

# Determinants of Undernutrition and Overweight among Women (19–45 Years): A Cross-sectional Study of Some South Asian Developing Countries

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## ABSTRACT

**Aims and background:** Being both underweight and overweight in women are major risks for maternal and fetal outcomes. This study aimed to find the double burden of malnutrition (DBM) in Pakistan, Bangladesh, Nepal, and Myanmar women, and sociodemographic factors involved.

**Materials and methods:** Data were taken from the latest Demographic and Health Survey (DHS) datasets. Frequencies, percentages, and multinomial logistic regression analyses were done to assess the effects of sociodemographic variables on body mass index (BMI).

**Results:** About 50% of women from Pakistan and Nepal, 65% from Bangladesh, and 71% from Myanmar lived in rural areas were involved in this study. About 50% of women from Pakistan, whereas less than 28% from Bangladesh, Nepal, and Myanmar had no formal education. About 40–50% of women from all four countries were poor. About 60% of women from Pakistan, whereas 30–40% from the other three countries had  $\geq 3$  “children ever born.” About 67% of women from Pakistan, whereas 40–50% from the other three had BMI  $\geq 23$ , whereas 7.5–14% of women from all four countries had BMI  $< 18.5$ . Multinomial regression showed increasing BMI with an increase in women’s age and socioeconomic status in all countries. Higher BMI was associated with urban residence in Pakistan and Myanmar, with higher education in Nepal, Bangladesh, and Myanmar, and with  $\geq 3$  children in Nepal and Myanmar.

**Conclusion:** Younger age, less education, rural residence, less wealth, and lesser number of children were major risk factors for underweight women, and opposite factors were risks for overweight.

**Clinical classical significance:** The nutritional status of women in developing countries should be improved to improve the health of future generations.

**Keywords:** Developing countries, Double burden of malnutrition, Obesity, South Asia, Underweight, Women.

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## INTRODUCTION

There is a double burden of malnutrition (DBM) in South Asian countries.<sup>1–7</sup> Double burden of malnutrition is defined by WHO as “the coexistence of undernutrition along with overweight, obesity or diet-related non-communicable diseases (NCDs), within individuals, households and populations, and across the life course.”<sup>6</sup>

Being overweight and obese in women, before pregnancy, and during gestation are major risks for maternal outcomes, such as gestational diabetes, hypertension, labor complications, and maternal death, and fetal outcomes, such as childhood obesity, cardiovascular disease, and diabetes.<sup>8</sup> Undernutrition in pregnant women is directly related to intrauterine growth retardation, resulting in low birth weight in infants.<sup>9,10</sup> When these underweight individuals progress economically, they become increasingly burdened by obesity and hence NCDs.<sup>11</sup> Hence, children, whose mothers were undernourished during pregnancy, have an increased risk of stunting, obesity, and NCDs in later life.<sup>12</sup> This concept was described by Wells, in 2018, as the “capacity-load model of NCD risk,” which suggests the development of certain physiological traits during initial life that allow individuals to maintain homeostasis whenever confronted by a metabolic load. These individuals are more prone to NCDs later.<sup>5,6</sup> This shows that along with obesity as

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a leading risk factor for NCDs, severe malnutrition in the mother, in early life is also related to a higher risk of NCDs in adulthood.<sup>5</sup>

Women carry the burden of producing the next generation. Their undernutrition as well as overnutrition is detrimental to the health of a country's future. Our study was aimed at finding the DBM in women of Pakistan, Bangladesh, Nepal, and Myanmar, and finding out the sociodemographic factors affecting malnutrition in these low-income countries from South Asia.

## MATERIALS AND METHODS

The data were taken from the latest Demographic and Health Survey (DHS) datasets of Pakistan (2017–2018), Bangladesh (2017–2018), Nepal (2022), and Myanmar (2015–2016). All women, who were ever married, aged 15–49, in the selected households, were questioned.

### Ethical Consideration

The DHS program provided ethical approval letters from all countries included in our study. The reference No. for ethical approval from Pakistan was 4-87/NCB-285//17/1438, given on November 17, 2017; from Bangladesh, it was BMRC/NREC/2016-2019/324, given on September 10, 2017; from Nepal, it was 678, given on September 30, 2021; and from Myanmar, it was 111/Ethics 2015, given on November 17, 2015.

### Outcome Variables

Body mass index (BMI) in DHS is coded as V445. It was in the form of numerical data. The authors categorized these data into three categories: (1) BMI < 18.5 as underweight, (2) BMI between 18.5 and 22.9 as normal, and (3) BMI ≥ 23 as overweight and obesity. These categories were made according to WHO recommendations,

where Asian BMI cut-off values were different from those set for Caucasians.<sup>13</sup>

### Independent Variables

Independent variables included in this analysis were women's age (code V012 and V013), women's education level (V106), the household wealth index (V190), urban/rural residence (V025), and number of children ever born (V201).

Women's age was present as nominal data as well as categories in DHS into five-year age-groups, that is, 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, and 45–49 years. Literacy level was categorized into "No education," "primary," "secondary," and "higher education" in DHS. The wealth index was categorized into "poorest," "poorer," "middle," "richer," and "richest," which were recategorized into three categories combining "poorest" with "poorer" and "richer" with "richest." The residence was categorized into "Urban" and "rural" by DHS. The DHS data had "children ever born" in numerical form. Authors recategorized the number of children ever born into "<3" and "≥3."

Demographic and Health Survey segregates women into "not pregnant/unsure" and "currently pregnant" under code V213. Data were analyzed by excluding "currently pregnant" from the data as BMI is affected by pregnancy.

SPSS version 22 was used to analyze the data. Frequencies and percentages of all categories were computed. Multinomial logistic regression analyses assessed the effects of various independent variables on BMI.

## RESULTS

Demographic and Health Survey interviewed about 5,000 women from Pakistan, 20,000 from Bangladesh, 7,000 from Nepal, and

**Table 1:** Frequencies of sociodemographic variables in various South Asian countries

Variable categories	Pakistan		Bangladesh		Nepal		Myanmar	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
<b>Pregnancy status</b>								
Not pregnant or unsure	4,681	87.9	18,682	94.4	7,045	95.8	12,163	96.1
Pregnant	644	12.1	1,116	5.6	307	4.2	499	3.9
Total	5,325	100.0	19,798	100.0	7,352	100.0	12,662	100.0
<b>Age-groups</b>								
15–29	1,776	38	7,944	42.5	3,599	51.1	5,203	42.8
30–39	1,777	38	6,147	32.9	1,981	28.1	3,657	30.1
40–49	1,128	24.1	4,591	24.6	1,465	20.8	3,303	27.1
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,163	100.0
<b>Residence</b>								
Urban	2,278	48.7	6,557	35.1	3,750	53.2	3,567	29.3
Rural	2,403	51.3	12,125	64.9	3,295	46.8	8,596	70.7
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,163	100.0
<b>Education level</b>								
No education	2,353	50.3	3,112	16.7	1,914	27.2	1,493	12.3
Primary	668	14.3	5,966	31.9	2,254	32.0	4,851	39.9
Secondary	953	20.4	7,115	38.1	2,620	37.2	4,569	37.6
Higher	707	15.1	2,489	13.3	257	3.6	1,250	10.3
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,161	100.0
<b>Wealth status</b>								
Poor	1,872	40.0	7,128	38.2	3,364	47.8	4,497	37.0
Middle	917	19.6	3,639	19.5	1,416	20.1	2,521	20.7
Rich	1,892	40.4	7,915	42.4	2,265	32.2	5,145	42.3
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,163	100.0

(Contd...)

**Table 1:** (Contd...)

Variable categories	Pakistan		Bangladesh		Nepal		Myanmar	
	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Number of total children ever born								
<3	1,952	41.7	11,250	60.2	4,849	68.8	8,512	70.0
≥3	2,729	58.3	7,432	39.8	2,196	31.2	3,651	30.0
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,163	100.0
BMI categories								
<18.5	354	7.6	2,299	12.3	976	13.9	1,313	10.8
18.5–23.0	1,205	25.7	7,171	38.4	3,261	46.3	6,209	51.0
≥23	3,122	66.7	9,212	49.3	2,808	39.9	4,641	38.2
Total	4,681	100.0	18,682	100.0	7,045	100.0	12,163	100.0

**Table 2:** Regression analysis for sociodemographic factors affecting overweight and obesity

Independent variables		Multinomial logistic regression (AOR)			
Variables	Categories	Pakistan	Bangladesh	Nepal	Myanmar
Woman's age	–	1.063 <sup>c</sup>	1.048 <sup>c</sup>	1.086 <sup>c</sup>	1.061 <sup>c</sup>
Residence (urban/rural)	Urban	1.219 <sup>a</sup>	–	–	1.436 <sup>c</sup>
	Rural	Reference	Reference	Reference	Reference
Woman's education	No education	–	0.421 <sup>c</sup>	0.399 <sup>c</sup>	0.806 <sup>a</sup>
	Primary	–	0.665 <sup>b</sup>	–	–
	Secondary	–	0.862 <sup>a</sup>	–	1.213 <sup>a</sup>
	Higher	Reference	Reference	Reference	Reference
Wealth index	Poor	0.317 <sup>c</sup>	0.396 <sup>c</sup>	0.417 <sup>c</sup>	0.521 <sup>c</sup>
	Middle	0.595 <sup>c</sup>	0.625 <sup>c</sup>	0.573 <sup>c</sup>	0.798 <sup>c</sup>
	Rich	Reference	Reference	Reference	Reference
No. of children ever born	–	–	–	0.953 <sup>a</sup>	1.047 <sup>c</sup>

<sup>a</sup>*p* < 0.05, <sup>b</sup>*p* < 0.005, <sup>c</sup>*p* < 0.001. AOR, adjusted odds ratio

12,000 from Myanmar (Table 1). Out of these women, about 12% from Pakistan, 5% from Bangladesh, and 4% each from Nepal and Myanmar were pregnant during the survey, hence, they were not included in the study.

About 24% of women from Pakistan and Bangladesh, 21% from Nepal, and 27% from Myanmar were older than 40 years of age (Table 1). About 50% of women from Pakistan and Nepal, 65% of women from Bangladesh, and about 71% of women from Myanmar lived in rural areas (Table 1). About 50% of women from Pakistan, whereas only about 17%, 27%, and 12% from Bangladesh, Nepal, and Myanmar, respectively had not gained any formal education (Table 1). About 40% of women were from Pakistan, Bangladesh, and Myanmar, whereas about 50% of women from Nepal were in the “poor” class (Table 1). About 60% of women from Pakistan, 40% of women from Bangladesh, and about 30% of women from Nepal and Myanmar had ≥3 “children ever born” (Table 1). About 67% of women from Pakistan, about 50% of women from Bangladesh, and about 40% of women from Nepal and Myanmar had a BMI ≥ 23 (Table 1). In contrast, about 7.5% of women from Pakistan, 12% from Bangladesh, 14% from Nepal, and 11% from Myanmar had a BMI < 18.5 (Table 1).

Multinomial regression analysis showed that increasing age was related to increasing BMI in all four countries (Table 2). Residence in urban areas was associated with an increase in BMI in women of Pakistan and Myanmar, but no effect was found in Bangladesh and Nepal. Body mass index was found to be lower in education categories of lower levels in Nepal, Bangladesh, and Myanmar, but no such association was found in Pakistanis (Table 2). Women

from the poor class had the lowest BMI level compared with the rich class in all four countries (Table 2). Body mass index seemed to be higher in women with a higher number of children in Nepal and Myanmar, but no such association was found in Pakistan and Bangladesh (Table 2).

## DISCUSSION

According to our study, the median prevalence of underweight was 11.3%, and of overweight and obesity was 46.8% for women from all four countries. The preponderance of underweight was found to be 7.3% in low- and middle-income (LMIC) countries globally, whereas the median for overweight and obesity was 41.7%.<sup>14</sup> In another study, the pooled preponderance of underweight was found to be 22% which was estimated from the studies from India, Pakistan, Afghanistan, and Nepal, and of overweight was 23% which was estimated from Bangladesh, India, Nepal, Pakistan, Bhutan, and Afghanistan.<sup>1</sup> These results were from the studies conducted from 2011 to 2017. It was observed in this study that there was a decline in underweight in these countries over time, with an increase in weight gain.<sup>1</sup> This may have happened because of the socioeconomic development in these countries. However, this increase in weight is due to the utilization of energy-rich foods, and drinks, along with a decrease in physical activity level. Hence, micronutrient deficiencies often co-occur with obesity.<sup>15</sup> The presence of micronutrient deficiencies without an energy-deficit diet is explained as “hidden hunger.”<sup>16,17</sup> Hence, the gain in weight in women in these countries did not reflect “health,” rather it just showed “fat gain.”

Our study showed an increase in BMI with an increase in women's age in all four countries. This finding is in accordance with the literature. A meta-analysis from studies in South Asia showed that underweight was more prevalent in women of the youngest age-group, that is, 15–19 years. A Nepali study showed undernutrition in the younger age-group and suggested that nutrition programs should target younger women to attend to undernutrition.<sup>4</sup> At the same time, overweight was higher in women of older age-groups.<sup>1</sup> The highest prevalence of underweight was found among the youngest group, that is, 18–24 years, in National Family Health Survey 2015–2016, India.<sup>18</sup> Probable reasons for this might be food insecurity and fear of obesity.<sup>19</sup> A Bengali study also showed that women in older age-groups were at risk of being overweight.<sup>20</sup> Intake of more energy-rich food and having less physical activity might explain overweight and obesity with increasing age. With increasing age there is development of NCDs and an increase in parity.<sup>21,22</sup> On the contrary, there was a decrease in the prevalence of obesity in women in the age-group 40–69 years in a Korean study.<sup>5</sup>

Our study found that about 50% of women from Pakistan and Nepal lived in rural areas, whereas 65% of women from Bangladesh, and about 71% of women from Myanmar lived in rural areas. Our study also found that urban residence was associated with an increase in BMI in women of Pakistan and Myanmar, but no such effect was found in Bangladesh and Nepal. However, a Bengali study showed a preponderance of overweight in urban women.<sup>4</sup> In studies from South Asia, underweight was found to be more dominant in women from rural areas, while overweight was prevalent in urban women.<sup>1</sup> Indian studies also found an association between rural residence and underweight, and urban residence with obesity.<sup>18,19</sup> The disparity in weight gain between urban and rural women is probably due to the lifestyle of rural women who are involved in many physical activities like agriculture and others.<sup>4</sup> However, in rural areas, overweight and obesity are limited to individuals from richer socioeconomic status, which might happen due to modifying patterns of diets toward sugary and fatty foods. It is also suggested that in poorer or rural areas large body sizes are considered to be associated with wealth. On the contrary, urban poor individuals have sedentary lifestyles due to technology replacing manual labor and better transport links,<sup>23</sup> and hence urban poor are also inclined toward overweight.

Our study found that about 50% of women from Pakistan had not obtained any formal education, whereas only about 17, 27, and 12% of women from Bangladesh, Nepal, and Myanmar respectively had not gained any formal education. Our study also found that BMI was more in women with higher literacy in Nepal, Bangladesh, and Myanmar, but no such association was found in Pakistani women. Other Bengali studies also showed that literate women had a relatively higher tendency to be overweight.<sup>5,20</sup> Indian studies also found an association between lower education with underweight and higher education associated with being overweight or obese.<sup>18,19</sup> A higher educational level leads women into more sedentary jobs and results in decreased physical activity.<sup>20,21</sup> Also, a higher education level leads to opportunities of higher socioeconomic status for women that might lead to weight gain.<sup>3,21</sup>

About 40% of women from Pakistan, Bangladesh, and Myanmar, whereas about 50% of women from Nepal were in the “poor” socioeconomic class. Our study also found that women from the poor socioeconomic class had the lowest BMI level compared with the rich class in all four countries. This finding was in line

with the literature. A meta-analysis from South Asia revealed that being underweight was more prevalent among those who were in the lowest wealth status, and being overweight was prevalent in the wealthiest families.<sup>1</sup> Bengali studies also showed that richer women in poorer countries have better food security and a poor physical activity level; hence, they are overweight and obese.<sup>5,20</sup> Underweight is an important issue among the less privileged women in poor countries; however, overweight or obesity levels are prevalent among the richest women. Privileged women in these countries are inclined toward Western food and lifestyle.<sup>14</sup> According to studies from India, poor socioeconomic status might be associated with less food security and more physical work.<sup>18,19</sup> Higher intake of fat and energy-rich foods increases with an increase in income.<sup>20</sup> Overweight and obesity were also found to be concentrated among the high socioeconomic class in Iran.<sup>24</sup> When a country progresses, the risk of being overweight and obese among the socioeconomically deprived section is expected.<sup>11</sup> Interestingly, in Korea, a decrease in obesity prevalence was observed in women with high income levels while an increase was found in other categories.<sup>22</sup> This trend was also observed in other countries from the Organization for Economic Cooperation and Development (OECD), such as the USA, Canada, and European countries. This was explained by the fact that wealthier people have access to information and resources that help to maintain a healthy weight, as healthy food and lifestyle are costly.<sup>22</sup> Poor food security and poor nutrition were the main issues in Korea right after the Korean War, and with economic development, fast food, Western diets, and obesity became prevalent in Korea. However, rich Korean women were less obese as compared with men. These women were less inclined to obesity because they experienced a strong stigma and social pressure that demanded thinner bodies.<sup>22</sup> Obesity could negatively affect job obtainability and economic status in Korean women. This difference in the effect of wealth status on BMI, between developed and developing countries, emphasized the effect of early stages of industrialization and globalization on a population's nutritional status. After development is achieved, there is a shift in lifestyle toward healthy living, where the rich can keep themselves healthy and physically fit, and the poor thrive on unhealthy diets and empty calories and are overweight and obese.<sup>25</sup> Although undernutrition has always been linked with poverty, and food insecurity, while obesity has been linked with prosperity and sedentary behavior; however, these two forms of malnutrition co-occur as stunting and overweight within communities.<sup>7</sup> Obesogenic environments are inflating while the undernutrition continues, along with an increasing number of people who were undernourished earlier in life and are overweight now.<sup>7</sup>

According to our study, about 60% of Pakistani women have  $\geq 3$  children. On the contrary, only about 40% of women in Bangladesh, and about 30% of women from Nepal and Myanmar had  $\geq 3$  children. Women from Pakistan generally have more BMI than men.<sup>26</sup> This may be because Pakistani women often get married in their 20s and are confined to home after marriage. They have a lower physical activity level which can be the main cause of being overweight.<sup>26</sup> Our study also found that BMI was higher in women with a higher number of children in Nepal and Myanmar, but no such association was found in Pakistan and Bangladesh. Multiparous women gain weight due to increased food intake and low physical activity.<sup>27</sup> The weight gain during pregnancy that often persists for life is also an important cause.<sup>3,21</sup> Although women try to regain their previous weight after childbirth, most of the women fail, hence becoming overweight.<sup>28</sup>

## CONCLUSION

Like other developing countries in the world, the major risk factors for underweight in women were found to be younger age, low educational level, rural residence, poor socioeconomic status, and a lesser number of children. Similarly, risk factors for overweight and obesity seemed to be older age, higher educational level, urban residence, higher socioeconomic status, and a higher number of children.

## Clinical Significance

There is a need for interventions for the betterment of the health of women in developing countries. Improvement of the nutritional status (both undernutrition and overnutrition) of women in a country will improve the health of future generations of that population.

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