Household wealth status and overweight and obesity among adult women in Bangladesh and Nepal

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Summary

Background

In South Asia, women were reported to be more likely to have higher normal body weight. However, nationally representative evidence on the association between socioeconomic status and body weight in terms of regional cut-offs for body mass index is limited for South Asian women. This study aimed to address this gap by investigating the association between household wealth status and overweight and obesity among adult women in Bangladesh and Nepal.

Methodology

Cross-sectional data on 6,144 Nepalese and 17,683 Bangladeshi women were obtained from most recent Demographic and Health Surveys in these countries. Cut-offs for overweight and obesity were defined as per World Health Organization recommendation for South Asian population.

Results

The mean age of respondents was respectively 28.76 (9.74) and 31.01 (9.21) in Nepal and Bangladesh. The prevalence of obesity and overweight was respectively 13.5% and 14% for Nepal and 15.3% and 24.2% for Bangladesh. Compared with women living in poorest households, the odds of being overweight were respectively 3.44, 2.12, 1.46 and 1.19 times higher for women living in richest, richer, middle and poorer wealth status households in Nepal. In Bangladesh, compared with poorest households, women in richest, richer, middle and poorer households had respectively 98%, 60%, 32% and 22% higher odds of being overweight. Among Bangladeshi women, the odds of being obese in richest households were 4.62 (adjusted odds ratio = 4.572; 95% confidence interval = 3.813–5.484) times and among Nepalese women 8.54 (adjusted odds ratio = 8.452; 95% confidence interval = 5.228–13.663) times higher compared with those in poorest households.

Conclusion

Higher household wealth is associated with an increased likelihood of being overweight and obese among adult women in Bangladesh and Nepal. Using the regional cut-offs for body mass index shows that the prevalence of obesity among women has for the first time exceeded that of overweight in both countries.

Keywords: Overweight, obesity, wealth status, women.

Introduction

Some estimates suggest that by 2025, three-quarters of the entire obese population worldwide will be living in non-industrialized countries (1,2). The number of overweight and adults with obesity in the developing world has increased fourfold between 1980 and 2013 (3,4). In different subregions of Africa (excluding Northern Africa), the combined prevalence overweight and obesity was found to be ranging from 6.4% to 8.7% (5,6), and in

many countries, prevalence of overweight/obesity is already higher than that of undernutrition (4). Although the disease structure in the developing countries is usually marked by a higher burden of undernutrition and infectious diseases, overweight/obesity and associated non-communicable diseases (NCDs) are fast becoming important public health concerns because of their significant health and socioeconomic consequences (4,7). In 2010, worldwide about 3.4 million deaths, 3.9% of years of life lost and 3.8% of disability-adjusted life years was attributable to overweight/obesity (5).

There is convincing consensus that the rapid emergence of overweight/obesity during past few decades in the developing countries has resulted to a large extent from recent economic and technological progress, fast urbanization, growing global interconnectedness and adoption of western diet and lifestyle (8–10). Similar to other developing world regions, South Asian countries are also undergoing these changes along with a noticeable shift in the disease structure marked by increasingly higher proportion of NCD-related morbidities (9). Although currently there is a lack of concrete evidence if overweight/obesity are significantly contributing to higher NCD-related mortalities, however, higher than normal body weight remains a serious concern because of higher susceptibility of South Asian population to diabetes and cardiovascular complications (11). In Bangladesh and Nepal, as some of the most impoverished of Asian nations, the epidemiological trend is historically characterized by higher burden of macronutrient and micronutrient deficiency disorders (e.g. anaemia, chronic energy deficiency and communicable and infectious diseases (9)). However, both of these countries have experienced a steady economic progress during the past 2 decades, which has been accompanied by certain demographic and nutritional transition with a rising prevalence of overweight/obesity amid widespread undernutrition, a phenomenon known as double burden of malnutrition (DBM) (12). Some researchers have found that DBM commonly coincides with the nutrition transition, which involves moving (usually driven by economic development) from traditional home cooked food to more processed and precooked food, which are usually calorie rich but nutrient poor (2,8,13).

Evidence from other developing countries suggests that households experiencing DBM are more likely to be urban and among the highest income levels compared with those with underweight individuals (14). As reflected through some research findings, urbanization and nutrition transition are two remarkable features in South Asia in the context of economic and cultural globalization (9). Although most countries are still predominantly rural, urbanization is occurring at a fast pace with the highest rate in Nepal followed by Bangladesh and India (9). Urbanization facilitates access to labour-saving technologies and rise in various non-farm sectors and is associated with the reduced need and scope for physical activities that can induce the development of overweight and obesity (2,9). Although a bulk of the scientific literature considers overweight/obesity as a result of rising prosperity, some recent studies reported that the burden is gradually shifting to the poor; however, result remains mixed. Therefore, the present study wanted to investigate whether or not women in wealthy households bear higher susceptibility to be overweight/obesity in Bangladesh and Nepal – two of the most impoverished of Asian nations. For this purpose, data from recent Demographic and Health Surveys (DHSs) were utilized, which provide reliable and nationally representative population health-related information in the region.

Methods

The surveys, sampling and data collection

Demographic and Health Surveys operate in developing countries across Asia, Africa and South America with the aim to providing quality data on a wide range of population health and development indicators. The ultimate objective is to assist the countries in making informed policy decisions, evidence-based planning, monitoring and evaluation of the outcomes of health programmes. Survey themes commonly include maternal and child nutrition, anaemia, birth outcomes, family planning, utilization of maternal and child health services and knowledge of HIV/AIDS among women age 15–49 years. The surveys also include men ageing 15 to 59 years and children ageing below 5 years. Data for the present survey were sourced from the latest DHS surveys in Bangladesh (Bangladesh Demographic and Health Survey [BDHS] 2014) and Nepal (Nepal Demographic and Health Survey 2011).

The 2011 Nepal Demographic and Health Survey is the fourth of its kind conducted in the country under the auspices of the Ministry of Health and Population with technical assistance from International Climate Fund (ICF) Macro and funding from United States Agency for International Development. The survey started on 2 February of 2011 and was completed on 14 June 2011. Nepal is broadly divided into three ecological regions – namely, Mountain, Hill and Terai each of which is further divided into five development regions. Out of 15 ecological regions (referred to as subregions or domains for the 2011 Nepal Demographic and Health Survey), 13

were selected for the survey and were stratified into urban and rural enumeration areas (EAs). Each urban EA contained randomly selected 35 households and each rural EA 40 households. In total, 11,353 households were selected for the sample of which 10,826 were finally interviewed with a household response rate of 99%.

The 2014 BDHS was conducted under the authority of the National Institute of Population Research and Training of the Ministry of Health and Family Welfare with technical assistance from ICF Macro and funding from United States Agency for International Development. The survey started on 21 May of 2014 and was completed on 17 August of the same year. Bangladesh is broadly divided into seven administrative divisions – Barisal, Chittagong, Dhaka, Khulna, Rangpur, Rajshahi and Sylhet. Each division is further subdivided into smaller administrative regions to divide the country into rural and urban areas. The BDHS employs a similar sampling strategy; however, each EA contained an average of 30 households. In total 17,989 households were selected for the survey of which 17,300 were finally interviewed with a response rate of 99%. Further details regarding the survey and sampling methods were described elsewhere (10,15).

Variables

The outcome variable in this study was body mass index (BMI). According to insights from previous researchers, Asian population shares an increased susceptibility to cardiovascular diseases and diabetes, for which lower BMI cut-off points are considered more appropriate measures of body weight (11). World Health Organization recommends a lower cut-off point of BMI as follows: less than 18.5 kg m^{-2} = underweight; 18.5–22.9 kg m^{-2} increased but acceptable risk; 23–27.5 kg m^{-2} = increased risk; and 27.5 kg m^{-2} = higher risk (11). Hence, instead of the conventional cut-offs, the Asian population specific cut-off points were used in the present study: 18.5 kg m^{-2} = underweight; 18.5–22.9 kg m^{-2} = normal weight; 23–27.5 kg m^{-1} = overweight; and 27.5 kg m^{-2} = obese (16).

Covariates: On the basis of insights from literature search, and availability of the data sets, the following covariates were included in the analysis: age: 15–24/25–34/35–44/44+ years; residency: urban/rural; education: no education/primary/secondary/higher; employment: no/yes; number of childbirths: 0/1/2/2+; frequency of watching TV: not at all/less than once a week/at least once a week; wealth status: richest/richer/middle/poorer/poorest.

Data analysis

Data were analysed using SPSS® version 22 (IBM, Armonk, NY, USA) for Mac. Data sets were checked for missing values and outliers and were weighted before analysis. Baseline sociodemographic information was presented by descriptive statistics. Chi-squared tests were performed to check for association between overweight and obesity and the explanatory variables. The variables that showed significance at $p \leq 0.01$ were retained for regression models. Multinomial logistic regression technique was used to examine the association between wealth status and overweight and obesity. Regression analyses were performed separately for each country. Results of bivariate and multivariate analysis were presented as odds ratios and 95% confidence intervals. All statistical tests were two tailed, and a $p < 0.05$ was considered statistically significant.

Results

Basic characteristics

In total, 6,144 women from Nepal and 17,683 from Bangladesh ageing between 15 to 49 years were included in the study. Table 1 shows the baseline sociodemographic characteristics of the study population. The mean age of respondents was respectively 28.76 (9.7) and 31.01 (9.21) in Nepal and Bangladesh (not shown in the table). In both countries, majority of the women were between 25 and 34 years of age. About one-third of the women were of rural origin in both countries (33.0% in Nepal and 34.4% in Bangladesh). Rates of literacy (76.5% vs. 61.5%) and primary level education were higher in Bangladesh; however, Nepal had higher rates of secondary and above secondary qualification compared with Bangladesh (47.4% vs. 43.3%). Rates of female unemployment were high in both countries, as more than one-third of the women in Nepal (35.9%) and more than two-thirds (68.5%) in Bangladesh reported having no employment. About one-third of the women in Nepal and one-tenth in Bangladesh had no children, and 36.7% and 41.4% had more than two children. About a quarter, women in Nepal reported never watching TV (23.9%), and little less than half (48.7%) reported watching at least once a week. In Bangladesh, on the other hand, about two-fifths (39.5%) reported never watching TV and more than half (51.8%) watching at least once a week.

The table also shows the percentage of overweight and obesity among the participants. The prevalence of obesity and overweight was respectively 13.5% and 14% for Nepal and 15.3% and 24.2% for Bangladesh. Results of chi-squared tests of association show that

Table 1 Basic sociodemographic characteristics of the study population

	Nepal			Bangladesh		
	N = 6,144	Overweight (14)	Obese (13.5)	*N* = 17,683	Overweight (15.3)	Obese (24.2)
Age (years)						
15–24	**40.6**	29.6	15.4	**29.0**	23.0	16.0
25–34	**29.4**	33.6	37.2	**35.6**	39.5	40.8
35–44	**21.8**	29.1	33.5	**25.3**	28.4	31.3
44+	**8.2**	7.6	13.8	**10.1**	9.1	11.8
p		**<0.0001**			**<0.0001**	
Residency						
Urban	**28.3**	33.0	49.0	**34.4**	37.9	50.5
Rural	**71.7**	67.0	51.0	**65.6**	62.1	49.5
p		**0.0001**			**0.0001**	
Education						
No education	**38.5**	36.4	31.7	**23.5**	20.3	16.2
Primary	**17.0**	16.2	18.4	**29.2**	27.4	24.8
Secondary	**36.3**	37.7	39.4	**33.8**	40.4	43.3
Higher	**8.2**	9.7	10.4	**9.5**	11.9	15.7
p		**0.001**			**0.000**	
Working						
No	**35.9**	34.8	43.0	**68.5**	68.0	72.0
Yes	**64.1**	65.2	57.0	**31.5**	32.0	28.0
p		**<0.0001**			**0.010**	
Parity						
0	**30.7**	21.9	14.4	**9.9**	9.0	6.2
1	**13.8**	14.9	15.3	**22.3**	21.5	20.2
2	**18.8**	22.9	28.7	**26.4**	29.4	32.3
2+	**36.7**	40.4	41.6	**41.4**	40.1	41.4
p		0.031			**<0.0001**	
Frequency of watching TV						
Not at all	**23.9**	22.2	9.7	**39.5**	31.7	22.3
Less than once a week	**27.4**	23.6	18.9	**8.7**	8.5	7.2
At least once a week	**48.7**	54.2	71.3	**51.8**	59.8	70.4
p		**<0.0001**			0.003	
Wealth status						
Richest	**24.4**	33.9	52.4	**21.5**	25.2	42.3
Richer	**19.4**	20.9	23.3	**21.2**	25.3	24.6
Middle	**18.7**	17.2	11.3	**20.3**	20.7	16.2
Poorer	**18.3**	14.5	8.0	**18.8**	16.5	10.1
Poorest	**19.2**	13.5	5.0	**18.2**	12.3	6.9
p		**<0.0001**			**<0.0001**	

the likelihood of being overweight and obese was higher among women between 25 and 34 years of age, being rural origin, having secondary level education and engaged in outdoor employment. Women with higher number of childbirths, watching TV at least once a week and living in wealthier households also had higher likelihood of being overweight and obese.

Association between household wealth status and body weight

The results of regression models analysing the association between household wealth status and being overweight and obese were presented in Table 2 (bivariate analysis) and Table 3. Table 3 contains the results of multivariable association and was adjusted for the covariates, which were found to have a significant association with overweight and obesity in the chi-squared tests. Results in both bivariate and multivariate analyses illustrate that women living in relatively wealthier households shared an increased likelihood of being overweight and obese in both of the countries. Compared with women living in poorest households, the odds of being overweight were respectively 3.44, 2.12, 1.46 and 1.19 times higher for women living in richest, richer, middle and poorer wealth status households in Nepal. In

Table 2 Association (unadjusted) between household wealth status and being overweight and obese among women ageing between 15 and 49 years in Nepal and Bangladesh

	Nepal		Bangladesh	
	Overweight COR (95%CI)	Obese COR (95%CI)	Overweight COR (95%CI)	Obese COR (95%CI)
Wealth index				
Poorest*	*	*	*	*
Poorer	1.159 (0.845–1.590)	1.736 (1.138–2.649)	1.324 (1.131–1.550)	1.441 (1.224–1.697)
Middle	1.437 (1.054–1.958)	2.557 (1.707–3.830)	1.630 (1.400–1.897)	2.286 (1.963–2.664)
Richer	2.009 (1.479–2.728)	6.079 (4.151–8.903)	2.160 (1.862–2.506)	3.764 (3.249–4.360)
Richest	3.324 (2.481–4.454)	13.976 (9.673–20.194)	3.120 (2.679–3.633)	9.383 (8.110–10.855)

*indicates reference category.
COR, crude odds ratios.

Table 3 Association (adjusted) between household wealth status and being overweight and obese among women ageing between 15 and 49 years in Nepal and Bangladesh

	Nepal		Bangladesh	
	Overweight AOR (95%CI)	Obese AOR (95%CI)	Overweight AOR (95%CI)	Obese AOR (95%CI)
Wealth index				
Poorest*	*	*	*	*
Poorer	1.190 (0.860–1.646)	1.620 (1.050–2.501)	1.216 (1.036–1.428)	1.282 (1.084–1.515)
Middle	1.458 (1.040–2.045)	1.968 (1.272–3.043)	1.318 (1.119–1.552)	1.694 (1.438–1.996)
Richer	2.127 (1.475–3.067)	4.385 (2.817–6.825)	1.602 (1.351–1.900)	2.419 (2.046–2.859)
Richest	3.442 (2.276–5.205)	8.452 (5.228–13.663)	1.975 (1.628–2.396)	4.572 (3.813–5.484)

*indicates reference category – adjusted for age, residency, employment status, parity and frequency of watching TV.
AOR, adjusted odds ratio.

Bangladesh, compared with poorest households, women in richest, richer, middle and poorer households had respectively 98%, 60%, 32% and 22% higher odds of being overweight. Among Bangladeshi women, the odds of being obese in richest households were 4.6 (adjusted odds ratio = 4.572; 95% confidence interval = 3.813–5.484) times and among Nepalese women were 8.5 (adjusted odds ratio = 8.452; 95% confidence interval = 5.228–13.663] times higher compared with those in poorest households.

Discussion and conclusions

While researchers widely acknowledge the rising prevalence of overweight/obesity as a serious public health challenge, the effective intervention to this issue in the developing countries is to a great extent being constrained by the dearth of accurate and quality data to understand the exact situation. Literature review on South Asian nations also reveals lack of research

evidence on the trends, determinants, vulnerable groups and the overall consequences on population health. Moreover, studies are not nationally representative, and majority of them classify body weight by international standards instead of the recommended cut-offs for Asian population, which gives an erroneous picture of the situation. To this end, present study tried to address these gaps by analysing most recent and nationally representative data sets on women in Bangladesh (2014) and Nepal (2011) by adopting the World Health Organization recommended cut-offs for these countries.

Findings show that in both of the countries, the prevalence of overweight/obesity far exceeds 10% and the combined and individual prevalence is higher among Bangladeshi women compared with Nepalese women. Although not shown in the analysis, it is worthy of noting that using lower cut-offs gives a marked difference in contrast with the internationally comparable one for both countries – (regional vs. internal cut-off) overweight 11.2% vs. 13.5% and obesity 2.2% vs. 14% for Nepal

and overweight 19.4% vs. 15.3% and obesity 4.4 % vs. 24.2% for Bangladesh. One remarkable unusuality regarding the use of lower cut-offs for BMI was that the prevalence obesity exceeded that of overweight for the first time among both Nepalese and Bangladeshi women. A recent study conducted on rural population in Bangladesh found a similar scenario – the prevalence of obesity (BMI $\geq$25 kg m^{-2} = 26.2%) was considerably higher than that of overweight (BMI 23–24.9 kg m^{-2} = 17.7%) (17). This gives a clear indication of the fact that the current situation of overweight/obesity could be far graver when considered in terms of the local contexts rather than the international ones. Therefore, the difference should be taken into consideration while making nationally comparable estimates and designing intervention programmes.

Finding from national economic outlooks suggests that these two countries have enjoyed a steady gross domestic product growth since the last 2 decades (average annual growth rate of about 6.2% for Bangladesh and 4.2% for Nepal since 2002) with a moderate reduction in poverty and extreme poverty rates, reduction in child and maternal undernutrition and rising share urban population. In Nepal, the percentage of underweight (BMI <18.5) women ageing between 15 and 49 years has decreased from 26.7% in 2001 to 18.2% in 2011 (10,18), while in Bangladesh, the rate has dropped by over half since 2004 (38% in 2004 vs. 18.6% in 2014) (15,19). Not surprisingly, these changes have coincided with a considerable rise in overweight/obesity rates during this time. Over the course of last 10 to 15 years, the prevalence of overweight/obesity has exceeded 10% for the first time in both of the countries. Compared with 2004 estimates, the combined prevalence overweight and obesity (BMI $\geq$25) among women ageing between 15 and 49 years in Bangladesh has increased more than twice in 2014 (9% in 2004 vs. 24% in 2014). A similar trend is observed when using a lower cut-off point for overweight/obesity (BMI $\geq$23) is considered (17% in 2004 vs. 39.5% in 2014) (15). In Nepal, on the other hand, the combined prevalence has more than doubled from 6.5% in 2001 to 13.4% in 2011 (BMI $\geq$25 to 29.9: 5.5% vs. 11.2%; BMI $\geq$30: 1% vs. 2.2%) (10,18).

In line with the findings from previous researches, the results show that women from households with higher wealth status were significantly more likely to be overweight and obese compared with those in less wealthy households. Significantly higher rates of general and central obesity were reported among men and women with higher socioeconomic status (SES) in Bangladesh and other South Asian nations (17,20). One study based on BDHS (2011) found that compared with the richest, the women from the poorest households were 2.75 times more likely to be underweight and least likely to be overweight (21). In India, a significantly positive correlation was observed between overweight/obese and higher SES among women in both rural and urban areas (4,22). Similar results have been reported in Nigeria where women in the richest group had substantially higher odds (3.45) of being overweight/obese (23). Interestingly, contrary to the findings from developing countries, overweight/obesity have been found to be more prevalent among the population with lower SES in developed countries, e.g. the USA (24–26). Among adult men and women in Pakistan, compared with the lowest quintile, those in upper wealth quintiles had significantly greater odds of being preoverweight, overweight and obesity (27), the underlying mechanism being the inequitable access to and affordability of healthy food among the lower SES neighbourhoods (25). The association between poverty and obesity is proposed to be mediated by the comparatively lower cost of energy-dense but nutrient-poor food, which serves as cheaper yet palatable sources of calorie for poor consumers (28,29). However, whether or not this situation exists in the context of South Asian countries remains subject to further investigation.

This is the first and largest study to explore the association between wealth status and overweight/obesity among adult women in South Asia. One particular strength of the present study is that it used two large and nationally representative data sets and measured overweight/obesity as per the regional cut-offs. However, there are certain limitations to be considered when interpreting the findings. As the data were cross-sectional, no causal relationship can be inferred between wealth status and overweight/obesity outcomes. The control over selection of variables was also limited because the data sets were secondary. Several relevant factors, such as dietary habit, level of physical activity, type of occupation and presence of any disease conditions, were not adjusted for which could have altered the prevalence rates. Moreover, household wealth status may not represent individual financial solvency among women because of gender disparities in familial wealth distribution across South Asia.

In conclusion, this study reports a gradual rise in the prevalence of overweight and obesity in Bangladesh and Nepal. Women living in household with higher wealth status are significantly more likely to be overweight and obese compared with those living in poorer households. By using the regional cut-offs for BMI, it is also the first nationally representative study to report that the

population of obese women has for the first time outnumbered that of overweight women in both countries.

Abbreviations

BDHS   Bangladesh Demographic and Health Survey
NCDs   non-communicable diseases
DBM   double burden of malnutrition
SES   socioeconomic status

Conflict of Interest Statement

None to declare.

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Consent for publication

Not applicable.

Ethics approval

The DHSs are reviewed and approved by ICF International Institutional Review Board. The data sets are available in public domain in anonymized form. Therefore, no additional approval was required.

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