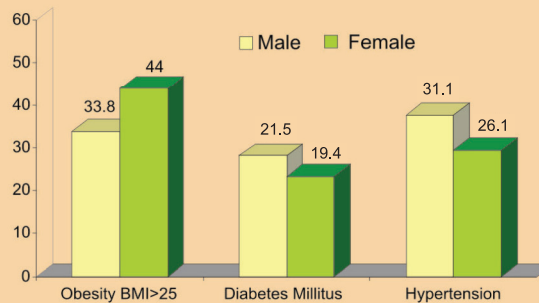# NATIONAL NUTRITION MONITORING BUREAU

Diet and Nutritional Status of Urban Population in India and Prevalence of Obesity, Hypertension, Diabetes and Hyperlipidemia in Urban Men and Women

- A brief NNMB Urban Nutrition Report

Prevalence (%) of NCDs

Male   Female

- Obesity BMI>25: 33.8 (Male), 44 (Female)
- Diabetes Millitus: 21.5 (Male), 19.4 (Female)
- Hypertension: 31.1 (Male), 26.1 (Female)

Prevalence (%) of undernutrition

Boys   Girls

- Underweight: 25.3 (Boys), 24.7 (Girls)
- Stunting: 29.8 (Boys), 27.6 (Girls)
- Wasting: 12.9 (Boys), 15.2 (Girls)

National Institute of Nutrition
(Indian Council of Medical Research)
Jamai Osmania Post, Hyderabad - 500 007
2017

NATIONAL NUTRITION MONITORING BUREAU

DIET AND NUTRITIONAL STATUS OF URBAN POPULATION IN INDIA AND PREVALENCE OF OBESITY, HYPERTENSION, DIABETES AND HYPERLIPIDEMIA IN URBAN MEN AND WOMEN
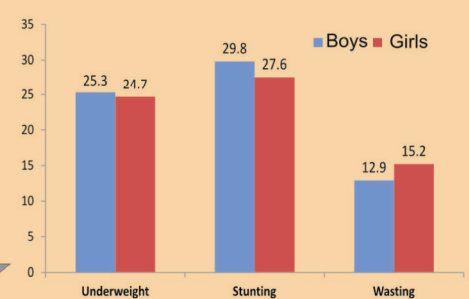
- NNMB Brief Report on Urban Nutrition

NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
Jamai-Osmania (P.O), Hyderabad 500 007
2017

NATIONAL NUTRITION MONITORING BUREAU

Director I/C : Dr KalpagamPolasa(Up to 30th April 2015),

Director I/C: Shri T.Longvah (From 1st May 2015)

CENTRAL REFERENCE LABORATORY

Name of Scientific Staff	Designation
Dr. A. Laxmaiah	Scientist G &HoD, Division of Community Studies
Dr. R. Hari Kumar	Scientist E
Dr. N. Arlappa	Scientist E
Dr. N. Balakrishna	Scientist E
Dr. I. I. Meshram	Scientist E
Dr. K. MallikharjunaRao (Up to June 2015)	Scientist D
Dr. M. S. Radhika,	Scientist D
Mr. Ch. Gal Reddy (Up to March 2015)	Scientist B
Mr. Sharad Kumar (Up to October 2016)	Sr. Technical Officer
Mr. M. Ravindranath (Up to October 2016)	Sr. Technical Officer

Name of Technical Staff & Designation		
Mr. P. VenkateshwarRao, T.O	Mr. N. Srinivasachary, T.O	Mr. G.L. Stephen, Technician
Mr. V. RadhakrishnaRao, T.O	Mr V Bhaskar TO	Mr. G. Manohar Reddy, R.O
Mr. U. D.Awasthi, T.O	Mr. Ch. Krishna, T.A	Ms. G.Neeraja, R.A
Mr. S. Prabhakar, T.O	Mr. R. RaghunadhBabu, T.A	Ms. R. Rajeswari, R.A
Mr. D. P. R. Vittal, T.O	Mr. C. Saibabu, Technician	Ms G. VijayaPushpalatha, R.A
Mr. K. NageswaraRao, T.O	Mr. S.P.V. Prasad, Technician	**Secretarial Staff**
Mr. Ch. Nagambika Prasad, T.O	Mr K. Sreerama Krishna Technician	Mr. G. H. Rao, P.A
Mr. B. Pothuraju, T.O	Ms. G. Madhavi, Technician	Mrs. G. Prashanthi, P.A

National Nutrition Monitoring Bureau (NNMB) State Units

State	Officer-In-Charge	Medical Officer/ Social Worker	Nutritionist
Andhra Pradesh	Dr. A. Laxmaiah	Dr. G. Praksah / Mr. N. SreenivasaRao	Ms. Vijaya Durga Ms Divya Harsha
Gujarat	Dr. HK Rathod	Dr. ManoharP.Barot/ MrArjanthaiGautamkumar	Ms. Krishna Patel
Karnataka	Dr. GundeRao	Dr. M.K. AshwiniMs. K.V. Jai Shankar	Ms.G. Shashi
Kerala	Dr. K.T.SreelathaKumari	Mr. T.Santosh KumarMs.P.H. Sumitha	Ms. Neetha Thomas
Madhya Pradesh	DrSurendra Kumar	Dr.RakeshBabu/ Mr.Gajanand S Dhore	Ms.SupriyaAgarwal
Orissa	Dr. S.K.Kar Dr G Bulliah	Dr.AmiyaRanjanMehant Ms.HarapravaSahu	Ms. SukhalathaPaikray
Tamil Nadu	Dr. Sanjay Mehendale	Dr. A Dinesh Kumar/ Ms. Mary JeraldinJeya	Mr. S. Manohar

National Nutrition Monitoring Bureau (NNMB) State Units (Contd..)

State	Officer-In-Charge	Medical Officer/ Social Worker	Nutritionist
Maharashtra	Dr. RP Rokade	Dr. Dinesh V.Bhale/ Ms. Mamta S Patil	Ms.Ojaswini MrsNehaHemne
Uttar Pradesh	Dr. Uday Mohan	Dr.Shravan Kumar Jaiswal Ms Sumita Verma	MsAameraFaruqui
A & N Islands	Dr. P Vijayachari	Dr Suresh Babu Ms. Sunitha Kumari	Ms Thaya Nachappa
Assam	Dr SK Sharma	Dr Kumarika Gohain Ms Rima Das	Ms Pinky Saikia
Bihar	Dr Pradeep Das	Ms Nivedita	Ms Rubeena Parween
Puducherry	Dr RLJ De Britto	Dr S Venkata Raman Ms K Bhamini	Ms A Nalini
Rajasthan	Dr GS Toteja	Dr Rameswar Lal Mr Nikhil Kumar	Ms Kanchan Jaiswal
Delhi	Dr GS Toteja	Dr Satyendranath Poona Ms Poonam	Ms Swathi

Lab Technicians under the project SANCD and NNMB			
South Asia Network for Chronic Diseases		National Nutrition Monitoring Bureau	
Andhra Pradesh	Mr. K. Pramod	A & N Islands	Mr. Guruprasad
Gujarat	Mr. H.A. Patel	Assam	Mr. NilotpalKaushik
Karnataka	Mr. K.C.M. Kumar	Bihar	
Kerala	Mr. S. Dileep Kumar	Puducherry	Mr P Shantha Kumar
Madhya Pradesh	Mr. ArifIqbal	Rajasthan	MrManipal Singh
Orissa	Mr. GurucharanMantri	Delhi	Mr. RajpalSuman
Tamil Nadu	Ms. S. Bhanupriya		
West Bengal	Mr. SarbeshwarSanpui		
Maharashtra	Mr. Pritesh P. Sahare		
Uttar Pradesh	Mr. SivasinghRajpoot		

1. INTRODUCTION

The National Nutrition Monitoring Bureau (NNMB) was established in 1972 by the Indian Council of Medical Research (ICMR) in 10 major States of India viz., Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Orissa, West Bengal and UttarPradesh. To give more spatial distribution of sample, NNMB has been expanded to six more new states namely Assam, Andaman & Nicobar Islands, Bihar, Rajasthan, Puducherry and New Delhi. The Bureau, since its inception, has been carrying out periodic surveys on Diet and nutritional status on a regular basis among the rural and tribal areas. It also carried special surveys during the intervening period. The results of the completed studies were published as NNMB Technical Reports (Nos1-26). In order to study the time trends in the diet and nutritional status of the rural and tribal communities, the Bureau has been regularly carrying out surveys at an interval of about every 10 years, in the same villages covered during the preceding surveys. Baseline surveys and first, second and third repeat surveys were carried out among rural population during 1985-87, 1988-90, 1996-97and 2011-12, respectively. The baseline, first and second repeat surveys were carried out among tribal population in the Integrated Tribal Development Project Areas (ITDA) during 1985-87, 1998-99 and 2008-09, respectively.

However, NNMB has not carried out time trend nutrition surveys among urban population in India, except a few sporadic surveys carried out at different points of time.NNMB had conducted its first survey in urban areas during 1983-1984 among different segments of urban population - high income group (HIG), middle income group (MIG), low income group (LIG), slums and industrial laborers in the cities of Trivandrum & Cochin (Kerala), Chennai (Tamil Nadu), Bangalore and Mysore (Karnataka), Hyderabad (Andhra Pradesh), and Nagpur & Pune (Maharashtra). Another survey among slum population was also carried out during 1993-94 in the cities of Ahmadabad, Bangalore, Bhopal, Bhubaneswar/Cuttack, Hyderabad, Lucknow, Madras, Nagpur and Trivandrum, where the headquarters of the state units of NNMB are located. According to the Census India (2011), there has been a steady increase in the proportion of urban proportion ranging from 28% in 2001 to 31% in 2011, due to large migration of population from rural and tribal areas to the urban areas.

Several studies carried out in the developing countries, including India, have been reporting burden of disease, i.e. under nutrition and over nutrition among urban population. Especially diet related chronic Non-Communicable (NCDs) diseases like overweight and obesity, insulin resistance, diabetes mellitus, hypertension, other cardiovascular diseases (CVDs), cancers etc., have been increasing in epidemic proportion among urban population. Major causes for the increase in incidences of NCDs are generally attributed to nutrition transition, sedentary behavior and unhealthy lifestyles and high risk behaviors. In addition, demographic and health transition, epigenetic, gene-environmental interactions and maternal & childhood under nutrition are leading causes for increase in the occurrence of NCDs in India. About 2.6 million Indians are predicted to

die due to coronary heart disease (CHD), which constitutes 54.1% of all CVD deaths in India by 2020.In addition, CHD in Indians has been shown to occur prematurely, that is, at least a decade or two earlier as compared to those in developed countries. Hypertension is an important risk factor for CVD alongside overweight and obesity and is a major public health problem in developing countries around the world.

Therefore, keeping in view of double burden of disease and the magnitude of NCDs, a comprehensive urban nutrition survey was carried out during 2015-16 with the objective to assess 'Diet and nutritional status of urban population and the prevalence of obesity, hypertension, diabetes and dyslipidemia among representative urban population in 16 states of India.

2. Objectives

2.1 Primary Objectives

To assess diet and nutritional status of urban population and prevalence of obesity, hypertension, diabetes mellitus and dyslipidemia among urban men and womeninall the 16 NNMB States viz., Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal, Assam, Andaman and Nicobar Islands, Bihar, Rajasthan, Puducherryand New Delhi.

2.2 Secondary Objectives

1. To assess the food and nutrient intakesamong different age/gender/ physiological/activity groups of urban population in all the16 NNMB Statesin India.

2. To assess the nutritional status of all the available individuals in the selected HHs in terms of anthropometry and clinical examination.

3. To assess current morbidity during previous fortnight among all the individuals covered for anthropometry,

4. To assess the infant and young child feeding (IYCF) practices among the mothers of <3year children.

5. To assess the prevalence and determinants of obesity, hypertension, diabetes mellitus and dyslipidemia among the urban adult men and women,

6. To assess body composition using body fat fold thickness at multiple sites, and bio-electrical impendence assessment (BIA) among men and women covered for anthropometry, and

7. To assess knowledge and practices of men and women with respect to obesity, hypertension, diabetes and dyslipidemia, lifestyles and risk behaviors ofmen and women.

3. METHODOLOGY

3.1 Study design

It was a community basedcross-sectional study in whichmulti-stage random sampling procedure was adopted.

3.2 Study setting

In the first stage, four cities with more than one lakh population from each state were selected randomly andthecapital city of the states where NNMB was located was selected purposely. In the second stage, 15 Municipal wards were selected randomly from each of the 5 selected cities/towns in each state.

3.3 Sample size

The sample size was calculated by considering current expected prevalence levels of different outcome variables proposed to be studied and details are given in the **Table 1**.

Table 1: Sample size covered for different variables

Investigations	No. of HHs	Age/Gender/Physiological Group	Assumed Prevalence	C.I	Relative precision	Sample size required	Design Effect	3SE groups	Total Sample required per State*
Anthropometry	3600	All the available individuals in the selected 3600 HHs							
Clinical Examination									
History of morbidity									
Diet survey	900	All the individuals partakingmealinthe selected HHs							
Diabetes Mellitus	3600	Men(≥18yrs)	12%	95%	20%	704	1.5	3	3484
		Women (≥18yrs)				704	1.5	3	3484
Blood pressure	3600	Men(≥18yrs)	20%	95%	20%	384	1.5	3	1899
		Women (≥18yrs)				384	1.5	3	1899
Lipid Profile	3600	Men(≥18yrs)	20%	95%	20%	384	1.5	3	1899
		Women (≥18yrs)				384	1.5	3	1899
K&P on NCDs & lifestyles	3600	Men(≥18yrs)	-	-	-	-	-	-	3484
		Women (≥18yrs)	-	-	-	-	-	-	3484
BIA	3600	Men(≥18yrs)	-	-	-	-	-	-	3484
		Women (≥18yrs)	-	-	-	-	-	-	3484

*Inclusive of 10% non-response   * SE-Socio-Economic group

3.4 Investigations

1. Household and Socio-demographic particulars
2. Measurement of anthropometric parameters such as height, weight, mid upper arm Circumference (MUAC), waist, and hip circumference and fat fold thickness at triceps, biceps, sub-scapular and suprailiac sites,
3. Clinical examination for the presence of nutritional deficiency signs and symptoms and collection of history of morbidity in all the subjects covered for anthropometry.
4. A 24-hour recall method of diet survey in every 4th HH selected for anthropometry (2diets perCEB/GA).
5. Food frequency questionnaire among all the available men and women in the selected HHs.
6. Measurement of blood pressure among all the availablemen and women in the selected HHs.
7. Estimation of fasting blood glucose among all the available men and women in the selected HHs.
8. Estimation of lipid profile in one man or woman (alternatively) from each of the selected HHs in all nuclear families. In case of joint families,atleast oneman andwoman were covered for lipid profile.
9. To collect information on Infant & young child feeding (IYCF) practices of mothers of <3year children
10. Information on knowledge and practices ofmen and women about hypertension, diabetes, hyperlipidemia and health and nutrition and lifestyles, including risk behaviors.

3.5 Training and Standardization of Investigators

The Medical Officers, Nutritionists, Social Workers and Technicians of all the project staff of NNMB Units were given a three-week orientation-cum-standardization training at NIN, Hyderabad. They were trained on the techniques of collection of socio/economic and demographic information, diet surveys, anthropometry, identification of nutritional deficiency signs, blood pressure measurement, estimation of fasting blood sugar, Lipid profile and administration of different survey instruments to capture the required data from the select households/subjects. During the training, emphasis was given on achieving maximum intra and inter-observer agreement with respect to all the measurements (**Table-2**). At the end of the training programme a mock survey was also conducted and demonstrated to all the investigators. This enabled them to grasp the practical way of following up of the sampling procedure in the field.

After the initial training, each team carried out mock surveys in their respective states and came out with their field experiences. The survey proformae were then finalized, considering theirexperiences. Given below is the table indicating the positive effect of training on the investigators. Also, the data pertaining to the mean Inter-Individual differences (difference between the measurements of investigators and the Anthropologist of NIN) is captured here.

4

Table 2 Training and Standardization of Investigators against various anthropometric measurements

Day of Training Programme	Mean Difference in Height (Cm)	Mean Difference in MUAC (Cm)	Mean Difference in FFT (mm)	Mean Difference in Waist Circumference (Cm)
Day 1	0.9	1.8	1.37	2.2
Day 2	1.0	0.9	0.70	1.76
Day 3	0.27	0.50	0.60	1.3
Day 4	0.26	0.35	0.57	1.34
Day 5	0.18	0.27	0.48	1.14
Day 6	0.17	0.28	0.67	0.64
Day 7	0.13	0.22	0.39	0.49

3.6 Quality Control

To ensure the quality of data collection, surprise visits were made by the scientists/Technical staff of NIN to all the NNMB states, at periodical intervals. During these visits,the supervisory staffof NIN were made to check the process of data collection and made to repeatsome selective measurements like anthropometry, blood pressure and household and demographic information with the help of structured instrument to validate and check the data quality. It was observed that the Inter-Individual variation for different measurements were within the acceptable limits. The Intra Class Correlation for anthropometry, clinical examination and blood pressure measurements are provided in **Table 3**.

Table 3.Intra Class Correlation of anthropometry, clinical examination and blood pressure measurements between standardized supervisors data collection and measurements carried out by the investigators

Measurements	Intra Class Correlation Co-efficient	N
Height	0.996	594
Weight	0.999	
Upper Arm Circumference	0.997	
FFT at Triceps	0.986	
Clinical	0.950	
Waist Circumference	0.992	181
Hip Circumference	0.983	
Systolic BP	0.924	218
Diastolic BP	0.842	

A detailed methodology is given in the main report (which is available at website: nnmbindia.org on or after 26th September 2017).

3.7 Ethical issues

Written consent was taken from all the heads of the households selected for study, regarding collectionof household level data and data regarding children and adolescents. However, written informed consent was taken from all the men and women recruited for the study.

3.8 Statistical Analysis

Data collection was done with the help of structured and validated (NNMB) schedules and data entry was done at NNMB Central Reference Laboratory (CRL), NIN, Hyderabad. The Excel data was screened for its inconsistencies and presence of outliers.. Only less than one percent data was found to be as outliers, which was not considered in the preparation of database and final analysis.

Data analysis was done using SPSS Windows Version 19.0. In the descriptive analysis, continuous variables were expressed as mean ± standard deviations (SD) and categorical variables were expressed as count (percentages) and calculated 95% CIs for all outcome variables. The prevalence of various outcome variables by age groups and gender is reported.

Age adjustment was carried out using the direct method with the 2011 Indian census urban population as the standard for NCD variables. Univariate analyses comparing distributions of socio-demographic and economic status and clinical/morbidity measures between groups was performed using unpaired student t test for normally distributed continuous variables and MannWhitney U Test for non-normally distributed continuous variables. For categorical variables, Pearson chi-square test was used. Prevalence (%) of various risk factors of subjects with different outcomes of present and absent is reported and significance of differences evaluated using odds ratio (OR). Multiple logistic regression analysis was carried out to examine the risk estimate between various exposures and outcomes with unadjusted and adjusted odds ratios (ORs) were calculated with 95% CI. $P < 0.05$ was considered as statistically significant.

4. Results

A. DIET AND NUTRITIONAL STATUS OF URBAN POPULATION

4.1. Coverage Particulars

A total of 1,71,928 individuals were covered in the survey for socio-demographic & economic status, anthropometry and clinical examination. Data was obtained from 52,577 HHs in 1,097 wards from 16 states. Food and nutrient intakes information was collected from 12,903 households through diet survey involving 44,883 individuals. A total of 5,642 mothers of <36 months children were interviewed to obtain information on antenatal care, infant and young child feeding (IYCF) practices, coverage for immunization, iron & folic acid tablets consumption and massive dose of vitamin A supplementation.

4.2. Socio-Demographic & Economic profile

A majority of the households belonged to Hindu religion (81.6%), followed by Muslims (11.9%), while the rest were either Christians (4.6%) or belonging to other religions (1.9%). In general, a majority of the HHs belonged to other communities (41.9%), followed by backward communities (40%), scheduled castes (15.9%) and scheduled tribes (2.2%). About 88% of adult men and 81% of the adult women in the HHs surveyed were literates. About 52% of the head of the households were engaged either in service (32.6%) or in business (20.3%), while about 18% were labourers. The average family size was 4.3, which ranged from a low 3.6 in the State of Kerala to a high 4.9 in Uttar Pradesh and Madhya Pradesh. The average monthly per capita income (PCI) was Rs. 4,941/- at the current rupee value (**Fig. 1**). Andaman & Nicobar had highest per capita monthly income of Rs 8,027, followed by Kerala (7,965), while West Bengal had the lowest income of Rs. 2,884.

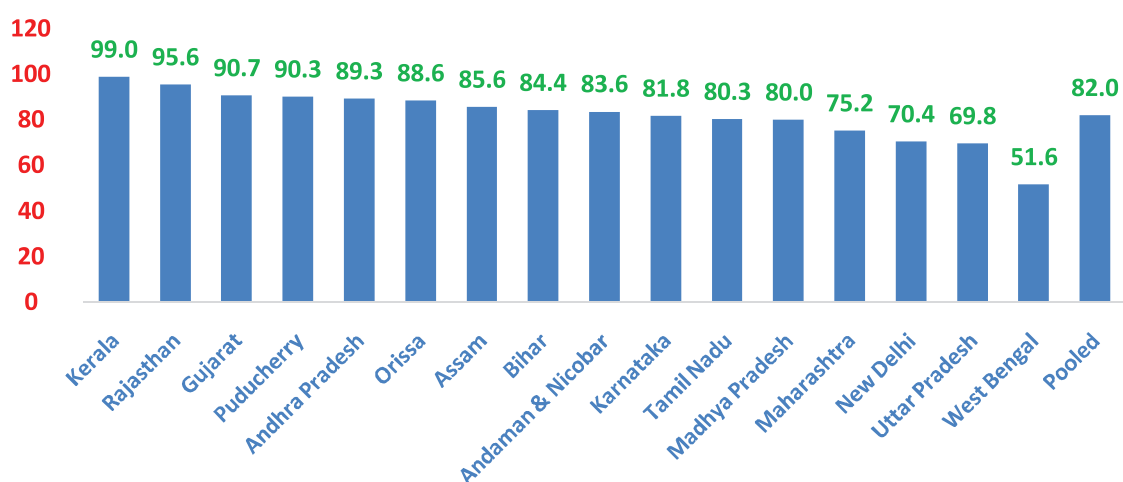

Fig. 1 Monthly percapita Income (Rupees) in urban area
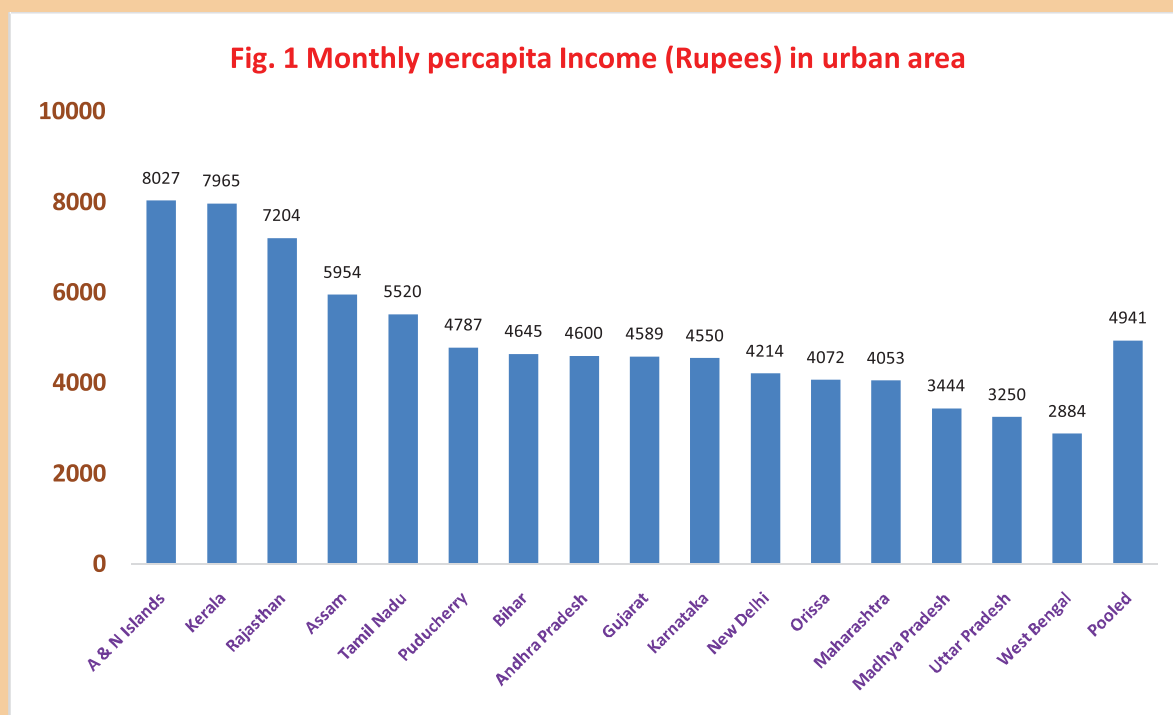
About 82% of the HHs had sanitary latrines at home (**Fig. 2**) and 86% of HHs had separate kitchen. Majority of the HHs (85.8%) were found to be using LPG as cooking fuel and, 99% of the HHs had electricity.
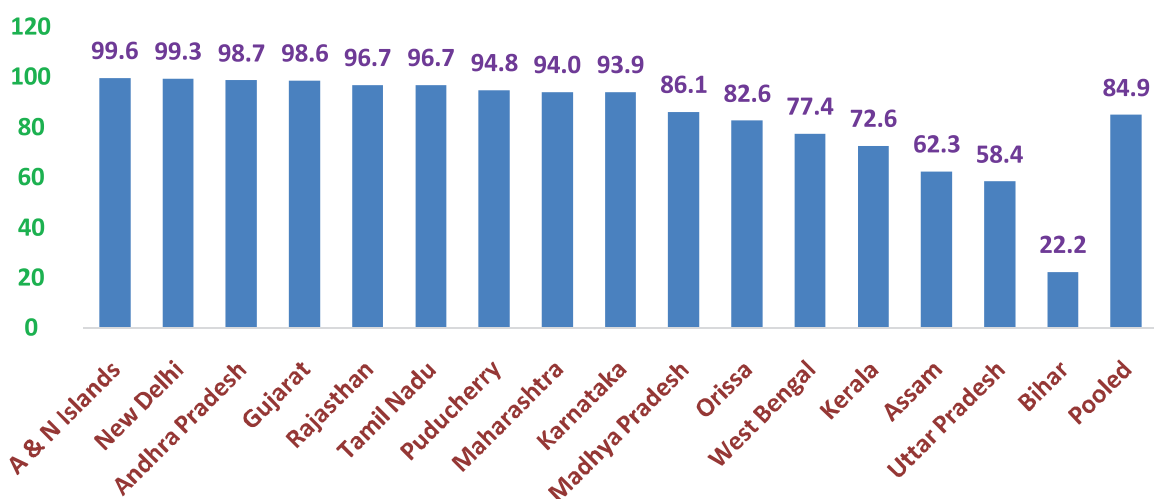
Table 4: COVERAGE PARTICULARS

State	No. of wards Surveyed	No of HHS surveyed	Diet Survey		Nutritional Assessment				Blood Pressure		Diabetes		Lipid Profile		IYCF practices (Mothers of <3yr children)
			HHs	Individuals	<5 Yr Children	School Age & Adolescents	Adults (≥18 Yrs) Men	Adults (≥18 Yrs) Women	Men	Women	Men	Women	Men	Women	
Kerala	75	3584	882	2725	658	1872	3332	4690	2710	4064	952	1365	969	1385	379
Tamil Nadu	75	3598	893	2848	887	2527	3783	4685	3130	4058	1392	1884	1332	1785	405
Karnataka	75	3604	894	3004	928	2435	3645	4918	2240	3608	1108	1607	1109	1608	494
Andhra Pradesh	74	3550	870	3011	949	2355	3740	4637	2863	3646	1196	1496	1229	1546	343
Maharashtra	74	3556	880	3297	961	2644	4263	5185	3156	3777	1373	1159	1429	1244	393
Gujarat	73	3599	882	3121	745	2239	3575	5017	2649	4353	1069	1619	1049	1580	461
Madhya Pradesh	73	3482	867	3163	1052	2754	4145	4995	2583	3206	1088	1234	983	1129	478
Orissa	75	3602	896	2830	771	2245	3011	4410	2540	3801	1192	1551	1212	1572	173
West Bengal	75	3599	896	3379	946	2756	3412	4805	1695	3212	858	1649	860	1669	503
Uttar Pradesh	74	3538	881	3514	1145	3824	3237	4605	2154	3150	855	1148	827	1138	574
A & N Islands	75	3584	879	2973	927	2877	4314	4730	3025	3603	1588	1511	1678	1630	498
Assam	41	2079	504	1475	315	645	1604	2518	1225	1897	789	1104	787	1076	164
Bihar	52	2369	577	2252	488	2743	2832	2874	2099	2233	1214	1254	1246	1290	167
New Delhi	57	2677	661	2633	431	1369	2370	3521	1837	2987	1160	1586	1196	1633	130
Puducherry	75	3566	878	2756	648	2102	3726	4698	3235	4209	1193	1379	1200	1397	429
Rajasthan	54	2590	563	1902	246	1269	2676	3219	2274	2632	1103	1126	1286	1307	51
Pooled	**1097**	**52577**	**12903**	**44883**	**12097**	**36656**	**53668**	**69507**	**39415**	**54436**	**18130**	**22672**	**18392**	**22989**	**5642**

Fig. 2 Percent (%) urban households possess sanitary latrines

Kerala 99.0, Rajasthan 95.6, Gujarat 90.7, Puducherry 90.3, Andhra Pradesh 89.3, Orissa 88.6, Assam 85.6, Bihar 84.4, Andaman & Nicobar 83.6, Karnataka 81.8, Tamil Nadu 80.3, Madhya Pradesh 80.0, Maharashtra 75.2, New Delhi 70.4, Uttar Pradesh 69.8, West Bengal 51.6, Pooled 82.0

A majority of the HHs (85%) were using Tap/filtered drinking/mineral/purchased water (**Fig. 3**) followed by tube well water (11.4%) and open well water (3.7%).

Fig. 3 Percent of urban household using protected drinking water

A & N Islands 99.6, New Delhi 99.3, Andhra Pradesh 98.7, Gujarat 98.6, Rajasthan 96.7, Tamil Nadu 96.7, Puducherry 94.8, Maharashtra 94.0, Karnataka 93.9, Madhya Pradesh 86.1, Orissa 82.6, West Bengal 77.4, Kerala 72.6, Assam 62.3, Uttar Pradesh 58.4, Bihar 22.2, Pooled 84.9

A majority of the households had television and mobile phones at their houses (93% each) followed by refrigerator (60.9%) and two wheelers (55.2%).

4.3. Food and Nutrient Intakes

4.3.1. Food Consumption

Cereals formed the bulk of the diets for the urban population. In the States of West Bengal, Assam, Bihar and Andaman & Nicobar Islands, the consumption of roots and tubers was comparatively high. Similarly, millet consumption was high in the States of Maharashtra, Gujarat and Karnataka. The average intake of cereals and millets was 320 g/CU/day which is lower than the RDI, while, the intake of pulses and legumes was about 42g/CU/day, which is on par with the suggested level of ICMR. The intake of GLV, milk & milk products and sugar & jaggery were lower than the RDI. (**Fig. 4**)
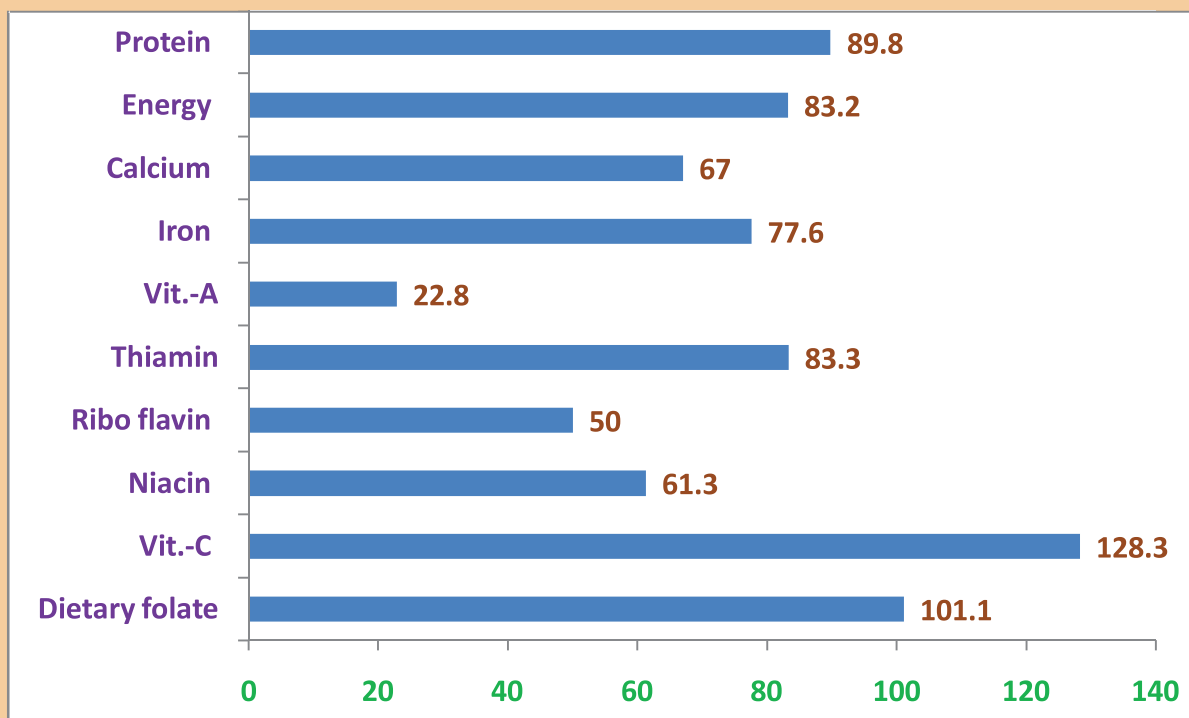
9

Fig. 4   Average household consumption of foodstuffs as % RDI

Fig. 4   Average household consumption of foodstuffs as % RDI

Foodstuff	% RDI
Cereals & Millets	69.6
Pulses & Legumes	104.5
Green Leafy Veg.	59.5
Other Vege-tables	125.7
Roots & Tubers	188.8
Milk & Milk Prod.	81.3
Fats & oils	159.5
Sugar & Jaggery	52.3
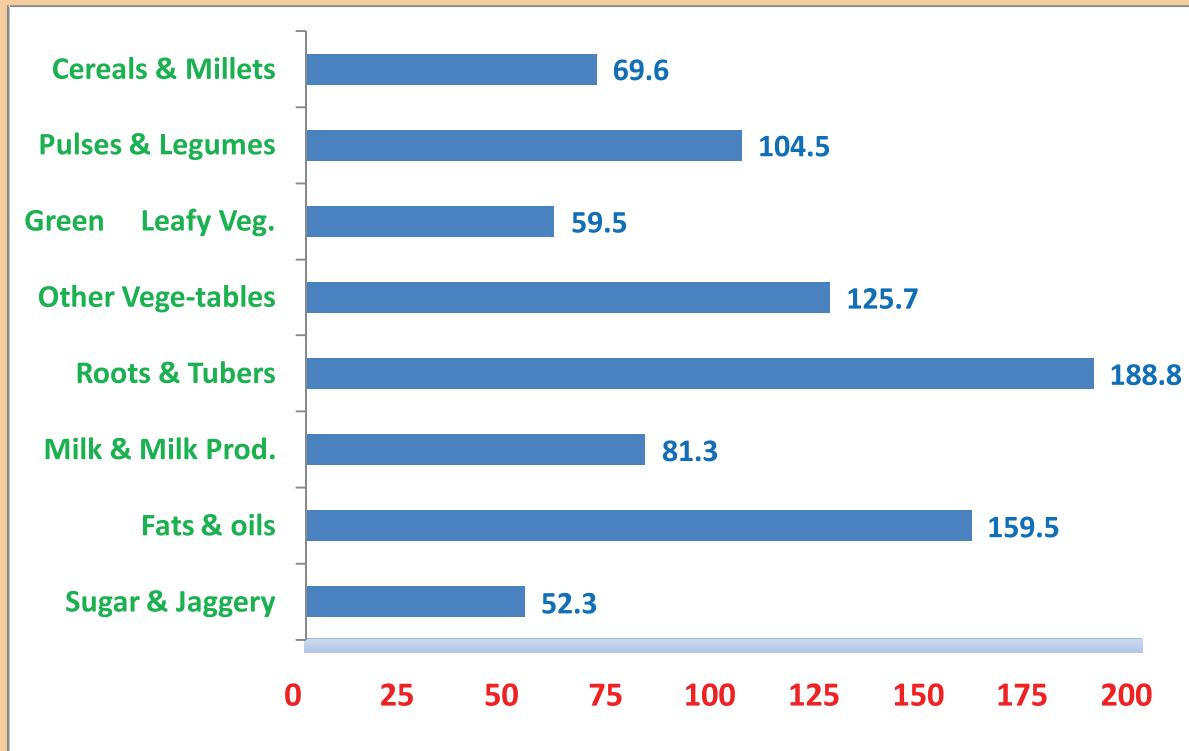
4.3.2. Nutrient Intakes

The average intake of the macro nutrients such as energy and protein and micronutrients like Iron, Thiamine and Niacin were observed to be below the RDA, whereas, the intake of Vitamin A and Riboflavin were grossly inadequate. The intake of Vitamin C and total folate were meeting the RDA (**Fig. 5**).

Fig. 5 Average Household Consumption Of Nutrients As % RDA

Nutrient	% RDA
Protein	89.8
Energy	83.2
Calcium	67
Iron	77.6
Vit.-A	22.8
Thiamin	83.3
Ribo flavin	50
Niacin	61.3
Vit.-C	128.3
Dietary folate	101.1

The proportion of preschool children consuming <50% of RDA of vitamins and minerals such as vitamin A, riboflavin, vitamin C, dietary folate and calcium, in general was very high and ranged from 2% to 93% and that of iron, thiamine and niacin ranged from 5% to 88%, with wide variations observed between the States. The proportion of pregnant women consuming vitamins and minerals less than 50% of RDA, in general was high with wide variations observed between the States.

About 57% of 1-3 year children and 68% of 4-6 year children were consuming adequate amounts of protein and calories. About 56% of the pregnant women were consuming adequate amounts of both the nutrients and ranged from a high 100% in Assam to a low 30% in Uttar Pradesh. Similarly, the proportion of lactating mothers (<12 months lactation) consuming adequate amounts of both protein and calories was 66%, the proportion being high in the States of Orissa and Karnataka (96%) and lowest in Bihar (25%).

4.4. Nutritional Status

4.4.1. Under 5yr Children

The overall prevalence of underweight, stunting and wasting among < 5 yr children was 25% (24.3 - 25.9), 29% (27.9 - 29.5) and 16% (14.9 - 16.3) respectively. The Prevalence of underweight was highest in the states of Uttar Pradesh (43.6%) followed by Madhya Pradesh (32.3%), Maharashtra (31%) and lowest in Puducherry (14.2%). There were no significant differences observed among both the genders (Boys: 25.3% Vs Girls: 24.7%). The prevalence of stunting was marginally higher among boys (29.8%) compared to girls (27.6%). The prevalence of stunting was highest in the States of Uttar Pradesh (40.8%), Maharashtra (36.4%), New Delhi (35.7%) & West Bengal (34.4%) and lowest in Puducherry (11.6%). The proportion of wasting was maximum in the States of Uttar Pradesh (28.9%) followed by Madhya Pradesh (19.6%), Rajasthan (19.0%), and Andhra Pradesh (16.6%) and was lowest in Orissa (8.4%). (**Fig. 6.1 & Fig. 6.2**)


Fig 6.1 Prevalence (%) of underweight among urban under five year Children

Fig. 6.2 Prevalence (%) of Stunting among urban under five year Children

Pudicherry 11.6, Tamil Nadu 15.4, A & N Islands 18.2, Assam 19.3, Kerala 23.1, Andhra Pradesh 23.4, Karnataka 29.0, Bihar 31.0, Rajasthan 31.0, Gujarat 32.9, Orissa 33.0, Madhya Pradesh 34.1, West Bengal 34.4, New Delhi 35.7, Maharashtra 36.4, Uttar Pradesh 40.8, Pooled 28.7

4.4.2. School Age Children & Adolescents

The nutritional status of adolescents revealed that the prevalence of thinness was more among boys than the girls. Overall, nearly 25% of the boys (5-9 yr: 24% CI: 22.9-24.9, 10-13yr: 27% CI: 25.8-28.1 and 14-17 yr: 26% CI: 24.9-27.2) and 18% of girls (5-9 yr: 19% CI: 18.2-20.1, 10-13yr: 20% CI: 18.5-20.6 and 14-17 yr: 14% CI: 13.2-15.0) were found to be thin. (**Fig. 7**).

Fig. 7 Prevalence (%) of Thinness among School age children and Adolescents

■ Boys ■ Girls

	Boys	Girls
5-9 Years	23.9	19.1
10-13 Years	26.9	19.5
14-17 Years	26	14.1
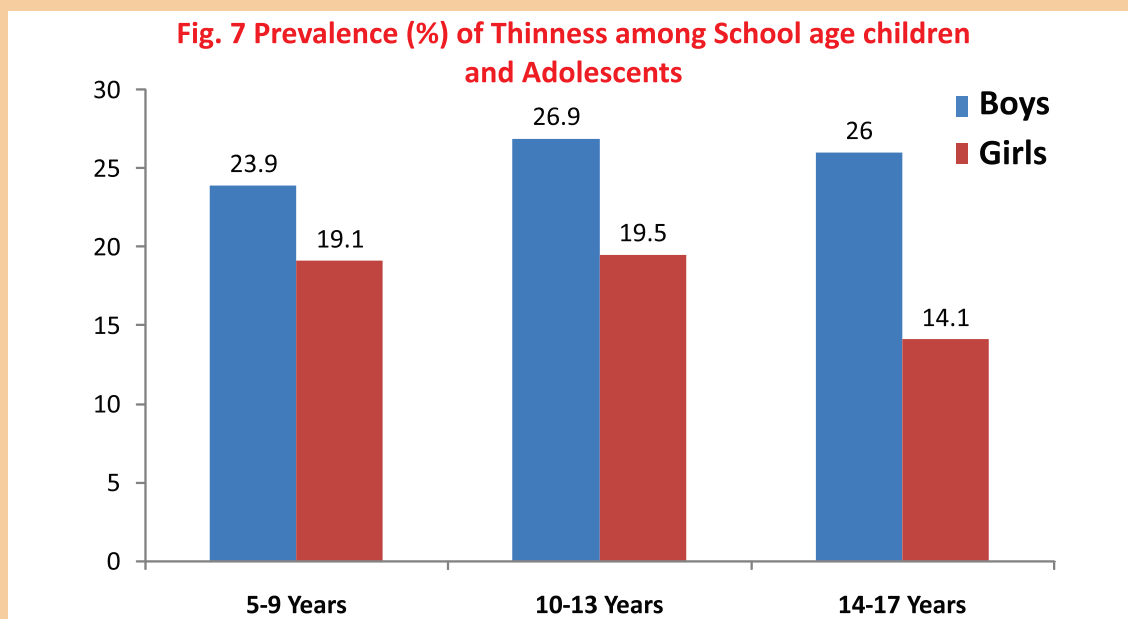
4.4.3. Adults (≥18 Years)

More number of urban women (44%) was found overweight & obese when compared with their male (34%) counterparts. **(Fig. 8)** The overall prevalence of overweight/obesity (BMI ≥25) among urban men was 34% which was found highest in the state of Rajasthan (42.6%) followed by Puducherry (42.5%) and Tamil Nadu (35.3%), and lowest in West Bengal & Uttar Pradesh (21%). The prevalence of chronic energy deficiency (CED; BMI<18.5) among men was 13%. About 44% of urban women were found overweight/obese. The prevalence of overweight/obesity was highest in the States of Puducherry (59.8%), Tamil Nadu (54.1%), New Delhi (52.3%), Gujarat (52.2%) and Kerala (52.1%), while, overweight/obesity was lowest in the state of Uttar Pradesh (29.7%). Nearly 11% of adult women had chronic energy deficiency.

Fig. 8 Prevalence (%) of Overweight and obesity among urban Adults
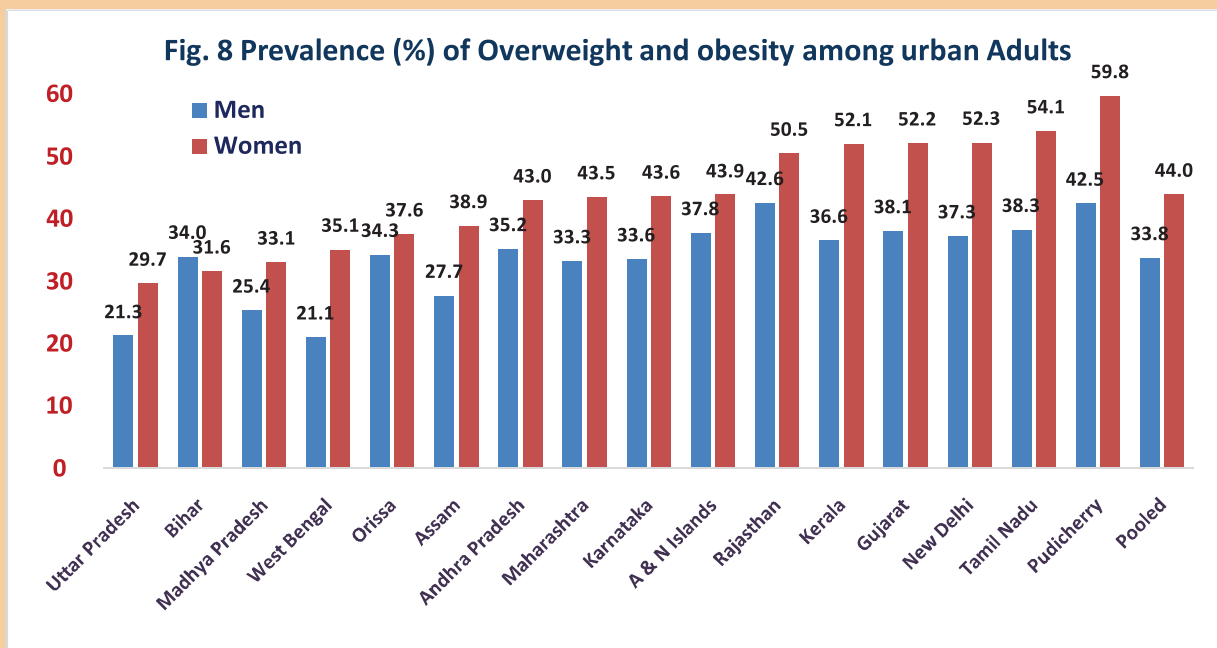
4.5. Infant and Young Child Feeding (IYCF) Practices

Almost all the pregnant women surveyed attended required number of 4 ANCs and a majority had received and consumed IFA tablets during their last pregnancy. As per the records of AWCs and MCP cards, the prevalence of LBW in the urban children was 16%. (**Fig. 9**).


Fig 9 Prevalence (%) of Low Birth Weight*

*The data collected from AWC registers / MCP Cards
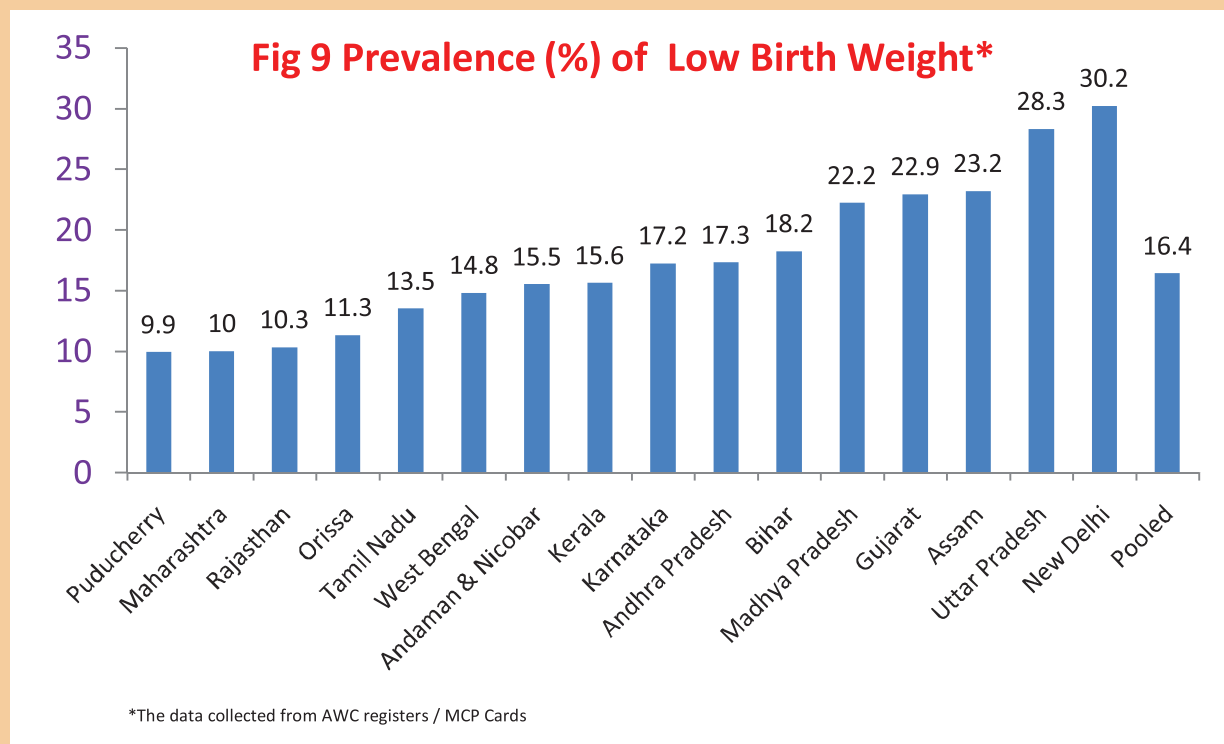
Information on breastfeeding and complementary feeding practices of mothers of <12 month children revealed that about 42% of mothers initiated breast feeding within 1 hour after delivery, which ranged from 14% in Gujarat to 55% in Andaman & Nicobar islands, while 31% were fed between 1-3 hours. (**Fig. 10**)

FIG. 10 TIME OF INITIATION OF BREAST FEEDING (< ONE HOUR AFTER BIRTH)
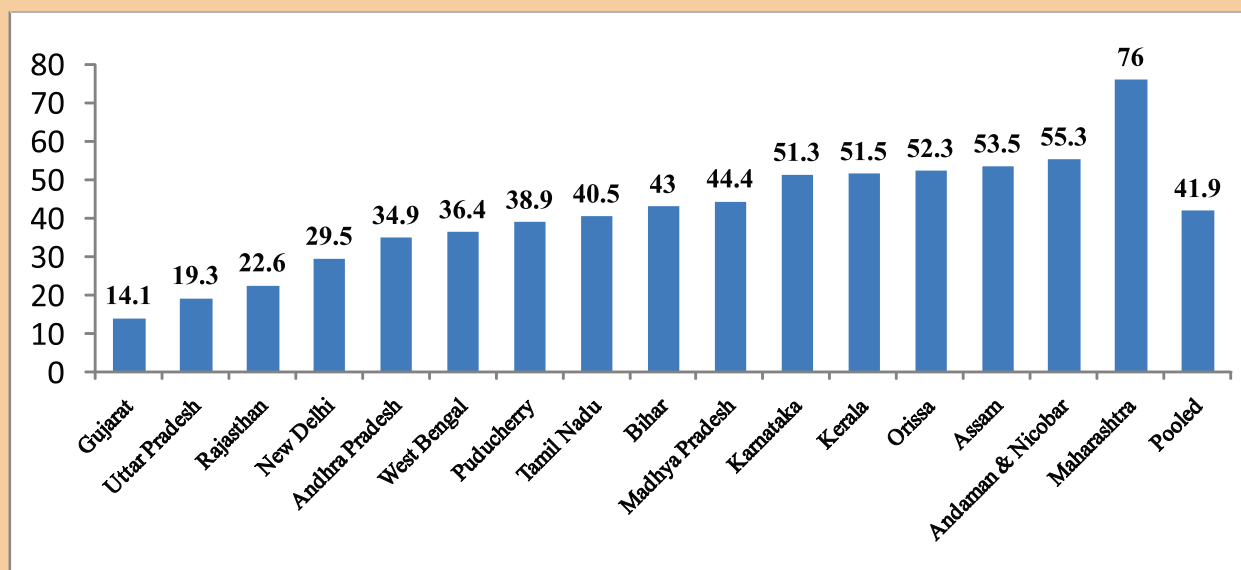
About one fourth of the mothers (25%) reportedly gave pre-lacteal feeds such as cow/goat milk, honey, sugar/glucose water etc. to their newborn, and 86% of the mothers reportedly fed colostrum to their newborn. About 36% of infants below 12 months were solely breastfed and about 34% had received complementary feeds immediately after completion of 6 months of age.(**Fig. 11**).

Fig. 11 Initiation of Complementary Feeding Immediately after compleation of 6 months of age
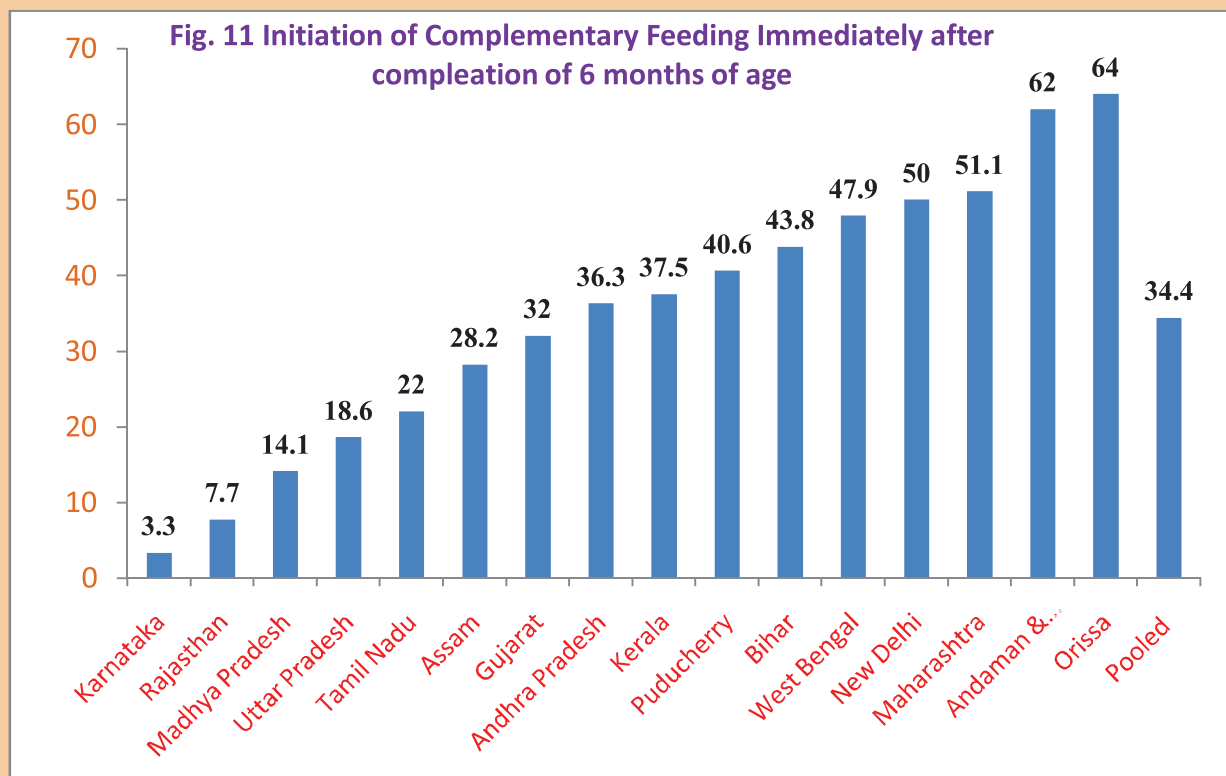
More than 90% of the 12-24 months children were completely immunised and 71% of the 12-36 months children received at least one massive dose of Vitamin A. Majority of the mothers of <36 months chidren had the habit of washing hands with soap after toilet use (95%) and before feeding the child (62%).

4.6. Association of under nutrition (< 5yr children) with Socio-Economic Variables

Overall, the prevalence of underweight, stunting and wasting of < 5yr children was significantly higher among the children belonging to the families of SC and ST, with lower per capita income, with illiterate fathers and not having the access to the sanitary latrines. (**Fig 12.1 to 12.6**).

Fig 12.1 Prevalence (%) of undernutrition among <5year urban Boys by Community
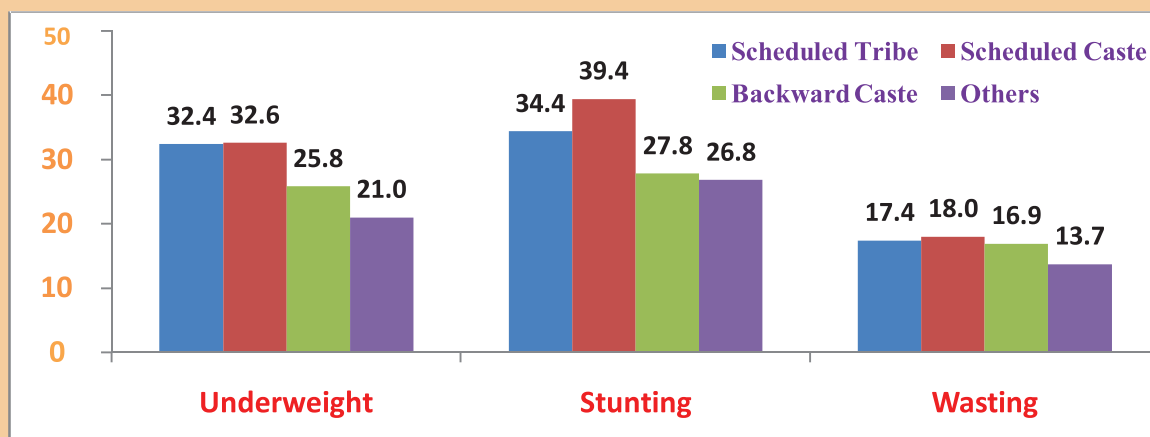
Fig 12.2 Prevalence (%) of under nutrition among <5yr urban Girls by Community
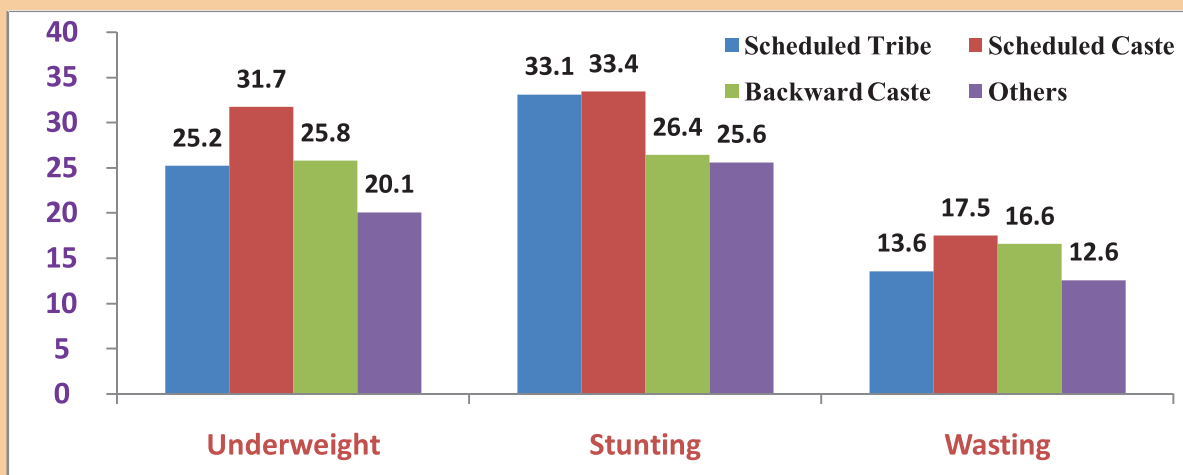
Fig. 12.3 Prevalence (%) of undernutrition among <5yr boys by literacy status of father
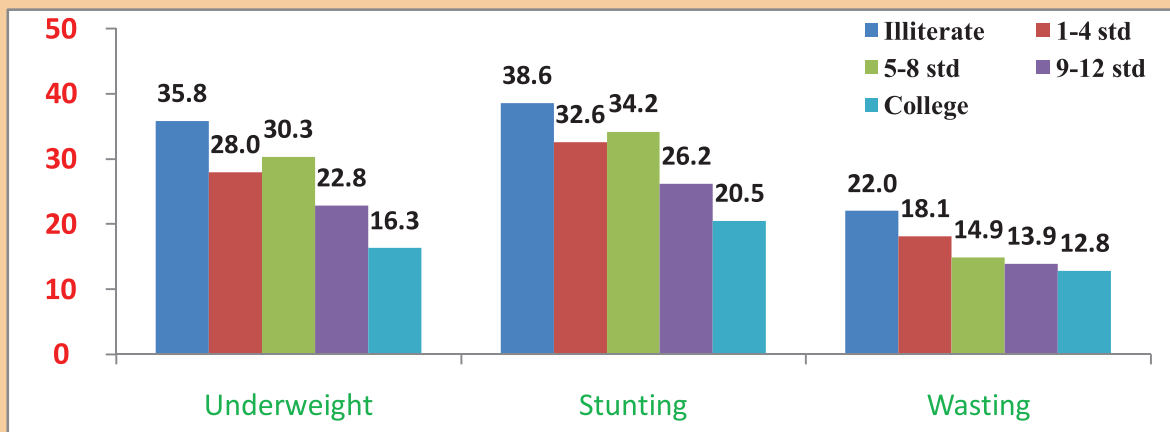
Fig. 12.4 Prevalence (%) of undernutrition among <5yr girls by literacy status of father
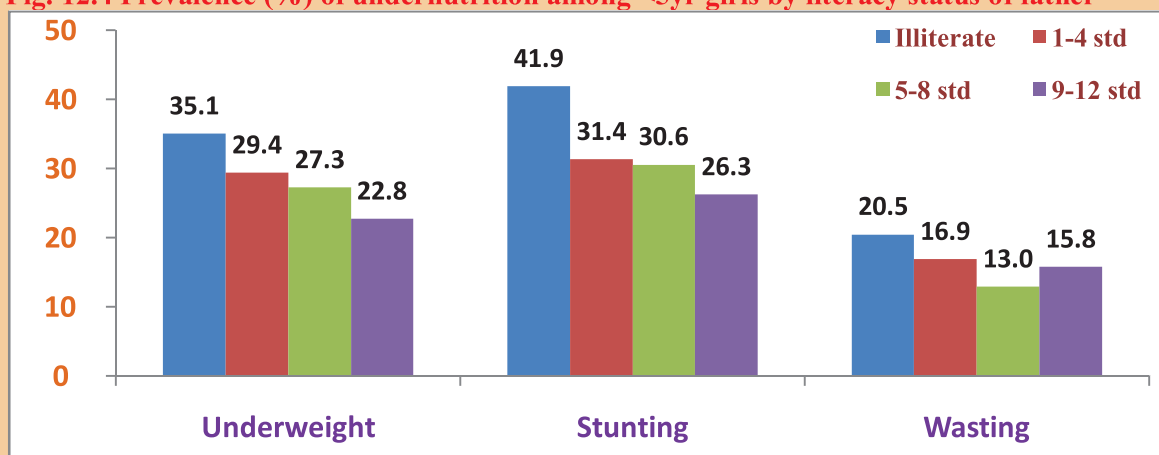
Fig. 12.5 Prevalence (%) of undernutrition among <5year urban Boys by use of sanitary latrine
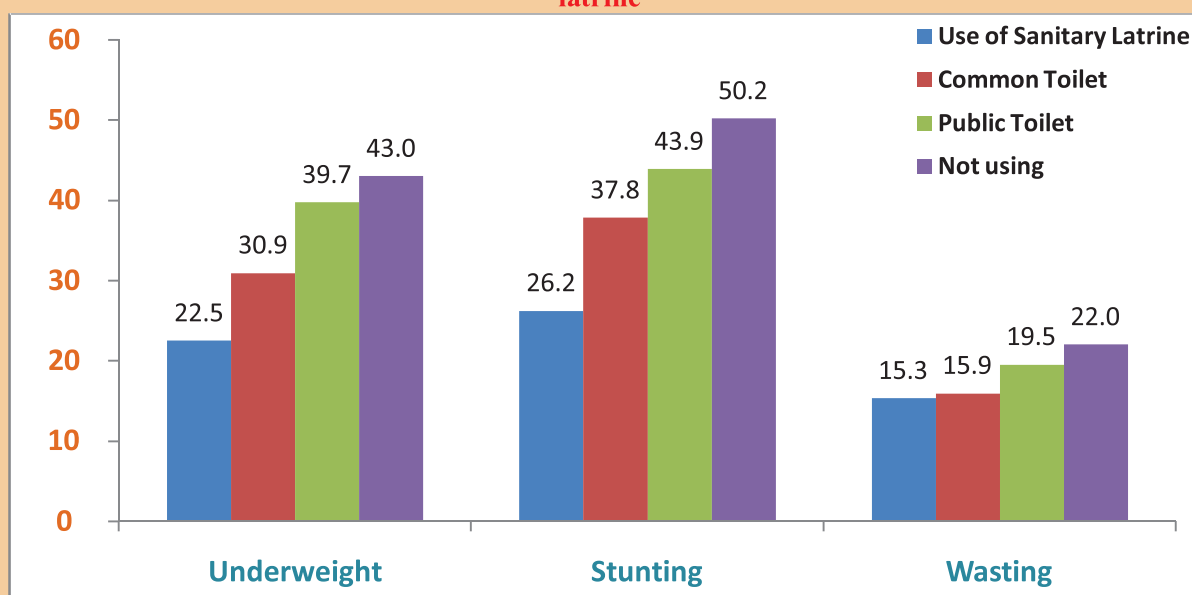
Fig. 12.6 Prevalence (%) of undernutrition among <5year urban Girls by use of sanitary latrine

16
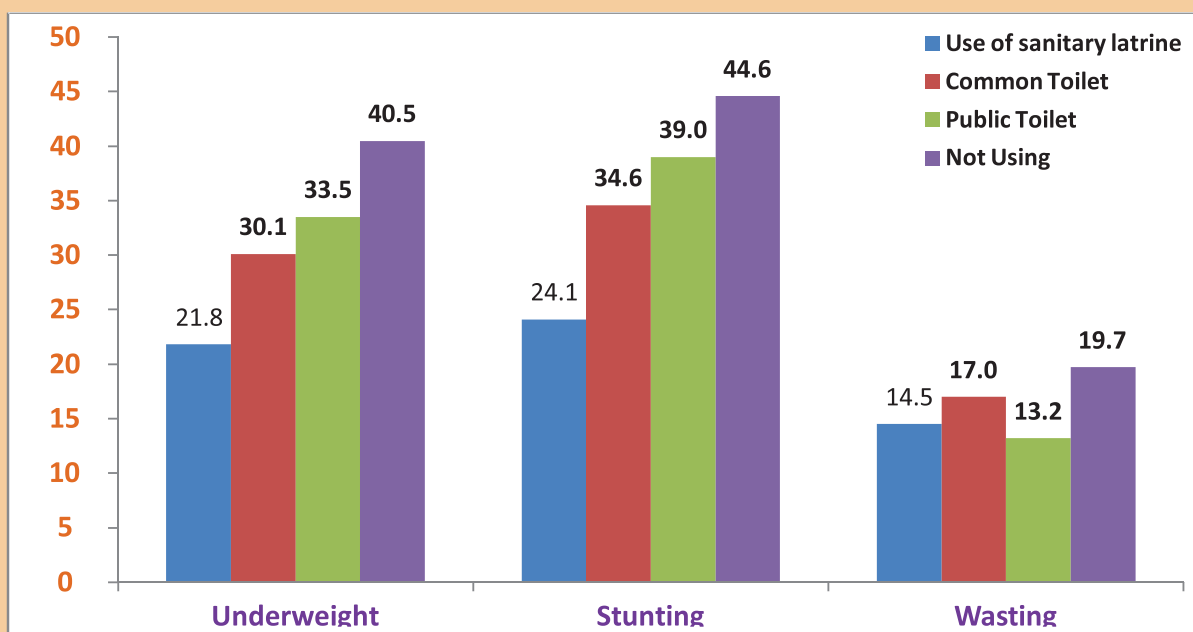
B. DIET-RELATED CHRONIC NON COMMUNICABLE DISEASES

5.1. Coverage Particulars

The blood pressure measurements were available for 39,415 men and 54,436 women of ≥ 18 years, while a total of 18,130 men and 22,672 women were covered for Fasting Blood Glucose analysis. The Lipid Profile was estimated on 18,392 men and 22,989 women. **(Table 4)**

5.2. Prevalence of Hypertension

The overall prevalence of hypertension (age adjusted) among men and women was 31.1% and 26.1% respectively. The prevalence of hypertension among men was higher in the States of Kerala (38.6%) followed by Andhra Pradesh (36.2%) and New Delhi (34.7%) and low in Bihar (22.2%). Among women, it was higher in Kerala (31.4%), followed by West Bengal (31%), Karnataka (28.6%) and Andhra Pradesh (28.2%) and lowest in Bihar (15.7%). **(Fig. 13).** The prevalence of hypertension increased with increase in age in both the genders.

Fig. 13 Prevalence (%) of Hypertension* among urban Men & Women
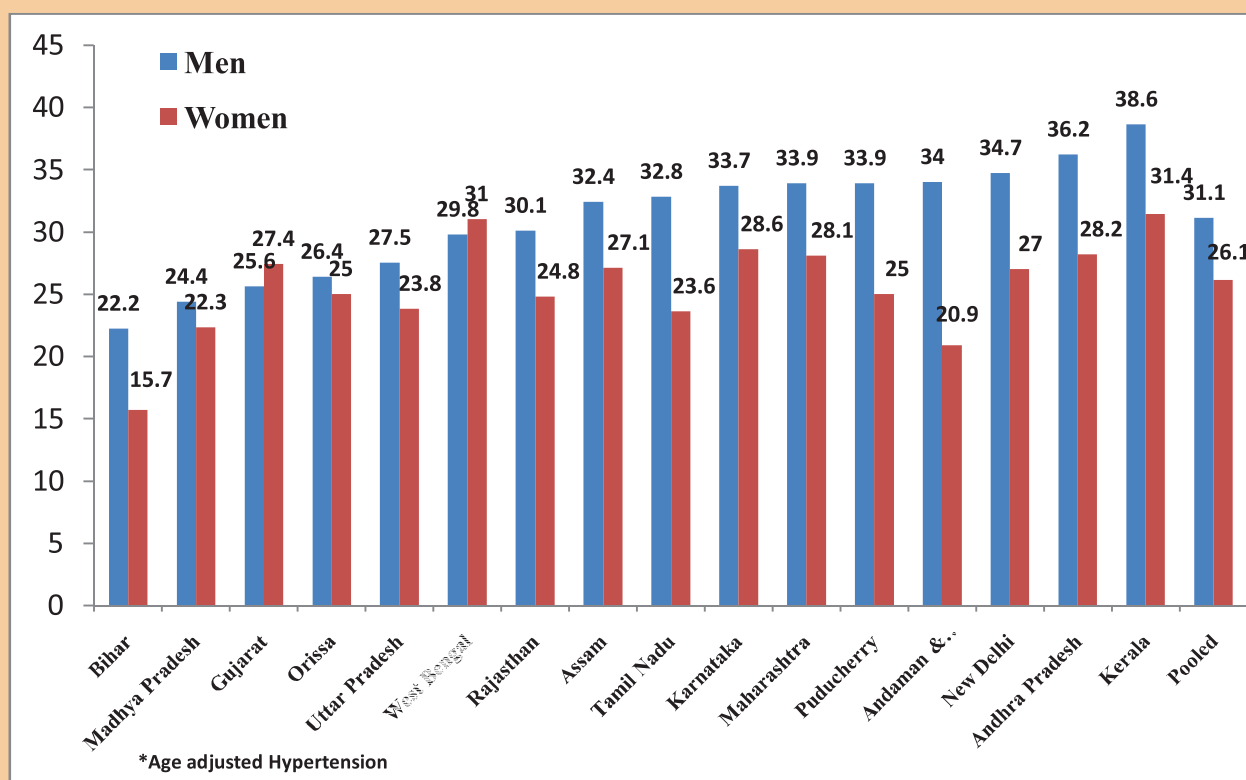
5.3. Prevalence of Diabetes

The overall prevalence of diabetes (age adjusted) among men was 21.5% and ranged from a high of 34% in Puducherry followed by 28.1% in New Delhi and 26% in Andaman & Nicobar and found lowest in Madhya Pradesh (12.9%). Among women, the overall prevalence was 19.4% ranged from a high of 29.8% in Puducherry and 25.5% in New Delhi to a low of 12.6% in Orissa. **(Fig. 14).** The prevalence of diabetes was highest in 60-70 yrs of age group and lowest in 18-30yrs age group in both the genders.

Fig.14 Prevalence (%) of Diabetes* among urban Men & Women

*Age adjusted Diabetes
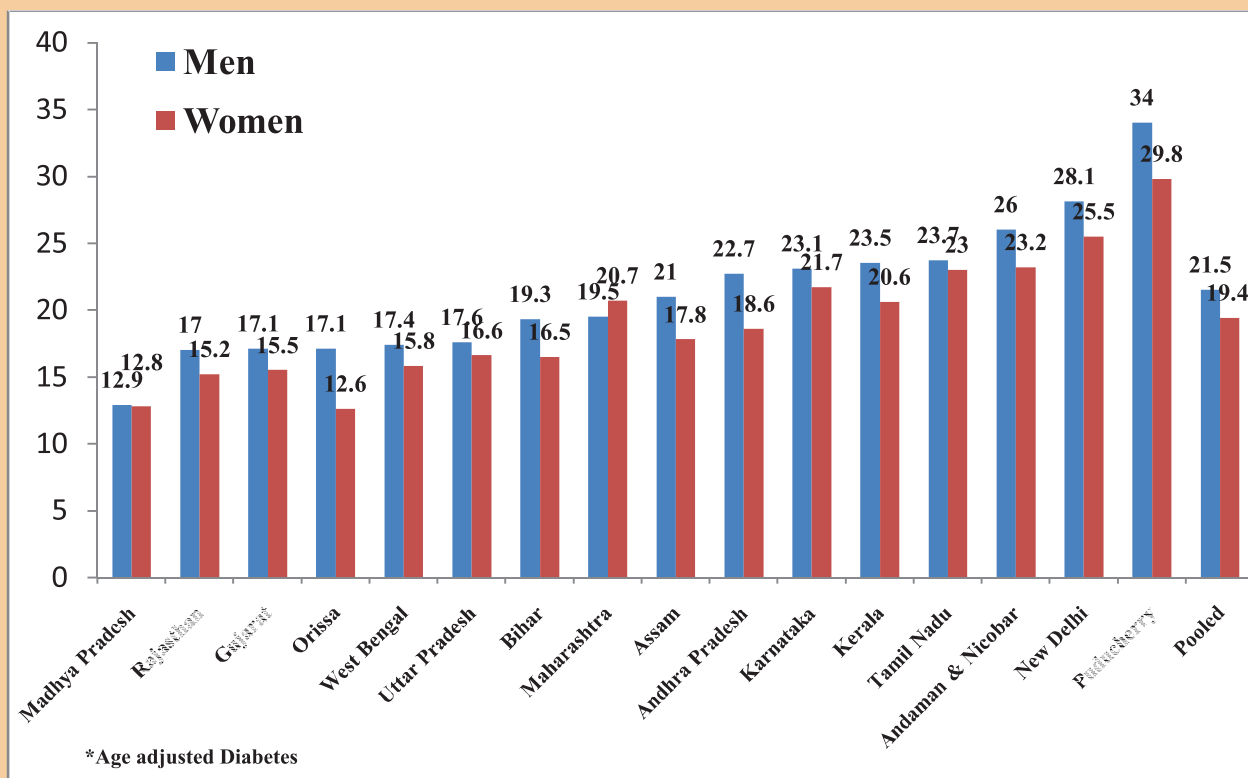
5.4. Prevalence of Dyslipidemia

In general, more than twenty percent of both men (22.3% CI-21.7-22.9) and women (22.4% CI-21.9-22.9) were observed to have total high cholesterol levels (≥200 mg/dl) which was found to be highest in the age group of 50-70yrs in both the genders. Similarly, 23% (22.4-23.6) men and 25% women (24.7-25.8) were observed to have high LDL cholesterol levels (≥130 mg/dl). About 74% of men (73.0-74.3) and 82% (81.7-82.7) of women were observed to have low HDL cholesterol levels (<40/50mg/dl). In both the genders the low levels of HDL was found to be higher in the lower age groups.   About 40% (39.6-41.1) men and 28% (27.2-28.3) women were observed to have high levels of triglyceride (≥150 mg/dl). (**Fig. 15.1, 15.2 & 15.3**)

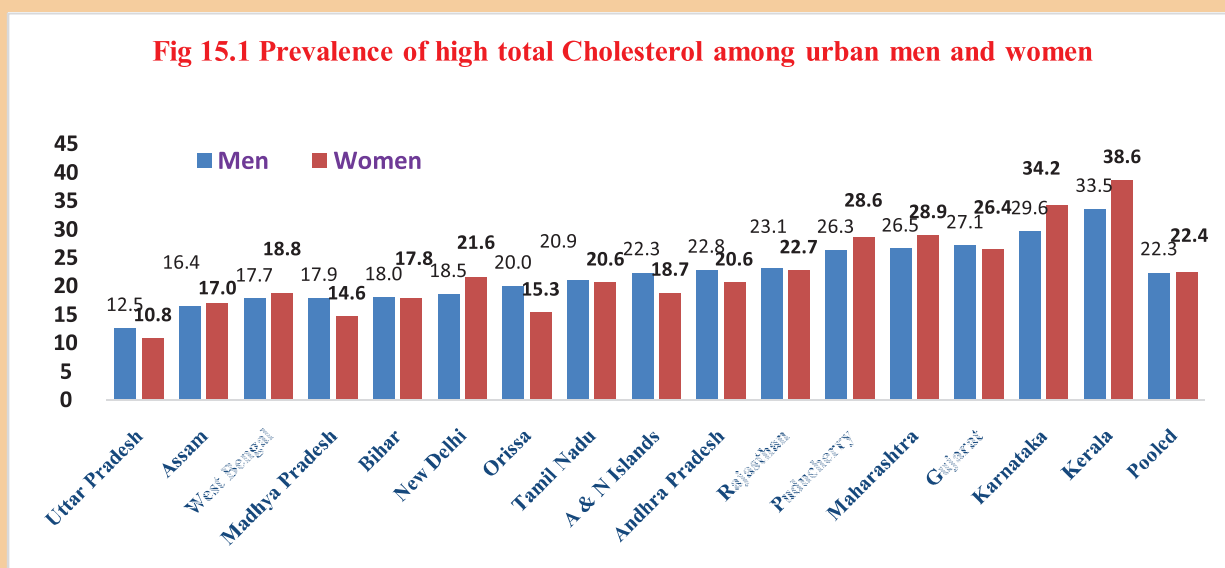### Fig 15.1 Prevalence of high total Cholesterol among urban men and women

Fig. 15.2 Prevalence (%) of High LDL Cholesterol levels (≥130mg/dL) among urban men and women

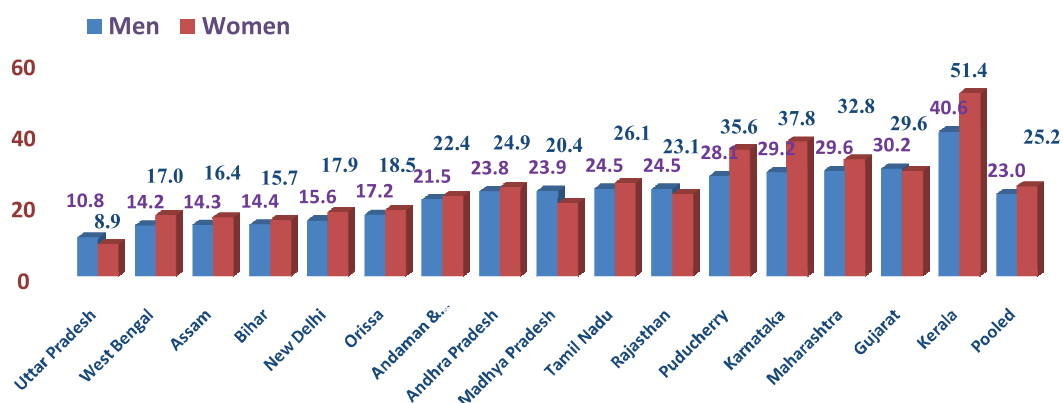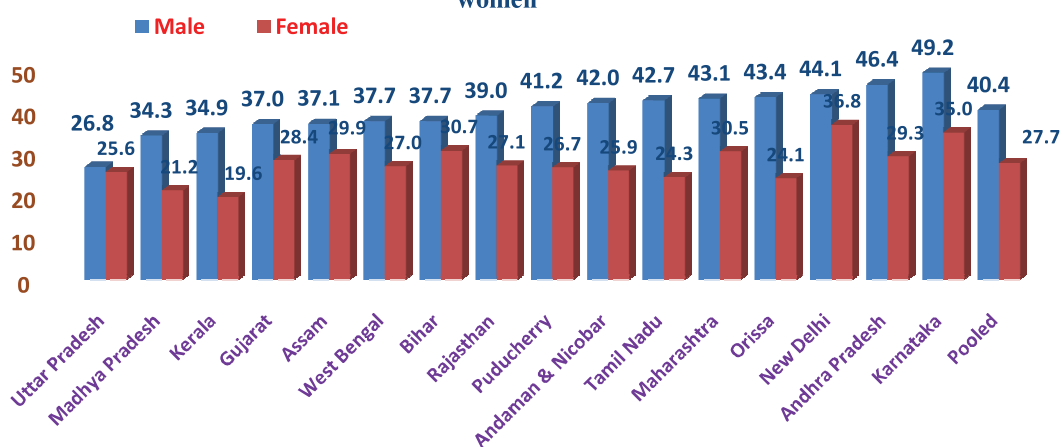**Fig 15.3 Prevalence (%) of high triglycerides (≥150mg/dL) among urban men and women**

5.5. Lifestyle practices

About two thirds of the urban men (63%) were working for more than 8 hours a day, while three fourth of women (72%) were working for <8 hour a day. And, most of them were doing their official work in the sitting posture, at their work place. On an average, more than a fourth of urban men (28%) were doing physical exercise, mainly 'walking' (21%), 'yoga' (4%) and 'floor exercise' (2%). Similarly, 15% of women were participating in physical exercise which included walking (11%) and yoga (3%). Among those who are having the habit of doing exercise, 23% of men and 12% of women were doing it daily. Most of the urban women surveyed were found to be engaged in household activities like cooking, gardening, maintenance of the house, etc.

More than half of the men (57%) and women (53%) were habituated to drinking carbonated water beverages (CWB) and it was found to be more in the state of West Bengal and low in the state of Maharashtra. History of chronic diseases among adult men and women (≥18 years) revealed that, hypertension (13% & 14%) was found to be the most prevalent disease, followed by diabetes mellites (11% & 8%) and heart attack (2% & 1%).

5.6. Risk Behaviors

About 16% of adult men were smoking different products of Tobacco including cigarettes/beedies/cigars and a quarter of the men (25%) were addicted to use smokeless tobacco products, whereas, 30% of the men were consuming alcohol. Most of the users of tobacco products and consuming alcohol were found to have these habits for a period of ≥10 years. **(Fig. 16 & 17)**

Fig.16 Tobacco smoking among urban Men

Fig. 17 Alcohol consumption among urban Men
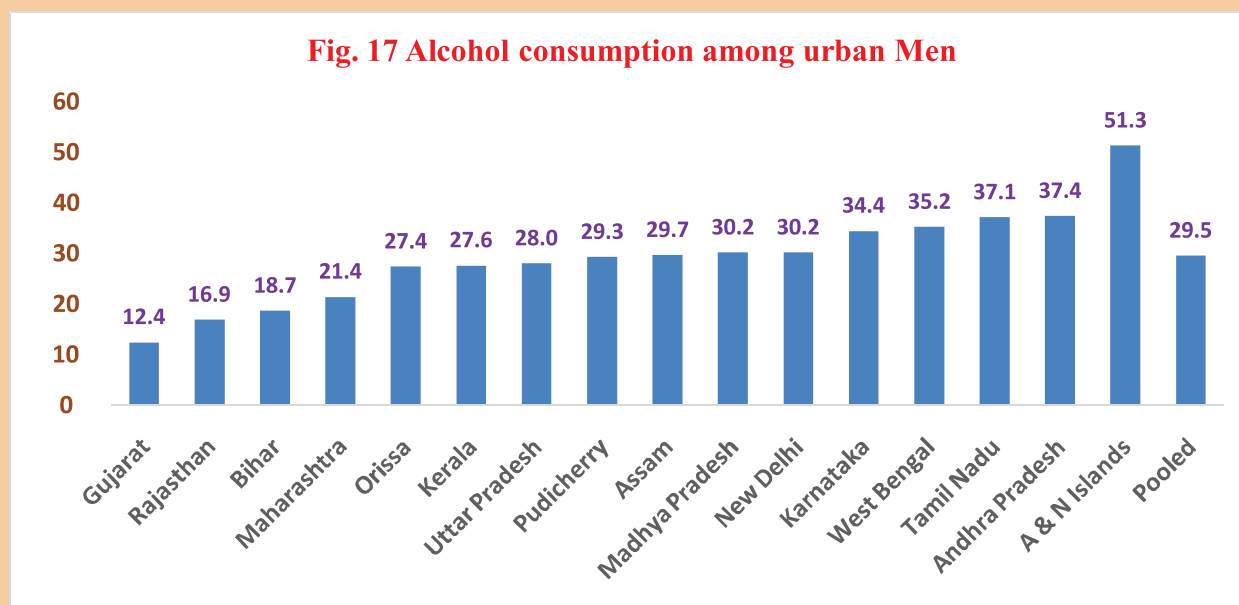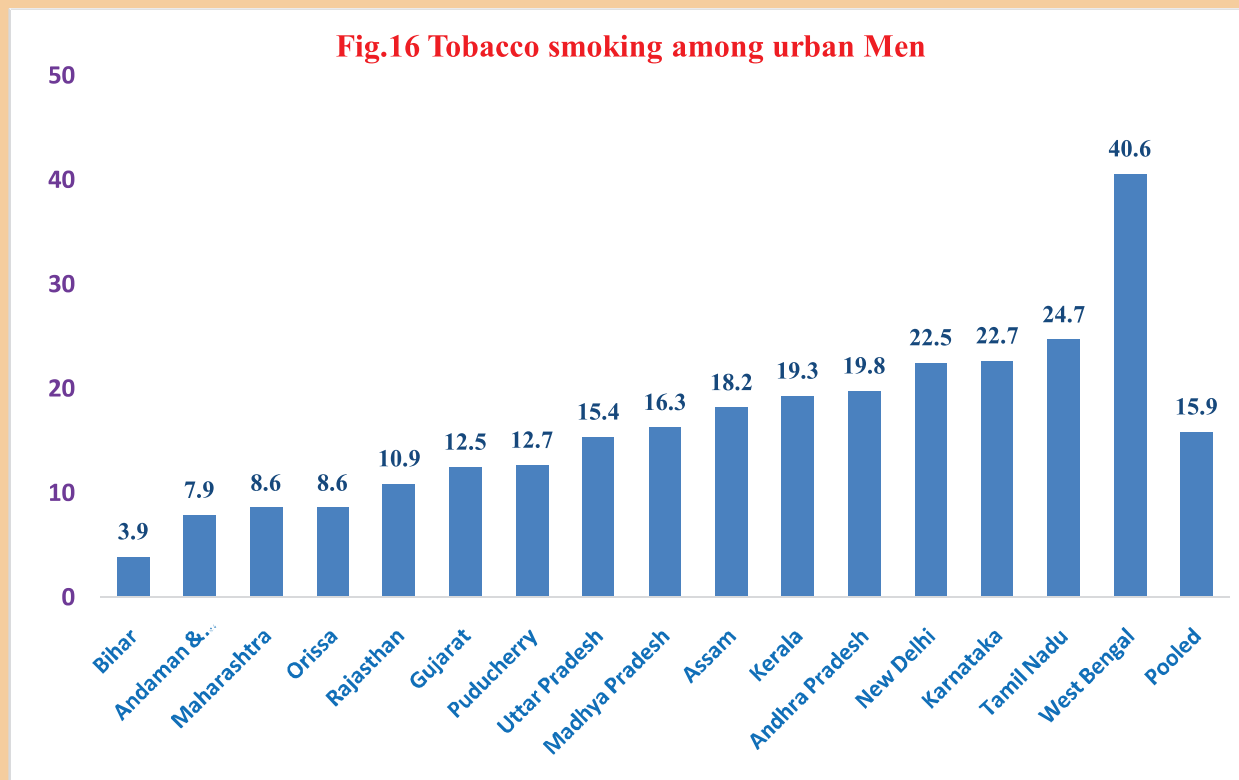
Consumption of high fat, high salt and high sugar diet, like consumption of carbonated beverages, chips, bakery foods, etc., was observed to be high among urban population. The risk behaviors were significantly associated with hypertension.

5.7 Determinants of Hypertension and Diabetes

Bi-variate and multivariate analysis was carried out between dependent variables like hypertension and diabetes and independent variables like socioeconomic variables (SLI: standard life index), age, body mass index (BMI), percent body fat, waist circumference (WC), hyper-lipidemia (triglycerides, LDL, TC) and risk behaviors like tobacco smoking and alcohol consumption. Age, BMI, WC, SLI, TG, LDL, TC were significantly associated with the prevalence of hypertension, while, age, percent body fat, SLI, WC, TG, TC were significantly associated with the prevalence of diabetes (**Fig. 18.1-18.8**).

Fig. 18.1 Prevalence (%) of NCDs among urban men Per Capita Income in quartiles
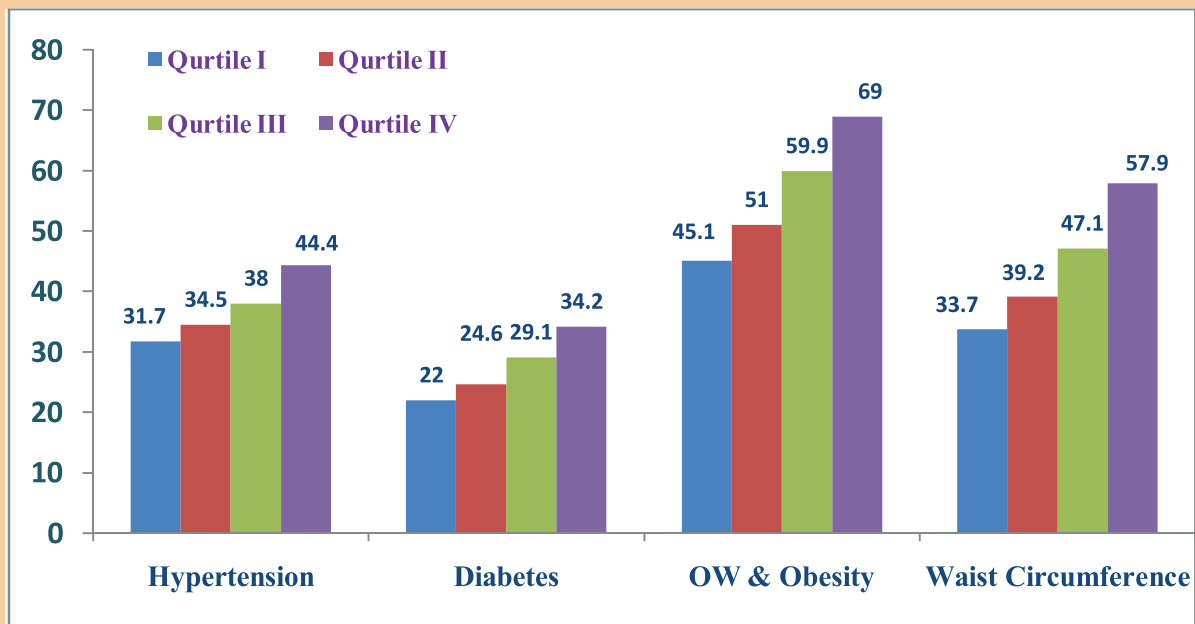

Fig. 18.2 Prevalence (%) of NCDs among urban women by Per Capita Income in quartiles
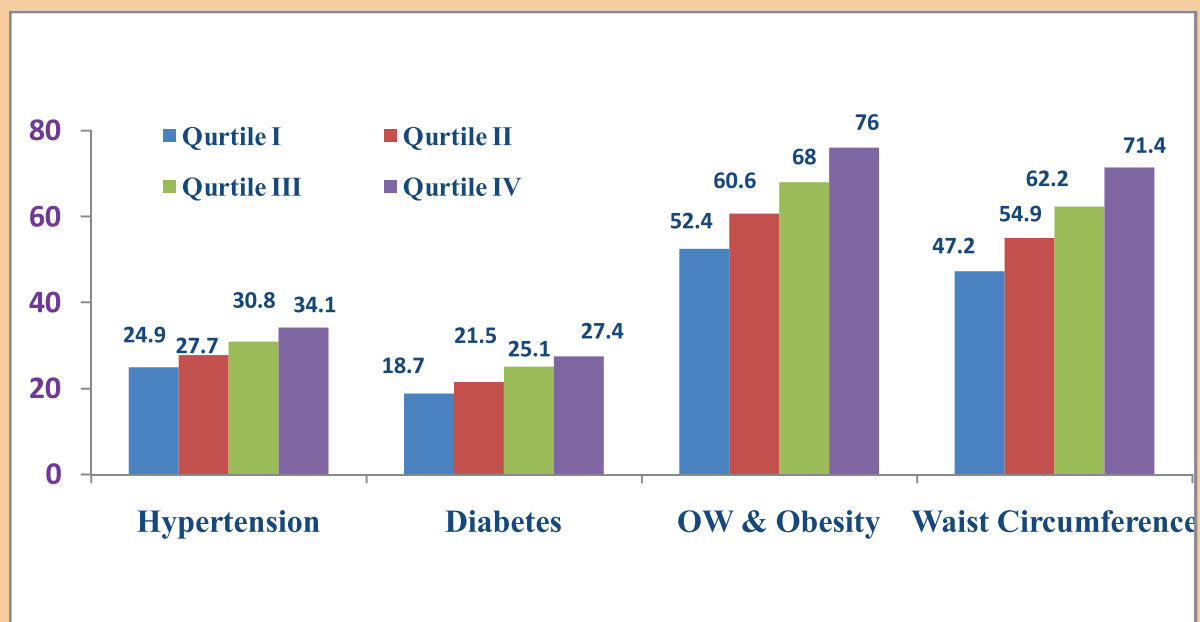
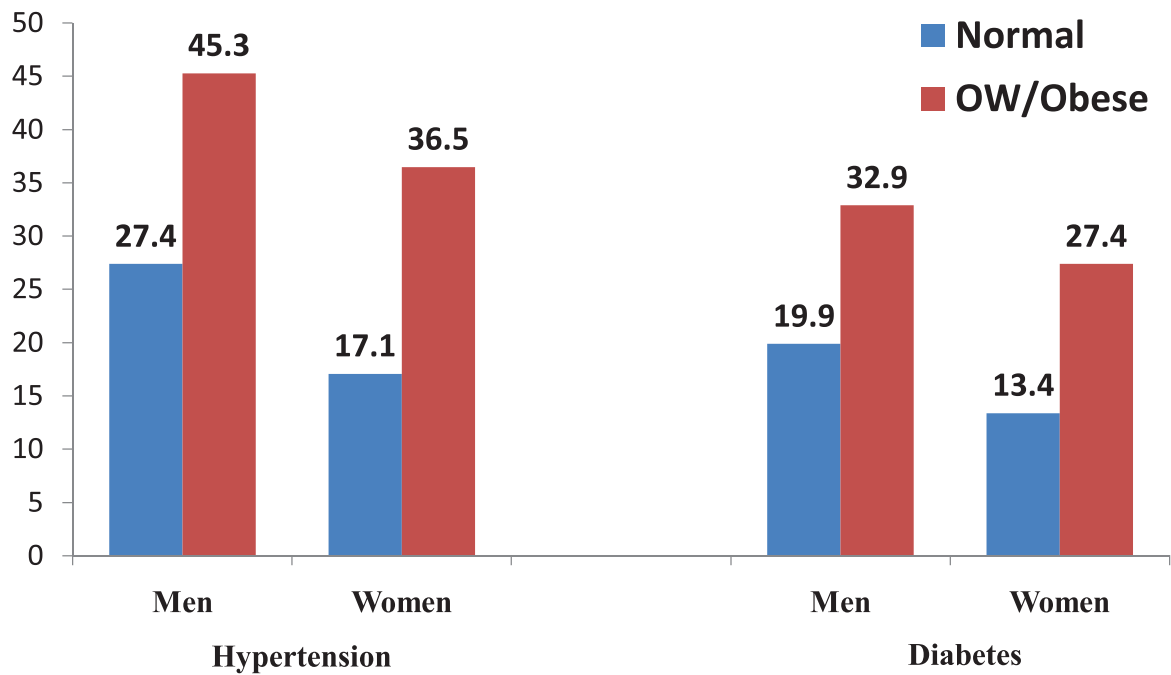**Fig. 18.3 Association of Hypertension & Diabetes with BMI (≥ 23)**

Legend: Normal, OW/Obese

Hypertension:
- Men: Normal 27.4, OW/Obese 45.3
- Women: Normal 17.1, OW/Obese 36.5

Diabetes:
- Men: Normal 19.9, OW/Obese 32.9
- Women: Normal 13.4, OW/Obese 27.4

Fig. 18.4 Association of Hypertension & Diabetes with Waist Circumference (Asian)

Legend: Normal, Abdominal adiposity

Hypertension:
- Men: Normal 27.3, Abdominal adiposity 50.1
- Women: Normal 15.8, Abdominal adiposity 39.1

Diabetes:
- Men: Normal 19.5, Abdominal adiposity 36.1
- Women: Normal 11.1, Abdominal adiposity 29.8
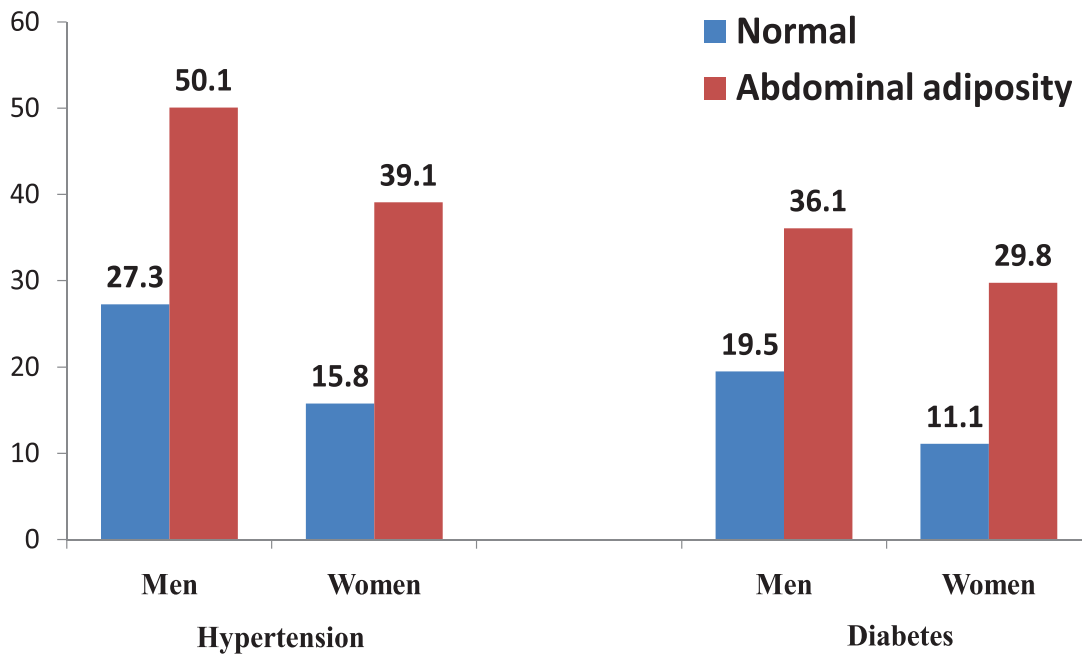
Fig. 18.5 Association of Hypertension & Diabetes with Percent body Fat

Legend:
- ■ Normal Body Fat
- ■ High Body Fat

Hypertension:
- Men: Normal Body Fat 24.7, High Body Fat 48.2
- Women: Normal Body Fat 9.5, High Body Fat 34.1

Diabetes:
- Men: Normal Body Fat 16.7, High Body Fat 35.1
- Women: Normal Body Fat 7.5, High Body Fat 26
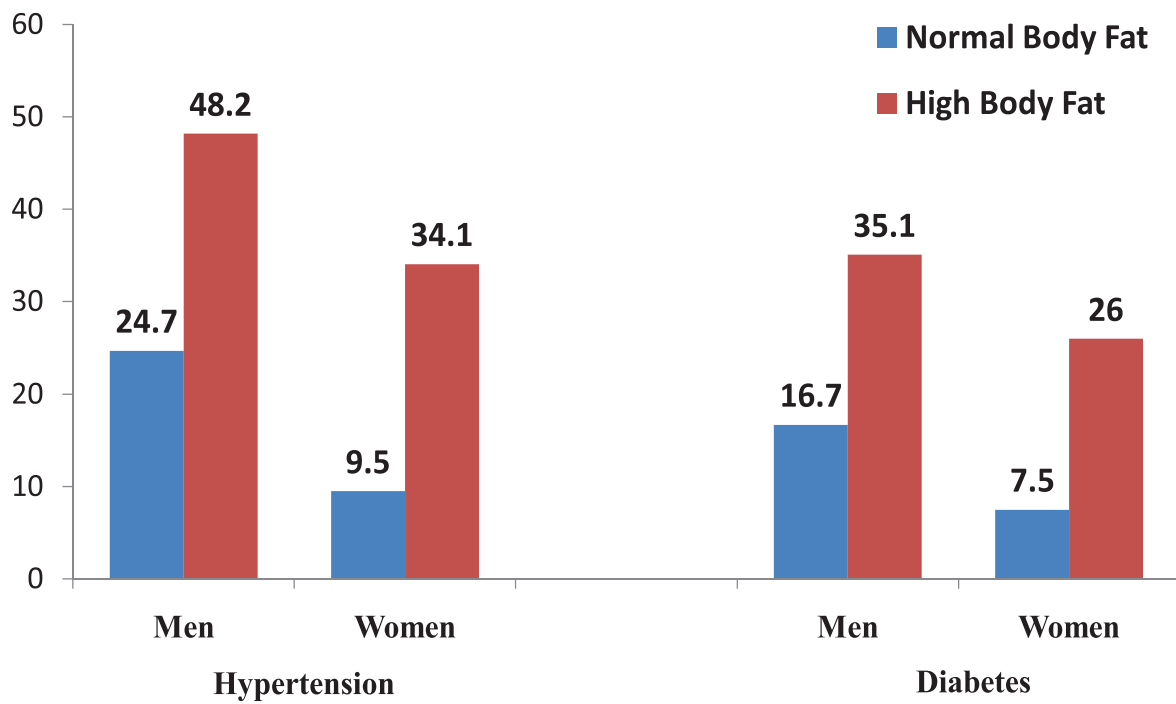
Fig. 18.6 Association of Hypertension & Diabetes with Total Cholesterol (mg/dl)

Legend:
- ■ TC < 200
- ■ TC ≥ 200

Hypertension:
- Men: TC < 200 39.3, TC ≥ 200 48.7
- Women: TC < 200 29.5, TC ≥ 200 46.7

Diabetes:
- Men: TC < 200 26.7, TC ≥ 200 34
- Women: TC < 200 20.5, TC ≥ 200 33.6
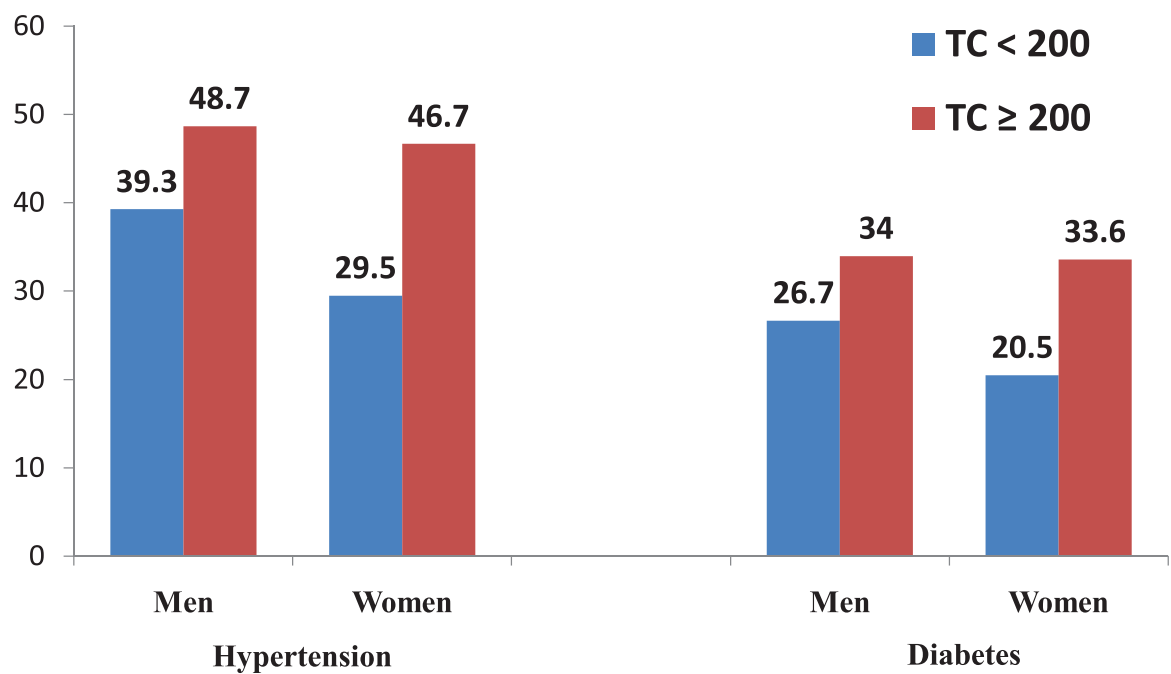
Fig. 18.7 Association of Hypertension & Diabetes with Triglycerides (mg/dl)

Legend: TG <150, TG ≥ 150

Hypertension:
- Men: TG <150 = 38.4, TG ≥ 150 = 46
- Women: TG <150 = 29.6, TG ≥ 150 = 43.5

Diabetes:
- Men: TG <150 = 23.3, TG ≥ 150 = 35.8
- Women: TG <150 = 18.2, TG ≥ 150 = 37.2
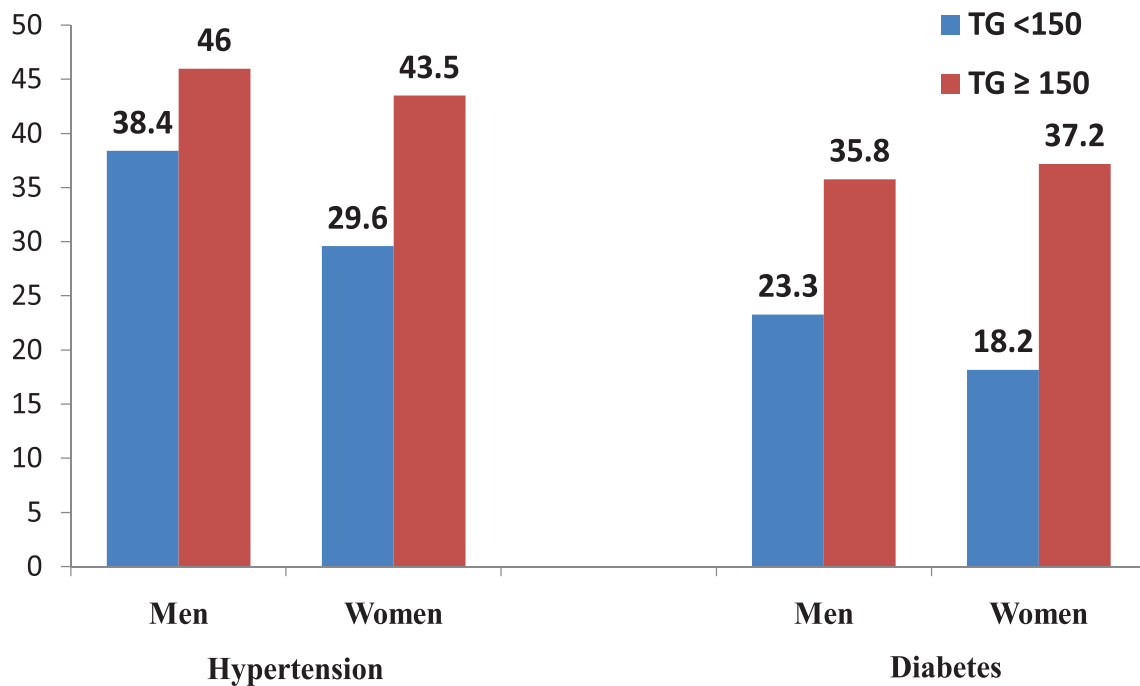
Fig. 18.8 Association of Hypertension with use of Tobacco and Alcohol

Legend: Tobacco, Alcohol

- Users: Tobacco = 39, Alcohol = 42.1
- Non Users: Tobacco = 37.2, Alcohol = 35.6
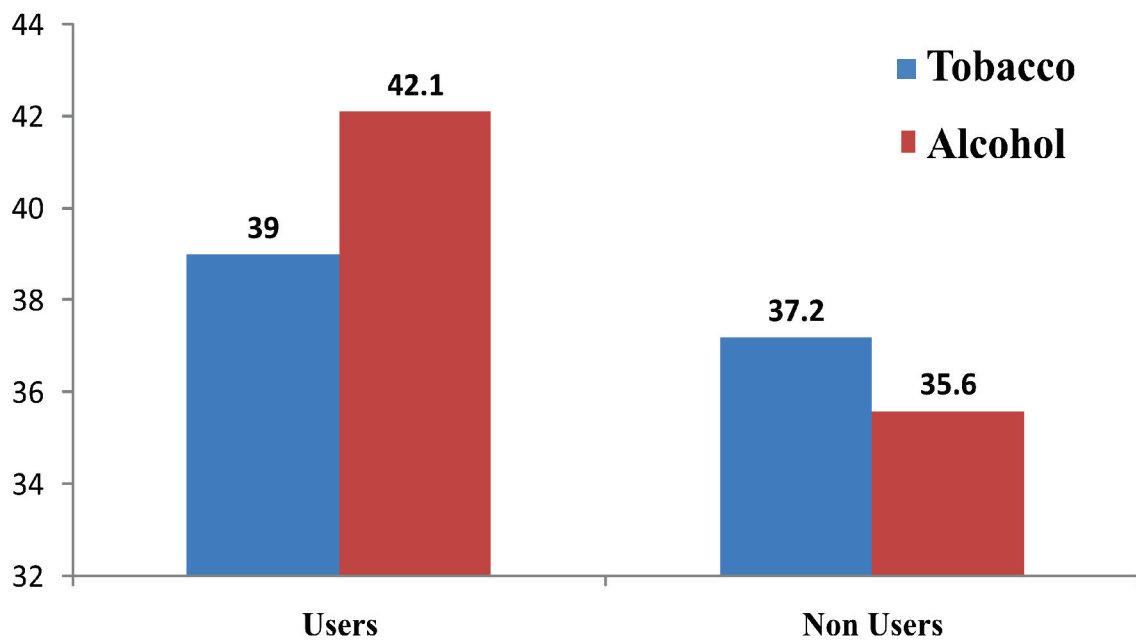
Conclusions and Recommendations

Even though the prevalence of undernutrition (underweight, stunting and wasting) among urban children was lower than the rural and tribal children, the prevalence was higher when the figures were compared with the developed nations. Similarly, the prevalence of chronic energy deficiency (CED = <18.5) was lower among urban men and women, however, these figures were also significantly higher when compared with the developed nations. There is a need to strengthen better infant and young child feeding practices of mothers of <12 months children and to promote healthy dietary practices.

Almost one third to one half of the men and women were seen suffering from overweight and obesity related problemsand one in every three urban men and women were observed to be suffering from hypertension. One in every four men and women were suffering from diabetes. About one in every three men and women were also suffering from hyperlipidemia. About one in every five men was a smoker, while one in every three men was seen to be consuming alcohol regularly.

There is a need to sensitize the community on the causes and consequences of obesity, hypertension, diabetes, etc., through health and nutrition education using IEC activities, and behaviour change communication (BCC) methods. People need to be educated on the benefits of healthy lifestyles and healthy dietary habits as it enables the prevention of non-communicable diseases and promotion of overall health.

For any clarifications contact

Dr. A. Laxmaiah
Scientist G & HoD,
Division of Community Studies
National Institute of Nutrition
Jamia-Osmania (PO)
Hyderabad - 500 007
India

E mail: laxmanavula09@gmail.com
Phone: 040 27019141
Mobile: 09395113419

National Institute of Nutrition

(Indian Council of Medical Research)
Jamai Osmania Post, Hyderabad - 500 007.
2017