

# Checking “the pressure:” an analysis of risk factors for hypertension in southeastern Ghana

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## Background/Purpose

- Cardiovascular diseases (CVD) are the leading cause of mortality worldwide with 82% of these deaths occurring in low to middle income countries. <sup>1</sup>
- In 1977, the urban prevalence of hypertension (HTN) in Ghana was reported to be 11.3% and the rural prevalence was reported to be 4.5%. <sup>2,3</sup>
- Recent studies in the greater Accra and Ashanti regions found urban HTN prevalences of 32.9% and 33.4% and rural HTN prevalences of 24.1% and 27.0%, respectively. <sup>4,5</sup>
- The study objective was to investigate the prevalence of HTN in southeastern Ghana and its associated risk factors.

## Methods

- Cross-sectional study design was used.
- Data was collected at several health care and non-health care based locations in Keta and Ketu Districts of Ghana.
- Survey locations included governmentally-run Ketu District Hospital (Aflao), two mission hospitals (IHDN Mission Hospital, Wheta, and Sacred Heart Hospital, Abor), a bank (Abor), the local outdoor market in Agbozume, and two blood pressure screening events held in a bush village (Worgbato).
- Verbal and written consent obtained from all subjects in accordance with human subjects requirements set forth by the University of Iowa and the Noguchi Memorial Institute for Medical Research—University of Ghana.
- Subjects completed a questionnaire documenting general demographic, economic, and risk factor information as well as CVD status via an interviewer in the language with which the subject was most comfortable.
- Subject’s blood pressure was measured three times at two minute intervals with an electronic sphygmomanometer (Welch Allyn Spot Vital Signs® Devices REF 420 Series).
- Height was measured to the nearest centimeter, weight measured to the nearest kilogram, and BMI calculated (weight in kilograms/height in meters<sup>2</sup>).
- Each subject was given an assessment of their cardiovascular health based on analysis of examination measurements and questionnaire results.

## Data Analysis

- All subjects were classified as being hypertensive or non-hypertensive.
- Second and third blood pressure measurements were averaged for all analyses.
- HTN defined as a subject that had an average systolic blood pressure greater than 140 mmHg and/or an average diastolic blood pressure greater than 90 mmHg or a self-report of being treated for hypertension (figure 1).
- Student’s *t*-tests used to evaluate continuous variables.
- Pearson’s Chi-Squared analyses and logistic regression used to evaluate significant differences in the occurrence of HTN within different categorical population characteristics.
- P value <0.05 considered statistically significant.

**Table 1: Baseline Study Characteristics**

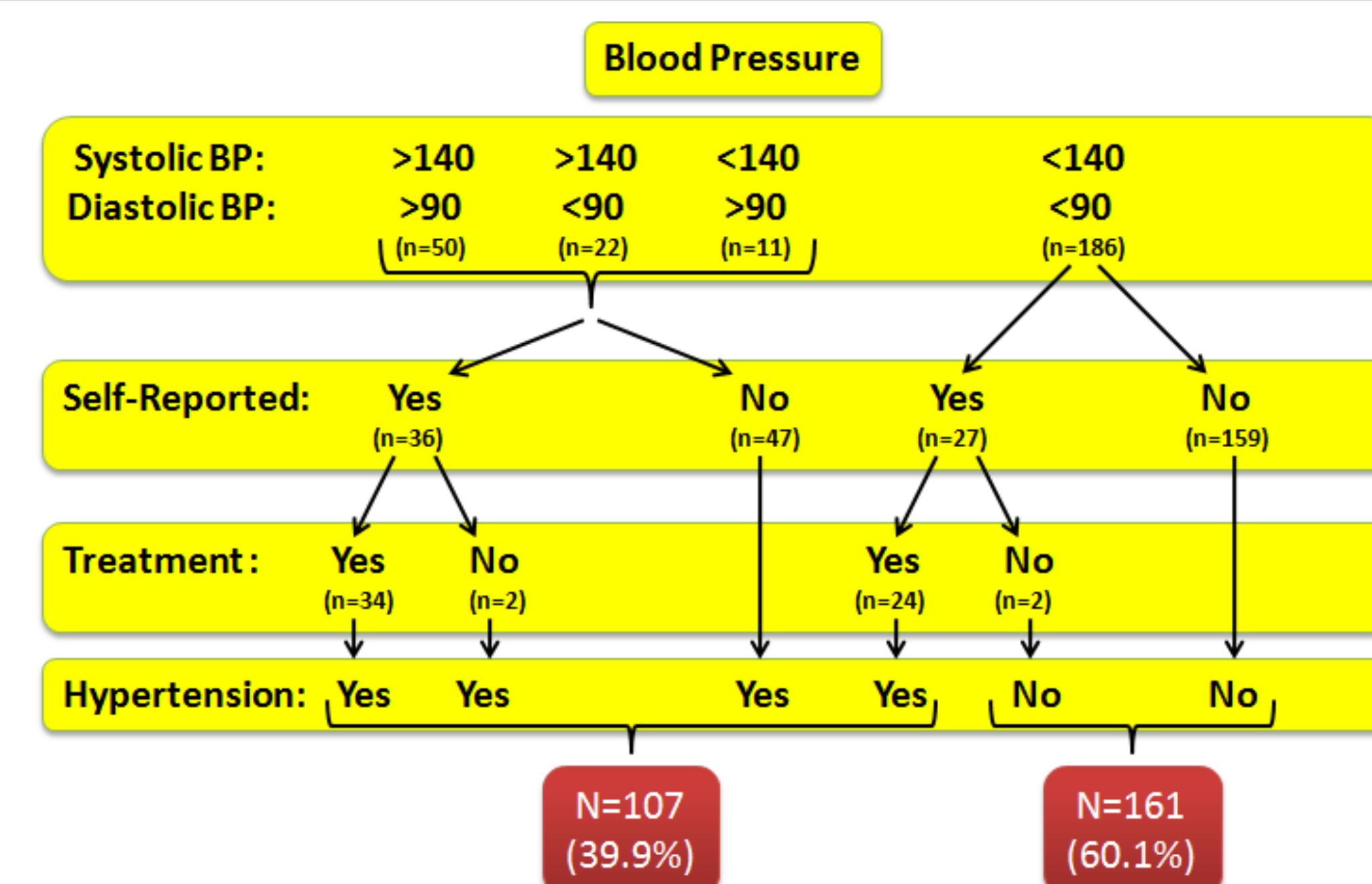
Variable (μ ± SD)	Total	HTN (n=107)	No HTN (n=161)	p value
Age	44.5 ± 16.5	52.8 ± 15.6	39.0 ± 14.7	<0.01
Systolic BP	131.2 ± 21.7	149.8 ± 21.0	118.9 ± 10.4	<0.01
Diastolic BP	81.1 ± 13.0	91.1 ± 13.0	74.4 ± 7.6	<0.01
BMI	25.3 ± 5.8	25.9 ± 5.0	25.0 ± 6.3	0.21

**Tables 2: Risk Factors by HTN Status**

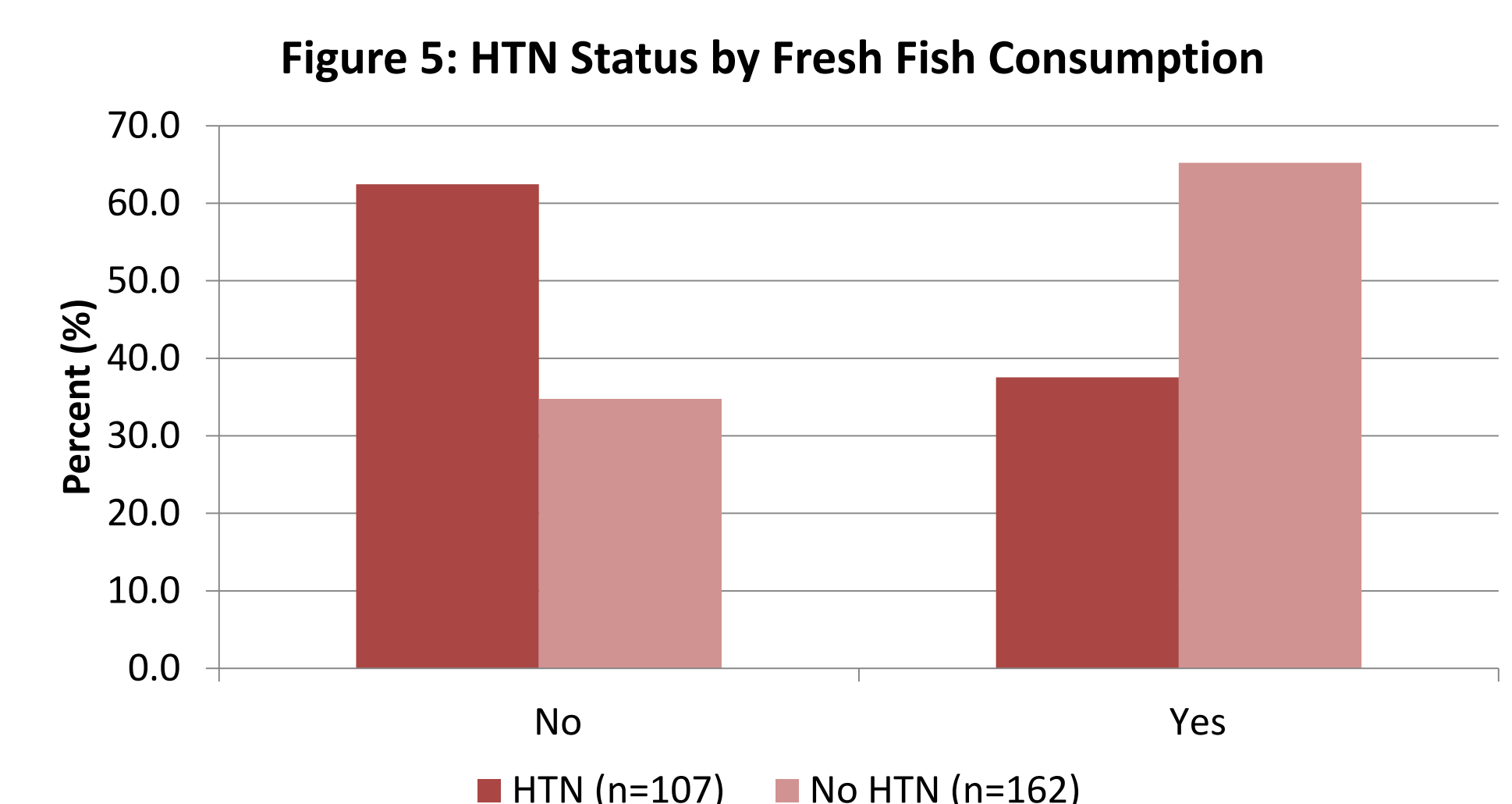
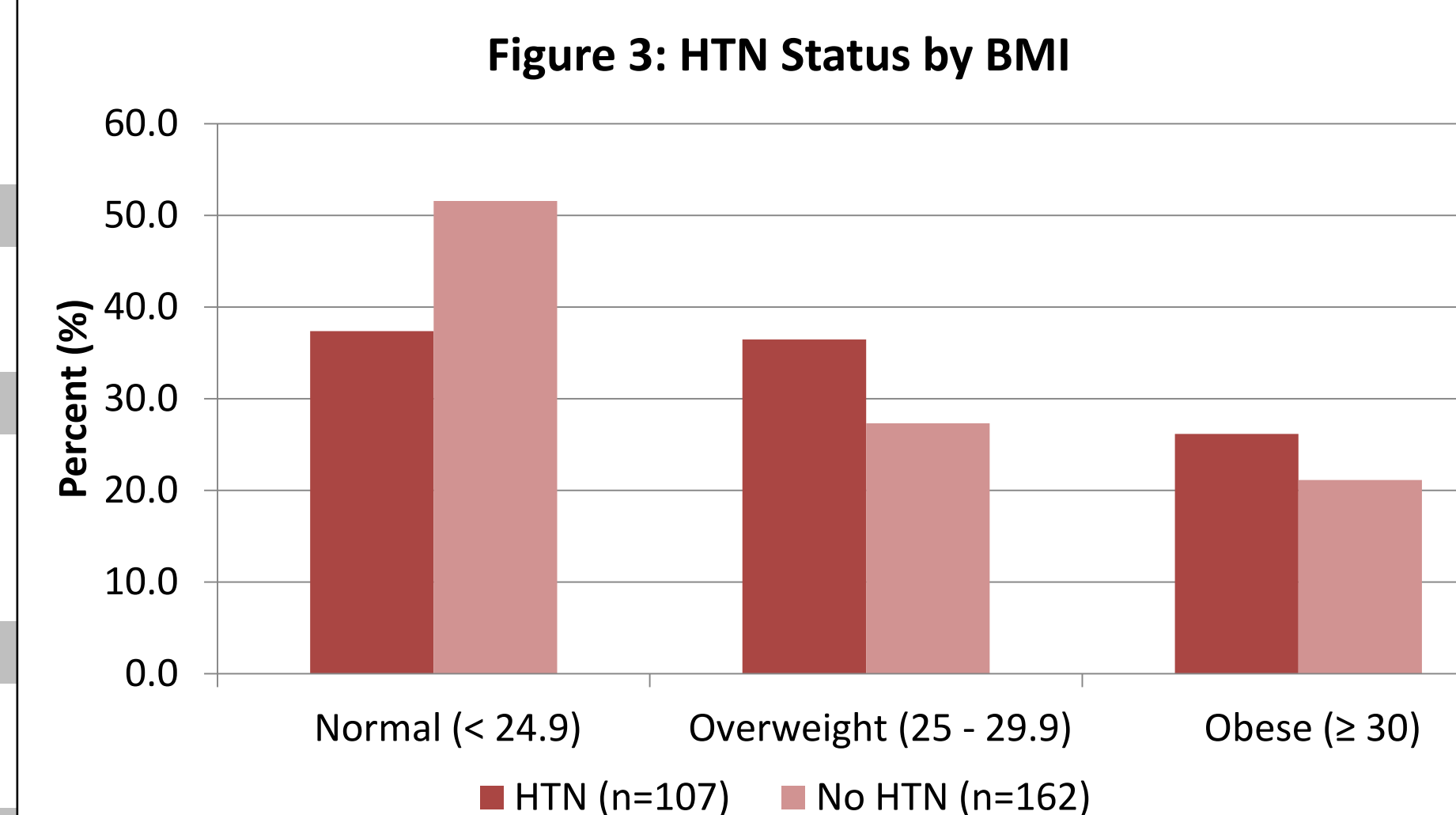
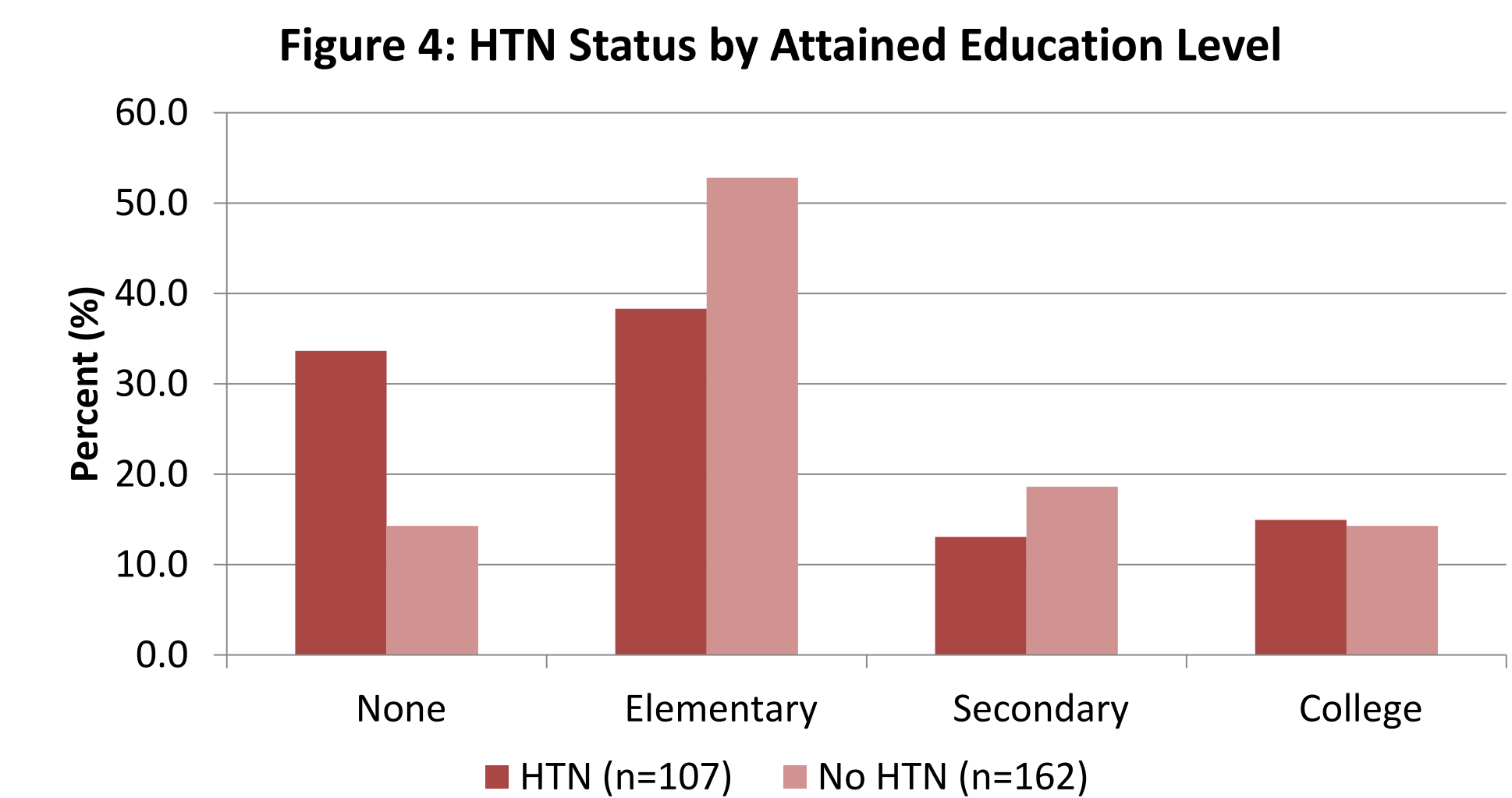
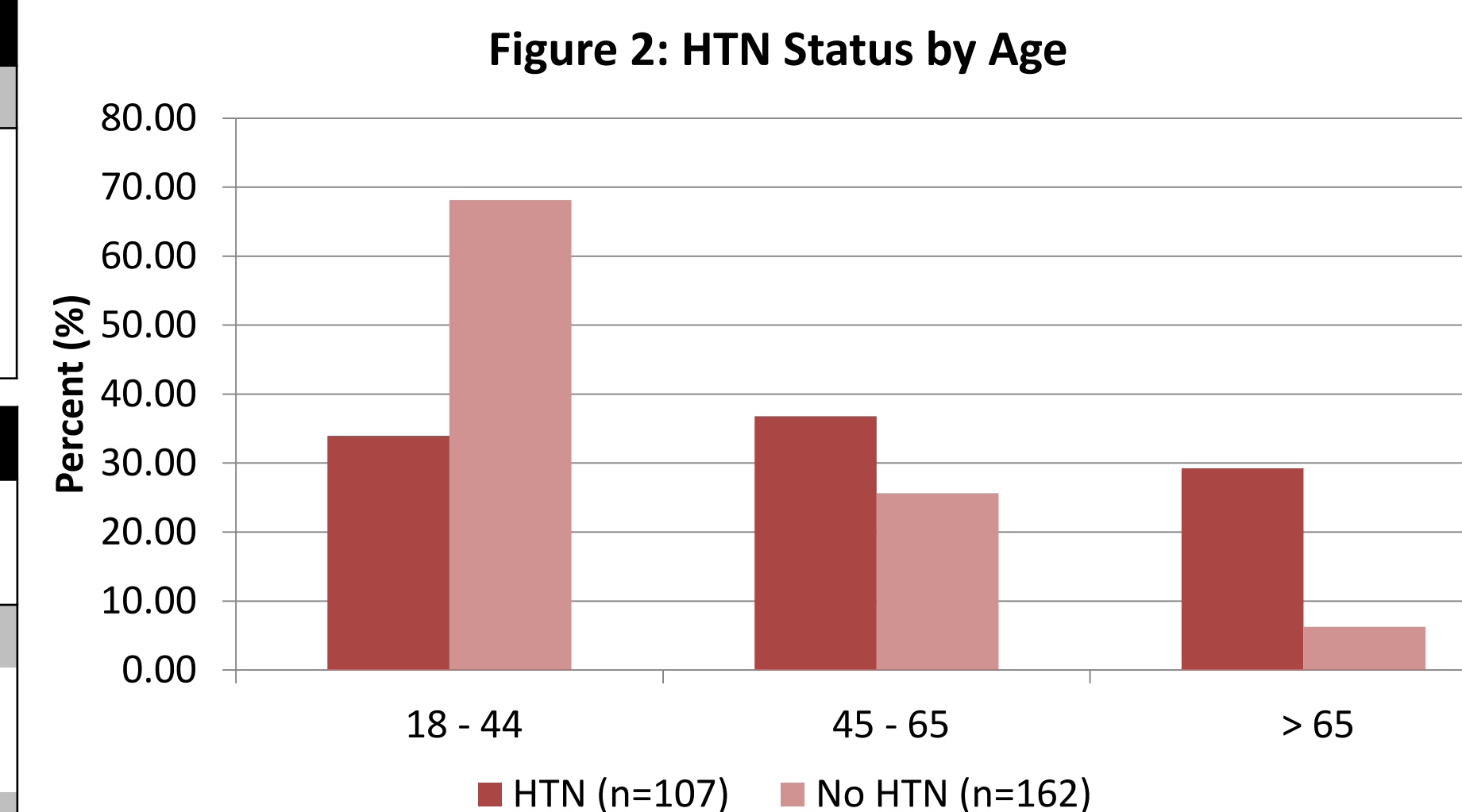
Variable	No HTN (n=162)		HTN (n=107)		OR	95% CI	P value
	n	%	n	%			
<b>Sex</b>							
Male	63	39.1	37	34.6	REF	REF	REF
Female	98	60.9	70	65.4	1.22	0.73-2.02	0.45
<b>Age</b>							
18 – 44	109	68.1	36	34.0	REF	REF	REF
45 – 65	41	25.6	39	36.8	2.88	1.62-5.13	<0.01
> 65	10	6.3	31	29.2	9.39	4.19-21.02	<0.01
<b>Subject Type</b>							
Patient	42	26.1	40	37.4	REF	REF	REF
Non-patient	119	73.3	67	62.6	0.59	0.35-1.00	0.05
<b>BMI Distribution</b>							
Normal (< 24.9)	83	51.6	40	37.4	REF	REF	REF
Overweight (25 - 29.9)	44	27.3	39	36.5	1.84	1.04-3.26	0.03
Obese (≥ 30)	34	21.1	28	26.2	1.71	0.91-3.20	0.09
<b>Family History of HTN</b>							
No	112	69.6	63	58.9	REF	REF	REF
Yes	49	30.4	44	41.1	1.60	0.96-2.66	0.07
<b>Alcohol Consumption</b>							
No	104	64.6	64	59.8	REF	REF	REF
Yes	57	35.4	43	40.2	1.23	0.74-2.03	0.43
<b>Smoke</b>							
No	154	95.7	105	98.1	REF	REF	REF
Yes	7	4.4	2	1.9	0.42	0.09-2.06	0.28
<b>Self Reported Diabetes</b>							
No	160	99.4	101	94.4	REF	REF	REF
Yes	1	0.6	6	5.6	9.50	1.13-80.08	0.04
<b>Education</b>							
None	23	14.3	36	33.6	REF	REF	REF
Elementary	85	52.8	41	38.3	0.31	0.16-0.59	<0.01
Secondary	30	18.6	14	13.1	0.30	0.13-0.68	<0.01
College	23	14.3	16	15.0	0.44	0.20-1.01	0.05
<b>Income/mo. GH¢ (\$)</b>							
<30 (21)	48	29.8	47	44.3	REF	REF	REF
31 - 100 (22-70)	49	30.4	34	32.1	0.71	0.39-1.28	0.26
>100 (70)	26	16.2	16	15.1	0.63	0.30-1.32	0.22
Other*	38	23.6	9	8.5	0.24	0.11-0.56	<0.01
<b>Fresh Fish Consumption</b>							
No	8	34.8	153	62.5	REF	REF	REF
Yes	15	65.2	92	37.6	0.32	0.13-0.79	0.01
<b>Primary Transportation</b>							
Automobile	61	56.5	100	62.5	REF	REF	REF
Walk or Bike	47	43.5	60	37.5	0.78	0.47-1.28	0.32

\*Refusal to answer or not applicable due to unemployment or dependent status

**Figure 1: HTN categorization algorithm**



## Results



- Study population comprised of more females (63%) than males (37%) and non-patients (69%) than patients (31%).
- Participants were not significantly overweight, with 77% having a BMI <30, and few reported being diabetic (3%) or smoking (3%).
- HTN prevalence was 40%.
- Approximately a third of the subjects reported some family history of HTN (35%), but no significant association was observed relative to HTN status.
- Age (p<0.01; figure 2), diabetes (p=0.04), and being overweight (p=0.03; figure 3) were observed to be significant risk factors in the likelihood of having HTN.
- Significant protective factors included elementary education (p<0.01), secondary education (p<0.01), and consumption of fresh fish (p≤0.01) [figures 4 & 5].
- Upon adjustment for age, all risk factors but family history were non-significant (\*Data Not Shown).

## Strengths

- Study population from a largely rural region of Ghana and of varied socioeconomic and health statuses.
- Multiple sequential blood pressures measurements used to determine hypertension status.

## Limitations

- Small sample size
- Selection bias likely exists and hypertensive patients may have been more (or less) likely to participate in the study.

## Conclusion

- High rates of HTN among the adult population were found despite limited appearance of risk factors such as obesity, diabetes, and smoking.
- Modifiable risk factors associated with high rates of HTN have yet to be elucidated.
- Results suggest that focusing on common Western risk factors may not be as relevant in this population.
- Findings may have implications in the development of future HTN prevention programs in the region.

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