Is body composition related to food insecurity among older adults in India? Evidence from the Study on global AGEing and adult health

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Food insecurity, traditionally defined as difficulties or limitations in obtaining nutritionally sufficient and socially acceptable foods (Parker, 1992), is widely used as a measure of population wellbeing. Both underweight and obesity contribute substantially to the global burden of disease, but the impact of food insecurity on these factors is understudied. Researchers that have investigated links between food insecurity and body composition have mostly focused on associations between food insecurity and obesity in high-income western countries. Though the results have been mixed, a number of studies have reported a positive association between being food insecure and a greater likelihood of being obese, especially among women (FRAC, 2011).

Few studies have examined the relationship between food insecurity and body composition in low- or middle-income countries. Fewer still have done so among older adults, a group that may be particularly vulnerable to the adverse consequences of food insecurity. One recent study, however, found evidence of associations between food insecurity and greater physical challenges, poorer cognitive function, and depression among older adults in middle-income countries (McClure et al., under review). With its aging population and increasing rates of obesity-related chronic disease despite a high prevalence of underweight, India is of particular interest regarding associations between food insecurity and body composition (Patel et al., 2011). To address the aforementioned gaps in the literature, we analyzed data from a nationally representative sample of older adults in India. We hypothesize that (1) food insecurity will be associated with greater odds of underweight vs. normal body mass index (BMI), (2) food insecurity will be associated with greater odds of obese vs. normal BMI and greater odds of obese vs. normal waist circumference (WC), and (3) associations between food insecurity and body composition will be more pronounced among women.

Methods

Data. The present study uses survey and anthropometric data from a nationally representative sample of older adults (aged 50+) in India drawn from the World Health Organization's Study on global AGEing and adult health (SAGE; http://www.who.int/healthinfo/sage/en/). For a thorough description of the SAGE data and methods, see Kowal et al. (2012).

Food Insecurity. Food insecurity was assessed using two five-point Likert scale-type survey items: one asking whether in the last 12 months the respondent had restricted their food consumption due to scarcity of food and another asking whether they had been hungry but did not eat because they could not afford food. The responses were then dichotomized by classifying those who answered affirmatively to either item categorized as "food insecure" and the rest categorized as "food secure".

Body Composition. The two measures of body composition employed were body mass index (BMI) and waist circumference (WC). Both outcome variables were divided into categories for analysis. In selecting cut off values, we used modified guidelines recommended for Asian populations (WHO, 2004; IDF, 2006). For the sake of simplicity, we chose brief labels for each category. For BMI, they are as follows: underweight BMI (<18.5 kg/m^2), normal BMI (18.5 – 22.9kg/m^2), overweight BMI (23 – 27.49 kg/m^2), and obese BMI (≥27.5 kg/m^2). The labels for WC categories are normal WC (men ≤90 cm, women ≤80cm), normal WC (men 90.01 – 102 cm, women 80.01 – 88 cm), and obese WC (men >102cm, women >88cm).

Data Analysis. Controlling for socioeconomic and demographic variables, we performed multinomial logistic regressions testing associations between food insecurity and two measures of body composition. Separate analyses were performed for each of the two outcomes variables. Subsequent models stratified by sex, urban vs. rural residence, and by both sex and urban vs. rural residence were executed in order to examine whether the associations varied across these socio-demographic groups. The covariates included in the models were age, sex, marital status, education level, income, urban vs. rural residence, and number of children in household. Cases were excluded in which there were missing values for predictor or outcome variables.

Results

In the total sample (n=7150), 3534 individuals were women (49.4%), 5289 were rural residents (74%), 1150 were food insecure (16.1%) and the mean age was 61.86 (SD=9.033). Selected sample characteristics sorted by body composition categories can be found in Table 1. Due to the multiple comparisons performed, results were considered significant at P≤0.01, rather than the traditional P≤0.05.

Food Insecurity and Body Composition. Full multinomial logistic regression models are presented in Table 2. Food insecurity was significantly associated with greater odds of underweight BMI vs. normal BMI (OR=1.229, P=0.008). When using WC as the outcome measure, food insecurity was associated with lower odds of obese WC vs. normal WC (OR=0.714, p=0.009). The remaining relationships for both outcome measures were consistent with the pattern of food insecurity being associated with lower odds of obesity/overweight vs. normal but were not statistically significant at the level of P≤0.01.

Food Insecurity and Body Composition by Sex. Among women, food insecurity was significantly associated with lower odds of obese WC vs. normal WC (OR= 0.656, P=0.003). None of the other sex-stratified associations between food insecurity and WC or BMI were statistically significant, though the association between food insecurity and underweight BMI vs. normal BMI approached significance among women (OR=1.298, P=0.021).

Food Insecurity and Body Composition by Residence. Among rural residents, food insecurity was associated with greater odds of underweight BMI vs. normal BMI (OR=1.282, P=0.003) and lower odds of obese WC vs. normal WC (OR=0.645, P=0.004). No association between food insecurity and either outcome was statistically significant among urban residents.

Food Insecurity and Body Composition by Sex and Residence. Restricting the analysis to rural residents and stratifying by sex, food insecurity was associated with lower odds of obese WC vs. normal WC among women (OR=0.595, P=0.002). Also among rural women, the association between food insecurity and underweight BMI vs. normal BMI approached statistical significance (OR=1.359, P=0.013). Among urban residents, none of the sex-stratified associations between food insecurity and body composition were statistically significant.

Conclusion

In the present study, we find support for our first and third hypotheses but not for our second. Food insecurity was associated with higher odds of underweight vs. normal BMI and lower odds of obese vs. normal WC. Stratifying by sex, there was a statistically significant association between food insecurity and lower odds of obese vs. normal WC among women only. Stratifying by residence, food insecurity was associated with greater odds of underweight vs. normal BMI and lower odds of obese vs. normal WC among rural residents. Restricting the analysis to rural residents and stratifying by sex, there were significant associations between food insecurity and higher odds of underweight vs. normal BMI as well as lower odds of obese vs. normal WC among women only.

Together, these results demonstrate a pattern of food insecurity being related to a greater likelihood of underweight BMI and a lesser likelihood of obese WC, especially among women and rural residents. The effects of food insecurity on body composition in this study vary from those in several studies in western high-income countries. Nevertheless, the particularly strong impact of food insecurity upon women in this study is consistent with previous studies (FRAC, 2011). This may be due to the fact that women are more likely to make dietary sacrifices in the context of food insecurity (Radimer et al., 1992). In summary, these findings suggest that food insecurity may be an important factor shaping body composition health risks in the target population, but longitudinal studies are needed to establish the direction of causality.

Support

NIH NIA Interagency Agreement YA1323-08-CN-0020; NIH R01-AG034479; University of Oregon

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Table 1a. Selected Sample Characteristics by Categories of BMI (n=6370)

Variable	Underweight n(%)	Normal n(%)	Overweight n(%)	Obese n(%)
Sex (n, %)				
Women (3150, 49.5)	1075(34.1)	1190(37.8)	560(17.8)	325(10.3)
Men (3220, 50.5)	1163(36.1)	1399(43.4)	515(16)	143(4.4)
Age (mean, SD)	63.14(9.2)	61.19(8.7)	60.28(8.2)	60.22(8.5)
Residence (n, %)				
Urban (1614, 25.3)	328(20.3)	630(39)	442(27.4)	214(13.3)
Rural (4756, 74.7)	1910(40.1)	1959(41.2)	633(13.3)	254(5.3)
Food Insecurity (n, %)				
Insecure (1110, 17.4)	545(49.1)	419(37.7)	107(9.6)	39(3.5)
Secure (5260, 82.6)	1693(32.2)	2170(41.3)	968(18.4)	429(8.2)
Total	2238(35.1)	2589(40.6)	1075(16.9)	468(7.3)

Table 1b. Selected Sample Characteristics by Categories of WC (n=6427)

Variable	Normal n(%)	Overweight n(%)	Obese n(%)
Sex (n, %)			
Women (3184, 49.5)	1860(58.4)	450(14.1)	874(27.4)
Men (3243, 50.5)	2550(78.6)	582(17.9)	111(3.4)
Age (mean, SD)	62.11(9.1)	61.23(8.6)	60.52(8.7)
Residence (n, %)			
Urban (1632, 25.4)	844(51.7)	368(22.5)	420(25.7)
Rural (4795, 74.6)	3566(74.4)	664(13.8)	565(11.8)
Food Insecurity (n,%)			
Insecure (1121, 17.4)	917(81.8)	110(9.8)	94(8.4)
Secure (5306, 82.6)	3493(65.8)	922(17.4)	891(16.8)
Total	4410(68.6)	1032(16.1)	985(15.3)

Table 2a. Multinomial Logistic Regression Model Predicting Categories of BMI (n=6330)

Category	OR	P-value
Underweight BMI vs. Normal BMI (Ref=Normal)		
Food Secure vs. Insecure (Ref=Secure)	1.229	0.008*
Sex (Ref=Women)	1.082	0.261
Age	1.022	<0.001*
Urban vs. Rural Residence (Ref=Rural)	0.733	<0.001*
Marital Status (Ref=Married)	1.09	0.249
Income	0.526	<0.001*
Educational Status	0.884	<0.001*
Number of children in household	1.025	0.094
Overweight BMI vs. Normal BMI (Ref=Normal)		
Food Secure vs. Insecure (Ref=Secure)	0.813	0.09
Sex (Ref=Women)	0.69	<0.001*
Age	0.988	0.01*
Urban vs. Rural Residence (Ref=Rural)	1.667	<0.001*
Marital Status (Ref=Married)	0.962	0.691
Income	1.956	<0.001*
Educational Status	1.072	0.012
Number of children in household	0.994	0.771
Obese BMI vs. Normal BMI (Ref=Normal)		
Food Secure vs. Insecure (Ref=Secure)	0.851	0.388
Sex (Ref=Women)	0.298	<0.001*
Age	0.991	0.188
Urban vs. Rural Residence (Ref=Rural)	1.631	<0.001*
Marital Status (Ref=Married)	0.863	0.277
Income	3.425	<0.001*
Educational Status	1.111	0.005*
Number of children in household	0.961	0.181

Table 2b. Multinomial Logistic Regression Model Predicting Categories of WC (n=6387)

Category	OR	P-value
Overweight WC vs. Normal WC (Ref=Normal WC)		
Food Secure vs. Insecure (Ref=Secure)	0.752	0.013
Sex (Ref=Women)	0.789	0.006*
Age	0.99	0.027
Urban vs. Rural Residence (Ref=Rural)	1.577	<0.001*
Marital Status (Ref=Married)	0.957	0.649
Income	3.098	<0.001*
Educational Status	1.045	0.101
Number of children in household	0.978	0.24
Obese WC vs. normal WC (Ref=Normal WC)		
Food Secure vs. Insecure (Ref=Secure)	0.714	0.009*
Sex (Ref=Women)	0.061	<0.001*
Age	0.992	0.129
Urban vs. Rural Residence (Ref=Rural)	1.914	<0.001*
Marital Status (Ref=Married)	0.781	0.01*
Income	3.346	<0.001*
Educational Status	1.153	<0.001*
Number of children in household	0.944	0.008*

* - Results significant at P≤0.01