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Hypertension and obstructive sleep apnea among adults with overweight or obesity in Tiko Health District, Cameroon: a community-based cross-sectional study

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Abstract

Background

Hypertension, excess adiposity, and obstructive sleep apnea (OSA) frequently coexist and contribute to cardiovascular risk, yet community-based data on their combined burden in Cameroon remain scarce. The study assessed the prevalence of hypertension, adiposity, and OSA risk among adults in the Tiko Health District, Cameroon.

Methods

This community-based cross-sectional study included adults aged ≥ 18 years who attended a one-week health screening campaign in four health areas of the Tiko Health District, Cameroon, in August 2026. Anthropometric measures, cardiovascular risk factors, blood pressure, and sleep-related symptoms were assessed using standardized procedures. Body mass index (BMI) was categorized according to WHO criteria. Blood pressure was defined as the mean of two seated measurements, and hypertension was defined as a measured blood pressure ≥ 140/90 mmHg or current antihypertensive treatment. OSA risk was assessed with the STOP-BANG questionnaire, and excessive daytime sleepiness with the Epworth Sleepiness Scale (ESS). Associations between adiposity and hypertension were evaluated using modified Poisson regression with robust variance to estimate adjusted prevalence ratios (aPRs). Statistical significance was set at $P < 0.05$.

Results

Of 304 participants, 221 (72.7%) were female, and the mean age was 43.4 ± 16.2 years. BMI was available for 302 participants; 95/302 (31.5%) were overweight, and 120/302 (39.7%) had obesity. Hypertension was present in 110/304 participants (36.2%, 95% CI 31.0–41.7). Among participants with hypertension, 48/110 (43.6%) were aware, 29/110 (26.4%) were receiving treatment, and 11/110 (10.0%) were controlled. A positive STOP-BANG screen occurred in 115/299 participants (38.5%, 95% CI 33.1–44.1), and ESS > 10 was present in 46/304 (15.1%). After adjustment for age, sex, residence, and diabetes, hypertension prevalence did not differ markedly between overweight (aPR 0.90, 95% CI 0.60–1.33) and obesity (aPR 1.27, 95% CI 0.90–1.79) and BMI < 25 kg/m². Each 5-kg/m² higher BMI was associated with a 13% higher prevalence of hypertension (aPR 1.13, 95% CI 1.03–1.24). Greater waist circumference (aPR 1.10 per 10 cm, 95% CI 1.02–1.20) and waist-to-height ratio (aPR 1.24 per 0.1 unit, 95% CI 1.13–1.37) were similarly associated with hypertension. Obesity was also associated with higher mean systolic blood pressure (β 9.5 mmHg, 95% CI 4.0–15.1) and diastolic blood pressure (β 7.8 mmHg, 95% CI 4.3–11.3) compared with BMI < 25 kg/m².

Conclusions

Among adults attending community screening, excess adiposity, hypertension, previously undetected high blood pressure, and elevated OSA risk were common. The accompanying gaps in hypertension awareness, treatment, and control underscore the need for community-based detection, confirmatory blood-pressure assessment, cardiovascular risk reduction, and referral for objective sleep evaluation.

Background

Excess adiposity has become a dominant global cardiovascular risk factor. In 2022, an estimated 2.5 billion adults were living with overweight, including more than 890 million with obesity [1]. Pooled population data indicate that adult obesity has more than doubled since 1990 [2]. Cameroon is undergoing the same nutritional transition: a national systematic review estimated the prevalence of adult overweight and obesity at 26.0% and 15.1%, respectively, with a higher burden among women but no urban–rural difference [3]. Adiposity promotes hypertension through sympathetic activation, stimulation of the renin–angiotensin–aldosterone system, sodium retention, insulin resistance, renal compression, and adipose-tissue inflammation [4].

Hypertension is the leading modifiable cardiovascular risk factor and remains inadequately detected and controlled in many low- and middle-income settings [5, 6]. A Cameroon-wide meta-analysis estimated a prevalence of 30.9%, with only 24.4% of affected adults aware of their status, 15.1% receiving treatment, and 8.8% controlled [7]. These losses across the care cascade are particularly consequential in settings where stroke, heart failure, and chronic kidney disease are frequently diagnosed after target-organ damage has developed.

OSA imposes a closely linked yet often unrecognized cardiovascular burden. Globally, approximately 936 million adults aged 30–69 years are estimated to have mild-to-severe OSA [8]. Recurrent upper-airway obstruction causes intermittent hypoxemia, autonomic surges, and sleep fragmentation, pathways associated with hypertension, atrial fibrillation, coronary disease, stroke, and heart failure [9]. Formal sleep testing remains scarce across much of sub-Saharan Africa [10]. In Yaoundé, 24.5% of community participants had a positive STOP-BANG screen [10], and a separate Cameroonian validation study found that STOP-BANG ≥ 3 was sensitive but not specific for OSA, reinforcing its role as a triage rather than diagnostic tool [11].

Community-based evidence on the overlapping burden of adiposity, hypertension, and OSA risk in Southwest Cameroon remains limited. Of particular importance is whether adults with excess adiposity bear a disproportionate burden of elevated blood pressure, undiagnosed or uncontrolled hypertension, and symptoms that warrant further sleep evaluation. Defining these patterns could strengthen cardiovascular risk detection and guide targeted assessment and referral in resource-constrained settings. This study therefore quantified BMI distribution, hypertension and its care cascade, OSA screening risk, and daytime sleepiness among adults in the Tiko Health District.

Methods

Study design and setting

This community-based cross-sectional study was conducted during a one-week health screening campaign in the Tiko Health District, Fako Division, Southwest Region of Cameroon [12], in August 2026. The district includes semiurban and rural communities with varying population densities, access to healthcare, and socioeconomic characteristics. Screening activities were conducted in Tiko Town, Holforth, Mutengene, and Missellele. Under the settlement classification used in the study, Tiko Town, Holforth, and Mutengene were classified as semiurban, whereas Missellele was classified as rural.

Participants and study size

Adults aged 18 years or older who had lived in the Tiko Health District for at least three months and attended one of the screening locations during the campaign were eligible. Participants were enrolled consecutively after providing written informed consent. During the screening encounter, weight, height, blood pressure, anthropometric measurements, OSA screening information, and other study variables were recorded. The minimum sample size was calculated using Cochran's single-proportion formula, $n = z^2 p\,(1-p)\,/d^2$, assuming a 24.5% prevalence of a positive STOP-BANG screen in Cameroon [10], a 95% confidence level, and 5% absolute precision. The minimum required sample size was 285 participants. After allowing 5% for incomplete data, the target sample was 300. A total of 304 participants were enrolled.

Data collection and measurements

Trained research assistants administered a structured questionnaire in English, Pidgin English, or French. Data collected included age, sex, residence, education, employment, income, smoking, alcohol use, physical activity, diet, sleep duration, self-reported diabetes, prior hypertension diagnosis, and antihypertensive medication use. Weight was measured to the nearest 0.5 kg, and height to the nearest 0.5 cm. Waist, hip, and neck circumferences were measured with a non-stretchable tape. BMI was calculated as weight in kilograms divided by height in meters squared and classified as underweight (< 18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), obesity class I (30.0–34.9 kg/m²), class II (35.0–39.9 kg/m²), or class III (≥ 40.0 kg/m²) [1]. For comparative analyses, BMI was grouped as < 25, overweight, and obesity.

Blood pressure (BP) was measured with an automated oscillometric device (OMRON HEM-7121; Omron Healthcare Co., Ltd., Kyoto, Japan) using an appropriately sized cuff after at least 10 minutes of seated rest. Participants who reported smoking or consuming alcohol or caffeine within the preceding 30 minutes rested further before measurement. Two readings were obtained, and the arithmetic mean was used. Participants with high blood pressure were counseled and referred to the nearest health facility.

OSA screening used the eight-item STOP-BANG questionnaire: snoring, tiredness, observed apnea, high blood pressure, BMI > 35 kg/m², age > 50 years, neck circumference > 40 cm, and male sex [13, 14]. The Epworth Sleepiness Scale (ESS) assessed the likelihood of dozing in eight situations; total scores ranged from 0 to 24 [15]. Physical activity was assessed with the WHO Global Physical Activity Questionnaire, from which weekly metabolic-equivalent minutes and activity categories were derived [16]. Diet was assessed using study-specific healthy and unhealthy food-frequency scores.

Outcomes

Hypertension was defined as mean systolic blood pressure ≥ 140 mmHg, mean diastolic blood pressure ≥ 90 mmHg, or current antihypertensive medication use [17]. Awareness was a prior professional diagnosis among participants with hypertension. Treatment was current antihypertensive medication use among participants with hypertension. Control was mean systolic blood pressure < 140 mmHg and mean diastolic blood pressure < 90 mmHg among treated participants. Newly detected high blood pressure was a measured value ≥ 140/90 mmHg among participants reporting no prior diagnosis.

A positive OSA screen was defined as a STOP-BANG score ≥ 3. High STOP-BANG risk was defined as a score ≥ 5 or at least two positive STOP items, together with male sex, BMI > 35 kg/m², or neck circumference > 40 cm [14]. The study's high OSA-risk outcome also included participants with STOP-BANG 3–4 and ESS > 10. Excessive daytime sleepiness (EDS) was defined as ESS > 10. Because apnea–hypopnea index data were not collected, these endpoints indicate screening risk and do not establish an OSA diagnosis.

Statistical analysis

Continuous variables were summarized with means and standard deviations or medians and interquartile ranges, as appropriate. Categorical variables were reported as n/N (%) with analysis-specific denominators, and prevalence estimates were accompanied by Wilson 95% confidence intervals. Differences in binary endpoints across BMI categories were assessed using Pearson’s chi-square test. Because hypertension was common, adjusted prevalence ratios (aPRs) were estimated using modified Poisson regression with a log link and robust variance [18]. BMI category was examined as the primary categorical adiposity exposure. The categorical model included age (per 10-year increase), sex, residence, and diabetes. BMI, waist circumference, and waist-to-height ratio were also modeled as continuous exposures in separate adjusted models, scaled per 5 kg/m², 10 cm, and 0.1 unit, respectively, with the same covariates. Adjusted mean differences in systolic and diastolic blood pressure were estimated using linear regression with robust standard errors and the same covariates.

Sensitivity analyses used a history-inclusive hypertension outcome and repeated the categorical BMI analysis after excluding underweight participants from the reference group. Excessive daytime sleepiness was examined exploratorily using modified Poisson regression, adjusted for BMI category,

age, sex, and residence. No multivariable model was fitted for a positive STOP-BANG screen because age, sex, BMI, and hypertension are constituent items of the score.

Analyses were based on participants with complete data for the variables required in each model. Because participants were recruited through a time-limited community screening campaign rather than a probability sampling design, analyses were unweighted, and estimates were interpreted as applying to the screened sample. All tests were two-sided, and $P < 0.05$ was considered statistically significant. Analyses were performed using StataNow version 19.5 (StataCorp, College Station, Texas, USA), and reporting followed STROBE guidance [19].

Ethical considerations

The study protocol was approved by the Regional Ethics Committee for Human Health Research, Southwest Region, Cameroon (Ref. No. 773/CRERSH/SW/C/09/2025; 15 September 2025). Administrative authorization was obtained from the Tiko Health District and relevant community authorities prior to the screening campaign. Written informed consent was obtained from each participant before enrollment. The analytical dataset was de-identified, and access to identifiable information was restricted to authorized study personnel.

Results

Participant characteristics and BMI distribution

Among the 304 participants, the mean age was 43.4 years (SD 16.2). Of these, 221 (72.7%) were female, and 200 (65.8%) lived in semi-urban settings. Diabetes was reported in 18 participants (5.9%), and 62 (20.4%) had a prior diagnosis of hypertension. Mean systolic and diastolic blood pressures were 130.7 (SD 20.4) mmHg and 83.5 (SD 12.8) mmHg, respectively (Table 1).

Table 1
Participant characteristics by BMI

Characteristic	Overall (N = 304)	BMI < 25 kg/m² (n = 87)	Overweight (n = 95)	Obesity (n = 120)
Demographic and socioeconomic characteristics				
Age, years, mean (SD)	43.4 (16.2)	41.4 (17.2)	43.2 (17.0)	45.0 (14.7)
Sex, n (%)				
Female	221 (72.7)	46 (52.9)	69 (72.6)	104 (86.7)
Male	83 (27.3)	41 (47.1)	26 (27.4)	16 (13.3)
Residence, n (%)				
Rural	64 (21.1)	16 (18.4)	25 (26.3)	21 (17.5)
Semiurban	200 (65.8)	57 (65.5)	59 (62.1)	84 (70.0)
Urban	40 (13.2)	14 (16.1)	11 (11.6)	15 (12.5)
Educational attainment, n (%)				
No formal education	19 (6.2)	4 (4.6)	8 (8.4)	7 (5.8)
Primary education	129 (42.4)	35 (40.2)	44 (46.3)	49 (40.8)
Secondary education	103 (33.9)	34 (39.1)	28 (29.5)	40 (33.3)
Tertiary education	53 (17.4)	14 (16.1)	15 (15.8)	24 (20.0)
Employment status, n (%)				
Employed	175 (57.6)	47 (54.0)	59 (62.1)	69 (57.5)
Retired	15 (4.9)	4 (4.6)	5 (5.3)	6 (5.0)
Student	25 (8.2)	12 (13.8)	5 (5.3)	8 (6.7)
Unemployed	89 (29.3)	24 (27.6)	26 (27.4)	37 (30.8)
Monthly income, CFA francs, n (%)				
< 25,000	129 (42.4)	42 (48.3)	39 (41.1)	48 (40.0)
25,000–50,000	89 (29.3)	23 (26.4)	20 (21.1)	44 (36.7)

Note. Values are mean (SD), median [IQR], or n (%), as indicated. BMI was available for 302 participants; the two participants without BMI are included only in the overall column. When the available denominator differs from the corresponding column total, it is shown in the cell. BP, blood pressure; CFA, Central African CFA franc; ESS, Epworth Sleepiness Scale; IQR, interquartile range; MET, metabolic equivalent of task; OSA, obstructive sleep apnea; SD, standard deviation.

Characteristic	Overall (N = 304)	BMI < 25 kg/m² (n = 87)	Overweight (n = 95)	Obesity (n = 120)
Demographic and socioeconomic characteristics				
50,000–100,000	50 (16.4)	10 (11.5)	22 (23.2)	18 (15.0)
> 100,000	36 (11.8)	12 (13.8)	14 (14.7)	10 (8.3)
Anthropometric and clinical characteristics				
BMI, kg/m², mean (SD)	29.1 (6.7) n = 302	22.3 (2.4)	27.5 (1.3)	35.5 (5.5)
Waist circumference, cm, mean (SD)	95.3 (16.3) n = 296	82.0 (8.5) n = 82	91.7 (9.7) n = 93	106.7 (14.6) n = 119
Waist-to-height ratio, mean (SD)	0.59 (0.11) n = 295	0.50 (0.05) n = 82	0.57 (0.06) n = 93	0.68 (0.10) n = 119
Systolic BP, mmHg, mean (SD)	130.7 (20.4)	127.0 (21.0)	128.0 (17.8)	135.7 (21.1)
Diastolic BP, mmHg, mean (SD)	83.5 (12.8)	80.5 (12.9)	82.1 (11.8)	86.8 (12.9)
Diabetes, n (%)	18 (5.9)	6 (6.9)	3 (3.2)	8 (6.7)
Previous hypertension diagnosis, n (%)	62 (20.4)	13 (14.9)	16 (16.8)	32 (26.7)
Sleep and lifestyle characteristics				
Sleep duration, hours, mean (SD)	7.1 (2.0) n = 303	7.1 (2.0)	7.2 (2.1) n = 94	6.9 (2.0)
ESS score, median [IQR]	6 [3–9]	5 [3–8]	6 [3–9]	6 [3–9]
STOP-BANG score, median [IQR]	2 [1–3] n = 299	2 [1–3]	2 [1–3] n = 94	2 [1–4] n = 118
Sedentary time, min/day, median [IQR]	60 [20–120]	60 [24–180]	60 [12–120]	60 [24–120]
Physical activity, MET-min/week, median [IQR]	1480 [336–4560]	1800 [480–4980]	1440 [240–5040]	1360 [440–3360]

Note. Values are mean (SD), median [IQR], or n (%), as indicated. BMI was available for 302 participants; the two participants without BMI are included only in the overall column. When the available denominator differs from the corresponding column total, it is shown in the cell. BP, blood pressure; CFA, Central African CFA franc; ESS, Epworth Sleepiness Scale; IQR, interquartile range; MET, metabolic equivalent of task; OSA, obstructive sleep apnea; SD, standard deviation.

Characteristic	Overall (N = 304)	BMI < 25 kg/m² (n = 87)	Overweight (n = 95)	Obesity (n = 120)
Demographic and socioeconomic characteristics				
	n = 297	n = 86	n = 91	n = 118
Healthy diet score, median [IQR]	9 [7–11]	9 [7–10]	9 [8–12]	9 [7–11]
Unhealthy diet score, median [IQR]	5 [3–6]	5 [3–7]	5 [3–6]	4 [3–6]
Smoking status, n (%)				
Never	271 (89.1)	71 (81.6)	87 (91.6)	111 (92.5)
Former	20 (6.6)	9 (10.3)	5 (5.3)	6 (5.0)
Current	13 (4.3)	7 (8.0)	3 (3.2)	3 (2.5)
Alcohol use, n (%)				
Never	112 (36.8)	35 (40.2)	40 (42.1)	37 (30.8)
Moderate	161 (53.0)	45 (51.7)	44 (46.3)	70 (58.3)
Heavy	31 (10.2)	7 (8.0)	11 (11.6)	13 (10.8)
Physical activity category, n (%)				
Low	94/297 (31.6)	25/86 (29.1)	31/91 (34.1)	36/118 (30.5)
Moderate	100/297 (33.7)	29/86 (33.7)	23/91 (25.3)	48/118 (40.7)
High	103/297 (34.7)	32/86 (37.2)	37/91 (40.7)	34/118 (28.8)

Note. Values are mean (SD), median [IQR], or n (%), as indicated. BMI was available for 302 participants; the two participants without BMI are included only in the overall column. When the available denominator differs from the corresponding column total, it is shown in the cell. BP, blood pressure; CFA, Central African CFA franc; ESS, Epworth Sleepiness Scale; IQR, interquartile range; MET, metabolic equivalent of task; OSA, obstructive sleep apnea; SD, standard deviation.

Table 1. **Participant characteristics by BMI**

BMI was available for 302 participants. Overall, 95/302 (31.5%, 95% CI 26.5–36.9) had overweight, and 120/302 (39.7%) had obesity; consequently, 215/302 (71.2%, 95% CI 65.8–76.0) had overweight or obesity. Among participants with valid BMI, obesity class I accounted for 22.8%, class II for 11.3%, and class III for 5.6% (Table 2).

Table 2
Distribution of BMI categories

BMI category	n	%	95% CI
Underweight	7	2.3	1.1–4.7
Normal weight	80	26.5	21.8–31.7
Overweight	95	31.5	26.5–36.9
Obesity I	69	22.8	18.5–27.9
Obesity II	34	11.3	8.2–15.3
Obesity III	17	5.6	3.5–8.8
Overweight or obesity	**215**	**71.2**	**65.8–76.0**
.			
BMI; body mass index			

Table 2. **Distribution of BMI categories among participants (302)**

Hypertension burden and care cascade

Hypertension was present in 110/304 participants (36.2%, 95% CI 31.0–41.7), and 99/304 (32.6%, 95% CI 27.5–38.0) had elevated measured blood pressure. Among participants with hypertension, 48/110 (43.6%) were aware of their status, and 29/110 (26.4%) were receiving treatment. Eleven of 29 treated participants had controlled blood pressure (37.9%, 95% CI 22.7–56.0), corresponding to 10.0% of all participants with hypertension. Among 242 participants without a prior diagnosis, 62 (25.6%, 95% CI 20.5–31.5) had newly detected high blood pressure (Fig. 1).

Hypertension was present in 110/304 participants (36.2%). Awareness denotes a previous professional diagnosis, and treatment denotes current antihypertensive medication use. "Controlled" denotes treated participants with systolic blood pressure < 140 mmHg and diastolic blood pressure < 90 mmHg: 11/110 (10.0%) of all participants with hypertension, equivalent to 11/29 (37.9%) of treated participants.

OSA risk, daytime sleepiness, and symptoms

Among 299 participants with complete STOP-BANG data, 115 (38.5%, 95% CI 33.1–44.1) screened positive for OSA, 63 (21.1%, 95% CI 16.8–26.0) were in the high STOP-BANG risk category, and 70 (23.4%, 95% CI 19.0–28.5) met the study's high OSA-risk criterion. EDS was present in 46/304 participants (15.1%, 95% CI 11.5–19.6). Daytime tiredness was the most commonly reported sleep symptom (199/304, 65.5%), followed by loud snoring (65/304, 21.4%) and observed apnea (29/304, 9.5%).

Among participants with BMI ≥ 25, hypertension was present in 81/215 (37.7%, 95% CI 31.5–44.3). Among 212 participants in this subgroup with complete STOP-BANG data, 86 (40.6%, 95% CI 34.2–47.3) had a positive OSA screen, and 52 (24.5%, 95% CI 19.2–30.7) had high OSA risk. EDS was present in 34/215 participants (15.8%, 95% CI 11.5–21.3).

Study outcome patterns across BMI

Hypertension prevalence was 33.3% in the BMI < 25 group, 31.6% among participants with overweight, and 42.5% among those with obesity (P = 0.198). Positive OSA screening differed across BMI groups (**P = 0.017**), with the highest prevalence in the obesity group (48.3%), compared with the BMI < 25 (33.3%) and overweight (30.9%) groups. High OSA risk was similarly concentrated in the obesity group: 33.1% versus 20.7% in the BMI < 25 group and 13.8% in the overweight group (**P = 0.004**). Loud snoring was also more frequent in the obesity group (30.8%; **P = 0.004**), whereas EDS, daytime tiredness, and observed apnea did not differ markedly across BMI categories (Table 3; Fig. 2; Fig. 3).

Table 3
Cardiovascular and sleep outcomes by BMI

Outcome	Overall	BMI < 25 kg/m²	Overweight	Obesity	P value
Hypertension	110/304 (36.2) [31.0–41.7]	29/87 (33.3) [24.3–43.8]	30/95 (31.6) [23.1–41.5]	51/120 (42.5) [34.0–51.4]	0.198
Positive OSA screen	115/299 (38.5) [33.1–44.1]	29/87 (33.3) [24.3–43.8]	29/94 (30.9) [22.4–40.8]	57/118 (48.3) [39.5–57.2]	0.017
High OSA risk	70/299 (23.4) [19.0–28.5]	18/87 (20.7) [13.5–30.4]	13/94 (13.8) [8.3–22.2]	39/118 (33.1) [25.2–42.0]	0.004
EDS	46/304 (15.1) [11.5–19.6]	12/87 (13.8) [8.1–22.6]	12/95 (12.6) [7.4–20.8]	22/120 (18.3) [12.4–26.2]	0.465
Loud snoring	65/304 (21.4) [17.1–26.3]	13/87 (14.9) [8.9–23.9]	14/95 (14.7) [9.0–23.2]	37/120 (30.8) [23.3–39.6]	0.004
Daytime tiredness	199/304 (65.5) [60.0–70.6]	53/87 (60.9) [50.4–70.5]	61/95 (64.2) [54.2–73.1]	85/120 (70.8) [62.2–78.2]	0.304
Observed apnea	29/304 (9.5) [6.7–13.4]	8/87 (9.2) [4.7–17.1]	7/95 (7.4) [3.6–14.4]	14/120 (11.7) [7.1–18.6]	0.562

Note. Cells show n/N (%) on the first line and the Wilson 95% confidence interval on the second line. P values are from Pearson chi-square tests comparing the three BMI groups. BMI was unavailable for two participants. STOP-BANG-derived endpoints were available for 299 participants. BMI, body mass index; CI, confidence interval; EDS, excessive daytime sleepiness; OSA, obstructive sleep apnea.

Table 3. **Cardiovascular and sleep outcomes by BMI**

Points represent available-case proportions and horizontal bars indicate Wilson 95% confidence intervals. Excessive daytime sleepiness was defined as an Epworth Sleepiness Scale (ESS) score > 10. BMI, body mass index.

Orange and blue points represent hypertension and a positive OSA screen (STOP-BANG ≥ 3), respectively; horizontal bars indicate Wilson 95% confidence intervals. Grey segments mark the numerical differences between the plotted estimates. BMI, body mass index; OSA, obstructive sleep apnea.

Factors associated with hypertension and blood pressure

In the adjusted hypertension model (n = 302), the prevalence ratios were 0.90 (95% CI 0.60–1.33) for overweight and 1.27 (95% CI 0.90–1.79) for obesity, compared with BMI < 25. The corresponding adjusted hypertension prevalences were 34.0% (95% CI 24.4–43.7), 30.5% (95% CI 22.1–38.8), and 43.1% (95% CI 34.9–51.3), respectively. Increasing age and semiurban residence were independently associated with hypertension; the prevalence ratio per 10-year age increase was 1.31 (95% CI 1.21–1.42), whereas the estimate for semiurban versus rural residence was 0.61 (95% CI 0.45–0.82).

Obesity was associated with higher mean systolic and diastolic blood pressure. Compared with BMI < 25, the adjusted mean differences were 9.5 mmHg (95% CI 4.0–15.1) for systolic blood pressure and 7.8 mmHg (95% CI 4.3–11.3) for diastolic blood pressure. Male sex was also associated with higher systolic (5.4 mmHg, 95% CI 0.7–10.1) and diastolic (5.3 mmHg, 95% CI 2.0–8.5) blood pressure. Semiurban residence was associated with lower systolic blood pressure than rural residence (− 6.8 mmHg, 95% CI − 12.5 to − 1.2).

Table 4. **Adjusted associations with hypertension and blood pressure**

Table 4
Adjusted associations with hypertension and blood pressure

Characteristic	Hypertension		Systolic blood pressure		Diastolic blood pressure	
	aPR (95% CI)	P value	β (95% CI), mmHg	P value	β (95% CI), mmHg	P value
Overweight vs BMI < 25	0.90 (0.60–1.33)	0.582	1.4 (− 3.9–6.8)	0.602	2.4 (− 1.1–5.9)	0.176
Obesity vs BMI < 25	1.27 (0.90–1.79)	0.182	9.5 (4.0–15.1)	**< 0.001**	7.8 (4.3–11.3)	**< 0.001**
Age, per 10 years	1.31 (1.21–1.42)	**< 0.001**	4.0 (2.6–5.5)	**< 0.001**	1.2 (0.4–2.1)	**0.006**
Male vs female	1.13 (0.83–1.53)	0.440	5.4 (0.7–10.1)	**0.024**	5.3 (2.0–8.5)	**0.002**
Semiurban vs rural	0.61 (0.45–0.82)	**0.001**	−6.8 (− 12.5 to − 1.2)	**0.018**	−3.4 (− 7.1–0.3)	0.074
Urban vs rural	0.91 (0.59–1.39)	0.654	1.8 (− 6.3–9.8)	0.666	−1.0 (− 6.2–4.2)	0.705
Diabetes vs no diabetes	1.20 (0.74–1.96)	0.458	4.3 (− 5.3–13.9)	0.377	3.7 (− 1.7–9.0)	0.177

Note. All models included 302 participants and were adjusted for BMI group, age (per 10-year increase), sex, residence, and diabetes. Modified Poisson regression with robust variance was used for hypertension; linear regression with robust standard errors was used for systolic and diastolic blood pressure. Reference categories were BMI < 25 kg/m², female sex, rural residence, and no diabetes. aPR, adjusted prevalence ratio; β, adjusted mean difference; BMI, body mass index; CI, confidence interval.

In separate adjusted models for continuous adiposity covariates, greater adiposity was consistently associated with a higher prevalence of hypertension. Each 5-kg/m² higher BMI was associated with a 13% higher prevalence of hypertension (aPR 1.13, 95% CI 1.03–1.24). Hypertension prevalence was also 10% higher for each 10-cm increase in waist circumference (aPR 1.10, 95% CI 1.02–1.20) and 24% higher for each 0.1-unit increase in waist-to-height ratio (aPR 1.24, 95% CI 1.13–1.37)

Sensitivity and exploratory analyses

The direction of the obesity estimate was similar whether a history of hypertension was included (aPR 1.25, 95% CI 0.90–1.74) or the seven underweight participants were excluded from the reference group (aPR 1.22, 95% CI 0.86–1.73). In the exploratory EDS model (n = 302), neither overweight (aPR 0.79, 95%

CI 0.37–1.69) nor obesity (aPR 1.10, 95% CI 0.56–2.16) was clearly associated with EDS. The estimate for urban versus rural residence was lower but imprecise (aPR 0.25, 95% CI 0.06–1.07; P = 0.062).

Discussion

This community-based cross-sectional study identified three converging cardiovascular concerns: excess adiposity was common among participants; more than one in three had hypertension, with substantial losses across the care cascade; and positive OSA screening was frequent. Although adjusted hypertension prevalence did not differ markedly across the three BMI categories, obesity was associated with higher systolic and diastolic blood pressure. Moreover, higher BMI, waist circumference, and waist-to-height ratio were each associated with higher hypertension prevalence in continuous models. The concordance of the continuous adiposity and blood-pressure analyses indicates a graded adiposity–blood-pressure relationship that was less apparent after categorizing BMI.

Hypertension burden and care gaps

Hypertension was present in 36.2% of the screened sample, exceeding the pooled national estimate of 30.9% [7] and approaching community estimates of 40.9% in the rural Baham Health District and 37.8% in the Far North Region [20, 21]. A lower prevalence of 19.8% was reported in rural Ombe in Southwest Cameroon [22]. Differences in age structure, adiposity, recruitment, and blood-pressure measurement limit direct comparisons, and the Tiko estimate should not be interpreted as district-wide prevalence. Nevertheless, the convergence of these estimates indicates a substantial burden of elevated blood pressure among adults identified outside routine clinical care. The care cascade was similarly concerning: 43.6% of participants with hypertension were aware, 26.4% were treated, and 10.0% were controlled. Across 44 low- and middle-income countries, the corresponding pooled proportions were 39.2% diagnosed, 29.9% treated, and 10.3% controlled [23]. Rural and urban studies in Cameroon have likewise documented major losses between detection, treatment, and control [20, 21]. In Tiko, newly detected high blood pressure in 25.6% of participants without a previous diagnosis further underscores the need for confirmatory assessment and linkage to care among screening participants.

Adiposity and blood pressure

Overweight or obesity was present in 71.2% of participants, considerably higher than pooled estimates for Cameroonian adults [3]. This proportion reflects the composition of a time-limited screening campaign, not the prevalence of excess adiposity in the Tiko Health District. The female predominance and self-selection among screening attendees further limit population-level interpretation.

Hypertension was most prevalent in the obesity group, although the adjusted categorical estimate was imprecise and non-significant. In contrast, obesity was associated with adjusted increases of 9.5 mmHg in systolic and 7.8 mmHg in diastolic blood pressure, while BMI, waist circumference, and waist-to-height ratio showed consistent positive associations with hypertension. These findings align with a screening study of 14,424 Cameroonian adults, in which general and central adiposity measures had graded

associations with blood pressure and screen-detected hypertension, with waist circumference and waist-to-height ratio among the more informative measures [24]. The observed pattern is also consistent with the sympathetic, renal, hormonal, and inflammatory mechanisms of obesity-related hypertension [4]. Together, these results support evaluating adiposity as a continuum and complementing BMI with a measure of central adiposity.

OSA screening burden

A positive OSA screen occurred in 38.5% of participants overall and in 40.6% of those with BMI ≥ 25 kg/m², compared with 24.5% in a younger community sample from Yaoundé [10]. Both that study and the Cameroonian validation study used a BMI threshold > 30 kg/m² for the STOP-BANG BMI item, compared with > 35 kg/m² in the present study [10, 11]. Participants in Tiko were older and had a higher prevalence of obesity, both of which directly contribute to STOP-BANG scores. Accordingly, the observed gradient across BMI groups is descriptive; because BMI, age, sex, and hypertension are constituent items, it cannot establish an independent association between adiposity and OSA. In the Cameroonian validation study, STOP-BANG ≥ 3 had 82.9% sensitivity but 34.4% specificity for OSA defined by respiratory polygraphy [11]. The present positive screens therefore identify participants who may benefit from clinical assessment and objective sleep testing, rather than confirmed OSA cases. EDS affected 15.1% of participants and was not clearly associated with BMI category, indicating that daytime sleepiness alone would not identify the broader group with a positive STOP-BANG screen.

Clinical and public-health implications

The findings support a staged community-to-clinic pathway. Participants with elevated blood pressure require confirmation on a separate occasion, cardiovascular risk assessment, and linkage to longitudinal hypertension care. Positive or high-priority OSA screens should prompt symptom review and referral for objective sleep testing, particularly in people with witnessed apnea, marked sleepiness, or difficult-to-control blood pressure. The American Heart Association recommends OSA screening in patients with resistant or poorly controlled hypertension and formal sleep assessment when OSA is suspected [9]. Weight management is also recommended as part of OSA care for adults with overweight or obesity [25] and is directly relevant to the blood-pressure gradient observed in this study.

The lower adjusted hypertension prevalence among semiurban participants compared with rural participants should be interpreted cautiously. The rural comparison was based on a single health area, and the estimate may reflect differences in the participants reached, health-area composition, or unmeasured socioeconomic and behavioral factors. Without participant-level health-area identifiers or sampling weights, the finding does not support a protective effect of semiurban residence.

Strengths and limitations

Strengths include recruitment across four health areas and standardized anthropometric and blood-pressure measurements. Evaluating BMI both categorically and continuously, alongside waist

circumference and waist-to-height ratio, showed consistency in adiposity findings across general and central measures.

The cross-sectional design precludes temporal or causal conclusions. Hypertension was based on two readings at a single encounter and medication use; a clinical diagnosis ordinarily requires confirmation on a separate occasion. STOP-BANG is a screening instrument, and hypertension and BMI are components of the score. No apnea–hypopnea index, oxygen-desaturation index, or sleep-study quality data were available. Recruitment was limited to a one-week campaign in four health areas; participants were self-selected, and selection probabilities were unavailable; consequently, the unweighted estimates apply to the screened sample rather than the district population. Self-reported diagnosis, medication use, sleep symptoms, and behavior may be affected by recall or social-desirability bias. The female-predominant sample and small numbers in some subgroups, particularly the treated hypertension group, reduced precision and limited generalizability.

Conclusion

Among adults attending a one-week screening campaign in the Tiko Health District, excess adiposity, hypertension, gaps in hypertension care, and positive OSA screening were common. Higher BMI, waist circumference, and waist-to-height ratio were consistently associated with hypertension, and obesity was linked to higher systolic and diastolic blood pressure. These findings support community-based detection with confirmatory blood-pressure assessment, longitudinal hypertension care, weight management, and objective sleep evaluation for screen-positive participants.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Regional Ethics Committee for Human Health Research, Southwest Region, Cameroon (Ref. No. 773/CRERSH/SW/C/09/2025; 15 September 2025). All participants provided written informed consent prior to participation.

Consent for publication

Not applicable; the manuscript contains no identifiable individual information.

Competing interests

The authors declare no competing interests.

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Author Contribution

LTM contributed to conceptualization, methodology, formal analysis, visualization, project administration, and writing the original draft. AMZS, TFT, BNS, MST, HOM, STE, and EI contributed to investigation, data curation, validation, and writing, review, and editing. CN and JJN contributed to conceptualization, methodology, supervision, validation, and writing, review, and editing. All authors read and approved the final manuscript and are accountable for all aspects of the work.

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Data Availability

The deidentified dataset supporting the findings of this study is publicly available in Mendeley Data: Mbapah, Leslie Tasha (2026), “Prevalence of OSA and Hypertension among Adults in Tiko Health District.dataset,” Mendeley Data, Version 1. https://doi.org/10.17632/53c6zzvhdw.1.

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Figures

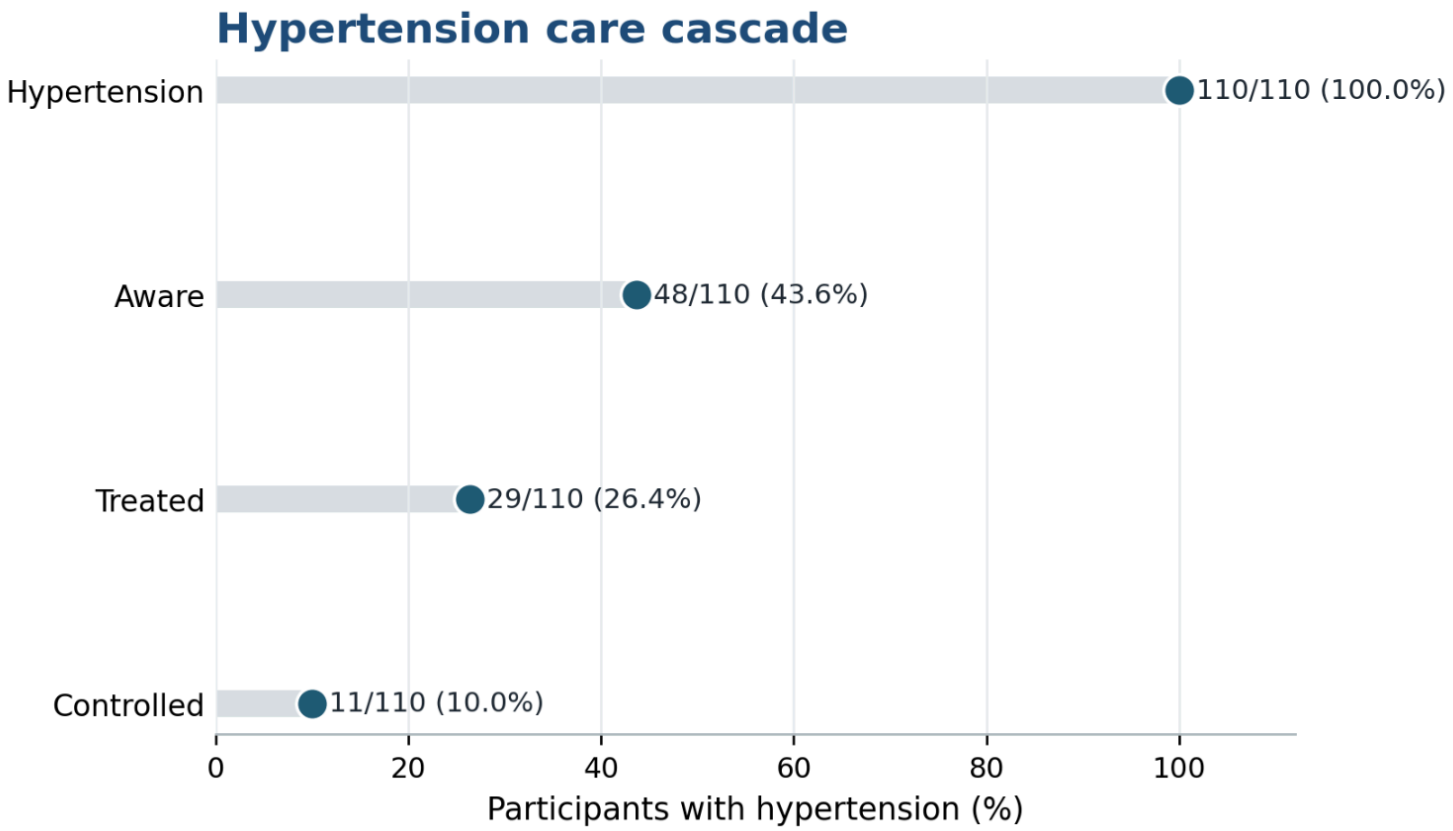


Figure 1

Hypertension care cascade.

Hypertension was present in 110/304 participants (36.2%). Awareness denotes a previous professional diagnosis, and treatment denotes current antihypertensive medication use. “Controlled” denotes treated participants with systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg: 11/110 (10.0%) of all participants with hypertension, equivalent to 11/29 (37.9%) of treated participants.

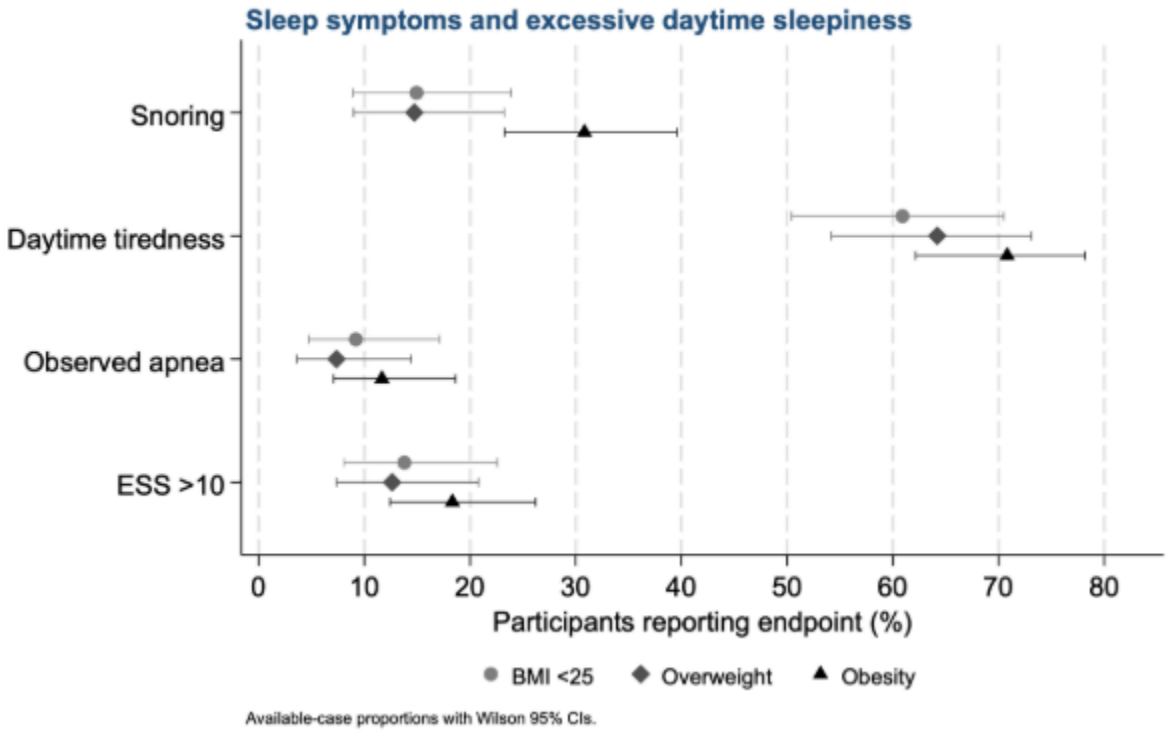


Figure 2

Sleep symptoms and excessive daytime sleepiness across BMI categories.

Points represent available-case proportions and horizontal bars indicate Wilson 95% confidence intervals. Excessive daytime sleepiness was defined as an Epworth Sleepiness Scale (ESS) score >10. BMI, body mass index.

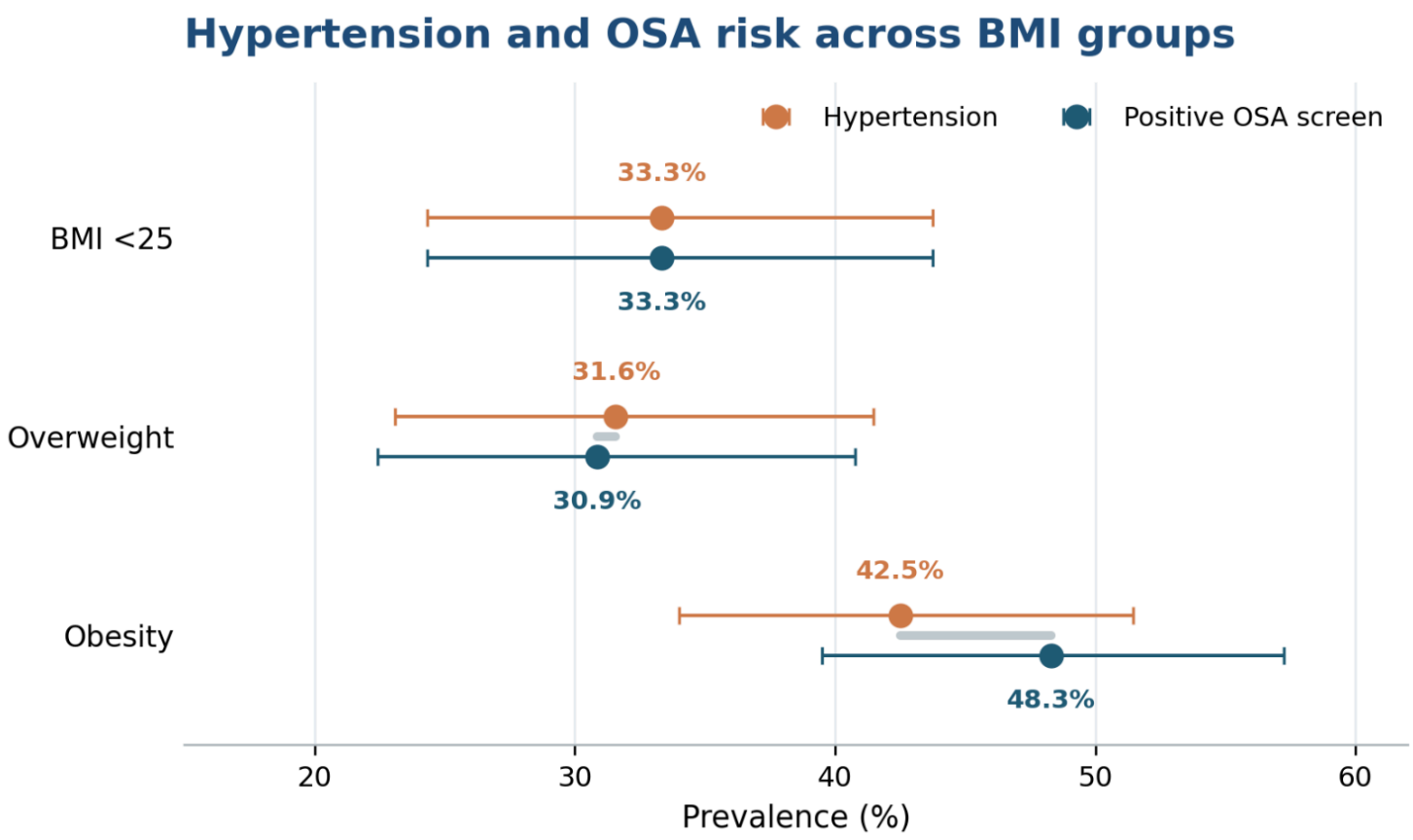


Figure 3

Hypertension and positive OSA screening prevalence across BMI groups.

Orange and blue points represent hypertension and a positive OSA screen (STOP-BANG ≥3), respectively; horizontal bars indicate Wilson 95% confidence intervals. Grey segments mark the numerical differences between the plotted estimates. BMI, body mass index; OSA, obstructive sleep apnea.