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SUSTAINABLE AGRICULTURE, FOOD SECURITY AND NUTRITION IN INDIA

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Abstract: Zero hunger, good health, and well-being goals are the important indicators of Sustainable Development Goals. These goals will be achieve when we able to provide food security to every household and individual. The present study analyse the sustainable agriculture, food security and nutritional status in India. Food and nutrition security are the main indicators of a healthy, secure & prosperous human life. Availability of cereals, pulses and food grains were increased 0.32 percent, 3.08 percent and 0.60 percent respectively during 2000 to 2018 in India. NFHS-4 has estimated 38.4 percent of children under age five years as stunted which signify chronic under-nutrition. The decreasing trends found in prevalence of stunting from 48.0 percent in 2005-06 to 38.4 percent in 2015-16. Similarly, prevalence of underweight was reduced by 0.68 percentage points from 2005-06 to 2015-16. The prevalence of obesity was higher among women than men. The decline trend of anaemia among women of reproductive age (15-49 years) from 53.3 percent to 51.4 percent between 2000 and 2016 respectively. The share of undernourished people in India decreased from 18.2 percent (191.2 million) in 2001 to 14.5 percent (194.4 million) in 2018. It means that, 1 in every 7 people in India still insufficient food for conducting an active and healthy life. Therefore, it is necessary to study the current status of agriculture production, food security and nutrition in India.

Key Words: Sustainable Development, Food Security, Nutrition, Zero Hunger

I. Introduction: Food security means access the adequate quantity and quality food to individuals and or households for meet their daily energy requirement. Nutrition security shows the economic, physical, and social access of nutrient diet to household and individual. The second goal of sustainable development goals is 'zero hunger- pledges to end hunger, achieve food security, improve nutrition and promote sustainable agriculture'. The major objective of this goal is to improve food access to all, end malnutrition with childhood stunting and wasting and improve agricultural sustainability.

Agriculture sector is the main pillar of food security and nutrition. In 2018-19, total food production of India was estimated at 284.95 million tonnes which is than the previous record of food grain production in 2012-13 (GoI, 2019). The growth rate of the agriculture & allied sectors were fluctuated at - 0.2 percent in 2014-15, 0.7 percent in 2015-16, 4.9 percent in 2016-17, 3 percent in 2017-18 and 2.9 percent in 2018-19. About 70 percent of the rural population still directly depends on agriculture & allied activities and it accounts for around 15.87 percent of total India's Gross Value Added (GVA) at current prices during 2018-19 (GoI, 2018). In the world, India is first rank in largest producer in milk, pulses & jute, and second rank in the largest producer of rice, groundnut, wheat, sugarcane, fruit, cotton and vegetables in 2017-18. It is also one of the leading producers of spices, fish and livestock. India contributed nearly 25 percent in

food production, 27 percent in consumption and 14 percent importer of pulses in the world (FAO, 2019). However, India is facing malnutrition among children (below 5 years age). India has the highest number of stunted and wasted children with 46.6 million and 25.5 million respectively in the world and nearly a third and half of all stunting and wasting children worldwide during 2018 (Claydon, 2018). Food and nutrition security is not only static analysis of availability, access, utilization and stability of food but also includes risk and vulnerability analysis. The present study focuses on the status of food security and nutritional level in the India.

II Objectives of the Research Study:

1. To explain the per capita net availability of food grains in India
2. To study the trends of food security and nutrition in India.

III. Research Methodology and Data Base:

The present study is based on secondary data. Secondary data is collected from reports of food and agriculture organization, global nutritional reports, global hunger reports, national family health survey reports, economic survey of India, and annual reports of ministry of agriculture and farmers welfare.

VI. Results and Discussion:

1. Per Capita Net Availability of Foodgrains in India:

Net availability of food grains is estimated as total production (-) seed, feed & wastage (-) exports (+) imports (+/-) change in stocks. Table 1 indicate that, per capita net availability of food grain was 165.9 kg per annum and 454.4 gram per day in India during 2000. This availability increases from the previous number of 180.3 kg per annum and 494.1 gram per day in 2018. The data of per capita net availability of cereals data was reported at 154.3 kg/annum and 422.7 g/day in 2000 and it was increased up to 160 kg/annum and 438.2 g/per day in 2018. Similarly, per capita net availability of pulses was increased from 11.6 kg/annum and 31.8 g/day in 2000 to 20.4 kg/annum and 55.9 g/day in 2018. Availability of cereals, pulses and food grains were increased 0.32 percent, 3.08 percent and 0.60 percent respectively during 2000 to 2018 in India.

Table 1: Per capita net availability of food grains in India

Year	Cereals		Pulses		Food Grains	
	Per Annum (kg)	Per Day (g)	Per Annum (kg)	Per Day (g)	Per Annum (kg)	Per Day (g)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
2000	154.3	422.7	11.6	31.8	165.9	454.4
2001	141.0	386.2	10.9	30	151.9	416.2
2002	167.4	458.7	12.9	35.4	180.4	494.1
2003	149.1	408.5	10.6	29.1	159.7	437.6
2004	155.8	426.9	13.1	35.8	168.9	462.7

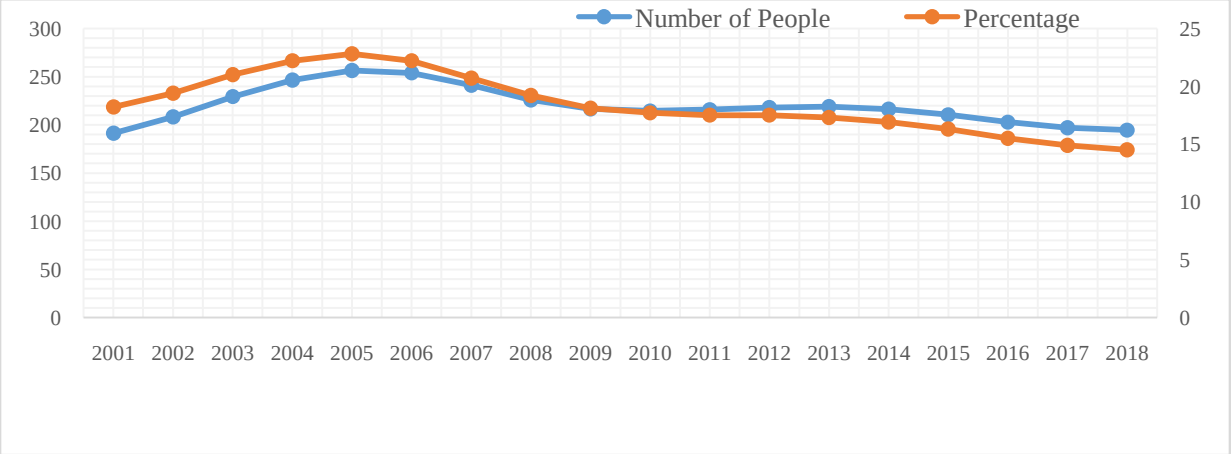
2005	142.7	390.9	11.5	31.5	154.2	422.4
2006	150.7	412.8	11.8	32.5	162.5	445.3
2007	148.7	407.4	12.9	35.5	161.6	442.8
2008	143.9	394.2	15.3	41.8	159.2	436.0
2009	148.6	407.0	13.5	37.0	162.1	444.0
2010	146.6	401.7	12.9	35.4	159.5	437.1
2011	149.9	410.6	15.7	43.0	170.9	468.2
2012	149.1	408.6	15.2	41.7	169.3	463.8
2013	158.1	433.2	15.8	43.3	179.5	491.9
2014	161.6	442.9	16.9	46.4	178.6	489.3
2015	153.8	421.4	16.0	43.8	169.8	465.1
2016	162.0	443.7	15.7	43.0	177.7	486.8
2017	158.4	434.0	20.0	54.7	178.4	488.7
2018	160.0	438.2	20.4	55.9	180.3	494.1
CGR	**0.32**	**0.32**	**3.08**	**3.07**	**0.60**	**0.60**
CV	**4.71**	**4.72**	**19.56**	**19.46**	**5.52**	**5.52**

Source: Directorate of Economics and Statistics, 2019

2. Prevalence of Undernourishment:

The prevalence of undernourishment indicator shows the peoples' inability to obtain adequate food to meet nutritional requirements. Figure 1 show that, despite the share of undernourished people in India decreased from 18.2 percent (191.2 million) in 2001 to 14.5 percent (194.4 million) in 2018. It means that, 1 in every 7 people in India still insufficient food for conducting an active and healthy life. The undernourished rate of reduction has slowed significantly since 2004-05. The compound growth rate of undernourished people in India was -0.73 percent and coefficient of variation was 8.81 percent during 2001-2018. The undernourished rate of India (14.5) was higher than world's undernourished rate (10.8) during 2018.

Figure 1: Trends of prevalence of undernourished people in India

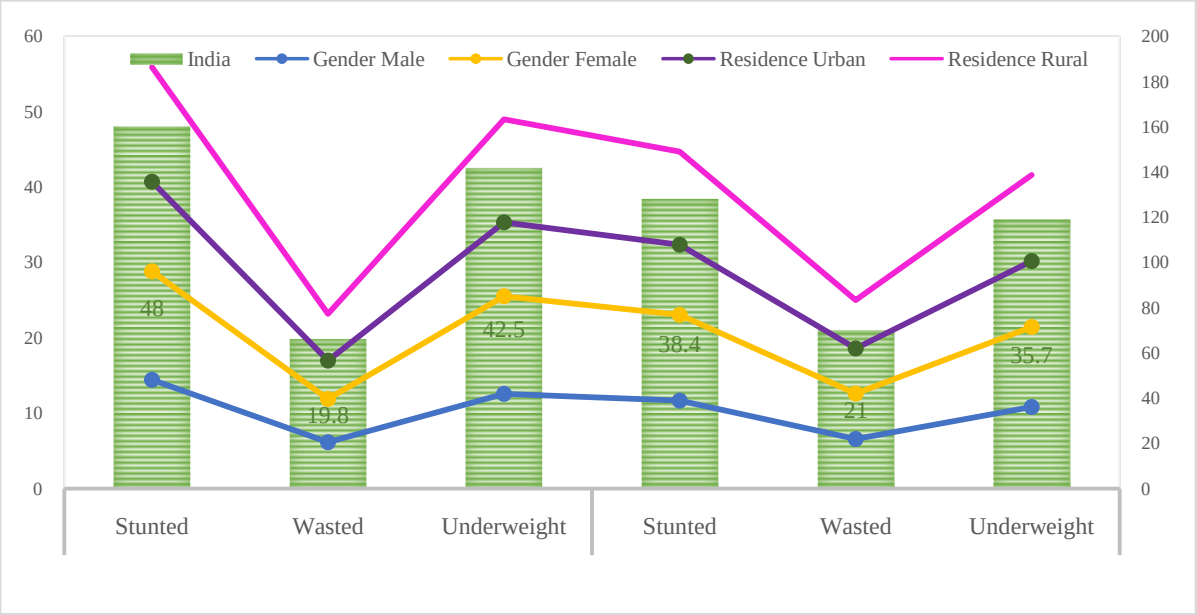


3. Nutritional Status of Children in India:

The nutritional status of children were classified as malnourished according to three indices stunted, wasted and underweight.

Figure 2: Trend in Nutritional Status of Children in India

(Percentage of children age 0-59 months)



Source: National Family Health Survey-4 Report, 2018

Figure 2 indicate that, decrease in stunting has been from 48 percent to 38.4 percent. Similarly, prevalence of underweight was reduced by 0.68 percentage points from 2005-06 to 2015-16. NFHS-4 has estimated 38.4 percent of children under age five years as stunted which signify chronic under-nutrition. The decreasing trends found in prevalence of stunting from 48.0 percent in 2005-06 to 38.4 percent in 2015-16. Stunting was observed to be higher among children in rural areas (41.2 percent) than urban areas (31 percent) during the period 2015-16. There were 21 percent of children (under age five years) in 2015-16 and 19.8 percent children in 2005-06 were wasted (too thin for their height), which signify acute under-nutrition. In India, 35.7 percent and 42.5 percent of children under age five years are underweight during 2015-16 and 2005-06 respectively.

4. State/UT-wise Nutritional Status of Children in India:

Table 2: Nutritional status of children (< 5 year) by state in India (in percent)

Sr. No	State/UT	Stunted		Wasted		Underweight	
		NFHS-3	NFHS-4	NFHS-3	NFHS-4	NFHS-3	NFHS-4
1	Andaman & Nicobar	N.A	23	N.A	18.9	N.A	21.5
2	Andhra Pradesh	42.7	31	12.2	17.2	32.5	31.9
3	Arunachal Pradesh	43.3	29	15.3	17.3	32.5	19.4
4	Assam	46.5	36	13.7	17	36.4	29.8
5	Bihar	55.6	48	27.1	20.8	55.9	43.9

6	Chadigarh	N.A	29	N.A	10.9	N.A	24.5
7	Chhattisgarh	52.9	38	19.5	23.1	47.1	37.7
8	Dadra & N. Haveli	N.A	42	N.A	27.6	N.A	38.8
9	Daman & Diu	N.A	23	N.A	24.1	N.A	26.7
10	Delhi	42.2	32	15.4	15.9	26.1	27
11	Goa	25.6	20	14.1	21.9	25.0	23.8
12	Gujarat	51.7	39	18.7	26.4	44.6	39.3
13	Haryana	45.7	34	19.1	21.2	39.6	29.4
14	Himachal Pradesh	38.6	26	19.3	13.7	36.5	21.2
15	Jammu & Kashmir	35	27	14.8	12.1	25.6	16.6
16	Jharkhand	49.8	45	32.3	29	56.5	47.8
17	Karnataka	43.7	36	17.6	26.1	37.6	35.2
18	Kerala	24.5	20	15.9	15.7	22.9	16.1
19	Lakshadweep	N.A	27	N.A	13.7	N.A	23.6
20	Madhya Pradesh	50	42	35.0	25.8	60.0	42.8
21	Maharashtra	46.3	34	16.5	25.6	37.0	36
22	Manipur	35.6	29	9.0	6.8	22.1	13.8
23	Meghalaya	55.1	44	30.7	15.3	48.8	28.9
24	Mizoram	39.8	28	9.0	6.1	19.9	12
25	Nagaland	38.8	29	13.3	11.3	25.2	16.7
26	Odisha	45	34	19.5	20.4	40.7	34.4
27	Puducherry	N.A	24	N.A	23.6	N.A	22
28	Punjab	36.7	26	9.2	15.6	24.9	21.6
29	Rajasthan	43.7	39	20.4	23	39.9	36.7
30	Sikkim	38.3	30	9.7	14.2	19.7	14.2
31	Tamil Nadu	30.9	27	22.2	19.7	29.8	23.8
32	Telangana	N.A	28	N.A	18	N.A	28.3
33	Tripura	35.7	24	24.6	16.8	39.6	24.1
34	Uttar Pradesh	56.8	46	14.8	17.9	42.4	39.5
35	Uttarakhand	44.4	34	18.8	19.5	38.0	26.6
36	West Bengal	44.6	33	16.9	20.3	38.7	31.5
37	**India**	**48.0**	**38.4**	**19.8**	**21.0**	**42.5**	**35.7**

Source: National Family Health Survey-4 Report, 2018

The prevalence of stunting among children (under age five year) was highest in Bihar (48 percent), followed by Uttar Pradesh (46 percent), Jharkhand (45 percent) and lowest in Kerala and Goa state (20 percent each). Jharkhand state was highest in prevalence of wasting (29 percent), followed by Dadra & Nagar Haveli (27.6 percent) and Gujarat (26.4 percent) in India during the period 2015-16. The lowest levels of wasting were observed in Mizoram (6.1 percent) and Manipur (6.8 percent). The prevalence of underweight was high in Jharkhand with 48

percent. The lowest level of underweight is observed in Mizoram (12 percent) and Manipur (14 percent). It was observed that, prevalence of wasting in children was increased from 19.8 percent in 2005-06 to 21.0 percent 2015-16 in India (table 2).

5. Prevalence of Anaemia in Children:

Anemia is a situation that marked by low levels of hemoglobin in the blood. The prevalence of anemia among children age (6-59 months) declined from 69.5 percent to 58.4 percent in 2005-06 and 2015-16 respectively in India (table 6). The prevalence of anaemia in children was the highest in Dadra and Nagar Haveli (84.6 percent), followed by Daman and Diu (73.8 percent), Chandigarh (73.1 percent) and Haryana (71.7 percent) in 2015-16. The lowest level of anaemia in children was found in Mizoram (17.7 percent) in same period. The prevalence of anaemia in children was increased in Goa and Delhi with 10.1 and 5.6 percent respectively during previous NFHS-3 to NFHS-4 survey. In Assam state, the percentage of anemic children was rapidly decreased from 69.7 percent in 2005-06 to 35.7 percent in 2015-16. It was found that, several union territories have even higher prevalence of anaemia in India during 2016-16 (table 3).

Table 3: Prevalence of anaemia in children by state/ut in India (in percent)

Sr. No	**State/UT**	**Anemia in children (6-59 months age)**		**Variation**
		NFHS-3	**NFHS-4**	
1	Andaman and Nicobar	N.A	49	-
2	Andhra Pradesh	N.A	58.6	-
3	Arunachal Pradesh	56.9	50.7	6.2
4	Assam	69.4	35.7	33.7
5	Bihar	78	63.5	14.5
6	Chandigarh	N.A	73.1	-
7	Chhattisgarh	71.2	41.6	29.6
8	Dadra and Nagar Haveli	N.A	84.6	-
9	Daman and Diu	N.A	73.8	-
10	Delhi	57	62.6	-5.6
11	Goa	38.2	48.3	-10.1
12	Gujarat	69.7	62.6	7.1
13	Haryana	72.3	71.7	0.6
14	Himachal Pradesh	54.4	53.7	0.7
15	Jammu & Kashmir	58.5	43.3	15.2
16	Jharkhand	70.3	69.9	0.4
17	Karnataka	70.3	60.9	9.4
18	Kerala	44.5	35.6	8.9
19	Lakshadweep	N.A	51.9	-
20	Madhya Pradesh	74	68.9	5.1
21	Maharashtra	63.4	53.8	9.6
22	Manipur	41.1	23.9	17.2

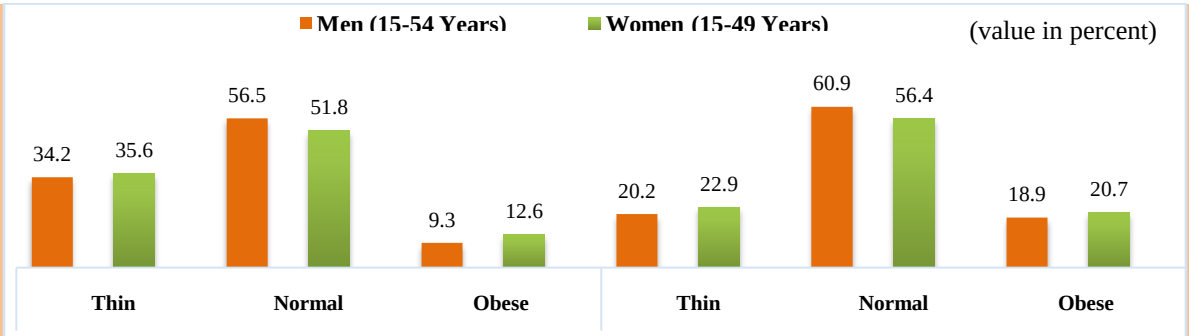
23	Meghalaya	63.8	48	15.8
24	Mizoram	43.8	17.7	26.1
25	Nagaland	N.A	21.6	-
26	Odisha	65	44.6	20.4
27	Puducherry	N.A	44.9	-
28	Punjab	66.4	56.6	9.8
29	Rajasthan	69.6	60.3	9.3
30	Sikkim	58.1	55.1	3
31	Tamil Nadu	64.2	50.7	13.5
32	Telangana	N.A	60.7	-
33	Tripura	62.9	48.3	14.6
34	Uttar Pradesh	73.9	63.2	10.7
35	Uttarakhand	60.7	59.8	0.9
36	West Bengal	61	54.2	6.8
	India	**69.5**	**58.4**	**11.1**

Source: National Family Health Survey-4 Report, 2018

6. Nutritional Status of Adults in India:

The nutritional indicators were used to estimate several measures of nutritional status of women (15-49 years) and men (15-54 years) with height and body mass index (BMI). There were 34.2 percent of men was thin in 2005-06; which was decreased to 20.2 percent in 2015-16. Total 56.5 percent of men in 2005-06 and 60.9 percent in 2015-16 was normal BMI level. There were 9.3 percent and 18.9 percent of men suffering to prevalence of overweigh in 2005-06 and 2015-16 respectively. The percentage of thin men decreases with age, whereas the proportion of overweight or obese men increases in India since 2005-06. The proportion of thin women age 15-49 declined from 35.6 percent in 2005-06 to 22.9 percent in 2015-16; at the same time the proportion of overweight or obese women increased from 12.6 percent to 20.7 percent. Overall, there has been an increase in the mean BMI from 20.5 in 2005-06 to 21.9 in 2015-16. It was found that, increasing trends in prevalence of overweight among both men and female in India.

Figure 3: Trends of adult's nutritional status in India



Source: National Family Health Survey-4 Report, 2018

7. State/UT wise Nutritional Status of Adults in India:

Table 4: Nutritional status of adults by state/ut in India-2015-16 (percent)

Sr. No	State/ Union Territory	Thin (BMI <18.5)		Normal (BMI 18.5-24.9)		Obese (BMI ≥25.0)	
		Men	Women	Men	Women	Men	Women
1	Andaman & Nicobar	8.8	53	55.1	13.1	38.2	31.8
2	Andhra Pradesh	14.8	51.7	49.2	17.6	33.5	33.2
3	Arunachal Pradesh	8.3	71.1	72.7	8.5	20.6	18.8
4	Assam	20.7	66.4	61.1	25.7	12.9	13.2
5	Bihar	25.5	62	57.8	30.5	12.6	11.7
6	Chandigarh	21.7	46.3	45.2	13.3	32	41.4
7	Chhattisgarh	24.2	65.7	61.4	26.7	10.2	11.9
8	Dadra & Nagar Haveli	19.7	57.3	52.2	28.7	22.9	19.2
9	Daman & Diu	12	57.4	55.4	12.9	30.7	31.7
10	Delhi	17.7	57.7	51.7	14.8	24.6	33.5
11	Goa	10.8	56.5	51.9	14.7	32.7	33.5
12	Gujarat	24.7	55.5	49	27.2	19.7	23.8
13	Haryana	11.3	68.7	63.2	15.8	20	21
14	Himachal Pradesh	18	60	55.2	16.2	22	28.7
15	Jammu & Kashmir	11.5	68	58.8	12.1	20.5	29.1
16	Jharkhand	23.8	65.1	58.1	31.6	11.1	10.3
17	Karnataka	16.5	61.3	56	20.8	22.1	23.3
18	Kerala	8.5	63	57.9	9.7	28.5	32.4
19	Lakshadweep	8.2	67.7	45.9	13.5	24.1	40.6
20	Madhya Pradesh	28.4	60.7	58	28.4	10.9	13.6
21	Maharashtra	19.1	57.1	53.1	23.5	23.8	23.4
22	Manipur	11.1	69.1	65.2	8.8	19.8	26
23	Meghalaya	11.6	78.4	75.7	12.1	10	12.2
24	Mizoram	7.3	71.9	70.6	8.4	20.9	21.1
25	Nagaland	11.4	74.7	71.6	12.3	13.9	16.2
26	Odisha	19.5	63.2	57	26.5	17.3	16.5
27	Puducherry	10.2	52.7	52	11.3	37.1	36.7
28	Punjab	10.9	61.2	57	11.7	27.8	31.3
29	Rajasthan	22.7	64.1	58.9	27	13.2	14.1
30	Sikkim	2.4	62.9	66.9	6.4	34.8	26.7
31	Tamil Nadu	12.4	59.3	54.4	14.6	28.2	30.9
32	Telangana	21.5	54.3	48.4	22.9	24.2	28.7
33	Tripura	15.7	68.4	65	19	15.9	16
34	Uttar Pradesh	25.9	61.5	58.2	25.3	12.5	16.5

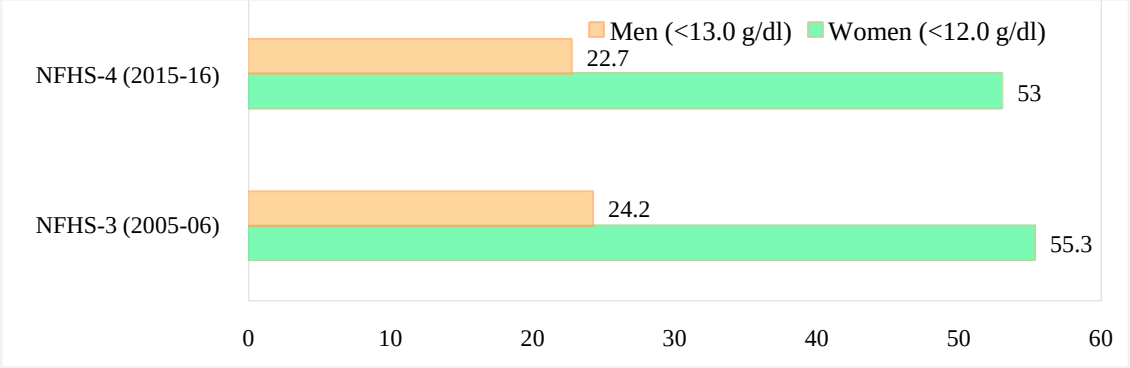
35	Uttarakhand	16.1	66.2	61.1	18.4	17.7	20.5
36	West Bengal	19.9	65.9	58.9	21.3	14.2	19.9
	India	**20.2**	**60.9**	**56.4**	**22.9**	**18.9**	**20.7**

Source: National Family Health Survey-4 Report, 2018

Table 4 shows the state differentials in nutritional status for men and women in India during 2015-16. The percentage of thin men was highest in Madhya Pradesh with 28.4 percent, followed by Uttar Pradesh 25.9 percent and Bihar 25.5 percent in 2015-16. Sikkim (34.8 percent), Andhra Pradesh (33.5 percent), Tamil Nadu (28.2 percent) and Kerala (28.5 percent) were the states with the highest level of obesity. The proportion of men who are thin varies substantially among the states. The proportion of women who are thin was particularly high in Jharkhand (31.6 percent), followed by Bihar (30.5 percent) and Dadra & Nagar Haveli (28.7 percent). The percentage of women who are obese was highest Goa with 33.5 percent, 33.2 percent in Andhra Pradesh, 32.4 percent in Kerala, and 30.9 percent in Tamil Nadu. The highest number of men and women who have normal BMI (18.5- 24.9) found in Meghalaya with 78.4 percent and 75.7 percent respectively during the period 2015-16.

8. Prevalence of Anemia in Adults (15-49 years):

Figure 4: Trends of adult's anaemia status in India (percent)



The minimum levels of haemoglobin for women is 12 grams per decilitre and men is 13 grams per decilitre (g/dl). The prevalence of anaemia was barely changed in last decade between NFHS-3 and NFHS-4, decreasing from 55.3 percent in 2005-06 to 53.0 percent in 2015-16 among women and from 24.2 percent in 2005-06 to 22.7 percent in 2015-16 among men (figure 6). Accounting NFHS-4, total 40 percent of women were mildly anaemic, 12 percent were moderately anaemic, and 1 percent were severely anaemic. Similarly, 12 percent of men were classified as mildly anaemic, 10 percent as moderately anaemic, and 1 percent as severely anaemic during 2015-16 in India. It was observed that, the prevalence of anaemia was high in women than men in both urban area and rural area of India since last two decade.

Conclusions:

Food and nutrition security in India has been achieving self-sufficiency in the food grain production after independence and in setting in the public distribution system. However, India still has high rates of malnutrition and starvation. In present situation, major challenge is not

improve the productivity of agriculture sector, but also making food grains accessible to poor and needy. The government needs to pay special attention to agriculture in order to provide qualify of food as to make food security scheme a success. There are need to increase in irrigation facilities, supply affordable agriculture inputs, uninterrupted supply of electricity, high yielding seeds, per capita availability of food grains, fair prices for agriculture commodities, enhanced efficient monitoring system, optimum warehouses for food storages, efficient public distribution system, control on manmade inflection and reduction of regional disparities in food grain. In addition there is a need for such number of studies in different views and areas because it has the vast scope and very significant from the measurement of sustainable agriculture development.

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