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Trends of under- and overweight among rural and urban poor women indicate the double burden of malnutrition in Bangladesh

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Background Although undernutrition and communicable diseases dominate the current disease burden in resource-poor countries, the prevalence of diet related chronic diseases is increasing. This paper explores current trends of under- and overweight in Bangladeshi women.

Method Nationally representative data on reproductive age women from rural Bangladesh ($n = 2\,424\,33$) and selected urban poor areas ($n = 39\,749$) collected by the Nutritional Surveillance Project during 2000–2004 were analyzed.

Results While the prevalence of chronic energy deficiency [CED, body mass index (BMI) $< 18.5 \text{ kg/m}^2$] continues to be major nutritional problem among Bangladeshi women (38.8% rural, 29.7% urban poor; $P < 0.001$), between 2000–2004, 9.1% of urban poor and 4.1% of rural women were overweight (BMI $\geq 25 \text{ kg/m}^2$, $P < 0.001$). In addition, 9.8% of urban poor and 5.5% of rural women were found to be 'at risk of overweight' (BMI $23.0 - < 25 \text{ kg/m}^2$). From 2000 to 2004, prevalence of CED decreased (urban poor: 33.8–29.3%; rural: 42.6–36.6%), while prevalence of overweight increased (urban poor: 6.8–9.1%; rural: 2.8–5.5%). The risk of being overweight was higher among women who were older and of higher socioeconomic status. Rural women with at least 14 years of education had a 8.1-fold increased risk of being overweight compared with non-educated women [95% confidence intervals (CI): 6.6–8.7]. Women living in houses of at least 1000 sqft (93 m²) were 3.7 times more likely to be overweight compared with women living in < 250 sqft (23 m²) houses (95% CI: 3.2–4.3).

Conclusion The recent increase in overweight prevalence among both urban poor and rural women, along with high prevalence of CED, indicates the emergence of a double burden of malnutrition in Bangladesh.

Keywords Anthropometry, chronic energy deficiency, developing countries, overweight, socioeconomic status

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Introduction

The magnitude of overweight and obesity is being recognized as a global public health problem by the World Health Organization (WHO)^{1,2} given that, over the last few decades, there has been an alarming upward trend in the prevalence of obesity both in developed and developing countries.^{3,4}

Overweight and obesity have significant health and economic consequences.⁵ In adults, they are associated with an increased risk of developing various non-communicable diseases (NCDs), including hypertension, coronary heart disease, diabetes, stroke and some forms of cancer.⁶ It is evident that there has already been a profound shift in the major causes of death and diseases in developing countries.^{7,8} In the poorest countries, even though undernutrition and infectious diseases dominate the current disease burden, the prevalence of major risk factors for chronic disease are increasing. For example, in Bangladesh, morbidity patterns are predominantly characterized by chronic energy deficiency (CED) and infectious diseases, but diet-related NCDs also constitute a major part of the adult morbidity both in urban and rural areas.^{9–11} This pattern is similar to many other mid- and low-income countries.^{3,12}

In a descriptive study, Shukla *et al.*¹³ have confirmed the double burden of malnutrition, i.e. the co-existence of under- and overnutrition, in South Asia. Countries in this region have been undergoing demographic and socioeconomic transitions for the last few decades.¹⁴ These transitions also include a shift in nutrition and morbidity patterns, which may lead Bangladesh to face the double burden as well. Hence, along with measuring the prevalence of undernutrition, it is obviously important to determine the national prevalence of overweight as well as its determining factors.¹⁵

Because malnutrition has been an immense and, therefore, predominant problem in Bangladesh, surveys and surveillance systems have yet to report on the emergence of overweight and obesity.^{16,17} The present article reports the current prevalence of overweight and obesity among reproductive-age women, as assessed from a nationally representative data, in both rural and urban poor areas, and compares the trends of overweight prevalence over the last 5 years to those of CED.

Materials and methods

Source of data

The data presented are drawn from the Nutritional Surveillance Project (NSP) of Helen Keller International (HKI), which has been conducted in Bangladesh since 1990, in collaboration with Institute of Public Health Nutrition (IPHN) of the Government of Bangladesh and partner non-government organizations (NGOs). The surveillance system collects data on nutrition and health from households with under-5-year-old children across rural and urban poor areas of Bangladesh every two months throughout the year. At individual level, the NSP collects data on anthropometry, dietary behaviour and morbidity. Moreover, household-level information on demography, socioeconomic status (SES), crisis coping and agricultural practices are collected. For this article, we analysed data from non-pregnant women, with children under 5 years in the sampled households, aged 15–45 years, from rural ($n=242433$) and urban poor areas ($n=39749$), collected during 2000–2004.

Study design

The NSP employs a multistage cluster sampling design in rural areas which is nationally and divisionally representative.

For each of the six divisions of the country, four sub-districts have been selected randomly, which remain the same for each of the subsequent rounds of data collection. From each sub-district, 15 mauza (smaller administrative units) are randomly selected for each round of data-collection. Within each mauza, one village is randomly selected and 25 households are sampled systematically. Thus, data are collected from 375 households in each of the 24 sub-districts per round, which amounts to a total of 9000 households per round nationwide.

In six divisional cities, the NSP collects information from slum areas. From each city, a number of wards (administrative units in cities) have been selected using probability-proportional-to-size sampling: 12 wards from Dhaka, six from Chittagong and three from Rajshahi, Khulna, Sylhet and Barisal. Every round, five slums are selected from each of these 30 wards, using simple random sampling and from each, 10 households are sampled systematically. Thus, data from 1500 households are collected from urban slums in each round. The sample collected from urban slum areas is referred to as 'urban poor' throughout the results and discussion sections in this paper.

Data collection procedure

Prior to the interview, the purpose of data collection is explained to the women and verbal consent is obtained. The survey includes two components: anthropometric measurements and interviewer administration of a structured questionnaire. The weight of the women wearing light clothing is measured using a digital bathroom scale (TANITA Corporation, model HD-305, 2001, Tokyo, Japan) and recorded to the nearest 0.1 kg. Height is measured using a locally constructed wooden stadiometer to the nearest 0.1 cm. Demographic, socioeconomic, health and nutrition data are recorded during a structured interview using a precoded questionnaire.

HKI provides training to field staff before each round of data collection. During each round, monitoring teams from HKI visit field sites to supervise data collection and calibrate equipment. Quality control teams recollect 5–10% of data on the following day to ensure accuracy. All data are entered by local partner NGO staff using a software package developed by HKI. Data editing and cleaning in the HKI office in Dhaka involves duplicate, mismatch, consistency and range checks.

Statistical analysis

Pregnant women and women with a body mass index (BMI, kg/m^2) <12 or $>50 \text{ kg/m}^2$ were excluded from the analysis.¹⁸ CED was defined as (i) 'Grade 1 CED' BMI = 17–18.49, (ii) 'Grade 2 CED' BMI = 16–16.99 and (iii) 'Grade 3 CED' BMI <16.0 . In 2004, a WHO expert consultation¹⁹ suggested using cut-offs of 23 kg/m^2 and 27.5 kg/m^2 to identify 'increased risk' and 'high risk' for overweight among Asian populations. According to these criteria, in this article overweight was classified as follows: (i) 'At risk of overweight' BMI = 23.0–24.99, (ii) 'Grade 1 overweight' BMI = 25.0–29.99 and (iii) 'Grade 2 overweight' BMI ≥ 30.0 . Trends in the prevalence were detected by 'percentage-point/year', calculated by dividing the difference of the prevalence between earliest and latest survey points (calendar years) by total number of

years between survey points assuming each year's sample was representative of the underlying population of interest.

Because multistage cluster sampling design was used, variances across divisions were adjusted applying a population weighing factor during analysis of rural national data. Descriptive statistics were expressed as mean, median, standard deviations (SD) or percentages and 95% confidence intervals (CI) where appropriate. To calculate the significance of the bivariate association among the variables the chi-square test and the Mann–Whitney U-test were used for comparing median BMI of rural and urban areas since BMI was non-normally distributed. Stepwise multivariate regression²⁰ analysis was performed using a forward conditional logistic regression method with overweight status as a dependent variable and age, level of education, area of main living house and proportion of monthly expenditure spent on food as independent variables. Odds ratios (OR) and corresponding 95% CIs were calculated and a *P*-value of <0.05 was considered statistically significant. All statistical analyses were performed using Statistical Package for Social Science (SPSS, version 11.5, SPSS Inc. Chicago, IL).

Results

Data collected from women during 2000 to 2004 show that the median BMI was higher among urban poor women compared with rural women (19.8 vs 19.0, *P* < 0.001) (Figure 1). This figure highlights that both among rural and urban poor women there was an increase in median BMI until the women reached their 30s. This increase with age was quite steep among women from urban poor areas: median BMI was higher among urban poor women that were older (18.9 among 15-years-old vs 20.7 among 29-years-old). For rural women, this age difference was not so prominent (18.6 among 15-years-olds vs 19.6 among 29-years-olds). Beyond 30 years of age, older women tended to have a lower BMI. Among rural women, median BMI of women aged 30 years was 19.7, which was 19.5 among women aged 45 years, while it was 21.2 and 20.0, respectively, among urban poor women. Compared with rural women, this decrease was seen approximately 5 years later in the urban poor women.

Figure 2 shows the overall prevalence of CED and overweight among women during the 5-year period. The prevalence of CED (BMI < 18.5) was 38.8 and 29.7% among rural and urban poor women, respectively. On the other hand, 9.1% of urban poor and 4.1% of rural women were 'overweight or obese' (BMI ≥ 25.0). Obesity (BMI ≥ 30.0) was found among 0.4% of rural and 1.1% of urban poor women. In addition, a larger proportion of women were 'at risk of overweight' (BMI 23.0–<25.0) (9.8% of urban poor and 5.5% of rural women). The prevalence of 'at risk of overweight or overweight' (BMI ≥ 23.0 kg/m²) was higher among urban poor compared with rural women (18.9 vs 9.6%; *P* < 0.001). Similarly, the prevalence of CED was higher among rural women than among urban poor women (38.8 vs 29.7%, *P* < 0.001).

During 2000–2004, a decreasing trend in the prevalence of CED and an increasing trend in overweight were detected (Figure 3). Over the 5-year period, the prevalence of overweight and obesity steadily increased from 2.8 to 5.5% among

rural women. Among urban poor women, prevalence of overweight and obesity increased considerably from 6.6% in 2000 to 10.1% in 2001, but did not increase afterwards. During the same period, CED decreased from 42.6 to 36.6% among rural women and from 33.8 to 29.3% among urban poor women (*P* < 0.001, both rural and urban). The trends indicated that CED decreased at an average rate of 1.2 and 0.9 percentage-point/year in rural and urban poor areas, respectively. Meanwhile, prevalence of overweight or being at risk of overweight (BMI ≥ 23.0) increased at 1.1 percentage-point/year in rural areas and 0.3 percentage-point/year in urban poor areas.

Level of education, area of the house and the proportion of monthly expenditure spent on food are three strong proxy indicators of SES among the Bangladeshi population.²¹ The proportion of overweight increased with increasing education level, whereas the proportion of CED decreased (Figure 4). Similar results were found with an increase in the area of the house (Tables 1 and 2). The proportion of overweight by monthly food expenditure showed that, both in urban and rural areas, overweight was more prevalent among the comparatively wealthiest group, i.e. those who spent <20% of their total expenditure on food, compared with the poorest who spent >80% on food (Figure 5). Although, in urban poor areas, the comparatively wealthiest group had the highest prevalence of overweight (12.2%), even among the poorest, the prevalence was 8.4%.

Multivariate logistic regression analyses presented in Tables 1 and 2 were from the end step of the model and the independent variables inserted in the model were adjusted for each other. Findings revealed that rural women aged 35 years or older were 9.4 times (95% CI: 7.5–11.8) more likely to be overweight compared with women aged <20 years (Table 1), and among the urban poor, this risk was 10.2 (95% CI: 7.2–14.5) times higher, comparing the same age groups (Table 2). Higher SES was significantly associated with overnutrition. In rural areas, women with 14 years of schooling had a 8-fold higher risk of being overweight compared with their non-educated peers (OR 8.1, 95% CI: 6.6–8.7). The total area of the main living house was generally larger in rural areas compared with urban poor areas. There was about a 3-fold increase in the risk of being overweight among women who lived in the larger houses (rural: OR 3.7, 95% CI: 3.2–4.3; urban poor: OR 3.0, 95% CI: 2.1–4.1). Among both rural and urban poor women, a slightly increased risk of being overweight was found when <20% of the total monthly expenditure was spent on food but the association was only significant for rural women (OR 1.3, 95% CI: 1.2–1.4).

Discussion

This article, to our knowledge, is the first to present trends in the prevalence of under- and overnutrition among Bangladeshi women of reproductive age over an extended period of time. Our results suggest that, while the pattern of malnutrition among Bangladeshi women is still dominated by undernutrition, the prevalence of overweight is steadily increasing.

A revisit of BMI cut-off points for overweight and obesity in Asian populations has been suggested.²² First, there is evidence of emerging type-II diabetes and cardiovascular risk

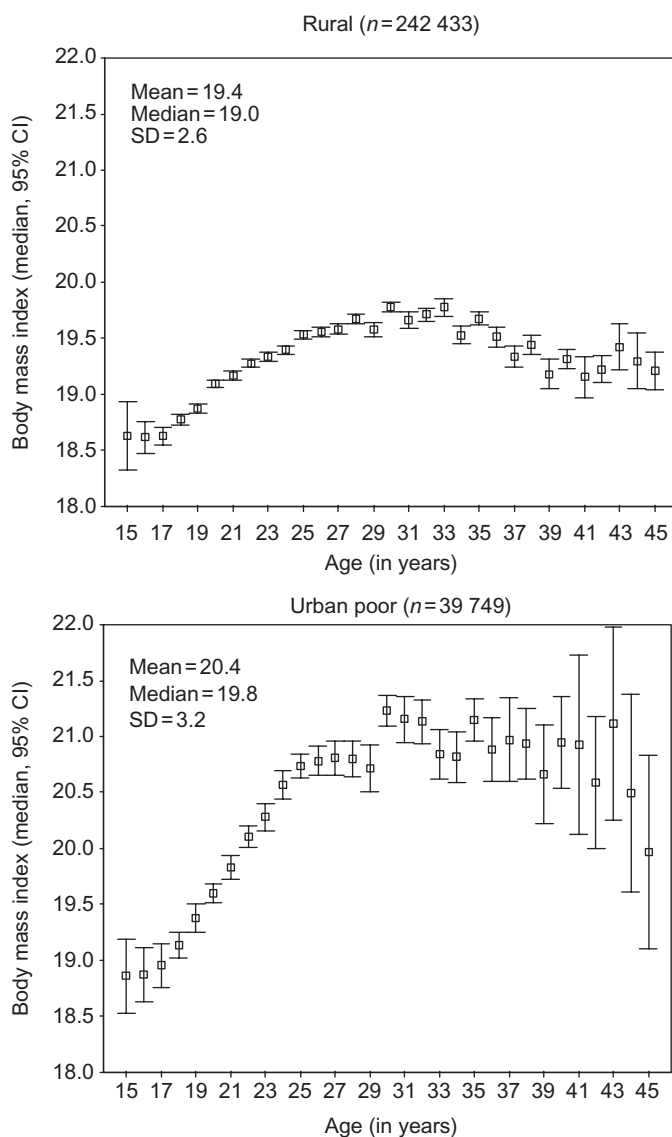


Figure 1 Age-specific^a body mass index (median* with 95% confidence interval^b) of non-pregnant women aged 15–45 years in rural and urban poor areas of Bangladesh, 2000–04^c.

^aAge (completed years) at time of data collection; * $P < 0,001$ for comparison between median BMI of rural and urban poor (Mann–Whitney U-test, as BMI was non-normally distributed); ^bError bars represent 95% confidence intervals; ^cIn all analyses, sample weight was applied; presented n are unweighed

factors among people with a BMI below the usual cut-off point of 25 kg/m². Second, in some Asian populations, a particular BMI reflects a higher percentage of body fat than in Caucasian populations. In view of that, in 2004, a WHO expert consultation¹⁹ identified potential public health action points along the continuum of the BMI for Asian populations. Cut-offs of 23 and 27.5 kg/m² were suggested to identify 'increased risk' and 'high risk' for overweight, respectively. Therefore, we have reported both 'overweight' and 'at risk of overweight'.

In 2004, the prevalence of overweight among urban poor women was quite high (9.1%) and almost double that among rural women (5.5%). In addition, the overall prevalence of women being at risk of or actually being overweight or obese

was 18.9% in urban poor areas and 9.6% in rural areas. These findings concur with those of a recently published report based on Bangladesh Demographic Health Survey (BDHS).²³ According to this study, from 1996/97 to 2004, the proportion of women with at-risk BMI (≥ 23) increased from 5.1 to 10.2% in rural areas and 24 to 26% in urban areas (note that this also included better-off women). One study found that 9.9% of 379 non-pregnant rural women, aged 20–69, were overweight.²⁴ Another study ($n = 191$), reported 23.4% overweight among non-pregnant urban women with higher SES, and no overweight among rural women with low SES.²⁵ The rural area of the latter study was purposively selected from flood and drought prone zones. Even though our study found a steady increase in BMI among women till

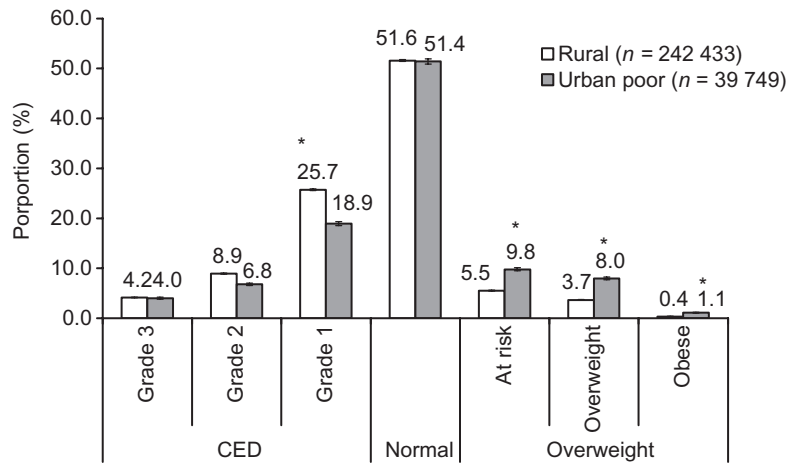


Figure 2 Prevalence of overweight^a and chronic energy deficiency (CED)^b among women in rural and urban poor areas in Bangladesh, 2000–04^c. * $P < 0.001$ for comparison between rural and urban poor (chi-squared test); ^aAt risk of overweight (BMI 23.0–<25 kg/m²), Overweight Grade 1 (BMI 25–<30 kg/m²), Overweight Grade 2 (BMI ≥ 30 kg/m²); ^bCED Grade 1 (BMI 17.0–<18.5 kg/m²), Grade 2 (BMI 16.0–<17 kg/m²), Grade 3 (BMI < 16 kg/m²); ^cError bars represent 95% confidence intervals

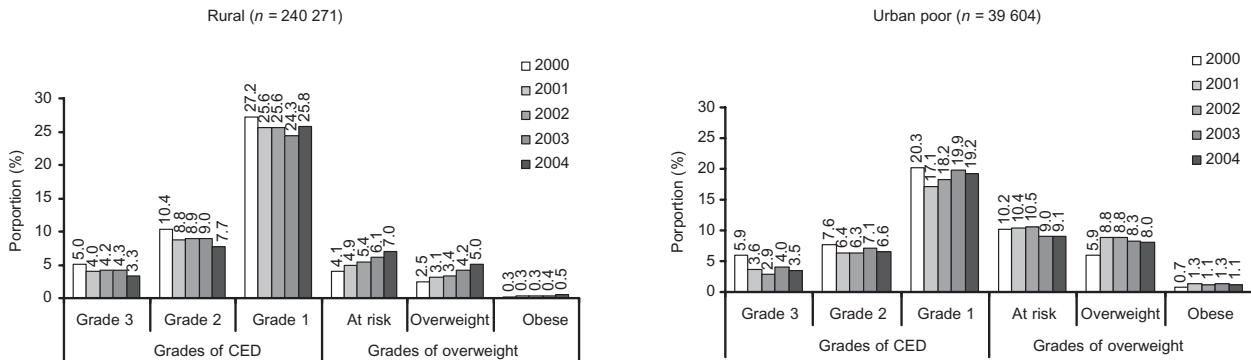


Figure 3 Trends in the prevalence of overweight^a and chronic energy deficiency (CED)^b among rural and urban poor women in Bangladesh, 2000–04^c. ^aAt risk of overweight (BMI 23.0–<25 kg/m²), Overweight Grade 1 (BMI 25–<30 kg/m²), Overweight Grade 2 (BMI ≥ 30 kg/m²); ^bCED Grade 1 (BMI 17.0–<18.5 kg/m²), Grade 2 (BMI 16.0–<17 kg/m²), Grade 3 (BMI < 16 kg/m²); ^cThe figure does not show 51.6% of rural and 51.4% of urban poor women with BMI 18.5–<23 kg/m² indicating normal weight

they reach their 30s, a decrease in mean BMI was seen among older women, especially in rural areas. Possible explanation for this could be discrepancies in intra-household food distribution coupled with lack of care-seeking during illness, attributable to cultural context and/or economic constraint. Another explanation could be the comparatively new phenomenon of increased BMI related to improved socioeconomic level of the population and urbanization, thus probably were more prevalent among younger generations of women. It remains to be seen what happens to the BMI of this generation of younger women when they become older.

Over the 5-year-period from which data were analysed for this study, there has been a trend towards an increasing prevalence of overweight among women both in urban and rural areas. This trend was more prominent in rural areas, possibly because the causes of overweight have recently started pervading from urban to rural areas. Several studies in

Southeast Asia also reported an increase in overweight.²⁶ In China between 1982 and 1992, the prevalence of overweight and obesity in young adults had increased from 9.7 to 14.9% in urban areas and from 6.2 to 8.4% in rural areas.²⁷ Concurrent with the increase of overweight and obesity in Bangladesh, there was a decrease of the prevalence of CED. However, the prevalence of CED among women of reproductive age is still very high (30–40%) and requires continued attention. In Bangladesh, a large number of women are married as adolescents and have recurrent pregnancies before they have completed their physical maturation, which increases the risk of CED. These women are already at an increased risk of CED due to the country’s proneness to frequent natural disasters, as de Pee *et al.*²⁸ showed substantial weight loss among adolescent girls and women during Indonesia’s economic crisis. Coexistence of under- and overweight among both men and women, aged 35 years or more, has also been reported in western India.¹³

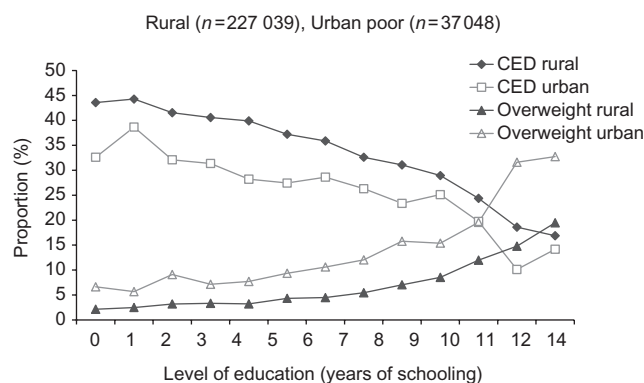


Figure 4 Proportion of women with overweight^a and CED^b in urban poor and rural areas by level of education^c in Bangladesh, 2000–04. ^aOverweight was defined as BMI ≥ 25 kg/m²; ^bCED was defined as BMI < 18.5 kg/m²; ^cNone of the women had 11 or 13 years of schooling

Another impact of CED among mothers is that it induces the intergenerational cycle of malnutrition.²⁹ Children born to malnourished mothers are more likely to be malnourished themselves at a young age and suffer from overweight or obesity and other chronic diseases in adulthood,^{30,31} especially in the face of an economic transition.^{3,26,27,32} Thus, although the two extremes of malnutrition have different determinants and consequences, they are also related and both pose an enormous economic burden. CED among women is associated with poor productivity, higher mortality and the intergenerational cycle of malnutrition, while overweight induces the burden of diet-related NCDs, e.g., cancer, diabetes, hypertension and cardiovascular disease.¹⁵ This article shows that Bangladesh, a country with a large economic burden due to undernutrition, now has to deal with overnutrition as well. An increasing burden of obesity-related chronic diseases in the Bangladeshi population has already been documented.^{9–11} And data from the Bangladesh Bureau of Statistics revealed that in 2002, 16% of the Bangladeshi population died from diet-related NCDs.³³

There are several possible causes for the increasing prevalence of overweight. One cause may be the high prevalence of early childhood, including intrauterine, malnutrition among this population. Another cause may be the eating behaviour and lifestyle practices, especially in urban areas. Several reports have shown that the Bangladeshi population has limited dietary diversity and poor eating behaviour.^{16,17} While that is in part due to poverty, it has also been found that fats and oils constitute a large proportion of the daily diet of people with higher SES and that most of the population does not consume adequate fruits and vegetables. In fact, at a national level, the production of fruits and vegetables is far below the estimated need.³⁴ Another cause is urbanization which has been reported to be associated with a shift of the BMI distribution of a population towards higher values, which is related to changes of the diet as well as lifestyle, in particular a reduction of physical activity.³⁵

Further analysis of the data of Bangladeshi women showed that both age and socio-economic status were strong risk factors for overweight and obesity. The increase of risk with

Table 1 Multiple logistic regression analysis^a of the association of overweight^b among rural women with selected demographic and socioeconomic covariates. Presented are odds ratios (OR) and corresponding 95% confidence intervals (95% CI)

Covariates	Rural (<i>n</i> = 222 364)			
	<i>n</i>	Overweight (%)	OR (95% CI)	<i>P</i> -value
Age of the women (in years)				
<20 years	16 604	0.9	1	–
20–24 years	74 352	2.4	2.4 (1.9–3.1)	<0.001
25–29 years	75 084	4.3	5.6 (4.5–7.1)	<0.001
30–34 years	41 913	5.9	8.7 (6.9–10.9)	<0.001
≥ 35 years	32 902	5.3	9.4 (7.5–11.8)	<0.001
Level of education^c (years of schooling)				
No formal education	1 04 545	2.0	1	–
1 year	819	2.4	1.0 (0.5–2.0)	0.986
2 years	4401	2.9	1.5 (1.2–2.0)	<0.001
3 years	8741	3.0	1.7 (1.4–2.0)	<0.001
4 years	16 946	2.9	1.6 (1.4–1.9)	<0.001
5 years	34 267	3.9	2.2 (2.0–2.5)	<0.001
6 years	9813	4.3	2.9 (2.5–3.4)	<0.001
7 years	10 681	5.6	3.8 (3.4–4.4)	<0.001
8 years	11 651	7.0	4.1 (3.6–4.6)	<0.001
9 years	12 990	8.6	5.2 (4.6–5.8)	<0.001
10 years	9323	12.0	6.1 (5.7–6.4)	<0.001
12 years	2612	14.8	7.5 (6.7–7.7)	<0.001
14 years	1078	19.9	8.1 (6.6–8.7)	0.004
Area of the living house (square-feet^d)				
<250 sqft	1 05 008	2.7	1	–
250–499 sqft	76 912	3.1	1.3 (1.2–1.4)	<0.001
500–749 sqft	12 930	3.7	1.9 (1.7–2.1)	<0.001
750–999 sqft	3394	5.4	2.4 (2.0–2.8)	<0.001
≥ 1000 sqft	2190	9.2	3.7 (3.2–4.3)	<0.001
Percentage of monthly household expenditure spent on food				
>80%	46 469	2.9	1	–
60–<80%	46 444	3.7	1.2 (1.1–1.3)	<0.001
40–<60%	46 426	4.0	1.2 (1.1–1.2)	0.033
20–<40%	46 397	4.3	1.2 (1.1–1.3)	0.002
<20%	46 456	4.8	1.3 (1.2–1.4)	<0.001

^a The multiple logistic regression analysis was performed using the stepwise forward conditional method and independent variables presented in the model were adjusted for the presence of the other variables in the model.

^b Overweight was defined as BMI ≥ 25 kg/m².

^c Functional education was considered as no education, and none of the women had 11 or 13 years of schooling.

^d 1 square-foot (sqft) = 0.0929 m².

increasing age was most pronounced between <20 and 30–34 years, after which it remained almost the same. Because the data are cross-sectional, it cannot be concluded whether BMI does not increase much further after the age of 35 or that older women had not experienced the same increase of BMI at a young age that the younger women had experienced, because of the recent onset of the economic transition. The fact

Table 2 Multiple logistic regression analysis^a of the association of overweight^b with selected demographic and socioeconomic covariates among urban poor women. Presented are odds ratios (OR) and corresponding 95% confidence intervals (95% CI)

Covariates	Urban poor (n = 37 324)			
	n	Overweight (%)	OR (95% CI)	P-value
Age of the women (in years)				
<20 years	3868	2.2	1	–
20–24 years	13 681	5.8	3.4 (2.4–4.7)	<0.001
25–29 years	10 766	10.7	7.2 (5.1–9.9)	<0.001
30–34 years	7128	13.5	10.9 (7.8–15.3)	<0.001
≥35 years	4229	14.2	10.2 (7.2–14.5)	<0.001
Level of education^c (years of schooling)				
No formal education	20 256	6.6	1	–
1 year	194	5.7	0.9 (0.4–1.7)	0.68
2 years	815	9.1	1.3 (0.9–1.8)	0.18
3 years	1442	7.1	0.9 (0.6–1.2)	0.51
4 years	2401	7.7	1.0 (0.8–1.3)	0.734
5 years	4844	9.3	1.6 (1.4–1.9)	<0.001
6 years	1245	10.6	2.0 (1.5–2.6)	<0.001
7 years	1254	12.0	2.2 (1.7–2.8)	<0.001
8 years	1592	15.8	2.3 (1.8–2.9)	<0.001
9 years	1398	15.4	2.2 (1.7–2.7)	<0.001
10 years	1135	19.6	2.5 (2.0–2.7)	<0.001
12 years	386	31.6	2.7 (2.2–3.3)	0.003
14 years	113	32.7	2.8 (1.9–3.6)	0.014
Area of the living house (square-feet^d)				
<100 sqft	6950	4.1	1	–
100–199 sqft	21 084	9.7	1.9 (1.6–2.3)	<0.001
200–299 sqft	3804	13.3	2.4 (1.9–3.0)	<0.001
300–399 sqft	914	16.2	2.8 (2.0–3.8)	<0.001
≥400 sqft	698	20.6	3.0 (2.1–4.1)	<0.001
Percentage of monthly household expenditure spent on food				
>80%	7664	8.4	1	–
60–<80%	7657	7.7	1.2 (1.0–1.4)	0.03
40–<60%	7680	8.2	1.3 (0.9–1.3)	0.187
20–<40%	7655	9.5	1.2 (1.0–1.4)	0.100
<20%	7658	12.2	1.0 (0.8–1.2)	0.758

^a The multiple logistic regression analysis was performed using the stepwise forward conditional method and independent variables presented in the model were adjusted for the presence of the other variables in the model.

^b Overweight was defined as BMI ≥ 25 kg/m².

^c Functional education was considered as no education, and none of the women had 11 or 13 years of schooling.

^d 1 square-feet (sqft) = 0.0929 m².

that BMI increases in other populations are also seen beyond 35–40 years of age³⁶ may mean that the BMI among older Bangladeshi women is also likely to increase in the future. The findings of a higher risk of overweight among women of higher SES (larger area of the house, higher level of education and lower proportion of expenditure on foods), concurs with findings from others. A study in urban Dhaka found that 23% of women of high SES were overweight or obese.²⁵ Thus,

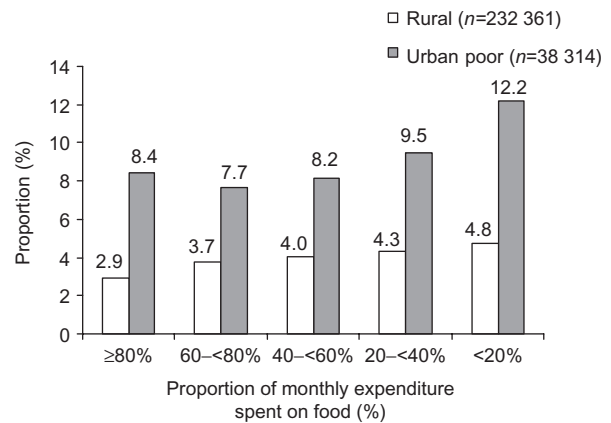


Figure 5 Prevalence of overweight^a among women by proportion of monthly expenditure spent on food (%)^b in Bangladesh, 2000–04. *Overweight was defined as BMI 25 ≥ kg/m²; ^aLowest quintile is the wealthiest group as they spent smallest proportion of their monthly expenditure for food

unlike in developed and some middle-income countries,³ overweight in Bangladesh is more prevalent in households with a higher SES. Monteiro *et al.*³⁷ reported that the burden of obesity tends to shift toward groups with lower SES as the country’s gross national product (GNP) increases. This phenomenon can be explained as follows. Higher income groups in developed countries can afford a nutritionally adequate diet that reduces the risk of overweight, while poorer groups are more likely to consume a less nutritious diet containing large amounts of fats and mono- or disaccharides. In developing countries at an early phase of the economic transition, such as Bangladesh, the poor often cannot afford an energy-sufficient diet and therefore suffer from CED, while richer population groups consume a diet rich in energy, often from fats or oils as well as sugars, which increases the risk of overweight and NCDs.

In conclusion, even though undernutrition still remains the dominant nutritional phenotype for women of reproductive age in Bangladesh, these data show that there is a steady increase of the prevalence of overweight, and thus establishes the existence of the double burden of malnutrition in rural and urban poor areas of Bangladesh. Because our urban data only represents a low-income group, amongst whom the prevalence of overweight is already 9.1%, the prevalence of overweight in urban adults of middle and high SES is expected to be higher and needs to be assessed. In addition, further operations research is needed to identify best strategies for reversing the trend of the increasing prevalence of overweight and obesity, while maintaining the reduction of undernutrition, both among adults as well as children. Addressing CED and childhood undernutrition remains crucial, not only because it reduces undernutrition, but also because malnutrition in early life is a risk factor for obesity and chronic diseases in later life. Therefore, public health programmes in Bangladesh need to address both undernutrition and overnutrition concurrently, and put forward interventions and awareness raising campaigns that emphasize the importance of a diet and lifestyle that promote optimal health and nutritional status among the entire population.

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KEY MESSAGES

- Bangladesh faces a double burden of both extremes of malnutrition, with CED remaining the dominant nutritional phenotype.
- Over the last 5 years, concurrently with the trend toward a decreasing prevalence of CED, a trend toward increasing overweight has been found.
- Contrary to what has been found in developed and some middle-income countries, overweight is more prevalent in relatively higher socioeconomic groups, while CED is more prevalent among lower socioeconomic groups.
- Health policy and nutrition interventions should address under- and overweight simultaneously, and put forward interventions and awareness raising campaigns that emphasize the importance of a diet and lifestyle that promote optimal health and nutritional status among the entire population.

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