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Factors associated with knowledge of hypertension risk factors and symptoms among Gambian women: A cross-sectional study based on the Gambia Demographic and Health Survey

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ABSTRACT

Background: We examined the factors associated with knowledge of hypertension risk factors and symptoms among Gambian women.
Methods: This cross-section study was based on 11, 865 female participants (aged 15–49 years) of The Gambia Demographic and Health Survey 2019–2020. We performed descriptive statistics, and multivariate-adjusted logistic regression models.
Results: Only 34.89 % and 36.82 % of the participants knew at least one risk factor and symptom of hypertension, respectively. Women who had never measured their blood pressure had a reduced odds of knowing a hypertension risk factor (OR = 0.68; 95 %CI: 0.60—0.77; $P < 0.01$) and symptom (OR = 0.56; 95 %CI: 0.49—0.64; $P < 0.01$). Compared to women with higher education, those with no education had a lower odds of knowing a hypertension risk factor (OR = 0.18; 95 %CI: 0.12—0.27; $P < 0.01$) and symptom (OR = 0.32; 95 %CI: 0.23—0.45; $P < 0.01$). Similarly, women who never used the internet had reduced odds of mentioning a hypertension risk factor (OR = 0.55; 95 %CI: 0.48—0.61; $P < 0.01$) and symptom (OR = 0.61; 95 %CI: 0.54—0.69; $P < 0.01$). Those who never watched television had decreased odds of knowing a hypertension risk factor (OR = 0.74; 95 %CI: 0.63—0.86; $P < 0.01$) and symptoms (OR = 0.68; 95 %CI: 0.58—0.80; $P < 0.01$).
Conclusion: Fewer women could mention at least one hypertension risk factor and symptom. We also found that knowledge of hypertension risk factors and symptoms was associated with education level and socio-economic status.

1. Introduction

Hypertension is an abnormal metabolic syndrome that contributes to morbidity and mortality. It is a proximal predictor of many chronic diseases, including, cardio-metabolic and neurodegenerative diseases hence, affecting the Quality of Life and Healthy Life Expectancy (Mills et al., 2016; Agarwal et al., 2015). Moreover, the prevalence of hypertension is higher in low- and middle-income countries (31.5 %, 1.04 billion people) than in high-income countries (28.5 %, 349 million people), and is among the leading causes of disability, dependence, and death (Mills et al., 2020; Kearney et al., 2005).

Despite much information and intervention alternatives available, knowledge of hypertension, particularly in low- and middle-income (LMIC) countries remains deficit. Evidence shows that knowledge of hypertension risk factors and symptoms is associated with better control of blood pressure and subsequent reduction in the burden of hypertension and cardiovascular diseases (Busingye et al., 2019). Moreover, higher education and awareness have been shown to promote a healthy lifestyle and positive health-seeking behavior. A community intervention study that focused on improving hypertension knowledge, diets, and lifestyles in a rural Chinese area revealed that after 3 years participants in the intervention group (who underwent the health education program) exhibited a significantly greater improvement in dietary habits and lifestyle behaviors, including reducing salty food intake, fat intake, and alcohol consumption (Huang et al., 2011). A previous study also reported that rural populations were less likely to uptake blood

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pressure, blood glucose, or cholesterol screening than urban dwellers who were more educated and of higher income status (Zaman et al., 2012). This could also be because urban areas usually have more access to information and healthcare services. Therefore, recent hypertension management guidelines, based on evidence-based instructions, increasingly emphasize primary healthcare, which is premised on educating and empowering the grassroots with knowledge and skills for hypertension prevention and management (Yin et al., 2022).

Since primary and secondary prevention of hypertension/ diseases is anchored by being aware of the risk factors and prodromal symptoms, it has also been suggested that poor knowledge of hypertension contributes to overburdening the health system (Collaboration, 2021). A study from a similar setting reported that less than half of hypertensive patients identified during the study were aware of their conditions, which means that the majority would not have sought early prevention and control measures (Paudel et al., 2020). However, awareness of hypertension status was also related to higher knowledge of risk factors for hypertension (Busingye et al., 2019). Although it could be argued that increased screening for hypertension could improve knowledge of risk factors, intensive health education and promotion about hypertension may empower communities with knowledge of risk factors and symptoms, and reduce the risk of developing hypertension (Babaee Beigi et al., 2014). Thus, efforts to understand the factors affecting knowledge of hypertension risk factors and symptoms among underdeveloped populations are significant. However, such studies in The Gambia are absent/rare and may not be published for public consumption, hence the Gambia Demographic and Health Survey (GDHS) provides a good opportunity to investigate this research question.

Most women in The Gambia are housewives and do not have the privilege of higher education. This coupled with cultural and religious myths could affect knowledge of hypertension risk factors and symptoms (Sosseh et al., 2023). Globally, the highest prevalence of hypertension is found in the African region (46 %), with a significant proportion remaining undiagnosed (WHO). In 2015, it was approximated that 8.5 million deaths were attributable to systolic blood pressure (SBP) $>$ 115 mmHg, with 88 % of these deaths occurring in low-income and middle-income countries (Zhou et al., 2021). While the prevalence of hypertension in the Gambia is not well established, a population-based cross-sectional study of adults in the Gambia and Sierra Leone revealed that 46.2 % of the females were hypertensive. The mean SBP and mean diastolic blood pressure (DBP) of the females were 134.3 $\pm$ 29.7 mmHg and 84.5 $\pm$ 17.5 mmHg, respectively (Awad et al., 2014). Cham, B., et al. (2018), also reported that nearly one-third of adults were hypertensive, with a notable portion remaining undiagnosed (86 % of men vs 71 % of women with hypertension). Moreover, individuals residing in rural and semi-urban areas of the Gambia and those classified as overweight or obese were more likely to have hypertension (Cham et al., 2005).

Poor health education and knowledge were previously reported to contribute to low uptake of Voluntary Counselling and Testing of HIV services, infant and childhood malnutrition, poor Birth Preparedness and Complication Readiness, poor diet, obesity, etc. (Barrow et al., 2022; Barrow et al., 2022; Senghore et al., 2018; Sambou et al., 2022). In addition, access to health care services and information has also been reported to be among the barriers to health education and health-seeking behaviors (Cham et al., 2005; Sambou et al., 2022). Therefore, this study aimed to investigate the factors affecting knowledge of hypertension risk factors and symptoms among women who participated in the GDHS 2019—2020. Addressing the identified factors influencing hypertension awareness is critical for improving population health outcomes and reducing the global burden of cardiovascular diseases. Targeted efforts to promote regular blood pressure screenings, enhance health literacy, and leverage media channels for health communication have the potential to significantly impact hypertension prevention and control on a large scale.

2. Methods

2.1. Study population

The study was based on data from the GDHS that was conducted in The Gambia between 2019 and 2020. The GDHS is a nationally representative cross-sectional survey with a stratified cluster sampling method, where clusters provide the primary sampling unit. Within each selected cluster, households were randomly sampled, and study participants were interviewed. The final sample selected for this study was 11,865 women aged 15—49 years. A detailed description of the GDHS is reported elsewhere (ICF GBoSGa, 2021).

2.2. Ascertainment of study variables

The GDHS utilized interview-administered questionnaires to gather information on hypertension risk factors and symptoms. Participants were asked a series of questions, with responses recorded as either 'yes' or 'no.' The factors assessed included: 1) does overweight increase the risk of hypertension? (Yes/No); 2) does tobacco increase the risk of hypertension? (Yes/No); 3) does too much salt intake increase the risk of hypertension? (Yes/No); 4) does an unhealthy diet increase the risk of hypertension? (Yes/No); 5) does lack of exercise increase the risk of hypertension? (Yes/No); 6) does drinking alcohol increase the risk of hypertension? (Yes/No); 7) does family history/genetics increase the risk of hypertension? (Yes/No); 8) does age increase the risk of hypertension? (Yes/No); 9) does sex/gender increase the risk of hypertension? (Yes/No); and 10) does stress increase the risk of hypertension? (Yes/No).

Similarly, the GDHS evaluated knowledge of hypertension signs through questions with responses recorded as 'yes' or 'no.' The signs assessed were: 1) Is dizziness a sign of hypertension? (Yes/No); 2) is headache a sign of hypertension? (Yes/No); 3) is blurry vision a sign of hypertension? (Yes/No); 4) is chest pain/pounding in the chest a sign of hypertension? (Yes/No); 5) is difficulty breathing a sign of hypertension? (Yes/No); 6) is irregular heartbeat a sign of hypertension? (Yes/No); 7) is confusion a sign of hypertension? (Yes/No); and 8) Is loss of consciousness a sign of hypertension? (Yes/No).

2.3. Ascertainment of knowledge of hypertension risk factors and symptom scores

In addition, a score was constructed out of all the variables that comprised each of knowledge of hypertension risk factors (range: 0–6) and symptoms (range: 0–8). Given that the majority of the participants were not professionals we selected a score of 1 or more as the cutoff point for judging whether or not knowing hypertension risk factors and symptoms. Hence, participants with a score of $\geq$ 1 were classified as knowing hypertension risk factors and symptoms, respectively (Busingye et al., 2019).

The independent variables considered were 'ever had blood pressure measured (yes/no),' 'hypertensive (yes/no),' 'ever been prescribed antihypertensive medication to control your blood pressure (yes/no),' 'education level (none/primary/secondary/higher),' 'currently employed (yes/no),' 'wealth index (wealthy/middle-class/poor),' 'owning a telephone/mobile phone(yes/no),' 'sex of household head (male/female),' 'use of the internet (never/yes),' 'frequency of watching TV in a week (often, sometimes, never),' 'frequency of listening to the radio in a week (often, sometimes, never),' and 'frequency of reading newspaper/magazine in a week (often, sometimes, never).' In our study, the adverbs of frequencies 'often' refer to 'less than once a week'; 'sometimes' refers to 'at least once a week', and 'never' refers to 'not at all.'

2.4. Ethical approval

The GDHS was approved by the National Ethical Review Board following the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. During the GDHS written informed consent was obtained from all the participants (ICF GBoSGa, 2021). Moreover, we received permission to download and use the GDHS dataset 2019–2020 from the DHS Program (Reference number: 135525), after the submission of a written proposal to archive@dhsprogram.com.

2.5. Statistical analysis

Descriptive statistics were performed to show the characteristics of the study participants as counts (%) or median (interquartile range) depending on whether the variable is categorical/ continuous. The prevalence of the knowledge of hypertension risk factors and symptoms was also presented in bar chats. We explored group differences according to the knowledge of hypertension risk factors and symptoms using the Chi-square (χ^2) test. Moreover, multivariate-adjusted logistic regression models were executed to assess the association between knowledge of hypertension risk factors and symptoms with the independent variables. The covariates adjusted for include age, type of area, region, ethnicity, religion, and marital status. The independent variables 'education level,' 'currently employed,' and 'wealth index' were also adjusted for one another. All analyses were performed in R (R version 4.3.0), and statistical significance was considered at $P < 0.05$.

3. Results

3.1. Characteristics of the study respondents stratified by hypertension knowledge status

The median age of the study participants was 27 years (IQR = 20, 35), and 86.16 % of the women had no diagnosis of hypertension. Most of the women were married (68.13 %); 54.87 % resided in urban areas; 5.18 % attained higher education, and 97.63 % were Muslims. The proportion of women knowing at least one risk factor and symptom of hypertension varied significantly by variables such as marital status, type of area lived, education levels, wealth index, type of occupation, ethnicity, region, hypertension status, owning a telephone, use of the internet, frequency of watching television (TV), frequency of listening to the radio, frequency of reading newspapers, and sex/gender of household head ($P < 0.05$) **(**Table 1**).**

3.2. Knowledge of hypertension risk factors and symptoms

The counts of responses to the variables signifying knowledge of hypertension risk factors and symptoms are presented in Fig. 1. Of the 11,865 women involved in this study, 230 (1.94 %), 68 (0.57 %), 1160 (9.78 %), and 2334 (19.67 %) of them knew that overweight/obesity, tobacco use, high-salt diet, and unhealthy diet were among the risk factors of hypertension, respectively. The least mentioned risk factor was sex/gender (0.14 %). About 573 (4.83 %), 2842 (23.95 %), and 3499 (29.49 %) of the participants knew that blurry vision, dizziness, and headache were some symptoms of hypertension, respectively (Fig. 1**)**. The least mentioned symptoms were difficulty breathing (0.59 %) and abnormal heart rhythm (0.61 %).

Fig. 2 displays the knowledge scores of hypertension risk factors and symptoms. Among our study respondents, 7725 (65.11 %) and 7496 (63.18 %) could not mention at least one risk factor or symptom of hypertension, respectively. About 2291 (19.31 %), 1384 (11.66 %), and 378 (3.19 %) knew at least one, two, and three risk factors of hypertension, respectively. Only 67 (0.56 %) women knew four risk factors of hypertension while only 20 (0.17 %) knew five to six risk factors of hypertension. Similarly, 1522 (12.83 %), 2130 (17.95 %), 588 (4.96 %), and 109 (0.92 %) of the participants could mention one, two, three, and four symptoms of hypertension, respectively while only 20 (0.17 %) women knew six to eight risk factors (Fig. 2**)**.

3.3. Factors associated with knowledge of hypertension risk factors and symptoms

Table 2 presents the multivariate-adjusted logistic regression results to identify factors associated with knowledge of hypertension risk factors and symptoms. Women who had never measured their blood pressure had a reduced odd of knowing a hypertension risk factor (OR = 0.68; 95 %CI: 0.60—0.77; $P < 0.01$) and symptom (OR = 0.56; 95 %CI: 0.49—–0.64; $P < 0.01$). Likewise, those who did not know their hypertension status were less likely to know a hypertension risk factor (OR = 0.51; 95 %CI: 0.42—0.61; $P < 0.01$) and symptom (OR = 0.14; 95 % CI: 0.10—–0.19; $P < 0.01$). Of those who are hypertensive, women who had never been prescribed an antihypertensive medication to control their blood pressure had a reduced odds of knowing a hypertension symptom (OR = 0.27; 95 %CI: 0.14—–0.53; $P < 0.01$). Compared to women with higher education, those with no education had a lower risk of knowing a hypertension risk factor (OR = 0.18; 95 %CI: 0.12—–0.27; $P < 0.01$) and symptom (OR = 0.32; 95 %CI: 0.23—–0.45; $P < 0.01$). Also, unemployment was associated with reduced odds of knowing a hypertension symptom (OR = 0.88; 95 %CI: 0.78—0.99; $P = 0.04$). In addition, women in the poor wealth category had a reduced odds of knowing a hypertension risk factor (OR = 0.56; 95 %CI: 0.47—–0.67; $P < 0.01$) and symptom (OR = 0.58; 95 %CI: 0.48—–0.69; $P < 0.01$), compared to the wealthy group. Referent to female-headed households, women from households headed by men were less likely to know a hypertension risk factor (OR = 0.79; 95 %CI: 0.68—–0.91; $P < 0.01$). In addition, those who do not own a telephone/mobile phone were less likely to know a hypertension risk factor (OR = 0.60; 95 %CI: 0.53—–0.68; $P < 0.01$) and symptom (OR = 0.65; 95 %CI: 0.57—–0.73; $P < 0.01$). Similarly, women who never used the internet had reduced odds of mentioning a hypertension risk factor (OR = 0.55; 95 %CI: 0.48—–0.61; $P < 0.01$) and symptom (OR = 0.61; 95 %CI: 0.54—–0.69; $P < 0.01$). Those who never watched television had decreased odds of knowing a hypertension risk factor (OR = 0.74; 95 %CI: 0.63—–0.86; $P < 0.01$) and symptom (OR = 0.68; 95 %CI: 0.58—–0.80; $P < 0.01$), compared to those who often watch television. Similar results were observed for never/rarely listening to the radio (OR = 0.55; 95 %CI: 0.48—–0.64; $P < 0.01$) and never reading newspapers/magazines (OR = 0.38; 95 %CI: 0.23—0.61; $P < 0.01$) (Table 2).

4. Discussion

In this cross-sectional study based on the Gambia Demographic and Health Survey, we found that knowledge of hypertension risk factors and symptoms was low among Gambian women. Less than 40 % of the women knew at least one risk factor and symptom of hypertension. Moreover, the results showed that the following factors were significantly associated with knowledge of hypertension risk factors and symptoms: 'ever had blood pressure measured,' 'knowledge of hypertension status,' 'education level,' 'wealth index,' 'owning a telephone/ mobile phone,' 'sex of the household head,' 'use of the internet,' 'frequency of watching television,' 'frequency of listening to the radio and frequency of reading newspapers/magazines.' Therefore, understanding the risk factors (including obesity, tobacco use, high salt intake, unhealthy diet, sedentary lifestyle, excessive alcohol consumption, and stress) and symptoms of hypertension could improve efforts to prevent and manage hypertension and its complications. Similarly, carefully designed and tailored interventions have the potential to lower the occurrence and impact of hypertension among Gambian women and the broader population.

The prevalence of hypertension in the Gambia remains a significant public health concern, with nearly half of the population (47.0 %) affected by the condition (Awad et al., 2014; Jobe et al., 2023).

Table 1
Descriptive characteristics of Gambian women as total count and stratified by knowledge status of hypertension risk factors and symptoms from the GDHS dataset 2019–2020.

Variables	All subjects	Knowledge of hypertension symptoms			Knowledge of hypertension risk factors		
		No	Yes	*P*	No	Yes	*P*
Age, Median (IQR)	27 (20, 35)	26 (19, 35)	29 (22, 37)	< 0.01	26 (19, 35)	28 (21, 37)	< 0.01
Age of household head, n (%)	52 (42, 64)	52 (42, 64)	52 (42, 64)	0.88	52 (42, 64)	52 (42, 63)	0.33
Marital status, n (%)							
Single	3226 (27.19)	2179 (29.07)	1047 (23.96)	< 0.01	2160 (27.96)	1066 (25.75)	**<0.01**
Married/ living with a partner	8083 (68.13)	4997 (66.66)	3086 (70.63)		5231 (67.72)	2852 (68.89)	
Windowed, separated, or divorced	556 (4.69)	320 (4.27)	236 (5.40)		334 (4.32)	222 (5.36)	
Type of area, n (%)							
Urban	6510 (54.87)	4022 (53.66)	2488 (56.95)	**<0.01**	4064 (52.61)	2446 (59.08)	**< 0.01**
Rural	5355 (45.13	3474 (46.35)	1881 (43.05)		3661 (47.39)	1694 (40.92)	
Education levels, n (%)							
None	4963 (41.83)	3194 (42.61)	1769 (40.49)	**< 0.01**	3385 (43.82)	1578 (38.116)	**< 0.01**
Primary	1972 (16.62)	1306 (17.42)	666 (15.24)		1355 (17.54)	617 (14.90)	
Secondary	4315 (36.37)	2645 (35.29)	1670 (38.22)		2647 (34.27)	1668 (40.29)	
Higher	615 (5.18)	351 (4.68)	264 (6.04)		338 (4.38)	277 (6.69)	
Religion, n (%)							
Islam	11,584 (97.63)	7309 (97.51)	4275 (97.85)	0.236	7544 (97.66)	4040 (97.59)	0.81
Christianity	281 (2.37)	187 (2.50)	94 (2.15)		181 (2.34)	100 (2.42)	
Wealth index, n (%)							
Poor	5587 (47.09)	3671(48.97)	1916(43.85)	**< 0.01**	3837(49.67)	1750 (42.27)	**< 0.01**
Middle-class	2270 (19.13)	1440 (19.21)	830 (18.99)		1503 (19.46)	767 (18.53)	
Rich	4008 (33.78)	2385 (31.82)	1623 (37.15)		2385(30.87)	1623(39.20)	
Currently employed n (%)							
No	5863 (49.41)	3864 (51.55)	1999 (45.75)	**< 0.01**	3937 (50.96)	1926 (46.52)	**< 0.01**
Yes	6002 (50.59)	3632 (48.45)	2370 (54.25)		3788 (49.04)	2214 (53.48)	
Ethnicity, n (%)							
Mandinka/Jahanka	3701 (31.19)	2285 (30.48)	1416 (32.41)	**< 0.01**	2249 (29.11)	1452 (35.07)	**< 0.01**
Wollof	1679 (14.15)	1011 (13.49)	668 (15.29)		1084 (14.03)	595 (14.37)	
Jola/Karoninka	782 (6.59)	461 (6.15)	321 (7.35)		476 (6.16)	306 (7.39)	
Fula/Tukulur/Lorobo	2569 (21.65)	1682 (22.44)	887 (20.30)		1774 (22.96)	795 (19.20)	
Sarahule	1143 (9.63)	776 9(10.35)	367 (8.40)		822 (10.64)	321 (7.75)	
Other Gambian ethnicities	788 (6.64)	466 (6.22)	322 (7.37)		462 (5.98)	326 (7.87)	
Non-Gambian	1203 (10.14)	815 (10.87)	388 (8.88)		858 (11.11)	345 (8.33)	
Region, n (%)							
Banjul	947 (7.98)	540 (7.20)	407 (9.32)	**< 0.01**	533 (6.90)	414 (10.00)	**< 0.01**
Kanifing	1612 (13.59)	978 (13.057)	634 (14.51)		974 (12.61)	638 (15.41)	
Brikama	2355 (19.85)	1442 (19.24)	913 (20.90)	**< 0.01**	1449 (18.76)	906 (21.88)	**< 0.01**
Mansakonko	1030 (8.68)	653 (8.711)	377 (8.63)		686 (8.88)	344 (8.31)	
Kerewan	1391 (11.72)	891 (11.89)	500 (11.44)		923 (11.95)	468 (11.30)	
Kuntaur	1319 (11.12)	892 (11.90)	427 (9.77)		963 (12.47)	356 (8.60)	
Janjanbureh	1262 (10.64)	739 (9.859)	523 (11.97)		777 (10.06)	485 (11.72)	
Basse	1949 (16.43)	1361 (18.16)	588 (13.46)		1420 (18.38)	529 (12.78)	
Ever had your blood pressure measured, n (%)							
Yes	4449 (42.11)	1088 (60.41)	3361 (76.93)	**< 0.01**	1325 (65.27)	3124 (75.46)	**< 0.01**
No	1721 (27.89)	713 (39.59)	1008 (23.07)		705 (34.73)	1016 (24.54)	
Hypertensive, n (%)							
Yes	854 (13.84)	44 (2.44)	810 (18.54)	**< 0.01**	157 (7.73)	697 (16.84)	**< 0.01**
No	5316 (86.16)	1757 (97.56)	3559 (81.46)		1873 (92.27)	3443 (83.16)	
Ever been prescribed an antihypertensive drug, n (%)							
Yes	114 (86.65)	27 (61.36)	713 (88.02)	**< 0.01**	136 (86.62)	136 (86.62)	**< 0.01**
No	740 (13.35)	17 (38.64)	97 (11.98)		21 (13.38)	93 (13.34)	
Owning a telephone, n (%)							
Yes	8604 (72.52)	5244 (69.96)	3360 (76.91)	**< 0.01**	5384 (69.70)	3220 (77.78)	**< 0.01**
No	3261 (27.48)	2252 (30.04)	1009 (23.10)		2341 (30.30)	920 (22.22)	
Use of Internet, n (%)							
Never	4768 (40.19)	3156 (42.10)	1612 (36.90)	**< 0.01**	3314 (42.90)	1454 (35.12)	**< 0.01**
Yes	7097 (59.81)	4340 (57.90)	2757 (63.10)		4411 (57.10)	2686 (64.88)	
Frequency of watching TV in a week, n (%)							
Never	2865 (24.15)	1945 (25.95)	920 (21.06)	**< 0.01**	2033 (26.32)	832 (20.10)	**< 0.01**
Sometimes	3150 (26.55)	1884 (25.13)	1266 (28.98)		1942 (25.14)	1208 (29.18)	
Often	5850 (49.30)	3667 (48.92)	2183 (49.97)		3750 (48.54)	2100 (50.73)	
Frequency of listening to the radio in a week, n (%)							
Never	2941 (24.79)	2039 (27.20)	902 (20.65)	**< 0.01**	2094 (27.11)	847 (20.46)	**< 0.01**
Sometimes	4242 (35.75)	2591 (34.57)	1651 (37.79)		2661 (34.45)	1581 (38.19)	
Often	4682 (39.46)	2866 (38.23)	1816 (41.57)		2970 (38.45)	1712 (41.35)	
Frequency of reading newspapers in a week, n (%)							
Never	10,539 (88.82)	6736 (89.86)	3803 (87.05)	**< 0.01**	6965 (90.16)	3574 (86.33)	**< 0.01**
Sometimes	1020 (8.60)	586 (7.82)	434 (9.93)		588 (7.61)	432 (10.44)	
Often	306 (2.58)	174 (2.32)	132 (3.02)		172 (2.23)	134 (3.24)	
Sex of household head, n (%)							
Male	9579 (80.73)	6150 (82.04)	3429 (78.49)	**< 0.01**	6374 (82.51)	3205 (77.42)	**< 0.01**
Female	2286 (19.27)	1346 (17.96)	940 (21.52)		1351 (17.49)	935 (22.59)	

Notes: For each quantitative variable, the P-value is obtained using the Mann-Whitney *U* test; for each categorical variable, the P-value is obtained through Pearson's $\chi 2$-test.

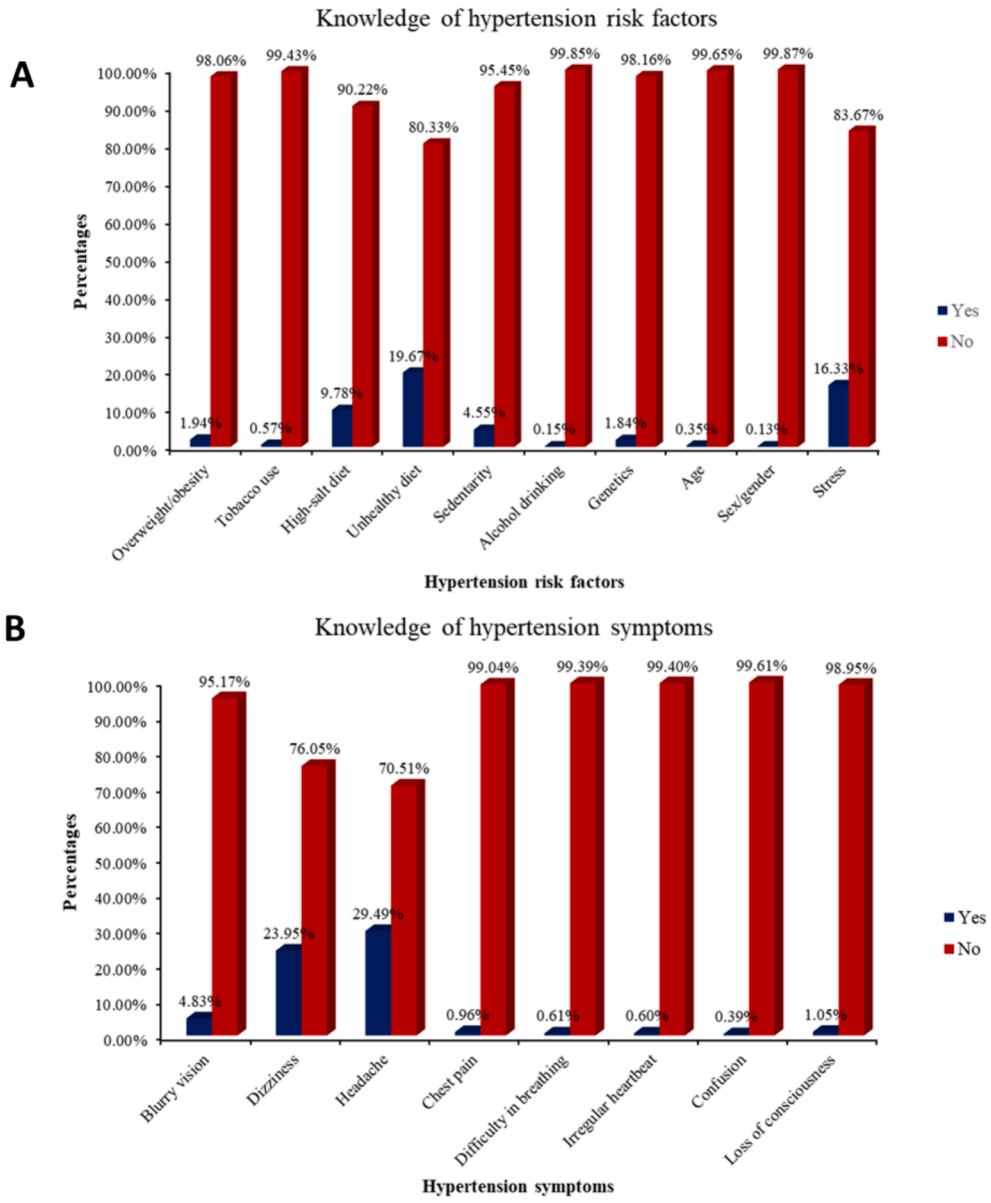

Fig. 1. Knowledge of hypertension risk factors (A) and symptoms (B) among Gambian women from the GDHS dataset 2019–2020 ($n = 11865$). The X-axis represents the names of variables and the Y-axis represents the percentages.

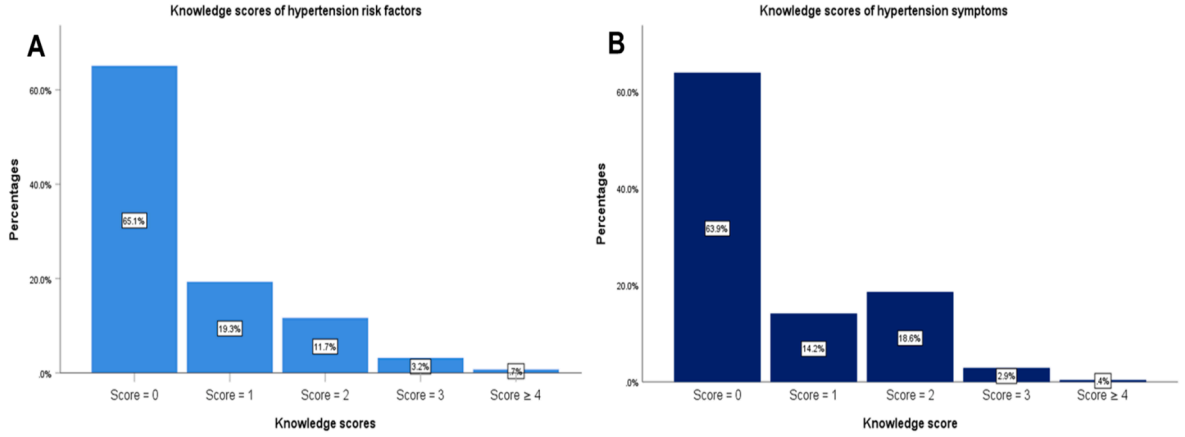

Fig. 2. Bar graph of the knowledge scores of hypertension risk factors (A) and symptoms (B) among Gambian women from the GDHS dataset 2019–2020 ($n = 11865$). The X-axis represents the scores and the Y-axis represents the percentages.

Table 2
Factors associated with knowledge of hypertension risk factors and symptoms among Gambian women from the GDHS dataset 2019–2020.

Variables	N (%)	Knowledge of hypertension symptoms OR (95 % CI)		Knowledge of hypertension risk factors OR (95 % CI)	*P*
Ever had your blood pressure measured					
Yes	4449 (42.11)	Ref.		Ref.	
No	1721 (27.89)	0.56 (0.49—0.64)	**<0.01**	0.68 (0.60—0.77)	**<0.01**
Hypertensive					
Yes	854 (13.84)	Ref.		Ref.	
No	5316 (56.16)	0.14 (0.10—0.19)	**<0.01**	0.51 (0.42—0.61)	**<0.01**
Ever been prescribed an antihypertensive drug					
Yes	114 (86.65)	Ref.		Ref.	
No	740 (13.35)	0.27 (0.14—0.53)	**<0.01**	1.01 (0.61—1.73)	0.97
Education level					
Higher	615 (5.18)	Ref.		Ref.	
Secondary	4315 (36.37)	0.63 (0.45—0.88)	**0.01**	0.42 (0.28—0.61)	**<0.01**
Primary	1972 (16.62)	0.36 (0.25—0.51)	**<0.01**	0.21 (0.14—0.32)	**<0.01**
No education	4963 (41.83)	0.32 (0.23—0.45)	**<0.01**	0.18 (0.12—0.27)	**<0.01**
Currently employed					
Yes	6002 (50.59)	Ref.		Ref.	
No	5863 (49.41)	0.88 (0.78—0.99)	**0.04**	0.94 (0.84—1.06)	0.31
Wealth Index					
Wealthy	4008 (33.78)	Ref.		Ref.	
Middle-class	2270 (19.13)	0.67 (0.57—0.80)	**<0.01**	0.59 (0.50—0.70)	**<0.01**
Poor	5587 (47.09)	0.58 (0.48—0.69)	**<0.01**	0.56 (0.47—0.67)	**<0.01**
Sex of household head					
Female	2286 (19.27)	Ref.		Ref.	
Male	9579 (80.73)	0.88 (0.75—1.02)	0.09	0.79 (0.68—0.91)	**<0.01**
Own a telephone					
Yes	8604 (72.52)	Ref.		Ref.	
No	3216 (27.48)	0.65 (0.57—0.73)	**<0.01**	0.60 (0.53—0.68)	**<0.01**
Use internet					
Yes	7097 (59.81)	Ref.		Ref.	
Never	4768 (40.19)	0.61 (0.54—0.69)	**<0.01**	0.55 (0.48—0.61)	**<0.01**
Frequency of watching TV weekly					
Often	5850 (49.30)	Ref.		Ref.	
Sometimes	3150 (26.55)	1.22 (1.06—1.41)	**0.01**	1.27 (1.10—1.46)	**<0.01**
Never	2865 (24.15)	0.68 (0.58—0.80)	**<0.01**	0.74 (0.63—0.86)	**<0.01**
Frequency of listening to the radio weekly					
Often	4682 (39.46)	Ref.		Ref.	
Sometimes	4242 (35.75)	1.01 (0.88—1.16)	0.90	1.03 (0.90—1.18)	0.65
Never	2941 (24.79)	0.55 (0.48—0.64)	**<0.01**	0.57 (0.50—0.66)	**<0.01**
Frequency of reading newspaper/ magazine weekly					
Often	306 (2.58)	Ref.		Ref.	
Sometimes	1020 (8.60)	0.75 (0.42—1.25)	0.28	0.65 (0.36—1.10)	0.12
Never	10,539 (88.82)	0.38 (0.23—0.61)	**<0.01**	0.32 (0.18—0.52)	**<0.01**

Notes: N, number of participants; % percentage; OR, odds ratio; 95 %CI, 95 % confidence interval; the models were adjusted for age, type of area, region, ethnicity, religion, and marital status.

However, despite its widespread occurrence, there exists a notable gap in awareness among Gambians regarding hypertension and its implications. The findings from a previous study by Jobe et al. (2023) underscored this issue, revealing that a substantial proportion of individuals living with hypertension were unaware of their condition (54.7 %), with limited access to treatment (32.5 %) and only 10 % had their hypertension under control (Cham et al., 2005; Jobe et al., 2023). Notably, the study observed little variation in awareness and management rates between urban and rural areas, suggesting a systemic challenge that transcends geographical boundaries. These findings emphasize the urgent need for comprehensive interventions aimed at increasing public awareness of hypertension, promoting early detection through regular screenings, and enhancing access to effective treatment and management strategies. Addressing these gaps in awareness and control is crucial for mitigating the burden of hypertension and its associated complications in the Gambia (Touray et al., 2023). Effective public health initiatives, such as community-based interventions and health education campaigns tailored to the specific needs and contexts of Gambian communities are essential steps toward achieving this goal.

The findings of this study carry significant implications for public health interventions aimed at addressing hypertension awareness and prevention. Firstly, the low percentage of participants demonstrating knowledge of hypertension risk factors and symptoms underscores a crucial gap in public health education and awareness campaigns. Hypertension, often referred to as a "silent killer," can lead to severe complications such as heart disease, stroke, and kidney failure if left untreated (Zhou et al., 2021). Therefore, enhancing public understanding of hypertension risk factors and symptoms is essential for early detection and management, ultimately reducing the burden of cardiovascular diseases.

The identified factors associated with lower odds of recognizing hypertension risk factors and symptoms provide valuable insights for targeted interventions. For instance, individuals who have never had their blood pressure measured exhibit reduced awareness of hypertension indicators. This highlights the importance of promoting regular blood pressure screenings as part of routine healthcare practices, particularly among underserved populations who may have limited access to healthcare services (Hannan et al., 2022).

Furthermore, the disparities observed based on educational attainment and internet usage suggest the need for tailored health literacy programs. Women with lower levels of education and those who do not use the internet are at a disadvantage in terms of hypertension awareness. Implementing community-based educational initiatives and leveraging digital health platforms to disseminate accurate information about hypertension could help bridge this gap and empower individuals to make informed decisions about their health (Sakima et al., 2022). Similarly, the association between television viewing habits and hypertension awareness implies that media channels can serve as effective

platforms for health communication. Integrating educational messages about hypertension into television programming could reach a wider audience and enhance public awareness.

Good knowledge of hypertension-related factors is associated with better control and prevention of hypertension (Almas et al., 2012). In this study, the knowledge of hypertension-related factors was lower than previously observed among studies (including both men and women) from China (Gong et al., 2020), Malaysia (Machaalani et al., 2022), and Nigeria (Anyanti et al., 2021) but higher than among studies including hypertensive patients from Italy (Fanelli et al., 2021) and Cameroon (Akoko et al., 2017). Compared to China, Malaysia, and Nigeria, the levels of health literacy and access to healthcare information may be lower in the Gambia, which could have been a contributing factor to the low knowledge of hypertension risk factors and symptoms observed in this study. Also, differences in the social environment, sample size, and the variations in knowledge measurements between the current study and other studies could have been the reasons for the divergences in findings.

Healthy attitudes and practices are invariably affected by knowledge and awareness levels; thus, it is important to strengthen efforts to educate populations (Johm et al., 2021; Ehiaghe and Barrow, 2022). This is the fundamental principle of Primary Health Care and the Bamako Initiatives, which aimed to bring health to the doorsteps of the grassroots but also to strengthen them with enough knowledge and skills to take charge of their health and provide them with essential services (Ridde, 2011). Besides the provision of essential health services, increased access to information is quite helpful and our study has shown that non-use of the internet, listening to the radio, and reading the newspapers are significantly related to a decreased knowledge of hypertension risk factors and symptoms. Thus, the Gambian mass media should be used (besides providing entertainment) to disseminate health-related information that can help to change negative health attitudes and myths and strengthen positive health behaviors in the population. Public health initiatives aimed to increase access to facilities, such as television, radio, and the Internet can also be very impactful in the dissemination of information regarding hypertension risk factors and symptoms. Additionally, educational interventions and outreach initiatives hold promise. These may take the form of standalone programs or be integrated into existing initiatives, such as public health department outreach education efforts or routine antenatal clinics, which have proven effective in engaging a significant number of women.

We also found that women with no/lower education levels (no formal education, primary, and secondary education) had significantly decreased odds of knowing the risk factors of hypertension, compared with women who attained higher education levels. Likewise, women with no formal education/only primary education levels had a decreased odds of knowing hypertension symptoms. This is reflective of the limited literary rate of the Gambian population, especially among the women who are mostly not privileged to acquire basic education. According to a study by UNESCO in 2015, the literacy rate among females 15 years and older was 41.6 %. The Gambia Education Fact Sheet 2020 by UNICEF also showed that only 7 % of females and 17 % of males aged 15—24 years old had basic Information Communication Technology (ICT) skills (UNICEF. The Gambia Education Fact Sheet, 2020). Previous studies that explored the association between education levels and knowledge of hypertension-related factors reported various findings. For instance, a study involving 534 people living in rural communities in Ghana reported a positive association between attained formal education level and knowledge of hypertension-related factors (Agyei-Baffour et al., 2018). Another study from China conducted among people at risk of hypertension found that those who acquired junior high school levels of education and above were more knowledgeable about hypertension-related factors (Gong et al., 2020). In addition, Chimberengwa et al. (Chimberengwa and Naidoo, 2019) found among hypertensive patients from Zimbabwe that medium and tertiary levels of education were associated with higher knowledge of hypertension-related factors.

Compared to women living in the richest households, women living in the poorer, and middle-class households were less likely to know hypertension risk factors and symptoms. Studies have reported that higher socioeconomic status predicted better knowledge of hypertension and other cardiovascular disease risk factors(Tsuji et al., 2018). In addition, people from higher-income families would be more receptive to innovations, have better health-seeking behavior, and adhere to health prescriptions. Therefore, strategies to empower the socio-economic capabilities of our populations are needed among others, to increase knowledge and awareness of hypertension risk factors and symptoms. Augmenting the economic capabilities of women would also help to balance the power dynamics in the household thereby enabling the woman to independently make decisions about her health and well-being. Interventions should also be tailored towards reducing the existing patriarchy, which will enable women to have more freedom in making decisions about their health. And also seeking and practicing health-enabling behaviors without fear of persecution from spouses, family, or society at large.

Moreover, we also found that those diagnosed with hypertension had a higher chance of knowing at least one hypertension risk factor than their counterparts with no hypertension. This could be partly because hypertensive patients were more likely to hear various perspectives and receive guidance from medical experts concerning the risk factors, symptoms, and other hypertension-related information than non-hypertensive patients. In light of this, their exposure to a variety of valuable information may increase their understanding of their illness.

5. Strengths and limitations

This well-designed study comprising a large sample of participants across The Gambia provided the opportunity to examine the knowledge of hypertension risk factors and symptoms among Gambia women. The finding is thus representative and generalizable to the entire Gambia women and thus would be a significant tool for influencing public health interventions and policy. However, it's essential to acknowledge the limitations inherent in the cross-sectional study design and the potential for reverse causation more explicitly. While the study may identify associations between certain behaviors or characteristics and hypertension, it cannot determine whether those factors directly cause hypertension or if individuals with hypertension exhibit these behaviors due to their condition. Furthermore, reverse causation is a significant concern in cross-sectional studies. This phenomenon occurs when the outcome of interest (knowledge of hypertension risk factors and symptoms, in this case) influences the exposure variables being studied. For instance, an individual's knowledge of hypertension (risk factors and symptoms) may encourage them to measure their blood pressure, in response to the new information or knowledge gained about hypertension risk factors and symptoms. This could lead to an overestimation of the association between these independent factors and knowledge of hypertension risk factors and symptoms if not properly accounted for in the analysis. Future research employing longitudinal study designs may help elucidate the temporal relationships between these associations, providing stronger evidence for causal pathways.

6. Conclusion

Fewer women could mention at least one hypertension risk factor and symptom. We also found that knowledge of hypertension risk factors and symptoms was associated with education level and socio-economic status (such as 'ever had blood pressure measured', 'knowledge of hypertension status', 'education level', 'wealth index', 'owning a telephone/ mobile phone', 'sex of the household head', 'use of internet', 'frequency of watching television', 'frequency of listening to the radio and frequency of reading newspapers/magazines). Hence, we recommend that intervention and policy initiatives be tailored to these factors

to engender increased knowledge of hypertension risk factors and symptoms in The Gambia.

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CRediT authorship contribution statement

Muhammed Lamin Sambou: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Solim Essomandan Clémence Bafei:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Paul Bass:** Writing – review & editing, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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