Risk of Developing NCDs in Later Life among the Overweight and Obese Women in India: Insights from a Nationally Representative Longitudinal Study

Abstract: The NFHS has documented a continuous rise of mean BMI among Indian adults in consecutive surveys, leading to higher estimate of overweight/obesity. Beside the rich, overweight/obesity has grown significantly among the poor. Literature suggests a closer link between obesity and non-communicable diseases (NCDs), but evidence is weaker from developing countries. Since progression to NCDs might not happen immediately to those obese, establishing any relationship between the two becomes difficult using cross-sectional data. Using a panel of eligible women from India Human Development Survey, we tried to identify the group of reproductive age women, who were at greater risk of becoming obese within seven years from first round of the survey and also assessed the likelihood of developing non-communicable diseases among the obese women by BMI status. Results indicate that the risk of developing NCDs is much higher among women from richer households. However, once a woman becomes overweight/obese, she gradually develops either one or more NCDs. The rich-poor difference becomes insignificant at that point. This poses a policy challenge as obesity has grown rapidly among the poor in last decade.

Extended Abstract

Background:

The June 2018 WHO fact sheet outlined non-communicable diseases (NCDs) as the leading cause of global deaths. The report mentioned that, every year NCDs kill 41 million people globally which accounted for 71 per cent of all mortality globally (WHO 2018). NCDs are the major cause of premature deaths in the low and middle income countries. The evidence of the impact of these NCDs on survival of fellow citizens of developing South Asian nations is quite weak. In India, NCDs accounted for 40% of all hospital stays and 35% of all outpatient visits in 2004 (Mahal, Karan et al. 2010). Literature in this area has attributed industrialization, socio-economic development, urbanization, changing age structure, changing lifestyle as potential cause of NCDs. While studies point out that the risk of developing NCDs is higher among the richer section of the population (Barik, Desai et al. 2018), the vulnerability of the poorer population to NCDs is undermined.

The instances of undernutrition have been reducing consistently, but, the menace of over-nutrition is growing rapidly among Indians. According to the latest available National Family Health Survey report, the proportion of overweight or obese women increased from 13 percent in 2005-06 to 21 percent in 2015-16. According to the WHO, overweight and obesity are considered as the fifth leading risk for global deaths. Obesity increases a person's risk of developing a number of non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, and cancer, etc. which require long term care (Ghosh 2015; Frühbeck et al 2014). As per WHO, 44% of the diabetes burden, 23% of the ischaemic heart disease burden, and approximately 7–41% of certain cancer burdens are attributable to overweight and obesity.

Dietary shift contributing to higher incidence of overweight and obesity

Before globalization, the prevalence of overweight and obesity was much higher in the developed countries. Globalization linked trade has made the packaged readymade food available to the developing world. So, nutrition transition is happening across the globe(Popkin 2006).

Overweight and obesity among Asian Women

Asian Indian women (Chopra, Misra et al. 2013)

While overweight/obesity is much higher among the affluent group, it has increased significantly among the poorer group as well. Available literature suggests a closer link between obesity and non-communicable diseases, but the evidence is weaker from developing countries due to non-availability of required longitudinal data. Since progression to NCDs might not happen immediately to those obese, establishing any relationship between obesity and risk of developing NCDs becomes difficult using cross-sectional data.

Research Questions:

Using the latest available panels of eligible women from India Human Development Survey (2004-05 and 2011-12), this paper tries to identify the group of women from IHDS round 1 survey, who grown obese by second round of the survey. Additionally, it tries to assess the risk of developing NCDs by second round of the survey among the women who were obese in round 1 of the survey. We also examines if the risk varies across wealth groups. Three specific research questions, which this paper tries to address are –

1. Which women are at greater risk of growing obese between the two rounds of the IHDS survey?
2. Is the risk of developing any non-communicable diseases in later life uniform across BMI groups?
3. Are the poor obese women immune to the NCDs?

Data and methods:

We have used two rounds of the India Human Development Survey (IHDS) Data for the present study. IHDS is a multi-topic panel study which followed individuals from more than 40,000 household during 2004-05 and 2011-12. IHDS collects information on reported prevalence of selected NCDs for all members of surveyed HHs. However, the information on BMI was collected for only one eligible women per HH and children of age below 5 years and those between ages 8-11 years during 2004-05 survey. IHDS followed 33,568 eligible women between the two surveys. Due to unavailability of some women for height & weight measures during Survey 1, the present analysis is based on 26,658 eligible women only for whom BMI data is available.

List of variables used for the analysis

NCD status (i.e. if the women reported of diagnosis of either high BP, or diabetes or heart disease by IHDS 2 survey). Set of variables controlled for were age, educational level, marital status, BMI status and household economic status of women in survey 1. In addition to these, the other predisposing factors like religion, caste, state of residence from Survey 2 were also controlled for. The sample excludes women who were either pregnant during survey 1 or delivered a baby two months earlier.

Obesity has been defined following the standard WHO definition of BMI above 30 kg/M^2 and those with BMI between 25-30 kg/M^2 have been defined as overweight. We have combined the overweight and obese women together in most of our analysis.

Multivariate logistic regression analysis was carried out separately to estimate the odds of growing obese as well as to develop NCDs. We also run separate multivariate regression model to understand the association between developing NCDs by change in BMI status between two rounds. Predicted probability was estimated to assess the effect of economic status on developing NCDs across various BMI groups. All the independent variables were included from survey 1 (except religion, caste, and state of residence) and the dependent variable from round 2.

Results:

Table 1: Factors determining a woman with normal BMI to become obese or remain non-obese within next seven years after IHDS round 1 survey.

	Newly Obese		Chronic non-obese	
VARIABLES	Co-eff	SE	Co-eff	SE
	.	.		
Age	-0.004	0.003	-0.040**	0.002
Education	0.022**	0.005	-0.033**	0.004
Number of Children	0.023	0.016	0.003	0.013
Marital status (Married Omitted)				
Married, no gauna	-0.027	0.114	-0.049	0.094
Widowed/Divorced/Separated	0.236*	0.097	-0.12	0.083
Any Work (No work)				
Yes	-0.017	0.014	0.069**	0.012
Perceived Health Status (Average Omitted)				
Very Good/ Good	0.117**	0.045	-0.063	0.038
Very Poor/ Poor	-0.100	0.094	-0.060	0.074
Social Groups (Forward Caste Omitted)				
OBC	0.034	0.053	0.087	0.044
Dalit	-0.010	0.060	0.119*	0.051
Adivasi	-0.317**	0.105	0.313**	0.086
Muslim	0.196**	0.071	-0.274**	0.060
Christian, Sikh, Jain	-0.060	0.106	-0.166	0.091
HH Asset Quintile (Middle Omitted)				
Poorest	-0.463**	0.079	0.632**	0.066
Second	-0.303**	0.068	0.408**	0.056

Fourth	0.290**	0.055	-0.427**	0.046
Richest	0.384**	0.065	-0.854**	0.053
HH Consumed Cereals (No Omitted)				
Yes	0.361	0.680	-0.541	0.636
HH Consumed Pulses (No Omitted)				
Yes	0.055	0.052	0.009	0.043
HH Consumed Egg (No Omitted)				
Yes	0.075	0.061	0.068	0.051
HH Consumed Non-vegetarian Food (No Omitted)				
Yes	-0.048	0.059	0.012	0.049
HH Consumed Milk and Milk Products (No Omitted)				
Yes	0.034	0.047	-0.065	0.039
HH Consumed Vegetables (No Omitted)				
Yes	-0.796**	0.173	0.624**	0.160
Place of Residence (Rural Omitted)				
Urban	0.236**	0.047	-0.442**	0.039
Constant	-1.330	0.685	2.034**	0.639
Observations	23,598		23,598	

** p<0.01, * p<0.05

All models include state dummy. Results are not shown for parsimony.

- Educated women are at significantly higher risk of growing obese within next seven years of the 2004-05 round survey.
- Muslim women are at higher risk of growing obese than women from the forward caste. But, the risk is significantly lower among women from the Adivasi group.
- Working women were significantly more likely to remain non-obese
- Women from richer households are at significantly greater risk of growing obese.
- Women from households consuming vegetables are significantly at lower risk of growing obese.
- Women residing in Urban areas are at higher risk of growing obese than their rural counterpart.

Table 2: Risk of developing NCDs within next seven years from IHDS round 1 survey among women from reproductive age in India.

	Odds Ratio		**S.E.**
Age	1.07	**	0.004
Completed years of education	0.99		0.009
Marital Status (currently married)			
widowed/divorced/separated	0.89		0.115
BMI 2005 (Normal omitted)			
Too thin for height	0.83	*	0.076
Overweight	1.65	**	0.140
Obese	2.53	**	0.300

Social Groups (Forward class omitted)			
OBC	0.86		0.077
Dalit	0.87		0.089
Adivasi	0.58	**	0.113
Muslim	1.40	**	0.151
Christian, Sikh, Jain	1.30		0.202
Place of residence (Rural omitted)			
Urban	1.10		0.082
HH Asset Quintile (Poorest omitted)			
Second Q	1.04		0.142
Middle Q	1.37	*	0.182
Fourth Q	1.73	**	0.241
Richest	1.51	**	0.234
Constant	0.01	**	0.003
Sample Size	26,658		
Chi-square	950.84		
DF	37		

** p<0.01, * p<0.05
All models include state dummy. Results are not shown for parsimony.

- Eligible women, who were overweight/obese in round 1 had higher risk of suffering from either hypertension or diabetes or heart disease in round 2 of the survey.
    - Overweight women were 1.65 times at higher risk of suffering from these NCDs than their other counterpart who had a normal BMI at the time of IHDS 1 survey.
    - Obese women were even at higher risk than the overweight women. The odds ratio between the normal and the obese women stands at 2.5.
- The likelihood of developing NCD was higher among all women in higher economic strata compared to the poorest.

The odds of developing NCDs is relatively less among women in the richest strata than the one from fourth wealth quintile.

Table 3: Log odds of developing NCDs or remain free from NCDs by change in BMI status among women of reproductive age within next seven years after IHDS round 1 survey.

	New Case of NCD		**No Case of NCD**	
	Co-efficient	SE	Co-efficient	SE
	.	.		

Age	0.065**	0.004	-0.077**	0.004
Education	0.006	0.008	-0.008	0.007
Number of Children	0.026	0.021	-0.023	0.018
Marital status (Married Omitted)				
Married, no gauna	-0.182	0.172	0.088	0.145
Widowed/Divorced/Separated	0.343**	0.119	-0.352**	0.105
Any Work (No work)				
Yes	-0.023	0.020	0.050**	0.017
Perceived Health Status (Average Omitted)				
Very Good/ Good	0.095	0.064	0.079	0.057
Very Poor/ Poor	0.273*	0.109	-0.763**	0.087
Obesity Status (Never Obese)				
New Obese	0.549**	0.072	-0.545**	0.064
Cured Obese	0.483**	0.114	-0.585**	0.098
Chronic Obese	0.865**	0.074	-0.982**	0.065
Social Groups (Forward Caste Omitted)				
OBC	-0.063	0.079	0.027	0.069
Dalit	0.069	0.087	-0.075	0.077
Adivasi	-0.402*	0.166	0.417**	0.149
Muslim	0.292**	0.098	-0.289**	0.087
Christian, Sikh, Jain	0.284*	0.129	-0.232*	0.118
HH Asset Quintile (Middle Omitted)				
Poorest	-0.472**	0.117	0.457**	0.101
Second	-0.250*	0.099	0.328**	0.089
Fourth	0.166*	0.081	-0.207**	0.071
Richest	0.052	0.094	-0.164*	0.083
Place of Residence (Rural Omitted)				
Urban	0.119	0.067	-0.119*	0.059
Constant	-4.666**	0.238	4.709**	0.212
Observations	23,486		23,486	

** p<0.01, * p<0.05

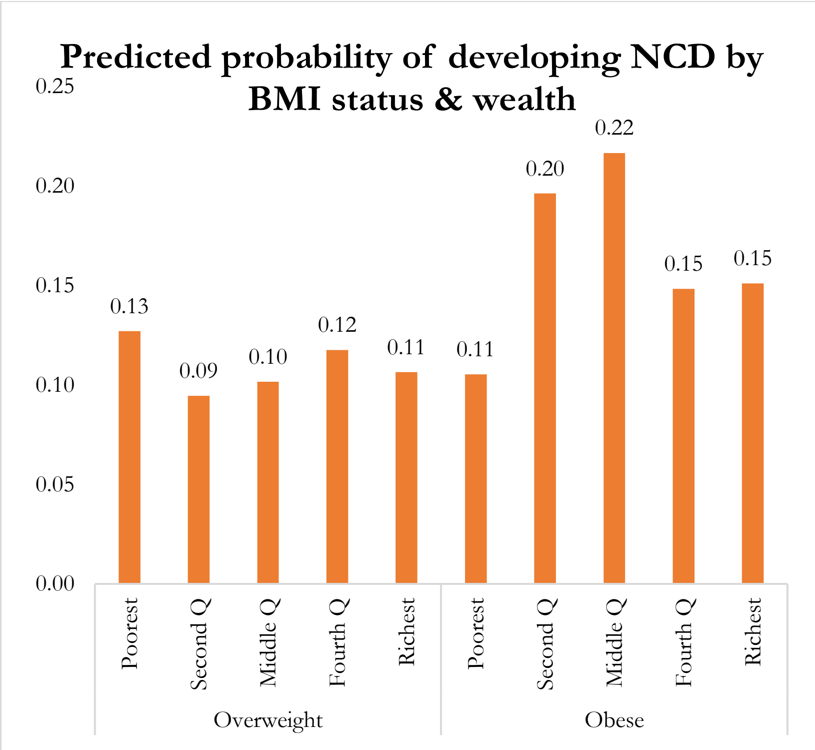
All models include state dummy. Results are not shown for parsimony.

- Chronic obese women had the highest risk of developing NCDs than those were never obese.
- Newly obese women had also higher likelihood of developing NCDs compared to those never obese. But, they had lower risk than those chronic obese.
- Obese women, who were able to reduce their BMI to normal level between the two survey rounds, had a higher likelihood of developing NCDs than those never allowed the BMI to

rise beyond the normal level. However, the group had lower risk than women from other two groups, i.e., newly obese and chronic obese.

The rich-poor difference in predicted probability of developing NCD is not significant across all BMI status

However, higher likelihood of NCD in richer household does not ensure that the association between wealth and NCD is uniform across all BMI level.



- The difference in predicted probability among rich and the poor is **not significant** across all BMI status

Discussion:

- ☐ Working women are more likely to remain non-obese than those not working. On the other hand, educated and richer women are at greater risk of growing obese.
- ☐ Eligible women, who were overweight/obese in round 1, were at higher risk of developing either hypertension or diabetes or heart disease by round 2 of the survey than those with normal BMI
- ☐ Women from the richer households were at higher risk than those from poorer household

- However, once a woman becomes overweight/obese, she gradually develops either one or more NCDs. The rich-poor difference becomes insignificant at that point.

References:

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1. Who became overweight/obese between 2004-05 and 2011-12?
2. Are the overweight/obese women are at higher risk of developing NCDs?
3.