Food and nutritional status of Chakhesang and Pochury tribes of Phek district of Nagaland

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ABSTRACT

Food security of tribal people residing in remote and hilly regions is generally under or over estimated due to few literature or study undertaken. The present article focuses on the household food security status and nutritional status of indigenous people of Phek district of Nagaland, north-east India. For obtaining the objectives a multi-stage random sample survey on rural households was conducted with pre tested structured interview schedule in Phek district during November 2016. Various parameters viz., socio-economic aspects, food basket, weekly consumption of food groups, weekly expenditure on food items etc were collected from principal women member of the sample households. The study found that small family sizes with less than four members were significantly food secure in terms of different food groups. Household monthly income and availability of packed food items in a week time were observed to be critical component in food security of the households. Overall milk availability and consumption was inadequate in the study region.

Keywords: Food security indicators, food possession, household, nutrition gap, tribes.

Introduction

Food and Agriculture Organization (FAO, 1990) defined food security as availability of sufficient quantity of food and sufficient means to purchase it. It comprises of four components: availability, accessibility, utilization and stability (Barrett, 2010).

Phek is the highest altitude district at above 2000m above mean sea level in the state hence colder climate over the year. It is mountainous and hilly region with weak infrastructure, frequent landslides, insurgency, blockades, with far away towns with daily market. About 0.17 million people, mostly belonging to Chakhesang and Pochury Scheduled Tribes of India resides in the district of 2026 sq km of area. The land holding pattern is traditional and unique with community based land holding. The major agriculture food items produced in Phek during 2013-14 were paddy, Maize, Soybean, Sugarcane, Potato, Cabbage, Tapioca, Ginger, Chilli, Colocasia, Pineapple, Orange, Banana, Passion fruit, Kiwi, Papaya, tea and many other horticultural fruits and various millets like Jowar, Barley, small millets *etc*. (Statistical Handbook of Nagaland, (2014) Livestock rearing *viz*., piggery, poultry, rabbit, etc and game meat (traditional hunting) are general feature among the rural households. The villagers had food habit of two meals a day with rice as staple starchy diet along with wild edibles and entomophagy (insect eating) food habits have been documented. The knowledge of local people on nutritional values and medicinal properties of wild edibles (plant products as well as wild animals and birds) and various insects has given direction to eating behaviour of the denizens.

Table 1: Per capita monthly quantity of consumption of cereals, pulses, sugar and onion in rural area of Nagaland (2011-2012)

State	Per capita monthly quantity of consumption (Kg)			
	Cereals	Pulses	Onion	Sugar
Nagaland	13.34	0.22	0.28	0.31
India	11.22	0.63	0.84	0.72

Source: www.indiastat.com

From table 1 it was observed that cereals consumption was higher compared to national average but vice versa in pulses, sugar and onion.

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Table 2: Per capita availability of milk in Nagaland (gram day^{-1})

State	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10
Nagaland	90	96	86	57	67	96
India	233	241	246	252	258	263

Source: www.indiastat.com

Milk production as well as consumption in the state was observed to be critically low (Table 2). Compared to all India level availability of milk, the state figures were abysmally low, however recent years showed considerable growth.

The recent Nagaland Food Security Act (NFSA, 2013) enacted by the state of Nagaland in June 2016 for priority households and Antyodaya Anna Yojana (AAY) beneficiaries show the need of role of government in ensuring food access and distribution (Candel, 2014). Under this Act, each member of target household were entitled for 5 kg of food grains (Rice and wheat) per month at a very nominal rate of Rs. 3/- for rice and Rs. 2/- for wheat. However, NFSA was falling short of food aspiration of people given that pattern of food consumption is shifting towards high protein and vitamin based items. Also such huge programme for subsidized food for priority households costs dearly to taxpayer and prone to leakages and corruption. Public Distribution System for distribution of food grains to priority households have been made biometric based (Aadhar platform) to check pilferage and precise reach to target families.

RESEARCH METHODOLOGY

The research study was conducted in Phek district of Nagaland which is home of Chakhesang and Pochury Scheduled Tribes (ST). Using multi stage sampling technique two blocks were sampled using simple random sampling without replacement, namely Kikruma and Pfutsero block. Four villages *viz.*, Phusachodu and Kikruma (population above 5000) under Kikruma block, Kami and Lekromi (population below 2000) under Pfutsero block was then randomly sampled. Then at last stage, 20 households were selected by systematic sampling from each village. A structured interview schedule was used to get information on household demography, food basket, primary occupation, household income, weekly food possession and consumption, food diversity, storage *etc*.

RESULTS AND DISCUSSION

The food and nutritional status of the households was studied with regard to food possession, consumption expenditure, nutrition intake and dietary recommendation versus nutrition consumption gap analysis.

Socio-economic and demography

The socio-economic and demographic characteristics of the selected households are an important parameter for understanding food security. The demography of the sample households (Table 3) indicated that adult member comprised maximum with 331 members (70%) and the lowest (5%) was observed for old age members (60 and above years) of total 480 members. In old age category, number of female old age members was found to be more than male old age in the region.

Table 3: Age wise distribution of sample household members

Sl. No	Category	Male	Female	Total
1	Young (<15 years)	64	60	124
2	Adult (15-59 years)	170	161	331
3	Old (> 59 years)	8	17	25
	Total	**242**	**238**	**480**

The distribution of households according to family size (Table 4) indicated that 66.25 per cent of the total households had a medium family size of 5 to 7 members, 17.50 per cent of large family size "more than 7 members" and 16.25 per cent of small family size with "less than 5 members". The above finding indicated that there were slightly more male members than female and majority of the households falls in the category of group B (5-7 members) family size.

Table 4: Distribution of household members according to gender and age

Family size	No. of households	Children (M)	Children (F)	Adult (M)	Adult (F)	Old Age (M)	Old Age (F)	Total
A-Small	13 (16.25)	3	3	19	21	0	2	48
B-Medium	53 (66.25)	48	47	101	96	6	12	310
C-Large	14 (17.50)	13	10	50	44	2	3	122
Total	**80**	**64**	**60**	**170**	**161**	**8**	**17**	**480**

Note: Figures in parentheses indicates percentage to total households; M: Male, F: Female

About 68.25 per cent of the total households had semi-*pucca* type of house having tin roof and bamboo sheet walls and 31.25 per cent had *pucca* type of house (Table 5). All the 80 households were privately owned and electrified with public tap as source of drinking water. Regarding sanitation facility all the households had attached toilet facility.

Table 5: Distribution of sample households according to type of house

Type of house / Family size	Semi-pucca	Pucca	No. of households
A	11 (13.75)	2 (2.50)	13
B	34 (42.50)	19 (23.75)	53
C	9 (11.25)	5 (6.25)	14
Total	**54 (67.50)**	**26 (32.50)**	**80**

(*Note: Figures in parentheses indicates percentage to the total households*)

Education plays an important part in socio-economic development and enhances overall quality of life of human. The study found that illiteracy in the sampled households was at 26.25 per cent of total households (Table 6). Higher illiteracy among head of the households indicated lower occupation levels and hence lower income levels.

Table 6: Literacy level of households in Phek district

Family size	Illiterate household head	Literate household head
Small	3(3.75)	10(12.50)
Medium	16(20.00)	37(46.25)
Large	2(2.50)	12(15.00)
Overall	21(26.25)	59(73.75)

(*Note: Figures in parentheses indicates percentage to the total households*)

Modern concept of food security revolves around livelihood and occupation, and four occupation patterns of the households were observed (Table 7). About 37.5 per cent of the respondents were having Government Service + Cultivators + Business.

Table 7: Distribution of households based on occupation type

Block	Village	Cultivators	Cultivators and Business	Govt. Serv. + Cultivators + Business	Professional/ Govt. Service
1) Kikruma	Phusachodu	7	5	7	1
	Kikruma	8	4	8	0
2) Pfutsero	Kami	4	10	6	0
	Lekromi	4	7	9	0
Overall		23 (28.75)	26 (32.50)	30 (37.50)	1 (1.25)

The two blocks were surveyed to identify whether difference exist in demography, social status, income pattern and food levels. The study found that Kikruma block was having higher proportion of overall members especially for women members (Table 8). Whereas, Pfutsero block had younger as well as aged population and relatively lesser adult members compared to other block.

Table 8: Block wise and village level demography of sample households

		Young (< 12 years)		Adult (12 to 59)		Old (> 59 years)		Total	
Blocks	Villages	Male	Female	Male	Female	Male	Female	M	F
Kikruma	Phusachodu	13	13	53	56	1	2	67	71
	Kikruma	15	18	44	44	2	5	61	67
Pfutsero	Kami	16	13	39	28	2	7	57	48
	Lekromi	20	16	34	33	3	3	57	52
Total		64	60	170	161	8	17	242	238

Large family size (≥ 8 members) had the highest average household monthly income and overall expenditure (Table 9). But household income level as well as monthly expenditure of three different family sizes was found to be statistically non-significant at 5% level of significance. This finding is relevant to the region as most of the households in the region had limited occupation and livelihood options given their remoteness and small village population.

Table 9: Average monthly income and expenditure pattern of sample households

Family size	Frequency	Average income (Rs.)	Average expenditure (Rs.)
Small	13	17923.08	12384.62
Medium	53	20169.81	14254.72
Large	14	20714.29	15214.29
SEm (±)		2327.85	1811.61
CD (p = 0.05)		NS	NS

Table 10 represents the food basket prepared from the responses of 80 sample households from two blocks of Phek district. Food basket is a combination of different food items consumed by household members residing in a particular region. The table 10 gives the different food items that were locally available in the villages covered.

Table 10: Food Basket of sample households in Phek district

Cereals	Rice, Maize, Millets *etc*.
Pulses	Lentil, Naga Dal, Pea, Beans, French beans, Cow pea *etc*.
Vegetables	Cabbage, Potato, Chilli, Sping onion, Ginger, Tomato, Chow Chow, Mustard leaf *etc*.
Fruits	Guava, Peach, Plum, Banana, Kiwi, Apple *etc*.
Meat	Pork, Beef, Chicken, Fish
Others	Egg, Milk, Oats, Sugar, Tea *etc*.
Wild Edibles	Wild vegetables, Wood worms, Mushrooms, Mollusc (Snail), Crab etc.

The household food possession which includes self produced and purchased food items is an important parameter to estimate the availability of food and food security of households. Food security based on owned farms, stored items or owned livestock give more psychological, economical as well as literary advantage over market dependent

food security especially for hilly and remote regions. Table 11 showed that average household weekly food possession was more in vegetables and fruits. Since Phek district is well known for vegetables and fruits production, hence its weekly possession was expected. It was observed that Kikruma block being far away from daily market area had more household food possession compared to Pfutsero block.

Table 11: Block wise average household weekly food possessions (kg week^{-1})

	Cereals (kg)	Vegetables (kg)	Fruits (kg)	Livestock (kg)
Kikruma	2.55	4.80	4.80	2.65
Pfursero	2.42	4.57	4.57	2.30
Overall Average	2.48	4.68	4.68	2.47

From the study, the household size was emphasized for studying food security. Table 12 indicated that larger family size had the highest average household food possession indicating higher food demand.

Table 12: Average household weekly food possession (kg week^{-1})

Family size	Cereals (kg/week)	Vegetables (kg/week)	Fruits (kg/week)	Livestock (kg/week)
Small	2.15	2.46	4.62	3.31
Medium	2.42	2.49	4.64	3.13
Large	2.64	2.50	4.50	3.64
Overall Average	2.40	2.48	4.59	3.36

Estimating the proportion of expenditure on food to total household income has become an important measure of food security level of households (Smith *et al.* 2006). Table 13 represents the weekly food expenses on different items and monthly expenses on food altogether. The proportion of monthly expenditure on food and monthly income was thereby calculated for different family sizes. The ratio was found least for medium household and higher for large families. However application of ANOVA to study difference among families yielded no significant difference at probability level (p=0.05) with standard error of mean proportion was 0.10. This indicates income and expenditure pattern of households of those villages are more or less homogenous irrespective of family size.

Table 13 : Weekly food expenses (Rs.) on different items and proportion of monthly expense on food to total income

Family Size	Cereals	Vegetables & Fruits	Milk	Egg	Meat	Pack food	Food exp. (Rs/month)	Ratio
Small	297.38	803.08	13.59	274.08	337.88	249.85	8467.93	0.529
Medium	322.57	873.21	17.02	293.38	375.43	295.68	9331.17	0.509
Large	376.17	951.43	19.65	367.21	453.16	362.79	10844.60	0.568
Overall	327.85	875.50	16.92	303.16	382.93	299.98	9455.74	-

Smaller families were observed to spend more for packed foods for children and on vegetables and fruits whereas larger families and medium sized families spent more on vegetables and fruits for old and adult members. Expenditure on Milk was observed to be least among all food items, as its availability in the region was few and uncertain (Table 14). Its alternative was powdered form of milk or packed milk expense on which had been observed in pack food category.

Table 14: Average weekly food expenses (Rs.) of each member

Family Size	Age Group	Frequency	Cereals	Vegetables & fruits	Milk	Egg	Meat	Pack food
Small	Young (0-15 yrs)	6	26.42	71.52	7.30	66.67	21.58	100.54
	Adult (15-59 yrs)	40	90.13	241.94	3.10	74.08	75.89	91.94
	Old (59+ yrs)	2	51.04	166.67	4.38	100.00	41.47	55.81
Medium	Young (0-15 yrs)	95	26.43	69.68	5.31	51.69	24.09	79.66
	Adult (15-59 yrs)	197	70.96	189.90	1.88	49.44	65.20	60.28
	Old (59+ yrs)	18	33.63	125.00	1.48	49.96	29.88	25.29
Large	Young(0-15 yrs)	23	20.52	49.32	4.51	46.77	20.14	69.39
	Adult (15-59 yrs)	94	49.87	125.16	1.77	41.51	47.94	49.62
	Old (60+ yrs)	5	21.37	84.20	1.00	32.59	21.82	16.75
Overall	Young (0-15 yrs)	124	25.33	65.99	5.26	51.51	23.24	78.77
	Adult (15-59 yrs)	331	67.29	177.80	2.00	50.16	61.59	61.08
	Old (59+ yrs)	25	32.57	120.17	1.61	50.49	29.20	26.02

Note: The estimate for food groups was obtained with weight attached to different age groups. (Annexure)

Household Consumption and Expenditure Surveys (HCES) helps in tracking food insecurity (Smith *et al.*, 2006, Fiedler, 2013) and supports evaluation of purchasing and consumption behaviour of households. The table 15 indicated that occupation of Professional or Government service had the highest overall weekly food expenditure per household followed by occupation (Cultivator+ Govt. Service+ business). The least weekly food expenditure for almost all food item classifications was for cultivators and cultivators + business occupations. It indicated that Government service had stable income and food status in the study region. Also, the finding indicated that the occupation was directly proportional to weekly food expenses *i.e,* higher the occupation type, higher the income hence greater the expenditure on food.

Table 15: Average households weekly food expenses (Rs.) of various primary occupation categories

Primary Occupation	Frequency	Cereals (Rs.)	Vegetables & fruits (Rs.)	Milk (Rs.)	Egg (Rs.)	Meat (Rs.)	Pack food (Rs.)
Cultivators	23	315.68	862.61	16.82	288.26	291.22	369.43
Cultivators + Business	26	314.10	846.15	15.97	296.31	287.12	370.29
Cultivators + Govt. Serv. + Business	30	347.44	906.67	17.62	318.53	314.50	401.29
Professional Govt.service	1	378.08	1000.00	23.35	363.00	400.00	471.20
Overall	80	327.85	875.50	16.92	303.16	299.98	382.93

For remote areas, hilly terrain and isolated regions, food accessibility involves frequency of availability as well as distance from food market. Most of the food items purchased by households for consumption were mainly from three market types, Weekly local markets (*haat*), Public Distribution System outlets and daily market in nearby town area. The market *haats* or weekly market was lifeline and these *haats* were held at a particular market place. Public Distribution System (PDS) and Fair Price Shops were present in the study area and run under Government supervision and direction. Rice and sugar were some of the items regularly supplied to local consumers especially for Below Poverty Line card holders, at fair and subsidized price. Daily market existed in nearby town and urban area. The

Pfutsero daily market was common to all the sample villages under the two blocks. Lekromi village was the nearest to Pfutsero town with a distance of 4 km and Kikruma village the farthest with a distance of 12 km. Mode of travel was limited to privately owned vehicle and condition of the road during rainy season was observed to be very deplorable. Pfutsero town was the market hub of all the four villages under study.

Food security of local tribal people depended a lot on how much storage capacity is maintained. Under the effect of seasonal and monsoon vagaries, it is inevitably a part of local tribes custom and tradition to maintain storage materials made up of locally available bamboo. Indigenous storage type made of bamboo material with storage volume of approximately 1000 kg were used mainly for storing cereals and dried items that were produced from their own fields.

Age-adjusted per-capita caloric intake was considered as best measure for studying food consumption pattern at the household level, and anthropometric measures of nutritional status were considered a standard for individuals (Hoddinott and Yohannes, 2002 ; Weismann *et al.,* 2006; Coates *et al.,* 2007). But nutritional status of a household is based on food security as well as other factors (Young and Jaspars, 2006 and 2009). For the study to find the average nutrition uptake of households, various parameters such as nutrition aspect of consumed food items, recommended nutrient intake etc was taken into consideration. Table 16 represents the recommended dietary requirements for different age groups in local conditions of the country given by National Institute of Nutrition (NIN), Hyderabad, India.

Table 16: Recommendation chart of daily nutrient intake

Nutrients	Per child		Per adult		Per old Age	
	Male	Female	Male	Female	Male	Female
Calorie intake (cal/day)	1350	1350	2730	2230	2320	1900
Protein (g/day)	20	20	60	55	60	55
Vitamin A_1 (mg/day)	400	400	600	600	600	600
Vitamin B_2 (mg/day)	0.8	0.8	1.6	1.3	1.4	1.1
Vitamin C (mg/day)	40	40	40	40	40	40
Fat (g/day)	25	25	30	25	25	20

Source: National Institute of Nutrition, Hyderabad, 2011

Table 17 represented food uptake of average household which indicated that the highest total uptake was of cereals and the lowest was of milk. It was observed that as family size increased, the consumption of each item also increased with a steady rate. However, calorie intake was observed to be less than recommended for almost all households.

Table 17: Daily average household food consumption and energy (kcal day^{-1}) up take

Family size	Average kcal/day	Cereals (Rice) kg/week	Cereals (Maize, millets) kg /week	Vegetables (kg/week)	Fruits (kg/week)	Milk (g/week)	Egg (piece/ week)	Fish (kg/ month)	Meat (kg/ week)
Small	3.52	8.77	1.27	7.69	3.54	292.31	4.69	1.27	1.27
Medium	4.23	10.45	1.51	8.42	4.02	340.57	5.42	1.51	1.51
Large	5.93	14.93	2.14	10.93	5.29	428.57	7.36	1.86	2.14
Overall	4.41	10.96	1.58	8.74	4.16	348.13	5.64	1.53	1.58

Household food requirement and consumption gap analysis

Joy (1973) noted that "food and nutrition planning starts not from the measurement of nutrition and food supply gaps but from the identification of who it is that is poorly nourished and why?". The observations gathered using survey instrument was indicative of actual consumption of the responding households during that survey period. Here an attempt was made to identify a gap for further recommendation and policy implications if any. To study the household demand balanced diet recommended was taken as base to obtain the food demand per person. Table 18 represented the balanced diet recommended by National Institute of Nutrition (NIN), Hyderabad, India.

Table 18: Balanced diet recommended by NIN, Hyderabad, India (2011)

Food items	Child		Adult		Old Age	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Cereals and millets (g/day)	300	240	450	330	375	270
Pulses (g/day)	60	60	90	75	75	60
Milk and milk products (g/day)	500	500	300	300	300	300
Vegetables (g/day)	300	300	300	300	300	300
Fruits (g/day)	100	100	100	100	100	100
Sugar (g/day)	30	30	30	30	20	20
Fat (g/day)	35	35	30	30	25	20

Table 19 represented the balanced diet requirement of each households taking support of commonly available food-nutrition value chart and keeping demography of the household in view. Also age classifications as well as family sizes were considered for preparing recommendation chart.

Table 19: Recommended weekly dietary requirement of average households

Family Groups	Cereals (Rice) kg/week	Pulses (kg/ week)	Vegetables (kg/ week)	Fruits (kg/ week)	Milk (kg/ week)	Egg (kg equiv. of pulses/ week)	*Fish (kg equiv. / of pulses week)	*Meat (kg equiv.of pulses/ week)	*Sugar (kg/ week)	Fat (kg/ week)
Small	9.50	2.03	7.75	2.58	8.40	3.65	3.65	3.65	0.76	0.78
Medium	14.30	3.06	12.28	4.09	14.79	5.51	5.51	5.51	1.20	1.27
Large	22.44	4.76	18.30	6.10	20.60	8.56	8.56	8.56	1.81	1.87
Overall	14.95	3.19	12.60	4.20	14.77	5.74	5.74	5.74	1.24	1.30

*The protein requirement to be filled up by pulses or from other protein sources like fish, egg and meat at rate of 50 gm pulses protein equivalent to 90 gm of other sources.

From the food intake chart Table 16, a weekly diet of average households was prepared keeping in view the requirement of carbohydrates, vitamins, proteins and fats. Table 20 shows the weekly consumption of carbohydrates from cereals, vitamins from fruits and vegetables, protein from pulses, fish, eggs and meat, and fat from different sources. The consumption was found more quantitatively in cereals and vegetables, but lowest in milk consumption. Protein supplying food items were pulses, egg, meat and fish which were consumed in limited quantity.

Table 20: Weekly diet composition of average households

Family Groups	Cereals (Rice) kg/week	Pulses (kg/ week)	Vegetables (kg/ week)	Fruits (kg/ week)	Milk (kg/ week)	Egg (kg equiv. of pulses/ week)	*Fish (kg equiv. / of pulses week)	*Meat (kg equiv.of pulses/ week)	*Sugar (kg/ week)	Fat (kg/ week) eqiv. of milk, egg & meat/ week)**
A-Small	10.04	0.23	7.69	3.54	0.29	0.35	0.32	1.27	0.38	0.41
B Medium	11.96	0.29	8.42	4.02	0.34	0.41	0.38	1.51	0.49	0.48
C-Large	17.07	0.44	10.93	5.29	0.43	0.55	0.46	2.14	0.58	0.67
Overall	12.54	0.30	8.74	4.16	0.35	0.42	0.38	1.58	0.49	0.50

Note: *The protein requirement to be filled up by pulses or from other protein sources like fish, egg and meat at rate of 50 gm pulses protein equivalent to 90 gm of other sources. ** The fat requirement to be filled up by milk at rate one-tenth and for egg and meat fat content at 7/30 each.*

Nutrition recommendation vs consumption gap analysis

Weekly requirement for a balanced diet for each households and consumption of the households were expected to be similar and any difference of the two was considered as the gap or surplus for nutrition analysis. Table 21 presents the nutrition analysis for different classes of family size.

Table 21: Weekly food recommended-consumption gap analysis of households

Family Groups	Cereals (Rice) kg/week	Pulses (kg/ week)	Vegetables (kg/ week)	Fruits (kg/ week)	Milk (kg/ week)	Egg (kg equiv. of pulses/ week)	*Fish (kg equiv. / of pulses week)	*Meat (kg equiv.of pulses/ week)	*Sugar (kg/ week)	Fat (kg/ week) eqiv. of milk, egg & meat/ week)**
Small	-0.54	1.80	0.06	-0.95	8.11	3.30	3.33	2.38	0.38	0.37
	(0.40)	(0.19)	(0.22)	(0.15)	(0.86)	(0.35)	(0.35)	(0.26)	(0.04)	(0.04)
Medium	2.34	2.77	3.87	0.08	14.45	5.10	5.13	4.00	0.72	0.79
	(0.43)	(0.19)	(0.31)	(0.09)	(0.98)	(0.35)	(0.35)	(0.28)	(0.05)	(0.05)
Large	5.37	4.31	7.37	0.81	20.17	8.01	8.09	6.42	1.22	1.20
	(0.98)	(0.45)	(0.90)	(0.20)	(2.09)	(0.83)	(0.84)	(0.68)	(0.13)	(0.13)
Overall	2.40	2.88	3.86	0.04	14.42	5.32	5.36	4.16	0.75	0.79
	(0.53)	(0.10)	(0.35)	(0.13)	(0.48)	(0.18)	(0.19)	(0.17)	(0.03)	(0.04)
SEm ($\pm$)	1.84	0.19	0.94	0.43	1.02	0.36	0.35	0.40	0.06	0.08
CD (p=0.05)	5.94	0.61	3.03	1.38	3.30	1.35	1.14	1.29	0.20	0.27

*The protein requirement to be filled up by pulses or from other protein sources like fish, egg and meat at rate of 50 gm pulses protein equivalent to 90 gm of other sources. ** The fat requirement to be filled up by milk at rate one-tenth and for egg and meat fat content at 7/30 each. Parenthesis represents Standard Error.

The weekly gap analysis on food recommended and consumption pattern was analyzed through ANOVA to identify effect of family size on persisting nutritional deficiency. The findings showed that highly significant difference (< p=0.01) existed among three family sizes towards nutritional security. In case of protein, gap was needed to be understood under pulses and pulses equivalent for egg, fish and meat together. In the above table 21, exclusive protein sources were considered and its requirement was fulfilled by all four items, hence its inference needs to be judiciously done. Negative gap represents surplus consumption over recommended chart, which included small families in two food items viz., cereals and fruits. High positive gap was identified for larger families towards almost all food item categories. This indicates that larger families in the survey area had propensity to low food as well as nutritional insecurity. Milk was observed to be single most critical food security constraint for all family size.

About 47.5 per cent of households faced major constraints in 'Money' since most of the households had primary occupation as cultivators. These cultivators had low disposable income and did not have a stable income throughout the year. Lack of good storage facility and low capacity of storage was considered as second major constraint (27.5%) by households. Transportation and access to variety of food was limited due to far away daily market at Pfutsero town. Daily market for varied food items, quality of food and food products available and fuel were considered constraints by fewer household respondents as the expectation for alternative was not visible. Cooking fuel was of the least constraints as the source of cooking was firewood and firewood as fuel was plenty in nearby forest areas. From the empirical study it is concluded that Phek district needs protein and fat based food items and milk and milk products need to be made available for enhancing balance diet of the rural households.

REFERENCES

Barrett, C. B. 2010. Measuring Food Insecurity. *Science* **327**: 825-28.

Candel, J.J.L. (2014) Food security governance: a systematic literature review, *Food Security, 6*: 585-601.

Coates, A., Swindale, A. and Bilinsky, P. 2007. Household food insecurity access scale for measurement of food access: indicator guide (v. 3). Washington, DC: Food and Nutrition Technical Assistance Project.

FAO (Food and Agriculture Organisation). 1990. The state of food and agriculture-World and regional reviews, structural adjustment and agriculture. Rome: Food and Agriculture Organisation of the United Nations.

Fiedler, J. L. 2013. Towards overcoming the food consumption information gap: Strengthening household consumption and expenditures surveys for food and nutrition policy making. *Global Food Security*. **2(1)** : 56-63.

Hoddinott, J. and Yohannes, Y. 2002. Dietary diversity as a food security indicator. Washington, DC: International Food Policy Research Institute.

NFSA (National Food Security Act). 2013. The Gazette of India, Ministry of Law and Justice, Government of India, New Delhi.

Smith, M., Pointing, J. and Maxwell, S. 1992. Household food security, concepts and definitions: an annotated bibliography, development bibliography No 8, institute of development studies. Brighton: University of Sussex.

Smith, L.C., Aderman, H. and Aduayom, D. 2006.. Food security in Sub-Saharan Africa: new estimates from household expenditure surveys. Washington, DC: International Food Policy Research Institute.

Statistical Handbook of Nagaland. 2014. Directorate of Economics and Statistics, Published by DES, Government of Nagaland.

Weismann, Doris, John Hoddinott, Noora-Lisa Aberman, and Marie T. Ruel. 2006. Review and Validation of Dietary Diversity, Food Frequency and Other Proxy Indicators of Household Food Security. Washington, D.C.: International Food Policy Research Institute.WFP 2009.

Young, H. and Jaspars, Y. 2006. The Meaning and Measurement of Acute Malnutrition in Emergencies: A Primer for Decision-Makers. HPN Network Paper 56.

Joy, L. 1973. Food and nutrition planning. *Journal of Agricultural Economics*. **24(1)**: 165-97.

URL accessed

www.indiastat.com, Accessed on March 2017

http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf, Accessed on June 2017