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Original article

Implications of the dissemination of healthy lifestyle advice for Afghan adults without histories of hypertension diagnosis or treatment

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Abstract

Objectives: This study explored the relationship between receiving healthy lifestyle advice from healthcare providers and hypertension among undiagnosed individuals in Afghanistan, defined as adults with no previous hypertension diagnosis or treatment history.

Materials and Methods: Data were extracted from the 2018–19 Afghanistan National Non-Communicable Diseases Risk Factors Survey, comprising 2,838 participants. Outcomes included hypertension (systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥80 mmHg) and elevated blood pressure (systolic blood pressure 120–129 mmHg and diastolic blood pressure <80 mmHg). Bivariate and multivariable multinomial logistic regression analyses were conducted to assess associated factors.

Results: Among the 2,838 participants, 1,344 (47.4%) had hypertension and 344 (12.1%) had elevated blood pressure. Most participants were aged <40 years (63.8%), male (55.8%), and ever-married (80.2%). Multivariable analysis revealed that not receiving healthy lifestyle advice was significantly associated with hypertension (adjusted relative risk ratio [aRRR]=1.24; 95% confidence interval [CI]: 1.04–1.47) and elevated blood pressure (aRRR=1.40; 95% CI: 1.08–1.81). Sociodemographic and behavioral factors such as age, sex, marital status, education, occupation, fruit consumption, physical activity, and excess weight were significantly associated with hypertension, whereas only sex and excess weight were significantly associated with elevated blood pressure.

Conclusion: Our findings underscore the association between receiving healthy lifestyle advice from healthcare providers and a lower prevalence of hypertension among undiagnosed Afghan adults. Accordingly, healthcare providers should recommend lifestyle changes to help manage hypertension among adults.

Key words: high blood pressure, healthy lifestyle advice, healthcare providers

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Introduction

In the current global health landscape, the high prevalence of hypertension, affecting approximately 1.28 billion adults worldwide, has become a pressing concern[1, 2]. This issue is particularly notable in low- and middle-income countries (LMICs), where two-thirds of the affected population resides[1]. Despite collaborative efforts to combat this public health challenge, achieving the target of reducing the prevalence of hypertension by 33% from 2010 to 2030 has encountered significant obstacles[3, 4]. One major barrier has been the pervasive lack of awareness among those affected, with approximately half of adults with hypertension worldwide typically being unaware of their condition, and only 42% having been formally diagnosed[1]. This significantly increases the vulnerability of this patient group to severe health consequences such as cardiovascular disease (CVD) and premature mortality[5]. These deficiencies are particular-

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ly pronounced in LMICs, where 80% of CVD-related deaths occur, emphasizing the urgent need to address this issue and mitigate its impact on global health[6–8].

Recent population-based studies have underscored the high prevalence of hypertension in adult populations across various South Asian countries, including Afghanistan (31%), Pakistan (46.2%), Bangladesh (18.8%), India (28.1%), Nepal (32.0%), and 44 LMICs (17.5%)[9–14]. These studies have also revealed that a significant proportion of individuals with hypertension were undiagnosed or untreated, with rates ranging from 9.5% to 50.4%. In Afghanistan, hypertension and other noncommunicable diseases (NCDs) are on the rise, yet they often remain undiagnosed and untreated owing to systemic healthcare deficiencies and access disparities[15, 16]. This gap in care exacerbates the long-term health and economic impacts on societies already burdened by infectious diseases and other health crises[17].

Effective management and prevention of hypertension require early diagnosis and continuous management, which are hindered in environments with constrained healthcare resources[18]. Addressing this challenge is crucial not only for improving individual health outcomes, but also for reducing the broader economic and social burdens associated with untreated hypertension[19]. Preventive measures, including lifestyle modifications and regular screening, are cost-effective strategies that can mitigate the impact of NCDs, including hypertension[17]. The success of lifestyle modification heavily relies on adopting healthy lifestyle behaviors[20–22]. The guidance offered by healthcare professionals during routine health checkups, particularly in primary healthcare settings, plays a crucial role in promoting such optimal health behaviors[23]. However, despite its potential influence, the association between receiving healthy lifestyle advice from healthcare providers and hypertension among undiagnosed adults remains unexplored. This research gap underscores the necessity for further investigation to inform the development of more effective prevention and management strategies to mitigate the prevalence of hypertension.

Therefore, this study aimed to investigate the association between receiving healthy lifestyle advice from healthcare providers during routine health checkups and hypertension among undiagnosed participants. The findings aim to provide insights and recommendations for interventions to assist healthcare professionals, particularly in resource-limited settings, in addressing the increasing burden of hypertension.

Materials and Methods

Study design and sample

This population-based, cross-sectional study was conducted between January 2018 and December 2019 in Afghanistan. It used the World Health Organization's (WHO) STEPwise approach with a multistage cluster sampling methodology to evaluate the risk factors for NCDs. The detailed methodology, including the sample size calculations, has been reported elsewhere[24]. Data extraction was performed using specific exclusion criteria to maintain consistency in the selected sample. First, participants with a medical history of hypertension were excluded. This parameter was defined as participants who responded "yes" to the question, "Have you ever been told by a doctor or other health worker that you have raised blood pressure or hypertension?" and were receiving treatment for hypertension—or had a systolic blood pressure of ≥130 mmHg or diastolic blood pressure of ≥80 mmHg. Next, individuals with a history of CVD, which might be related to hypertension, were excluded because of the unavailability of CVD risk factors data in our dataset. Finally, pregnant women were also excluded from the analysis to avoid the potential effects of pregnancy-induced hypertension. Our final analytical sample comprised 2,838 adults aged 16–70 years, as is presented in Figure 1.

Study variables

Outcomes

Our outcomes were hypertension and elevated blood pressure. Hypertension was defined as systolic blood pressure ≥130 mmHg or diastolic blood pressure ≥80 mmHg, while elevated blood pressure was defined as systolic blood pressure within the range of 120–129 mmHg and diastolic blood pressure <80 mmHg[25]. To obtain blood pressure measurements, the participants were instructed to maintain a calm seated position with uncrossed legs for a 15 min resting period before readings were taken. Using calibrated sphygmomanometers, three consecutive readings were recorded with 3 min rest intervals between each. Our analysis was conducted based on the average of the second and third readings.

Main explanatory variable

In this study, the main explanatory variable was a composite measure created from six indicators of healthy lifestyle advice from healthcare providers. The participants were asked the following six questions: "Over the past 3 years, has a doctor or other health provider advised you to, 1) quit tobacco or avoid its initiation, 2) reduce salt intake in the diet, 3) consume at least five servings of fruits/vegetables daily, 4) reduce fat consumption, 5) begin or increase physical activity, and 6) maintain a healthy body weight or achieve weight loss?" A composite score was generated, assigning a value of 1 for a "yes" response and 0 for a "no" response, yielding a score ranging from 0 to 6. Individuals with a sum score of 1 or higher (i.e., answered "yes" to at least one question) were considered to have received healthy lifestyle advice. Those with a score of 0 (i.e., answered "no"

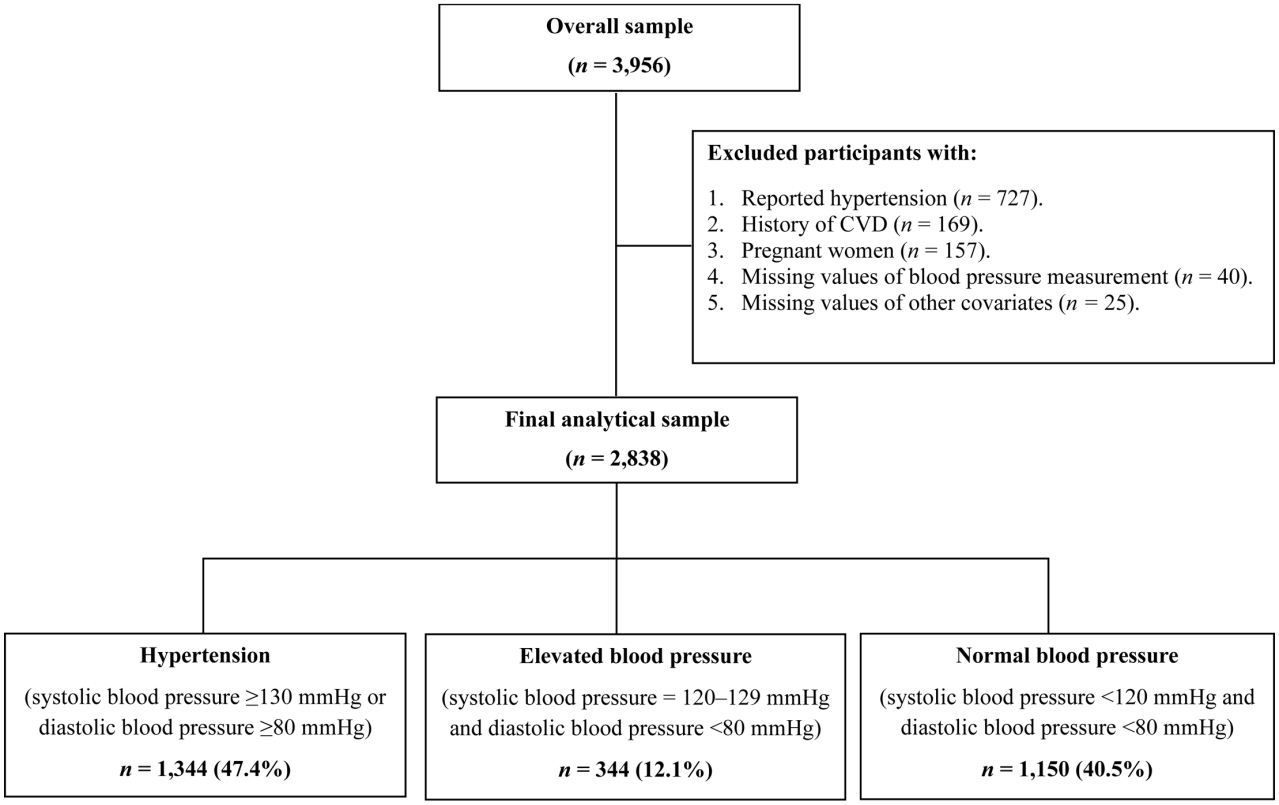

Figure 1 Flowchart of the study sample selection.

to all six questions) were regarded as not having received such advice. The components of the composite measure were conceptually and statistically related to each other. The Cronbach's alpha value was 0.879, indicating a high level of internal consistency among these components. Item-test correlations ranged from 0.624 to 0.852, showing that each item meaningfully contributed to the construct.

Sociodemographic factors

This study considered several sociodemographic variables. Age was dichotomized into two categories: <40 years and ≥40 years. Sex was represented as male or female. Marital status was categorized as never-married or ever-married. Residence was categorized as either rural or urban, according to the local administrative classification of the districts. Educational level was classified into three groups: no formal education, primary or lower education, and secondary or higher education. Finally, occupations were categorized as unemployed, employed, self-employed, or homemaker.

Lifestyle and behavioral factors

Our lifestyle behavior questionnaire included questions on tobacco use, fruit consumption, and physical activity. To assess tobacco use, participants were asked the following questions: "Do you currently smoke any tobacco products such as cigarettes, cigars, or pipes?" and "Do you currently use any smokeless tobacco products such as snuff, chewing tobacco, or betel?" Responses were categorized as "yes" if the participants reported the use of any tobacco product, and "no" otherwise. Regarding the frequency of fruit consumption, participants responded to the question, "In a typical week, how many days do you eat fruit?". Their responses were recoded into two categories: <4 days per week or ≥4 days per week. Physical activity levels were evaluated using the Global Physical Activity Questionnaire analysis guide, and participants were classified as having sufficient physical activity if their metabolic equivalent minutes of physical activity per week totaled ≥600; otherwise, they were classified as having insufficient physical activity[26].

Body weight status

Body weight status was assessed using body mass index (BMI), calculated by dividing weight in kilograms (kg) by the square of height in meters (m^2). Individuals with BMIs of ≥25.0 kg/m^2 were classified as being overweight or obese[27].

Statistical analysis

Descriptive statistics were used to summarize the characteristics of the study participants, delineating frequencies (n) and percentages (%) for categorical variables. The χ^2 test

was used to compare proportions across different groups. Using a multinomial approach, the study outcomes were categorized into hypertension, elevated blood pressure, and normal blood pressure, using the final category as reference. To investigate the factors associated with the outcomes, both bivariate and multivariable multinomial logistic regression analyses were performed. Variables included in the multivariable regression model were selected based on their statistical significance (P<0.05) in the bivariate analysis or their relevance to the existing literature. Multicollinearity among independent variables was assessed using the variance inflation factor (VIF). A mean VIF of 1.19 was obtained, indicating minimum multicollinearity[28]. The goodness of fit of the model was assessed using the generalized Hosmer–Lemeshow test. The model exhibited a good fit, χ^2 (16)=12.404, P=0.716. The strengths of the associations are presented as adjusted relative risk ratios with their corresponding 95% confidence intervals. Statistical significance was indicated by P-values <0.05. The analyses were conducted using Stata (version 18.0; StataCorp, College Station, TX, USA).

Results

Characteristics of the study participants

Among the 2,838 participants, 1,344 (47.4%) had hypertension and 344 (12.1%) exhibited elevated blood pressure. The majority were under 40 years of age (63.8%), male (55.8%), ever-married (80.2%), urban residents (51.4%), lacking formal education (51.1%), and self-employed (39.9%). Regarding lifestyle factors, 39.4% received healthy lifestyle advice, 22.3% were tobacco users, 31.3% consumed fruit at least four days per week, and 76.7% reported sufficient physical activity. Finally, 40.0% of participants were identified as being overweight or obese (Table 1).

Receipt of healthy lifestyle advice

Table 2 shows the proportion of participants who received healthy lifestyle advice from healthcare providers over the 3 years preceding the study. Overall, 1,119 (39.4%) participants received healthy lifestyle advice. This proportion was significantly higher in ever-married individuals, employed individuals, those engaged in sufficient physical activity, and those classified as being overweight/obese (P<0.05).

Factors associated with hypertension and elevated blood pressure

Table 3 shows the results of the multinomial logistic regression analysis of the factors associated with hypertension and elevated blood pressure. Participants who did not receive healthy lifestyle advice, and were aged 40 years and above, male, or ever-married, were more likely to have hypertension versus normal blood pressure compared with those who received advice, and were younger adults, female, or never-married (P<0.05). Educational attainment and employment status, including being self-employed and a homemaker, were associated with a lower likelihood of hypertension versus normal blood pressure (P<0.05). Fruit consumption (≥4 days per week) and sufficient physical activity were also associated with a lower likelihood of hypertension versus normal blood pressure (P< 0.05). Lastly, individuals classified as being overweight or obese were more likely to have hypertension versus normal blood pressure compared with those classified as being normal/underweight (P<0.001). Participants who did not receive healthy lifestyle advice and were male or classified as being overweight or obese, were more likely to have elevated blood pressure (P<0.05).

Discussion

This study provides novel evidence highlighting the influence of healthy lifestyle advice from healthcare providers on reducing the prevalence of hypertension among undiagnosed individuals in Afghanistan. Our results revealed that individuals who had not received healthy lifestyle advice had an increased likelihood of developing hypertension or elevated blood pressure. Moreover, certain sociodemographic and behavioral factors—including age, sex, marital status, education, occupation, fruit consumption, physical activity, and excess weight—were found to be significantly associated with hypertension. Similar findings were observed for elevated blood pressure, in which sex and excess weight were significantly associated with the condition.

Our findings revealed a notable prevalence of hypertension, with 47.4% (41.8% in females and 51.8% in males) observed among undiagnosed Afghan adults, closely aligned with the global trends (41% in females and 51% in males)[2]. However, the observed prevalence exceeded the figures reported for neighboring or South Asian countries—including Iran (14.1%), Pakistan (21.3%), India (17.7%), and Bangladesh (22.9%)—whereas it remained lower than that reported in Nepal (50.4%) among undiagnosed groups[10, 12, 29–31]. Methodological differences in sample selection, data collection, and the definition of hypertension may explain these variations. Comprehensive cross-country studies are warranted to uncover the underlying factors driving these variations and to guide tailored interventions to reduce hypertension burdens across this region.

Differences in the likelihood of developing hypertension were observed based on employment status. This was possibly because of workplace wellness programs, which often include healthy lifestyle advice services that are more readily available to those in employment settings. These programs are more accessible in larger organizations, such as international non-governmental organizations and private

Table 1 Participants' sociodemographic, lifestyle, and clinical characteristics

Variables	Total	Hypertension	Elevated blood pressure	*P*-value
N (%)	2,838 (100.0)	1,344 (47.4)	344 (12.1)	
Age				<0.001
<40 years	1,812 (63.8)	736 (40.6)	248 (13.7)	
≥40 years	1,026 (36.2)	608 (59.3)	96 (9.4)	
Sex				<0.001
Female	1,254 (44.2)	524 (41.8)	111 (8.9)	
Male	1,584 (55.8)	820 (51.8)	233 (14.7)	
Marital status				<0.001
Never-married	562 (19.8)	190 (33.8)	101 (18.0)	
Ever-married	2,276 (80.2)	1,154 (50.7)	243 (10.7)	
Residence				0.546
Rural	1,379 (48.6)	641 (46.5)	175 (12.7)	
Urban	1,459 (51.4)	703 (48.2)	169 (11.6)	
Education				<0.001
No formal education	1,451 (51.1)	738 (50.9)	152 (10.5)	
Primary or lower	520 (18.3)	249 (47.9)	65 (12.5)	
Secondary or higher	867 (30.6)	357 (41.2)	127 (14.7)	
Occupation				<0.001
Unemployed	743 (26.2)	348 (46.8)	98 (13.2)	
Employed	259 (9.1)	122 (47.1)	31 (12.0)	
Self-employed	1,131 (39.9)	578 (51.1)	154 (13.6)	
Homemaker	705 (24.8)	296 (42.0)	61 (8.7)	
Healthy lifestyle advice				0.011
No	1,719 (60.6)	829 (48.2)	227 (13.2)	
Yes	1,119 (39.4)	515 (46.0)	117 (10.5)	
Tobacco use				<0.001
No	2,204 (77.7)	1,001 (45.4)	263 (11.9)	
Yes	634 (22.3)	343 (54.1)	81 (12.8)	
Fruit consumption				0.001
<4 days per week	1,951 (68.7)	970 (49.7)	233 (11.9)	
≥4 days per week	887 (31.3)	374 (42.2)	111 (12.5)	
Physical activity				0.003
Insufficient	660 (23.3)	344 (52.1)	59 (8.9)	
Sufficient	2,178 (76.7)	1,000 (45.9)	285 (13.1)	
Body mass index				<0.001
Under/normal weight	1,702 (60.0)	671 (39.4)	214 (12.6)	
Overweight/obesity	1,136 (40.0)	673 (59.2)	130 (11.4)	

Data are represented as frequencies (%).

companies in Afghanistan. Such workplaces offer amenities such as on-site sports facilities, healthy food options in cafeterias, smoking cessation services, stress management workshops, and health screenings. Additionally, organizational policies—such as flexible work schedules and smoking bans—may further promote healthier lifestyles among employees[32, 33]. Our findings also revealed intriguing patterns concerning health-related behaviors, with participants who reported being actively engaged in sufficient levels of physical activity showing a higher likelihood of having received healthy lifestyle advice, compared with their insufficiently active counterparts. Similarly, more individuals who were overweight or obese reported receiving healthy lifestyle advice than those who were of normal weight or underweight. These findings highlight the demographics that are more proactive in terms of health engagement and the importance of tailored interventions to address disparities in accessing healthy lifestyle advice[34]. Such insights are valuable for designing targeted public health strategies aimed at expanding hypertension prevention efforts, ultimately contributing to the global agenda for achieving sustainable development goals related to NCDs[35, 36].

Individuals aged ≥40 years demonstrated a higher likelihood of developing hypertension, a finding that aligns with prior research. This increased prevalence is primarily attributable to physiological factors such as increased arterial

Table 2 Proportions of participants who received healthy lifestyle advice

Variables	Total	Receipt of healthy lifestyle advice		*P*-value
		Yes	No	
N (%)	2,838 (100.0)	1,119 (39.4)	1,719 (60.6)	
Age				0.061
<40 years	1,812 (63.8)	691 (38.1)	1121 (61.9)	
≥40 years	1,026 (36.2)	428 (41.7)	598 (58.3)	
Sex				0.081
Female	1,254 (44.2)	517 (41.2)	737 (58.8)	
Male	1,584 (55.8)	602 (38.0)	982 (62.0)	
Marital status				<0.001
Never-married	562 (19.8)	177 (31.5)	385 (68.5)	
Ever-married	2,276 (80.2)	942 (41.4)	1,334 (58.6)	
Residence				0.983
Rural	1,379 (48.6)	544 (39.4)	835 (60.6)	
Urban	1,459 (51.4)	575 (39.4)	884 (60.6)	
Education				0.158
No formal education	1,451 (51.1)	580 (40.0)	871 (60.0)	
Primary or lower	520 (18.3)	186 (35.8)	334 (64.2)	
Secondary or higher	867 (30.6)	353 (40.7)	514 (59.3)	
Occupation				<0.001
Unemployed	743 (26.2)	295 (39.7)	448 (60.3)	
Employed	259 (9.1)	128 (49.4)	131 (50.6)	
Self-employed	1,131 (39.9)	405 (35.8)	726 (64.2)	
Homemaker	705 (24.8)	291 (41.3)	414 (58.7)	
Tobacco use				0.406
No	2,204 (77.7)	860 (39.0)	1,344 (61.0)	
Yes	634 (22.3)	259 (40.8)	375 (59.2)	
Fruit consumption				0.237
<4 days per week	1,951 (68.7)	755 (38.7)	1,196 (61.3)	
≥4 days per week	887 (31.3)	364 (41.0)	523 (59.0)	
Physical activity				0.001
Insufficient	660 (23.3)	222 (33.6)	438 (66.4)	
Sufficient	2,178 (76.7)	897 (41.2)	1,281 (58.8)	
Body mass index				0.028
Under/normal weight	1,702 (60.0)	643 (37.8)	1,059 (62.2)	
Overweight/obesity	1,136 (40.0)	476 (41.9)	660 (58.1)	

Data are represented as frequencies (%).

stiffness and reduced elasticity, which develop as a consequence of aging[37, 38]. Males exhibited a higher likelihood of having hypertension than females, which aligns with the existing literature and may be because of a lower awareness of hypertension risk factors among males[2, 39, 40]. The inverse association between educational attainment and hypertension highlights a significant decrease in the likelihood of developing the condition, reflecting increased health awareness and the adoption of healthy lifestyle choices among individuals with higher levels of education[41]. Participants' employment statuses also provided valuable insights, revealing a consistent and statistically significant inverse association between occupation and the likelihood of having hypertension. Employed individuals, self-employed individuals, and homemakers exhibited a lower likelihood than unemployed individuals. Possible explanations for this association include the positive influence of employment on mental wellbeing, financial stability facilitating greater access to healthcare resources, and the routines and structures that employment often brings into daily life[42–44].

Our analyses of lifestyle and behavioral factors revealed that individuals who frequently consumed fruit and engaged in sufficient physical activity showed a lower overall likelihood of having hypertension. These findings align with established guidelines, which suggest that individuals who recognize the importance of these behaviors may be more proactive in monitoring their blood pressure, thus contributing to the lower prevalence of hypertension observed in

Table 3 Associated factors of hypertension and elevated blood pressure

Variables	Hypertension				Elevated blood pressure			
	RRR (95% CI)	*P*-value	aRRR (95% CI)	*P*-value	RRR (95% CI)	*P*-value	aRRR (95% CI)	*P*-value
Healthy lifestyle advice								
Yes	1		1		1		1	
No	1.18 (1.01–1.39)	0.041	1.24 (1.04–1.47)	0.014	1.43 (1.11–1.83)	0.006	1.40 (1.08–1.81)	0.011
Age								
<40 years	1		1		1		1	
≥40 years	2.12 (1.80–2.51)	<0.001	1.51 (1.25–1.83)	<0.001	1.00 (0.76–1.30)	0.973	0.89 (0.66–1.20)	0.442
Sex								
Female	1		1		1		1	
Male	1.82 (1.56–2.14)	<0.001	2.19 (1.68–2.85)	<0.001	2.45 (1.90–3.14)	<0.001	2.84 (1.91–4.23)	<0.001
Marital status								
Never-married	1		1		1		1	
Ever-married	1.87 (1.53–2.30)	<0.001	1.41 (1.10–1.82)	0.007	0.74 (0.57–0.97)	0.030	0.80 (0.57–1.12)	0.193
Residence								
Rural	1		1		1		1	
Urban	1.05 (0.90–1.23)	0.529	1.04 (0.88–1.24)	0.609	0.93 (0.73–1.18)	0.533	0.93 (0.72–1.19)	0.548
Education								
No formal education	1		1		1		1	
Primary or lower	0.92 (0.74–1.14)	0.440	0.79 (0.62–0.99)	0.046	1.16 (0.84–1.62)	0.368	0.84 (0.59–1.19)	0.329
Secondary or higher	0.71 (0.59–0.85)	<0.001	0.72 (0.57–0.90)	0.005	1.22 (0.94–1.60)	0.141	0.82 (0.59–1.15)	0.252
Occupation								
Unemployed	1		1		1		1	
Employed	0.98 (0.73–1.33)	0.908	0.70 (0.49–0.99)	0.043	0.89 (0.56–1.41)	0.608	0.68 (0.41–1.13)	0.135
Self-employed	1.24 (1.01–1.51)	0.038	0.75 (0.58–0.95)	0.020	1.17 (0.87–1.57)	0.297	0.77 (0.55–1.09)	0.146
Homemaker	0.73 (0.58–0.90)	0.004	0.71 (0.54–0.94)	0.015	0.53 (0.37–0.76)	<0.001	0.88 (0.56–1.37)	0.570
Tobacco use								
No	1		1		1		1	
Yes	1.53 (1.26–1.86)	<0.001	1.03 (0.83–1.29)	0.783	1.38 (1.03–1.84)	0.030	1.02 (0.74–1.40)	0.923
Fruit consumption								
<4 days per week	1		1		1		1	
≥4 days per week	0.72 (0.61–0.85)	<0.001	0.76 (0.63–0.91)	0.003	0.89 (0.69–1.15)	0.357	0.88 (0.67–1.15)	0.344
Physical activity								
Insufficient	1		1		1		1	
Sufficient	0.84 (0.70–1.01)	0.059	0.80 (0.65–0.99)	0.037	1.39 (1.02–1.90)	0.039	1.14 (0.82–1.59)	0.435
Body mass index								
Under/normal weight	1		1		1		1	
Overweight/obesity	2.46 (2.08–2.91)	<0.001	2.45 (2.05–2.92)	<0.001	1.49 (1.16–1.92)	0.002	1.17 (1.36–2.30)	<0.001

The model was adjusted for healthy lifestyle advice, age, sex, marital status, education, occupation, tobacco use, fruit consumption, physical activity, and BMI. aRRR (adjusted relative risk ratio).

our study[44]. Furthermore, our findings indicate an increased likelihood of hypertension among participants who were overweight or obese. Previous studies have also revealed that weight gain and being overweight or obese independently contribute to an elevated risk of developing hypertension[45, 46]. Although the precise biological mechanism underlying the increased risk of hypertension associated with higher BMI is not yet completely understood, it may be caused by complex interactions within the metabolic and neurohormonal pathways that contribute to the development of high blood pressure[47, 48].

Considering that previous research has underscored the independent association between elevated blood pressure and increased CVD risk, identifying 12.1% of participants with elevated blood pressure in our study emphasizes the pressing need for proactive interventions to address this prevalent health concern[49, 50]. Moreover, our study revealed significant associations of factors such as not receiving healthy lifestyle advice, being male, and being overweight or obese, with elevated blood pressure, highlighting key areas for targeted interventions and prevention strategies to reduce new-onset hypertension.

This study acknowledges the limitations of its cross-sectional design, which impeded the establishment of caus-

al relationships and temporal exploration. The reliance on self-reported data may also have introduced some potential bias, particularly concerning the participants' self-reporting of having received healthy lifestyle advice. Additionally, there was a significant amount of missing data on sodium consumption, which is why we were unable to include it in the analysis as a behavioral risk factor. In future studies, a longitudinal design is recommended to provide insights into changes in health behaviors and outcomes over time, offering a more robust basis for understanding the impact of healthy lifestyle advice on the prevalence of hypertension.

Conclusions

Our findings highlight a significant association between receiving healthy lifestyle advice from healthcare providers and a lower prevalence of hypertension among undiagnosed individuals in Afghanistan. Healthcare professionals should continue providing advice regarding lifestyle modifications to manage hypertension and avoid complications. These changes may include staying physically active, following a nutritious diet, maintaining a healthy weight, quitting smoking, and reducing salt consumption. This study also underscores the need to address disparities in access to healthy lifestyle advice to more effectively target vulnerable populations.

Conflict of interest: The authors declare no conflict of interest.

Ethics approval and consent to participate: The survey was approved by the Institutional Review Board of the Ministry of Public Health of Afghanistan, and all participants provided informed consent before enrollment. Permission to use the dataset of Afghanistan National Non-Communicable Diseases Risk Factors Survey for the current analysis was obtained from the WHO NCDs microdata repository: https://extranet.who.int/ncdsmicrodata/index.php/catalog/782. All the methods used in this study were in accordance with the standards and regulations of the Declaration of Helsinki[51].

Consent for publication: All authors have reviewed the final version of the manuscript and consent to its submission to the Journal of Rural Medicine.

Data availability statement: The dataset used in this study is available on request from the WHO repository website: https://extranet.who.int/ncdsmicrodata/index.php/catalog/782.

Authors' contributions: IH, KN, and KS conceptualized the study. IH obtained, extracted, and analyzed the data under the supervision of KN and KS. IH prepared the manuscript, and all authors contributed to its review and revisions.

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