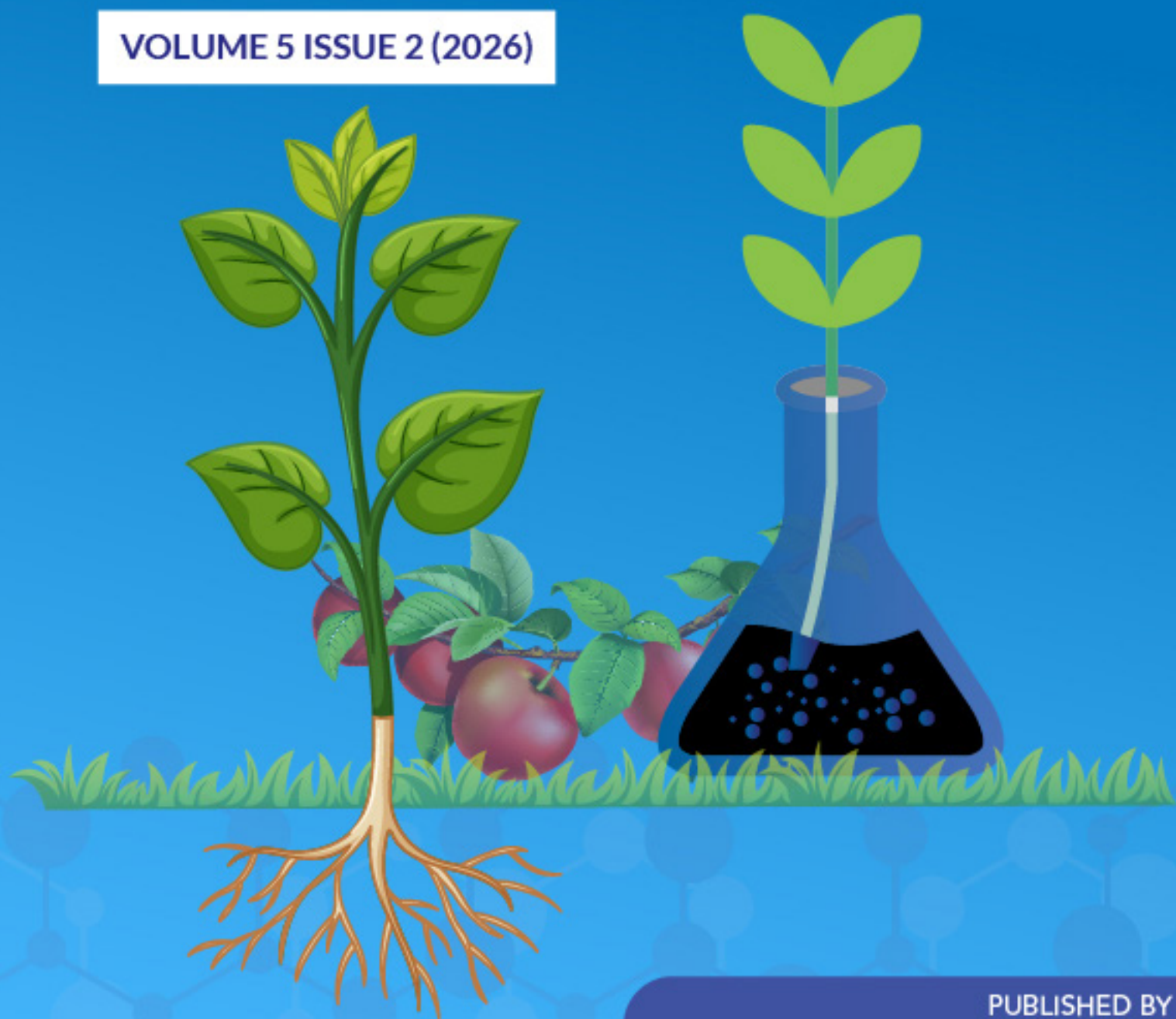




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Prevalence and Distribution of Obesity Among Market Women in the Kassena Nankana Municipality of Northern Ghana

Joseph Laari Dakwari¹*, Elizabeth Dujin¹, Evans Bagura Gariba¹

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ABSTRACT

The global obesity epidemic has extended to developing countries, with women being disproportionately affected. Market women in Ghana face unique occupational and lifestyle risks for obesity, yet comprehensive prevalence data remain limited. This study examined the prevalence and distribution of general and abdominal obesity among market women in the Kassena Nankana Municipality of Ghana. A cross-sectional study involving 264 market women aged ≥ 18 years was conducted. Body Mass Index (BMI) was calculated from measured weight and height, with obesity defined as BMI ≥ 30 kg/m². Waist circumference (WC) was measured, with abdominal obesity defined as WC ≥ 88 cm. Prevalence rates were calculated overall and stratified by socio-demographic characteristics. Chi-square tests examined associations between obesity and demographic variables. The overall obesity prevalence was 54.2% (143/264), with an additional 36.7% (97/264) being overweight and only 9.1% (24/264) having normal weight. Abdominal obesity prevalence was even higher at 73.5% (194/264). Mean BMI was 31.4 ± 5.0 kg/m² and mean WC was 97.0 ± 11.1 cm. Obesity prevalence increased dramatically with age: 18-28 years (4.0%), 29-39 years (45.7%), 40-50 years (80.8%), and 51-65 years (94.4%; $p < .$). Educational level showed an inverse association with obesity: no education (64.9%), basic education (62.7%), secondary education (30.2%), vocational (61.9%), and tertiary (51.6%), $p = 0.005$. Married women had significantly higher obesity rates (60.6%) compared to single (25.6%), divorced (48.3%), and widowed (47.7%) women, $p < 0.001$. The combined prevalence of overweight and obesity was 90.9%, indicating that the vast majority of market women had excess body weight. The prevalence of obesity among market women in the Kassena Nankana Municipality is alarmingly high, exceeding rates reported in most urban Ghanaian populations. The nearly universal presence of overweight or obesity (90.9%) represents a public health crisis requiring urgent attention. Age-specific and education-targeted interventions are critically needed to address this epidemic among vulnerable market women.

INTRODUCTION

Obesity has emerged as one of the most significant public health challenges of the 21st century, affecting both developed and developing nations. Defined by the World Health Organization (WHO) as abnormal or excessive fat accumulation presenting health risks, obesity is medically classified as a Body Mass Index (BMI) ≥ 30 kg/m² (WHO, 2011, p. 489). What was once considered a problem exclusive to high-income countries has now become a global epidemic affecting low- and middle-income countries with increasing severity.

Globally, obesity prevalence has nearly tripled between 1980 and 2016, with more than 2 billion adults classified as overweight or obese by 2014, representing 39% of the adult population worldwide (WHO, 2015, p. 489). The International Association for the Study of Obesity (IASO) reported that obesity prevalence increased dramatically in the last decade, with projections indicating that by 2025, three-quarters of the world's obese population will reside in developing countries (WHO, 2005, p. 489; IASO, 2012, p. 489).

In sub-Saharan Africa, obesity prevalence has increased substantially, particularly in urban areas. Studies indicate

that 20-50% of urban African populations are classified as overweight or obese (Kamadjeu *et al.*, 2006, p. 489; Sodjinou *et al.*, 2008, p. 489). This dramatic increase is attributed to rapid urbanization, economic development, nutritional transition characterized by increased consumption of energy-dense foods, and adoption of sedentary lifestyles (Méndez *et al.*, 2005, p. 489; Ziraba *et al.*, 2009, p. 489).

Ghana, a middle-income West African country, has experienced a significant increase in obesity prevalence in recent years. A systematic review and meta-analysis reported that the prevalence of obesity among Ghanaian women was 22% nationally, with higher rates in urban areas (Ofori-Asenso *et al.*, 2016, p. 489). The Ghana Demographic and Health Survey (GDHS) of 2014 reported that approximately 40% of Ghanaian women were overweight or obese (GDHS, 2015, p. 493). These alarming statistics underscore the urgent need for comprehensive surveillance and intervention efforts.

Women globally experience higher obesity rates compared to men, with 14% of women classified as obese versus 10% of men (WHO, 2015, p. 489). This gender disparity is particularly pronounced in developing countries and is attributed to multiple factors including physiological

¹ Community Health Nurses' Training College, Navrongo, Ghana

* Corresponding author's e-mail: dakwarilaarijoseph77@gmail.com

differences in body composition (women naturally have higher body fat percentages), hormonal influences, pregnancy-related weight retention, cultural practices, and socioeconomic factors (Lovejoy, 1998; Shi & Clegg, 2009; Taylor *et al.*, 2010; van Propel, 2012, p. 489). Studies in Ghana have consistently documented higher obesity prevalence among women than among men (Abubakari *et al.*, 2008; Amegah *et al.*, 2011; Mogre *et al.*, 2012).

Market women represent a particularly vulnerable subgroup due to their unique occupational characteristics. Market trading in Ghana typically involves prolonged sitting during sales activities (often 8-12 hours daily), limited physical activity, irregular eating patterns with frequent consumption of energy-dense convenience foods, and high levels of work-related stress (Arday, 2017, p. 497). These occupational factors create an obesogenic environment that promotes weight gain and obesity development.

Despite the recognized vulnerability of market women to obesity, comprehensive prevalence data from rural and peri-urban areas of Ghana remain scarce. Most existing studies have focused on urban populations in major cities like Accra and Kumasi, with limited research examining obesity patterns among women in rural settings (Mattah *et al.*, 2013, p. 489). The few studies that have examined rural women have identified concerning trends, but specific data on market women—who face unique occupational risks—are lacking.

Understanding the true prevalence and distribution of obesity among market women is essential for several reasons. First, accurate prevalence data are needed to quantify the burden of obesity in this population and inform resource allocation for prevention and treatment programs. Second, examining how obesity prevalence varies by age, education, and other demographic characteristics can identify high-risk subgroups requiring targeted interventions. Third, local prevalence data are needed to raise awareness among policymakers, healthcare providers, and community members about the severity of the obesity problem in this vulnerable population.

This study was conducted to address these knowledge gaps by comprehensively examining the prevalence and distribution of both general obesity (measured by BMI) and abdominal obesity (measured by waist circumference) among market women in the Kassena Nankana Municipality of Ghana. The specific objectives were to: (1) determine the overall prevalence of obesity and abdominal obesity, (2) examine how obesity prevalence varies by age, educational level, marital status, and other socio-demographic characteristics, (3) calculate age-specific and education-specific obesity rates, and (4) compare findings with available national and regional data.

MATERIALS AND METHODS

Study Design and Setting

This population-based cross-sectional study was conducted at the Navrongo Central Market in the Kassena Nankana Municipality, Upper East Region, Ghana (p.

765). The municipality, with an estimated population of 135,610 and density of 104 people per square kilometer, comprises one urban community (Navrongo) and 98 rural communities (KNM, 2015, p. 771). The Navrongo Central Market is the largest market in the municipality, with approximately 600 women traders representing diverse ethnic backgrounds and socioeconomic statuses.

Study Population and Sample Size

The study population comprised market women aged 18 years and above who had demarcated stores, shops, or stands in the market (p. 779). Women with physical deformities (humps, cripples) that could affect anthropometric measurement accuracy were excluded (p. 789). Sample size ($n=264$) was calculated using Cochran's formula (1967) based on 22% obesity prevalence among Ghanaian women (Ofori-Asenso *et al.*, 2016, p. 793). Systematic random sampling was used to select participants.

Anthropometric Measurements

Weight was measured using calibrated digital scales (Seca 876, Germany) to the nearest 0.1 kg, with participants wearing light clothing without shoes. Height was measured using a stadiometer (Seca 213, Germany) to the nearest 0.1 cm with participants standing erect barefoot. BMI was calculated as weight (kg) divided by height squared (m^2). Obesity classification followed WHO criteria: underweight ($<18.5 \text{ kg}/m^2$), normal weight ($18.5\text{-}24.9 \text{ kg}/m^2$), overweight ($25.0\text{-}29.9 \text{ kg}/m^2$), and obese ($\geq 30.0 \text{ kg}/m^2$) (WHO, 2011, p. 489).

Waist circumference was measured at the midpoint between the lowest rib and iliac crest using non-stretchable measuring tape to the nearest 0.1 cm. Abdominal obesity was defined as WC ≥ 88 cm for women according to WHO criteria (WHO, 2011, p. 489). All measurements were taken by trained personnel following standardized protocols.

Data Collection and Analysis

Socio-demographic data including age, educational level, marital status, ethnicity, income, and housing status were collected using structured questionnaires. Data were analyzed using SPSS version 25. Obesity prevalence was calculated as the proportion of participants with BMI $\geq 30 \text{ kg}/m^2$. Prevalence rates were computed overall and stratified by socio-demographic characteristics. Chi-square tests and Fisher's exact tests examined associations between obesity and demographic variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the Committee on Human Research, Publication and Ethics at Kwame Nkrumah University of Science and Technology. Written informed consent was obtained from all participants. Confidentiality was maintained throughout the study.

RESULTS AND DISCUSSION

Participant Characteristics

A total of 264 market women participated in the study. Mean age was 39.5 ± 11.8 years (range 18-65 years). The majority (39.8%) were aged 29-39 years, 27.7% were 40-50 years, 18.9% were 18-28 years, and 13.6% were 51-65 years. Regarding education, 28.4% had basic education, 23.9% had secondary education, 28.0% had no formal education, 11.7% had tertiary education, and 7.9% had vocational training. Most participants were married (64.4%), while 16.3% were single, 11.0% divorced, and 8.3% widowed.

Overall Obesity Prevalence

The overall obesity prevalence was 54.2% (143/264), with an additional 36.7% (97/264) classified as overweight. Only 9.1% (24/264) had normal weight, and no participants were underweight ($p = 1133$). The combined prevalence of overweight and obesity was 90.9% (240/264), indicating that the vast majority of market women had excess body weight. Mean BMI was 31.4 ± 5.0 kg/m², falling within the obese category.

Abdominal obesity prevalence was even higher at 73.5% (194/264), with mean waist circumference of 97.0 ± 11.1 cm ($p = 1133$). This indicates that nearly three-quarters of market women had abdominal obesity, placing them at increased risk for cardiovascular diseases and metabolic disorders.

Age-Specific Obesity Prevalence

Obesity prevalence showed a dramatic increase with age ($p < 0.001$). Among women aged 18-28 years, obesity prevalence was only 4.0% (2/50), with 62.0% having normal weight and 34.0% overweight. In the 29-39 age group, obesity prevalence increased to 45.7% (48/105), with 5.7% normal weight and 48.6% overweight.

The highest obesity prevalence was observed in the 40-50 year age group at 80.8% (59/73), with only 1.4% having normal weight and 17.8% overweight. Among women aged 51-65 years, obesity prevalence reached 94.4% (34/36), with no participants having normal weight and only 5.6% overweight ($p = 1150-1156$).

Mean BMI and waist circumference also increased significantly with age. For 18-28 years: BMI 26.3 ± 2.2 kg/m², WC 86.7 ± 6.3 cm; 29-39 years: BMI 30.2 ± 3.6 kg/m², WC 94.5 ± 9.5 cm; 40-50 years: BMI 34.5 ± 4.7 kg/m², WC 102.7 ± 10.4 cm; 51-65 years: BMI 36.0 ± 4.0 kg/m², WC 107.3 ± 6.4 cm (all $p < 0.001$) ($p = 1480-1486$).

Education-Specific Obesity Prevalence

Educational level showed a significant inverse association with obesity ($p = 0.005$). Among women with no formal education, obesity prevalence was 64.9% (48/74), compared to 62.7% (47/75) among those with basic education, 61.9% (13/21) with vocational training, 51.6% (16/31) with tertiary education, and 30.2% (19/63) with secondary education ($p = 1160-1168$).

Normal weight prevalence showed the opposite pattern,

being highest among women with secondary education (15.9%) and lowest among those with no education (4.1%).

Marital Status and Obesity

Marital status demonstrated a strong association with obesity ($p < 0.001$). Obesity prevalence was highest among married women at 60.6% (103/170), compared to 25.6% (11/43) among single women, 48.3% (14/29) among divorced women, and 47.7% (15/22) among widowed women ($p = 1172-1177$).

Discussion

This study reveals an alarmingly high prevalence of obesity among market women in the Kassena Nankana Municipality, with more than half (54.2%) classified as obese and an additional 36.7% overweight. The combined overweight/obesity prevalence of 90.9% is considerably higher than national estimates for Ghanaian women (40% according to GDHS 2015, $p = 493$) and higher than the 22% obesity prevalence reported in a national meta-analysis (Ofori-Asenso *et al.*, 2016, $p = 489$).

The 73.5% abdominal obesity prevalence is particularly concerning given that abdominal obesity is a strong predictor of cardiovascular disease, type 2 diabetes, and metabolic syndrome, independent of overall obesity (Rankinen *et al.*, 1999, $p = 751$; Despres, 2007, $p = 751$). Abdominal fat accumulation, particularly visceral adipose tissue, is metabolically active and contributes to insulin resistance, dyslipidemia, and hypertension (Amato *et al.*, 2013, $p = 751$).

The dramatic age-related increase in obesity prevalence—from 4.0% in 18-28 year olds to 94.4% in 51-65 year olds—represents one of the steepest age gradients reported in the literature. This pattern likely reflects cumulative effects of sedentary occupation, progressive metabolic changes, hormonal transitions (particularly menopause), and accumulated lifestyle behaviors over time. The peak obesity rate of 94.4% among women aged 51-65 years indicates that obesity is nearly universal in older market women, representing a severe public health crisis.

The inverse association between educational attainment and obesity, with 64.9% obesity prevalence among women with no education versus 30.2% among those with secondary education, highlights education as a protective factor. This relationship may operate through multiple mechanisms including health literacy, access to health information, income levels enabling healthier food purchases, and occupational differences (Ayesu, 2013, $p = 547$; Ziraba *et al.*, 2009, $p = 547$).

The higher obesity prevalence among married women (60.6%) compared to single women (25.6%) may reflect lifestyle changes associated with marriage, including dietary pattern modifications, reduced physical activity, pregnancy-related weight retention, and cultural expectations about body weight in married women.

Comparison with other studies reveals that obesity prevalence among market women in this municipality

exceeds rates reported for most Ghanaian populations. Studies in urban Ghana have reported obesity prevalence ranging from 15-30% among general female populations (Amoah, 2003; Addo *et al.*, 2009). The substantially higher rates observed in this study suggest that market women face unique obesity risks related to their occupation.

Several factors may contribute to the exceptionally high obesity prevalence observed. First, the sedentary nature of market trading, involving 8-12 hours daily of sitting, provides limited opportunity for physical activity. Second, market women often consume energy-dense convenience foods due to time constraints and food availability in market settings. Third, irregular meal patterns and frequent snacking may contribute to positive energy balance. Fourth, work-related stress may promote weight gain through various physiological and behavioral mechanisms.

The public health implications of these findings are profound. With 90.9% of market women classified as overweight or obese, this population faces substantially elevated risks for numerous chronic diseases including type 2 diabetes, cardiovascular diseases, hypertension, dyslipidemia, metabolic syndrome, certain cancers, osteoarthritis, and sleep apnea (WHO, 2011, p. 489). The economic burden associated with obesity-related diseases, including direct medical costs and indirect costs from lost productivity, represents a significant challenge for individuals, families, and the healthcare system.

Urgent comprehensive interventions are needed to address this epidemic. Strategies should include: (1) health education programs targeting market women and delivered through market associations, (2) environmental modifications in markets to promote physical activity (e.g., standing workstations, walking areas), (3) improved access to healthy foods in market settings, (4) stress management programs, (5) screening programs for early detection of obesity-related complications, and (6) policy interventions creating supportive environments for healthy behaviors.

Interventions should be age-targeted and education-appropriate, with particular focus on middle-aged women (40-50 years) who show the steepest obesity rates and women with limited formal education. Prevention efforts should also target younger women (18-39 years) before significant weight gain occurs.

Study limitations include the cross-sectional design preventing assessment of obesity trends over time, potential selection bias from studying a single market, and inability to establish causality. However, the study's strengths include the large sample size, standardized anthropometric measurements, and comprehensive demographic characterization.

CONCLUSION

This study documents an alarmingly high prevalence of obesity (54.2%) and abdominal obesity (73.5%) among market women in the Kassena Nankana Municipality. The nearly universal presence of overweight or obesity

(90.9%) represents a severe public health crisis requiring urgent attention. The dramatic age-related increase in obesity prevalence, with nearly all women aged 51-65 years being obese, underscores the cumulative nature of obesity risk in this occupationally sedentary population.

These findings call for immediate action to implement comprehensive, culturally appropriate interventions targeting modifiable risk factors. Priority should be given to age-specific programs, educational initiatives for women with limited formal schooling, and structural modifications in market environments to promote healthier behaviors. The exceptionally high obesity rates documented in this study highlight market women as a critical target population for obesity prevention and management efforts in Ghana.

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