Risk factors for underweight and overweight among reproductive aged women in a national sample in Nepal

Angela KC[1], Andrew L. Thorne-Lyman[1], Shiva Bhandari[2], Sumanta Neupane[1], Swetha Manohar[1], Binod Shrestha[3], Rolf D. Klemm[1], Keith P. West[1]
[1] Johns Hopkins University, Baltimore, USA, [2] University of South Carolina, Columbia, USA, [3] Feed the Future Innovation Lab for Nutrition, Kathmandu, Nepal

Background

- Like many countries, Nepal is facing a rise in the prevalence of overweight and obesity, while at the same time dealing with a high prevalence of underweight.[1]
- Most risk factor studies of women's nutritional status have either focused on the right side of the distribution (overweight) or the left side (underweight) but few have simultaneously explored factors associated the double burden malnutrition, with both over and underweight in the same model – an approach that could have more meaningful implications for policy.

Objectives and Methods

Objective:
- To estimate the prevalence and identify the factors associated with the risk of being underweight and overweight among women of reproductive age in Nepal
- To explore whether there are any similarities or differences in these factors

Methods:
- Sampling: Data was collected in 2016 on a national sample of households with recently married women and/or children under 5 years from 21 Village Development Committees, 7 from each of the three agro-ecological zones of Nepal.
- Sample size: 4,541 non-pregnant women with weight, height and valid BMI measurements.
- Covariates: Continuous covariates included women's age, a 7-item dietary diversity score derived with one point assigned for each food group consumed at least once over the previous 7 days; Categorical covariates included region of residence, women's education, ownership of a mobile phone, parity, household size, SES quintiles generated using principle components analysis of house characteristics and asset ownership, household food insecurity calculated using the Household Food Insecurity Access Scale, smoking, and a summary variable of processed food consumption (noodles and snacks), and caste.
- Statistical modeling: We used multinomial logistic regression models with three outcome categories of body mass index (BMI<18.5kg/m^2, 18.5 to 25kg/m^2, and >25 kg/m^2) to estimate multivariable adjusted relative risks including all covariates described above, with robust standard error to estimate 95% confidence intervals. Analyses were conducted with Stata® SE version 15.1

Table 1: Background characteristics of women in 2016 (n=4,541 women)

	Underweight	Normal	Overweight/ obese	Total
Total N	1017	2917	607	4541
Region (%)				
Mountains	14.4	71.3	14.3	686
Hills	13.2	67.5	19.3	1098
Terai	28.0	61.2	10.8	2757
Mean age (Mean, SD)	25.7 (6.0)	26.5 (6.0)	29.1 (5.5)	26.7 (6.0)
Dietary diversity score (Mean, SD)	6.2 (1.7)	6.4 (1.7)	7.0 (1.6)	6.3 (1.5)
Woman's education (%)				
No education	29.6	61.9	8.5	1964
Primary	18.8	67.8	13.4	575
Secondary	17.9	66.1	16.1	1294
Higher secondary or more	13.7	64.4	21.9	708
Mobile ownership (%)				
Owns	31.1	61.2	7.8	1288
Does not own	19.0	65.4	15.6	3253
Parity (%)				
No children	25.8	68.8	5.5	365
1-2 children	20.7	64.3	15.0	2395
3-5 children	24.4	62.7	12.9	1572
More than 5 children	21.5	66.5	12.0	209
SES category (%)				
Lowest	31.9	62.9	5.2	886
Lower	25.3	67.3	7.4	863
Middle	23.4	66.8	9.7	913
Higher	19.3	64.1	16.6	948
Highest	12.8	60.3	27.0	931
Household food insecurity (%)				
None	21.5	64.1	14.4	3643
Mild	22.4	67.7	9.9	393
Moderate	27.7	61.7	10.6	358
Severe	32.0	65.3	2.7	147

Table 2: Relative risk ratios of women's underweight (BMI<18.5) or overweight/obesity (BMI>25)[1] against the reference group of women with normal BMI.

	Underweight	Overweight/ obese
Region		
Mountains (Ref)	1.00 (Ref)	1.00 (Ref)
Hills	1.44 [1.01, 2.05]	0.93 [0.58, 1.48]
Terai	2.26 [1.50, 3.41]	1.04 [0.65, 1.65]
Woman's age	0.97 [0.95, 0.99]	1.10 [1.07, 1.12]
MDDW-7 score	0.99 [0.93, 1.06]	1.08 [0.99, 1.17]
Woman's education		
No education (Ref)	1.00 (Ref)	1.00 (Ref)
Primary	0.69 [0.53, 0.89]	1.40 [0.89, 2.20]
Secondary	0.74 [0.57, 0.96]	1.54 [1.01, 2.33]
Higher secondary or more	0.77 [0.54, 1.08]	1.51 [0.95, 2.43]
Mobile ownership		
Does not own (Ref)	1.00 (Ref)	1.00 (Ref)
Owns	0.84 [0.72, 0.98]	1.11 [0.85, 1.44]
Parity		
No children (Ref)	1.00 (Ref)	1.00 (Ref)
1-2 children	1.10 [0.78, 1.56]	1.97 [1.27, 3.05]
3-5 children	1.08 [0.77, 1.52]	2.02 [1.05, 3.88]
More than 5 children	0.86 [0.52, 1.44]	1.36 [0.51, 3.63]
SES category		
Lowest (Ref)	1.00 (Ref)	1.00 (Ref)
Lower	0.90 [0.72, 1.11]	1.16 [0.73, 1.84]
Middle	0.80 [0.66, 0.95]	1.49 [0.96, 2.29]
Higher	0.64 [0.49, 0.84]	2.61 [1.75, 3.89]
Highest	0.53 [0.40, 0.72]	3.84 [2.50, 5.91]
Household food insecurity		
None (Ref)	1.00 (Ref)	1.00 (Ref)
Mild	1.04 [0.77, 1.42]	0.80 [0.56, 1.14]
Moderate	1.24 [0.96, 1.61]	1.12 [0.78, 1.61]
Severe	1.00 [0.67, 1.49]	0.36 [0.15, 0.84]
Processed food consumption (7-day frequency)		
None (Ref)	1.00 (Ref)	1.00 (Ref)
1-4 times/ week	1.09 [0.91, 0.80]	1.26 [0.96, 1.66]
More than 4 times/ week	0.94 [0.80, 1.11]	1.20 [0.93, 1.55]
Smokes cigarette/ beedi		
No (Ref)		
Yes	1.58 [1.03, 2.41]	0.45 [0.22, 0.91]

[1]Also adjusted for caste and household size

Results

- The prevalence of underweight was 22.4% (95% CI 19.0-26.3), normal weight was 64.2 (62.3-66.2) overweight was 11.5% (9.1-14.4) and obesity was 1.9% (1.1-3.1).
- Household socioeconomic status had strong monotonically positive and negative associations with women's risk of being underweight and overweight respectively, with the highest SES quintile associated with an ≈4 times greater risk of overweight and ≈50% lower risk of underweight (**Table 2**).
- Residence in the Terai was associated with more than two-fold risk of underweight but not overweight,; residence in the Hills was associated with ≈44% greater risk of being underweight and 7% less risk of being overweight than the Mountains.
- Women's age as associated with a 10% increase in the risk of being overweight, while having up to 5 children was associated with a ≈2 times greater risk of overweight.
- Processed food consumption increased the risk of overweight by 20% while smoking increased the risk of being underweight by ≈60%.
- Having any education was associated with a ≈50% greater risk of overweight; increasing education was associated with decreased risk of being underweight.
- The predicted probability of being underweight decreased with women's age, while that of being overweight increased with age across all SES strata (**Figures 1a & c**).
- Women in the highest two SES quintiles appeared to have a higher probability of being normal weight when young, but a lower probability when older (**Figure 1b**), a trend that also corresponded with increased overweight risk (Figure 1c).
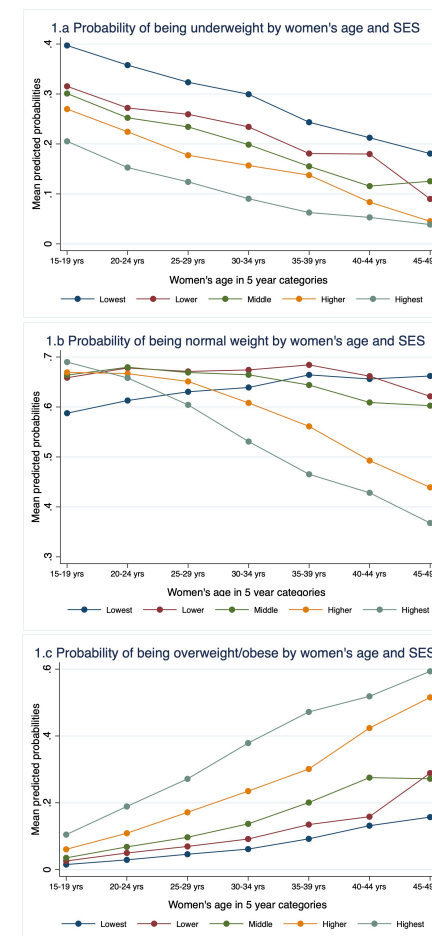

Figure 1: Probabilities of being underweight, normal weight and overweight/ obese by woman's age and socioeconomic status (SES)

Conclusions

- Underweight persists as an important problem among women in Nepal despite growing prevalence of overweight. Strong regional differences also remain, with Terai having double the underweight prevalence compared to the other regions.
- Prevalence of overweight has surpassed that of underweight in the Hills, but is comparable in the Mountains, suggesting that the three regions are at different stages of the double burden.
- Both SES and age are strongly related to women's BMI in Nepal. Women in the highest SES categories appear to have greater prevalence of normal weight when young and lower when older, corresponding to an increase in the prevalence of overweight/obesity as they age.
- In contrast, the mean probability of normal weight remains largely constant by age for the lower three SES quintiles.

References

1. Balarajan Y, Villamor E. Nationally representative surveys show recent increases in the prevalence of overweight and obesity among women of reproductive age in Bangladesh, Nepal, and India. The Journal of Nutrition. 2009 Nov 1:jn-109.