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ORIGINAL RESEARCH

Socioeconomic Disparities in the Prevalence of Cardiometabolic Risk Factors in Ghanaian Women

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Abstract

BACKGROUND Recent trends toward urbanization in developing countries like Ghana, coupled with nutritional transition and aging populations, have led to a rapid increase in the prevalence of noncommunicable diseases such as obesity, diabetes, and hypertension. The purpose of this study was to evaluate the association between socioeconomic status and cardiometabolic risk factors among women in Ghana.

METHODS Data for this analysis were obtained from Wave 1 of the Ghana Study of Global Aging and Health, conducted in 2007, and included women 18 years and older. Survey weighted descriptive and multivariable linear regression models were used to examine the association between socioeconomic status and cardiometabolic risk factors.

RESULTS Among a total of 1988 women, 48% ages 40-64 years, almost half were overweight or obese (47%) and 21% had current hypertension, whereas only 4.3% and 2% of women self-reported a history of hypertension and diabetes, respectively. Multivariable adjusted analysis indicated that women with a high school education had 2-fold increased odds of being overweight or obese compared with those with no formal education (odds ratio [OR]: 2.02, 95% confidence interval [CI]: 1.20-3.42). Women employed in the public sector had almost a 5 times higher odds of being overweight or obese (OR: 4.94, 95% CI: 1.42-17.15), whereas those employed in the private sector or self-employed had reduced odds of diabetes (OR: 0.27, 95% CI: 0.10-0.70) and hypertension (OR: 0.43, 95% CI: 0.21-0.86).

CONCLUSION The prevalence of cardiometabolic risk factors varies by socioeconomic status among Ghanaian women. Targeted intervention programs to reduce overweight and obesity may begin among Ghanaian women employed in the public sector, and improved access to health care will be critical for timely diagnosis and management of other disease risk factors.

KEY WORDS socioeconomic, disparities, cardiometabolic factors, Ghana, obesity

INTRODUCTION

Noncommunicable diseases risk factors such as obesity, hypertension, and diabetes are rapidly increasing in developing countries,[1] mainly as a result of urbanization, associated changes in nutrition and diet, and demographic changes, with a growing number of aging adults.[2] This trend has

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been referred to as the epidemiologic transition, as the prevalence of communicable diseases decline and the incidence of lifestyle-related chronic diseases increase. Studies have estimated that the trend of increasing prevalence of chronic diseases will continue in lower-income countries such as Ghana, exerting a significant burden on individual health, health systems, and population health.[3] Noncommunicable diseases and associated complications accounted for more than two-thirds of all medical admissions and more than 50% of all deaths in Ghana in 2006.[4]

Data from the Ghana's Demographic and Health Surveys over a 15-year period revealed that the prevalence of obesity among Ghanaian women aged 15-49 increased by 39% between 1993 and 2008, and by 2023 it is projected that 15.1% of Ghanaian women in this age group will be obese.[5] The prevalence of hypertension has also increased markedly in Ghanaian women,[6,7] and hypertension is the second most common cause of outpatient morbidity in Ghanaian adults older than 45 years.[8] Established risk factors for hypertension in this population include older age, overnutrition, high body mass index, high salt consumption, and alcohol use.[9] However, a recent study reported that less than one-third of hypertensive participants in Ghana were aware that they had hypertension and less than one-tenth had their blood pressure controlled.[9] Additionally, the World Health Organization (WHO) estimates that almost 8% of the population of sub-Saharan Africa older than 25 years are diabetic,[10] and Amoah et al[11] observed that susceptibility to diabetes among Ghanaians increased with age and was associated with higher body mass index and systolic and diastolic blood pressure. These cardiometabolic risk factors tend to co-occur within the same individuals, and the cluster of obesity, hypertension, and diabetes has been associated with increased risk of mortality, cancer, and cardiovascular diseases.[12]

Although multiple studies have examined the sociodemographic factors associated with cardiometabolic risk factors, few have specifically assessed the impact of socioeconomic status (SES) in Ghanaian women. A recent analysis of the Demographic and Health Survey found that 19% of Ghanaian women with higher education were obese compared with 4% of women with no education.[13] Another study found a higher risk for hypertension among people with higher income and residence in urban areas.[14] These findings are in contrast to multiple studies from the United States showing that women of higher SES are less likely to be obese or develop diabetes, likely because of better access to health care and healthy dietary patterns, whereas lower SES women were more likely to be obese, diabetic, and hypertensive.[15-19] This contrasting pattern of association between SES and health may be due to the relatively recent economic transition in countries like Ghana, as studies of other developing countries have revealed a pattern of an initial increase in overnutrition and sedentary lifestyles as a result of urbanization, preceding a later shift to increased recreational physical activity and healthy dietary patterns as the negative health consequences become apparent.[20-26]

Studies of SES disparities in cardiometabolic risk factors in rapidly transitioning countries can provide important clues into which population subgroups should be targeted for interventions. Such programs may focus on improving awareness of the negative health effects of these risk factors, and promoting healthy behaviors such as improved diet patterns and physical activity. Therefore, the purpose of this study was to evaluate the association between SES and cardiometabolic risk factors among women in Ghana.

METHODS

Data Source and Analytic Variables. Data for analyses were obtained from Wave 1 of the Ghana Study of Global Aging and Health (SAGE), conducted in 2007.[27] The SAGE study was organized by the World Health Organization and designed as a longitudinal study focused on adults aged 18 and older from nationally representative samples in China, Ghana, India, Mexico, Russia, and South Africa. The survey was designed to assess the health status and well-being of adult populations by focusing on individual and household-level variables. Further information on the SAGE study can be obtained through the WHO SAGE website.[27] Our sample consisted of women aged 18 years and older surveyed as part of the Ghana SAGE study, representing 47% of the Ghana SAGE study population. Data on individual sociodemographic and socioeconomic variables, as well as anthropometric measures, were obtained from the SAGE dataset. Participant education was categorized into no formal education, primary school only, high school graduate, and college or higher degree; participant employment was categorized into unemployed, public sector employment, private sector employment, and self-/informal employment.

Body mass index (BMI) was calculated based on height and weight measurements obtained by the interviewer during the study interview process, with BMI >25 kg/m^2 considered overweight or obese. Diabetes and hypertension were assessed based on self-reported responses on whether participants had been previously diagnosed or had been prescribed medication for high blood sugar or hypertension in the past. Current hypertension was defined based on the average of 3 blood pressure measurements obtained during study interviews, and participants were categorized as hypertensive if systolic blood pressure was ≥140 and diastolic blood pressure was ≥90. Other risk factors included in the analysis were nutrition deficit (self-reported <5 servings of fruits and vegetables), reduced physical activity (self-reported recreational or nonrecreational physical activity minutes <240 min/wk), and self-reported smoking.

Statistical Analysis. We conducted descriptive analysis to determine the baseline characteristics of participants as well as the associated cardiometabolic risk factors. We defined SES based on education and employment status, and evaluated associations with each cardiometabolic risk factor. Survey weighted multivariable logistic regression models were created to obtain odds ratios and 95% confidence interval, adjusting for age, health status, residence, marital status, nutrition deficit, reduced physical activity and smoking. For all analyses, P values ≤ .05 were considered statistically significant. All statistical analyses were performed with SAS Version 9.4 (SAS Institute Inc., Cary, NC) using survey weight and strata variables provided with the SAGE dataset and enabling the study to provide generalizable results.

RESULTS

Participant Characteristics. A total of 1988 women 18 years and older were included in the analysis (Table 1). The majority of women were 40-64 years (48%); were divorced, separated, or widowed (31%); and rated their overall health as good (61%). Participants were almost equally distributed between rural and urban areas. More than one-half of these women had no formal education (51%) and more than two-thirds were self-employed (77%).

Cardiometabolic Risk Factors. Almost half of the participants in the study were overweight or obese (47%) and 21% had current hypertension, whereas only 4.3% and 2% of women self-reported a history of hypertension and diabetes, respectively (Table 2). Most of the women with the metabolic risk factors were aged 40-64 years (overweight or obese: 52%, diabetes: 42%, history of hypertension:

Table 1. Baseline Sociodemographic Characteristics and Metabolic Risk Factors Among Women, 2007 Ghana Study of Global Aging and Health (SAGE) (N = 1988)

	n (%)*
Age	
18-24	33 (7.3)
25-39	147 (35.9)
40-64	1048 (47.8)
≥65	759 (9.0)
Marital status	
Never married	58 (9.3)
Married	691 (59.5)
Divorced/separated/widowed	1238 (31.2)
Overall health	
Poor	328 (7.9)
Moderate	845 (30.0)
Good	813 (62.1)
Residence	
Rural	1028 (49.8)
Urban	959 (50.2)
Individual education	
No formal education	1377 (51.3)
Primary school or less	231 (17.6)
High school	323 (27.4)
College or more	48 (3.6)
Individual employment	
Unemployed	562 (16.2)
Public	59 (4.1)
Private	34 (2.5)
Self-employed	1303 (77.2)
Metabolic risk factors	
Overweight/obese†	834 (47.0)
Diabetes‡	62 (1.9)
History of hypertension§	206 (4.3)
Current hypertension‖	726 (20.7)
Lifestyle-associated risk factors	
Nutrition deficit¶	1345 (67.5)
Reduced physical activity#	538 (22.5)
Smoking**	129 (5.2)

* Weighted percent.
† Body mass index (BMI) was calculated based on height and weight measurements taken by the interviewer during the questionnaire administration process, with BMI >25 kg/m^2 considered overweight/obese.
‡ Diabetes based on self-reported past diagnosis of diabetes or use of medication to control blood sugar.
§ History of hypertension based on self-reported past diagnosis of hypertension or use of antihypertensive medication.
‖ Current hypertension based on systolic and diastolic blood pressure measurements at study enrollment.
¶ Nutrition deficit if fruit and vegetable intake <5 servings/day based on self-report.
# Reduced physical activity if recreational or nonrecreational physical activity <240 min/wk based on self-report.
** Smoking if smoking is yes based on self-report.

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Table 2. Distribution of Metabolic Risk Factors by Demographic and SES Characteristics, 2007 Ghana Study of Global Aging and Health (SAGE)

	Metabolic Risk Factors n (%)*			
Participant Characteristics	Overweight/Obese 834 (47.0)†	Diabetes 62 (1.9)‡	History of Hypertension 206 (4.3)§	Current Hypertension 726 (20.7)‖
Age				
18-39	78 (41.1)	3 (37.8)	1 (0.1)	22 (24.7)
40-64	504 (52.4)	27 (41.6)	100 (72.2)	366 (55.6)
≥65	252 (6.5)	32 (20.6)	105 (27.6)	338 (19.7)
Marital status				
Never married	21 (6.3)	3 (37.8)	3 (3.7)	14 (9.2)
Married	311 (61.3)	22 (18.1)	44 (31.8)	207 (49.7)
Divorced/separated/widowed	502 (32.4)	37 (44.1)	159 (64.5)	505 (41.1)
Overall health				
Poor	109 (4.9)	14 (36.5)	46 (12.0)	150 (12.2)
Moderate	360 (34.7)	37 (55.0)	105 (47.0)	310 (40.1)
Good	364 (60.3)	11 (8.5)	55 (41.0)	266 (47.6)
Residence				
Rural	307 (33.8)	16 (20.8)	53 (25.0)	366 (43.5)
Urban	527 (66.1)	46 (79.2)	153 (75.0)	360 (56.5)
Education				
No formal education	487 (43.5)	39 (62.7)	111 (48.1)	539 (61.4)
Primary school or less	111 (14.2)	6 (3.3)	23 (8.7)	71 (12.3)
High school	204 (38.4)	14 (31.8)	60 (40.0)	102 (21.1)
College or more	28 (3.8)	3 (2.2)	11 (3.1)	11 (5.2)
Employment				
Unemployed	226 (11.9)	31 (47.9)	106 (33.3)	248 (25.0)
Public	39 (6.6)	2 (22.5)	12 (14.0)	19 (5.1)
Private/self-employed	562 (81.5)	28 (29.6)	88 (52.7)	448 (69.8)

SES, socioeconomic status.
* Weighted percent.
† Body mass index (BMI) was calculated based on height and weight measurements taken by the interviewer during the questionnaire administration process, with BMI >25 kg/m^2 considered overweight/obese.
‡ Diabetes based on self-reported past diagnosis of diabetes or use of medication to control blood sugar.
§ History of hypertension based on self-reported past diagnosis of hypertension or use of anti-hypertensive medication.
‖ Current hypertension based on systolic and diastolic blood pressure measurements at study enrollment.

72%, current hypertension: 56%) and resided in urban areas (overweight or obese: 66%, diabetes: 79%, history of hypertension: 75%, current hypertension: 57%). Almost half of the women with history of diabetes were unemployed (48%), and 63% had no formal education. In addition, approximately 48% of women with a history of hypertension and 61% of women with current hypertension had no formal education, and 53% and 70%, respectively, were employed in the private sector.

Adjusted Model for SES and Health Status. After adjusting for age, marital status, health status, nutrition deficit, reduced physical activity, and smoking (Table 3), women with a high school education (odds ratio [OR]: 2.03, 95% confidence interval [CI]: 1.19-3.45) had 2-fold increased odds of being overweight or obese compared with those with no formal education. There were no significant associations between education and history of hypertension or current hypertension; however, having a primary school education or less was associated with lower odds of diabetes (OR: 0.19, 95% CI: 0.05-0.66). The strongest associations were found among those who were employed in the public sector (OR: 4.77, 95% CI: 1.29-17.62), with almost 5 times higher odds of being overweight or obese, and those working in the private sector or self-employed (OR: 1.77, 95% CI: 1.00-3.14) having almost 80% higher odds of being overweight or obese compared with those who were unemployed. Being employed in the private sector or self-employed was associated with

Table 3. Multivariable Adjusted Analysis of Cardiometabolic Risk Factors, 2007 Ghana Study of Global Aging and Health (SAGE)

	Overweight/Obese OR (95% CI)[*,†]	Diabetes OR (95% CI)[*,‡]	History of Hypertension OR (95% CI)[*,§]	Current Hypertension OR (95% CI)[*,‖]
Age				
18-39	1.48 (0.77-2.85)	0.89 (0.22-3.54)	**0.001 (0.001-0.012)**	**0.23 (0.12-0.45)**
40-64	1.45 (0.93-2.24)	1.29 (0.41-4.08)	0.62 (0.30-1.32)	**0.55 (0.35-0.87)**
≥65	**Ref**	**Ref**	**Ref**	**Ref**
Marital status				
Never married	**Ref**	**Ref**	**Ref**	**Ref**
Married	**2.53 (1.05-6.10)**	**0.18 (0.05-0.61)**	0.50 (0.07-3.82)	0.40 (0.15-1.09)
Divorced/separated/widowed	2.45 (0.92-6.54)	0.25 (0.06-1.09)	0.99 (0.16-6.37)	0.43 (0.15-1.20)
Overall health				
Poor	**Ref**	**Ref**	**Ref**	**Ref**
Moderate	**2.45 (1.26-4.79)**	0.66 (0.24-1.85)	1.01 (0.57-1.79)	0.99 (0.53-1.83)
Good	1.51 (0.81-2.81)	**0.09 (0.03-0.28)**	0.89 (0.36-2.16)	0.73 (0.37-1.42)
Residence				
Rural	**Ref**	**Ref**	**Ref**	**Ref**
Urban	**3.45 (2.23-5.33)**	2.07 (0.65-6.57)	**2.54 (1.17-5.49)**	1.60 (0.96-2.67)
Education				
No formal education	**Ref**	**Ref**	**Ref**	**Ref**
Primary school or less	0.84 (0.44-1.62)	**0.19 (0.05-0.66)**	0.94 (0.34-2.58)	0.72 (0.35-1.49)
High school	**2.03 (1.19-3.45)**	0.57 (0.23-1.44)	1.61 (0.56-4.64)	0.59 (0.32-1.09)
College or more	0.75 (0.26-2.18)	0.25 (0.04-1.68)	0.47 (0.08-2.84)	0.97 (0.25-3.71)
Employment				
Unemployed	**Ref**	**Ref**	**Ref**	**Ref**
Public	**4.77 (1.29-17.62)**	4.18 (0.49-35.66)	1.58 (0.32-7.72)	0.72 (0.21-2.42)
Private/self-employed	**1.77 (1.00-3.14)**	**0.37 (0.14-0.96)**	**0.40 (0.21-0.76)**	0.59 (0.34-1.02)

Bold indicates $P < .05$.
CI, confidence interval; OR, odds ratio.
* Weighted analysis and adjusted for age, marital status, health status, residence, education and employment status, nutrition deficit, reduced physical activity, and smoking.
† Body mass index (BMI) calculated based on height and weight measurements taken by the interviewer during the questionnaire administration process, with BMI >25 kg/m^2 considered overweight/obese.
‡ Diabetes based on self-reported past diagnosis of diabetes or use of medication to control blood sugar.
§ History of hypertension based on self-reported past diagnosis of hypertension or use of antihypertensive medication.
‖ Current hypertension based on systolic and diastolic blood pressure measurements at study enrollment.

reduced odds of history of diabetes (OR: 0.37, 95% CI: 0.14-0.96) and hypertension (OR: 0.40, 95% CI: 0.21-0.76). Residing in an urban region increased the odds of being overweight or obese (OR: 3.45, 95% CI: 2.23- 5.33) by more than 3-fold and increased the odds of having a history of hypertension by 2.5-fold (OR: 2.54, 95% CI: 1.17-5.49).

DISCUSSION

In a large, nationally representative sample of Ghanaian women, high school education and employment in the public sector were associated with significantly higher odds of being overweight or obese. Although <2% of women reported a history of diabetes and only 4% reported a history of hypertension, 21% had current hypertension based on blood pressure measurement at the time of enrollment, suggesting that underdiagnosis remains a critical issue in this population.

Cardiometabolic risk factors are increasingly being recognized as a major public health issue because of the association with adverse health outcomes, including the risk of stroke and cancer. As developing countries experience rapid urbanization and changes in demographic and nutritional patterns, the risk of obesity, diabetes, and hypertension also increase.[28] Out-of-home meals are increasingly common in urban areas of Ghana (leading to increased consumption of calorie-dense, Western-style food items low in fiber and leafy vegetables), often without concurrent increases in physical activity levels.[29] SES is an important predictor of cardiometabolic risk factors because of the association between income and employment with dietary and physical activity patterns.[30-33] For instance, higher

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income and education increase access to and affordability of healthy foods and improved knowledge about the harmful health effects of obesity.[34,35] On the other hand, in developing countries in particular, higher income and education may lead to increased access to and affordability of "exotic" Western-style diets that are calorie dense and associated with obesity.[1,21,25,29,30,36] Here, we found that women with high school, but not college, education were almost twice as likely to be overweight or obese compared with uneducated women, and employed women were almost 5 times as likely to be overweight or obese compared with unemployed women, suggesting that the latter explanation is plausible among Ghanaian women.

We also found an almost 3-fold increase in the odds of obesity among urban-dwelling women, which corresponds to the higher concentration of Western-style fast food establishments in urban regions.[37] Studies from other developing countries have reported similar findings of higher prevalence of obesity among higher SES women and residents of urban areas.[38-41] For instance, a study by Pradeepa et al[42] reported that Indians living in urban areas had a higher prevalence of central obesity (82.9%) than women living in rural areas (77.1%), and individuals in the highest income groups in India were more likely to be obese than those in lower income groups.[42] Increasing attention is being paid to these patterns because, as a recent major newspaper article in Nigeria reports, "Weight goes with wealth in Africa today."[36] These patterns suggest that public health interventions focused on reducing the prevalence of overweight and obesity may begin by focusing on more educated women living in urban areas. Strategies may include employment-based awareness campaigns to increase knowledge of healthy food options, physical activity strategies, and the negative health consequences obesity. Such strategies, if coupled with access to community-based health care, may further improve diet and physical activity and reduce overweight and obesity prevalence among lower-income and less-educated women as well. Structural barriers to healthy diet and physical activity may also be addressed through community-based strategies that will likely have far-reaching impact on population health—for instance, reducing access to calorie-dense, nutrition-poor fast food through a combination of higher taxes, prominent display of calorie counts, geographic restrictions, and building safe walking environment in neighborhoods to encourage physical activity.

Although only 2% of women reported a history of diabetes, we found lower odds of diabetes among less-educated women compared with highly educated women and among women employed in the private sector. We additionally found that women in urban areas were significantly more likely to report a history of diabetes compared with those in rural areas. This result is consistent with findings by Obirikorang et al[43] indicating that women in urban areas were more likely to develop type 2 diabetes compared with women residing in rural areas. Future studies are needed to examine whether this is due to underdiagnosis of diabetes among poorer, less-educated women residing in rural areas, leading to lower levels of awareness of diabetic status, or if there are certain lifestyle-related factors protective against the development of diabetes, such as higher physical activity levels or dietary patterns. Furthermore, our finding that <5% of women reported a past diagnosis of hypertension although 21% had current hypertension based on blood pressure measurements at study enrollment confirms that whereas hypertension appears to be a significant problem in this population, awareness of hypertensive status is very low. Urban residents also had 2.5 times higher odds of reporting a history of hypertension; however, there was no observed association among women with higher education, although women who were employed in the private sector had significantly lower odds of history of hypertension. This is consistent with the report by Addo et al[44] indicating an association between employment status and hypertension among urban Ghanaians and underscores the need for future studies assessing multiple measures of SES in relation to cardiometabolic risk factors. Non et al[45] reported that in African Americans, higher education was associated with reduced risk of high blood pressure, a trend that may be due to better treatment and awareness of high blood pressure status among high-SES (specifically, highly educated) African-American women. Future studies will be needed to better characterize the association among specific SES measures such as income, education, and employment, in relation to hypertension to better understand whether issues of awareness, financial resources, and/or access to health care are the most important social determinants in this population.

There is likely significant between-country heterogeneity in the association between SES and cardiometabolic risk factors.[46-50] For instance, several US studies report an inverse association between SES and obesity,[51] with the prevalence of overweight

and obesity highest among low-income US women compared with higher-income women.[52] It should also be noted that the association between SES and cardiometabolic risk factors might vary depending on the measure of SES, such as income, education, or employment. For instance, income-based measures may show an inverse association with risk factors in subgroups where higher income is associated with improved dietary patterns, recreational physical activity, and access to health care, whereas the association may be positive in subgroups where higher income is associated with unhealthy dietary and physical activity patterns. Employment-based measures may also reveal inverse associations in subgroups where employment is associated with health insurance and better access to care but may have inverse associations through the mediating effect of an increased sedentary lifestyle and lower physical activity. Therefore, country-specific assessments of the association between SES and health outcomes, including which measures of SES are most important, and relevant categorical cut-points for cardiometabolic risk factors are critical. Further studies are especially needed in countries with rapidly transitioning economies to identify subgroups where chronic disease risk factor prevention strategies should be focused.

There are several strengths and limitations relevant to this study. The analysis used data from the Wave 1 Ghana Study of Global Aging and Health, organized in 2007 by the World Health Organization.[27] The quality of the data was enhanced by the use of standardized protocols and questionnaires developed through WHO, the use of highly trained interviewers, and the focus on variables that affect the health of individuals and households. Another key strength of the study is the fact that it focuses on the relationship among measures of socioeconomic status and metabolic risk factors of obesity, hypertension, and diabetes. A limitation of the study is the survey nature of the responses, which may be susceptible to recall bias, the reliance on self-reported data on history of hypertension and diabetes, and the use of data from 2007. Since then, like many other countries in the region, Ghana has experienced significantly increased levels of urbanization and further shifts in the demographic transition, making it likely that the observations reported here may be even more pronounced in recent years. However, this high-quality dataset provides valuable baseline data, including objective measures of BMI and current hypertension, to which data from later years may be compared and important information that can be used to guide health policy and frame future studies.

CONCLUSION

In conclusion, the prevalence of cardiometabolic risk factors varies by SES among Ghanaian women and identifies a subgroup of public sector employees who may benefit from intervention strategies to reduce overweight and obesity. Although public health strategies are urgently needed to address these issues, specific attention needs to be paid to improving access to health care to reduce the proportion of undiagnosed hypertensives and provide immediate treatment.

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