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Association between ABO Blood Groups and Hypertension among Adult Patients Attending the Diabetes and Hypertension Support Centre at Weija-Gbawe Municipal Hospital, Ghana

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Abstract:

Methods: A cross-sectional analytical study was conducted among 150 clinically diagnosed hypertensive adults. Sociodemographic, lifestyle, and clinical data were collected using structured questionnaires. ABO and Rh blood grouping were performed using standard methods, while blood pressure classifications followed WHO and ACC/AHA guidelines. Chi-square tests assessed associations between blood groups and hypertension categories, and binary logistic regression evaluated the predictive influence of age, sex, and BMI.

Results: Blood group O was the most prevalent (70.7%), followed by B (18.0%), A (10.0%), and AB (1.3%). Most participants (68.7%) were classified as having Stage 2 hypertension despite ongoing treatment. Chi-square analysis showed no significant association between ABO blood groups and hypertension categories ($\chi^2 = 8.647$, $p = 0.470$). Logistic regression revealed that sex ($p = 0.592$), age ($p = 0.766$), and BMI ($p = 0.785$) were not significant predictors of hypertension within the sample.

Conclusion: The distribution of ABO blood groups among hypertensive patients largely mirrored the general Ghanaian population, and no significant association was found between blood group type and hypertension severity. Demographic variables also showed no predictive value. These findings suggest that ABO blood group typing does not contribute to hypertension risk stratification in this setting. Efforts should instead focus on addressing modifiable lifestyle and metabolic risk factors.

Keywords: ABO blood group, hypertension, genetic markers, risk factors, Ghana, cardiovascular health.

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Introduction

Hypertension remains one of the leading global public health challenges and a major contributor to cardiovascular disease, stroke, and renal failure (World Health Organization [WHO], 2021; Mensah et al., 2019). More than 1.28 billion adults worldwide are hypertensive, with the majority residing in low- and middle-income countries, including many in sub-Saharan Africa (WHO, 2021). In Ghana, hypertension continues to rise and constitutes a major cause of outpatient visits, morbidity, and premature mortality (Ghana Health Service, 2023). Traditional risk factors such as age, obesity, high salt intake, alcohol consumption, physical inactivity, and genetic predisposition are well established (Mills et al., 2020). However, recent attention has shifted toward exploring non-traditional and genetic risk markers, including the ABO blood group system.

The ABO blood group system, which classifies individuals into groups A, B, AB, or O, is one of the most clinically significant blood grouping systems due to its immunological relevance in transfusion medicine (Daniels, 2013; Harmening, 2012). Beyond transfusion science, evidence suggests that ABO antigens may influence vascular and inflammatory pathways involved in endothelial function, thrombosis, and blood pressure regulation (Chowdhury et al., 2018; Bhattacharya et al., 2019). Several epidemiological studies worldwide have investigated the relationship between ABO blood groups and hypertension, yet findings remain inconsistent. Some studies report increased hypertension risk among individuals with blood group A or AB (Elzouki et al., 2016; Yousuf et al., 2020), while others find no significant association (Jalali et al., 2019; Gedefaw et al., 2015).

Within African populations, available data on the association between ABO blood groups and hypertension are limited and inconclusive. Research from Nigeria, Sudan, and Burkina Faso has reported variable blood group distributions among hypertensive patients, with some suggesting a higher burden in non-O blood groups (Adeoye & Olayemi, 2017; Babiker et al., 2019; Sawadogo et al., 2020). Given the high prevalence of hypertension in Ghana and the increasing interest in genetic markers as potential risk indicators, further research is needed to better understand this relationship within local populations.

This study therefore seeks to assess the association between ABO blood groups and hypertension among adult patients

attending the Diabetes and Hypertension Support Centre at the Weija-Gbawe Municipal Hospital in Ghana. Understanding whether ABO blood type contributes to hypertension risk may enhance early risk stratification and support tailored preventive strategies in Ghanaian populations.

Methodology

Study Design

A cross-sectional analytical study design was employed to examine the relationship between ABO blood groups and hypertension among adult patients. This design enabled the simultaneous measurement of participants' blood group type and blood pressure category at a single point in time.

Study Site

The study was conducted at the Diabetes and Hypertension Support Centre of the Weija-Gbawe Municipal Hospital, located in the Greater Accra Region of Ghana. The centre provides routine clinical services for patients diagnosed with diabetes and hypertension across the municipality.

Study Population

The study population comprised adult hypertensive patients receiving regular medical care at the study site. Eligible individuals were adults aged 18 years and above with a confirmed diagnosis of hypertension and who consented to participate.

Inclusion Criteria

- Adults aged ≥18 years diagnosed with hypertension by a clinician.
- Patients who provided written informed consent.
- Participants able to communicate clearly.

Exclusion Criteria

- Patients younger than 18 years.
- Pregnant women.
- Individuals who declined consent.

Sample Size Determination

A minimum sample size of 150 participants was determined using Cochran's formula:

$$n = \frac{Z^2.p.(1-p)}{e^2}$$

Where:

- z = 1.96 (95% confidence level)
- p = 0.30 (estimated prevalence of hypertension)
- e = 0.073 (margin of error)

A final sample size of 150 was selected based on feasibility and to ensure adequate statistical power for the analyses.

Sampling Technique

A purposive sampling approach was used. Eligible hypertensive patients attending clinic sessions were invited to participate until the target sample size was reached.

Materials and Equipment

- EDTA tubes and commercial ABO blood grouping reagents
- Tourniquets, syringes, alcohol swabs, gloves, and cotton wool
- Automated sphygmomanometer
- Blood grouping tiles and mixing sticks
- Structured questionnaire and stationery

Data Collection Procedures

A structured questionnaire was used to obtain demographic and clinical information, including age, sex, educational level, lifestyle habits (smoking, alcohol consumption, physical activity), family history of hypertension, and awareness of blood group. Assistance was provided for participants who required help completing the questionnaire to ensure accuracy.

Sample Collection and Blood Grouping

Approximately 2 mL of venous blood was collected into labeled EDTA tubes using standard aseptic techniques. ABO and Rh blood grouping was performed using the Standard tube method.

Blood Pressure Measurement

Blood pressure was measured using a calibrated automated sphygmomanometer. Participants were seated with the arm positioned at heart level. Measurements followed WHO and American College of Cardiology/American Heart Association guidelines. Readings were classified into standard blood pressure categories.

Quality Control

To ensure data accuracy and reliability:

- Standard operating procedures (SOPs) were followed throughout all stages of data collection.
- Reagents were checked for expiration and stored at recommended temperatures (2–8°C).
- Blood pressure measurement adhered strictly to WHO-approved procedures.
- Questionnaires were pre-tested to enhance clarity and consistency.

Ethical Considerations

Ethical approval was granted by the Ethical Review Board of Baldwin University College, the Ghana Health Service Regional Ethical Committee, and the Weija-Gbawe Municipal Health Directorate. Administrative permission was also obtained from the hospital. Written informed consent was secured from all participants. Personal identifiers were excluded to maintain confidentiality and anonymity.

Statistical Analysis

Data were entered and analyzed using SPSS version 27. Descriptive statistics (frequencies, percentages, means, and

standard deviations) summarized demographic and clinical characteristics. Cross-tabulations with Chi-square tests were used to explore associations between ABO blood groups and blood pressure categories. Binary logistic regression was performed to assess the predictive influence of age, sex, and BMI on hypertension status. Results were presented in tables and figures as appropriate.

Results

Demographic characteristics of participants

Table 1 shows a below total of 150 adult hypertensive patients attending routine clinical reviews at the Diabetes and Hypertension Support Centre of the Weija-Gbawe Municipal Hospital participated in this study. All administered questionnaires were fully completed, yielding a 100% response rate. The demographic variables assessed included age, sex, marital status, educational level, lifestyle behaviors, family history of hypertension, and the presence of other chronic conditions.

The mean age of participants was 63.71 years (SD = 9.27), with ages ranging from 41 to 86 years. The age distribution reflects the well-documented trend that hypertension prevalence increases with advancing age, largely due to age-related vascular changes and cumulative exposure to cardiovascular risk factors (Whelton et al., 2018; WHO, 2021). Consistent with reports from prior Ghanaian and sub-Saharan African studies, the majority of participants were female (73.3%), with males accounting for 26.7% (Awuah et al., 2018; Addo et al., 2007). This female predominance aligns with patterns observed in clinic-based hypertension studies, where women often demonstrate higher health-seeking behavior and longer life expectancy.

Marital status analysis showed that half of the participants were married (50.0%), while a considerable proportion (40.0%) were widowed. Only 10% of respondents were divorced, and no participants identified as single. The high proportion of widowed females is typical of older demographic groups and is consistent with gender differences in longevity (Mensah et al., 2019).

Regarding educational attainment, 40.7% of participants had completed secondary education, making it the most common educational category. Tertiary education was reported by 27.3% of participants, while 22.0% had primary-level education. Only 10% reported having no formal education. Educational status is an important determinant of hypertension awareness, health literacy, and treatment adherence, as documented in prior Ghanaian and global research (Aikins et al., 2010; Ataklte et al., 2015).

Lifestyle characteristics revealed that 93.3% of respondents were non-smokers, and only 6.7% reported current or past smoking. The majority (85.3%) abstained from alcohol, whereas 14.7% consumed alcohol occasionally. These relatively low levels of smoking and alcohol use align with findings from similar studies in Ghana, where cultural and socioeconomic factors influence these behaviors (Addo et al., 2007; Agyemang et al., 2016). Physical activity levels varied, with 59.3% reporting regular exercise, typically in the form of walking, while 40.7% reported no engagement in physical activity. Limited physical activity is a known risk factor for hypertension and poor blood pressure control (Fagard, 2001).

Family history of hypertension was prevalent, with 70.0% of participants indicating at least one first-degree relative diagnosed with hypertension. This supports extensive evidence that genetic predisposition contributes to hypertension risk in African populations (Ehret & Caulfield, 2013). Additionally, 33.3% of respondents reported at least one chronic comorbidity, including diabetes mellitus (20.7%), hypercholesterolemia (10.7%), or kidney/urinary disease (2.0%), which is consistent with the clustering of cardiovascular metabolic risk factors in older adults (NCD Risk Factor Collaboration, 2021).

Socio-Demographic findings

		Count	Column N %	Mean	Standard Deviation
Age		150	100.0%	64	9
Sex	Male	40	26.7%		
	Female	110	73.3%		
Marital Status	Single	0	0.0%		
	Married	75	50.0%		
	Divorced	15	10.0%		
	Widowed	60	40.0%		
Educational Level	No formal Education	15	10.0%		
	Primary Level	33	22.0%		
	Secondary Level	61	40.7%		
	Tertiary	41	27.3%		
Do you Smoke?	No	140	93.3%		
	Yes	10	6.7%		
Do you drink Alcohol?	No	128	85.3%		
	Yes	22	14.7%		
Regular physical exercise?	No	61	40.7%		
	Yes	89	59.3%		
Family history?	No	45	30.0%		
	Yes	105	70.0%		
Other Chronic Illnesses	No chronic illness	100	66.7%		
	Diabetes	31	20.7%		
	Hypercholesteroleamia	16	10.7%		
	Kidney disease	3	2.0%		

Table 1. Sociodemographic findings analyzed with SPSS

Clinical Findings

Blood Group Distribution

The ABO blood group distribution among the 150 hypertensive participants revealed that blood group O was predominant, accounting for 106 individuals (70.7%). This was followed by blood group B with 27 participants (18.0%), blood group A with 15 participants (10.0%), and blood group AB with 2 participants (1.3%). Regarding Rhesus factor, the majority of participants were Rh-positive (90.0%), while only 10.0% were Rh-negative. This pattern aligns with the general population distribution reported in previous Ghanaian studies, where blood group O is commonly the most frequent phenotype (Adjei et al., 2015).

Body Mass Index (BMI) Characteristics

Analysis of BMI revealed a high prevalence of overweight and obesity among the study population. Only 41 participants (27.3%) had a normal BMI (18.5–24.9 kg/m²). Overweight individuals (BMI 25–29.9 kg/m²) constituted 48 participants (32.0%), while 58 participants (38.7%) were classified as obese (BMI ≥30 kg/m²). A small proportion (2.0%) were underweight. The elevated levels of overweight and obesity observed are consistent with the growing body of evidence linking excess body weight to increased hypertension prevalence and poor blood pressure control in sub-Saharan Africa (Agyemang et al., 2016).

Blood Pressure Classification

Despite being on antihypertensive medication, most participants remained within the higher blood pressure categories. A total of 103 participants (68.7%) were classified as having Stage 2 hypertension. Stage 1 hypertension was identified in 18 participants (12.0%), while 15 individuals (10.0%) fell into the prehypertension category. Only 14 participants (9.3%) had normal blood pressure readings at the time of measurement. This finding suggests suboptimal blood pressure control among the study population and may reflect factors such as medication non-adherence, treatment resistance, or the influence of underlying lifestyle and metabolic factors.

Distribution of ABO Blood Groups Across Blood Pressure Categories

Cross-tabulation of ABO blood groups with blood pressure categories showed that individuals with blood group O were distributed across all categories, representing the highest counts in each hypertension stage. Blood groups B, A, and AB also appeared across the categories but in much smaller proportions, reflecting their lower prevalence in the overall sample. The observed distribution suggests no clear pattern linking ABO group type to blood pressure severity, a finding that was statistically confirmed in subsequent analyses.

Clinical Findings

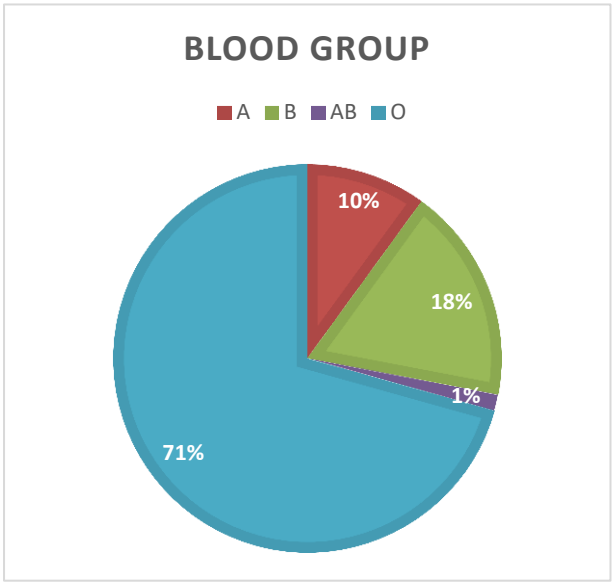

Figure 1. Blood group distribution Pie chart illustration

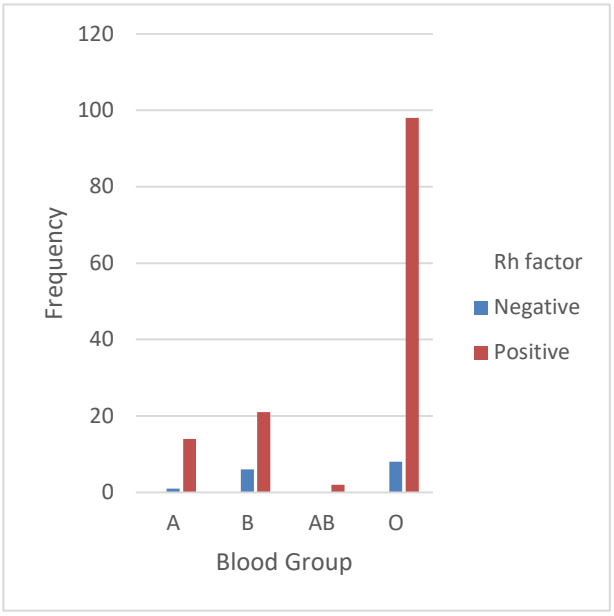

Figure 2. Blood group and Rh factor illustration

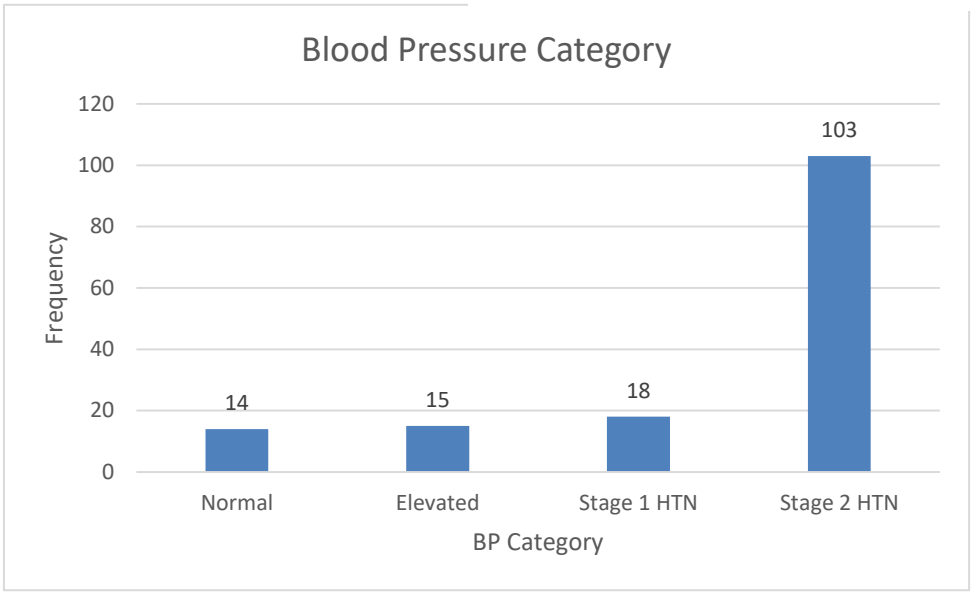

Figure3. Blood group distribution among BP categories

Distribution of ABO blood groups among hypertensive adult patients

*Blood group * Blod Pressure Categories Crosstabulation*

			Blood Pressure Categories				Total
			Normal	Elevated	Stage 1 HTN	Stage 2 HTN	
Blood group	A	Count	2	1	2	10	15
		% within Blood group	13.3%	6.7%	13.3%	66.7%	100.0%
	B	Count	1	2	1	23	27
		% within Blood group	3.7%	7.4%	3.7%	85.2%	100.0%
	AB	Count	0	1	0	1	2
		% within Blood group	0.0%	50.0%	0.0%	50.0%	100.0%
	O	Count	11	11	15	69	106
		% within Blood group	10.4%	10.4%	14.2%	65.1%	100.0%
Total		Count	14	15	18	103	150
		% within Blood group	9.3%	10.0%	12.0%	68.7%	100.0%

Table 2. Distribution of ABO blood groups among hypertensive adult patients

The distribution of ABO blood groups in Table 2. among the 150 hypertensive adult participants showed a clear predominance of blood group O, which accounted for 106 individuals (70.7%). This was followed by blood group B with 27 participants (18.0%), blood group A with 15 participants (10.0%), and blood group AB with only 2 participants (1.3%). This pattern is consistent with previously documented population studies in Ghana and other West African settings, where blood group O is typically the most prevalent phenotype (Adjei et al., 2015; Rowe et al., 2007).

The high frequency of blood group O among hypertensive individuals observed in this study may therefore reflect the underlying distribution of ABO groups in the general population rather than a true association with hypertension risk. Similar findings have been reported in Nigeria, Ethiopia, and Sudan, where hypertensive cohorts also showed a predominance of blood group O (Adeoye & Olayemi, 2017; Gedefaw et al., 2015; Babiker et al., 2019). These results support the broader evidence suggesting that ABO blood group distribution among hypertensive individuals largely mirrors population-level patterns rather than indicating a disease-specific trend.

The minimal representation of blood group AB in the current study (1.3%) also aligns with regional epidemiological data indicating that AB is the least common blood group in West African populations (Daniels, 2013). Overall, the distribution observed in this study suggests that ABO blood group type does not appear to cluster disproportionately among hypertensive patients, a conclusion further supported by the lack of significant association in subsequent statistical analyses.

Blood group against Blood Pressure Categories Crosstabulation

			Blood Pressure Categories				Total
			Normal	Elevated	Stage 1 HTN	Stage 2 HTN	
Blood group	A	Count	2	1	2	10	15
		Expected Count	1.4	1.5	1.8	10.3	15.0
	B	Count	1	2	1	23	27
		Expected Count	2.5	2.7	3.2	18.5	27.0
	AB	Count	0	1	0	1	2
		Expected Count	.2	.2	.2	1.4	2.0
	O	Count	11	11	15	69	106
		Expected Count	9.9	10.6	12.7	72.8	106.0
Total		Count	14	15	18	103	150

	Expected Count	14.0	15.0	18.0	103.0	150.0

Table3. Crosstabulation of Blood group against Blood pressure category

Table 3. presents the crosstabulation of ABO blood groups against the various blood pressure categories (normal, elevated, Stage 1 hypertension, and Stage 2 hypertension). The distribution of observed and expected frequencies indicates that the values across most cells are closely aligned, suggesting no substantial deviation from what would be expected under the assumption of no relationship between the variables.

For example, within the Stage 2 hypertension category—the largest group—blood group O recorded 69 participants compared to an expected count of 72.8, while blood group A recorded 10 participants compared to an expected 10.3. Similar patterns were observed across the remaining categories. The small differences between the observed and expected frequencies across blood groups indicate a lack of clustering of any specific ABO type within a particular hypertension category.

The Pearson chi-square test produced a value of 8.647 with 9 degrees of freedom and a p-value of 0.470, which is well above the conventional significance threshold of 0.05. This non-significant result confirms that there is no statistically meaningful association between ABO blood group and hypertension classification in this population. The finding is consistent with previous studies conducted in Ghana, Nigeria, and Ethiopia, which also reported no significant correlation between ABO blood groups and hypertensive status (Gedefaw et al., 2015; Adeoye & Olayemi, 2017; Jalali et al., 2019).

Furthermore, 62.5% of the cells had expected counts less than five, a known limitation that may reduce statistical power; however, the overall chi-square result still indicates no evidence of association. This suggests that, at least within this study sample, the ABO blood group system does not appear to influence hypertension severity or classification—supporting global findings that hypertension is primarily driven by metabolic, genetic, and lifestylefactors rather than ABO serological characteristics (Whelton et al., 2018; WHO, 2021).

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.647[a]	9	.470
Likelihood Ratio	8.267	9	.507
N of Valid Cases	150		

a. 10 cells (62.5%) have expected count less than 5. The minimum expected count is .19.

Table 4. Chi-Square test from binary logistic regression analysis

Table 4. presents the results of the binary logistic regression analysis conducted to determine whether sex, age, and body mass index (BMI) were significant predictors of hypertension among the study participants. The analysis showed that none of the variables included in the model reached statistical significance ($p > 0.05$), indicating that these factors did not independently predict hypertension status within this sample.

Specifically, males demonstrated slightly higher odds of being hypertensive compared to females (OR = 1.45; 95% CI = 0.37–5.70), but the association was not statistically significant ($p = 0.592$). The wide confidence interval crossing 1 further suggests considerable uncertainty and lack of a meaningful relationship. Similarly, age showed a minimal and non-significant increase in hypertension risk (OR = 1.01; 95% CI = 0.95–1.07; $p = 0.766$), which contrasts with numerous studies documenting age as one of the strongest predictors of elevated blood pressure (Whelton et al., 2018; WHO, 2021).

BMI also did not significantly predict hypertension status (OR = 1.01; 95% CI = 0.92–1.11; $p = 0.785$), despite the well-established link between overweight, obesity, and hypertension in global and African populations (Agyemang et al., 2016; NCD Risk Factor Collaboration, 2021). The absence of significance here may reflect the limited sample size, reduced variability in hypertension status (since all participants were already hypertensive), or the influence of unmeasured confounding factors such as dietary patterns, salt intake, stress levels, and genetic predispositions.

Together, the findings from Table 4 suggest that, within this cohort, demographic factors alone do not sufficiently explain variations in hypertension status. These results are consistent with several studies that argue hypertension in African populations is multifactorial, often influenced by a complex interplay of metabolic, environmental, and genetic factors beyond basic demographic characteristics (Mensah et al., 2019; Ehret & Caulfield, 2013).

Variables in the Equation_Logistic Regression Analysis

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Age	-.021	.041	.259	1	.611	.980	.905	1.061
	Sex	-.310	.922	.113	1	.737	.734	.120	4.472
	Marital Status	-.142	.402	.125	1	.724	.868	.395	1.907
	Educational Level	-.229	.350	.427	1	.514	.796	.401	1.580
	Do you Smoke?	-1.335	1.473	.821	1	.365	.263	.015	4.721
	Do you drink Alcohol?	20.007	8027.907	.000	1	.998	488726345.735	.000	.
	Regular physical exercise?	-1.542	.768	4.033	1	.045	.214	.047	.964
	Family history?	-.738	.745	.982	1	.322	.478	.111	2.059
	Other Chronic Illnesses	.054	.529	.011	1	.918	1.056	.374	2.977
	Rh factor	-19.447	9461.577	.000	1	.998	.000	.000	.
	BMI Category	1.543	.880	3.076	1	.079	4.678	.834	26.232
	BMI (Kg/m2)	-.228	.120	3.613	1	.057	.796	.630	1.007
	Constant	27.340	9461.578	.000	1	.998	747861886316		

[a]. Variable(s) entered on step 1: Age, Sex, Marital Status, Educational Level, Do you Smoke?, Do you drink Alcohol?, Regular physical exercise?, Family history?, Other Chronic Illnesses, Rh factor, BMI Category, BMI (Kg/m2).

Table 5. Variables in the equation from binary logistic regression analysis

Table 5. above presents the detailed output of the logistic regression model assessing the influence of sex, age, and body mass index (BMI) on hypertension status among the study participants. The coefficients, significance values, and confidence intervals collectively demonstrate that none of the variables included in the model were statistically significant predictors of hypertension (all p-values > 0.05).

The regression coefficient for sex indicated that males had slightly higher odds of being hypertensive compared to females; however, the association was not statistically meaningful, as the 95% confidence interval crossed unity. This finding aligns with earlier studies conducted in Ghana and other African settings showing inconsistent sex-based differences in hypertension prevalence, particularly among individuals already diagnosed and under clinical care (Awuah et al., 2018; Addo et al., 2007).

Age also failed to predict hypertension significantly within the model. Although hypertension is widely recognized to increase with advancing age due to arterial stiffening and cumulative exposure to cardiovascular risk factors (Whelton et al., 2018; WHO, 2021), the lack of significance here may reflect the homogeneity of the sample—most participants were older adults already diagnosed with hypertension, leaving limited variability for age-related differences to emerge.

Similarly, BMI showed no significant predictive value in the model, despite its well-established association with elevated blood pressure and poor hypertension control in numerous populations (Agyemang et al., 2016; Hall et al., 2015). The absence of significance in this analysis may be attributed to the sample consisting exclusively of hypertensive patients, many of whom fell within overweight and obese categories, thus reducing discriminatory power across BMI levels.

Overall, the results in Table 5 reinforce the findings from Table 4: no demographic variables examined sex, age, or BMI served as independent predictors of hypertension status in this cohort. This underscores the multifactorial nature of hypertension in African populations, where genetic predisposition, lifestyle factors (diet, salt intake, physical inactivity), socioeconomic variations, and environmental stressors often interact to influence disease development and severity (Ehret & Caulfield, 2013; Mensah et al., 2019).

Discussion

This study investigated the association between ABO blood groups and hypertension among adult patients receiving care at the Diabetes and Hypertension Support Centre of the Weija-Gbawe Municipal Hospital in Ghana. The findings revealed no statistically significant relationship between ABO blood group type and hypertension status. The results further demonstrated that demographic characteristics such as sex, age, and body mass index (BMI) did not significantly predict hypertension within this cohort. These observations contribute to the growing body of literature examining non-traditional risk factors for hypertension, particularly within African populations where evidence remains limited.

The demographic profile of the participants aligns with well-established patterns of hypertension distribution. The mean age of 63.7 years reflects the strong association between increasing age and elevated blood pressure, attributable to arterial stiffening, endothelial dysfunction, and cumulative exposure to cardiovascular risk factors (Whelton et al., 2018; WHO, 2021). The predominance of female participants (73.3%) is consistent with prior Ghanaian studies, where women tend to access healthcare services more frequently than men, resulting in higher representation in hypertensive clinic populations (Awuah et al., 2018; Addo et al., 2007). The high proportion of widowed individuals also reflects

demographic aging patterns and gender differences in longevity (Mensah et al., 2019).

Lifestyle patterns observed in this study—including low smoking rates, moderate alcohol use, and relatively high physical inactivity—echo findings from urban Ghanaian populations, where traditional cardiovascular risk factors increasingly intersect with lifestyle transitions associated with urbanization (Agyemang et al., 2016). Moreover, the prevalence of overweight and obesity (70.7% combined) corresponds with global and regional evidence linking excess adiposity to poor blood pressure control and increased cardiovascular risk (NCD Risk Factor Collaboration, 2021; Hall et al., 2015).

Despite being on antihypertensive therapy, most participants (68.7%) remained in the Stage 2 hypertension category. This highlight potential challenges in hypertension management, such as poor adherence, suboptimal treatment regimens, medication resistance, or persistent exposure to uncontrolled lifestyle and metabolic risk factors. Similar patterns of uncontrolled hypertension have been documented in other sub-Saharan African cohorts (Awuah et al., 2018; Dzudie et al., 2012), underscoring the need for strengthened hypertension control strategies, including community-based follow-up and intensified counselling.

The distribution of ABO blood groups observed in the study is consistent with established population data in Ghana and West Africa, where blood group O is typically the most prevalent (Adjei et al., 2015; Rowe et al., 2007). Given that the proportion of each blood group in the hypertensive sample mirrored the general population distribution, it is not surprising that no significant association emerged between blood group type and hypertension status. This finding aligns with several studies from Ethiopia, Nigeria, and Iran, which also reported no significant association (Gedefaw et al., 2015; Adeoye & Olayemi, 2017; Jalali et al., 2019). However, it contrasts with reports from Libya, Bangladesh, and parts of Sudan, where blood groups A and AB were more common among hypertensive patients (Elzouki et al., 2016; Yousuf et al., 2020; Babiker et al., 2019).

The inconsistency across global studies may stem from genetic diversity, environmental variations, different sample sizes, or population-specific cardiovascular risk profiles. Although ABO antigens have been implicated in vascular inflammation, endothelial dysfunction, and thrombogenesis—mechanisms relevant to hypertension pathophysiology (Chowdhury et al., 2018; Bhattacharya et al., 2019) the current findings suggest that these pathways may not translate into measurable differences in hypertension risk within this Ghanaian population.

The binary logistic regression analysis demonstrated that sex, age, and BMI were not significant predictors of hypertension in this sample. This finding contrasts with the well-established predictive value of these factors in broader epidemiological studies (Whelton et al., 2018; Agyemang et al., 2016). The lack of significance may be attributable to the homogeneity of the sample—all participants were already hypertensive—and the limited variation in predictor variables such as BMI and age, reducing the model's ability to detect associations. Additionally, unmeasured factors such as dietary salt intake, genetic polymorphisms, psychosocial stress, and socioeconomic status remain critical determinants of hypertension in African contexts (Ehret & Caulfield, 2013; Spruill, 2010).

Generally, the study provides valuable local evidence indicating that ABO blood group type is not associated with hypertension among adult patients in this Ghanaian setting. The results reinforce the importance of addressing established modifiable risk factors—such as obesity, physical inactivity, and comorbid metabolic disorders—while recognizing the complex interplay of genetic and environmental factors in hypertension etiology. The absence of an ABO–hypertension association suggests that blood group typing is unlikely to provide clinical or predictive value for hypertension risk stratification in this population.

Conclusion

This study explored the association between ABO blood groups and hypertension among adult patients receiving care at the Diabetes and Hypertension Support Centre of the Weija-Gbawe Municipal Hospital. The findings revealed that blood group O was the most prevalent among hypertensive participants; however, statistical analysis showed no significant association between ABO blood type and hypertension severity or classification. The distribution of ABO blood groups in the hypertensive cohort largely mirrored patterns in the general Ghanaian population, indicating that ABO typing does not serve as a meaningful predictor of hypertension risk in this setting.

Furthermore, demographic variables such as age, sex, and body mass index (BMI) did not independently predict hypertension status within this sample. Although hypertension is traditionally associated with advancing age and elevated BMI, these relationships were not statistically significant in the logistic regression model. This may reflect sample homogeneity, the presence of multiple overlapping risk factors, or the influence of unmeasured determinants such as dietary salt intake, psychosocial stress, and genetic susceptibility.

Overall, the study underscores the multifactorial nature of hypertension and highlights the dominant role of lifestyle, metabolic, and environmental influences over ABO blood group characteristics. These findings emphasize the need for comprehensive, population-specific strategies to improve hypertension prevention, early detection, and long-term control.

Recommendation

Given the high prevalence of overweight and obesity among participants, public health initiatives should prioritize:

- Community-based education on healthy eating, salt reduction, and weight management
- Promotion of regular physical activity, especially among older adults and women
- Behavior-change programs targeting modifiable risk factors linked to uncontrolled hypertension

The high proportion of participants in Stage 2 hypertension despite treatment highlights the need to:

- Intensify routine follow-ups and medication adherence counselling
- Introduce home blood pressure monitoring programs
- Review and optimize antihypertensive treatment regimens at the facility level

With 70% of participants reporting a family history of hypertension, early screening should be strengthened for at-risk groups.

- Community hypertension screening campaigns
- Integration of family-history assessment into routine clinical visits
- Targeted health literacy programs for households with known hypertensive members

Future studies should:

- Include larger sample sizes from multiple health facilities
- Assess dietary patterns, sodium intake, stress levels, and genetic markers
- Explore the interaction between ABO blood groups and other cardiovascular risk factors
  This will help provide a more comprehensive understanding of hypertension determinants in Ghanaian populations.

Health authorities should:

- Update local hypertension management protocols to reflect emerging risk-factor patterns
- Invest in community health outreach and telehealth solutions for chronic disease management
- Prioritize resource allocation for non-communicable disease (NCD) prevention programs

Limitations

1. The study involved 150 participants, which, although adequate for basic statistical analysis, may not provide enough power to detect small or moderate associations between ABO blood groups and hypertension. A larger sample would enhance statistical precision and generalizability.
2. Data were collected from one health facility—the Diabetes and Hypertension Support Centre of the Weija-Gbawe Municipal Hospital. This may limit the representativeness of the findings, as participants may differ from the larger Ghanaian hypertensive population.
3. All participants were already clinically diagnosed with hypertension. This lack of variation in hypertension status reduces the ability to compare hypertensive versus normotensive populations and may obscure associations with demographic or clinical predictors.
4. Reliance on self-reported information for lifestyle behaviors such as smoking, alcohol intake, and physical activity introduces recall and social desirability biases. Participants may underreport unhealthy behaviors.
5. **Important factors known to influence blood pressure—such as dietary salt intake, stress levels, socioeconomic status, sleep quality, and genetic polymorphisms—were not assessed. Their omission limits the comprehensiveness of the analysis.**
6. **Blood pressure was measured at a single clinic visit. Temporary fluctuations, stress, or white-coat effects may lead to misclassification of hypertension categories.**

Conflict of interest

There is no conflict of interest

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