Prevalence of Hypertension and Associated Risk Factors in Adults from a Semi Urban District in Ghana: A Population Based Survey

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ABSTRACT

Objectives: Given the paucity of community based surveys on hypertension and other non-communicable diseases in the Akwapim North District (AKND) of Ghana's Eastern-Region (ER), we conducted a population survey to determine the prevalence of hypertension and its associated determinants.

Methods: We recruited 519 adults age ≥ 25years in a multi-stage sample of enumeration centres over a one-month period. We measured body weight, waist and hip circumference, height, blood pressure (BP), and obtained demographic and risk factor information. Univariate and bivariate-analysis determined the prevalence of hypertension, significant difference and predictors of known risk factors ($p < 0.05$).

Results: Among the 519 participants, 62.8% were women. The mean age and body mass index (BMI) were 48.6 ±16.8 years and 23.2 ± 5.2 kg/m^2 respectively. Prevalence of hypertension was 32.2% with a male-to-female distribution of 27.5% and 35.0% respectively. The prevalence of alcohol use was high at 65.6% (340/519). Age and waist circumference were predictors of diastolic BP.

Conclusions: There is a high prevalence of hypertension in the AKND of Ghana. Stakeholders should structure interventions on hypertension to promote healthier-lifestyles.

Key words: Hypertension, prevalence, community, Akwapim North District, Ghana

INTRODUCTION

Hypertension, defined as blood pressure in excess of 140/90 mm Hg is now the leading risk factor for global disease burden. The large disease burden attributable to high blood pressure emphasises the importance of implementing both population-wide and high-risk approaches to reduction of blood pressure [Lim et al. 2013].

Until recently, hypertension was thought to be rare in rural Africa [Shaper et al. 1969; Pobee et al. 1977], but it is now ranking among the top ten global disease burden risk factors in all parts of sub Saharan Africa [Lim et al. 2013]. High rates of hypertension and its complications, including stroke, heart failure, and renal failure, have been reported in persons of African origin all over the world. The prevalence of hypertension in 2008 in Sub Saharan Africa is estimated at 16.2% (slightly higher in men than women and higher in urban than rural populations). In 2025, the equivalent figure is expected to rise to 17.4% [Poulter 2011].

Over the last 50-60 years there has also been an increase in prevalence of chronic diseases especially hypertension in Ghana [Aikins 2007]. Studies in rural Ghanaian communities during the 1970s/1980s reported hypertension prevalence between 2% and 5%. In the 1980s/90s a prevalence of 4.1% was reported; thereafter prevalence estimates increased dramatically to 32.8% reported in 2002; 25.4% reported in 2005; 19.3% reported in 2009 [Pobee et al 1977; Burket 2006; Addo et al. 2006; Kunutso 2009]. Meanwhile, a national NCDs review (1998), recorded a prevalence of 27.8% for hypertension while more recent studies reported prevalences ranging from 19% to 48% [Bosu 2007; 2010]. Bosu [2010] estimated that at least, 3.5 million adults have hypertension. Although this compares highly with 236,151 adults

estimated to be living with HIV and AIDS in Ghana, response by national health policy to hypertension has been considerably weaker to date.

In 2006, prevalence rate of smoking in a study in Amasaman near Accra was 6.1% and 0.3% in men and women respectively [Addo et al. 2006]. An NCD-risk-factor-survey conducted in 2010, in Greater Accra Region reported smoking prevalence rate of 5.5% and 0.3% among males and females respectively. According to the Ghana Demographic Health Survey (GDHS), 53% of Ghanaian women and 26% of men are not physically active. Similarly, 18% of Ghanaian women and 52% of men in their early forties drink alcoholic beverages [GSS 2008]. A world-wide health survey in 52 countries identified Ghana as having a low fruit and vegetable intake with a prevalence of 36.6% in males and 38% for women [Hall 2009].

Data on hypertension and its risk factors in populations from the Eastern region (ER) of Ghana is still sparse. From the reports of ER public health facilities demonstrate that proportional morbidity of hypertension increased from 5.1 % in 2006 to 8.5% in 2010 [ERHD 2010]. Similarly, the Akwapim-North-District (AKND) of ER recorded an increase from 1.2 % in 2006 to 6.2% in 2010 [Opare 2011]. But this information on the prevalence of hypertension and its risk factors in the ER of Ghana is unreliable due to poor data capture. The accuracy and representativeness of the routine institutional data is inadequate. There have been no population-based studies in any of the 21 districts in the ER on the magnitude and risk factors of NCDs where Akwapim-North is located. Considering that hypertension is becoming more common as urbanization increases, the purpose of the study was to provide population based data on the prevalence of hypertension and their known major risk factors in a semi urban AKND to provide the much needed reference data on NCDs risk factors to drive NCDs prevention and control strategies in this district.

METHODS

Akwapim North District (AKND) is located in the south-eastern part of the ER and is about 58 km from Accra**.** It has an estimated population of 122,068 with 450 km^2 land area and a percentage urban: rural population of about 60:40. It has a population growth rate of 1.4% and a sex ratio of 96.8 males to 100 females. It consists of 8 sub-districts and is served by 2 hospitals and 29 smaller health facilities. Hypertension continues to be among the common causes of out-patient attendance with stroke as a major cause of mortality. Interventions on NCDs have been centered on the promotion of health-walks in the communities and some health-education the prevention of NCDs.

Sample size and sampling

The study design involved a cross-sectional household survey, using a structured questionnaire adapted from the WHO-STEP as well as direct physical measurements. Inclusion criteria were residency in the AKND for a minimum period of 6 months and age 25years or older. Sample size calculation was based on the sample size calculator provided by WHO-STEP [Bonita 2002]. To determine a 20% or higher prevalence of hypertension [Bosu 2010] at a precision of 0.05% a sample size of 460 participants would be sufficient. With a response rate of 80% and design effect of 1.5 the sample was rounded-up to 530.

A multi-stage sampling technique was used to select study participants in the district. Two out of the five enumeration areas were randomly selected and a number of households were randomly selected from each sampled enumeration area by probability proportional to size (PPS). Within a household, all persons aged 25 years and above in the selected households were invited to participate in the survey. A total of 519 adults, whose ages ranged between 25 and 89 years, consented and participated in the house survey, yielding a response rate of 98%.

Ethical issues

Ethical clearance was sought from the Ghana-Health-Service Ethics-Committee and an official permission from the District-Health-Directorate. The importance of the study, the aims and processes as well as any possible risks involved was fully explained to the participants before obtaining their informed consent. Informed-consent was also obtained from community chiefs, elders, and household-heads. Participants had the right to take part in the study or not. The confidentiality of the respondents was protected through the use of de-identified and coded-data. Data was stored in a cabinet with access restricted to the research team. Results of blood pressure were communicated to individual respondents during the time of field measurements and necessary advice rendered based on individual status. There was a prior arrangement with near-by health facilities for possible referrals.

Data collection

Primary data was collected with reference to WHO STEPS approach for non-communicable diseases risk factor surveillance [Bonita, 2002].

Step 1: Questionnaire:

The WHO STEPS questionnaire was translated into the local language and suitably modified. It captured data on socio-demographic characteristics and 5 parameters related to tobacco, alcohol use, diet, physical activity and history related to diagnosis and treatment of hypertension

Step 2: Physical Measurements:

(a) Anthropometric

Height, weight, and waist measurements were taken using SECA-instruments. Body weight was measured on subjects in light clothing and without shoes to the nearest 0.1 kg using a mechanical scale. Height was measured to the nearest 0.1 cm with a commercial stadiometer in standing position with closed feet, holding their breath in full inspiration and Frankfurt line of

vision. Body-mass-index (BMI) was calculated as weight in kilograms divided by height in meters square. Overall obesity was defined as a BMI ≥ 30 [WHO 1993]. The Figure Finder Tape Measure was used to measure the waist circumference in centimetres. This measurement was taken in a private area. The midpoint between the inferior margin of the last rib and the crest of the ileum were marked using a tape measure. With the assistance of the participant, the tape measure was wrapped around the waist directly over the skin or light clothing. Just before the measurement was taken, the participant was requested to stand with their feet together, place their arms at their side of their body with the palms of their hands facing inwards, and breathe out gently. Abdominal obesity was defined as a waist circumference of ≥ 102cm in men or ≥88 cm in women [WHO 1999].

(b) Blood pressure

The blood-pressure was measured using an electronic BP monitor (Omron Healthcare Inc., Vernon Hills, Illinois, USA), with adult size-cuff. Two readings of systolic and diastolic blood pressure were taken on the right arm of each subject in a sitting position after a 10-minute rest. The time interval between the first and the second reading was at least 5 minutes. If the difference in the two readings is >10 mm Hg, a third reading was taken. The mean of the two (or three) readings was used in the analyses. Hypertension was defined as a systolic BP ≥140 mm Hg and/or a diastolic BP ≥90 mm Hg or being on drug therapy for hypertension. [Chalmers et al., 1999].

Data Quality Control Measures

The Principal Investigator and data collectors were trained on standard data collection methods and measurements prior to the exercise in a 2-day workshop to ensure uniformity. Questionnaires were pretested in a non-selected district and adapted as needed. A random selection and review of completed questionnaires and measurements were done. There was a daily calibration of instruments.

Data management and statistical analysis

Two data entry clerks were trained to enter the data using Epi Data version 3.5.1. Data was double entered and validated. The data entry template had consistency and range checks embedded in it. The data entry clerks were trained and supervised by the Principal Investigator**.** Univariate analyses were applied to derive absolute disease and risk factor prevalences. Inferential statistics of independent sample t-test was used to compare the difference in physical characteristics and BP of the participants with respect to sex.

A linear regression model with logarithmically transformed continuous blood pressure as the outcome and a random effect for household assessed the independent influence of age, gender, risk factors (alcohol intake, tobacco smoking and chewing, BMI, waist circumference, fruit & vegetable intake, physical activity on blood pressure. Significance level was set at 95% confidence level. To assess their knowledge of hypertension, participants were asked to mention any three facts (any correct facts on nature of disease, clinical signs, prevention) on the disease and all those who answered correctly were classified as having adequate knowledge .The analysis was carried out using SPSS 13.0 version software (SPSS Inc., Chicago, Illinois, USA) and Epi-info version 3.5.1

RESULTS

Characteristics of the study population

A total of 519 adults participated in the study [193(37.2%) men and 326(62.8%) women]. The mean age, weight, height, and body mass index were 48.6 ±16.8 years, 60.0 ± 11.5 kg, 1.64±0.85m, and 23.2 ± 5.2 kg/m2, respectively. The ages of respondents ranged from 25 to 89 years. The mean BP of all the participants were 131±25 mmHg and 75 ±13.4 mmHg for SBP and DBP respectively whereas the pulse rate was 73.1 ±12.6 beats/min. (Table 1). Two hundred and ten (40.55) participants had obtained some formal education, 287(55.35) were married and 58% worked in the farming sector.

193 Table1: General characteristic of the participants, AKND-2012

Variable	Male participants(n=193)	Female participants (n=326)	All	*P* value
Age (yrs)	48.7 ±17.5	48.5 ± 16.4	48.6 ±16.8	0.9000
Weight(kg)	60.0 ± 10.3	59.5 ± 12.1	60.0 ± 11.5	0.1577
BMI(kg/m^2)	22.2 ± 4.9	23.8 ±5.3	23.2 ± 5.2	0.0011*
SBP(mm hg)	129.2 ± 22.7	132.7 ± 26.3	131±25	0.1274
DBP(mm Hg)	73.0 ± 11.9	75.9 ± 14.1	75 ±13.4	0.0327*
Heart rate (beats/minute)	71.1 ±12.3	74.7 ± 12.6	73.1 ±12.6	0.0003*
Waist circumference	84.4±9.8	88±12.2	86±11.5	0.0006*

194
195 BMI, body mass index; DBP, diastolic blood pressure; SBP, systolic blood pressure. * Indicate
196 significance difference at P <0.05.
197
198
199
200 **Prevalence of hypertension**
201 The prevalence estimate of hypertension based on 140/90 mm Hg definition was 32.2%
202 (167/519) with a male-to-female distribution of 27.5% (53/193) and 35.0% (114/326)
203 respectively. Hypertension prevalence increased with age and was more common in women.
204 (Table 2 & 3).
205
206
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Table 2: Body mass index (BMI), blood pressure levels, and hypertension prevalence according to age and sex-AKND, 2012

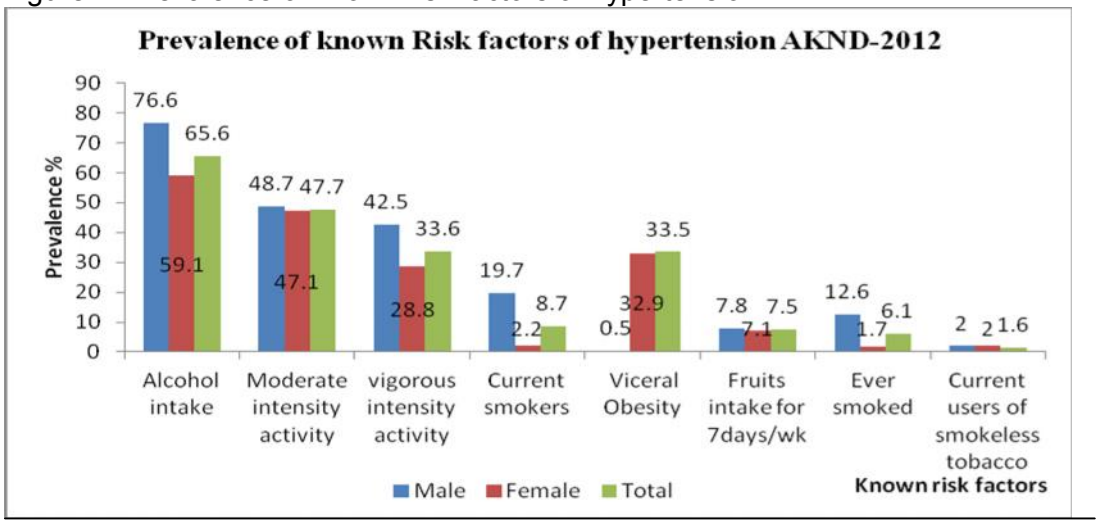
Age (yrs) Men	Number	BMI	SBP mm Hg	DBP mm Hg	Hypertension 140/90mm Hg (n)%
25-34	55	23.2±6.3	118.3±15.4	66.5±100	4(7.3)
35-44	32	23.1±4.3	119.8±13.4	70.7±9.4	2(6.3)
45-54	32	22.4±3.9	125.6±16.5	72.8±10.5	8(25)
55-64	27	21.4±3.0	138.3±22.2	77.2±11.9	10(37.0)
≥65	47	20.9±4.7	145.4±27.5	79.9±12.3	29(61.7)
Total	**193**				**53 (27.5)**

Table 3: Body mass index (BMI), blood pressure levels, and hypertension prevalence according to age and sex-AKND, 2012

Age (yrs) Women	Number	BMI	SBP mm Hg	DBP mm Hg	Hypertension 140/90mm Hg (n)%
25-34	70	24.7±5.7	118.3±18.8	71.4±14.1	5(7.1)
35-44	82	24.3±4.8	125.4±19.7	74.3±10.9	19(23.2)
45-54	64	24.4±5.5	133.1±29.1	76.2±15.5	19(29.7)
55-64	41	22.8±15.6	142±26	81.5±16.7	22(53.7)
≥65	69	22.1±5.0	149.9±25.9	78.6±13.1	49(70.0)
Total	**326**				**114 (35%)**

The prevalence of obesity and overweight were 7.5% and 26.0% respectively. A high prevalence of alcohol intake was reported 65.6% (338/515) as well as a very low intake of fruits and vegetables according to recommendations 7.3% (69/519) (figure1).

Figure 1: Prevalence of known risk factors of hypertension



226 Table: 4: Effects of risk factors and others on blood pressure, AKND-2012

	Systolic Blood Pressure				Diastolic Blood Pressure		
Variable	**Estimates**	**Std Error**	**P-Value**		**Estimates**	**Std Error**	**P-Value**
Alcohol intake	0.0328	0.01541	0.0338		-0.01112	0.01593	0.4857
Age	0.005223	0.000438	<.0001*		0.003128	0.000452	<.0001*
BMI	0.00025	0.001604	0.876		-0.00169	0.001654	0.3088
Fruit servings	0.000859	0.006075	0.8876		0.000264	0.006281	0.9665
Waist Circumference	0.001827	0.000714	0.0108*		0.002764	0.000738	0.0002*
Vigorous work	0.02797	0.01615	0.0838		0.02266	0.01668	0.175
Moderate Intensity	-0.01312	0.02401	0.5849		-0.00234	0.02481	0.925
Gender	0.01147	0.01572	0.4658		0.02937	0.01625	0.0713
Smoke tobacco	-0.02857	0.02716	0.2933		0.000496	0.02808	0.9859
CONSTANT	0.0328	0.01541	0.0338		-0.01112	0.01593	0.4857

227 * Indicate significance at P <0.05.
228
229 Only age and waist circumference turned out to be the significant predictors of systolic and
230 diastolic blood pressures blood pressure (Table 4).

231 **Level of awareness and knowledge among the people on hypertension**
232
233 Ninety percent 90% (467/519) of the respondents were aware of their hypertension but
234 adequate knowledge on the disease which involved the knowledge of any three correct facts on
235 the disease was very low 8% (41/519).

236
237 **DISCUSSIONS**
238
239 Our study found that hypertension is prevalent (32.2%) in the Akwapim North District in the ER
240 of Ghana and adds to the evidence that high rates of hypertension are no longer restricted to
241 urban settings in sub-Saharan Africa.

242 In various studies of adult populations in urban and semi-urban areas in Ghana, the prevalence
243 of hypertension (BP140/90 mmHg) ranged from 25.4 to 29.4% [Amoah 2003; Cappuccio et al.
244 2004; Addo et al. 2006; Agyemang 2006]. In one study conducted in rural communities
245 surrounding the capital city of Accra, the prevalence of hypertension was 25.4%; hypertension
246 was considered a rare disease in this area only 30 years ago [Addo et al. 2006].The prevalence

247 of hypertension (32.2%) in this study was almost similar with prevalence estimate of 32.9% in
248 another study in semi-urban communities from Kumasi, Ghana using the 140/90 mm Hg
249 definition [Cappuccio et al 2004]. The setting of both studies are alike in characteristics, as a
250 semi-urban community was described in terms of availability of real infrastructure such as main
251 water supply or sewage, electricity and proximity to urban centers compared with the rural
252 setting where most of these are missing. An even higher prevalence of hypertension (35%) has
253 been reported in a study in Adankwame, a rural community, near Kumasi in the Ashanti Region
254 of Ghana [Mariana Cook-Huynh et al 2012] and 36.6% in a historical ancient town of Ile-Ife,
255 Nigeria [Adedoyin et al. 2008] representing the first community-based survey on hypertension
256 from a semi-urban setting in Nigeria. Very high prevalences of hypertension in semi-urban
257 studies have also been reported in Burkina Fasso (40%) [Niakara et al. 2007]
258
259 Pobee et al., described an epidemic of hypertension in Ghana in 1979 [Pobee et al. 1979] and
260 this community-based study has demonstrated that the epidemic has persisted or increased.
261 The consistently higher prevalence of hypertension among Ghanaian adults is difficult to
262 explain. BMI has been shown to be one of the most important factors for explaining
263 geographical differences in hypertension among African descent populations [Copper et al.,
264 1997] The fact that in our study BMI, an established risk factor for hypertension, was more
265 prevalent in younger age groups suggests that the prevalence of hypertension will continue to
266 increase as these younger birth cohorts age. Increasing stress, and a decline of the traditional
267 social support systems due to increasing urbanization and adoption of western lifestyles may be
268 contributing to the high BP levels. [Agyeman et al., 2006]
269 Our study and those from Ghana cited above are not nationally representative, and as yet, no
270 nationwide study has been conducted to determine the prevalence of hypertension in Ghana.
271 However, because this chronic disease requires early diagnosis and consistent follow-up to
272 control, it is important to recognize it in any population. Country and region specific population-

273 based data is essential for estimating the burden of disease and for determining policy needs
274 [Chan 2013].
275 Our study revealed that hypertension prevalence was more common in women and increased
276 across age gradient from young to old adults. Using the blood pressure (BP) greater than or
277 equal to 140/90mmHg BP threshold, this finding agrees with other studies that found
278 hypertension to be commoner among women [Cappuccio et al. 2004, 1997; Amoah 2003]
279 based on this cut-off point. However, it disagrees with a similar study in a semi urban
280 community in Nigeria [Adedoyin et al. 2008]. Though the degree of hypertension varies among
281 the sexes, no clear pattern of association between hypertension and sex has emerged.
282 Among the known risk factors alcohol intake was found to exhibit a high prevalence. This might
283 be a contributory factor to the high prevalence of hypertension in this semi-urban communities,
284 as epidemiologic evidence suggests that heavy alcohol consumption is strongly associated with
285 increased risk of hypertension [Taylor 2009]. Alcohol intake was in fact independently and
286 positively associated with systolic blood pressure in our survey. Besides alcohol, the high
287 prevalence of visceral adiposity observed in this study is also of concern, given its independent
288 association with both, systolic and diastolic blood pressure. Finally, age was a strong
289 independent risks factor of BP, paralleling other study findings from semi-urban communities in
290 Ghana and Uganda [Agyeman et al. 2005, 2006; Maheret al. 2011; Wamala et al. 2009].
291
292 Our study also found out that while awareness of hypertension was relatively high, the
293 knowledge on the basic facts on hypertension and its prevention remain very low. Other studies
294 have assessed hypertension knowledge and awareness in the general population with some,
295 but not all, showing a decreased level of knowledge and awareness [Hinds, 1983; Weiland et
296 al.1991; Chockalingam et al.1998]. A facility-based study conducted in Sekondi–Takoradi
297 among patients attending a hypertension clinic in Ghana, indicated a 73% knowledge level on
298 hypertension and diabetes. More than 50% knew high salt intake, obesity, smoking tobacco,

and drinking alcohol to be among the risk factors for diabetes and hypertension and more than 40% recognised the beneficial effects of physical activity [Collins 2004; Spencer et al. 2005]. Changing modifiable risk factors may result in an increase burden of hypertension, and people have to know that they are at risk of hypertension to be able to make voluntary lifestyle changes. However, there are many barriers to such awareness in rural and minority populations, including lack of formal school education, communication gaps, and inaccessibility to routine health education programs on diet, physical activity, alcohol, tobacco use etc. Many studies have reported the prevalence of hypertension and its risk factors, but few have paid attention to the prevalence of knowledge and awareness about these risk factors in their study populations.

Potential limitation of the current study

Though the study design provides reliable and valid information, the study may have some limitations. Our findings may be biased to the extent that non-respondents differed from those that participated in the survey. Additionally, some bias may have resulted from including in our study sample subjects from the same household. Household members are more likely to share lifestyle than persons from different households. We are unable to assess the direction of the bias. The study did not look at lipids and glucose metabolism due to financial constrains

Conclusions and recommendations

There is a high prevalence of hypertension in the Akwapim North District of the Eastern region of Ghana with a relative high awareness but rather inadequate knowledge on the disease. Although this study is small, it adds significant information to the relatively scanty information available on hypertension. The knowledge of this current prevalence rates is obviously critical for the development of strategies to prevent and treat hypertension. It is however recommended

that Stakeholders need to intensify health education on HPT especially on the known risk factors, and encourage formation of more fitness clubs in the communities.

Competing interests

The authors declare that they have no competing interests

Authors' contributions

JKLO drafted the proposal, participated in the design of the study, supervised data collection and drafted the manuscript. EA, NPH, AH participated in the proposal design, interpretation of the results and helped to critically revise the manuscript. DM reviewed study design and CS assisted in data analysis. OSO assisted in reviewing the pilot study. All authors read and approved the final manuscript.

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