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ARTICLES

Rural - Urban Divide in Diet Diversity and Nutritional Security: Some Insights from Karnataka State

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ABSTRACT

The study has assessed the status of nutrient intake and dietary habits across rural and urban households of Karnataka by collecting primary data from 160 rural and urban households using averaged two days 24 hours recall method from February to April during the year 2016. The study has found that most of the households were nutritionally insecure (80 per cent) and on an average, the intake of both macronutrients like energy, protein and fat and micronutrients such as β-carotene, niacin and folic acid was lower than the recommended dietary allowance (RDA). The mean daily per capita energy intake was higher in the rural (2163.13 kcal) than the urban (2003.75 kcal) households. A high degree of inequality exists in food consumption expenditure between low and high-income groups. The regression results have indicated that, age, education, production diversity, income and food expenditure of the households have a positive and significant influence and market distance has a negative and significant influence on the dietary diversity of households. The major policy options suggested are: distributing subsidised nutritive food commodities, milch animals, imparting training on kitchen garden practices, generating awareness about nutrition, etc. to improve nutritional security of the households.

Keywords: Nutritional security, Dietary diversity, Lorenz curve, Karnataka

JEL: I12, R0, E2, R2, D63

I
INTRODUCTION

Ensuring food security is an issue of great importance for Asian countries including India. Currently, India represents one-sixth of the world's population and it will surpass China by 2050 with the population of 1.70 billion (The Hindu, 2015). Although India has achieved food grain production of 253 million tonnes (MT) during the year 2015-16, it has to produce additionally 85 MT of food grains by 2020 to meet the demand of growing population (Government of India, 2015). Nearly two billion people are food insecure and six million children die of hunger every year or 17,000 every day in the world (FAO, 2012). In India, the situation is far more pathetic; about 17.5 per cent (217 million) of the population is under-nourished and the country is ranked 63rd out of 69 countries in Global Hunger Index (IFPRI, 2013). The proportion of chronically hungry households[1] at the all-India level was about 0.5 per cent in the rural areas and 0.1 per cent in the urban areas (NSSO, 2014). Occurrence of underweight in children less than five years is also alarming with 40.2 per cent, of which, India ranked second

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highest prevalence in the world (IFPRI, 2012). The condition of women is also very poor; approximately 36 per cent of Indian women of childbearing age are underweight, compared with only 16 per cent in 23 sub-Saharan African countries (Deaton and Dreze, 2009). In particular to Karnataka state is one of the emerging economies of the country and it is the seventh largest gross domestic product (GDP) producing state in India but the state has failed to achieve similar drive in human development front. In Karnataka state during 2005-06 42 per cent of children under three years of age were chronically malnourished which remained unchanged from 1998-99 period and anaemia among women aged 15-49 years was higher in 2005-06 (52 per cent) as compared to 1998-99 (42 per cent) (NFHS III, 2005-06).

The dietary habits of people have substantial implications on the quality of life and nutritional security. Due to changes in dietary patterns, the demand for fruits, vegetables, dairy, meat, poultry and fisheries has been increased considerably, which warranted crop diversification to meet the changing food demand for better nutrition. Diets with greater variety of foods or food groups are associated with greater energy and nutrient intake (Kant, 2004). Therefore, measuring dietary diversity (i.e. the number of different types of food items included in a food basket of the household) is important to assess the diet quality or the extent to which nutritional needs of the households are being met (FAO, 1996). It helps in understanding the household dietary pattern and diversity helps to analyse the status of food and nutritional security of the households (Taruvinga *et al*., 2013; Headey and Ecker, 2013). The dietary diversity of people in a region is determined by a variety of factors including production diversity (Sibhatu *et al*., 2015), income/expenditure levels of the households (Drescher *et al*., 2009) and the demographic and socio-economic characteristics of the households. The rising per capita household income and changes in the prices of food commodities tend to induce greater changes in the composition of food consumption. To have food security and be adequately nurtured, it is necessary to understand what constitutes an appropriate diet for the healthy condition as well as to make good food choices. Developing policies and interventions to increase nutritional security therefore requires an understanding of each of these factors, their inter-relationships and their relevance to particular groups of people. Therefore, this paper has attempted to study the nutritional status and dietary diversity of households in Karnataka state with the following objectives: (i) to assess the dietary pattern and nutrient intake across different income groups, (ii) to examine the expenditure pattern on food items and (iii) to analyse the factors determining the dietary diversity of the households.

II

DATA AND METHODOLOGY

Although the National Sample Survey Organisation (NSSO) conducts survey on household consumer expenditure on food and non-food commodities over one lakh samples across India once in every five years (quinquennially) from 1972-73, this data was not used in this study for the following reasons: (i) data on consumer survey were

not available for the year 2015-16, (ii) sample size was not enough to explain the nutritional and dietary pattern across different income categories, (iii) data on dietary diversity determinants such as access to public distribution system (PDS), market distance, farm size and production diversity[2] were not available. Therefore, the present study used cross-sectional data to examine the rural-urban divide in dietary diversification and nutritional status in Karnataka state because of significant level of malnutrition prevalence in the state.

In order to study rural-urban difference in the consumption pattern, multi-stage sampling procedure was followed for selecting the households. In the first stage, Vijayapura district was selected purposively due to more prevalence of malnutrition and underweight in children below five years (73.10 per cent) and child anemia (69.30 per cent) (Achiro, 2015) and it falls under the lowest income (Rs. 45,912) category of the state (Government of Karnataka, 2015). At the second stage, one village was selected randomly from each of the five taluks of Vijayapura district. Finally, 16 households were selected randomly from each selected village making 80 rural households. For selecting urban households, taluk headquarter was chosen and 16 households were selected randomly from each taluk, constituting a total of 80 urban households thus constituting a total sample size of 160 households. The selected households were categorised using cumulative frequency method into four income groups based on annual per capita household income such as poor, low, middle and high income group households. The cross sectional data on household size, age, education, occupation and general information were collected through well structured and pre-tested questionnaire by personal interview method from February to April during the year 2016. The menu and quantity of the food prepared, quantity of food consumed by each individual and related details were assessed by 24-hour recall[3] (Fiedler *et al*., 2013; Foster *et al*., 2014; Castell *et al*., 2015), which is a retrospective method of recent food intake. The study not only included foods prepared and consumed within the household, but also those that were consumed outside (e.g. at restaurants, social functions and children's mid-day meal programmes) including processed food items and beverages. The quantity served to the guest has been excluded while estimating the nutrient intake (Gebhardt *et al*., 2002). Seven days or more of data are usually needed to get accurate estimates of usual intake from 24-hour dietary recalls. To overcome this limitation, the participants who reported that they ate more or less food than their usual intake on the day of the dietary assessment and those with implausible dietary intake were excluded; an average of two dietary recalls, i.e., three days gap between the two recall period was used (Basiotis *et al*., 1987).

Method of Estimation

(a) *Calculation of Nutrient Intake from Different Food Items by Households*

To assess the dietary pattern and nutrient intake, consumption of each food item was recorded using 24 hours recall method. The quantum of nutrient and calorie intake by the household were calculated by multiplying total consumption of a particular

food item with conversion factors and then it was compared with the Recommended Dietary Allowance (RDA) as suggested by Indian Council of Medical Research (ICMR, 2010 and Gopalan *et al*., 1991).

Nutrient intake$_i$= Quantity of food item X ICMR Conversion factor

where, i= 1 to n, which refers energy, carbohydrates, protein, fat, calcium, riboflavin, iron, thiamin, β-carotene, niacin and folic acid.

The nutritional security status of the sample households was analysed in terms of "Security Ratio", which is computed by ratio of energy intake to RDA for energy as recommended by ICMR, 2010. If this ratio was greater than or equal to one, then the households were categorised as "nutritionally secure", while it was less than one was categorised as "nutritionally insecure". The insecured households were further classified into "mildly insecure", "moderately insecure" and "severely insecure" based on value of the security ratio, which is falling in the range of 0.80 to 0.99, 0.50 to 0.79 and less than 0.50, respectively (Kiresur and Raghavendra, 2015; Nazni and Vimala, 2010).

(b) *Examining the Food Expenditure Pattern of Households*

In order to examine the food expenditure pattern and inequality in food expenditure across rural and urban households, tabular analysis, Lorenz curve and Gini Co-efficient (GC) were employed. A Gini coefficient of '0' indicates perfect food expenditure equality, while a '1' indicates perfect food expenditure inequality among households.

(c) *Measurement of Household Dietary Diversity*

Simpson Index of Dietary Diversity (SD) was used to measure the household dietary diversity (Katanoda *et al*., 2006; Shinoj *et al*., 2015). According to FAO, 2013 guidelines, food consumed outside the house were excluded from the household dietary diversity. It is calculated in terms of number as well as distribution of different food items in the consumption basket of the households and the formula is given as:

$$SD = 1 - \sum_{i=1}^{n} S_i^2$$

where, S_i is the share of i-th food item in the total amount of food consumed by the household members. The index is bound between 0 and 1, whose value approximates 1 which indicates that the number of food items (n) increases and 0 indicates an individual consumes only few or less of food items. The scores of SD were obtained for individual households belonging to different income categories.

(d) *Determinants of Dietary Diversity*

To further understand the variation in diversity score due to influence of various determinants across rural and urban households, the following multiple linear regression model was used (Shinoj *et al.,* 2015)

$$SD_i = \beta_0 + \beta_1 FH + \beta_2 GEN + \beta_3 PDS + \beta_4 HHSIZE + \beta_5 AGE + \beta_6 EDU + \beta_7 MKTDIST + \beta_8 LSTOCK + \beta_9 FSIZE + \beta_{10} PD + \beta_{11} ONFARM + \beta_{12} NONFARM + \beta_{13} FOODEXP + u_i$$

where, SD_i is Simpson Index of Dietary diversity (SD) which is measured as the share of i-th food item in the total amount of food consumed by the household members; FH, GEN,PDS and LSTOCK are dummy variables respectively for food habits of the household, gender of the head, access of PDS and possession of livestock (1 for vegetarian / male/PDS consumer /rearing livestock; 0 for otherwise); HHSIZE-Household size which indicates the number of family members; AGE represents age of household head (in years); EDU is a Education status of the household head measured in number of years of formal education; MKTDIST represents distance of the household from the market; FSIZE is operated landholding by households (hectares); PD represents production diversity which measures the number of crops produced in the farm land in a year; ONFARM and NONFARM represents monthly per capita farm income earned from on-farm activities and non-farm activities, respectively (in Rs.) and FOODEXP is monthly per capita food expenditure of household (in Rs.).

III

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Households

The socio-economic characteristics of households are given in Table 1. The age of the household heads ranged from 40 to 60 years. The type of activity of family members also determines the energy requirements. The activities are classified as sedentary (teacher, tailor, barber, peon, postman, retired personnel, etc.), moderate (farmer, farm and non-farm labour, rural artisans, etc.) and heavy (stone cutter, wood cutter, etc.) based on the occupation of an individual. Most of the households belong to the category of moderately active in both rural (73.75 per cent) and urban areas (51.25 per cent). Therefore, the nutrient intake was calculated using the conversion factors given for moderately active person in this study. The households size were larger in rural (5.21) than urban (4.36). Similarly, the computed consumption unit was high in rural areas (4.47) as compared to urban areas (4.28). Food requirements of the households besides home grown foods were obtained either from the open market or the PDS. PDS was the major source of cereals for poor households, which was high in

rural households (38.75 per cent) than the urban households (30 per cent). It was observed that male-headed households were most prevalent (94 per cent) and the remaining six per cent were female. The literacy rate was high in urban areas (87.50 per cent) as compared to rural areas (79.23 per cent). Since most of the households were literate, it is easy to educate them about the nutrition. Among the literate, the average level of education of most the household heads were 11-12 years of formal education. With respect to food habit, most households were vegetarian, which was higher in rural area (68.75 per cent) as compared to urban area (52.50 per cent). The average distance of consumer market for food items was 4.30 kms in rural area and 1.95 kms in urban area. Providing easy and regular market access for food products could contribute to higher dietary diversity and household nutrition (Sibhatu *et al*., 2015). It was observed that the rearing livestock was practiced predominantly by rural households (65 per cent) as compared to urban households (5 per cent) with an average herd size of 1.86. The average farm size was larger in rural (2.37 ha) than in urban areas (1.98 ha). In terms of the production diversity in the study area it was observed that, around 3 to 6 crops were cultivated by the sample households in the year.

TABLE 1.SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLDS

Particulars (1)		Rural (2)	Urban (3)
Age of household head (Year)		46.27	39.15
Occupational status (No.)	Sedentary	14	34
		(17.5)	(42.5)
	Moderate	59	41
		(73.75)	(51.25)
	Heavy	7	5
		(8.75)	(6.25)
Household size (No.)		5.21	4.36
Consumption unit (CU)		4.47	4.28
Access to PDS (No.)		31	24
		(38.75)	(30.00)
Vegetarian (No.)		55	42
		(68.75)	(52.50)
Male household head (No.)		75	76
		(93.75)	(95.00)
Literacy rate (per cent)		79.23	87.50
Distance to consumer market (km)		4.30	1.95
Ownership of milking animals (No.)		52	4
		(65.00)	(5.00)
Farm size (ha)		2.37	1.98
Production diversity (No.)		6.53	3.66
Monthly household income (Rs.)		6249	10059
Total no. of households		80	80

Figures in parentheses indicate the percentage to the total.

The major crops were sorghum, wheat, bajra, groundnut, red gram, green gram, sunflower etc., besides vegetables and fruits. Further, it was high in rural areas (6 to 7 crops) as compared to urban areas (3 to 4 crops), since agriculture was the primary

occupation in the rural areas. The average monthly income of a household in urban areas (Rs. 10059) was higher than that in rural areas (Rs. 6249).

Assessment of Household's Dietary Pattern Across Different Income Groups

The dietary habits of the households of a region have substantial implications for the quality of life and nutritional security since it consist of several food items which provides all the required nutrients. Therefore, existing dietary pattern of the households for different food groups across different income groups has been calculated based on 24 hours recall method and it was normalised for the consumption units[4] for each of the households. The results are presented in Table 2.

The mean daily per capita intake of different food items was slightly higher in rural area (729.52g) as compared to urban area (725.88 g). Further it was observed that the quantity of food consumed has proportionately increased with the income level of the households. Cereals are the most economic source of energy constituted 39.91 and 38.41 per cent of the total consumption in rural and urban areas, respectively. Misra *et al., (*2009) also reported the similar findings. Next to the cereals, milk and dairy products from animal sources are an important part of diet in both the rural and urban areas. The average daily intake of these products was 19.76 and 18.81 per cent of the average quantity in rural and urban households respectively. Vegetables were the third major food item, which accounted 16.33 per centto the average total quantity of consumption. The urban households consume more of vegetables as compared to rural households due to the proximity of the sandies and vegetable markets. In general, pulses, oilseeds, sugar and jaggery were consumed more in rural areas whereas edible oil, spices, egg and meat, fruits and nuts were consumed more by urban households. Across the income groups, high-income group consumed more quantity of all food items both in rural (765.62g) and urban (750.17 g) areas respectively, followed by middle, low and poor households except cereals.

The consumption of food items, which contains proteins such as egg and meat and rich in fibers such as fruits and nuts were found to be deficit as compared to RDA. Dietary pattern showed that most of the households are vegetarians and food items rich in micronutrients (vegetables, fruits and nuts, oilseeds and animal products) are generally consumed less frequently. Consumption of monotonous cereals based diet was more prevalent in the study area, which may promote inadequate nutrient intake (Maria *et al.,* 2014).

Nutrient Intake by Households across Different Income Groups

For the estimation of nutrient intake of each household, the information on different food item consumption and food composition is required. From this information, calculation of nutrient intake has been made based on the ICMR, 2010 guidelines, which provide conversion factors to quantify the nutrient intake from the

TABLE 2. CONSUMPTION OF DIFFERENT FOOD COMMODITIES ACROSS DIFFERENT INCOME GROUPS

(g/CU/day)

Food commodities	Rural					Urban				
	Poor	Low	Middle	High	Overall	Poor	Low	Middle	High	Overall
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Cereals	298.34	294.56	289.72	282.10	291.18	286.38	278.68	277.44	272.75	278.81
	(42.58)	(41.20)	(39.32)	(36.85)	(39.91)	(40.37)	(38.87)	(38.17)	(36.36)	(38.41)
Pulses	33.34	34.27	36.41	35.39	34.85	31.43	31.90	31.13	32.81	31.82
	(4.76)	(4.79)	(4.94)	(4.62)	(4.78)	(4.43)	(4.45)	(4.28)	(4.37)	(4.38)
Oil seeds	16.57	18.42	19.58	20.61	18.79	17.58	18.66	18.90	22.02	19.29
	(2.36)	(2.58)	(2.66)	(2.69)	(2.58)	(2.48)	(2.60)	(2.60)	(2.94)	(2.66)
Edible oil	25.70	28.24	30.33	36.53	30.20	28.30	33.15	37.13	41.22	34.95
	(3.67)	(3.95)	(4.12)	(4.77)	(4.14)	(3.99)	(4.62)	(5.11)	(5.50)	(4.82)
Sugar and sugar products	34.11	35.26	38.22	42.60	37.55	34.85	35.14	35.40	34.51	34.97
	(4.87)	(4.93)	(5.19)	(5.56)	(5.15)	(4.91)	(4.90)	(4.87)	(4.60)	(4.82)
Spices	8.82	8.66	9.56	10.25	9.32	9.53	11.49	12.38	14.82	12.05
	(1.26)	(1.21)	(1.30)	(1.34)	(1.28)	(1.34)	(1.60)	(1.70)	(1.98)	(1.66)
Milk and milk products	134.11	136.99	145.95	159.54	144.15	133.34	134.07	137.11	141.51	136.51
	(19.14)	(19.16)	(19.81)	(20.84)	(19.76)	(18.80)	(18.70)	(18.86)	(18.86)	(18.81)
Egg, fish and meat	14.85	12.20	11.87	9.42	12.08	15.36	19.23	13.80	15.75	16.03
	(2.12)	(1.71)	(1.61)	(1.23)	(1.66)	(2.17)	(2.68)	(1.90)	(2.10)	(2.21)
Vegetables	106.10	113.72	117.71	127.12	116.16	115.71	116.61	118.28	123.52	118.53
	(15.14)	(15.91)	(15.97)	(16.60)	(15.92)	(16.31)	(16.26)	(16.27)	(16.47)	(16.33)
Fruits and nuts	28.71	32.63	37.50	42.07	35.23	36.91	38.09	45.38	51.26	42.91
	(4.10)	(4.56)	(5.09)	(5.49)	(4.83)	(5.20)	(5.31)	(6.24)	(6.83)	(5.91)
Average daily intake of food items	700.65	714.95	736.87	765.62	729.52	709.39	717.02	726.94	750.17	725.88

Figures in parentheses indicate the percentage share of food item in total quantity food consumed.

different sources of food items. It is useful for developing and implementing effective interventions to improve nutritional status of the households based on the current status of the target group. The level of nutrient intake and its adequacy level were calculated and the results have been presented in Table 3.

The average intake of daily per capita energy in rural and urban area was 2163.13 kcal and 2003.75 kcal respectively, which was 20.76 and 26.60 per cent less than RDA (2730 kcal). Pant, 2002 also reported the chronic energy deficiency due to less dietary diversity in hilly tribal people. Energy intake by rural households was higher than urban households, which may due to more consumption of cereals and milk and milk products by the rural households along with fruits and vegetables. In both rural and urban regions, intake of energy is increasing across income groups. This coincides with the results of Umanath *et al*., (2015), they found that positive income elasticity of energy intake in both rural and urban Karnataka.

TABLE 3. NUTRIENT INTAKE AND ITS NUTRIENT ADEQUACY LEVEL ACROSS DIFFERENT INCOME GROUPS

(CU/day)

Nutrients	Energy intake	Protein	Fat	Carboh-ydrates	Calcium	Iron	β – Carotene	Thiamine	Riboflavin	Niacin	Folic acid
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RDA*	2730 Kcal	60 g	30 g	130.00 g	600 mg	17 mg	4800 mg	1.40 mg	1.60 Mg	18 mg	200 µg
					Rural						
Poor	1603.34	37.81	21.33	219.35	402.33	15.00	389.61	2.03	1.04	11.43	92.17
Low	2134.17	38.19	23.05	212.43	677.59	22.22	1341.32	2.92	1.35	16.82	96.14
Middle	2234.39	43.32	23.87	223.71	731.82	19.69	764.03	3.27	1.55	16.60	101.47
High	2680.62	47.62	28.56	238.23	1166.67	22.71	953.92	3.14	1.68	20.01	126.86
Overall	2163.13	41.74	24.20	223.43	744.60	19.90	862.22	2.84	1.40	16.21	104.16
					Urban						
Poor	1724.64	34.96	23.15	209.37	336.62	16.26	440.86	2.69	1.26	13.21	82.20
Low	1806.00	36.21	23.67	218.11	508.42	19.84	794.09	3.61	1.65	15.40	86.24
Middle	1910.19	43.36	27.55	221.18	572.60	13.21	843.71	2.29	1.44	13.41	109.78
High	2574.19	45.62	31.13	231.27	956.63	18.59	1078.51	2.73	1.82	18.18	128.51
Overall	2003.75	40.04	26.38	219.98	593.57	16.97	789.29	2.83	1.54	15.05	101.68
					Nutrients Surplus(+)/Deficit(-) (per cent)						
Rural	-20.76	-30.44	-19.33	71.87	24.10	17.06	-82.04	102.86	-12.50	-9.94	-47.92
Urban	-26.60	-33.27	-12.08	69.22	-1.07	-0.18	-83.56	102.14	-3.75	-16.39	-49.16

* RDA for moderately active person.

In case of carbohydrates, the average daily intake in both rural and urban regions was 223.43 g / CU and 219.98 g / CU, respectively, which were higher than the RDA. It is found that jowar, bajra and wheat based foods in rural; and rice and wheat based food in urban were the major sources of carbohydrates. The intake of carbohydrate across different income group was more than the recommended level due to easy availability of its sources with cheaper cost. Ravindranath *et al*., (2005) also reported that more intake of carbohydrate sources due to home-grown and more availability in Karnataka state.

Around 24 and 26 grams of fat was consumed by rural and urban consumers, respectively and it was also lower than the RDA level (30 g). The major sources of fat were edible oil, milk, groundnut based food products and butter in both rural and urban regions. The average protein consumption by rural and urban households was 41.74 g and 40.04 g, which was 30.44 and 33.27 per cent lower than the RDA level. The food items like wheat, pulses and milk products were the major sources for protein.

The intake of calcium and iron was found to be inadequate in urban region, while, it was more than RDA level among the rural households. Buffalo milk[5] and leafy vegetables were consumed by the most of the rural households due to buffalo based dairying and more availability of vegetables, which supply the sufficient amount of calcium and iron. The mean daily intake of B-carotene, thiamine, riboflavin, niacin and folic acid were found to be deficit in both rural and urban regions.

The mean daily intake of calcium, iron, thiamine and riboflavin was comparable to the recommended levels, while that of other nutrients, such as energy, β-carotene, niacin and folic acid were abysmally lower than the recommended levels in the sample households. The inadequate intake of these micronutrients was also reported by several studies (Jethi and Chandra, 2013).

In general, it was observed that the current consumption pattern provides less of both macronutrients (except carbohydrates) and micronutrients. It is suggested that, the sample households need to increase the intake of protective foods such as coarse grains, vegetables, fruits, dairy products, egg and meat to correct such inadequacies and get balanced nutrition (Prakruthi and Jamuna, 2013).

Nutritional Security Status of Households

The nutritional status was measured by taking the ratio of actual intake and Recommended Dietary Allowance (RDA) for energy as recommended by ICMR. Accordingly, the frequency of households under different categories of nutritional security status is given in Table 4. The nutritionally secure households were high in urban (20 per cent) as compared to rural areas (17.50 per cent). Most of the rural households fall in the category of moderately insecure (46.25 per cent), whereas, the urban households were mildly insecure (37.50 per cent). In a nutshell, the poor and low income groups were victimized under "nutritionally insecure" due to low purchasing power of high valued nutritious food items and the same was also documented by Kiresur and Raghavendra, 2015.

TABLE 4. NUTRITIONAL SECURITY STATUS OF HOUSEHOLDS

Nutritional security status (1)	Rural (2)	Urban (3)
Secure (>1)	14 (17.50)	16 (20.00)
Mildly insecure (0.50-0.79)	26 (32.50)	30 (37.50)
Moderately Insecure (0.80-0.99)	37 (46.25)	32 (40.00)
Severely insecure (<0.50)	3 (3.75)	2 (2.50)
Total households	80	80

Figures in parentheses indicate percentage to the total.

Food Expenditure Pattern of Households

The composition of consumption expenditure between food and non-food items also reflects the economic well being of the population. Generally, the poor households are expected to spend substantially more on food items as against the non-food items. One expects the proportion of expenditure on food decline with development and economic prosperity of the households. The monthly per capita expenditure on various major food items has been presented in Table 5. It was observed that, the average monthly per capita food expenditure of households in rural and urban areas were Rs. 1742 and Rs. 2454, respectively. Of which, more than 50 and 40 per cent of the total expenditure was incurred for food items in rural and urban

TABLE 5. MONTHLY EXPENDITURE ON MAJOR FOOD ITEMS BY HOUSEHOLDS

(Rs.)

	Rural expenditure					Urban expenditure				
Items	Poor	Low	Middle	High	Overall	Poor	Low	Middle	High	Over all
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Cereals	140	276	257	289	241	125	226	263	261	219
Pulses	85	77	78	133	93	83	80	76	138	94
Oil seeds	37	56	46	77	54	40	53	65	73	58
Edible oils	55	59	88	105	77	61	58	115	111	86
Sugar and jaggery	42	45	45	54	47	37	33	66	60	49
Milk and dairy products	103	198	168	233	176	101	98	246	265	178
Vegetables	97	107	116	113	108	110	119	147	139	129
Fruits and nuts	24	30	67	79	50	36	89	103	219	112
Egg and meat	44	38	36	32	38	46	51	53	55	51
Others	26	27	26	37	29	27	29	43	47	37
Total consumption expenditure(A)*	653 (58.04)	913 (62.62)	927 (48.03)	1152 (46.91)	911 (52.30)	666 (49.15)	836 (47.26)	1177 (40.46)	1368 (36.15)	1012 (41.22)
Total non-food expenditure(B)*	472 (41.96)	545 (37.38)	1003 (51.97)	1304 (53.09)	831 (47.70)	689 (50.85)	933 (52.74)	1732 (59.54)	2416 (63.85)	1443 (58.78)
Total household expenditure (A+B)	1125	1458	1930	2456	1742	1355	1769	2909	3784	2454

*Figures in parentheses indicates percentage to the total household expenditure.

households, respectively. However, expenditure made on food was significantly higher in urban area as compare to rural area. For middle and high-income households, the dietary pattern diversified towards non-cereal, high value commodities (milk and milk products, fruits, vegetables, egg and meat), which accounted for 50-60 per cent of the total food expenditure in both rural and urban areas. As expected, food expenditure as a proportion of total expenditure falls when income of the households increases (Sidhu *et al.*, 2008). The expenditure on cereals ranged between Rs. 140 to Rs. 289 in rural and in urban areas it was Rs. 125 to Rs. 261. Although the poor income households consume more quantity of cereals, they spent less for these items due to

subsidised food items from public distribution system (PDS) in both rural and urban areas. With respect to milk and milk products, high-income households spent more in both rural (Rs. 233) and urban (Rs. 265) areas.

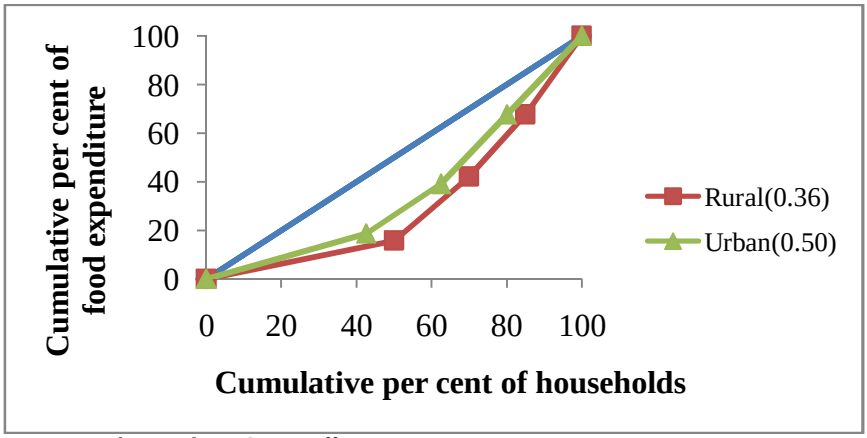
The results of the study indicated that the expenditure on food items was high in urban areas (Rs. 1,012) as compared to rural areas (Rs. 911). Further, the expenditure on fruits and nuts in rural households was less than their urban counterparts due to less availability and more consumption of locally grown seasonal fruits like mango, sapota, guava. This indicates that, the subsistence characteristic of rural households where they have home grown varieties in their consumption basket. The expenditure on egg and meat was also low in rural households due to its less availability, expensive and strict adherence to religious food habits.

Food Expenditure Inequality

Lorenz curve is an effective way of showing inequality of food expenditure between different rural and urban households and which is presented in Figure 1. The examination of food expenditures inequality for rural and urban households indicates that, food expenditure inequality was more in rural areas as compared to urban areas. The points on the Lorenz curve represent that, the bottom 70 per cent of all households have 42 per cent of expenditure on food items in rural areas and 62 per cent households have 39 per cent of expenditure on food items in urban areas. It was further confirmed with the Gini coefficient (given in Figure 1) that, the food expenditure inequality was high in rural households (0.50) than the urban households (0.36). Similar results in many Indian states were documented by Chand, 2007.

Household Dietary Diversity Across Rural and Urban Areas

Dietary diversity in food and nutrient intake is good for reduced prevalence of morbidity and poor nutrition status of population, especially when consumed in



Figures in parentheses indicate Gini co-efficient.

Figure 1. Rural and Urban Food Expenditure Inequality.

adequate amounts. Dietary diversity can serve as a proxy measure for nutritional adequacy (Jones *et al*., 2014). The Simpson Index of Dietary Diversity (SD) score was used to measure the dietary diversity across rural and urban households and the results are presented in the Table 6. On an average, SD score was 0.74 in rural area and 0.79 in urban area. The urban households have more access to consume a wider range of food items as compared to rural households due to the easy and regular market accessibility and also regular and high income of the households. Further, it was observed that there was a positive linear relationship between dietary diversity and household per capita income. It indicates high income households could have more access to diverse food items, thus they have more SD score. The SD score of food groups constituted different food items in rural areas ranged from 0.67 to 0.83 and 0.68 to 0.89 in urban areas, respectively.

TABLE 6. CALCULATED SCORES OF SD ACROSS RURAL AND URBAN AREAS

Income group (1)	Rural (2)	Urban (3)
Poor	0.67	0.68
Low	0.69	0.76
Middle	0.75	0.81
High	0.83	0.89
Overall	0.74	0.79

Factors Influencing the Dietary Diversity of Rural and Urban Households

To study the impact of different factors on dietary diversity, the SD score used as a dependent variable and socio-demographic, ownership of assets and economic factors were used as independent variables. The parametric estimates of dietary diversity with respect to rural and urban households were estimated by using multiple linear regression model and the results are presented in Table 7. The 'F' values ($p<0.1$) for all the three models indicate the overall significance of these models. The value of R square was 85 per cent, 65 per cent and 53 per cent in rural, urban and pooled categories indicate that, the variation in dietary diversity could be adequately explained by the independent variables included in the model.

The impact of the food habit on dietary diversity was significantly negative for urban households which indicate that the vegetarian households would have less choice of food items as compare to non-vegetarian households, thus limiting the nutritional security. Access to PDS was another major determinant, which had positive and statistically significant impact for rural, urban and pooled categories. It clearly indicates that households have more access to subsidised foods under PDS system that enables the households to make more budgetary savings, through which they can spent additional food items. The impact of household size had a positive and significant impact on dietary diversity for all categories of households. If the size of the household increase by one unit, would increase SD score by 0.3320, 0.0738 and 0.0657 in rural, urban and pooled due to change in taste and preferences of

TABLE 7. FACTORS INFLUENCING THE DIETARY DIVERSITY OF HOUSEHOLD IN RURAL AND URBAN AREAS

Variable name	Rural	Urban	Pooled
(1)	(2)	(3)	(4)
Intercept (β_0)	1.3486**	−0.5664*	−0.2878
	(0.0179)	(−1.912)	(−1.093)
Food habit (FH)	−0.0064	−0.0317**	−0.0063
	(2.1750)	(1.3718)	(1.0454)
Access to PDS (PDS)	0.045***	0.095**	0.056**
	(0.3139)	(0.1898)	(0.1639)
Gender of the household head (GEN)	0.015	0.026	0.0126
	(0.6783)	(0.4431)	(0.3766)
Household size (HHSIZE)	0.3320***	0.0738*	0.0657*
	(0.1664)	(0.1253)	(0.0964)
Age of the household head (AGE)	−0.6477***	0.4176***	0.2323**
	(0.0345)	(0.0241)	(0.0179)
Education of household head (EDU)	0.0445*	0.1079***	0.0479***
	(0.0241)	(0.0272)	(0.0222)
Distance to market (MKTDIST)	−0.0051*	−0.0253	−0.0943***
	(0.2144)	(0.1131)	(0.0881)
Ownership of milking animals (LSTOCK)	0.0502***	0.0657	0.0161
	(0.1607)	(0.8522)	(0.5140)
Farm Size (FSIZE)	−0.0523	−0.0089	0.0492
	(0.1663)	(0.0191)	(0.0964)
Production diversity (PD)	0.3381*	0.0434	0.3348***
	(0.2732)	(0.5028)	(0.1869)
Monthly farm income (ONFARM)	0.0386***	0.0038	0.0100
	(0.0023)	(0.0052)	(0.0045)
Monthly non-farm income (NONFARM)	0.0106*	0.0117**	0.0214
	(0.0010)	(0.0041)	(0.0003)
Monthly Food Expenditure (FOODEXP)	0.2742**	0.1904***	0.2132***
	(0.0015)	(0.0014)	(0.0012)
Adjusted R^2	0.85	0.65	0.53
F value	29.94**	15.57**	14.05***

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

individuals of the households (Shinoj *et al.*, 2015). Age and education were the most important factors which were significantly contributed to improve the household nutritional security through experience, better knowledge on different nutritious diets and health (Liu *et al*., 2014; Shinoj *et al*., 2015). The market distance had an adverse impact on dietary diversity of households, which implies that the market distance for rural households limit the food basket and frequency of consumption of different food items (Liu *et al*., 2014; Sibhatu *et al*., 2015). A possession of milch animals and impact diversity had positive impact for rural households. Most of the rural households rearing milch animals and cultivating more crops have significantly contributed to improve their nutritional status as compared to their urban counterparts (Sibhatu *et al*., 2015). A priori, food expenditure had positive impact on diversity which implies that an every rupee spent on food items would increase the dietary diversity by 0.27, 0.19 and 0.21 unit in rural, urban and pooled respectively (Liu *et al*., 2014; Jones *et al*. 2014; Shinoj *et al*., 2015).

IV

CONCLUSIONS AND POLICY RECOMMENDATION

The present study assessed the status of nutrient intake and dietary habits across rural and urban households of Karnataka state. More than half of the households have been found nutritionally insecure due to poor and monotonous consumption of low nutritive cereal and millets based food items and less consumption of high nutritive items such as fruits and nuts, vegetables and animal protein sources. This consumption pattern may not fulfil the daily Recommended Dietary Allowance (RDA) of energy, macronutrients like protein and fat and micronutrients like calcium, β-carotene, niacin and folic acid. Therefore, households need to increase the intake of nutrient rich food items such as vegetables, fruits and milk and dairy products, egg and meat along with their regular consumption to reduce the existing nutrient deficiency. Since, most of the households are vegetarian, necessary efforts such as crop diversification, kitchen garden and rearing milch animals should be intensified to increase the availability of energy and micro nutrient sources like vegetables and dairy based products. Moreover, it gives additional and regular income to the households that reduce the inequality in food consumption expenditure among the households thereby increase the nutritional security.

The dietary diversity in turn has a strong effect on calorie and protein intake. The study also revealed that the urban households consume less diversified foods as compared to rural households. From a policy perspective, it is therefore important to focus interventions on improving dietary diversity and nutrition security with inclusion of more nutritive food items into PDS, mid-day meal schemes, free/subsidised distribution of milch animals to the poor, managing price rise and creating market infrastructure in rural areas will have to be augmented to alleviate malnutrition. Therefore, food and nutritional security can be improved by providing attractive avenues for earning income. The findings from the study imply that there should be targeted policy and program interventions to improve the nutritional status of poor households while effective nutrition communication strategies are necessary to address the undernourishment among households. The limitation of this study is not consideration of seasonality in the consumption. There is further scope for the research.

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NOTES

1. Households which are not getting enough to eat during any month of the year is defined as chronically hungry (FAO, 2009).
2. Production diversity is number of crops grown on household operational holding in year (Sibhatu *et al.*, 2015).
3. The 24 hours recall method is defined as, the individual is asked to provide estimates of the amount of food and drink they have consumed during the previous 24-hour period. This standard methodology was widely adopted by the premier institutions like National Nutrition Monitoring Bureau (NNMB), Hyderabad.

4. Consumption unit (CU), which is standard unit computed to normalise the nutrient intake of different age and sex group households in a family (ICMR, 2010).

5. Calcium content in buffalo milk is 2.1 mg; whereas, it is only 1.2 mg in cow milk. That is why, the level of calcium intake was low among urban households although equal amount of milk consumed.

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