	2 (3.85)	1 (2.33)	9 (12.50)	6 (5.61)	7 (12.28)	1 (3.70)	1 (50.00)	27 (7.50)		
Obese class I (25-29.99)	8 (15.38)	4 (9.30)	7 (9.72)	12 (11.22)	8 (14.03)	2 (7.41)	-	41 (11.39)		
Obese class II (≥30)	1 (1.92)	1 (2.33)	-	1 (0.93)	-	-	1 (50.00)	4 (1.11)		
Total	52	43	72	107	57	27	2	360		

NS- Non significant

Thus, education did not influence nutritional status in rural setting among the selected respondents.

4.6 Risk of metabolic complications among of rural women of different zones

The variations in the waist and hip circumferences of women are categorized to depict the risk of metabolic complications. Classification of women according to risk of metabolic complications based on waist circumference (Table 17) revealed that, in all the zones a majority of women belonged to no risk category which was highest in zone 10 (91.67 %), followed by zone 3 (80.00 %), zone 9 (78.33 %) and lowest were seen from zone 8 (74.17 %), followed by those in increased risk which was highest in zone 9 (20.00 %) preceded by zone 8 (17.50 %), zone 3 (15.83 %) and lowest were recorded from zone 10 (8.33 %). A very few number of women were found in substantially increased category which were highest in zone 8 (8.33 %), followed by zone 3 (4.17 %), zone 9 (1.67 %) and there were no women observed in zone 10. On overall basis it was observed that a majority of women belonged to no risk category (79.72 %) followed by increased risk (15.83 %) and lowest were recorded from substantially increased risk (4.45 %) category. It was observed that there was no significant association between risk of metabolic complications among rural women and the agro-climatic zones.

With regard to metabolic risk complications based on waist to hip ratio (Table 17) it was found that a majority of women from all the zones belonged to no risk category which was highest in zone 10 (95.00 %) followed by zone 9 (86.67 %), zone 3 (85.83 %) and lowest were from zone 8 (80.00 %). The vice-versa was observed in substantially increased category in which women from zone 8 (20.00 %) were highest followed by zone 3 (14.17 %), zone 9 (13.33 %) and lowest were noted from zone 10 (5.00 %). It seen that on the whole a majority of women belonged to no risk (85.56 %) category than the substantially increased category (14.44 %). There was no significant association observed between risk of metabolic complications among rural women and the agro-climatic zones.

Women recorded diversified risks of metabolic complications in different agro-climatic zones.

4.6.1 Risk of metabolic complications v/s age of rural women

Age of the women has an influence on different proportions of body sizes. The classification of rural women's risk of metabolic complications as per age revealed (Table 18) that a majority of women in all the zones were from no risk category which was highest among women in age category of 15-20 years (92.78 %), followed by those aged 21-25 years (87.50 %), 26-30 years (68.24 %) and lowest were from age range of 31-35 years (64.86 %). With regard to increased risk category it was observed that a majority of women were in age group of 31-35 years (28.38 %), followed by 26-30 years (22.35 %), 21-25 years (10.58 %) and lowest were recorded in age group of 15-20 years (6.19 %). The lowest number of women were found in substantially increased category which was highest among women aged between 26-30 years (9.41%), followed by those who were 31-35 years (6.76 %), 21-25 years (1.92 %) and lowest were found among women who were 15-20 years (1.03 %) old. On the whole, it was recorded that a majority of women exhibited no risk (79.72 %), followed by increased risk (15.83 %) and lowest were from substantially increased risk (4.45 %). There was significant association between risk of metabolic complications and the age of rural women.

Table 17. Risk of metabolic complications among rural women of different zones

N=360

Risk of metabolic complications	Zone 3 (n=120)	Zone 8 (n=120)	Zone 9 (n=60)	Zone 10 (n=60)	Total	χ^2
Based on waist circumference (cm)						
No risk (≤80)	96 (80.00)#	89 (74.17)	47 (78.33)	55 (91.67)	287 (79.72)	14.94 NS
Increased risk (80-88)	19 (15.83)	21 (17.50)	12 (20.00)	5 (8.33)	57 (15.83)	
Substantially increased risk (>88)	5 (4.17)	10 (8.33)	1 (1.67)	-	16 (4.45)	
Based on waist to hip ratio (WHR)						
No risk (<0.85)	103 (85.83)	96 (80.00)	52 (86.67)	57 (95.00)	308 (85.56)	8.19 NS
Substantially increased risk (≥0.85)	17 (14.17)	24 (20.00)	8 (13.33)	3 (5.00)	52 (14.44)	

Figures in parentheses indicate per cent values
NS- Non significant

Table 18. Risk of metabolic complications by age of rural women in different zones

N=360

Risk of metabolic complications	Age (years)				Total	χ^2
	15-20	21-25	26-30	31-35		
Based on waist circumference (cm)						
No risk (≤80)	90 (92.78)#	91 (87.50)	58 (68.24)	48 (64.86)	287 (79.72)	33.20**
Increased risk (80-88)	6 (6.19)	11 (10.58)	19 (22.35)	21 (28.38)	57 (15.83)	
Substantially increased risk (>88)	1 (1.03)	2 (1.92)	8 (9.41)	5 (6.76)	16 (4.45)	
Total	97 (26.94)	104 (28.89)	85 (23.61)	74 (20.56)	360 (100.00)	
Based on waist to hip ratio (WHR)						
No risk (<0.85)	91 (93.81)	95 (91.35)	68 (80.00)	54 (72.97)	308 (85.56)	19.22**
Substantially increased risk (≥0.85)	6 (6.19)	9 (8.65)	17 (20.00)	20 (27.03)	52 (14.44)	
Total	97 (26.94)	104 (28.89)	85 (23.61)	74 (20.56)	360 (100.00)	

Figures in parentheses indicate per cent values
**Significant at p≤0.01

The classification of women's risk of metabolic complications based on waist to hip circumference it depicted in Table 18. It was observed that a majority of women in all the zones were from no risk category which was highest among women who belonged to of 15-20 years (93.81 %), followed by those in 21-25 years (91.35 %), 26-30 years (80.00 %) and lowest was in the age range of 31-35 years (72.97 %). However, in contrast the substantially increased category of women were in maximum proportion and aged between 31-35 years (27.03 %), followed by those who were 26-30 years (20.00 %) old, 21-25 years (8.65 %) old and lowest were in the age range of 15-20 years (6.19 %). On overall basis it was found that a majority of women were from no risk category (85.56 %) than the substantially increased risk category (14.44 %). There was significant association between risk of metabolic complications and the age of rural women.

Thus, women recorded a varied risk of metabolic complications according to age.

4.7 Food intake and nutrient adequacy among rural women of different agro-climatic zones

Food consumption has an influence on the nutritional status of women in the long run. Adequate nutrient intake nourishes the body adequately and thus leads to normal nutritional status. Excess or inadequate nutrient intake leads to malnutrition. Hence is important to know the adequacy of nutrients among women.

Adequacy of nutrients depends on several factors such as age, gender, physiological state and type of occupation. In the present investigation an attempt was made to study the nutrient intake and adequacy of sedentary and moderately working non-pregnant, non-lactating rural women. The results are presented under the following titles.

4.7.1 Mean food intake and adequacy among sedentary rural women

The mean food intake and adequacy among sedentary rural women is depicted in Table 19. It was observed that mean intake of cereals and millets was adequate in all zones and recorded highest in zone 9 (354.11 ± 22.67 g) with 131.15 ± 8.40 per cent adequacy and lowest in zone 3 (299.13 ± 50.48 g) with 110.79 ± 18.70 per cent adequacy. Over all pulse consumption was inadequate and it was recorded highest in zone 8 (53.37 ± 17.55 g) with 88.94 ± 29.29 per cent adequacy and lowest in zone 10 (18.75 ± 37.50 g) with 31.25 ± 62.50 per cent adequacy. The overall milk and milk products consumption was inadequate with highest recorded in zone 8 (135.02 ± 32.76 ml) with 45.80 ± 10.24 per cent adequacy and lowest in zone 3 (102.86 ± 21.96 ml) with 34.29 ± 7.32 per cent adequacy. There was inadequate consumption of roots and tubers and it was recorded highest in zone 10 (78.10 ± 28.86 g) with 39.05 ± 14.43 per cent adequacy and lowest in zone 8 (56.49 ± 55.76 g) with 28.24 ± 27.88 per cent adequacy. The green leafy vegetable consumption was inadequate and it was recorded highest in zone 10 (32.90 ± 53.55 g) with 32.90 ± 53.55 per cent adequacy and lowest in zone 3 (26.38 ± 56.71 g) with 26.38 ± 56.71 per cent adequacy. There was inadequate consumption of other vegetables and it was recorded highest in zone 9 (86.49 ± 62.24 g) with 43.24 ± 31.12 per cent adequacy and lowest in zone 3 (55.53 ± 66.53 g) with 27.77 ± 33.27 per cent adequacy. The fruits consumption was inadequate and recorded highest in zone 3 (72.66 ± 80.39 g) with 72.66 ± 80.39 per cent adequacy and lowest in zone 8 (28.16 ± 36.57 g) with 28.16 ± 36.57 per cent adequacy.

Table 19. Mean food intake of rural women (sedentary worker) indifferent agro-climatic zones

N=25

Food (g/day)	RDI	Zone 3 (n=7)		Zone 8 (n=9)		Zone 9 (n=5)		Zone 10 (n=4)		Total	
		Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)
Cereals and millets	270	299.13 ± 50.48	110.79 ± 18.70	334.30 ± 43.95	123.82 ± 16.28	354.11 ± 22.67	131.15 ± 8.40	302.34 ± 29.13	111.98 ± 10.79	323.30 ± 44.26	119.74 ± 16.39
Pulses	60	48.93 ± 27.63	81.55 ± 46.06	53.37 ± 17.58	88.94 ± 29.29	47.69 ± 21.42	82.82 ± 35.71	18.75 ± 37.50	31.25 ± 62.50	43.45 ± 26.46	72.41 ± 44.11
Milk and milk products (ml)	300	102.86 ± 21.96	34.29 ± 7.32	135.02 ± 32.76	45.80 ± 10.24	107.80 ± 24.60	35.93 ± 8.20	113.07 ± 52.23	39.69 ± 17.41	110.50 ± 35.41	36.83 ± 11.80
Roots and tubers	200	59.16 ± 49.90	29.58 ± 24.95	56.49 ± 55.76	28.24 ± 27.88	61.78 ± 48.68	30.89 ± 24.34	78.10 ± 28.86	39.05 ± 14.43	61.75 ± 47.06	30.87 ± 23.53
Green leafy vegetables	100	26.38 ± 56.71	26.38 ± 56.71	29.63 ± 36.76	29.63 ± 36.76	29.24 ± 47.27	29.24 ± 47.27	32.90 ± 53.55	32.90 ± 53.55	27.08 ± 42.18	27.08 ± 42.18
Other vegetables	200	55.53 ± 66.53	27.77 ± 33.27	80.58 ± 56.87	40.29 ± 28.43	86.49 ± 62.24	43.24 ± 31.12	66.57 ± 54.40	33.29 ± 27.20	72.50 ± 57.92	36.25 ± 28.96
Fruits	100	72.66 ± 80.39	72.66 ± 80.39	28.16 ± 36.57	28.16 ± 36.57	32.32 ± 42.59	32.32 ± 42.59	44.51 ± 4.15	44.51 ± 4.15	39.26 ± 53.38	39.27 ± 53.38
Meat and meat products	60	0.00 ± 0.00	0.00 ± 0.00	14.13 ± 37.37	23.54 ± 62.29	0.00 ± 0.00	0.00 ± 0.00	47.82 ± 39.21	76.03 ± 68.78	20.63 ± 43.31	34.39 ± 72.18
Fats	20	26.00 ± 8.27	130.00 ± 41.33	25.80 ± 13.20	129.02 ± 66.02	35.50 ± 6.35	177.50 ± 31.75	20.76 ± 8.93	103.78 ± 44.64	25.59 ± 10.14	127.96 ± 50.72
Sugars	20	25.19 ± 9.21	104.78 ± 36.85	28.59 ± 1.42	112.37 ± 5.69	29.42 ± 6.01	135.68 ± 24.05	28.24 ± 1.15	109.94 ± 4.61	29.33 ± 6.12	121.32 ± 24.48

RDI- Recommended dietary intake

There was inadequate consumption of meat and meat products and it was recorded highest in zone 10 (47.82 ± 39.21 g) with 76.03 ± 68.78 per cent adequacy and none consumed in zone 3 and 9. The fat intake was observed to be adequate with highest recorded in zone 9 (35.50 ± 6.35 g) with 177.50 ± 31.75 per cent adequacy and lowest in zone 10 (20.76 ± 8.93 g) with 103.78 per cent adequacy. The sugar intake was adequate with highest recorded in zone 9 (29.42 ± 6.01 g) with 135.68 ± 24.05 per cent adequacy and lowest in zone 3 (25.19 ± 9.21 g) with 104.78 ± 36.85 per cent adequacy. On over all basis cereals (323.30 ± 36.57 g), fats (25.59 ± 10.14 g) and sugars (29.33 ± 6.12 g) were adequate with adequacy of 119.74 ± 16.39 per cent, 127.96 ± 50.72 per cent and 121.32 ± 24.48 per cent. The consumption of pulses (43.45 ± 26.46 g), milk and milk products (110.50 ± 35.41 ml), roots and tubers (61.75 ± 47.06 g), green leafy vegetables (27.08 ± 42.18 g), other vegetables (72.50 ± 57.92 g), fruits (39.26 ± 53.38 g) and meat and meat products (20.63 ± 43.31 g) were inadequate with 72.41 ± 44.11 per cent, 36.83 ± 11.80 per cent, 30.87 ± 23.53 per cent, 27.08 ± 42.18 per cent, 36.25 ± 28.96 per cent, 39.27 ± 53.38 per cent and 34.39 ± 72.18 per cent, respectively.

4.7.2 Nutrient intake and adequacy among sedentary rural women

Sedentary working women are those engaged in the light activities requiring less labour. Nutrient intake and nutrient adequacy sedentary working rural women in all four agro-climatic zones is presented in Table 20. Among the macro-nutrients, over all mean energy intake was 1,932 ± 143 Kcal with mean adequacy of 99.98 ± 10.42 per cent which was found highest in zone 9 (2,037 ± 99 Kcal) with adequacy of 107.23 ± 5.20 per cent and lowest in zone 10 (1,868 ± 93 Kcal) with adequacy of 98.33 ± 4.88 per cent. The overall mean protein intake was inadequate (52.34 ± 5.13 g) with mean adequacy of 95.09 ± 9.32 per cent which was found highest in zone 10 (53.60 ± 4.16 g) with adequacy of 97.45 ± 7.56 per cent and lowest zone 3 (50.55 ± 6.07 g) with adequacy of 91.91 ± 11.03 per cent. The overall mean fat intake was 36.07 ± 9.33g with mean adequacy of 174.51 ± 51.99 per cent which was found highest in zone 9 (40.01 ± 3.01 g) with adequacy of 200.03 ± 15.04 per cent and lowest was found in zone 3 (31.16 ± 5.67 g) with adequacy of 155.79 ± 28.33 per cent. All the women were consuming more than the RDA for sedentary women for fat.

With regard to micronutrients like minerals it was seen that, only magnesium was adequate and rest all were inadequate. The overall mean calcium intake was inadequate (399.94 ± 98.97 mg) with mean adequacy of 65.48 ± 17.56 per cent which was found highest in zone 8 (427.02 ± 114.49 mg) with adequacy of 69.55 ± 20.85 per cent and lowest in zone 3 (342.74 ± 47.27 mg) with adequacy of 57.12 ± 7.88 per cent. The overall mean iron intake was inadequate (20.06 ± 6.56 g) with adequacy of 95.82 ± 30.82 per cent which was found highest in zone 9 (20.48 ± 7.18 g) with adequacy of 97.52 ± 34.21 per cent and lowest in zone 8 (19.88 ± 4.84 g) with adequacy of 93.23 ± 25.27 per cent. The mean magnesium intake was adequate (580.29 ± 62.25 mg) with mean adequacy of 191.25 ± 19.21 per cent which was found highest in zone 9 (609.54 ± 53.11 mg) with adequacy of 196.63 ± 17.13 per cent and lowest in zone 10 (546.45 ± 15.75 mg) with adequacy of 176.27 ± 5.08 per cent. The mean zinc intake was inadequate (6.25 ± 1.22 mg) with adequacy of 61.85 ± 12.94 per cent which was found highest in zone 9 (6.70 ± 0.32 mg) with adequacy of 67.00 ± 3.16 per cent and lowest in zone 10 (5.00 ± 1.09 mg) with adequacy of 50.00 ± 10.94 per cent.

With regard to micronutrients like vitamins it was found that the mean β-carotene intake was inadequate (659.88 ± 827.19 □g) with adequacy of 13.75 ± 17.23 per cent which was found highest in zone 10 (1,284.50 ± 1,656.79 □g) with adequacy of 26.76 ± 34.52 per cent and lowest in zone 3 (305.00 ± 98.89 □g) with adequacy of 6.35 ± 2.06 per cent.

The mean Vitamin A intake was inadequate (116.25 ± 105.69 □g) with adequacy of 19.37 ± 17.62 per cent which was found highest in zone 8 (154.07 ± 149.90 □g) with adequacy 25.68 ± 24.98 per cent and lowest in zone 3 (84.90 ± 22.34 □g) with adequacy of 14.15 ± 3.73 per cent.

Among the B-complex vitamins it was seen that the mean thiamine intake was adequate in all the zones (1.47 ± 0.43 mg) with adequacy of 147.20 ± 42.97 per cent which was found highest in zone 8 (1.61 ± 0.54 mg) with adequacy of 161.11 ± 53.72 per cent and lowest in zone 10 (1.00 ± 0.34 mg) with adequacy of 100.00 ± 33.66 per cent.

The mean riboflavin intake was inadequate (0.71 ± 0.21 mg) with adequacy of 64.39 ± 18.74 per cent which was found highest in zone 9 (0.78 ± 0.15 mg) with adequacy of 70.91 ± 13.48 per cent and lowest in zone 10 (0.57 ± 0.26 mg) with adequacy of 52.27 ± 23.91 per cent.

The mean niacin intake was adequate (15.84 ± 2.52 mg) with adequacy of 130.70 ± 22.48 per cent which was found highest in zone 9 (17.55 ± 2.60 mg) with adequacy of 146.25 ± 21.65 per cent and lowest in zone 10 (13.74 ± 1.00 mg) with adequacy of 114.48 ± 8.34 per cent.

The mean vitamin B_6 intake was inadequate (0.33 ± 0.24 mg) with adequacy of 16.60 ± 12.05 per cent which was found highest in zone 3 (0.43 ± 0.24 mg) with adequacy of 21.43 ± 12.15 per cent and lowest in zone 10 (0.10 ± 0.20 mg) with adequacy of 5.00 ± 10.00 per cent.

The mean vitamin B_{12} intake was inadequate (0.04 ± 0.11 □g) with adequacy of 5.72 ± 11.54 per cent which was found highest in zone 10 (0.09 ± 0.21 □g) with adequacy of 9.45 ± 21.35 per cent followed by zone 8 (0.03 ± 0.07 □g) with adequacy of 3.33 ± 7.26 per cent and not recorded in zone 3 and zone 9.

The mean vitamin C intake was inadequate (15.78 ± 31.34 mg) with adequacy of 39.45 ± 78.36 per cent which was found highest in zone 8 (26.47 ± 48.04 mg) with adequacy of 66.18 ± 120.09 per cent and lowest in zone 9 (6.80 ± 11.08 mg) with adequacy of 17.00 ± 27.71 per cent.

The mean folate intake was inadequate (136.64 ± 69.87 □g) with adequacy of 68.32 ± 34.93 per cent which was found highest in zone 8 (175.50 ± 79.67 □g) with adequacy of 87.75 ± 39.84 per cent and lowest in zone 10 (62.37 ± 69.54 □g) with adequacy of 31.19 ± 34.77 per cent.

On the whole it was observed that among the sedentary worker rural women nutrients like fat (174.51 %), magnesium (191.25 %), thiamine (147.20 %), and niacin (130.70 %) were above the adequacy where as energy (99.98 %), protein (95.09 %), iron (95.82 %) were nearly adequate. The nutrients like calcium (65.48 %), zinc (61.85 %), β-carotene (13.75 %), vitamin A (19.37 %), riboflavin (64.39 %), vitamin B_6 (16.60 %), vitamin C (39.45 %), folate (68.32 %), and vitamin B_{12} (1.20 %) were highly inadequate.

Thus, it was observed that a majority of nutrients among the sedentary worker rural women were inadequate.

Table 20. Mean nutrient intake of rural women (sedentary worker) in different agro-climatic zones

N=25

Nutrients	RDA	Zone 3 (n=7)		Zone 8 (n=9)		Zone 9 (n=5)		Zone 10 (n=4)		Total	
		Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)
Energy (Kcal)	1900	1891 ± 201	99.52 ± 10.57	1934 ± 111	99.41 ± 10.48	2037 ± 99	107.23 ± 5.20	1868 ± 93	98.33 ± 4.88	1932 ± 143	99.98 ± 10.42
Protein (g)	55.0	50.55 ± 6.07	91.91 ± 11.03	53.08 ± 6.06	96.42 ± 11.02	52.48 ± 2.75	95.43 ± 5.00	53.60 ± 4.16	97.45 ± 7.56	52.34 ± 5.13	95.09 ± 9.32
Fat (g)	20	31.16 ± 5.67	155.79 ± 28.33	36.94 ± 12.89	177.17 ± 71.50	40.01 ± 3.01	200.03 ± 15.04	37.76 ± 9.44	188.78 ± 47.21	36.07 ± 9.33	174.51 ± 51.99
Calcium (mg)	600	342.74 ± 47.27	57.12 ± 7.88	427.02 ± 114.49	69.55 ± 20.85	424.40 ± 118.50	70.73 ± 19.75	408.53 ± 96.41	68.09 ± 16.07	399.94 ± 98.97	65.48 ± 17.56
Iron (mg)	21	20.23 ± 8.15	96.33 ± 38.83	19.88 ± 4.84	93.23 ± 25.27	20.48 ± 7.18	97.52 ± 34.21	20.14 ± 8.70	91.36 ± 31.41	20.06 ± 6.56	95.82 ± 30.82
Magnesium (mg)	310	581.11 ± 82.63	187.46 ± 26.66	578.43 ± 62.37	191.84 ± 14.01	609.54 ± 53.11	196.63 ± 17.13	546.45 ± 15.75	176.27 ± 5.08	580.29 ± 62.25	191.25 ± 19.21
Zinc (mg)	10	6.21 ± 1.00	62.14 ± 9.97	6.59 ± 1.47	64.76 ± 15.47	6.70 ± 0.32	67.00 ± 3.16	5.00 ± 1.09	50.00 ± 10.94	6.25 ± 1.22	61.85 ± 12.94
β-carotene (□g)	4800	305.00 ± 98.89	6.35 ± 2.06	615.78 ± 599.57	12.83 ± 12.49	736.40 ± 831.16	15.34 ± 17.32	1284.50 ± 1656.79	26.76 ± 34.52	659.88 ± 827.19	13.75 ± 17.23
Vitamin A (□g)	600	84.90 ± 22.39	14.15 ± 3.73	154.07 ± 149.90	25.68 ± 24.98	100.02 ± 13.71	16.67 ± 2.29	106.30 ± 145.04	17.72 ± 24.17	116.25 ± 105.69	19.37 ± 17.62
Thiamine (mg)	1.0	1.47 ± 0.26	147.14 ± 25.63	1.61 ± 0.54	161.11 ± 53.72	1.60 ± 0.25	160.00 ± 24.49	1.00 ± 0.34	100.00 ± 33.66	1.47 ± 0.43	147.20 ± 42.97
Riboflavin (mg)	1.1	0.71 ± 0.18	64.94 ± 16.12	0.73 ± 0.23	65.99 ± 20.71	0.78 ± 0.15	70.91 ± 13.48	0.57 ± 0.26	52.27 ± 23.91	0.71 ± 0.21	64.39 ± 18.74
Niacin (mg)	12	16.24 ± 3.46	135.32 ± 28.80	15.52 ± 1.42	127.38 ± 14.15	17.55 ± 2.60	146.25 ± 21.65	13.74 ± 1.00	114.48 ± 8.34	15.84 ± 2.52	130.70 ± 22.48
Vitamin B_6 (mg)	2.0	0.43 ± 0.24	21.43 ± 12.15	0.37 ± 0.18	18.33 ± 9.01	0.32 ± 0.30	16.00 ± 15.17	0.10 ± 0.20	5.00 ± 10.00	0.33 ± 0.24	16.60 ± 12.05
Vitamin C (mg)	40	13.65 ± 21.34	34.13 ± 53.35	26.47 ± 48.04	66.18 ± 120.09	6.80 ± 11.08	17.00 ± 27.71	18.67 ± 29.95	45.67 ± 72.54	15.78 ± 31.34	39.45 ± 78.36
Folate (□g)	200	131.64 ± 39.96	65.82 ± 19.98	175.50 ± 79.67	87.75 ± 39.84	133.12 ± 40.02	66.56 ± 20.01	62.37 ± 69.54	31.19 ± 34.77	136.64 ± 69.87	68.32 ± 34.93
Vitamin B_{12} (□g)	1.0	0.00 ± 0.00	0.00 ± 0.00	0.03 ± 0.07	3.33 ± 7.26	0.00 ± 0.00	0.00 ± 0.00	0.09 ± 0.21	9.45 ± 21.34	0.04 ± 0.11	5.72 ± 11.54

RDA- Recommended dietary allowance

4.7.3 Mean food intake and adequacy among moderate working rural women

The mean food intake and adequacy among moderate working rural women is depicted in Table 21. It was observed from the table that over all cereals and millet consumption was inadequate with highest recorded in zone 9 (326.94 ± 0.00 g) with 98.67 ± 0.00 per cent adequacy and lowest in zone 8 (289.50 ± 33.86 g) with 86.21 ± 10.26 per cent. The overall pulse consumption was inadequate and it was observed highest in zone 3 (70.63 ± 11.91 g) with 92.51 ± 15.88 per cent adequacy and lowest in zone 10 (25.13 ± 28.12 g) with 36.42 ± 42.54 per cent adequacy. The consumption of milk and milk products was highest in zone 8 (144.34 ± 36.85 ml) with 48.11 ± 19.85 per cent adequacy and lowest in zone 9 (90.27 ± 0.00 ml) with 30.09 ± 0.00 per cent adequacy. The roots and tubers consumption was inadequate and it was observed highest in zone 9 (90.35 ± 0.00 g) with 45.18 ± 0.00 per cent adequacy and lowest in zone 8 (20.63 ± 15.96 g) with 10.31 ± 7.97 per cent adequacy. The green leafy vegetable consumption was inadequate and it was observed highest in zone 9(40.55 ± 0.00 g) with 45.00 ± 0.00 per cent adequacy and lowest in zone 3 (28.64 ± 38.02 g) with 28.64 ± 38.02 per cent adequacy. The consumption of other vegetables was observed highest in zone 3 (65.86 ± 53.21 g) with 32.93 ± 26.61 per cent adequacy and lowest in zone 10 (47.22 ± 45.93 g) with 23.61 ± 22.96 per cent adequacy. The fruit consumption was recorded highest in zone 9 (80.20 ± 0.00 g) with 80.20 ± 0.00 per cent adequacy and lowest in zone 8 (18.21 ± 7.20 g) with 18.21 ± 7.20 per cent adequacy. The highest consumption of meat and meat products was recorded in zone 10 (55.50 ± 4.79 g) with 89.16 ± 7.98 per cent adequacy and lowest in zone 8 (4.36 ± 15.36 g) with 6.58 ± 2.56 per cent adequacy. The fats consumption was adequate and recorded highest in zone 9 (31.41 ± 0.00 g) with 128.23 ± 0.00 per cent adequacy and lowest in zone 3 (25.50 ± 7.78 g) with 98.14 ± 25.93 per cent adequacy. The overall sugars intake was inadequate and recorded highest in zone 8 (33.49 ± 7.00 g) with 117.46 ± 35.00 per cent adequacy and lowest in zone 9 (27.86 ± 5.13 g) with 89.28 ± 25.65 per cent adequacy. On over all basis the consumption of all the foods was inadequate and cereals and millets (319.92 ± 44.69 g) with 96.94 ± 13.54 per cent adequacy, pulses (50.59 ± 30.19 g) with 67.45 ± 40.25 per cent adequacy, milk and milk products (99.35 ± 4.43 ml) with 33.11 ± 15.81 per cent adequacy, roots and tubers (49.62 ± 38.15 g) with 24.81 ± 43.42 per cent adequacy, green leafy vegetables (28.81 ± 43.42 g) with 28.81 ± 43.32 per cent, other vegetables (56.07 ± 51.71 g) with 28.03 ± 25.85 per cent adequacy, fruits (43.29 ± 54.05 g) with 43.29 ± 54.05 per cent adequacy, meat and meat products (22.83 ± 40.18 g) with 48.60 ± 28.82 per cent, fats (29.18 ± 8.64 g) with 115.61 ± 28.20 per cent adequacy, sugars (29.16 ± 6.30) with 95.80 ± 31.50 per cent adequacy were recorded.

4.7.4 Nutrient intake and adequacy among moderate working rural women

The moderate working rural women are those who are engaged in the moderately heavy activities, working as daily wager*,* agricultural labourer, servant/maid *etc.* requiring more energy than the sedentary working rural women. Nutrient intake and adequacy among moderate worker rural women of four different agro-climatic zones is depicted in Table 22. It was observed that among the macro-nutrients overall mean energy intake was more than the recommended intake (1,921 ± 187 Kcal) and mean adequacy was 86.14 ± 8.37 per cent which was found highest in zone 9 (2,052 ± 0 Kcal) with adequacy of 91.99 ± 0.00 per cent and lowest in zone 8 (1,836.00 ± 171 Kcal) with adequacy of 82.33 ± 7.64 per cent.

Table 21. Mean food intake of rural women (moderate worker) in different agro-climatic zones

N=11

Food (g/day)	RDI	Zone 3 (n=5)		Zone 8 (n=3)		Zone 9 (n=1)		Zone 10 (n=2)		Total	
		Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)
Cereals and millets	330	317.38 ± 51.99	91.15 ± 15.75	289.50 ± 33.86	86.21 ± 10.26	326.94 ± 0.00	98.67 ± 0.00	302.62 ± 9.45	91.70 ± 2.86	319.92 ± 44.69	96.94 ± 13.54
Pulses	75	70.63 ± 11.91	92.51 ± 15.88	50.95 ± 19.88	67.93 ± 26.51	65.89 ± 0.00	87.85 ± 0.00	25.13 ± 28.12	36.42 ± 42.54	50.59 ± 30.19	67.45 ± 40.25
Milk and milk products (ml)	300	106.84 ± 23.12	35.61 ± 7.71	144.34 ± 36.85	48.11 ± 19.85	90.27 ± 0.00	30.09 ± 0.00	96.87 ± 25.23	32.98 ± 15.89	99.35 ± 4.43	33.11 ± 15.81
Roots and tubers	200	40.16 ± 14.37	20.08 ± 7.18	20.63 ± 15.95	10.31 ± 7.97	90.35 ± 0.00	45.18 ± 0.00	62.67 ± 46.46	31.34 ± 23.23	49.62 ± 38.15	24.81 ± 19.07
Green leafy vegetables	100	28.64 ± 38.02	28.64 ± 38.02	36.85 ± 32.08	36.85 ± 32.08	40.55 ± 0.00	40.55 ± 0.00	31.84 ± 29.60	31.84 ± 29.60	28.81 ± 43.42	28.81 ± 43.42
Other vegetables	200	65.86 ± 53.21	32.93 ± 26.61	48.67 ± 78.73	24.33 ± 39.36	53.07 ± 0.00	26.54 ± 0.00	47.22 ± 45.93	23.61 ± 22.96	56.07 ± 51.71	28.03 ± 25.85
Fruits	100	37.21 ± 57.72	37.21 ± 57.72	18.21 ± 7.20	18.21 ± 7.20	80.20 ± 0.00	80.20 ± 0.00	73.69 ± 66.75	73.69 ± 66.75	43.29 ± 54.05	43.29 ± 54.05
Meat and meat products	60	10.25 ± 23.44	15.36 ± 26.82	4.36 ± 15.36	6.58 ± 22.56	12.04 ± 0.00	20.06 ± 0.00	55.50 ± 4.79	89.16 ± 7.98	22.83 ± 40.18	48.60 ± 28.82
Fats	25	27.82 ± 5.24	102.67 ± 23.87	29.33 ± 6.35	113.11 ± 21.17	31.41 ± 0.00	128.23 ± 0.00	25.50 ± 7.78	98.14 ± 25.93	29.18 ± 8.64	115.61 ± 28.20
Sugars	30	29.30 ± 8.90	96.50 ± 44.51	33.49 ± 7.00	117.46 ± 35.00	27.86 ± 5.13	89.28 ± 25.65	29.44 ± 3.37	97.84 ± 11.33	29.16 ± 6.30	95.80 ± 31.50

RDI- Recommended dietary intake

Table 22. Nutrient intake of rural women (moderate worker) in agro-climatic zones

N=11

Nutrients	RDA	Zone 3 (n=5)		Zone 8 (n=3)		Zone 9 (n=1)		Zone 10 (n=2)		Total	
		Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)	Intake	Adequacy (%)
Energy (Kcal)	2230	1947 ± 245	87.32 ± 10.98	1836 ± 171	82.33 ± 7.64	2052 ± 0.00	91.99 ± 0.00	1918 ± 91	85.98 ± 4.06	1921 ± 187	86.14 ± 8.37
Protein (g)	55.0	52.74 ± 6.19	95.89 ± 11.26	47.45 ± 3.53	86.27 ± 6.41	54.08 ± 0.00	98.24 ± 0.00	53.68 ± 1.70	97.60 ± 3.08	51.73 ± 5.14	94.06 ± 9.35
Fat (g)	25	35.99 ± 18.59	143.98 ± 74.37	36.87 ± 4.07	147.49 ± 16.27	38.31 ± 0.00	153.24 ± 0.00	35.56 ± 4.23	142.24 ± 16.91	36.37 ± 12.00	145.47 ± 48.01
Calcium (mg)	600	366.56 ± 32.75	61.09 ± 5.46	434.90 ± 151.83	72.48 ± 25.31	369.90 ± 0.00	61.65 ± 0.00	366.40 ± 171.26	61.07 ± 28.54	385.47 ± 94.77	64.25 ± 15.79
Iron (mg)	21	17.30 ± 3.720215	82.38 ± 17.71	19.87 ± 10.65	94.60 ± 50.70	16.30 ± 0.00	77.62 ± 0.00	19.70 ± 11.95	92.57 ± 56.91	18.72 ± 6.81	89.13 ± 32.41
Magnesium (mg)	310	592.76 ± 44.69	191.21 ± 14.42	537.60 ± 90.80	173.42 ± 29.29	533.90 ± 0.00	172.23 ± 0.00	553.5 ± 67.46	178.55 ± 21.76	565.23 ± 60.30	182.33 ± 19.45
Zinc (mg)	10	6.96 ± 1.21	69.60 ± 12.09	5.53 ± 0.80	55.33 ± 8.02	6.80 ± 0.00	68.00 ± 0.00	4.80 ± 0.42	48.00 ± 4.24	6.16 ± 1.26	61.64 ± 12.57
β-carotene (□g)	4800	374.40 ± 124.87	7.80 ± 2.60	1224.33 ± 1003.98	25.51 ± 20.92	584.00 ± 0.00	12.17 ± 0.00	439.00 ± 63.64	10.98 ± 1.32	600.64 ± 613.77	12.51 ± 12.79
Vitamin A (□g)	600	118.89 ± 81.69	19.82 ± 13.62	306.68 ± 251.48	51.11 ± 41.91	148.90 ± 0.00	24.82 ± 0.00	96.15 ± 57.49	16.03 ± 9.58	168.70 ± 153.92	28.12 ± 25.65
Thiamine (mg)	1.1	1.56 ± 0.31	141.82 ± 28.46	1.37 ± 0.21	124.24 ± 18.92	2.20 ± 0.00	200.00 ± 0.00	1.05 ± 0.07	95.45 ± 6.43	1.47 ± 0.38	133.88 ± 34.52
Riboflavin (mg)	1.3	0.65 ± 0.31	50.00 ± 23.71	0.62 ± 0.18	47.44 ± 13.51	0.90 ± 0.00	69.23 ± 0.00	0.8 ± 0.00	61.54 ± 0.00	0.69 ± 0.23	53.15 ± 17.78
Niacin (mg)	14	15.18 ± 2.82	108.44 ± 20.13	13.77 ± 3.05	98.35 ± 21.82	16.88 ± 0.00	120.5714 ± 0.00	17.72 ± 4.72	126.57 ± 33.74	15.41 ± 3.06	110.08 ± 21.89
Vitamin B_6 (mg)	2.0	0.60 ± 0.33	30.00 ± 16.58	0.57 ± 0.32	28.33 ± 16.07	0.20 ± 0.00	10.00 ± 0.00	0.16 ± 0.09	8.23 ± 3.52	0.45 ± 0.36	22.27 ± 17.80
Vitamin C (mg)	40	29.36 ± 61.86	73.40 ± 154.66	3.73 ± 3.48	9.33 ± 8.71	7.20 ± 0.00	18.00 ± 0.00	8.33 ± 11.77	20.81 ± 29.43	16.53 ± 41.24	41.33 ± 103.10
Folate (□g)	200	125.27 ± 27.49	62.64 ± 13.74	115.78 ± 52.70	57.89 ± 26.35	139.90 ± 0.00	69.95 ± 0.00	41.5 ± 22.20	20.75 ± 11.10	108.78 ± 45.39	54.39 ± 22.69
Vitamin B_{12} (□g)	1.0	0.04 ± 0.07	3.80 ± 7.15	0.02 ± 0.03	2.00 ± 3.46	0.06 ± 0.00	6.00 ± 0.00	0.07 ± 0.10	7.00 ± 9.90	0.13 ± 0.32	13.18 ± 31.75

RDA- Recommended dietary allowance

The overall mean protein intake was inadequate (51.73 ± 5.14 g) with adequacy of 94.06 ± 9.35 per cent which was found highest in zone 9 (54.08 ± 0.00 g) with adequacy of 98.24 ± 0.00 per cent and lowest zone 8 (47.45 ± 3.53 g) with adequacy of 86.27 ± 6.41 per cent. The mean fat intake was more than the recommended intake (36.37 ± 12.00 g) with adequacy of 145.47 ± 48.01 per cent which was found highest in zone 9 (38.31 ± 0.00 g) with mean adequacy of 153.24 ± 0.00 per cent and lowest was found in zone 10 (35.56 ± 4.23 g) with mean adequacy of 142.24 ± 16.91 per cent.

With regard to micronutrients like minerals it was seen that only magnesium was adequate and rest all were inadequate. The overall mean calcium intake was inadequate (385.47 ± 94.77 mg) with adequacy of 64.25 ± 15.79 per cent which was found highest in zone 10 (366.40 ± 171.26 mg) with adequacy of 61.07 ± 28.54 per cent and lowest in zone 8 (434.90 ± 151.83 mg) with adequacy of 72.48 ± 25.31 per cent. The overall mean iron intake was inadequate (18.72 ± 6.81 mg) with adequacy of 89.13 ± 32.41 per cent which was found highest in zone 8 (19.87 ± 10.65 mg) with adequacy of 94.60 ± 50.70 per cent and lowest in zone 9 (16.30 ± 0.00 mg) with mean adequacy of 77.62 ± 0.00 per cent. The mean magnesium intake was adequate (565.23 ± 60.30 mg) with mean adequacy of 182.33 ± 19.45 per cent which was found highest in zone 3 (592.76 ± 44.69 mg) with adequacy of 191.21 ± 14.42 per cent and lowest in zone 9 (533.90 ± 0.00 mg) with adequacy of 172.23 ± 0.00 per cent. The mean zinc intake was inadequate (6.16 ± 1.26 mg) with adequacy of 61.64 ± 12.57 per cent which was found highest in zone 3 (6.96 ± 1.21 mg) with adequacy of 69.60 ± 12.09 per cent and lowest in zone 10 (4.80 ± 0.42 mg) with adequacy of 48.00 ± 4.24 per cent.

With regard to micronutrients like vitamins it was found that the mean β-carotene intake was inadequate (600.64 ± 613.77 □g) with adequacy of 12.51 ± 12.79 per cent which was found highest in zone 8 (1,224.33 ± 1,003.98 □g) with adequacy of 25.51 ± 20.92 per cent and lowest in zone 3 (374.40 ± 124.87 □g) with adequacy of 7.80 ± 2.60 per cent.

The mean vitamin A intake was inadequate (168.70 ± 153.92 □g) with adequacy of 28.12 ± 25.65 per cent which was found highest in zone 8 (306.68 ± 251.48 □g) with adequacy 51.11 ± 41.91 per cent and lowest in zone 10 (96.15 ± 57.49 □g) with adequacy of 16.03 ± 9.58 per cent.

Among the B-complex vitamins it was seen that the mean thiamine intake was adequate in all the zones (1.47 ± 0.38 mg) with adequacy of 133.88 ± 34.52 per cent which was found highest in zone 9 (2.20 ± 0.00 mg) with adequacy of 200.00 ± 0.00 per cent and lowest in zone 10 (1.05 ± 0.07 mg) with adequacy of 95.45 ± 6.43 per cent.

The mean riboflavin intake was inadequate (0.69 ± 0.23 mg) with adequacy of 53.15 ± 17.78 per cent which was found highest in zone 9 (0.90 ± 0.00 mg) with adequacy of 69.23 ± 0.00 per cent and lowest in zone 8 (0.62 ± 0.18 mg) with adequacy of 47.44 ± 13.51 per cent.

The mean niacin intake was adequate (15.41 ± 3.06 mg) with adequacy of 110.08 ± 21.89 per cent which was found highest in zone 10 (17.72 ± 4.72 mg) with adequacy of 126.57 ± 33.74 per cent and lowest in zone 8 (13.77 ± 3.05 mg) with adequacy of 98.35 ± 21.82 per cent.

The overall mean Vitamin B_6 intake was inadequate (0.45 ± 0.36 mg) with adequacy of 22.27 ± 17.80 per cent which was found highest in zone 3 (0.60 ± 0.33 mg) with adequacy of 30.00 ± 16.58 per cent and lowest in zone 10 (0.16 ± 0.09 mg) with adequacy of 8.23 ± 3.52 per cent.

The overall mean vitamin B_{12} intake was inadequate (0.13 ± 0.32 □g) with adequacy of 13.18 ± 31.75 per cent which was found highest in zone 10 (0.07 ± 0.10 □g) with adequacy of 7.00 ± 9.90 and lowest in zone 8 (0.02 ± 0.03 □g) with adequacy of 2.00 ± 3.46 per cent.

The overall mean Vitamin C intake was inadequate (16.53 ± 41.24 mg) with adequacy of 41.33 ± 103.10 per cent which was found highest in zone 3 (29.36 ± 61.86 mg) with adequacy of 73.40 ± 154.66 per cent and lowest in zone 8 (3.73 ± 3.48 mg) with adequacy of 9.33 ± 8.71 per cent.

The overall mean folate intake was inadequate (108.78 ± 45.09 □g) with adequacy of 54.39 ± 22.69 per cent which was found highest in zone 9 (139.90 ± 0.00 □g) with adequacy of 69.95 ± 0.00 per cent and lowest in zone 10 (41.50 ± 22.30 □g) with adequacy of 20.75 ± 11.10 per cent.

On the whole it was observed that among the moderate women nutrients like fat (145.47 %), magnesium (182.33 %), thiamine (133.88 %), and niacin (110.08 %) were more than the recommended intake, where as energy (86.14 %), protein (94.06 %), iron (89.13 %) were nearly adequate. The nutrients like calcium (64.25 %), zinc (61.64 %), β-carotene (12.51 %), vitamin A (28.12 %), riboflavin (53.15 %), vitamin B_6 (22.27 %), vitamin C (41.33 %), folate (54.39 %), and vitamin B_{12} (13.18 %) were highly inadequate.

Thus, it was observed that a maximum per cent of nutrients were found to be inadequate along with energy and protein.

4.8 Nutrition education intervention of rural women

Nutrition education intervention alters nutrition knowledge of women by changing negative attitudes, false beliefs besides enhancing information, leading towards introspection of knowledge among women and to head with positive direction required to sustain good health (Plate 6).

4.8.1 Demographic profile of rural women selected for educational intervention

The demographic profile gives the details of the women selected for nutrition education intervention. The demographic profile data of randomly selected women taken for educational intervention is detailed in Table 23. It was observed that a majority of women belonged to age range of 15-20 years (36.67 %) followed by those in 31-35 years (23.33 %) and lowest proportion of women belonged to age range of 21-25 years and 26-30 years (20.00 % in each).

With regard to marital status a majority of women were married (60.00 %). It was observed that half of the women belonged to nuclear families (50.00 %), followed by those in joint families (46.67 %) and lowest were recorded from extended families (3.33 %). The mean total family size was 5.80 ± 2.61 and it consisted of 2.70 ± 1.62 males, 3.27 ± 1.51 females, 4.23 ± 2.33 total adults and 1.70 ± 1.06 children. All the selected women were Hindus and most of them were matriculate (46.67 %), followed by those who persuaded only higher primary (20.00 %) and lowest proportion of women were graduates (3.33 %) and none of the women were post graduates. With regard to occupation, a majority of women were not engaged in gainful employment (63.34 %). Among the women who had gainful employment a majority of them were engaged in business (13.33 %) followed by those working as agricultural labourers (10.00 %) and lowest proportion were agriculturists and engaged as other labourers (3.33 %). Thus, it was noted that rural women had varied demographic profiles.

Plate 6: Women in educational intervention through games innovative learning objects

Table 23. Demographic profile of rural women selected for educational intervention

N=30

Parameters	Criteria	Frequency (%)
Age (years)	15-20	11 (36.67)
	21-25	6 (20.00)
	26-30	6 (20.00)
	31-35	7 (23.33)
Marital status	Married	18 (60.00)
	Unmarried	12 (40.00)
Type of family	Nuclear	15 (50.00)
	Joint	14 (46.67)
	Extended	1 (3.33)
Family composition (mean ± SD)	Males	2.70 ± 1.62
	Females	3.27 ± 1.51
	Adults	4.23 ± 2.33
	Children	1.70 ± 1.06
Family size (mean ± SD)	Total	5.80 ± 2.61
Religion	Hindus	30 (100.00)
	Muslims	Nil
	Christians	Nil
	Jains	Nil
Education level	No schooling	3 (10.00)
	Primary	3 (10.00)
	Higher primary	6 (20.00)
	SSLC	14 (46.67)
	PUC / Diploma	3 (10.00)
	Graduate	1 (3.33)
	Post graduate	-
Occupation	Not working	19 (63.34)
	Agriculture	1 (3.33)
	Agricultural labourer	3 (10.00)
	Other labourer	1 (3.33)
	Business	4 (13.33)
	White color jobs / Govt. Jobs	2 (6.67)

4.9 Impact of educational intervention on nutrition knowledge and health hazards of junk foods

Nutrition education is an important process to bring a change in nutrition knowledge and food behaviour.

4.9.1 Impact of educational intervention on awareness about nutrition knowledge of women

The nutrition knowledge of rural women before and after educational intervention is recorded in Table 24. It was observed that on total 53.33 per cent of women were recorded with low awareness before educational intervention that were in cent per cent proportion aged between 31-35 years and the proportion was lowered to 42.86 per cent after educational intervention and were observed to be moderately aware with 42.86 per cent and highly aware with 14.28 per cent. A maximum proportion of moderately aware (63.64 %) women were recorded in the age group of 15-20 years before educational intervention and the proportion was reduced to 18.18 per cent after educational intervention and a majority of women possessed high awareness (81.82 %). On total the proportion of highly aware women was 16.67 per cent before educational intervention which was increased to 36.67 per cent after educational intervention. Although the per cent of highly aware women was increased after educational intervention, a majority of women were recorded as moderately aware (43.33 %). There was significant ($p \leq 0.01$) increase in the nutrition knowledge of women after educational intervention.

The impact of educational intervention on different aspects of healthy food consumption (Fig. 4) revealed that the knowledge of women was enhanced on general nutrition and health (52.05 % to 78.71 %), nutrient composition of foods (37.62 % to 72.38 %) and food safety practices (46.67 % to 87.22 %). Thus, nutrition education played a role in enhancing the nutrition knowledge of women.

4.9.2 Impact on awareness about health hazards of junk foods

Appropriate education in congenial setting offer desired positive impact. Efforts were made to bring about a change in awareness of women about health hazards of junk foods. Results of the study are briefed below.

Awareness about health hazards of junk foods among rural women before and after educational intervention is presented in Table 25. It was observed that on total 63.33 per cent of women were recorded with low awareness before educational intervention among which a major of proportion women were aged between 31-35 years (85.71%) and the proportion was lowered to 14.29 per cent after educational intervention and were observed to be moderately aware with 57.14 per cent and highly aware with 28.57 per cent. A maximum proportion of moderately aware (27.80 %) women were recorded in the age group of 15-20 years before educational intervention and the proportion was reduced to 9.09 per cent after educational intervention and a majority of women possessed high awareness (72.73 %). In total, the proportion of highly aware women was 20.00 per cent before educational intervention which was increased to 43.33 per cent after educational intervention and a majority of women possessed high awareness about health hazards of junk foods. There was significant ($p \leq 0.01$) increase in the awareness about health hazards of junk foods among women after educational intervention.

Table 24. Impact of educational intervention on nutrition knowledge of rural women selected for educational intervention

N=30

Age (years)	Frequency	Level of awareness						Paired- t value
		Before			After			
		Low	Moderate	High	Low	Moderate	High	
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
15-20	11	-	7 (63.64)	4 (36.36)	-	2 (18.18)	9 (81.82)	11.51**
21-25	6	4 (66.66)	1 (16.67)	1 (16.67)	1 (16.67)	4 (66.66)	1 (16.67)	
26-30	6	5 (83.33)	1 (16.67)	-	2 (33.33)	4 (66.67)	-	
31-35	7	7 (100.00)	-	-	3 (42.86)	3 (42.86)	1 (14.28)	
Total	30	16 (53.33)	9 (30.00)	5 (16.67)	6 (20.00)	13 (43.33)	11 (36.67)	

**Significant at p≤0.01

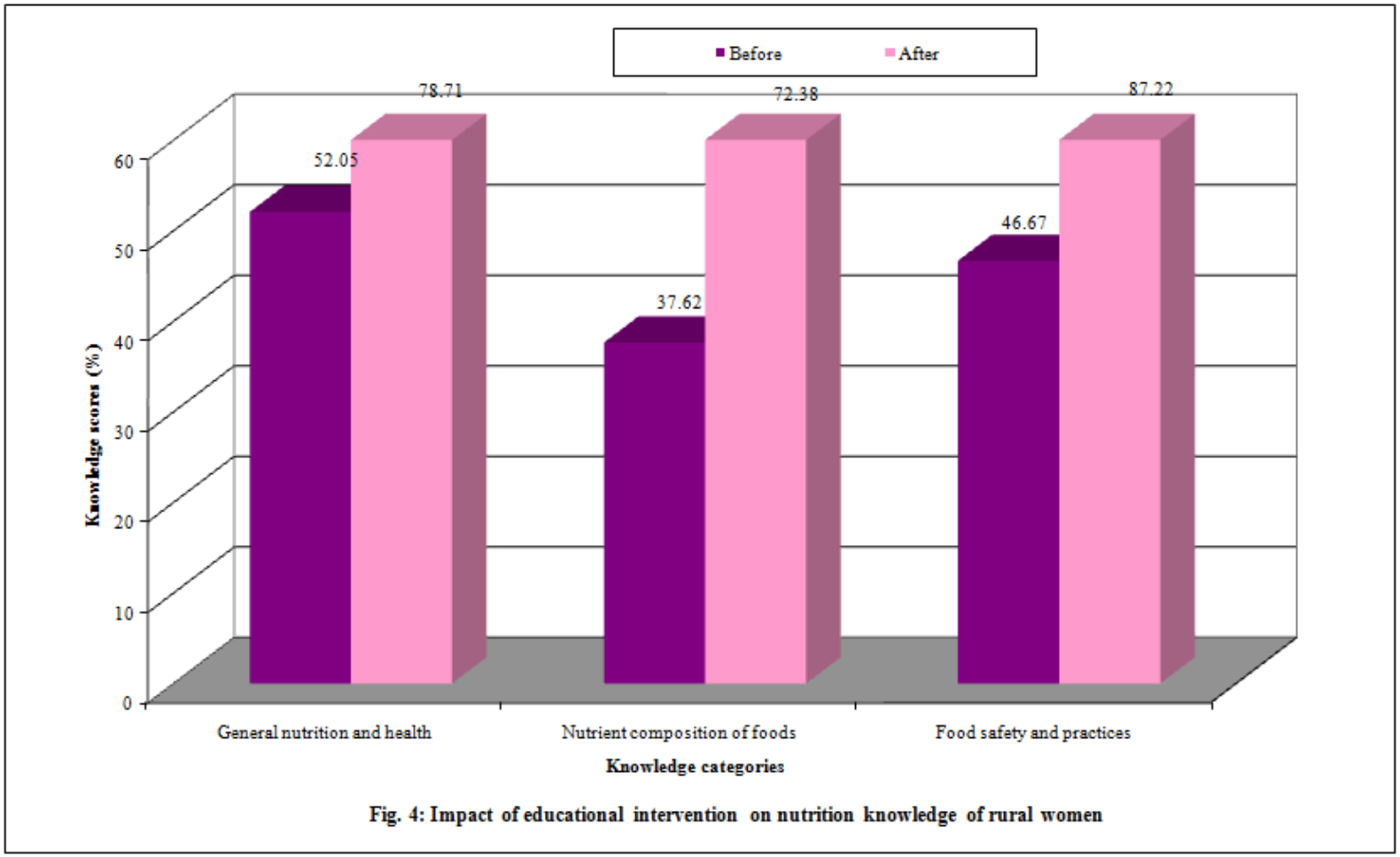


Fig. 4: Impact of educational intervention on nutrition knowledge of rural women

Fig. 4: Impact of educational intervention on nutrition knowledge of rural women

The impact of educational intervention on different aspects of junk food consumption (Fig. 5) revealed that the knowledge of women was enhanced on general aspects of junk foods (48.09 % to 93.81 %), additives in junk foods (25.00 % to 49.17 %) and health implications of junk foods (17.62 % to 66.19 %).

Thus, nutrition education intervention played a role in enhancing awareness about health hazards of junk foods among women.

4.9.3 Impact of educational intervention on food behaviour

Food behaviour is a basic food intake pattern formulated by an individual. Education influences knowledge, attitude and practices. Thus, may influence food behaviour in terms consumption of junk foods and healthy foods.

4.9.3.1 Impact of educational intervention on consumption of junk foods

The impact of educational intervention on frequency of consumption of junk foods is depicted in Table 26. It was observed that the highly consumed junk foods by rural families on daily basis before educational intervention were biscuits (50.00 %) and chocolates/candies (36.67 %) and after educational intervention biscuits (30.00 %) were consumed on weekly basis and chocolates (30.00 %) on twice a week basis. *Kurkuri* consumed on twice a week basis was shifted to weekly basis. Bread, potato chips and green/red *vatani, hurakadli, papadi, rasgulla and khava* consumption was high on weekly basis in the rural families before and also after educational intervention but, its consumption was reduced by number of families. Cake and *khardani, ghate* consumed highly on weekly basis were shifted to fortnightly basis. The consumption of chat foods and *batar*/toast/rusk was high on fortnightly basis before and also after educational intervention but the number of families reduced. The *manchurian*, *chakkali/kodbale* and *badang* consumed highly on fortnightly basis was shifted to monthly basis. The foods like *dil khush/dil pasand, khari*/puffs were consumed highly on monthly basis were shifted to rarely basis. The rarely consumed junk foods were chewing gum, *Mysorepak,* soft drinks, noodles, ice cream/ice candy and *samosa/kachori* before and also after educational intervention. Most of families never consumed popcorn before and also after educational intervention.

The highly ranked and most popular junk foods (Table 27) before the nutrition education intervention were biscuits, chocolates/ candies, *kurkuri*, and bread which sustained the same rank after nutrition education intervention but there was reduction in their frequency of consumption. The moderately popular junk foods before educational intervention were *rasgulla, khardani, khava*, chat foods, *batar/*toast/rusk, *ghate,* bun:cream/jam/*khara*, *manchurian, chakkali/kodbale* and after educational intervention the number of products in moderate category were reduced and were recorded to be *hurakadli, papadi, khardani, rasgulla, batar*/toast/rusk, chat foods, bun: cream/ jam/ *khara*. The less popular junk foods before educational intervention were observed to be *badang, dil khush/dil pasand*, *khari*/puffs, chewing gum, *Mysorepak,* soft drinks, noodles, ice-cream/ice candy, *samosa/kachori*, popcorn and the number of products in less popular category were increased and were observed to be *ghate, khari*/puffs, *manchurian, chakkali/kodbale, badang, dil khush/dil pasand*, chewing gum, *Mysorepak*, soft drinks, ice cream/ice-candy, noodles, popcorn, *samosa/kachori.*

Table 25. Impact of educational intervention on health hazards of junk foods among rural women selected for educational intervention

N=30

Age (years)	Frequency	Level of awareness						Paired-t value
		Before			After			
		Low	Moderate	High	Low	Moderate	High	
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
15-20	11	4 (36.36)	3 (27.28)	4 (36.36)	2 (18.18)	1 (9.09)	8 (72.73)	12.84**
21-25	6	4 (66.67)	-	2 (33.33)	1 (16.67)	3 (50.00)	2 (33.33)	
26-30	6	5 (83.33)	1 (16.67)	-	4 (66.66)	1 (16.67)	1 (16.67)	
31-35	7	6 (85.71)	1 (14.29)	-	1 (14.29)	4 (57.14)	2 (28.57)	
Total	30	19 (63.33)	5 (16.67)	6 (20.00)	8 (26.67)	9 (30.00)	13 (43.33)	

**Significant at p≤0.01

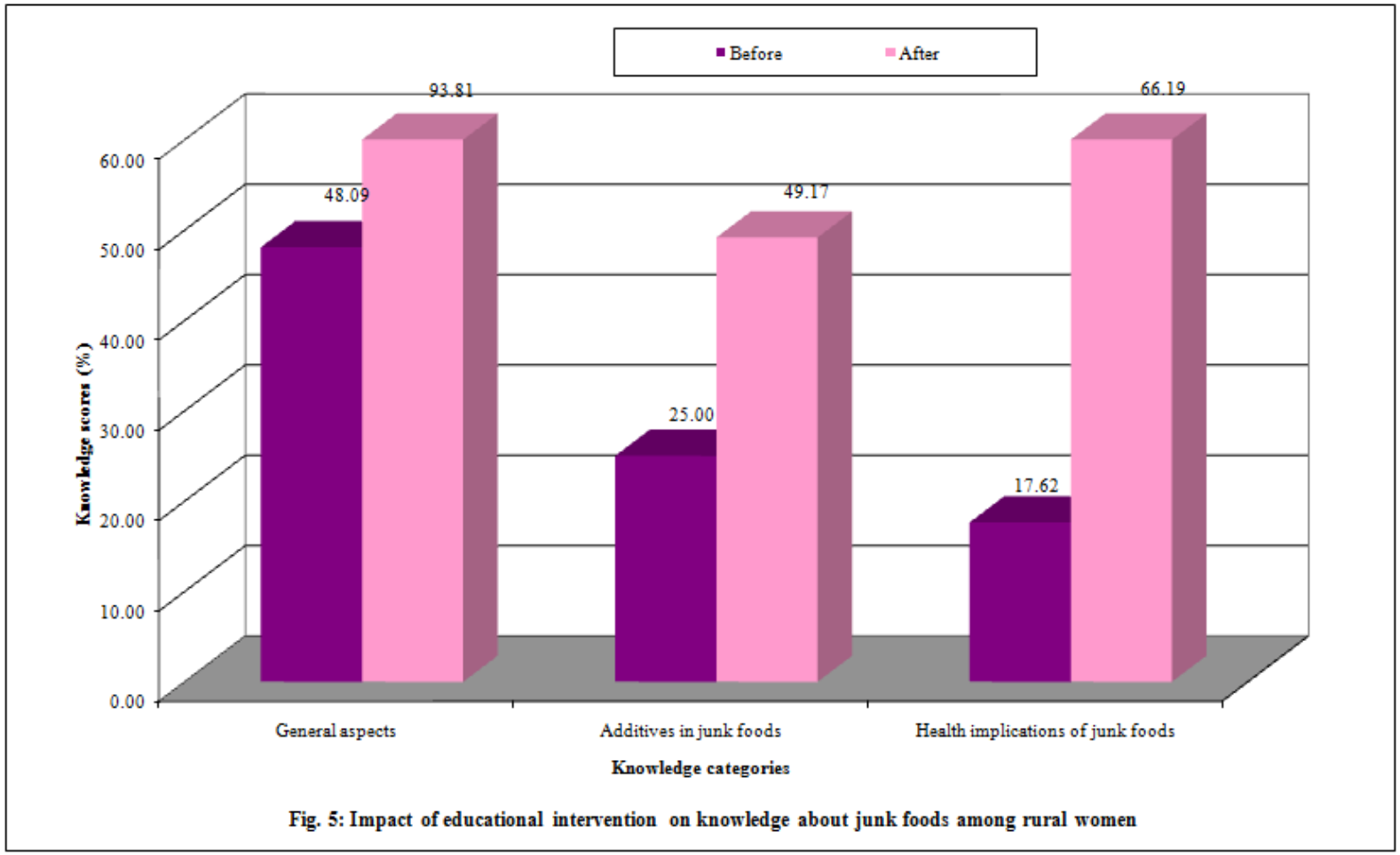


Fig. 5: Impact of educational intervention on knowledge about junk foods among rural women

Fig. 5: Impact of educational intervention on knowledge about junk foods among rural women

Table 26. Impact of educational intervention on frequency of consumption of different junk foods

N=30

Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Biscuits	15 (50.00)#	7 (23.33)	7 (23.33)	5 (16.67)	4 (13.33)	6 (20.00)	2 (6.67)	9 (30.00)	2 (6.67)	3 (10.00)	-	-	-	-	-	-
Chocolates / candies	11 (36.67)	8 (26.67)	5 (16.67)	4 (13.33)	8 (26.67)	9 (30.00)	4 (13.33)	4 (13.33)	2 (6.67)	3 (10.00)	-	1 (3.33)	-	-	-	1 (3.33)
Kurkuri	2 (6.67)	2 (6.67)	5 (16.67)	4 (13.33)	9 (30.00)	6 (20.00)	8 (26.67)	8 (26.67)	2 (6.67)	4 (13.33)	2 (6.67)	2 (6.67)	1 (3.33)	1 (3.33)	1 (3.33)	3 (10.00)
Bread	2 (6.67)	-	1 (3.33)	-	9 (30.00)	5 (16.67)	13 (43.33)	12 (40.00)	3 (10.00)	10 (33.33)	2 (6.67)	3 (10.00)	-	-	-	-
Potato chips	1 (3.33)	-	-	-	8 (26.67)	3 (10.00)	12 (40.00)	11 (36.67)	5 (16.67)	9 (30.00)	1 (3.33)	2 (6.67)	1 (3.33)	-	2 (6.67)	5 (16.67)
Green / red *vatani*	1 (3.33)	-	1 (3.33)	-	3 (10.00)	1 (3.33)	17 (56.67)	15 (50.00)	3 (10.00)	7 (23.33)	3 (10.00)	3 (10.00)	1 (3.33)	1 (3.33)	1 (3.33)	3 (10.00)
Cake	1 (3.33)	-	-	1 (3.33)	2 (6.67)	2 (6.67)	18 (60.00)	10 (33.33)	3 (10.00)	11 (36.67)	5 (16.67)	5 (16.67)	1 (3.33)	1 (3.33)	-	-
Hurakadli	-	-	2 (6.67)	-	3 (10.00)	-	16 (53.33)	14 (46.67)	2 (6.67)	4 (6.67)	3 (10.00)	6 (20.00)	2 (6.67)	2 (6.67)	2 (6.67)	4 (13.33)
Papadi	-	-	3 (10.00)	2 (6.67)	6 (20.00)	4 (13.33)	11 (36.67)	8 (26.67)	2 (6.67)	5 (16.67)	1 (3.33)	1 (3.33)	2 (6.67)	2 (6.67)	5 (16.67)	8 (26.67)
Rasgulla	2 (6.67)	-	3 (10.00)	2 (6.67)	2 (6.67)	2 (6.67)	12 (40.00)	9 (30.00)	1 (3.33)	2 (6.67)	-	1 (3.33)	2 (6.67)	3 (10.00)	8 (26.67)	11 (36.67)
Kharadani	-	-	1 (3.33)	-	-	-	14 (46.67)	10 (33.33)	10 (33.33)	12 (40.00)	1 (3.33)	3 (10.00)	1 (3.33)	1 (3.33)	3 (10.00)	4 (13.33)
Khava	2 (6.67)	2 (6.67)	4 (13.33)	4 (13.33)	2 (6.67)	2 (6.67)	15 (50.00)	12 (40.00)	1 (3.33)	2 (6.67)	1 (3.33)	1 (3.33)	1 (3.33)	-	4 (10.00)	7 (23.33)
Chat foods:*pani puri* etc.	-	-	1 (3.33)	-	-	-	4 (13.33)	2 (6.67)	18 (60.00)	12 (40.00)	5 (16.67)	7 (23.33)	2 (6.67)	5 (16.67)	-	4 (13.33)
Batar / toast / rusk	-	-	-	-	1 (3.33)	-	5 (16.67)	2 (6.67)	13 (43.33)	12 (40.00)	9 (30.00)	9 (30.00)	-	3 (10.00)	2 (6.67)	4 (13.33)

Contd…..

Contd....

Junk foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Rarely		Never	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Ghate	-	-	2 (6.67)	-	3 (10.00)	1 (3.33)	9 (30.00)	6 (20.00)	4 (13.33)	8 (26.67)	2 (6.67)	2 (6.67)	3 (10.00)	3 (10.00)	7 (23.33)	10 (33.33)
Bun:cream / jam / *khara*	-	-	-	-	1 (3.33)	1 (3.33)	6 (20.00)	3 (10.00)	4 (13.33)	7 (23.33)	18 (60.00)	10 (33.33)	1 (3.33)	5 (16.67)	-	4 (13.33)
Manchurian	-	-	-	-	-	-	1 (3.33)	1 (3.33)	15 (50.00)	7 (23.33)	13 (43.33)	8 (26.67)	-	5 (16.67)	1 (3.33)	9 (30.00)
Chakkali / kodbale	-	-	2 (6.67)	-	3 (10.00)	2 (6.67)	6 (20.00)	4 (13.33)	8 (26.67)	2 (6.67)	2 (6.67)	12 (40.00)	9 (30.00)	9 (30.00)	-	1 (3.33)
Badang	-	-	1 (3.33)	-	1 (3.33)	-	9 (30.00)	5 (16.67)	12 (40.00)	6 (20.00)	1 (3.33)	16 (53.33)	2 (6.67)	2 (6.67)	4 (13.33)	1 (3.33)
Dil Khush /dil pasand	-	-	-	-	-	-	2 (6.67)	-	2 (6.67)	2 (6.67)	18 (60.00)	11 (36.67)	8 (26.67)	14 (46.67)	-	3 (10.00)
Khari / puffs	-	-	-	-	-	-	1 (3.33)	-	2 (6.67)	5 (16.67)	20 (66.67)	9 (30.00)	7 (23.33)	15 (50.00)	-	1 (3.33)
Chewing gum	-	-	1 (3.33)	-	-	-	3 (10.00)	2 (6.67)	1 (3.33)	1 (3.33)	7 (23.33)	5 (16.67)	14 (46.67)	13 (43.33)	4 (13.33)	9 (30.00)
Mysorepak	-	-	-	-	1 (3.33)	-	7 (23.33)	4 (13.33)	-	-	1 (3.33)	1 (3.33)	12 (40.00)	16 (53.33)	9 (30.00)	9 (30.00)
Soft drinks	-	-	-	-	-	-	-	-	3 (10.00)	3 (10.00)	2 (6.67)	1 (3.33)	24 (80.00)	23 (76.67)	1 (3.33)	3 (10.00)
Noodles	-	-	-	-	1 (3.33)	-	-	-	-	-	8 (26.67)	5 (16.67)	16 (53.33)	10 (33.33)	5 (16.67)	15 (50.00)
Ice-cream / ice candy	-	-	-	-	1 (3.33)	-	1 (3.33)	-	1 (3.33)	1 (3.33)	3 (10.00)	4 (13.33)	16 (53.33)	17 (56.67)	8 (26.67)	8 (26.67)
Samosa / kachori	-	-	-	-	1 (3.33)	-	2 (6.67)	-	-	-	2 (6.67)	2 (6.67)	4 (13.33)	2 (6.67)	21 (70.00)	26 (86.67)
Popcorn	-	-	-	-	-	-	2 (6.67)	-	1 (3.33)	2 (6.67)	1 (3.33)	1 (3.33)	5 (16.67)	1 (3.33)	21 (70.00)	26 (86.67)

#Figures in parentheses indicate per cent values

Table 27. Impact of educational intervention on junk food consumption frequency scores of different foods

Before			After		
Foods	**Rank**	**CFS**	**Foods**	**Rank**	**CFS**
Most popular					
Biscuits	1	181	Biscuits	1	154
Chocolates/candies	2	169	Chocolates/candies	2	152
Kurkuri	3	132	*Kurkuri*	3	117
Bread	4	130	Bread	4	110
Potato chips	5	113	Cake	5	100
Green/red *vatani*	6	112	Green/red *vatani*	6	95
Cake	7	109	Potato chips	7	91
Hurukadli	8	105	*Khava*	8	89
Papadi	9	102	**Moderately popular**		
Moderately popular			*Hurakadli*	9	84
Rasgulla	10	95	*Papadi*	10	83
Kharadani	11	95	*Kharadani*	11	83
Khava	12	94	*Rasgulla*	12	69
Chat foods: *pani puri etc.*	13	88	*Batar*/toast/rusk	13	65
Batar/toast/rusk	14	82	Chat foods: *pani puri etc.*	14	63
Ghate	15	82	Bun:cream/jam*/khara*	15	63
Bun:cream/jam*/khara*	16	78	**Less popular**		
Manchurian	17	75	*Ghate*	16	60
Chakkali/kodbale	18	67	*Khari*/puffs	17	48
Less popular			*Manchurian*	18	47
Badang	19	63	*Chakkali/kodbale*	19	45
Dil Khush/dil pasand	20	58	*Badang*	20	44
Khari/puffs	21	57	*Dil Khush/dil pasand*	21	42
Chewing gum	22	49	Chewing gum	22	34
Mysorepak	23	47	*Mysorepak*	23	34
Soft drinks	24	37	Soft drinks	24	34
Noodles	25	37	Ice-cream/ice candy	25	28
Ice-cream/ice candy	26	34	Noodles	26	20
Samosa/kachori	27	21	Popcorn	27	11
Popcorn	28	18	*Samosa/kachori*	28	6

CFS-Consumption frequency score

Impact of educational intervention on frequency of consumption of junk foods in rural families is depicted in Table 28. It was observed that the consumption frequency score of junk foods on daily basis was 259 which decreased significantly ($p \leq 0.05$) to 133 after nutrition education intervention. The consumption of junk foods which were consumed by rural families were reduced significantly ($p \leq 0.01$). The consumption frequency scores were 234 on thrice a week basis, 345 on twice a week basis and 780 on weekly basis which were reduced to 132, 220 and 620, respectively. However, there was no significant reduction in the consumption of junk foods consumed by rural families on fortnightly, monthly and rarely basis. On over all basis it was observed that the consumption frequency scores for junk foods reduced significantly ($p \leq 0.01$) from score of 2,230 before nutrition education intervention to 1,873 after nutrition education intervention. Thus a positive impact of educational intervention on food behaviour was observed.

4.9.3.2 Impact on consumption of healthy foods

The impact of educational intervention of consumption frequency of healthy foods is presented in Table 29. It was observed that there was no change in the number of families consuming cereals, fats and oils and sugar/jaggery after educational intervention. The nuts and oil seeds were consumed highly on thrice a week basis (50.00 %) increased to daily basis (60.00 %). The green leafy vegetable consumption was observed high on twice a week basis (53.33 %) and after educational intervention it shifted to thrice a week basis (40.00 %). The other vegetables consumed highly on thrice a week basis (53.33 %) shifted to daily basis (63.33 %). The roots and tubers consumed on fortnightly basis (50.00 %) shifted to twice a week basis (40.00 %). Fruits were consumed highly on twice a week basis before and also after educational intervention, but the number of families increased (60.00 % to 70.00 %). The milk and milk products consumed highly on thrice a week (33.33 %) basis shifted to daily basis (66.67 %). The number of families with no consumption of meat and meat products remained to be higher before and also after educational intervention.

The change in consumption frequency score of healthy foods after educational intervention is depicted in Table 30. The positive change in consumption frequency score of roots and tubers (34), green leafy vegetables (17) and fruits (13) was recorded after educational intervention. There was no change in the consumption frequency score for cereals, fats and oils and sugar/jiggery was noted. The overall consumption frequency score for healthy foods before educational intervention was 1,860 which increased to 1,956 after educational intervention, but was non-significant.

Healthy foods are the one which are good sources of vital nutrients and without harmful food additives. The impact of educational intervention on frequency of consumption of healthy foods in rural families is depicted in Table 31. It was observed that the consumption frequency scores for healthy foods on daily basis was 1,085 which increased significantly ($p \leq 0.05$) to 1,281 after nutrition education intervention. However, there was no significant decrease in the consumption of healthy foods by rural families on thrice a week, twice a week, weekly, fortnightly, monthly and rarely basis. On over all basis, it was observed that the consumption frequency score of healthy foods was increased significantly ($p \leq 0.01$) with score of 1,860 before nutrition education intervention to 1,956 after nutrition education intervention.

Table 28. Impact of educational intervention on consumption frequency of junk foods

Frequency	Junk food consumption frequency score		Paired-t value
	Before	After	
Daily	259	133	2.08*
Thrice a week	234	132	4.09**
Twice a week	345	220	3.15**
Weekly	780	620	3.06**
Fortnightly	315	402	1.33 NS
Monthly	262	212	1.46 NS
Rarely	135	154	1.25 NS
Total	2330	1873	12.52**

*Significant p≤0.05 **Significant p≤0.01 NS – Non significant

Table 29. Impact of educational intervention on frequency of consumption of different healthy foods

N=30

Foods	Daily		Thrice a week		Twice a week		Weekly		Fortnightly		Monthly		Never	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Cereals	30 (100.00)#	30 (100.00)	-	-	-	-	-	-	-	-	-	-	-	-
Pulses	26 (86.67)	28 (93.33)	4 (13.33)	2 (6.67)	-	-	-	-	-	-	-	-	-	-
Nuts and oil seeds	12 (40.00)	18 (60.00)	15 (50.00)	11 (36.67)	2 (6.67)	1 (3.33)	1 (3.33)	-	-	-	-	-	-	-
Green leafy vegetables	-	5 (16.67)	8 (26.67)	12 (40.00)	16 (53.33)	10 (33.33)	6 (20.00)	3 (10.00)	-	-	-	-	-	-
Other vegetables	14 (46.67)	19 (63.33)	16 (53.33)	11 (36.67)	-	-	-	-	-	-	-	-	-	-
Roots and tubers	-	1 (3.33)	-	6 (20.00)	5 (16.67)	12 (40.00)	10 (33.33)	8 (26.67)	15 (50.00)	3 (10.00)	-	-	-	-
Fruits	-	2 (6.67)	3 (10.00)	5 (16.67)	18 (60.00)	21 (70.00)	9 (30.00)	2 (6.67)	-	-	-	-	-	-
Milk and milk products	13 (43.33)	20 (66.67)	15 (50.00)	10 (33.33)	2 (6.67)	-	-	-	-	-	-	-	-	-
Fats and oils	30 (100.00)	30 (100.00)	-	-	-	-	-	-	-	-	-	-	-	-
Meat / Fish / poultry	-	-	-	-	-	2 (6.67)	6 (20.00)	7 (23.33)	5 (16.67)	4 (13.33)	3 (10.00)	1 (3.33)	16 (53.33)	16 (53.33)
Sugar / jaggery	30 (100.00)	30 (100.00)	-	-	-	-	-	-	-	-	-	-	-	-

Figures in parentheses indicate per cent values

4.9.4 Impact of educational intervention on nutrient adequacy of food consumed by rural women

The adequacy of nutrients among sedentary worker rural women is recorded in the Table 32. It was observed that, the mean adequacy of macro nutrients such as energy (102.46 ± 13.37 %) and fat (174.10 ± 44.77 %) and micro-nutrients such as magnesium (194.34 ± 30.42 %), thiamine (162.40 ± 45.30 %) and niacin (139.20 ± 33.78 %) were adequate before the educational intervention and also after the educational intervention. Further, one more nutrient added to adequate group after educational intervention was protein (104.39 ± 17.93 %).

The nutrients like iron (92.93 ± 44.53 %), zinc (67.16 ± 12.34 %), riboflavin (70.91 ± 21.44 %) and folate (164.02 ± 65.01 %) were observed to be with more than 50.00 per cent adequacy before educational intervention and the per cent adequacy of nutrients was increased to 97.46 ± 46.93 per cent, 67.96 ± 11.20 per cent, 81.27 ± 21.69 per cent and 75.99 ± 20.04 per cent, respectively after educational intervention.

The nutrients such as vitamin C (45.48 ± 152.29 %), β-carotene (14.07 ± 12.77 %), vitamin A (30.09 ± 25.14 %), vitamin B_6 (19.80 ± 11.04 %) and vitamin B_{12} (1.20 ± 2.87 %) were highly inadequate *i.e,* less than 50.00 adequacies before educational intervention. It was observed that only vitamin C (64.39 ± 215.15 %) was more than 50.00 per cent adequate after educational intervention and rest all nutrients although increased but was non-significant.

On over all basis, it was observed that, although there was increase in the mean intake of nutrients after nutrition education intervention but was non-significant.

The nutrient intake of moderate worker rural women is recorded in the Table 33. It was observed that, fat (140.96 ± 30.43 %), magnesium (186.02 ± 12.76 %), thiamine (152.73 ± 41.86 %) and niacin (105.04 ± 13.02 %) were adequate before and after the educational intervention.

The adequacy of energy was recorded as 89.37 ± 4.14 per cent which was enhanced to 95.16 ± 6.32 per cent and the significant ($p \leq 0.01$) change was noted before and after nutrition education intervention. The adequacy of nutrient like protein (92.80 ± 7.47 %) was nearly adequate before educational intervention and was increased to 97.65 ± 5.68 per cent.

The nutrients like calcium (64.56 ± 12.03 %), iron (72.00 ± 6.96 %), zinc (66.20 ± 8.35 %), riboflavin (60.77 ± 19.69 %) and vitamin C (58.70 ± 121.84 %) were more than 50.00 per cent adequate before the nutrition education intervention and the per cent of adequacy was increased to 80.20 ± 19.22, 96.09 ± 35.57, 73.40 ± 7.13, 73.85 ± 19.31 and 77.50 ± 173.30 respectively.

The nutrients like β-carotene (12.03 ± 5.66 %), vitamin A (24.01 ± 11.24 %), vitamin B_6 (28.00 ± 13.04 %), and vitamin B_{12} (4.60 ± 10.29 %) were less than 50.00 per cent adequacy before educational intervention and not much positive change in the intake of these nutrients was noted after educational intervention.

On over all basis, it was observed that, among the moderate worker rural women, there was significant increase in the mean intake of energy ($p \leq 0.01$) and niacin ($p \leq 0.05$). The mean intake of other nutrients although increased but not significant.

Table 30. Impact of educational intervention on healthy food consumption frequency scores of different foods

Sl No.	Foods	Score		Change
		Before	After	
1	Cereals	210	210	0
2	Pulses	206	208	2
3	Nuts and oil seeds	188	197	9
4	Green leafy vegetables	152	169	17
5	Other vegetables	194	199	5
6	Roots and tubers	110	144	34
7	Fruits	144	157	13
8	Milk and milk products	191	200	9
9	Fats and oils	210	210	0
10	Meat / fish / poultry	45	52	7
11	Sugar / jaggery	210	210	0
	Total	1860	1956	96
Paired t-value		2.06^{NS}		

NS – Non significant

Table 31: Impact of educational intervention on consumption frequency of healthy foods

Frequency	Consumption frequency score		Paired-t value
	Before	After	
Daily	1085	1281	3.13**
Thrice a week	366	342	0.34 ^{NS}
Twice a week	215	230	0.28^{NS}
Weekly	128	80	1.60 ^{NS}
Fortnightly	60	21	1.09^{NS}
Monthly	6	2	1.00 ^{NS}
Rarely	0	0	0.00 ^{NS}
Total	1860	1956	2.87**

**Significant p≤0.01 NS – Non significant

Table 32. Impact of educational intervention on mean nutrient intake and adequacy among sedentary working rural women

N=30

Nutrients	Recommended dietary allowance	Before		After		Paired-t value
		Intake Mean ± SD	Adequacy (%)	Intake Mean ± SD	Adequacy (%)	
Energy (Kcal)	1900	1947 ± 254	102.46 ± 13.37	1989 ± 233	104.68 ± 12.24	0.605^{NS}
Protein (g)	55	53.26 ± 8.70	96.84 ± 15.82	57.41 ± 9.86	104.39 ± 17.93	1.549^{NS}
Fat (g)	20	34.82 ± 8.96	174.10 ± 44.77	33.89 ± 8.50	169.44 ± 42.49	0.363^{NS}
Calcium (mg)	600	427.99 ± 152.88	71.33 ± 25.48	418.22 ± 94.59	69.70 ± 15.77	0.248^{NS}
Iron (mg)	21	19.04 ± 9.35	92.93 ± 44.53	20.36 ± 9.86	97.46 ± 46.93	0.107^{NS}
Magnesium (mg)	310	602.45 ± 94.32	194.34 ± 30.42	621.54 ± 87.67	200.49 ± 28.28	0.745^{NS}
Zinc (mg)	10	6.72 ± 1.23	67.16 ± 12.34	6.80 ± 1.12	67.96 ± 11.20	0.232^{NS}
β-carotene (□g)	4800	675.20 ± 612.81	14.07 ± 12.77	900.88 ± 1600.99	18.77 ± 33.35	0.626^{NS}
Vitamin A (□g)	600	180.51 ± 150.82	30.09 ± 25.14	228.62 ± 399.64	38.10 ± 66.61	0.536^{NS}
Thiamine (mg)	1.0	1.62 ± 0.45	162.40 ± 45.30	1.72 ± 0.40	172.40 ± 39.51	0.757^{NS}
Riboflavin (mg)	1.1	0.78 ± 0.24	70.91 ± 21.44	0.89 ± 0.24	81.27 ± 21.69	1.552^{NS}
Niacin (mg)	12	16.71 ± 4.05	139.28 ± 33.78	17.51 ± 4.67	145.89 ± 38.89	0.593^{NS}
Vitamin B_6 (mg)	2.0	0.40 ± 0.22	19.80 ± 11.04	0.49 ± 0.26	24.60 ± 13.22	1.342^{NS}
Vitamin C (mg)	40	18.19 ± 60.91	45.48 ± 152.29	25.76 ± 86.06	64.39 ± 215.15	0.346^{NS}
Folate (□g)	200	164.02 ± 65.01	82.01 ± 32.50	151.99 ± 40.07	75.99 ± 20.04	0.815^{NS}
Vitamin B_{12} (□g)	1.0	0.01 ± 0.03	1.20 ± 2.87	0.08 ± 0.19	7.60 ± 19.93	1.553^{NS}

NS-Non significant

Table 33. Impact of educational intervention on mean nutrient intake and adequacy among moderately working rural women

N=30

Nutrients	Recommended dietary allowance	Before		After		Paired-t value
		Intake Mean ± SD	Adequacy (%)	Intake Mean ± SD	Adequacy (%)	
Energy (Kcal)	2230	1993 ± 92	89.37 ± 4.14	2122 ± 141	95.16 ± 6.32	3.929 **
Protein (g)	55	51.04 ± 4.11	92.80 ± 7.47	53.81 ± 3.12	97.65 ± 5.68	1.895^{NS}
Fat (g)	25	35.24 ± 7.61	140.96 ± 30.43	34.29 ± 4.92	137.15 ± 19.69	0.399 ^{NS}
Calcium (mg)	600	387.38 ± 72.18	64.56 ± 12.03	481.20 ± 115.29	80.20 ± 19.22	1.959 ^{NS}
Iron (mg)	21	15.12 ± 1.46	72.00 ± 6.96	20.18 ± 7.47	96.09 ± 35.57	1.857 ^{NS}
Magnesium (mg)	310	576.68 ± 39.56	186.02 ± 12.76	611.82 ± 53.65	197.36 ± 17.31	1.490 ^{NS}
Zinc (mg)	10	6.62 ± 0.83	66.20 ± 8.35	7.34 ± 0.71	73.40 ± 7.13	1.365 ^{NS}
β-carotene (□g)	4800	577.60 ± 271.58	12.03 ± 5.66	522.00 ± 237.98	10.88 ± 4.96	0.304 ^{NS}
Vitamin A (□g)	600	144.05 ± 67.45	24.01 ± 11.24	131.70 ± 58.94	21.95 ± 9.82	0.270 ^{NS}
Thiamine (mg)	1.1	1.68 ± 0.46	152.73 ± 41.86	1.78 ± 0.34	161.82 ± 30.42	0.620 ^{NS}
Riboflavin (mg)	1.3	0.79 ± 0.26	60.77 ± 19.69	0.96 ± 0.25	73.85 ± 19.31	1.149 ^{NS}
Niacin (mg)	14	14.71 ± 1.82	105.04 ± 13.02	17.24 ± 0.94	123.13 ± 6.69	2.838*
Vitamin B_6 (mg)	2.0	0.56 ± 0.26	28.00 ± 13.04	0.38 ± 0.30	19.00 ± 15.17	1.500 ^{NS}
Vitamin C (mg)	40	23.48 ± 48.74	58.70 ± 121.84	31.45 ± 69.32	77.50 ± 173.30	0.177 ^{NS}
Folate (□g)	200	144.33 ± 27.14	72.17 ± 13.57	139.70 ± 18.02	69.85 ± 9.01	0.363 ^{NS}
Vitamin B_{12} (□g)	1.0	0.05 ± 0.10	4.60 ± 10.29	0.03 ± 0.04	2.60 ± 3.98	0.213 ^{NS}

** Significant at p≤0.01 *Significant at p≤0.05 NS-Non significant

Thus, it was observed that a number of junk foods were being sold in the rural areas. And there was low awareness prevailing about health hazards of junk foods among rural women. A majority of women in rural area were normal, although underweight women were observed in next highest category. A majority women were not having metabolic risk complications. The nutritional status of women was affected by age and socio-economic status. The women were found to be deficient with regard to micro-nutrients in all the agro-climatic zones. The educational impact on health hazards of junk foods and nutrition knowledge had a significant impact and change in dietary behaviour of women and their families was recorded.

5. DISCUSSION

Women as great contributors of food selection and establishers of food pattern, play a very important role in maintaining the nutritional status of the family. Women should possess adequate nutrition knowledge to maintain and improve the health of family members. Results of investigation to know the food pattern and create awareness of health hazards of junk foods through innovative learning objects carried out to create healthier societies are discussed in this chapter.

5.1 Scenario of junk foods in rural north Karnataka

Rural population is gradually becoming slave of junk foods, probably due to lack of education and commercial advertisements on print and social media. Everything that is available in market is believed to be of good quality and nourishing to the body. In the present investigation a number of unbranded junk foods in attractive shape, varied in size and colour were documented in all the rural areas of four agro-climatic zones studied. Gupta *et al.* (2016) also reported the sales of a variety of junk foods in rural areas including those in unlabeled transparent packages and open glass jars.

The unbranded and simulated processed products (Plate 7a, 7b and 7c) were easily available. Their colour and shapes were fascinating and were also of low cost (Table 8), which promoted the sales of such foods among the rural population. Product such as *rasgulla* was made out of refined flour and dipped in sugar syrup and red in colour was not actually a product of milk. Another product called as the ice-cream sold in petty shop was of rural Karnataka (zone 3), not made out of milk cream and was not a real ice cream but made out of some kind of fat and unknown ingredients which could be retained in emulsified form at room temperature. Other products called *pedas and dhoodh pedas* were not real milk products but made of refined flour and sugar. Many of these products were made out of cheap ingredients and were laden with additives. Further in the present study it was observed that the cost of such foods was low and affordable.

One of the major changes observed in dietary patterns of rural residents is in consumption of processed foods and eating away from home. The consumption trends of processed and catered foods among rural population has increased and major influencing factor was indicted to be the price of commodities. The children of the family were prey for consumption of junk foods. Puttaratnamma *et al.* (2015) also reported that younger generation was more attracted towards the processed foods and price was the most important factor in consumption of processed products. Hoffmann *et al.* (2012) reported that a majority of rural adolescents most often declared that they consumed sweet and salty snacks daily in rural areas of Szamotuly, Poland. Eating out with peers and eating from the school canteen was related with higher consumption of junk foods (Bargiota *et al.,* 2013).

The low cost junk foods were very notably consumed as indicated by Amir and Ghufran (2015) where the price was the second most important factor for consumption of junk foods among rural people residing in urban areas of Lucknow district. The consumption of such processed foods has increased probably due to low cost, ease of availability and marketing strategies adapted by manufacturers of such foods as reported by Suganya and Aravinth (2014).

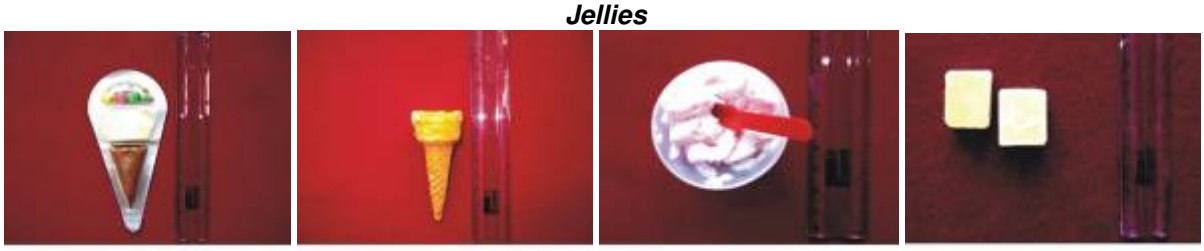
Badam puri *Balusha*

Basan laddu *Puthani laddu* *Kharadani laddu* *Til laddu*

Halwa *Nippattu* *Shankarpale* *Dhoodh Peda*

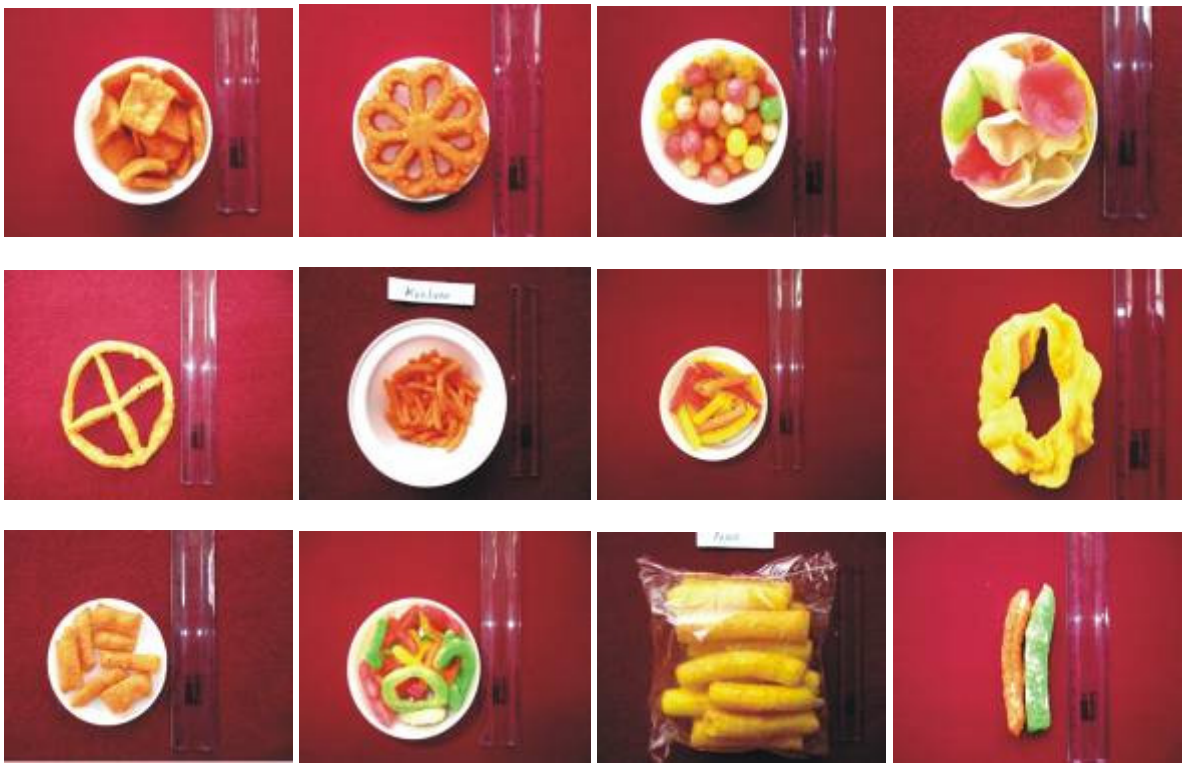
Burfi *Khava Peda* *Cream roll*

Jellies

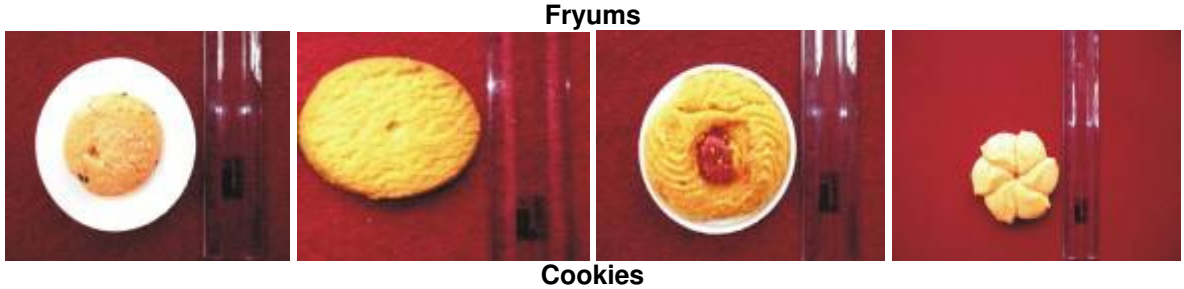


Cream chocolate Cone ice cream Cup ice cream *Khava*

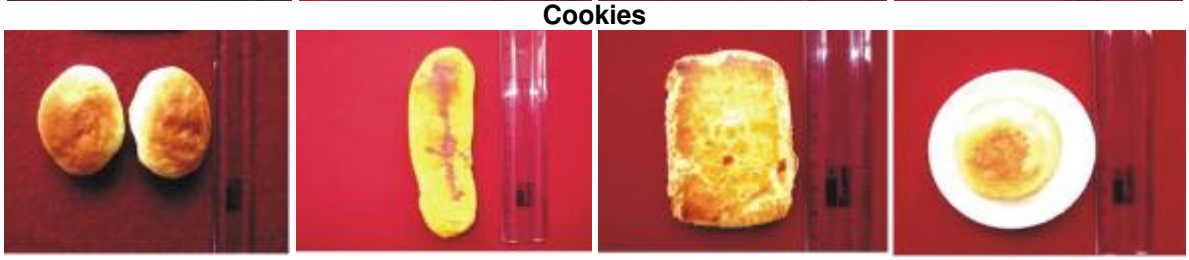
Plate 7a. Junk foods of rural north Karnataka



Fryums



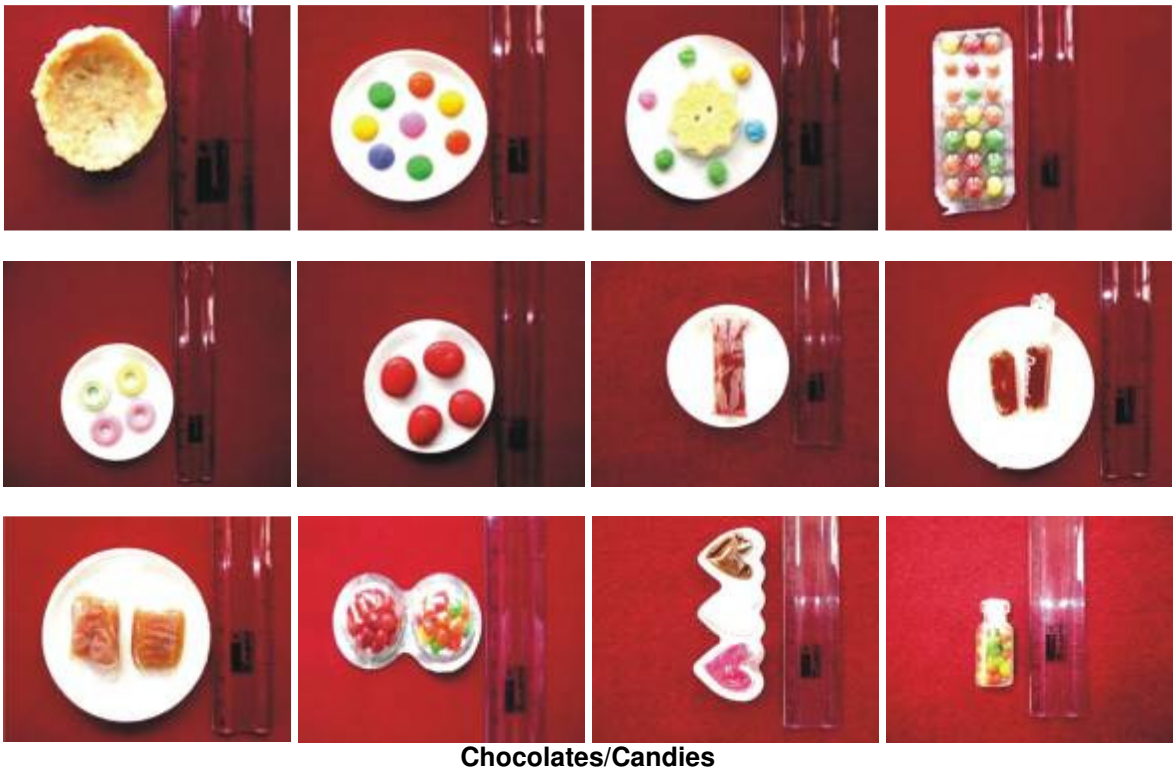
Cookies



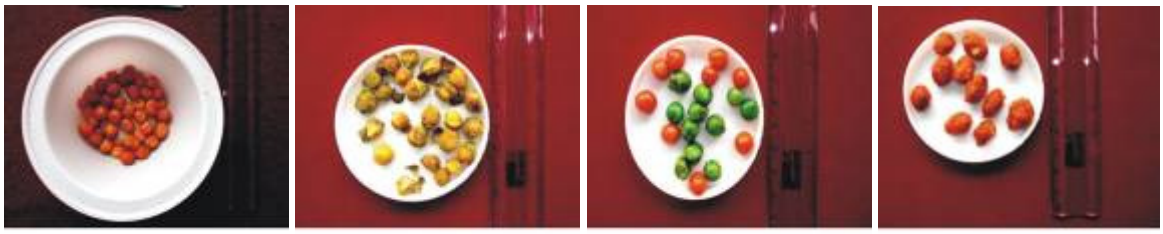
Batar **Bun** **Toast** **Cake**

Lolli pops

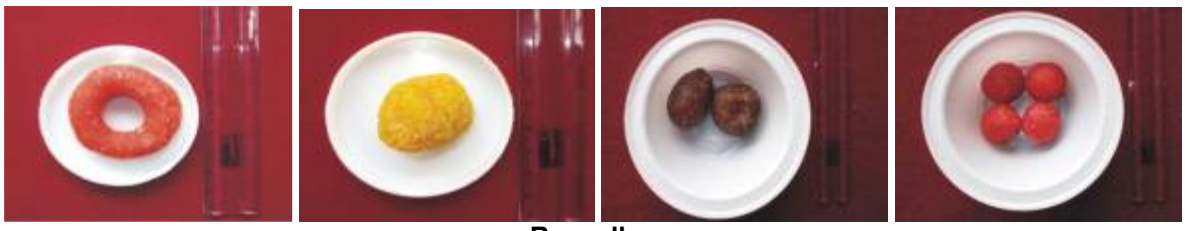
Plate 7b. Junk foods of rural north Karnataka



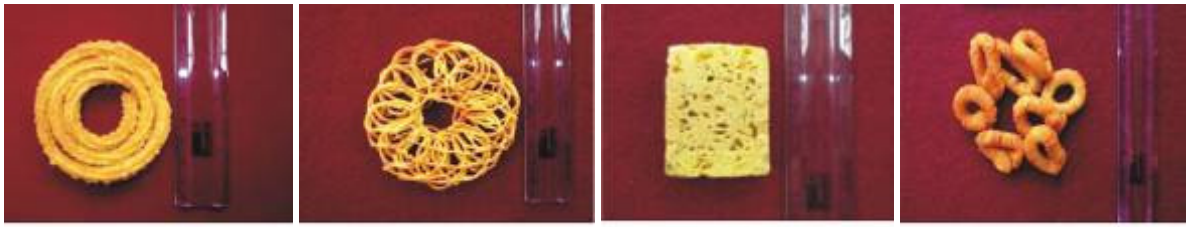
Chocolates/Candies



Vatani *Hurakadli* Green/Red *Vatani* Fried groundnut



Resgullas



Chakkali *Kharadani chakkali* *Mysore pak* *Kodbale*

Plate 7c. Junk foods of rural north Karnataka

The junk food consumption pattern in rural north Karnataka revealed that biscuits, chips, chocolates were most popular junk foods (Table 7). Similar reports were also published by Puttaratnamma *et al.* (2015) where in there higher consumption of biscuits in rural areas was followed by chips, while ice-creams, soft drinks were rarely consumed. Consumption of rusks, puffs, *chakkali* and *kodbale* were average in south India. The higher consumption biscuits was also observed in households of women in Lucknow district who migrated from rural areas (Amir and Ghufran, 2015). Among bakery items bread was highly consumed followed by cakes, but in controversy buns were highly consumed after bread in a study conducted in villages of Mysore (Puttaratnamma *et al.,* 2015). The consumption of foods considered as less healthy such as fast foods/pastries, sweets, chocolates, soft drinks were reported to be less frequent among rural population in Faizabad district, Uttar Pradesh (Pandey and Neerubala, 2016). But frequency of consumption of chocolates/candies was observed to be high in rural areas in the present investigation (Table 7). This could be due to regional variation or too low cost of the products.

Regarding the consumption of junk foods in different agro-climatic zones (Table 3 to 6) there was higher consumption of junk foods in zone 3. It may be because of low awareness, lack of education or increased affordability of low cost junk foods. A majority were belonging to poor and very poor socio-economic status in this zone compared to other zones hence they could not afford the high cost branded foods and they tend to consume the products available in petty shops of villages. It was interesting to know that, there was lower consumption of junk foods in zone 10. It may be due a high educational status of the population and availability of varied fruits in the hilly areas of zone 10. Further the houses are situated at distant places unlike in the planes, thus accessibility of petty shops could be difficult. And most of the people in the region stick on to traditional foods due to a large climatic variation compared to the other zones and traditional habits were found to be extremely different compared to other zones and zone 10 people mainly belong to the coastal areas and consumption of fish and other non-vegetarian foods is on higher side as compared to other zones.

Availability of various types of junk foods in the rural areas of different agro-climatic zones (Table 7) indicate the transition of rural dietary pattern across the zones. The petty shops in remote villages displayed junk foods of different types. Such from home cooked traditional meals to processed foods was evident, which could possibly compromise the nutrient intakes (Amir and Ghufran, 2015). The preference for readymade snacks than the home made snacks was noticed as it consumed more time and was laborious for the preparation of snacks at home.

5.2 Awareness about health hazards of junk foods among rural women

The awareness about health hazards of junk foods is important in combating adverse effects of its consumption. In the current study prevalence of low awareness about health hazards of junk foods was recorded among rural women in all the agro-climatic zones (Table 9) which could be due to low educational status. The women were ignorant about the harmful additives present in junk foods and also about the health hazards posed by non-permitted colours and additives in such foods. Kumari *et al.* (2010), Dhobal and Raghuvanshi (2012) also reported poor nutrition knowledge among rural women in Bihar and Uttarakhand, respectively. But the rural residents in Iran recorded moderate

nutrition knowledge and good attitudes (Ahadi *et al.,* 2014). A study conducted by Singh *et al.* (2015) showed that a majority of rural women were unaware about the nutritional significance of underutilized green leafy vegetables. The findings of Tashara *et al.* (2015) reported inadequate knowledge and unfavourable practices with regard to iron deficiency anaemia and its prevention. Apart from knowledge gained in schools on good nutrition a majority of rural adolescents in Chiraigaon, Varanasi were ignorant about micro-nutrients and protective foods and recorded poor nutrition knowledge (Choudhary *et al.,* 2010). The most of the studies recorded inadequate or poor knowledge among the rural women on nutritional aspects.

A majority of women in zone 3 were recorded with low awareness because a majority of women in this zone were not highly educated compared to other zones (Table 9). There was significant association noticed between age of the respondents and awareness regarding health hazards of junk foods. As a majority of women in higher age groups were not highly educated low awareness was prevailing among them compared to lower age groups. Women from rural area, women in younger age groups showed a higher level of knowledge/awareness about importance of iron in nutrition was reported (Alibabica *et al.,* 2016). In rural areas, nutritional knowledge was found to be decreasing with the advancement of ages and in all the age groups (Dhobal and Raghuvanshi, 2012).

A majority of women completed with graduation and post graduation were highly aware and a majority of women with no schooling and primary schooling showed low awareness regarding the health hazards posed by consumption of junk foods (Table 10). It may due to higher formal education leads to higher knowledge.

The educational status of women and awareness level about junk foods were positively co-related. As level of education increased, the awareness of rural women on health hazards of junk foods also increased. Hence the awareness level was dependent on the educational status of women in rural areas.

The women in higher socio-economic status were highly aware about health hazards of junk foods (Table 11) as majority of them possessed more gadgets of mass communication media for information and most first important among them was television, followed by radio and news papers. The affordability to these media and information gained probably helped in high awareness among rural women. Also a majority of women in high socio-economic status were better educated than other women. Thus awareness was influenced by educational level, socio-economic status and communication medias.

5.3 Nutritional status of rural women in different agro-climatic zones

Assessment of nutritional status gives an indication of health status of community. It was found that a majority of rural women were recorded with normal nutritional status in rural areas of all the agro-climatic zones (Table 13) and it was in accordance with findings of Devi and Sindhuja (2015), Prakruthi and Prakash (2013) and Dhobal and Raghuvanshi (2012). This probably could be heavy working culture of rural women both at homestead and in farms. Jayamani *et al.* (2013) revealed a similar phenomenon wherein women engaged in heavy physical activity were reported to be underweight/normal.

A majority of women in zone 10 (35.00 %) were underweight probably due to heavy work and lower middle socio-economic status (71.67 %) compared to other zones (Table 2). In zone 8, a majority of women were found in obese class I (17.50 %) because of the huge diversity in their diet and majority of them were observed in upper middle socio-economic status when compared to other zones.

It was observed that a majority of women in younger age (15-20 years) group were underweight (42.27 %) because of lack attention in feeding practices given to girl children in rural families. A majority of women in 31-35 years were observed to belong to obese class I (28.38 %) and class II (2.70 %) as depicted in Table 14. It was reported that with increased age nutritional status of women was significantly ($p \leq 0.01$) dependent on the age of the respondents (McArdle *et al.,* 1991).

The major proportion of normal (66.67 %) and obese class (33.33 %) women belonged to high socio-economic status whereas majority of women in underweight (50.00 %) were belonging to very poor socio-economic status (Table 15). The nutrition and health care among young women in rural areas are influenced by several factors, the most important being the socioeconomic status (Nagamani, 2014). It was also reported that the standard of living of households influenced nutritional status of women (Rout, 2009).

In the present investigation, nutritional status of women was not significantly dependent on the educational level of the women (Table 16). This was in contradiction with results reported by Rout (2009) where nutritional status was found to be positively related with education of respondent. The rural women of Karnataka are engaged in heavy works related to field operation. Further attention to women's diet is neglected in comparison with men's diet.

The lower risk of metabolic complications was observed among a majority of rural women (Table 17).Similar results were also reported by Devi and Sindhuja (2015). With regard to waist circumference (91.67 %) and waist to hip ratio (95.00 %) a majority of women in zone 10 belonged to no risk category. This was probably due to hilly termination which required more physical exertion in farm activities.

A majority of women in zone 9 (20.00 %) belonged to increased risk category with respect to waist circumference which may be due to the influence of Maharashtrian and Goan diets among Khanapur taluk people where oil and coconut were in abundance. Besides a majority of women were not engaged in gainful employment as compared to women of other zones. A majority of women in zone 8 were belonging to substantially increased risk category with respect to both waist circumference and waist to hip ratio, it might due to the upper middle socio-economic status of the women in this zone (Table 2).

The study revealed no risk of metabolic complications among women of 15-20 years as per waist circumference or waist to hip ratio (Table 18), because majority of them were underweight (Table 14). However, with increased age (31-35 years) the BMI increased and risk increased. Such a phenomenon has been reported by McArdle *et al.* (1991).

With respect to nutrient adequacy of diets consumed by both sedentary and moderately working women (Fig. 6a and 6b), it was observed that only fat content of the diet was meeting the daily recommendation (Table 19 and 20). This could be due to judicious use of fat in habitual fried preparation. It is a common practice to use abundant oil in cookery which could be attributed to adequacy of fat in the diet. Poor nutrition knowledge and education of women could have contributed to judicious use of fat in the diet. Although sedentary working women were meeting the RDA for energy, the moderately working women did not meet the recommendation. This could be inadequate consumption of energy contributing foods other than fats (Table 21 and 22). Further, Komakech (2010) reported that all the macro-nutrients were inadequate among women in Erute village of Uganda. Mishra *et al.* (2011) reported that a majority of rural women were in negative energy balance in Azamgarh of Uttar Pradesh. However, in content to this Prakruthi and Prakash (2013) reported that rural women in Mandya district were adequate with respect to intake of all the macro-nutrients. Devi and Sindhuja (2015) reported inadequacy of all the macro-nutrients among adult tribal women of rural Kerala.

In the present investigation, it was also observed that diets of sedentary and moderate working women were not meeting RDA for respective groups. This could be attributed to low consumption of protein rich foods like pulses and foods of animal origin. However, contradictory results of meeting the RDA recommendations among rural women in villages of Uttarakhand was reported by Dhobal and Raghuvanshi (2012).

Among both sedentary and moderate working women B-complex vitamins like thiamine and niacin were adequate however riboflavin was found to be inadequate, which could be due to low intake of milk and milk products and green leafy vegetables (Table 19 and 21). The thiamine and niacin adequacy could be due to consumption whole grain cereals, pulses. Varied levels of adequacy of these B-complex vitamins have been indicated by several investigators. Inadequate intake of riboflavin, niacin, folic acid and thiamine was indicated by Mittal (2013) among rural women of Gurgaon. But adequate levels of thiamine (Prakruthi and Prakash, 2013) among rural Mandya women and adequacy of thiamine, riboflavin and niacin were reported in rural Uttarakhand (Dobhal and Raghuvanshi, 2012) and adult tribal rural women of Kerala (Devi and Sindhuja, 2015)

The vitamins like B_6 and B_{12} were deficient in diets of both sedentary and moderate working rural women probably because of low intake of animal products. (Table 20 and 22). Folic acid was also found to be inadequate among both the categories of women because of inadequate consumption of pulses, leafy vegetables and animal products.

The minerals like iron, calcium and zinc were also inadequate among both categories of women and only magnesium was found to be adequate. The inadequacy of iron may be due to the low consumption of green leafy vegetables and calcium inadequacy may be due to low consumption of milk and milk products. The iron inadequacy was found to be due to low bioavailability of dietary iron from plant foods because majority of the respondents were vegetarians was reported by Chandra *et al.* (2013). The adequacy of magnesium may be due to high consumption of staple foods like cereals which are high in magnesium.

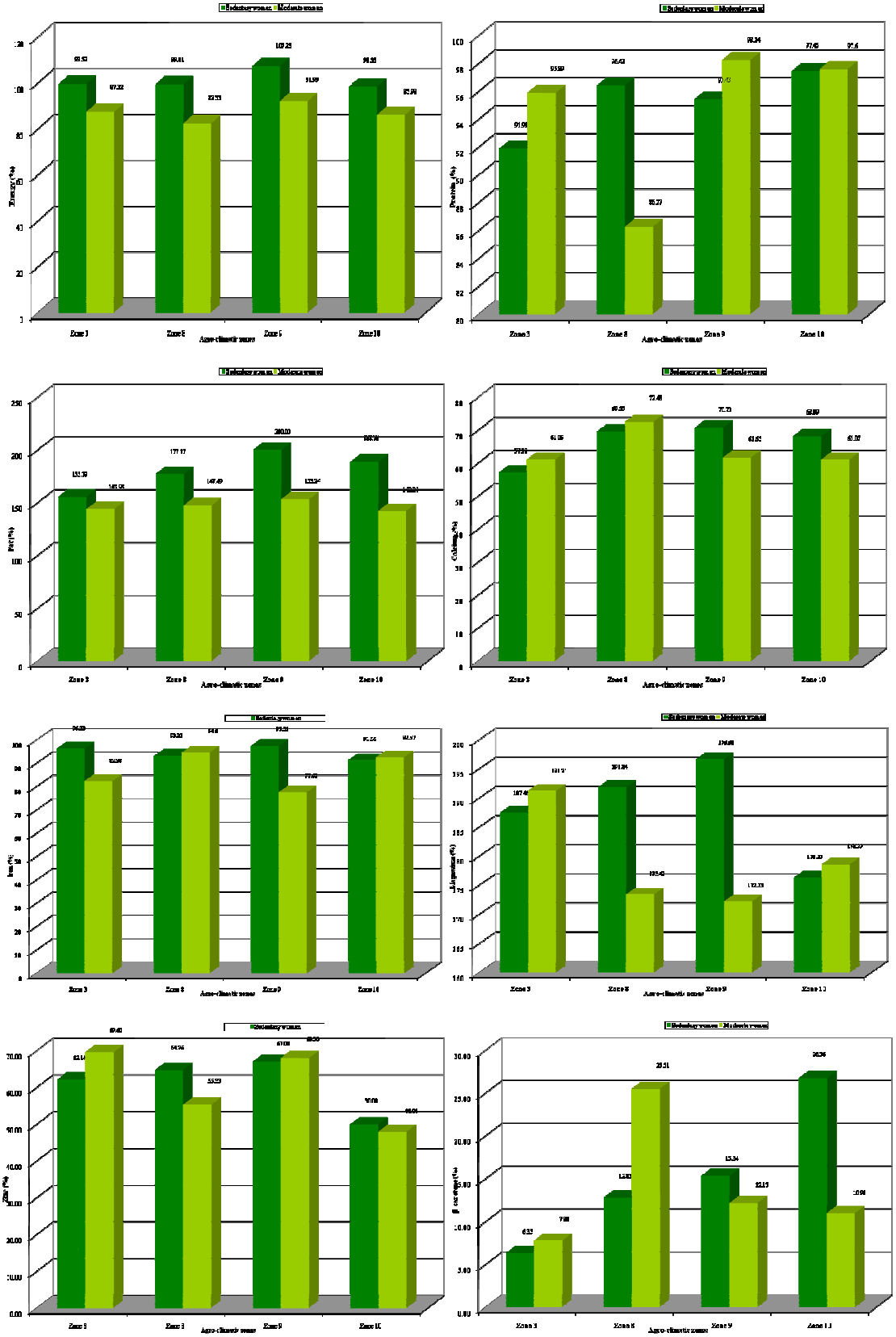


Fig. 6a: Nutrient adequacy of diets consumed by rural women in different zones of north Karnataka

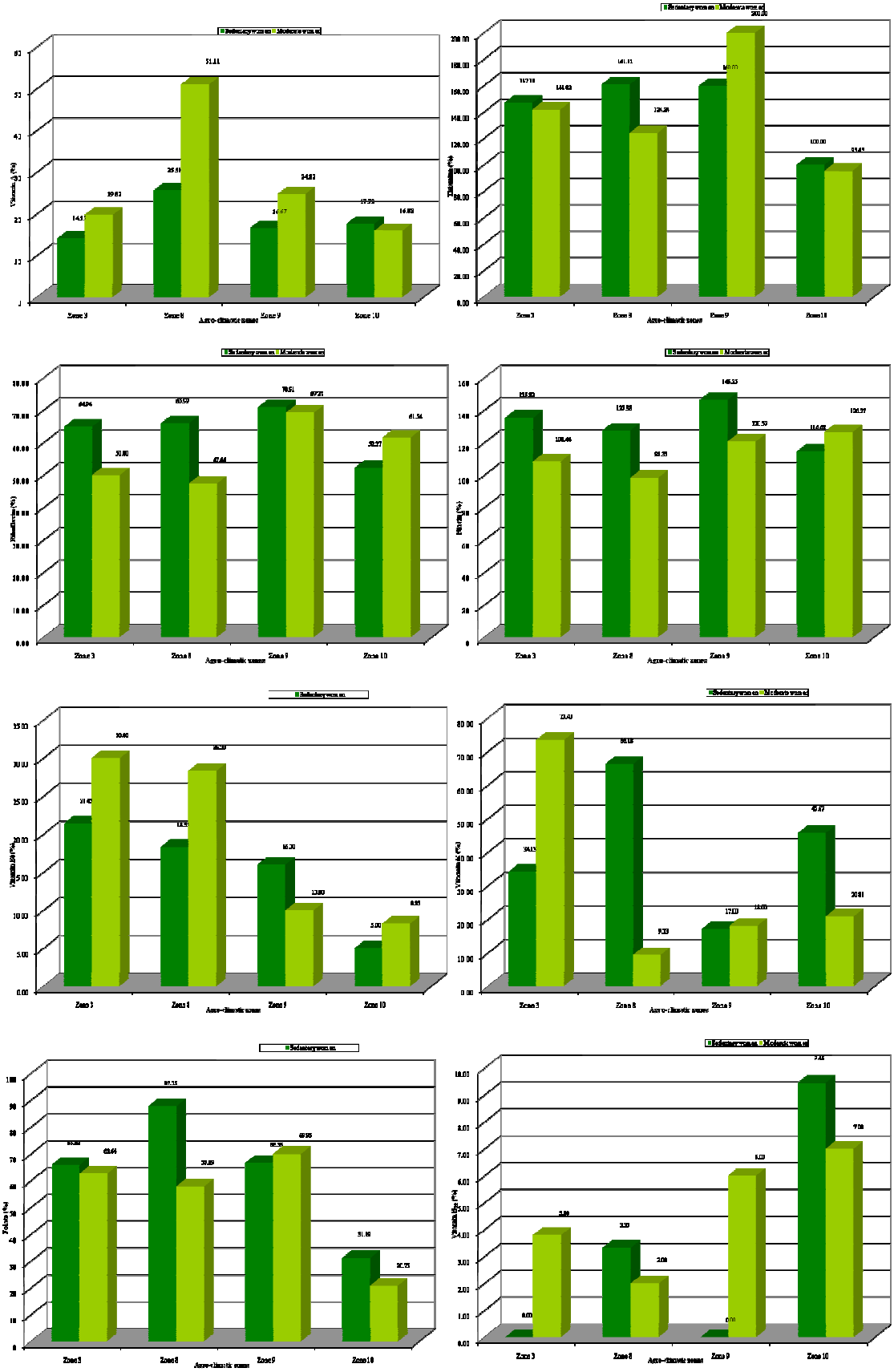


Fig. 6b: Micronutrient adequacy of diets consumed by rural women in different zones of north Karnataka

The intake of vitamin A and C were very low among rural women. The most deficient nutrients in the diet were vitamin A and vitamin C (Mittal, 2013) because of poor consumption of green leafy vegetables as well as fruits. Vitamin A intake was found to be adequate among women in Erute internally displaced persons' camp Lira district of Uganda due to the consumption of corn soy blend and vegetable oil fortified with vitamin A (Komakech, 2010). Prakruthi and Prakash (2013) also reported the inadequacy of vitamin A and Vitamin C among the rural women of Mandya due to the low level intake of green leafy vegetables, other vegetables and fruits.

The low micronutrient adequacy of diets consumed by rural women could be due to poor diet quality which lacked green leafy vegetables, fruits, and animal foods. Khanam *et al.* (2014) reported that the average micro-nutrient intake of women of reproductive age group was inadequate due to insufficient food available at house hold level and more consumption of low cost staple foods. Further inclusion of expensive foods such as animal products, fruits and vegetables rich in micronutrients were indicated to be less which lead to micro-nutrient inadequacy (Komakech, 2010). Though the consumption of green leafy vegetables and other vegetables was more during winter months due to seasonal availability but low micro-nutrient intake was recorded, lower than the RDI (Chandra *et al.,* 2013).

Thus the scenario of nutritional status of rural women although indicated to be poor to normal in a majority of cases, obesity of varied degrees was also observed. These condition of malnutrition needs to be observed with caution for health of family depends on woman of the family.

5.4 Impact of educational intervention on nutrition knowledge and food behaviour

The role of nutrition education intervention in imparting the knowledge about health hazards of junk foods and healthy eating behaviour is stressed by many of the research scholars. Singla and Dhillon (2013) suggested that there is a need to impart nutrition counseling for longer duration to improve the nutritional status of adolescent girls by including high fibre foods like whole grain cereals, whole pulses, fruits and vegetables in their daily diet.

In the present investigation, the nutrition education that was provided with traditional material (flash cards and pamphlets) and innovative learning objects (card and board games) resulted in significant increase in the knowledge of rural women ($p \leq 0.01$) Besides, there was improvement in food consumption pattern where women significantly reduced the consumption of junk foods. There was increase in the consumption of healthy foods. Similar reports of increased nutrition knowledge are made by several investigators in the field. Amaro *et al.* (2006) reported that children playing Kelado board game showed a significant increase in nutrition knowledge ($p \leq 0.05$) and in weekly vegetable intake. The kelado board game improved the nutrition knowledge and dietary behaviour over six months period in adolescents at a school in Italy (Viggiano *et al.,* 2015). It was reported by Torkar *et al.* (2010) that fruit and vegetable playing cards improved knowledge of children regarding the nutrients in fruits and vegetables and also their importance in healthy diet. In the present investigation the card and board games used to impart knowledge not only enhanced nutrition knowledge but also offered fun, enjoyment and social interaction among women.

Similar reports of enhanced nutrition knowledge was made by Kumari *et al.* (2010). Knowledge scores were found to be increasing with decreasing age and they were significantly associated with educational status (Upadhyay *et al.,* 2011).

In the present investigation it was evident that, there was a significant ($p \leq 0.01$) increase in the knowledge of rural women about healthy foods and also regarding the health hazards of junk foods after educational intervention (Table 24 and 25). Similar reports were made by Devi and Sindhuja (2015) among rural women of Kerala.

In the current study, improvement in food behaviour was also recorded (Table 30) to some extent. There was a significant decrease in the consumption of junk foods after educational intervention among the rural families (Table 28). Rustad and Smith (2013) also reported that the women decreased consumption of fast foods, processed snacks with high sugar, salt and fat and fatty cuts of meat after short term nutrition education intervention in St.Paul metropolitan area, U.S.

Low income and inadequate knowledge of rural women about balanced diet were the reasons for low consumption of some food items like fruits and egg/meat was reported by Kumari (2013). Fruits consumption were least ranked as indicated by Amir and Ghufran, 2015). Consumption of fruits was found less by rural women due to lower economic reason was also reported by Kaur and Virk (2014).

The educational intervention brought a change in food behaviour that resulted in nutrient adequacy of diets to some extent (Table 32 and 33).The adequacy of all the nutrients although increased but was non-significant especially with regard to micro-nutrients. The adequacy of energy and niacin in moderate working women were found to be significant after educational intervention because of consumption cereal and cereal products in high amount. Kaur *et al.* (2007) reported that there was significant increase in the adequacy of all the nutrients except B_{12} after nutrition education intervention among the rural adolescent girls in Himachal Pradesh. In the present investigation, pronounced changes in nutrient adequacy were recorded probably due to the SES, education or inadequate diet consumption.

There was improvement in the nutrition knowledge among the rural women and change in dietary behaviour of rural families was noticed. It was suggested that a community-based nutrition education programme could contribute to knowledge about balanced diet, economical nutrition and dietary practices in low-income communities (Walsh *et al.,* 2003).

Thus, the study revealed that healthier societies could be created through educational intervention of rural women by improving nutrition knowledge and food behaviour thus indirectly influencing family nutrition.

Future line of work may be focused on nutrient analysis of junk foods and contribution of junk food to food basket in rural and urban families.

6. SUMMARY AND CONCLUSIONS

A study was conducted in four agro-climatic zones of UAS, Dharwad *viz.,* zones 3, 8, 9 and 10 to know the scenario of junk food consumption among rural families; to assess the nutritional status of rural women; nutrient composition and adequacy of diets consumed by rural women and to create awareness on healthy eating behaviour in rural families through nutrition education of rural women of reproductive age group of 15-35 years.

Information on socio-demographic variables and awareness about health hazards of junk foods among 360 women was collected through structured and pre-tested interview schedules. Pattern of junk food consumption behaviour of 120 rural families of different agro-climatic zones was assessed through food frequency questionnaire and nutrient adequacy of diets consumed among 36 women of different agro-climatic zones was collected through 24 hour recall method. Nutritional status of 360 rural women in reproductive age group was assessed through nutritional anthropometry.

Nutrition education was provided to 30 rural women for three months at monthly intervals in a selected village of Dharwad taluk, of zone 8. Innovative learning objects, pamphlets, demonstrations and interactive lecture sessions were carried out.

Impact of nutrition education was assessed through pre and post tests on awareness about health hazards of junk foods, nutrition knowledge, food behaviour and nutrient adequacy of diets consumed by rural women. The findings of the investigation are summarized in this chapter.

It was observed that a majority of the selected women were in the age range of 21-25 years (28.89 %), followed by those in the age group of 15-20 years (26.94 %), 26-30 years (23.61 %) and lowest proportion of women were recorded in the age range of 31-35 years (20.56 %). Women in younger age group (15-20 years) were recorded in maximum proportion in zone 9 (31.67 %) and highest proportion of women in older age group (31-35 years) were recorded in zone 10 (35.00 %).

A majority of selected women (73.33 %) were married and a majority belonged to zone 3 (81.67 %). Women belonging to joint families were in highest proportion (49.72 %) followed by those in nuclear families (45.28 %) and lowest from extended families (5.00 %), across the zones.

The mean total family size on overall basis was 5.58 ± 2.73 which composed of 2.72 ± 1.48 male and 2.88 ± 1.69 female members, comprising of 3.99 ± 2.27 total adults and 1.60 ± 1.18 children. Mean family size was highest in zone 8 (6.31 ± 3.81) and lowest in zone 10 (4.62 ± 1.38).

A majority of respondents were Hindus (91.11 %), highest recorded both in zone 8 and 10 (93.33 % each). The subjects included 6.11 per cent Muslims and 2.22 per cent Christians.

The proportion of matriculate women was relatively across all agro-climatic zones, except in zone 10 (16.67 %) and the highest proportion was in zone 3 (33.33 %). Graduate and post graduate women were in highest proportion in zone 10 (11.67 %), followed by zone 8 (8.33 %). On overall basis, 14.44 per cent of women had no formal education and a majority of them were belonging to zone 8 (16.67 %), followed by zone 3 (15.00 %).

A majority of women were not engaged in gainful employment (57.50 %) and maximum proportion were observed in zone 9 (76.67 %). Among the women with gainful employment a majority were working as agricultural labourers (18.18 %) and a maximum proportion were recorded in zone 3 (30.00 %). On overall, the lowest proportion of women were in white collar/ Govt./private jobs (2.78 %) and a maximum proportion of them were observed in zone 10 (10.00 %).

A maximum proportion of women were recorded in lower middle socio-economic status (59.44 %) in all the agro-climatic zones and a majority were observed in zone 10 (71.67 %). The next category of women belonged to upper middle class (24.72 %) in all the agro-climatic zones and a maximum proportion were observed in zone 8 (31.67 %). The lowest proportions of women were recorded in high socio-economic status (1.67 %) and very poor socio-economic status (0.56 %). There was no significant association between agro-climatic zones and socio-economic status of rural families.

The most popular junk foods consumed by rural families were biscuits, chocolates/candies, *kurkuri, rasgulla*, potato chips, *papadi*, bread, *khava*, *khardani*, green/ red *vatani*, *batar*/toast/rusk and cakes whereas chewing gum, soft drinks, pop corn, ice-cream/ice-candy, noodles, *samosa/kachori* were least popular/consumed.

A large proportions of women (53.89 %) were less aware of health hazards of junk foods and was found highest in zone 3 (60.00 %). The awareness level about health hazards of junk foods was significantly ($p \leq 0.01$) influenced by age of the respondents. Women with no schooling or primary education were less aware of health hazards of junk foods. There was significant co-relation ($p \leq 0.01$) and association ($p \leq 0.01$) between awareness about health hazards of junk foods with educational level.

A majority of women in poor (75.51 %) and very poor socio-economic status (100.00 %) were found to have low awareness in all the agro-climatic zones and women in high socio-economic status were found to have high awareness (50.00 %) in all the agro-climatic zones except in zone 8 and no women were recorded in high SES in zone 10. There was significant co-relation ($p \leq 0.01$) and association ($p \leq 0.01$) between awareness about health hazards of junk foods among the rural women with socio- economic status.

The mean height of women was 155.24 ± 4.06 cm, mean weight was 49.82 ± 7.79 kg and the mean body mass index was 20.68 ± 3.31. The mean ideal body weight of women was 90.35 ± 14.77 per cent of standard. The mean waist and hip circumference were 75.75 ± 5.52 cm and 91.76 ± 4.83 cm, respectively and mean waist to hip ratio was 0.83 ± 0.04. A maximum proportion of women (50.83 %) recorded normal nutritional status and were found highest in zone 9 (53.34 %). A majority of women were underweight in zone 10 (35.00 %).

Younger women aged 15-20 years (42.27 %) were underweight, where as those aged 21-25 years (56.73 %) were in normal category of nutritional status. Women in both age groups of 26-30 years and 31-35 years fell in obese classes compared to other age groups. There was significant association between body mass indices and age of the respondents ($p \leq 0.01$).

A majority of women of high socio-economic status category (66.67 %) were normal, but those in poor (42.86 %) or very poor (50.00 %) were underweight. No significant co-relation between body mass indices and socio-economic status of women was seen although recorded a significant association ($p \leq 0.05$) was evident.

Level of education did not have any co-relation or association on nutritional status of rural women.

A majority of women had no risk of metabolic complications based on both waist circumference and waist to hip ratio among different agro-climatic zones.

Few women in 31-35 years (28.38 %) and 21-25 years (9.41 %) were observed to have increased risk and substantially increased risk with respect to waist circumference. A majority of women in the age range of 31-35 years (27.03 %) were observed to have substantially increased risk with respect to waist to hip ratio. There was significant ($p \leq 0.01$) association between risk of metabolic complications and the age of rural women.

Women in sedentary working category recorded adequate nutrients intake for energy (99.98 %), fat (174.51 %), magnesium (191.25 %), thiamine (147.20 %), and niacin (130.70 %) whereas, protein (95.09 %), iron (95.82 %) were nearly adequate. However, for calcium (65.48 %), zinc (61.85 %), β-carotene (13.75 %), vitamin A (19.37 %), riboflavin (64.39 %), vitamin B_6 (16.60 %), vitamin C (39.45 %), folate (68.32 %), and vitamin B_{12} (1.20 %) intakes were highly inadequate.

Women in moderate working category recorded adequate with nutrients like fat (145.47 %), magnesium (182.33 %), thiamine (133.88 %), and niacin (110.08 %) where as energy (86.14 %), protein (94.06 %), iron (89.13 %) were nearly adequate. The nutrients like calcium (64.25 %), zinc (61.64 %), β-carotene (12.51 %), vitamin A (28.12 %), riboflavin (53.15 %), vitamin B_6 (22.27 %), vitamin C (41.33 %), folate (54.39 %), and vitamin B_{12} (13.18 %) were highly inadequate.

The nutrition education recorded a significant ($p \leq 0.01$) impact on the nutrition knowledge of women, where the proportion of highly aware women increased from 16.67 per cent to 36.67 per cent after intervention.

The impact of educational intervention on level of awareness about health hazards of junk foods, it was observed that the proportion of highly aware women was 20.00 per cent before educational intervention which was increased to 43.33 per cent after educational intervention and a majority of women possessed high awareness about health hazards of junk foods. There was significant ($p \leq 0.01$) increase in the awareness about health hazards of junk foods among women after educational intervention.

A positive impact of educational intervention on food behaviour was observed where the consumption frequency scores for junk foods reduced significantly ($p \leq 0.01$) from scores of 2,230 to 1,873 after intervention.

Although, there was an increase in the mean intake of nutrients among sedentary working rural women after nutrition education intervention but was non-significant. Among the rural women, who were moderate workers, there was significant increase in the mean intake of energy ($p \leq 0.01$) and niacin ($p \leq 0.05$) but the mean intake of other nutrients although increased but was not significant.

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APPENDIX-I

Questionnaire to elicit general information

Subject No:

1.Name of the respondent:

2.Age and date of Birth:

3.Place and address with contact number:

4.Education:

5.Occupation:

6.Marital status: Married/Unmarried

7.Religion/Caste:

8.Composition of family: Family size : a) No. of males: b) No. of females:

c) No, of adults: d) No. of Children (<15):

9. Nutritional anthropometry:

Height (cm)	Weight (Kg)	WC (inches)	HC (inches)	BMI	WHR

A. Dietary pattern of rural families

Meal	Food items
Early morning	
Breakfast	
Lunch	
Snacks	
Dinner	
Any other	

B. Individual dietary information of rural women

Meal pattern	Menu	Ingredients used	Method of preparation	Quantity of food consumed (Cup No)
Early morning				
Breakfast				
Lunch				
Snacks				
Dinner				

APPENDIX-II

A. Questionnaire to elicit information on junk food consumption frequency

Junk foods	Daily	Thrice a week	Twice a week	Weekly	Fortnightly	Monthly	Rarely
Bread							
Bun:cream/jam/*khara*							
Cake							
Biscuits							
Khari/puffs							
Dil Khush/dil pasand							
Batar/toast/Rusk							
Chocolates/candies							
Khava							
Rasgulla							
Mysore pak							
Ice-cream/ice candy							
Kurkuri							
Popcorn							
Potato chips							
Papadi							
Ghate							
Kharadani							
Chakkli/kodbale							
Samosa/kachori							
Badang							
Green/red *vatani*							
Hurakadli							
Soft drinks							
Chat foods:pani puri , *sev puri* etc.							
Noodles							
Manchurian							
Chewing gum							

B. Questionnaire to elicit information on healthy food consumption frequency

Junk foods	Daily	Thrice a week	Twice a week	Weekly	Fortnightly	Monthly	Rarely
Cereals							
Pulses							
Nuts and oil seeds							
Green leafy vegetables							
Other vegetables							
Roots and tubers							
Fruits							
Milk and milk products							
Fats and oils							
Meat/Fish /poultry							
Sugar/ jaggery							

APPENDIX-III

Questionnaire to elicit awareness of rural women about of junk foods

ಜಂಕ್ ಆಹಾರಗಳ ಸಾಮಾನ್ಯ ತಿಳುವಳಿಕೆ ಪ್ರಶ್ನಾವಳಿ

ಕ್ರ. ಸಂ	ಪ್ರಶ್ನೆಗಳು	ಹೌದು	ಇಲ್ಲ	ಗೊತ್ತಿಲ್ಲ
1	ನಿಮಗೆ ಜಂಕ್ ಆಹಾರಗಳ ಬಗ್ಗೆ ಗೊತ್ತೆ?			
2	ಜಂಕ್ ಆಹಾರಗಳು ಆರೋಗ್ಯಕ್ಕೆ ಮಾರಕ			
3	ಜಂಕ್ ಆಹಾರಗಳು ದೇಹಕ್ಕೆ ಬೇಕಾದ ಎಲ್ಲ ಪೋಷಕಾಂಶಗಳನ್ನು ಒಳಗೊಂಡಿರುತ್ತವೆ			
4	ಜಂಕ್ ಆಹಾರಗಳಲ್ಲಿ ಹಾನಿಕಾರಕ ಕೃತಕ ಬಣ್ಣ ಮತ್ತು ಪರಿಮಳವನ್ನು ಉಪಯೋಗಿಸುತ್ತಾರೆ			
5	ಜಂಕ್ ಆಹಾರಗಳು ಕೆಡದಿರಲು ಹಾನಿಕಾರಕ ವಸ್ತುಗಳನ್ನು ಬಳಸುತ್ತಾರೆ			
6	ಜಂಕ್ ಆಹಾರಗಳಲ್ಲಿ ರುಚಿಯನ್ನು ಹೆಚ್ಚಿಸುವ ಅನೇಕ ಹಾನಿಕಾರಕ ವಸ್ತುಗಳಿರುತ್ತವೆ.			
7	ಇಂತಹ ಆಹಾರಗಳನ್ನು ತಿನ್ನುವುದರಿಂದ ಬೊಜ್ಜು ಬರುತ್ತದೆ			
8	ಇವುಗಳಲ್ಲಿ ಬಳಸುವ ಡಾಲ್ಡಾದಿಂದ ಡಯಾಬಿಟೀಸನಂತಹ ಅನೇಕ ರೋಗಗಳು ಬರುತ್ತವೆ			
9	ಅಂಗಡಿಯಲ್ಲಿರುವ ಬಣ್ಣದ ಸಿಹಿತಿಂಡಿಗಳು ,ಬಣ್ಣದ ವಠಾಣಿ ಮತ್ತು ಹುರಿಗಡಲೆ ಮಕ್ಕಳಿಗೆ ಸುರಕ್ಷಿತವೆ?			
10	ಇವುಗಳಲ್ಲಿರುವ ರಾಸಾಯನಿಕಗಳು ಮಕ್ಕಳಲ್ಲಿ ಮಾನಸಿಕ ಕಿರಿಕಿರಿಯನ್ನು ಉಂಟುಮಾಡುತ್ತವೆ			
11	ಇವುಗಳಲ್ಲಿರುವ ಕೊಲೆಸ್ಟರಾಲ್ ಹೃದಯ ಸಂಬಂಧಿತ ರೋಗಗಳನ್ನು ತರುತ್ತದೆ			
12	ಇವುಗಳಲ್ಲಿರುವ ಅನೇಕ ವಸ್ತುಗಳನ್ನು ಸರ್ಕಾರವು ಬಳಸಬಾರದೆಂದು ಹೇಳಿದೆ. ನಿಮಗೆ ಗೊತ್ತೆ?			
13	ಬೇಕರಿ ಆಹಾರಗಳನ್ನು ತಯಾರಿಸುವ ಮೈದಾದಲ್ಲಿ ಪೋಷಕಾಂಶಗಳು ಕಡಿಮೆ ಇರುತ್ತವೆ			
14	ಈ ಆಹಾರಗಳಲ್ಲಿರುವ ಕೃತಕ ಪರಿಮಳಗಳು ಅಸ್ತಮಾ, ಅರ್ಲಜಿ ಮತ್ತು ಚರ್ಮರೋಗವನ್ನು ತರುತ್ತವೆ			
15	ಬಾಟಲಿಯಲ್ಲಿರುವ ಪೇಯಗಳನ್ನು ಕುಡಿಯುವುದರಿಂದ ಎಲುಬು ಮತ್ತು ಹಲ್ಲುಗಳಿಗೆ ಧಕ್ಕೆಯಾಗುತ್ತದೆ			
16	ಕೇಕ್‌ಗಳಲ್ಲಿ ಬಳಸುವ ಕ್ರೀಮ್ ಕೊಲೆಸ್ಟರಾಲ್ ಮತ್ತು ಬೊಜ್ಜನ್ನು ಹೆಚ್ಚಿಸುತ್ತದೆ			
17	ಬೀದಿಯಲ್ಲಿ ಮಾರುವ ಅನೇಕ ಆಹಾರಗಳಲ್ಲಿ ಬಳಸುವ ಬಣ್ಣಗಳಿಂದ ಕ್ಯಾನ್ಸರ್ ಬರಬಹುದು			
18	ಬಬ್ಬಲ್‌ಗಮ್‌ಗಳಲ್ಲಿ ಬಳಸುವ ಕೃತಕ ಸಕ್ಕರೆಯಿಂದ ಮಾನಸಿಕ ಖಿನ್ನತೆ, ನಿದ್ರಾಹೀನತೆ ಉಂಟಾಗುವುದು			
19	ಪ್ಯಾಕ್ ಮಾಡಿದ ಆಲೂಗಡ್ಡೆ ಚಿಪ್ಸ್‌ನಲ್ಲಿ ತಲೆಶೂಲೆ, ಮಂಪರು ಬರುವ ಉಪ್ಪನ್ನು ಹಾಕಿರುತ್ತಾರೆ			
20	ಕುರುಕುರೆ ಅಂತಹ ಹಗುರ ಆಹಾರಗಳು ಮಕ್ಕಳಿಗೆ ಆರೋಗ್ಯಕರವಲ್ಲ			
21	ಪೆಪ್ಪರ್‌ಮೆಂಟುಗಳಲ್ಲಿ ಬಳಸುವ ಪರಿಮಳಗಳು ಕರುಳಿಗೆ ಧಕ್ಕೆಮಾಡುತ್ತವೆ			
22	ಸೋಡಾ ಮತ್ತು ಇತರೆ ಪಾನೀಯಗಳು ಮೂತ್ರಕೋಶದಲ್ಲಿ ಕಲ್ಲುಗಳನ್ನು ಉಂಟುಮಾಡುತ್ತವೆ			
23	ಜಂಕ್ ಆಹಾರಗಳಲ್ಲಿರುವ ರಾಸಾಯನಿಕಗಳು ಏಕಾಗ್ರತೆ ಮತ್ತು ನೆನಪಿನ ಶಕ್ತಿಗೆ ಧಕ್ಕೆಮಾಡುತ್ತವೆ			
24	ಪ್ಲಾಸ್ಟಿಕ್‌ಪ್ಯಾಕ್‌ನಲ್ಲಿರುವ ವಿಷಕಾರಿ ಪದಾರ್ಥಗಳು ಮತ್ತು ಘಟಕಗಳು ಜಂಕ್ ಆಹಾರ ಮತ್ತು ಪೇಯಗಳೊಂದಿಗೆ ಸೇರಿ ಕ್ಯಾನ್ಸರ್ ಮತ್ತು ಜನನ ದೋಷಗಳನ್ನು ಉಂಟುಮಾಡುತ್ತದೆ			
25	ಜಂಕ್ ಆಹಾರಗಳಲ್ಲಿ ಬಳಸುವ ರಾಸಾಯನಿಕಗಳು ದೇಹ ಮರಗಟ್ಟುವಿಕೆ ಮತ್ತು ಜೋಮು ಉಂಟುಮಾಡುತ್ತವೆ			

APPENDIX-IV

Questionnaire to elicit nutrition knowledge of rural women

ಗ್ರಾಮೀಣ ಮಹಿಳೆಯರ ಪೋಷಣಾ ಜ್ಞಾನದ ಪ್ರಶ್ನಾವಳಿ

1	ಅನೇಕ ರೀತಿಯ ಪೋಷಕಾಂಶಗಳು ಆಹಾರದಲ್ಲಿರುತ್ತವೆ	ಹೌದು /ಇಲ್ಲ
2	ದೇಹದ ಬೆಳವಣಿಗೆಗೆ ಮತ್ತು ಅಭಿವೃದ್ಧಿಗೆ ಎಲ್ಲ ಬಗೆಯ ಪೋಷಕಾಂಶಗಳು ಬೇಕು	ಹೌದು /ಇಲ್ಲ
3	ಹಸಿರು ತಪ್ಪಲು ಪಲ್ಲೆಗಳನ್ನು ಹೆಚ್ಚು ಸೇವಿಸುವುದರಿಂದ ದೇಹದಲ್ಲಿ ರಕ್ತವು ಹೆಚ್ಚುತ್ತದೆ	ಹೌದು /ಇಲ್ಲ
4	ಮೊಳಕೆಯೊಡಿಸಿದ ಕಾಳುಗಳಲ್ಲಿರುವ ಸತ್ವಗಳು ಜೀರ್ಣವಾಗುವುದಿಲ್ಲ	ಹೌದು /ಇಲ್ಲ
5	ಕೇಸರಿ ಮತ್ತು ಹಳದಿ ಹಣ್ಣು, ತರಕಾರಿಗಳು ಕಣ್ಣಿಗೆ ಒಳ್ಳೆಯದು	ಹೌದು /ಇಲ್ಲ
6	ಗುಡ್ಡದ ನೆಲ್ಲಿಕಾಯಿ, ಪೇರಲ ಹಣ್ಣುಗಳನ್ನು ಸೇವಿಸುವುದರಿಂದ ವಸಡುಗಳು ಗಟ್ಟಿಯಾಗುತ್ತವೆ	ಹೌದು /ಇಲ್ಲ
7	ದಿನವೂ ಮೊಸರು ತಿನ್ನುವುದರಿಂದ ಜೀರ್ಣಶಕ್ತಿಯು ಕುಂಠಿತಗೊಳ್ಳುತ್ತದೆ	ಹೌದು /ಇಲ್ಲ
8	ಅಗಸೆಯು ಆರೋಗ್ಯಕಾರಿ ಆಹಾರ	ಹೌದು /ಇಲ್ಲ
9	ಹಾಲು ಕುಡಿಯುವುದರಿಂದ ಹಲ್ಲು ಮತ್ತು ಎಲುಬುಗಳು ಟೊಳ್ಳಾಗುತ್ತವೆ	ಹೌದು /ಇಲ್ಲ
10	ವನಸ್ಪತಿ ಅಥವಾ ಡಾಲ್ಡಾದಿಂದ ತಯಾರಿಸಿದ ಆಹಾರಗಳಿಂದ ದೇಹಕ್ಕೆ ಯಾವುದೆ ಹಾನಿಯಿಲ್ಲ	ಹೌದು /ಇಲ್ಲ
11	ತಯಾರಿಸಿದ ಆಹಾರವನ್ನು ಯಾವಾಗಲೂ ಮುಚ್ಚಿಡಬೇಕು	ಹೌದು /ಇಲ್ಲ
12	ಹಣ್ಣು ಮತ್ತು ತರಕಾರಿಗಳನ್ನು ಸ್ವಚ್ಛವಾದ ನೀರಿನಿಂದ ತೊಳೆದು ಉಪಯೋಗಿಸಬೇಕು	ಹೌದು /ಇಲ್ಲ
13	ಲಿಂಬೆ ಜಾತಿಯ ಹಣ್ಣುಗಳನ್ನು ತಿನ್ನುವುದರಿಂದ ರೋಗ ನಿರೋಧಕ ಶಕ್ತಿ ಕಡಿಮೆಯಾಗುತ್ತದೆ	ಹೌದು /ಇಲ್ಲ
14	ಆರೋಗ್ಯಕ್ಕಾಗಿ ಎಲ್ಲ ರೀತಿಯ ಆಹಾರಗಳನ್ನು ದಿನವೂ ಸೇವಿಸಬೇಕು	ಹೌದು /ಇಲ್ಲ
15	ಎಣ್ಣೆಬೀಜಗಳು ಮತ್ತು ಒಣ ಹಣ್ಣುಗಳು ಕೇವಲ ಶಕ್ತಿಯನ್ನು ಕೊಡುತ್ತವೆ	ಹೌದು /ಇಲ್ಲ
16	ಮಿಶ್ರ ಧಾನ್ಯಗಳ ಆಹಾರವು ಉತ್ತಮ	ಹೌದು /ಇಲ್ಲ
17	ಮಾರುಕಟ್ಟೆಯಲ್ಲಿರುವ ಆಹಾರಗಳಲ್ಲಿ ಹೆಚ್ಚು ಪೋಷಕಾಂಶಗಳು ಇರುತ್ತವೆ	ಹೌದು /ಇಲ್ಲ
18	ನವಣೆ, ಸಾವೆಯಂತಹ ಕಿರುಧಾನ್ಯಗಳನ್ನ ದಿನವೂ ತಿನ್ನಬೇಕು	ಹೌದು /ಇಲ್ಲ
19	ತರಕಾರಿಗಳನ್ನು ಹೆಚ್ಚಿದ ನಂತರ ತೊಳೆಯುವುದು ಉತ್ತಮ	ಹೌದು /ಇಲ್ಲ
20	ಆಹಾರದಲ್ಲಿ ಪೌಷ್ಟಿಕತೆಗಿಂತ ರುಚಿಯೇ ಮುಖ್ಯ	ಹೌದು /ಇಲ್ಲ
21	ಹೆಚ್ಚಿನ ನಾರಿನಾಂಶವಿರುವ ಆಹಾರದಿಂದ ಮಲಬದ್ಧತೆಯನ್ನು ತಡೆಗಟ್ಟಬಹುದು	ಹೌದು /ಇಲ್ಲ
22	ಪೊಲಿಷ್ ಮಾಡದೆ ಇರುವ ಕೆಂಪು ಅಕ್ಕಿಯು ಬಿಳಿ ಅಕ್ಕಿಗಿಂತ ಕಡಿಮೆ ಪೌಷ್ಟಿಕ	ಹೌದು /ಇಲ್ಲ
23	ತರಕಾರಿಗಳನ್ನು ಕಡಿಮೆ ನೀರಿನಲ್ಲಿ ಕುದಿಸಿ ಬಸಿಯಬೇಕು	ಹೌದು /ಇಲ್ಲ
24	ಮೀನು, ಮೊಟ್ಟೆ, ಮಾಂಸ ಮತ್ತು ಬೇಳೆಕಾಳುಗಳು ದೇಹದ ಬೆಳವಣಿಗೆಗೆ ಸಹಕಾರಿಯಾಗಿವೆ	ಹೌದು /ಇಲ್ಲ
25	ಇಡಿಯಾದ ಕಾಳುಗಳನ್ನು ಸೇವಿಸುವುದರಿಂದ ದೇಹವು ನಿಶಕ್ತಗೊಳ್ಳುವುದು	ಹೌದು /ಇಲ್ಲ
26	ಅಯೋಡಿನ್‌ಯುಕ್ತ ಉಪ್ಪು ಆರೋಗ್ಯಕ್ಕೆ ಉತ್ತಮವಲ್ಲ	ಹೌದು /ಇಲ್ಲ

APPENDIX-V

Taluka wise distribution of demographic profile of rural women (15-35 years) in different agro-climatic zones of UAS, Dharwad

Parameters	Criteria	Talukas of zone 3 (n=120)			Talukas of zone 8 (n=120)			zone 9 (n=60)	zone 10 (n=60)	Total (N=360)
		Vijayapura	Gadag	Total (%)	Dharwad	Haveri	Total (%)	Khanapur	Ankola	
Age(years)	15-20	14	16	30(25.00)#	23	14	37 (30.84)	19(31.67)	11(18.33)	97(26.94)
	21-25	25	18	43 (35.83)	13	14	27 (22.50)	18(30.00)	16(26.67)	104(28.89)
	26-30	14	15	29 (24.17)	13	18	31 (25.83)	13(21.67)	12(20.00)	85(23.61)
	31-35	7	11	18 (15.00)	11	14	25 (20.83)	10(16.66)	21(35.00)	74(20.56)
Marital status	Married	53	45	98 (81.67)	34	48	82 (68.33)	44 (73.33)	40(66.67)	264(73.33)
	Unmarried	7	15	22 (18.33)	26	12	38 (31.67)	16 (26.67)	20(33.33)	96 (26.67)
Type of family	Nuclear	27	19	46 (38.33)	29	26	55 (45.83)	29 (48.33)	33(55.00)	163(45.28)
	Joint	28	36	64 (53.34)	27	31	58 (48.33)	31 (51.67)	26(43.33)	179(49.72)
	Extended	5	5	10 (8.33)	4	3	7 (5.84)	-	1(1.67)	18 (5.00)
Family composition (mean ± SD)	Males	2.57 ± 1.24	3.03 ± 1.13	2.80 ± 1.21	3.22 ± 2.31	2.78 ± 1.40	3.00 ± 1.91	2.50 ± 1.37	2.22 ± 0.76	2.72 ± 1.48
	Females	2.43 ± 1.14	2.83 ± 1.14	2.63 ± 1.15	3.87 ± 2.95	2.83 ± 1.24	3.35 ± 2.31	2.88 ± 1.34	2.40 ± 1.09	2.88 ± 1.69
	Adults	3.32 ± 1.68	4.03 ± 1.45	3.68 ± 1.60	5.35 ± 3.86	4.10 ± 1.74	4.73 ± 3.05	4.03 ± 1.98	3.15 ± 1.19	3.99 ± 2.27
	Children (≤15 years)	1.68 ± 1.00	1.83 ± 0.98	1.76 ± 0.99	1.73 ± 1.79	1.52 ± 1.16	1.63 ± 1.51	1.35 ± 1.05	1.48 ± 0.85	1.60 ± 1.18
Family size (mean ± SD)	Total	5.00 ± 1.88	5.88 ± 1.74	5.44 ± 1.85	7.00 ± 4.92	5.62 ± 2.00	6.31 ± 3.81	5.38 ± 2.29	4.62 ± 1.38	5.58 ± 2.73
Religion	Hindus	57	48	105(87.50)	60	52	112(93.33)	55(91.67)	56(93.33)	328(91.11)
	Muslims	3	8	11(9.17)	-	8	8(6.67)	2(3.33)	1(1.67)	22 (6.11)
	Christians	-	3	3(2.50)	-	-	-	2(3.33)	3(5.00)	8 (2.22)
	Jains	-	1	1(0.83)	-	-	-	1(1.67)	-	2 (0.56)

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Parameters	Criteria	Talukas of zone 3 (n=120)			Talukas of zone 8 (n=120)			zone 9 (n=60)	zone 10 (n=60)	Total (N=360)
		Vijayapura	Gadag	Total (%)	Dharwad	Haveri	Total (%)	Khanapur	Ankola	
Education level	No schooling	12	6	18(15.00)	4	16	20 (16.67)	8(13.33)	6(10.00)	52 (14.44)
	Primary	3	13	16(13.33)	3	9	12 (10.00)	6(10.00)	9(15.00)	43 (11.95)
	Higher primary	13	17	30(25.00)	9	8	17 (14.17)	10(16.67)	15(25.00)	72 (20.00)
	SSLC	24	16	40(33.33)	23	15	38 (31.67)	19(31.67)	10(16.67)	107(29.72)
	PUC/Diploma	5	4	9 (7.50)	13	10	23 (19.17)	12(20.00)	13(21.66)	57(15.83)
	Graduate	3	4	7 (5.84)	7	2	9 (7.50)	5(8.33)	6(10.00)	27 (7.50)
	Post graduate	-	-	-	1	-	1 (0.83)	-	1(1.67)	2 (0.56)
Occupation	Not working	30	26	56 (46.67)	47	26	73 (60.83)	46(76.67)	32(53.33)	207 (57.5)
	Agriculture	10	5	15 (12.50)	3	2	5 (4.17)	1(1.67)	4(6.67)	25 (6.94)
	Agricultural labourer	16	20	36 (30.00)	3	16	19 (15.83)	8(13.33)	6(10.00)	68 (18.89)
	Other labourer	3	-	3 (2.50)	1	7	8 (6.67)	2(3.33)	5(8.33)	22 (6.11)
	Business	1	7	8 (6.67)	4	8	12 (10.00)	2(3.33)	7(11.67)	28 (7.78)
	White collar / Govt./ Private job	-	2	2(1.67)	2	1	3 (2.50)	1(1.67)	6(10.00)	10 (2.78)

Figures in parentheses indicate per cent values

APPENDIX-VI

Taluka wise distribution of socio-economic status of rural women of different agro-climatic zones of UAS Dharwad

Socio-economic status	Talukas of zone 3 (n=120)			Talukas of zone 8 (n=120)			Zone 9 (n=60)	Zone 10 (n=60)	Total (N=360)
	Vijayapura	Gadag	Total (%)	Dharwad	Haveri	Total (%)	Khanapur taluk	Ankola taluk	
High	1	2	3 (2.50)#	-	1	1 (0.83)	2 (3.33)	-	6 (1.67)
Upper middle	8	20	28 (23.33)	21	17	38 (31.67)	13 (21.67)	10 (16.67)	89 (24.72)
Lower middle	35	33	68 (56.67)	32	32	64 (53.33)	39 (65.00)	43 (71.67)	214 (59.44)
Poor	15	5	20 (16.67)	7	10	17 (14.17)	5 (8.33)	7 (11.66)	49 (13.61)
Very poor	1	-	1 (0.83)	-	-	-	1(1.67)	-	2 (0.56)
Total	60	60	120	60	60	120	60	60	360

Figures in parenthesis indicate per cent values

APPENDIX-VII

Taluka wise distribution on awareness about health hazards of junk foods among rural women in different agro-climatic zones of UAS, Dharawd

Age (years)	Talukas of zone 3 (n=120)									Talukas of zone 8 (n=120)									Zone 9 (n=60)			Zone 10 (n=60)		
	Vijayapura			Gadag			Total			Dharwad			Haveri			Total			Khanapur			Ankola		
	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H	L	M	H
15-20	4	6	4	3	4	9	7	10	13	6	5	12	2	4	8	8	9	20	3	6	10	2	3	6
21-25	13	8	4	13	3	2	26	11	6	5	4	4	5	7	2	10	11	6	8	7	3	9	1	6
26-30	12	1	1	11	4	-	23	5	1	7	5	1	13	3	2	20	8	3	10	3	-	9	2	1
31-35	7	-	-	9	-	2	16	-	2	10	1	-	9	5	-	19	6	-	10	-	-	14	5	2
Total	36	15	9	36	11	13	72	26	22	28	15	17	29	19	12	57	34	29	31	16	13	34	11	15

L- Low awareness M- Moderate awareness H- High awareness

CREATING AWARENESS FOR IMPROVEMENT OF FOOD BEHAVIOUR AMONG RURAL WOMEN OF NORTH KARNATAKA

CHAITRA R. ASUNDI **2016** **DR. BHARATI CHIMMAD**
MAJOR ADVISOR

ABSTRACT

A study was conducted to create awareness about health hazards of junk foods and to assess the nutritional status of women in rural areas of four agro-climatic zones of UAS, Dharwad. The junk foods available in 24 villages of six talukas were documented and 120 rural families were enquired for junk food consumption. A total of 360 non pregnant non lactating rural women (15 to 35 years) from 12 villages were assessed for awareness about health hazards and nutritional status. Nutrition education through innovative learning objects was provided to 30 women in a selected village of Dharwad taluka and its impact on nutrition knowledge and family food behaviour was studied. The results revealed that different types of junk foods were being sold in rural areas. The consumption of biscuits, chocolates or candies, *kurkuri, papadi, rasgulla* and bread were most popular across the four zones. There was low awareness (53.89 %) prevailing about health hazards of junk foods among rural women, more so in zone 3 (60.00 %). The level of formal education, age and socio-economic status influenced the nutritional awareness of women. Nutritional anthropometry revealed that 50.83 per cent of rural women were although normal, 29.17 per cent were underweight. Predicted risk of metabolic complications based on waist circumference and waist to hip ratio were not evident in 79.72 per cent and 85.60 per cent of women, respectively. Nutritional status of women was associated with age and socio-economic status. Micronutrient deficiency was rampant among women of all the agro-climatic zones studied. Nutrition education recorded a significant increase ($p \leq 0.01$) in awareness about health hazards of junk foods and improvement in food behaviour with simultaneous reduction in junk food consumption.