The Twin Problems of Changing Nutritional Status among Women in India

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Abstract

In India, nutrition research and policy focus always remained on undernutrition. After witnessing seven decades of high undernutrition, now India is witnessing the over-nutrition from last two decades. The data from National Family Health Surveys (NFHS-3 & 4) shows that with persistent undernutrition, the prevalence of overweight/obesity is increasing more severely among adults. The overall prevalence of overweight/obesity, body-mass-index (BMI) $\geq$ 24.99 have increased from 13 to 21 percent among adult women aged 15-49, and 9.3 to 19 percent among adult men between 2005-06 and 2015-16. Large number of studies have focused on either undernutrition of overweight/obesity. The aim of the present study is to understand simultaneously the problem of undernutrition and over-nutrition. The study has identified some convergence of overweight/obesity prevalence across wealth quantiles in both urban and rural areas among women in Front-runner, Performer and Aspirant states. Findings show that there is a substantial geographical variation across states and no specific geographical pattern of prevalence of underweight and overweight/obesity. Overtime decline in underweight was highest in Tripura followed by Chhattisgarh, Andhra Pradesh and Haryana from 2005-06 to 2015-16. findings suggest that an urgent response is needed to slow the increasing trend of overweight and obesity among women in Front-runner, Performer and Aspirant states irrespective of residence and wealth status.

Keywords; Undernutrition, Overweight/Obesity, Dual burden, India.

1. Introduction

The World Health Organization (WHO) defines overweight and obesity as "abnormal and excessive fat accumulation that may impair health" (WHO, 2017a). Generally, overweight considered as a body-mass-index (BMI) $\geq$ 25 worldwide and (BMI) $\geq$ 23 for Asians i.e. the weight in kilograms divided by the square of the height in meters.

Obesity as (BMI) ≥ 30 for international standard and (BMI) ≥ 27.5 is considered for Asian countries (WHO; 2017a). WHO consultation experts identified a different association between BMI and its health risks among Asian people than among others. Experts find that Asians have a high risk of type 2 diabetes and cardiovascular disease at BMIs lower than the existing WHO cut-off point for overweight. Worldwide prevalence of overweight and obesity have been become approximately tripled since 1975. In 2016, more than

1.9 billion or 39 percent and 650 billion or 13 percent adults, above 15 years, have been identified as overweight and obese, respectively (WHO, 2017a). Nowadays, the high prevalence of overweight/obesity epidemic is not limited to developed countries (B. M. Popkin and Slining, 2013; Fruh, 2017; Gregg & Shaw, 2017, WHO, 2017a). The rate of increasing prevalence of overweight/obesity is more severe in Low- and Middle-Income Countries (LMIC), Asian countries (WHO, 2000, 2011) as well as in India (Misra et al., 2007; Luhar et al., 2018) than western countries. The prevalence for the same is still high in developed countries.

In India, nutrition research and policy focus always remained on 'undernutrition'. After witnessing seven decades of high undernutrition, now India is witnessing the over-nutrition from last two decades (Ramachandran, 2018). The data from National Family Health Surveys (NFHS-3 & 4) shows that with persistent undernutrition, the prevalence of overweight/obesity is increasing more severely among adults. The overall prevalence of overweight/obesity, body-mass-index (BMI) ≥ 24.99 have increased from 13 to 21 percent among adult women aged 15-49, and 9.3 to 19 percent among adult men between 2005-06 and 2015-16 (IIPS, 2007; IIPS, 2017). In India, 31, 27 percent of urban and 15, 14 percent of rural women and men are overweight/obese, respectively (IIPS, 2017). This 'dual burden of malnutrition', increase in overweight/obesity with a high prevalence of undernutrition situation poses a significant challenge for most developing countries and will pose a new threat to the health system, future economic growth and human well- being (Abdullah, 2015).

2. Review of literature and Research Gaps

Women aged 15-49 are more susceptible to overweight/obesity irrespective of overall prevalence, their residential status and economic stratum (Gouda and Prusty, 2014). The proportion of overweight/obesity has increased and there is no unique pattern of rise across states in India. The ratio of prevalence of overweight/obesity to underweight among adult women is more than one in almost 2/3rd states of India which was not the case earlier (IIPS, 2007; IIPS; 2017). There is a considerable geographical variation in overall prevalence (IIPS, 2017) and also among women (Chockalingam et al., 2011). Many states, along with making some progress in eradicating undernutrition, are facing the problem of overweight/obesity as a major public health issue. On the other hand, the prevalence of overweight/obesity has increased with persistent high undernutrition

in states like Jharkhand, Bihar, and Madhya Pradesh which poses the "double burden" (Kulkarni et al., 2017) of malnutrition (IIPS, 2017). If a person is underweight in childhood, it is more likely that he/she will be overweight/obese in late adulthood (Kulkarni et al., 2017).

Epidemiological studies have identified high Body Mass-Index as a risk factor for a defined group of Non-Communicable Diseases (NCD's) called "New World Syndrome", (Kalra and Unnikrishnan, 2012). In 1997, using the global burden of diseases (GBD's) data (Murray and Lopez 1997) predicted that by 2020 NCD's would cause approximately 7 out of every 10 deaths in developing countries. In India, the proportion of NCD's in total diseases was 31 percent in 1990, 45 percent in 2016 (Siddique et al., 2017). Collectively these diseases accounted for 63 percent of all deaths in 2016 (WHO, 2018) and their casual relation with overweight/obesity poses massive public health challenges (Upadhyay, 2012).

Along with Epidemiological transition, the process of overtime changing patterns of diseases largely from infectious and communicable to chronic NCD's (Omram, 2005). Demographic transition is defined as "progress from a pre-modern regime of high fertility and high mortality to a post-modern regime of low fertility and low mortality" (Yadav and Arokiasamy, 2014; Kirk, 1996), and nutrition transition are taking place in India (Griffiths & Bentley, 2001). By using NSSO three rounds (1993-1994, 2004-2005, and 2011-2012) consumption data, it has been found that proportion of fat calorie in total calorie intake has increased in all wealth group in the rural household and among poorer in urban (Siddique et al., 2017). This is consistent with the theory of 'nutrition transition' proposed by Popkin in 1993 which is "rapidly developing societies experience changes in dietary patterns and a decline in the level of physical activities among its population. Food basket transforms from more cereal and home-based foods towards more non-vegetarian, fat, sugar and salt-based and ready-made foods". Using National Family Health Surveys (NFHS-2 and NFHS-3) data and Asian population standard for overweight and obesity, the annual rate of increase in overweight was higher among women in rural area in the states where the prevalence of overweight was also highest. Rate of the increase was higher among low economic status women in both types of states where the prevalence was highest and lowest (Sengupta et al., 2015). When rural areas reap the fruit of development in recent years, BMI in rural population has been seen rising, with the increasing incidence of overweight and obesity, and with increases in related non- communicable illnesses (Ramachandran et al., 2004).

3. Research Gaps

Existing literature so far studied nutritional status in specific states and at household level. Some of the studies identified the problem of nutritional change until 2005-06. More than ten years already have been passed. Therefore, a deep analysis of change in

last ten years are required. No study so far discussed the problem of nutritional change among women with reference to any of developmental indicator, especially sustainable development goal indicator.

4. Research Questions

1. What is the status of the prevalence of underweight, overweight and obesity among women in India?

2. Is the pattern of above is different among Front-runner, Performer, and Aspirant states as per sustainable development goal-India index Baseline report?

3. Is there any evidence of twin problems of nutritional change in these states?

5. Objectives

1. To understand the prevalence of undernutrition, overweight and obesity among women's in India.

2. To analyses the pattern of overweight, underweight and obesity in Front-runner, Performer and Aspirant state according to place residence and wealth index.

6. Methods

6.1. Data

The National Family Health Surveys (NFHS) 2005–2006 and 2015-2016 also called the Indian Demographic and Health Survey is a nationwide household survey provide estimates of key health indicators including mortality, morbidity, fertility, nutrition and family planning for India as a whole. Rural (village) and urban (ward and municipal localities) are the primary sampling unit's (PSU). For each state, a separate proportion to the size sampling technique used to select the rural-urban PSU's. The NFHS-4 includes all 29 states by rural-urban residence, socioeconomic characteristics and for different age groups, 15-49 for women and 15-54 for men (IIPS, 2017). NFHS-3 and NFHS-4 collected information from 1, 24,385 and 6, 99,686 eligible women. NFHS- 4 data includes for all 29 states and 7 union territories (UT's) while in NFHS-3 data are available for 28 states and Delhi (UT) only. The state of Telangana formed in 2014 and data for all (UT's) are available in NFHS-4 only. I used data for 28 states and Delhi (UT). In this study, all pregnant women, those who gave birth in the last two-month from the date of the interview, and with missing body-mass-index (BMI) information are not included in the sample. National sampling weight for women is used and after eliminating missing BMI information, pregnant and women who gave birth in preceding two months from date of interview, without national sampling weight sample remains for analysis was 6, 43,115 in NFHS- 4 and 110865 in NFHS-3.

6.2 Body Mass-Index criterion for adults.

(a) World Health Organization's International criteria

Body Mass-Index = weight in kilogram/ height in meter squared.

Status	Underweight	Normal	Overweight	Obese
BMI	<18.5	18.5-24.99	25-29.99	>30

Source: WHO Classification, 2007

This is a general criterion, which can be further categorized in mild, moderate and severe undernutrition and in terms of obesity, obesity-1, obesity-2 and obesity-3.

(b) World Health Organization body mass-index criterion for Asian population

Status	Undernutrition	Normal	Overweight	Obese
BMI	<18.5	18.5-22.99	23-27.49	>27.5

Source: WHO Classification, 2004

6.3 Selection of states

I have identified (4 Front runner, 4 Performer and 5 Aspirants) 13 states for analysis on the basis of NITI Aayog SDG India Index - Baseline Report 2018, which categorized all the states in Four (Achiever, Front runner, Performer, and Aspirant) category for all 16 Sustainable Development Goals on the basis of different indicators used for each of 16 SDG's index.

I have used two indexes for selection of states, which are directly or indirectly related nutrition and well-being.

(a) Zero hunger index

(b) Good health and well-being

States that are common in both Zero hunger, Good health and well-being index as well as in Front- runner, Performer and Aspirant categories

States		
Front runner	**Performer**	**Aspirant**
Goa	Haryana	Bihar
Kerala	Himachal Pradesh	Jharkhand
Punjab	Jammu and Kashmir	Chhattisgarh
Manipur	Tripura	Madhya Pradesh
-	-	Rajasthan

Source: author's compilation based on SDG India index baseline report, 2018.

After showing overall prevalence of undernutrition, overweight and obesity according

to Asian body mass-index criterion from NFHS-3 to NFHS-4, I particularly focused on these selected states.

7. Analysis

Table 1: State-wise prevalence of Underweight and Overweight/obesity among women (15-49 year) in India during NFHS-3 (2005-06) and NFHS-4 (2015-16).

| STATES | *2005-06* | *2015-16* | | | *2005-06* | *2015-16* | | |
	Underweight (%)	Underweight (%)	Decline	Rank	Overweight/ Obesity (%)	Overweight/ Obesity (%)	Increase	Rank
Tripura	36.91	18.98	-17.93	1	15.95	31.14	15.18	8
West Bengal	38.91	21.32	-17.59	2	19.76	34.38	14.61	12
Chhattisgarh	43.45	26.78	-16.67	3	10.66	21.78	11.12	17
Andhra Pradesh	33.52	17.59	-15.93	4	25.24	46.87	21.63	1
Haryana	31.40	15.81	-15.59	5	26.74	37.18	10.45	19
Orissa	41.43	26.51	-14.92	6	13.13	27.77	14.64	11
Karnataka	35.55	20.76	-14.79	7	24.15	36.47	12.32	15
Bihar	45.22	30.60	-14.61	8	10.55	20.95	10.40	20
Tamil Nadu	28.51	14.66	-13.85	9	32.05	46.93	14.88	9
Himachal Pradesh	29.95	16.24	-13.71	10	23.88	42.82	18.94	2
Madhya Pradesh	41.71	28.42	-13.29	11	13.55	23.88	10.33	21
Goa	27.92	14.70	-13.22	12	32.40	50.69	18.28	4
Maharashtra	36.31	23.50	-12.81	13	23.72	36.35	12.63	14
Jammu And Kashmir	24.61	12.17	-12.44	14	28.40	45.00	16.60	7
Uttarakhand	30.13	18.45	-11.68	15	22.51	33.80	11.29	16
Jharkhand	42.92	31.55	-11.37	16	11.37	18.82	7.45	28
Uttar Pradesh	36.15	25.40	-10.76	17	17.02	27.84	10.82	18
Assam	36.30	25.71	-10.59	18	15.61	25.07	9.46	22
Rajasthan	36.61	27.05	-9.56	19	16.78	25.28	8.51	26
Gujarat	36.42	27.24	-9.18	20	26.45	35.53	9.08	23
Kerala	17.97	9.65	-8.32	21	42.62	51.58	8.95	24

Arunachal Pradesh	16.33	8.52	-7.82	22	20.76	37.63	16.87	6
Punjab	18.83	11.72	-7.11	23	42.75	49.96	7.22	29
Manipur	14.84	8.81	-6.03	24	25.92	44.57	18.65	3
Mizoram	14.37	8.39	-5.98	25	21.72	38.71	16.99	5
Nagaland	17.43	12.27	-5.15	26	17.36	30.91	13.56	13
Sikkim	11.20	6.38	-4.82	27	32.60	47.38	14.78	10
Meghalaya	14.72	12.11	-2.61	28	16.95	25.66	8.72	25
Delhi	14.88	14.90	0.02	29	40.29	48.56	8.27	27

Source: Author's own calculation using NFHS -3 and NFHS -4 data.

Table 1 shows state-level prevalence of underweight, overweight/obesity among women aged 15-

49. It shows that there is a substantial geographical variation across states and no specific geographical pattern of prevalence. Punjab has the highest prevalence of overweight/obesity followed by Kerala and Delhi, while the prevalence of underweight in the same age group was highest in Bihar followed by Jharkhand, Chhattisgarh and Madhya Pradesh in 2005-06. Almost all socio-economic and vital health indicators are good in states where the prevalence of overweight/obesity was highest. This is consistent with a worldwide study based on 244 Demographic and Health Surveys (DHS) which found a positive relation between education (as a proxy for socioeconomic status) and overweight in low- and middle- income countries (Goryakin and Suhrcke, 2014). In 2015-16, leading state in the prevalence of underweight was Jharkhand followed by Bihar, Madhya Pradesh and Rajasthan. Overtime decline in underweight was highest in Tripura followed by Chhattisgarh, Andhra Pradesh and Haryana during 2005-06 to 2015-16. In terms of overweight/obesity leading four states are that were in NFHS-3 but position changed, Kerala is at the top followed by Goa, Punjab and Delhi. Increase in overweight/obesity was highest in Andhra Pradesh, followed by Himachal Pradesh, Manipur, Goa and Mizoram and there are five Northeastern states out of ten, where increase from 2005-06 to 2015-16 was highest this shows that these states are shifting towards overweight/obesity.

Table 2: Prevalence of underweight, overweight and obesity among women (15-49 year) in Front- runner, Performer and Aspirant states during NFHS-3 (2005-06) and NFHS-4 (2015-16).

Front Runner States	% Underweight		% Overweight		% Obesity	
	2005-06	**2015-16**	**2005-06**	**2015-16**	**2005-06**	**2015-16**
Goa	27.92	14.70	21.73	32.83	10.67	17.85
Kerala	17.97	9.65	29.61	36.13	13.02	15.44
Punjab	18.83	11.72	25.40	32.59	17.35	17.37
Manipur	14.84	8.81	20.99	32.36	4.92	12.21
Performer	% Underweight		% Overweight		% Obesity	
	2005-06	**2015-16**	**2005-06**	**2015-16**	**2005-06**	**2015-16**
Haryana	31.40	15.81	17.51	26.88	9.22	10.30
Himachal Pradesh	29.95	16.24	18.48	27.73	5.40	15.10
Jammu And Kashmir	24.61	12.17	20.62	29.36	7.77	15.64
Tripura	36.91	18.98	13.64	24.78	2.31	6.36
Aspirant	% Underweight		% Overweight		% Obesity	
	2005-06	**2015-16**	**2005-06**	**2015-16**	**2005-06**	**2015-16**
Bihar	45.22	30.60	8.80	15.65	1.75	5.30
Chhattisgarh	43.45	26.78	8.11	16.35	2.55	5.43
Jharkhand	42.92	31.55	8.93	13.99	2.45	4.83
Madhya Pradesh	41.71	28.42	10.03	17.14	3.52	6.73
Rajasthan	36.61	27.05	12.94	18.36	3.83	6.92

Source: Author's own calculation using NFHS -3 and NFHS -4 data.

Table 2, shows the nutrition status of women in Front-runner Performer and Aspirant states. Among Front-runner states, Goa has the highest prevalence of underweight in 2005-06 and 2015- 16 and overtime decline is highest in goa followed by Kerala. Prevalence of overweight was highest in Kerala, but the increase in prevalence was highest in Manipur and Goa; this shows that Kerala has managed to maintain their health status. The highest prevalence of obesity was in Punjab and the highest increase was in Manipur. This shows that Manipur is shifting from undernutrition to overweight/obese. Among Performer states, there is moderate decline in underweight in all states. Except for Haryana prevalence of obesity increased three times in all three other Performer states.

In Aspirant states, Bihar has the highest prevalence of underweight in 2005-06 and an increase in overweight and obesity was highest in Bihar during 2005-06 to 2015-16. Other Aspirant states also have a similar kind of pattern, and this indicates the 'twin problem' of nutritional change. Twin problem of nutritional change is the increase in overweight/obesity with persistent high undernutrition. It has significant policy and health implications for these states.

Table 3: Prevalence of underweight, overweight and obesity among women (15-49 year) in Front- runner, Performer and Aspirant states during NFHS-3 (2005-06) and NFHS-4 (2015-16) by their place of residence.

	2005-06 Urban (in %)			2015-16 Urban (%)		
	Underweight	Overweight	Obesity	Underweight	Overweight	Obesity
Front Runner	16.4	28.5	18.7	9.1	36.0	16.8
Performer	19.7	25.3	15.6	11.4	31.3	14.9
Aspirant	31.2	18.7	8.2	20.3	24.1	12.5
	2005-06 Rural (%)			2015-16 Rural (%)		
	Underweight	Overweight	Obesity	Underweight	Overweight	Obesity
Front Runner	19.7	26.6	12.2	11.8	33.2	15.7
Performer	33.6	15.5	4.7	17.1	25.6	10.5
Aspirant	45.4	7.2	1.1	31.7	14.2	4.0

Source: Author's own calculation using NFHS -3 and NFHS -4 data.

Table 3 shows the nutritional status according to the respondent's place of residence. Results indicate that in the urban area, there is a mild decrease in obesity in front runner and Performer states however, there is highest increase in overweight in these states from 2005-06 to 2015-16. The decrease in obesity may be due the increasing health consciousness in people in urban area whereas increase in number of people in overweight category is because of people who were normal but now have gained some extra calorie (Sengupta, Angeli, Syamala, Dagnelie, & Schayck, 2015, Jaaks et al., 2015). There is also a slight increase in obesity in aspirant states from 2005-06 to 2015-16. Data shows that Aspirant states have recorded highest decline in underweight.

In rural areas, performer states have shown highest decline in underweight followed

by aspirant and front-runner states respectively. While in rural areas, growth in overweight, as well as obesity, is highest in performer states (Table 3). Prevalence of overweight and obesity in the aspirant state has increased by two and four times, respectively. In the rural area, there is persistent high undernutrition among aspirant states that indicates the problem of 'twin nutritional' change.

Table 4: Prevalence of underweight, overweight and obesity among women (15-49 year) in Front- runner, Performer and Aspirant states during NFHS-3 (2005-06) and NFHS-4 (2015-16) by wealth quantile.

Front Runner	2005-06			2015-16		
	UW (%)	OW (%)	Obesity (%)	UW (%)	OW (%)	Obesity (%)
Q1 POOREST	41.02	14.63	3.84	23.15	24.11	5.99
Q2 POORER	30.87	18.86	4.55	16.73	27.16	8.56
Q3 MIDDLE	27.53	20.79	5.79	15.50	30.58	11.82
Q4 RICHER	21.13	25.25	11.04	11.10	34.12	15.41
Q5 RICHEST	12.36	31.61	20.70	8.62	36.17	18.27
PERFORMER						
	UW (%)	OW (%)	Obesity (%)	UW (%)	OW (%)	Obesity (%)
Q1 POOREST	44.03	6.54	1.17	23.61	16.15	2.54
Q2 POORER	46.65	7.77	1.66	22.08	20.21	5.32
Q3 MIDDLE	34.76	12.12	3.06	19.69	23.68	6.86
Q4 RICHER	30.27	19.07	5.01	15.18	28.15	12.27
Q5 RICHEST	18.44	27.08	16.42	10.61	31.63	16.54
ASPIRANT						
	UW (%)	OW (%)	Obesity (%)	UW (%)	OW (%)	Obesity (%)
Q1 POOREST	51.56	3.80	0.43	36.53	9.91	1.78
Q2 POORER	47.64	5.21	0.92	33.22	12.37	2.80
Q3 MIDDLE	41.11	9.91	1.34	27.52	18.30	6.06
Q4 RICHER	35.50	15.04	3.23	21.95	22.81	9.97
Q5 RICHEST	22.75	23.85	11.36	14.66	27.92	16.47

Source: Author's own calculation using NFHS -3 and NFHS -4 data.

Note: In this table, quantiles are generated taking the summation of undernutrition, overweight and obesity in each state with their reference category.

In front-runner state, the highest decline in underweight is observed in the lowest quantile and there is a substantial increase in overweight in the highest quantile. The

highest increase in overweight is observed in Q3. All four quantiles except highest show that there is an increase in both overweight and obesity. This is consistent with existing literature that indicates nutrition transition is underway in India. Performer states also show the same pattern as Front-runner state except in richest quantile. There is no change in obesity in the highest quantile.

In aspirant states, there are three and six times increase in obesity in Q4 and Q3 respectively. Prevalence of overweight in Q1 has increased more than three times followed by Q2 and Q3. Highest decline in underweight is observed in Q1, Q2 and Q3 however, there is still a high prevalence of underweight in these quantiles. Such a high increase in overweight and obesity with persistent undernutrition again confirms that Aspirant states are facing the problem of 'twin burden' of nutritional changes.

8. Conclusion

India is still considered as a lower-middle-income country with a high prevalence of undernutrition. This study has identified some convergence of overweight/obesity prevalence across wealth quantiles in both urban and rural areas among women in Front-runner, Performer and Aspirant states. Findings show that there is a substantial geographical variation across states and no specific geographical pattern of prevalence of underweight and overweight/obesity. Overtime decline in underweight was highest in Tripura followed by Chhattisgarh, Andhra Pradesh and Haryana from 2005-06 to 2015-16. Among Performer states, there is a moderate decline in underweight in all states. In Aspirant states, Bihar has the highest prevalence of underweight in 2005-06 and an increase in overweight and obesity was highest in Bihar during 2005-06 to 2015-16. Other Aspirant states also have a similar kind of pattern this indicates the 'twin problem' of nutritional change.

Our findings suggest that an urgent response is needed to slow the increasing trend of overweight and obesity among women in Front-runner, Performer and Aspirant states irrespective of residence and wealth status. Increasing exposure to overweight and obesity-related diseases might compound an already high exposure to infectious diseases and their causal relation with (Non-Communicable Diseases) NCD's increases the severity of the problem.

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