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Daily dietary adequacy of rural households as an indicator to assess food and nutrition

SHASHI JAIN[1], KUSUM SHARMA[2] AND SHIPRA CHELAWAT[3]
[1]Professor & Dean and [2&3]Senior Research Fellow
All India Coordinated Research Project, Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan) India
(Email : shashijain13@yahoo.com)

ABSTRACT

The purpose of this study was to determine the gaps related to food and nutrition insecurity among rural households in Udaipur District; Rajasthan. A total of 90 families of rural households were selected after screening with equal representation to three SES group. Information were collected like general background: seasonal availability of food at household level, food habits and number of meals taken in a day and dietary intake of each of the family member was recorded using 24 hour recall method for 3 consecutive days. The food and nutrient intake was compared with balance diet andrecommended dietary allowances for various nutrients according to age, sex and physical activity. Nutrient intake of each day by each of the family member was computed using a Diet Cal software. Food Consumption pattern of the family was obtained by 3 days dietary recall method for 3 consecutive days and average intakes of household members was computed. The intake is expressed as consumption units (CUs) per day (*Gopalan et al., 2004*). Results reveal that the cereal, pulse and milk intake was higher among high socioeconomic group while intake of leafy vegetables, roots and tubers and fruits were very poor among rural households of all socioeconomic profile. Although the intake of various food groups were higher among (P>0.05) HIG families but lower than recommended amount for the groups. Wheat and maize are the staple cereals consumed daily in the diet. Cereal intake to per cent balance dietfor irrespective of socioeconomic groups were 68.71. More than 80 per cent families were including pulses and milk in daily diet. In roots and tubers, onion, garlic and ginger were reported to be consumed daily by 20-40 per cent of the families. The study indicated that all food groups were in access at household level in the study area. Intake of leafy vegetables and fruits was very low as compared to suggested balance diet for Indians. The overall mean energy intake was 1485 kcal /d/CU by the study families. Overall mean protein intake was 47.13g/d. The intake of iron was 17.41 mg, calcium 492.45 mg and zinc was 8.87 µg/d /CU. The intake of micronutrients was highest among the HIG families. It was observed that diet of rural families was poor in almost all the nutrients. It was 75 to above 90 per cent for vitamin c and calcium intake. The iron intake was 90.06 per cent per consumption unit of families. The intake of β carotene was only 3 per cent of RDA as the diet was lacking in fruits and leafy vegetables. However intake was better in HIG families and lowest in LIG families.

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Key Words : Food and nutrition security, Socio economic group, Consumption Unit, Food intake, Dietary adequacy, Nutrient adequacy

INTRODUCTION

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (Food and Agriculture Organization, 2003). Food security can be examined at various levels, *i.e.* global, national, regional, household, and individual. Food security at the national or regional level does not necessarily indicate food security among communities, households, and individuals. Achievement of household food security does not necessarily account for the security at individual levels because of factors, such as gender discrimination (Miller, 1997, Mukharjee, 2010 and Haddad, 1996).

The State of Food Insecurity in the World (2012) estimates that India is home to more than 217 million undernourished people (FAO/WFP/IFAD, 2012). The Global Hunger Index (GHI) for India in the year 2010 was 24.1, which placed it in the "alarming category" (ranked 67, well below neighbouring countries, like China and Pakistan) (Grebmer, 2010; *http://www.ncbi.nlm.nih.gov*).

Food consumption patterns can be defined as the familiar ways of eating foods. Rural residents tend to adhere to their eating patterns instead of changing to a new and more appropriate eating habits (Ogunniyi, 2012). In order to maintain healthful diet, (Jama, 2002) stated that a variety and balance of foods from all food groups and moderate consumption of all food items is very important. Widespread poverty resulting in chronic and persistent hunger is the biggest problem in the developing countries.

Food consumption studies assess immediate causes of malnutrition, and food security studies predict the adequacy of household dietary intake and nutritional status. Food security is defined as access to nutritionally adequate and safe food for a healthy and active life. Food insecurity exists when the availability of nutritionally adequate and safe foods, or the ability to acquire foods in a socially acceptable way, is limited or uncertain (Life Sciences Research Office, 1990). There is a direct relationship between food insecurity, hunger, and poverty. Also, studies have shown a direct relationship between food insecurity and malnutrition (Huet, 2012,Nalty, 2013 and Sean, 2012). One of the contributing factors to food insecurity is socio-economic status. Limited income causes people to restrict the number and quality of meals they eat, reduce dietary variety, and look for inexpensively processed food. These options are usually low in essential nutrients and high in fats with empty calories (Nagataab, 2012). The Tenth Five Year Plan of country focused on comprehensive interventions aimed at improving food and nutrition security. The Tenth Plan envisaged that there will be a paradigm shift from (i) household food security and freedom from hunger to nutrition security for the family and the individual; (ii) untargeted food supplementation to screening of all the persons from vulnerable groups, identification of those with various grades of undernutrition and appropriate management; and (iii) lack of focused interventions on the prevention of over nutrition to the promotion of appropriate lifestyles and dietary intakes for the prevention and management of over-nutrition and obesity (Prema Ramachandran, 2012).

Prolonged lack of food and nutrients leads to various physical and mental impairments of human beings. It prevents children from growing into productive members of the society and be adults who are fully able to participate in the economic and social development of their countries. Sustainable food and nutrition security is life saving for people today and beneficial for future generations.

The conceptual framework for food and nutrition security (Gross *et al.*, 2000) is helpful in disaggregating the related concepts of food security and nutrition security at both Household and individual levels.**Household Food security:** A household is food secure if it can reliably gain *access to food* in sufficient quantity and quality for all its household members to enjoy a healthy and active life. An individual is food secure when he/she can reliably gain *access to enough food* for an active and healthy life.**Household nutrition security:** A household achieves nutrition security when it has secure access to food *coupled with* a sanitary environment, adequate health services, and knowledgeable care to ensure a healthy life for all household members.

Furthermore, an individual is nutrition secure when he/she has secure access to food *coupled with* a sanitary environment, adequate health Services, and knowledgeable care to ensure a healthy life for all households (Benson, 2004).

Various studies have been conducted to assess food insecurity at the global level; however, the literature is limited as far as India is concerned. Lack of sufficient studies on the burden of the problem poses a hurdle in formulating strategies to combating this epochal issue. Food and nutrition security is an important mission of government of India. Atgrass rood level it can be minimizes by rural surveys, intervention programmes.

This is an important contribution, because the rural population was not aware about nutrition borne diseases and its harmful effects. Taking all this into consideration, the present study was undertaken with the objective toassess food and nutrition security among rural households of Udaipur (Rajasthan) India.

METHODOLOGY

Study area:

Study was conductedon assessment of foods and nutrition security at household level of rural families in Udaipur District. Udaipur is located in southern Rajasthan. Bargoan Panchayat Samity adjoining to Udaipur city was purposively selected for the study area. Badgoan block is again sub divided into many gram panchayats like Kavita, Amberi, Bedla, Lakhawali, etc. Out of this Lakhawali was selected at randomly. The Lakhawaligram panchayat was a cluster of villages from which a cluster of 5 villages *i.e.* Nohra, Manpura, Lakhawali, Bhilwara and Deokabada was taken to assess the gaps related to food and nutrition security at household level of rural families.

Study was conducted in two parts:

- Screening of farm families for their socioeconomic categories
- Assessment of gaps in Food and Nutrition security by SES profile at household level

Screening of farm families for their socioeconomic categories :

One hundred and fifty families were contacted from the cluster of five villages to

assess the Socio-economic status. For this purpose a tool developed under All India Co-ordinated Research Project (AICRP) in Home Science for rural families was used. This tool contains details related to social and economic structure of families.

Socio-economic scores of families:

Social structure of families:

Social scores of families included caste, family structure, family occupation, family education and membership of various organization. The maximum scores given under this category were 15.98.

Economic structure of families:

Economic scores were calculated on the basis of land holding, live stocks, dwelling for live stocks, farm assets, household assets, media ownership, transport facility and household items. The maximum scores kept as 22.32.

As per the scores obtained by the families, then have been categorized as given below-

LIG (Low Income Group) below 30,MIG (Middle Income Group) 30-50, HIG (High Income Group) Above 50

Assessment of gaps in food and nutrition security by SES profile at household level:

To find out the food and nutrition related gaps in the selected farming system,a tool was developed. On the basis of screening and SES scores, the families were divides into three groups.In this way a group of 90 families were identified with equal representation to three SES group *i.e.* High income, Middleand Low. Following information were collected to assess the gaps like general background: seasonal availability of food at household level, food habits and no. of meals taken in a day

Diet and nutrient adequacy:

Dietary intake of each of the family member was recorded using 24 hour recall method for 3 consecutive days. Intake of various Socio-Economic groups was calculated on the basis of average intake by the member of the family in three days under the group. Thefood intake was compared with balance diet on suggested by ICMR, intake of nutrients were compared with RDA (ICMR, 2010) for each members of family with respect to their age, sex and physical activity. Nutrient intake of each day by each of the family members was computed using a Diet Cal software (Gurdeep Kaur, 2014). Data was also collected on food consumption by the family on daily, weekly, and monthly basis of different food groups *i.e.* cereal, pulses, leafy vegetables, roots and tubers, other vegetables, nuts and oil seeds, fruits, meat and poultry, milk and milk products, sugars and jaggery and uncommon foods to assess the food consumption pattern of family in all three socio economic groups.

Consumption unit of family:

NIN (2014) had given consumption unitCU (Gopalan *et al.,* 2004) to each category of age, sex and stages (Table 1). From this table units were assigned to each member according age, sex and stages. CU of all the members in the family were then summed and divided by

Table 1 : Coefficient for computing consumption unit of family (CU)

Sr. No.	Group	Cu-units	Sr. No.	Group	Cu-units
1.	Adult Male (Sedentary worker)	1.0	7.	Adolescents 12-21 yrs.	1.0
2.	Adult Male (Moderate worker)	1.2	8.	Children-9-12 yrs.	0.8
3.	Adult Male (Heavy worker)	1.6	9.	Children-7-9 yrs.	0.7
4.	Adult Female (Sedentary worker)	0.8	10.	Children-5-7 yrs.	0.6
5.	Adult Female (Moderate worker)	0.9	11.	Children-3-5 yrs.	0.5
6.	Adult Female (Heavy worker)	1.2			

total number of family members as given below-

$$\text{(1.) Family CU} = \frac{(\text{cum1}+\text{cum2}+\text{cum3}+\text{————————————})}{\text{No. of family members}}$$

$$\text{(2) Intake/CU} = \frac{\text{Total intake of food nutrient of family}}{\text{CU of family}} \times 1$$

Diet and nutrient intake of each family was then expressed for 1consumption unit as-

RESULTS AND DISCUSSION

Screening of families for socio-economic profile:

A group of 150 families summed and from this 90 families were selected with equal representation to three socio-economic categories *i.e.* high, medium, low. The mean social scores for lower, middle and higher income group was 11.13, 14.58 and 22.33 whereas economic scores for lower, middle and higher income group was 14.67, 21.07 and 31.30. Overall mean socio-economic scores of ninety family was found 38.36.

Seasonal availability of foods :

Data on availability of foods in the operational villages in the three major seasons *i.e.* summer, rainy and winter were collected for various food groups. All the families reported the availability of major cereals (wheat, maize, rice, rice flakes), pulses (black gram, green gram, bengalgram, red gram), roots and tubers (onion and potato) and green chillies in all the three seasons in their area. For vegetables (GLVs, other vegetables), fruits and, roots and tubers availability was reported pertaining to the season. The availability of common vegetables and fruits cultivated in the area viz. cluster beans, ladies finger, bottle gourd, ridge gourd, bitter gourd, pumpkin, mango and guava was reported in summer and rainy season; while foods of winter season like bathua, spinach, fenugreek leaves, radish, carrots, colocassia, cauliflower, custard apple, kinnow/ oranges, ber and ripe tomato were reported to be available by majority of the families. From the above data it can be depicted that major food items were adequately available to the villagers during all the seasons.

Food habits:

All the families under study were vegetarian. Majority of the families were following the two meal pattern, while only 10-20 per cent of them were following the three meal pattern.

Dietary intake:

Cereals:

Table 2 revealed that intake of cereals were higher in High socioeconomic group. The data clearly shows that in cereals wheat and maize were being consumed daily, while rice is consumed weekly by the families. The mean intake of cereal in LIG, MIG and HIG was 268.69, 274.77 and 313.37. Cereal content for all three socioeconomic group was 285.79 g/ CU. There was no significant difference (P > .05) in cereal content between all three SES groups but when compared with each other the cereal content of HIG was significantly higher as compared to LIG and MIG. Radhakrishna and Ravi, 1992; Rao, 2000 reported that the NSS data reveal that the per capita cereal consumption has been declining since the early seventies despite a significant increase in per capita cereal production.

Pulses:

No single pulse is consumed daily but these were consumed on weekly basis. Commonly consumed pulses were bengal gram, black gram, and green gram. In nuts and oilseeds, only few families were consuming groundnuts once in a week while some were consuming once or twice in a month.

It was observed that the mean intake of pulse was (P > .05) highest in HIG *i.e.* 32.62 g/ d/CU and the lowest in LIG 21.45 g/d/CU and the overall pulse intake was 26.86 g/d/CU. The pattern of consumption across the expenditureclasses among the urban population reveals the same tendency. Per capita consumption of foods rich in protein such as pulses, milk products, eggs, fish and meat is farfrom adequate in all income classes. Consumption of pulses is barely above the Indian Council of Medical Research (ICMR) norm only in the highest three income classes, constituting about 20 per cent of the population. None of the expenditure groups consume adequate quantities of eggs, fish and meat. Forty per cent of the population consume milk below the norm of 150 ml (SwarnaSadasivam Vepa1, 2002).

Table: 2 Intake of foods by rural households (g / day/CU)

Group		CU of family	Cereal % RDA 420g	Pulses% RDA 60 g	Sugar and Jaggery % RDA 25g	Fats and oil %RDA 20 g	Leafy veg %RDA 100 g	Roots and tubers %RDA 200g	Other veg % RDA 100	Fruits % RDA 100	Milk and its products % RDA 300
LIG	Mean	3.87	62.97	35.74	56.40	84.89	3.89	4.53	106.75	57.44	114.53
N 30	SD	1.81	17.38	25.40	38.21	58.06	11.57	6.29	67.19	166.42	81.51
	SE	0.33	3.18	4.64	6.99	10.61	2.11	1.15	12.28	30.42	14.90
MIG	Mean	4.93	68.35	46.53	69.89	129.63	0.00	5.22	101.78	0.00	151.64
N 30	SD	1.94	26.17	41.82	50.73	55.45	0.00	9.07	55.24	0.00	100.84
	SE	0.36	4.78	7.65	9.28	10.14	0.00	1.66	10.10	0.00	18.43
HIG	Mean	4.84	74.61	54.37	59.87	169.42	0.00	10.29	120.72	0.00	176.31
N 30	SD	1.99	24.53	49.77	25.65	57.34	0.00	10.78	59.85	0.00	89.50
	SE	0.36	4.49	9.10	4.69	10.48	0.00	1.97	10.94	0.00	16.36
Overall	Mean	4.55	68.71	45.55	62.05	127.98	1.30	6.68	109.75	19.15	147.49
N 90	SD	1.95	23.30	40.57	39.52	66.16	6.85	9.18	60.81	98.82	93.49
	SE	0.21	2.46	4.28	4.17	6.98	0.72	0.97	6.41	10.42	9.86

Fats and oil seeds:

The overall mean fats intake was 25.17 g/d and the highest mean fat intake was found inhigher income families. There difference (P > .05) was not significant for all SES groups (Table 2). FAO, (2003) reported a rise in oil per capita consumption of edible oil over the last eleven years by as much as 30% in rural.

Vegetables (GLV and Other):

Similar to pulses, the same green leafy vegetables, other vegetables are not consumed by any of the families daily rather different vegetables are consumed once or twice in a week. Spinach, cabbage, coriander leaves and fenugreek leaves were commonly consumed leafy vegetables by majority of the families. In other vegetables the commonly consumed were bottle gourd, ridge gourd, brinjal, ladies finger, green peas and cauliflower. The Table 1 shows that the intake of leafy vegetables were only by the LIG, it was 3.88 g/d whereas MIGand HIG families were not consuming them. The overall mean intake for leafy vegetables were only 1.29 g/d/CU (Table 2).

As per the National Nutrition Monitoring Bureau (NNMB, 2002) surveys, rural communities are subsisting on inadequate diets, both in terms of quality and quantity leading to protein, energy and micronutrient malnutrition. The time trends (NNMB, 1999) also show that the mean intake of protective foods such as pulses and legumes and non-leafy vegetables continues to be low and was below the recommended dietary intakes (RDI) for Indians (ICMR, 1981), while the consumption of green leafy vegetables (GLV), a rich source of vitamins and minerals was grossly deficient during the three points of time that is 1975 - 1979, 1988 - 9090 and 1996 -1997. This was reflected in the median intakes of micronutrients like iron, vitamin A and folic acid, which were grossly deficient in the diet of the rural community. This was also reflected on nutritional status of the rural community as per NCHS standards (Hamill *et al.*, 1979).

Roots and tubers:

In roots and tubers, onion, garlic and ginger were reported to be consumed daily 20-40 per cent of the families. Consumption of potato was reported by more than 50 per cent of the families on weekly basis, while carrot and radish were being consumed on monthly basis by majority of the families in the season. Similar to cereals and pulses, the consumption of roots and tubers were found highest in HIG, it was 20.58g/d. The difference was significantly higher (P > .05) in HIGfollowed by MIG (9.37 g/d) and LIG (9.05 g/d). The overall intake for all three socioeconomic groups were 13.01g/d/CU.

Fruits:

Intake of leafy vegetables and fruits was very poor in study area irrespective of socioeconomic groups. In fruits ripe tomato and mango was consumed weekly by the families. Fruits commonly consumed once or twice a month were banana, papaya, guava, musk melon, water melon and oranges.

Similar to leafy vegetables, fruit and sugar not consumed by MIG and HIG whereas in LIG, it was 57.43 g/d and overall mean fruits intake of socioeconomic group was19.14 g/d.

Consumption of foods such as fruit that provide vitamins and micronutrients is fairly low, even in the diets of the higher-income classes. Fruit consumption is barely above the ICMR norm in any expenditure class, with the exception of the highest class, constituting 5 per cent of the population. Consequently, 95 per cent of the people have diets that are lacking in fruit. Impact of globalization on the food consumption of urban India. (Swarna , 2002).

Milk and milk products:

Milk was consumed by more than 80 per cent of the families and butter milk by 70 per cent families daily. Milk and milk products seems to be available in the area and is within reach of families as its intake was adequate by the families under study. The intake of milk and milk products of all socioeconomic groups were increased. Its intake was found highest in high income groups (528.98ml/d) followed by middle (437.28 ml/d) and lower (343.60 ml/d) income groups. Statistical analysis did not show significant difference for all three SES groups. The percentage of households reporting milk consumption has grown in both rural and urban areas between 1993-94 and 2004-05 by 5 percentage points – 66% to 71% in rural areas and 80% to 85% in urban areas (NFHS-3):(*http://mohfw.nic.in/nfhsfactsheet.htm*).

Sugar and jaggery:

Sugar was consumed daily by 100 per cent of the families. Data revealed that consumption of type of food groups did not varying much with socioeconomic profile of families except the milk and milk products. Frequency of consuming rice in cereals, gingerly seeds in oilseeds and few fruits were more among higher socioeconomic families. This study suggest that diet is lacking in quantity and quality (Table 2).

Dietary adequacy :

Per cent adequacy to balance diet:

Consumption of food groups were calculated by per cent adequacy to balance diet.

Cereal:

Table 3 shows that cereal intake to per cent RDA for all socioeconomic groups were 68.71 per cent. The highest per cent of cereal intake was found (P>0.05) in higher income group and lowest was in lower income group. More recently, Rao, 2000 (ibid.) has shown that the decline in cereal consumption was greater in the rural areas.

Pulses:

The pulses intake was less than 50 per cent to RDA for both lower and middle groups, it was comparatively above in higher group. Overall pulse consumption for three socio economic group were only 45.55 per cent. Between 1972 and 2001, there was a substantial increase in the proportion of expenditure spent on pulses in the lowest income group, but expenditure on pulses remained relatively unaltered in the middle and highest income groups. In spite of increased expenditure, household consumption of pulses declined in all income groups and in both urban and rural areas (Kennedy *et al.*, 2003).

Sugars and jaggery:

Per cent intake of sugars and jaggeryfor three socioeconomic groups were between 55- 70 per cent. The highest per cent of sugar was found in middle income group and overall was 62.05 per cent. The fat intake was above than 100% of RDA among MIG and LIG. The overall consumption of fat was 127.98 per cent (Table 3).

Table 3 : Per cent Adequacy to balance diet of food at Household Level /CU/ / day of rural families

Family details		Cereals	Pulses	Sugar & Jaggery	Fats & Oils	Leafy Veg.	Root & Tubers	Other Veg.	Fruits	Milk & Products	Other Foods
LIG	Mean	268.69	21.45	14.10	16.98	3.88	9.05	106.75	57.43	343.60	0.27
(N 30)	SD	75.37	15.23	9.55	11.61	11.56	12.57	67.18	166.42	244.53	1.48
	SE	13.81	2.78	1.76	2.12	2.11	2.29	12.28	30.42	44.91	0.27
MIG	Mean	274.77	26.48	15.92	24.61	0	9.37	99.71	0	437.28	0
(N 30)	SD	102.50	23.38	12.30	9.49	0	14.75	56.74	0	285.87	0
	SE	18.72	4.27	2.18	1.73	0	2.69	10.36	0	52.28	0
HIG	Mean	313.37	32.62	14.97	33.88	0	20.58	120.72	0	528.92	1.08
(N 30)	SD	103.04	29.86	6.41	11.46	0	21.55	59.84	0	268.50	5.96
	SE	18.83	5.45	1.1719	2.09	0	3.94	10.94	0	49.08	1.09
Overall	Mean	285.79	26.86	15.22	25.17	1.29	13.01	109.12	19.14	437.01	0.45
(N 90)	SD	95.54	23.77	9.54	12.82	6.85	17.40	61.33	98.82	274.85	3.54
	SE	10.07	2.50	1.00	1.35	0.72	1.83	6.47	10.42	28.99	0.37

Leafy and other vegetables, roots and tubers:

Per cent adequacy of leafy vegetables, roots and tubers were very low than RDA. It was only 1.30 and 6.68 per cent for leafy and roots and tubers for three socioeconomic group whereas for other vegetables it was above than 100 % to balance diet. The overall adequacy of other vegetables were 109.75 per cent.

Fruits:

Fruits are totally negligible in the diet by MIG and HIG family whereas it was 57.44 per cent among LIG family.

Milk and milk products:

Milk and milk products consumption in three socioeconomic group were above than RDA. The difference was not significant (P>0.05)for all SES families. Overall adequacy of milk and milk products were 147.49 per cent (Table 3).Data from the NSSO 2000 survey show that middle and upper income groups spent more on milk and animal products, so their protein intakes were not adversely affected by the reduction in pulses. Pulses are still the major source of protein in the lowest income group. In order to ensure adequate protein intake for this group (Kennedy *et al.,* 2003).

Intake of nturients :

The mean intake of energy by LIG families was 1301 kcal, MIG was 1453 kcal and

HIG was 1818 kcal/d/CU. The overall mean energy intake was 1485 kcal /d by the study families. The mean overall intake of protein of three socioeconomic groups were 47.13g/d. The highest protein intake was obtained in higher income group it was 54.71g/d. The mean intake of carbohydrate was found almost same for LIG and HIG families it was 264g/d. The mean fat intake of rural families were found highest in HIG families, it was 60.34g/d followed by MIG and LIG families. The overall mean fat intake was 45.62g /d by three SES families. The mean intake of β carotene by LIG families was 126.96µg/d, MIG was 159.28 µg/dand HIG was 227.12µg/d. The overall mean intake ofâ carotenewas 167.64µg/d by the study families. The mean intake of vitamin C content was found almost same in all three SES families. The overall mean vitamin C intake was 33.21 mg/d by the families. The mean intake of iron by LIG families was 16 mg, MIG was 16.25 and HIG was 22.24 mg/d/CU. The overall mean iron intake was 17.41 /d by the study families. The mean overall intake of calcium of three socioeconomic groups were 492.45 mg/d. The highest calcium intake was obtained in higher income group followed by MIG and LIG families. The mean intake of zinc by LIG families was 10.51 µg/d, MIG was 8.28µg/d and HIG was 10.67 µg/d /CU. The overall mean iron intake was 8.87µg/d by the study families. The above results showed that there were no difference (P>0.05) found in almost all the nutrients but when compared with each other HIG found slightly higher amount as compared to LIG and MIG (Table 4).

Table 4 : Intake of nutrients by rural households (g / day/CU)

Family details		CU of family	Energy (Kcal)	Protein (g)	CHO (g)	Fat (g)	β carotene (µ g)	Vitamin C (mg)	Iron (mg)	Calcium (mg)	Zinc (µ g)
LIG	Mean	3.87	1301.35	43.30	264.34	32.19	126.96	33.72	16.00	457.45	10.51
(N= 30)	SD	1.80	331.33	7.84	246.90	11.53	53.00	22.82	9.47	97.28	15.01
	SE	0.31	60.57	1.43	45.14	2.11	9.69	4.17	1.73	17.78	2.74
MIG	Mean	5.12	1453.44	46.69	254.11	46.42	159.28	30.57	16.25	465.71	8.28
(N= 30)	SD	1.98	403.44	13.91	133.52	31.25	65.70	21.37	6.56	157.68	5.86
	SE	0.36	73.76	2.54	24.41	5.71	12.01	3.91	1.20	28.83	1.07
HIG	Mean	4.84	1818.27	54.71	264.51	60.34	227.12	36.94	22.24	579.63	10.67
(N= 30)	SD	1.99	544.51	11.96	62.32	44.89	83.07	21.26	13.22	192.08	13.96
	SE	0.36	99.54	2.19	11.39	8.21	15.19	3.89	2.42	35.11	2.55
Overall	Mean	4.60	1485.37	47.13	255.91	45.62	167.54	33.21	17.41	492.45	8.87
(N= 90)	SD	1.96	516.00	13.66	166.49	34.22	81.68	21.90	10.00	171.59	9.37
	SE	0.20	54.43	1.44	17.56	3.61	8.62	2.31	1.06	18.10	0.99

Nutrient adequacy :

The per cent energy by LIG and MIG families was 56.09 kcal and 62.65 kcal, respectively. The overall energy was 65.70 kcal per cent by the study families. The highest per cent adequacy was found in high income group which was 78.37 kcal/day/CU.Per cent adequacy of protein was found above 70 per cent for all SES groups. The highest per cent adequacy of protein was found in high income (P>0.05) groups which was 91.19 g followed by middle and lower income groups and overall was 80.39 per cent.Statistical analysis did not show significant difference in all SES families. The per cent adequacy of carbohydrate was found

above 70 per cent of the RDA for all SES groups. The overall per cent adequacy of carbohydrate for all SES groups were found 75 per cent. Table 4 shows that the per cent adequacy of fat for LIG, MIG and HIG was found above the recommended dietary allowances. The fat of high income families were found 241.35 per cent of the RDA followed by MIG and LIG respectively (Table 5).

Per cent adequacy of vitamin C was found above 75 per cent of the RDA. The highest per cent adequacy of vitamin C was found in HIG (P>0.05) followed by LIG (84.30 g) and MIG (76.42 g), respectively. Per cent adequacy of calcium was found above 75 per cent of the RDA. The highest per cent adequacy of calcium was found in HIG (96.60 mg) followed by MIG (77.62 mg) and LIG (76.24 mg) respectively. The overall adequacy of calcium was found above 80 per cent.The intake of â carotene was only 3 per cent of RDA as the diet was lacking in fruits and leafy vegetables.The iron intake was 90.06 per cent per consumption unit of families. The adequacy of per cent iron was found above the RDA for high income groups which was 130.83 µg followed by MIG and LIG.

Adequacy of nutrients was observed that Diet of rural families was less than RDA among all the nutrients except fat only. However intake was better in HIG families and lowest in LIG families. Adequacy of Zinc for all SES groups were above 80 per cent of the RDA. The lowest adequacy of zinc was 69.03 per cent for MIG and highest was 88.89 per cent for high income families (Table 5).

Table 5 : Per cent nutrient adequacy to Recommended Dietary Allowances/CU/day

Family Details (Sed. Wor.)		Consu mption unit	Per cent Ade. of energy	Per cent Ade. of protein	Per cent Ade. of CHO	Perc ent Ade. of Fat	Per cent Ade. of β carotene	Per cent Ade. ofVit. C	Per cent Ade. of Iron	Per cent Ade. of Calcium	Per cent Ade. of Zinc (µ g)
LIG	Mean	3.86	56.09	72.17	75.96	128.77	2.65	84.30	94.14	76.24	87.60
(N= 30)	SD	1.74	14.28	13.06	70.95	46.12	1.10	57.06	55.70	16.21	125.11
	SE	0.32	2.61	2.39	12.97	8.43	0.20	10.43	10.18	2.96	22.87
MIG	Mean	4.93	62.65	77.81	73.02	185.68	3.32	76.42	95.59	77.62	69.03
(N= 30)	SD	1.94	17.39	23.18	38.37	125.01	1.37	53.43	38.57	26.28	48.80
	SE	0.36	3.18	4.24	7.01	22.85	0.25	9.77	7.05	4.80	8.92
HIG	Mean	4.84	78.37	91.19	76.01	241.35	4.73	92.35	130.83	96.60	88.89
(N= 30)	SD	1.99	23.47	19.93	17.91	179.56	1.73	53.15	77.77	32.01	116.36
	SE	0.36	4.29	3.64	3.27	32.83	0.32	9.72	14.22	5.85	21.27
Overall(	Mean	1.04	65.70	80.39	75.0	185.27	3.57	84.36	106.85	83.49	81.36
N= 90)	SD	0.08	20.80	20.60	47.18	135.74	1.65	54.35	61.30	22.05	102.18
	SE	0.01	2.19	2.17	4.98	14.32	0.17	5.73	6.47	2.85	10.77

Conclusion :

The study thus reveal that there are serious gaps in nutrition statistics, and even the most basic nutrition trends are far from clear. There is a gross lake in quality and quantity of diet indicating a gap in food and nutrition security. The results indicated that all food groups were in access and within the reach of rural families. The intake of food and nutrition among socio-economic groups were found highest in high income group whereas lowest in

low income groups and when compared with RDA it was found less than RDA which was not adequate for the proper growth anddevelopment. Data revealed that consumption of type of food groups did not varying much with socioeconomic profile of families except the milk and milk products. So there is a need to organize an awareness programme to educate the rural households for their future health.

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Abbreviation :

CU – Consumption Unit
HIG – High Income Group
MIG – Middle Income Group
LIG – Low Income Group
SES – Socio-Economic Status

REFERENCES

Benson, T. (2004). Africa's food and nutrition security situation: Where are we and how did we get there? International Food Policy Research Institute. 2020 Discussion Paper, No. 37. Washington, DC, USA.

FAO/WFP/IFAD. (2012).The State of food insecurity in the world: economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition. Rome: Food and Agriculture Organization; p. 61. [PMC free article] [PubMed]

Food and Agriculture Organisation. (2003). Food security: concepts and measurement. Food and Agriculture Organisation. Trade reforms and food security: conceptualizing the links. Rome: Food and Agriculture Organisation, 25-34.,retrived from (*http://www.fao.org/docrep/005/y4671e/y4671e06.htm*).

Gopalan, C., Rama, B.V. and Balasubramaniam, S.C. *et al.* (1994). Nutritive value of Indian foods. Revised and updated by Rao, B.S.N., Deoshthale, Y.G..Pant, K.C.,et al. National Institute of Nutrition. ICMR, Hyderabaad.

Grebmer, K.V., Ruel, M.T., Menon, P., Nestorova, B., Olofinbiyi, T., Fritschel, H. *et al.* (2010). Washington, DC: *International Food Policy Research Institute*; Global Hunger Index. The challenge of hunger: focus on the crisis of child undernutrition; p. 17.

Gross, R. (2002). Food and Nutrition Security in Poverty Alleviation: Concepts, Strategies, and Experiences at the German Agency for Technical Cooperation. *Asia Pacific J. Clinical Nutrition,* **11** (Suppl): S341-S347.

Haddad, L.J., Peña, C., Nishida, C., Quisumbing, A.R. and Slack, A.T. (1996) Food security and nutrition implications of intrahousehold bias: a review of literature. Washington, DC: International Food Policy Research Institute; p. 65. (FCND discussion paper no. 19).

Hamill, P.V.V., Drizd, T.A., Johnson, C.L., Reed, R.B., Roche, A.F., Moore, W.M., (1979). Physical

Growth: National Centre for Health and Statistics Percentiles. *American J. Clinical Nutrition*, **32**: 607-629.

Huet, C., Roso, R. and Egeland, G. (2012). The Prevalence of food insecurity is high and the diet quality poor in Inuit communities. *Nutrition J.,* **142** (20): 541–47.

Jama, P.P. (2002). A healthy diet. *JAMA*, **283**: 2198-000.

Kaur, G. (2014). A tool for Dietary Assessment and Planning. Diet Cal

Kennedy, G., Nantel, G., and Shetty, P. (2003). Nutrition Planning, Assessment and Evaluation Service, Food and Agriculture Organization of the United Nations.Assessment of the double burden of malnutrition in six case study countries.Retrieved fromhttp*://www.fao.org/docrep/009/a0442e/a0442e03.htm#bm03.*

Life Sciences Research Office (1990). Federation of American Societies for Experimental Biology. *Journal of Nutrition* 120S: 1559-600.

Miller, B.D.,(1997).Social class, gender and intrahousehold food allocations to children in South Asia. SocSciMed.; 44:1685–95. [PubMed] retrieved from *http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4216959/*

Mukherjee, A. (2010). Food insecurities faced by women and girl children Bogor: CAPSA-ESCAP, (Occasional CAPSA paper no. 2).[16] Nagataab, J., Magerengec, R., Youngd, S., Ogutac, S., Weisere, S., Cohenf, C., (2012). Social determinants, lived experiences, and consequences of household food insecurity among persons living with HIV/AIDS on the shore of Lake Victoria, Kenya. AIDS Care-Psy and Socio-Med Asp of AIDS/HIV, **24** (6): 728-36.05.08.2015.

Nalty, C., Sharkey, J. and Dean, W. (2013). Children's reporting of food insecurity in predominately food insecure households in Texas border colonias. *Nutrition J.*, **12** (15) : 1-9.

National Family Health Survey (NFHS-3):retrieved fromhttp://mohfw.nic.in/nfhsfactsheet.htm.

National Nutrition Monitoring Bureau (NNMB) (2002). Diet and nutritional status of rural population Report No.21.National Institute of Nutrition (Indian Council of Medical Research), Hyderabad, India.

National Nutrition Monitoring Bureau (NNMB) (1999). Repeat Surveys Report No.18.National Institute of Nutrition (Indian Council of Medical Research), Hyderabad, India.

Ogunniy, L.T., Ajao, A.O., Oladejo, J.A., (2012). Food consumption pattern in Ogbomoso Metropolis of Oyo State Nigeria. JASR, 12 (1): 74-83.

Radhakrishna, R., and Ravi, C. (1992). Effects of Growth, Relative Price and Preference on Food and Nutrition. *Indian Economic Review*, **27** (Special Number) : 303-323.

Rao, C.H.H., (2000). Declining Demand for Foodgrains in Rural India: Causes and Implications", *Economic & Political Weekly*, January 2.

Sean, M., Lambert, M., O'Loughlin, J., Gray-Donald, K., (2012). Household income, food insecurity and nutrition in Canadian Youth. *Canadian J. Public Health*, **103** (2): 94-99.

SwarnaSadasivam Vepa1, 2002. Globalization of food systems in developing countries: impact on food security and nutrition. *215-230.*Retrieved from*http://www.fao.org/3/a-y5736e/y5736e02.pdf)* last accessed on date 17.8.15.

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