RESEARCH NOTE

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Associations of tobacco use, physical activity and diet with hypertension in the city of Kandahar, Afghanistan: a community-based cross-sectional study

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Abstract

Objective Hypertension exerts a substantial financial burden on individuals, families, communities, and the health system of a country. The current study aimed to describe the association of hypertension with its main risk factors in the Afghan population living in Kandahar city.

Results The prevalence of tobacco smoking, naswar use, physical activity and a healthy diet was 22%, 55%, 63.9% and 33.6%, respectively, in men, while in women, the prevalence was 4.8%, 6.5%, 57.6% and 13.5%, respectively. The prevalence of hypertension was 28.2% and 23.9% in men and women, respectively. Hypertension was associated with age greater than 45 years [aOR (95% CI) = 2.13 (1.56–2.91)], widows [aOR (95% CI) = 1.91 (1.25–2.91)], medium and high monthly income [aOR (95% CI) = 3.45 (2.33–5.10) and aOR (95% CI) = 2.34 (1.50–3.64)], high physical activity [aOR (95% CI) = 1.72 (1.15–2.56)], obesity [aOR (95% CI) = 1.64 (1.16–2.34)] and family history of hypertension [aOR (95% CI) = 4.70 (2.44–9.04)]. Naswar use is more prevalent than tobacco smoking among urban residents from Kandahar province. Improved monitoring and control of risk factors for hypertension are required in all regions of Afghanistan.

Keywords Hypertension, Naswar use, Physical inactivity, Tobacco smoking

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Introduction

The four major modifiable risk factors for NCDs are tobacco use, injurious alcohol habits, unhealthy diet, and physical inactivity [1]. According to a World Health Organization 2022 report, 22.3% of the world's population (36.7% men and 7.8% women) uses tobacco, which causes more than 7 million deaths. The most common form of tobacco is cigarette smoking, and most of these tobacco users live in low- and middle-income countries [2]. Smoking is a universal leading cause of avoidable morbidity and premature mortality, especially in LMICs [3]. In addition to smoking, naswar is also a non-chewable, moist, dipping, and smokeless tobacco product that

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is commonly used in Afghanistan, Iran, Pakistan, and Central Asian countries [4].

Hypertension affects approximately one billion people globally, and this number is expected to increase to 1.5 billion by the year 2025 [5]. At the global level, in 2019 the age-standardized prevalence of hypertension was 34% in men and 32% in women who were aged 30–79 years [6]. Hypertension exerts a substantial financial burden on individuals, families, communities, and the health system of any country [7]. Lifestyle changes prevent or delay the progression of the illness in at-risk individuals or those affected by hypertension [8]. The benefits of lifestyle modifications, such as smoking cessation, a healthy diet, and moderate physical activity, for the prevention of hypertension have been well recognized [9, 10].

In Afghanistan, the prevalence of hypertension has increased [11] and according to World Health Organization's 2023 report, the age-standardized prevalence of hypertension among adults aged 30–79 years old has reached 40% [12]. The country's decades of conflicts, poor health system and few studies due to lack of proper funds for health surveys are the major challenges for the improvement of population's health. Understanding the major risk factors in the Afghan population and preventing these risk factors could play a major role in decreasing the burden of hypertension and other NCDs in Afghanistan [13]. As data on the prevalence and risk factors of hypertension in Kandahar province are still scarce, therefore, the current study assessed the associations of physical inactivity, unhealthy diet, tobacco smoking and naswar use with hypertension in the Afghan population living in Kandahar city.

Methods
Data source
In this study, we used secondary data from a community-based cross-sectional study that was conducted from January 2019 to May 2019 in Kandahar, Afghanistan, and has been described in detail elsewhere [14]. The survey collected data from both male and female residents of Kandahar city and included information on socio-economic and demographic characteristics, personal and medical history, lifestyle, physical activity, anthropometric measurements and diet. The study was approved by Kandahar University's institutional review board (IRB), and written informed consent was obtained from all participants prior to data collection.

Sampling procedure
The study recruited both men and women aged 25 years and older living in the 15 districts of Kandahar city using a systematic random sampling method. For this reason, first, a sampling frame of houses in all the 15 districts of Kandahar city was obtained from the Directorate of

Kandahar Municipality. Then, the calculated sample size was divided by the proportional number of houses in each district to calculate the sampling interval. Next, the initial house was randomly selected by the lottery method and other houses were selected according to the sampling interval. Finally, in each household, an eligible male and female participants were selected on first contact with the interviewer. In case of refusal (3.3%), a neighboring house was selected. In case of multiple families living in one house or when eligible men were not available, more than two persons were selected, hence, the total number of participants reached 1308. After excluding participants with missing data, 1246 participants were included in the final statistical analyses.

Data collection procedure
The study questionnaire included information on sociodemographic characteristics (age, sex, marital status, level of education, job, and living area), personal health history (hypertension, diabetes mellitus, and dyslipidemia), lifestyle (smoking tobacco and naswar use), anthropometric parameters (weight, height, and waist circumference), nutritional status, and physical activity level of the study participants. All the data were collected by trained health workers, which included both male and female staff.

Body mass index (BMI) was calculated as weight (kilograms) divided by standing height (meters) squared and was categorized according to the WHO's classification: normal weight (BMI of 18.5–24.9), overweight (BMI of 25.0-29.9) and obese (BMI of ≥30) [15]. Dietary intake was assessed by collecting data on the participants eating behaviors. All study participants were asked about the number of meals eaten per day, the frequency of consuming fruits, the frequency of consuming raw and cooked vegetables and the frequency of consuming different types of meat per week or month. Diet was categorized as healthy or unhealthy based on the servings of fruits and vegetables per day. A diet with five or more servings of fruits and/or vegetables per day was considered a healthy diet, while a diet with fewer than five servings was considered unhealthy [16, 17]. The tobacco use data were divided into two categories: cigarette smoking and naswar (snuff) use. Naswar is a mixture of powdered tobacco, ash, flavoring and coloring agents, oil and sometimes lime. This smokeless tobacco product is usually kept in the mouth under the tongue and sucked for several minutes [18]. Study participants were asked about current smoking status and quantity, age at smoking initiation and cessation, current or past use (no use for more than 6 months) of the naswar and duration of smoking.

To measure the participants' physical activity levels, we used the short version of the International Physical Activity Questionnaire (IPAQ), which includes questions

about the duration of physical activity in minutes and the intensity of vigorous, moderate and light physical activity. These data were later converted into total METs (metabolic equivalent) minutes per week [19].

Statistical analysis

In this secondary data analysis, after excluding participants with missing data, 1246 participants were included in the final statistical analyses. The data are expressed as the mean±standard deviation or number (percent). For the comparison of continuous and categorical variables, one-way analysis of variance and the χ^2 test were performed, respectively. Logistic regression was used to study the association between the exposures of interest (smoking tobacco, naswar use, physical activity and type of diet) and the risk of hypertension. Potential confounders available were adjusted for in each analysis. All the statistical analyses were conducted using Stata 14.0 (StataCorp LP, College Station, TX, USA). A two-sided p value<0.05 was considered to indicate statistical significance.

Results

In our study, a total of 1246 subjects aged≥25 years were included in this secondary data analysis, which consisted of 446 men (35.8%) and 800 women (64.2%). The characteristics of the study population according to the risk factors for noncommunicable diseases are summarized in Table 1. The prevalence of smoking was 11% among the study participants, which was significantly greater for men than women (22.0% vs. 4.8%, *p*<0.001). Smoking was more prevalent among older adults, literate individuals, and participants with a high socioeconomic status. The prevalence of naswar was 24% among the participants, which was greater among men than among women (55.0% vs. 6.5%, *p*<0.001). Naswar was significantly associated with older age, education and high socioeconomic status. The level of physical activity was significantly greater in men (63.9%) than in women (57.6%), and it decreased with age and was greater among single participants and literate individuals. Greater physical activity was significantly more common among participants with high socioeconomic status, individuals with obesity and individuals without T2DM. In this study, 20% of the overall population had access to a healthy diet. This proportion of healthy diet was significantly greater among participants who were men, older adults (70+), literate individuals, in high socioeconomic status, in the normal weight category, without central obesity, and who were suffering from hypertension.

Prevalence of hypertension and its associated factors stratified by sex

The prevalence of hypertension was greater among men than women (28.2% vs. 23.9%, *p*=0.089), as summarized in Table 2. According to age categories, older age was significantly associated with hypertension in both sexes, while, regarding marital status, being a widow was associated with hypertensive state in women only. Among women, current smokers and naswar use were more common among those who had hypertension than among those without hypertension, while among men, smoking and naswar use were not significantly different. Higher physical activity was negatively associated with hypertension in men (*p*=0.893) and positively associated with hypertension in women (*p*<0.001). Hypertension was more prevalent among participants with healthy diet, but the association was only significant in females. Obesity in men was notably associated with hypertension (*p*=0.029) but not in women.

Analysis of risk factors associated with hypertension

Concerning hypertension and its associated risk factors (Table 3), age more than 45 years (cOR 2.16, 95% CI 1.65–2.81, *p*<0.001), being a widow (OR 2.02, 95% CI 1.40–2.93, *p*<0.001), having a medium or high monthly income (cOR 3.43, 95% CI 2.38–4.96, *p*<0.001 and cOR 2.63, 95% CI 1.76–3.94, *p*<0.001), having a medium SES (OR 1.43, 95% CI 1.05–1.97, *p*=0.025), having a history of naswar use (cOR 1.51, 95% CI 1.13–2.01, *p*=0.005), having a high physical activity (cOR 1.54, 95% CI 1.08–2.18, *p*=0.016), having obesity (cOR 1.46, 95% CI 1.07–1.99, *p*=0.018) and having a family history of hypertension (cOR 4.64, 95% CI 2.55–8.43, *p*<0.001) had significantly positive associations with hypertension in the crude model. Similarly, in the adjusted model, the predictors of hypertension were age greater than 45 years (aOR 2.13, 95% CI 1.56–2.91, *p*<0.001), widow status (OR 1.91, 95% CI 1.25–2.91, *p*=0.003), moderate and high income (aOR 3.45, 95% CI 2.33–5.10, *p*<0.001 and aOR 2.34, 95% CI 1.50–3.64, *p*<0.001), high physical activity (aOR 1.72, 95% CI 1.15–2.56, *p*=0.008), obesity (aOR 1.64, 95% CI 1.16–2.34, *p*=0.006) and family history of hypertension (aOR 4.70, 95% CI 2.44–9.04, *p*<0.001).

Discussion

In our study, the prevalence of smoking in Kandahar was comparable to the prevalence of current smoking at the national level [20]. Smoking tobacco was more common among men than women, which is in accordance with other studies conducted in Afghanistan [20, 21]. In our analysis, there was a borderline association between current smoking status and hypertension. While tobacco smoking is widely perceived as an important risk factor for cardiovascular diseases, it has a complex association

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Table 1 Characteristics of the study population ($n = 1246$) according to smoking tobacco, naswar use, physical activity and diet

Variables[1]	Tobacco Smoking			Naswar Use			Physical Activity			Diet		
	No	Yes	P value[2]	No	Yes	P value[2]	No	Yes	P value[2]	Unhealthy	Healthy	P value[2]
	1110 (89%)	136 (11%)		949 (76%)	297 (24%)		500 (40%)	746 (60%)		988 (80%)	258 (20%)	
	N (%)			N (%)			N (%)			N (%)		
Gender			<0.001			<0.001			0.030			<0.001
Male	348 (78.0)	98 (22.0)		201 (45.0)	245 (55.0)		161 (36.1)	285 (63.9)		296 (66.4)	150 (33.6)	
Female	762 (95.2)	38 (4.8)		748 (93.5)	52 (6.5)		339 (42.4)	461 (57.6)		692 (86.5)	108 (13.5)	
Age in Categories			<0.001			<0.001			<0.001			<0.001
25–39 Years	343 (92.7)	27 (7.3)		327 (88.4)	43 (11.6)		91 (24.6)	279 (75.4)		291 (78.7)	79 (21.3)	
40–54 Years	535 (90.1)	59 (9.9)		470 (79.1)	124 (20.9)		240 (40.4)	354 (59.6)		500 (84.2)	94 (15.8)	
55–69 Years	155 (83.3)	31 (16.7)		107 (57.5)	79 (42.5)		105 (56.4)	81 (43.6)		133 (71.5)	53 (28.5)	
70+	77 (80.2)	19 (19.8)		45 (46.9)	51 (53.1)		64 (66.7)	32 (33.3)		64 (66.7)	32 (33.3)	
Marital Status			0.202			0.696			<0.001			0.554
Married	973 (89.7)	112 (10.3)		824 (75.9)	261 (24.1)		412 (38.0)	673 (62.0)		857 (79.0)	228 (21.0)	
Single	21 (87.5)	3 (12.5)		20 (83.3)	4 (16.7)		6 (25.0)	18 (75.0)		18 (75.0)	6 (25.0)	
Widow	116 (84.7)	21 (15.3)		105 (76.6)	32 (23.4)		82 (59.9)	55 (40.1)		113 (82.5)	24 (17.5)	
Educational Status			<0.001			0.014			0.048			<0.001
Illiterate	987 (90.7)	101 (9.3)		841 (77.3)	247 (22.7)		448 (41.2)	640 (58.8)		896 (82.3)	192 (17.7)	
Literate	123 (77.9)	35 (21.1)		108 (68.4)	50 (31.6)		52 (32.9)	106 (67.1)		92 (58.2)	66 (41.8)	
Socioeconomic Status (missing = 2)			<0.001			<0.001			0.019			<0.001
Low	400 (95.2)	20 (4.8)		400 (95.2)	20 (4.8)		177 (42.1)	243 (57.9)		364 (86.7)	56 (13.3)	
Medium	383 (93.0)	29 (7.0)		344 (83.5)	68 (16.5)		180 (43.7)	232 (56.3)		353 (85.7)	59 (14.3)	
High	326 (79.1)	86 (20.9)		204 (49.5)	208 (50.5)		143 (34.7)	269 (65.3)		270 (65.5)	142 (34.5)	
BMI Classes			<0.001			0.049			0.001			<0.001
Normal Weight	326 (84.9)	58 (15.1)		281 (73.2)	103 (26.8)		184 (47.9)	200 (52.1)		276 (71.9)	108 (28.1)	
Overweight	317 (87.8)	44 (12.2)		291 (80.6)	70 (19.4)		140 (38.8)	221 (61.2)		287 (79.5)	74 (20.5)	
Obese	467 (93.2)	34 (6.8)		377 (75.2)	124 (24.8)		176 (35.1)	325 (64.9)		425 (84.8)	76 (15.2)	
Central Obesity			<0.001			<0.001			0.663			0.016
No	270 (83.9)	52 (16.1)		205 (63.7)	117 (36.3)		120 (37.3)	202 (62.7)		252 (78.3)	70 (21.7)	
Yes	667 (92.0)	58 (8.0)		604 (83.3)	121 (16.7)		260 (35.9)	465 (64.1)		612 (84.4)	113 (15.6)	
Hypertension			0.182			0.005			0.615			0.001
No	834 (89.8)	95 (10.2)		726 (78.1)	201 (21.9)		369 (39.7)	560 (60.3)		757 (81.5)	172 (18.5)	
Yes	276 (87.1)	41 (12.9)		223 (70.3)	94 (29.7)		131 (41.3)	186 (58.7)		231 (72.9)	86 (27.1)	
T2DM			0.001			<0.001			0.029			0.167
No	956 (90.4)	102 (9.6)		826 (78.1)	232 (21.9)		411 (38.9)	647 (61.1)		846 (80.0)	212 (20.0)	
Yes	154 (81.9)	34 (18.1)		123 (65.4)	65 (34.6)		89 (47.3)	99 (52.7)		142 (75.5)	46 (24.5)	

[1] Number of missing values is 0 unless otherwise specified; [2] Chi-square test

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Table 2 Characteristics of the study population according to gender and hypertension status (*n* = 1246)

Variables[1]	GENDER					
	MALE 446 (35.8)			**FEMALE 800 (64.2)**		
	Normotensive	**Hypertensive**	**P value[2]**	**Normotensive**	**Hypertensive**	**P value[2]**
	320 (71.8)	**126 (28.2)**	**-**	**609 (76.1)**	**191 (23.9)**	**0.089**
	n (%)	*n* (%)		*n* (%)	*n* (%)	
Mean age in years (SD)	48.8 (14.3)	53.5 (13.9)	**0.002**	43.2 (9.2)	49.7 (14.3)	**< 0.001**
Age in Categories			**< 0.001**			**< 0.001**
25–39	91 (87.5)	13 (12.5)		215 (80.8)	51 (19.2)	
40–54	126 (68.9)	57 (31.2)		342 (83.2)	69 (16.8)	
55–69	70 (66.7)	35 (33.3)		38 (46.9)	43 (53.1)	
70+	33 (61.1)	21 (38.9)		14 (33.3)	28 (66.7)	
Marital Status			0.534			**< 0.001**
Married	297 (71.2)	120 (28.8)		530 (79.3)	138 (20.7)	
Single	8 (72.3)	3 (27.3)		10 (76.9)	3 (23.1)	
Widow	15 (83.3)	3 (16.7)		69 (58.0)	50 (42.0)	
Educational Status			0.689			0.096
Illiterate	225 (71.2)	91 (28.8)		584 (75.6)	188 (24.4)	
Literate	95 (73.1)	35 (26.9)		25 (89.3)	3 (10.7)	
Tobacco Smoking			0.572			**0.001**
Never Smoker	246 (70.7)	102 (29.3)		588 (77.2)	174 (22.8)	
Former Smoker	29 (78.4)	8 (21.6)		13 (72.2)	5 (27.8)	
Current Smoker	45 (73.8)	16 (26.2)		8 (40.0)	12 (60.0)	
Naswar Use			0.868			**< 0.001**
No	145 (72.1)	56 (27.9)		581 (77.7)	167 (22.3)	
Yes	175 (71.4)	70 (28.6)		28 (53.9)	24 (46.1)	
Physical Activity Level			0.839			**< 0.001**
High	82 (73.9)	29 (26.1)		50 (53.8)	43 (46.2)	
Moderate	123 (70.7)	51 (29.3)		305 (82.9)	63 (17.1)	
Low	115 (71.4)	46 (28.6)		254 (74.9)	85 (25.1)	
Diet			0.140			**0.006**
Unhealthy	219 (74.0)	77 (26.0)		538 (77.8)	154 (22.2)	
Healthy	101 (67.3)	49 (32.7)		71 (65.7)	37 (34.3)	
BMI Classes			**0.029**			0.541
Normal Weight	123 (79.3)	32 (20.7)		179 (78.2)	50 (21.8)	
Overweight	86 (69.3)	38 (30.7)		182 (76.8)	55 (23.2)	
Obese	111 (66.5)	56 (33.5)		248 (74.2)	86 (25.8)	
Central Obesity			0.472			0.133
No	143 (78.6)	39 (21.4)		113 (80.7)	27 (19.3)	
Yes	106 (75.2)	35 (24.8)		436 (74.7)	148 (25.3)	
T2DM			**0.047**			**< 0.001**
No	263 (73.9)	93 (26.1)		565 (80.5)	137 (19.5)	
Yes	57 (63.3)	33 (36.7)		44 (44.9)	54 (55.1)	

[1] Number of missing values is 0 unless otherwise specified; [2] Chi-square test or ANOVA

Continuous variables are shown with mean and standard deviation; Categorical variables are shown with number and percentage

with hypertension. Globally, national cohorts and longitudinal surveys have revealed different patterns between smoking and hypertension. A recent longitudinal study in the U.S. and a cohort study in China did not report a significant association between tobacco smoking and the risk of hypertension [22, 23]. In contrast, a systematic review of hypertension in low- and middle-income countries indicated that smoking was an independent risk factor for hypertension in Asian communities [24]. These mixed results demonstrate that various factors, such as different populations and cultures, lifestyles, diets, physical activities and other confounders, may influence these relationships.

As shown in our results, naswar use is much more common than tobacco smoking in Afghanistan, both among men and women. The main reason for the greater use of this smokeless tobacco product may be its low price and easy availability among the public [4]. The

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Table 3 Logistic regression analysis on the effect of the socio-demographic characteristics of respondents for risk factors associated with hypertension

Variables	Hypertension					
	cOR	(95% CI)	P value	aOR	(95% CI)	P value
Gender						
Men	Reference (1.0)			Reference (1.0)		
Women	0.80	(0.61–1.04)	0.089	0.87	(0.48–1.60)	0.662
Age						
<45 years	Reference (1.0)			Reference (1.0)		
≥45 years	2.16	(1.65–2.81)	**<0.001**	2.13	(1.56–2.91)	**<0.001**
Marital Status						
Married	Reference (1.0)			Reference (1.0)		
Single	1.07	(0.42–2.72)	0.890	1.31	(0.49–3.50)	0.588
Widow	2.02	(1.40–2.93)	**<0.001**	1.91	(1.25–2.91)	**0.003**
Education						
Illiterate	Reference (1.0)			Reference (1.0)		
Literate	0.92	(0.62–1.36)	0.668	1.03	(0.63–1.68)	0.920
Monthly Income						
Below 10,000 AFN	Reference (1.0)			Reference (1.0)		
10,000 to 20,000 AFN	3.43	(2.38–4.96)	**<0.001**	3.45	(2.33–5.10)	**<0.001**
More than 20,000 AFN	2.63	(1.76–3.94)	**<0.001**	2.34	(1.50–3.64)	**<0.001**
Socioeconomic Status						
Low SES	Reference (1.0)			Reference (1.0)		
Medium SES	1.43	(1.05–1.97)	**0.025**	1.03	(0.71–1.48)	0.887
High SES	1.30	(0.95–1.79)	0.106	0.57	(0.29–1.11)	0.100
Tobacco Smoking						
No	Reference (1.0)			Reference (1.0)		
Former	0.94	(0.49–1.77)	0.837	0.74	(0.37–1.48)	0.401
Current	1.60	(0.99–2.57)	0.055	1.59	(0.93–2.72)	0.088
Naswar Use						
No	Reference (1.0)			Reference (1.0)		
Yes	1.51	(1.13–2.01)	**0.005**	1.32	(0.90–1.93)	0.155
Physical Activity						
Low	Reference (1.0)			Reference (1.0)		
Moderate	0.75	(0.56–0.99)	**0.050**	0.85	(0.62–1.18)	0.355
High	1.54	(1.08–2.18)	**0.016**	1.72	(1.15–2.56)	**0.008**
Diet						
Unhealthy	Reference (1.0)			Reference (1.0)		
Healthy	1.64	(1.22–2.21)	**0.001**	1.56	(1.11–2.20)	**0.010**
BMI						
Normal Weight	Reference (1.0)			Reference (1.0)		
Overweight	1.28	(0.91–1.79)	0.157	1.42	(0.98–2.06)	0.067
Obese	1.46	(1.07–1.99)	**0.018**	1.64	(1.16–2.34)	**0.006**
Family History of Hypertension						
No	Reference (1.0)			Reference (1.0)		
Yes	4.64	(2.55–8.43)	**<0.001**	4.70	(2.44–9.04)	**<0.001**

cOR, crude odds ratio; aOR, adjusted odds ratio; CI, confidence interval

levels of naswar use observed in our investigation were greater than those reported in a previous study that analyzed data from the 2015 Afghanistan Demographic and Health Survey (DHS) [20]. This difference may be explained by the fact that the participants in the survey were younger (15 to 49 years) than those in our study (25 to 70+years). We also found that naswar use was positively associated with hypertension in our analysis. Smokeless tobacco products are associated with harmful health outcomes, such as cancers, cardiovascular disease, stroke, hypertension, and dyslipidemia [25]. Blood pressure is acutely increased by nicotine present in smokeless tobacco products such as naswar, but studies have

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not confirmed this effect on resting blood pressure levels during nonexposure to naswar use [26].

Approximately 8% of NCDs and more than 7% of all-cause and cardiovascular disease deaths worldwide are attributable to physical inactivity, and the greatest number of people affected by physical inactivity are residents of middle-income countries [27]. 40% of the urban population in our study had insufficient physical activity. The physical activity level was greater in men (63.9%) than in women (57.6%). Although several provincial surveys have reported physical activity levels in Afghanistan, information from national surveys is lacking considering the assessment of the physical activity levels of Afghan adults aged older than 18 years [28, 29].

Diet was divided into two categories in our analysis. A diet with five or more servings of fruits and/or vegetables per day was considered a healthy diet, while a diet with fewer than five servings was considered unhealthy. In the current study, one unanticipated result was that a healthy diet was positively associated with hypertension. Several studies, including systematic reviews and meta-analyses, have reported that high-quality diets are associated with a significant reduction in the incidence of cardiovascular diseases [30–32]. The unexpected result of our study may be explained by the fact that classification of diet based only on servings of fruits and vegetables may not be able to assess the dietary patterns in the Afghan population. In addition, it is possible that these results might be biased by misreporting of the servings by the study participants. Hence, further diet quality studies are required to assess dietary patterns through the use of food frequency questionnaires (FFQs) in this population and evaluate their association with hypertension.

Limitations

Although our study included data on the prevalence of hypertension and its risk factors, it was a cross-sectional study, which cannot assess causes and relationships. In addition, as the survey was conducted during the day, most of the working men may not have been enlisted in the survey, which may have caused oversampling of the women. Furthermore, the study was conducted in only one province of Afghanistan and is therefore not nationally representative.

Conclusion

The results of this study suggest that naswar use is more prevalent than tobacco smoking among urban residents of Kandahar province. As hypertension can be easily detected in the community and primary care centers, effective preventive and treatment strategies should be an objective of national health programs.

Abbreviations

AFN	Afghani
aOR	Adjusted odds ratio
BMI	Body mass index
CI	Confidence interval
cOR	Crude odds ratio
DHS	Demographic health survey
IPAQ	International Physical Activity Questionnaire
IRB	Institutional Review Board
METs	Metabolic equivalents
NCDs	Noncommunicable diseases
SD	Standard deviation
SES	Socioeconomic status
T2DM	Type 2 diabetes mellitus

Declarations

Ethics approval and consent to participate
The study protocol was approved by Kandahar University's Institutional Ethics Committee (Registration number KDRU-EC7-20181121). Prior to data collection, patients who agreed to participate were informed about the objectives of the study and were assured regarding their anonymity and the confidentiality of the information. Written informed consent was obtained from all participants prior to data collection.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

References
1. World Health Organization. Noncommunicable diseases country profiles 2018 [Internet]. Geneva: World Health Organization. 2018. 224 p. Available from: https://apps.who.int/iris/handle/10665/274512
2. World Health Organization. Tobacco [Internet]. 2022 [cited 2023 Apr 11]. Available from: https://www.who.int/news-room/fact-sheets/detail/tobacco
3. Bump JB, Reich MR. Political economy analysis for tobacco control in low- and middle-income countries. Health Policy Plan. 2013;28(2):123–33.
4. Khan Z, Dreger S, Shah SMH, Pohlabeln H, Khan S, Ullah Z et al. G Papaccio editor 2017 Oral cancer via the bargain bin: the risk of oral cancer associated with a smokeless tobacco product (Naswar). PLoS ONE. 2017;12(7):e0180445.

5.   Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365(9455):217–23.

6.   Zhou B, Carrillo-Larco RM, Danaei G, Riley LM, Paciorek CJ, Stevens GA, et al. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. Lancet. 2021;398(10304):957–80.

7.   Gbadamosi MA, Tlou B. Modifiable risk factors associated with non-communicable diseases among adult outpatients in Manzini, Swaziland: a cross-sectional study. BMC Public Health. 2020;20(1):665.

8.   World Health Organization. Global status report on noncommunicable diseases 2010 [Internet]. Geneva: World Health Organization. 2011. Available from: https://apps.who.int/iris/handle/10665/44579

9.   Mendis S, O'Brien E, Seedat YK, Yusuf S. Hypertension and diabetes: entry points for Prevention and Control of the Global Cardiovascular Epidemic. Int J Hypertens. 2013;2013:1–3.

10. Kontis V, Mathers CD, Rehm J, Stevens GA, Shield KD, Bonita R, et al. Contribution of six risk factors to achieving the 25×25 non-communicable disease mortality reduction target: a modelling study. Lancet. 2014;384(9941):427–37.

11. World Health Organization. Afghanistan Hypertension Fact Sheet [Internet]. Geneva: World Health Organization. 2018 p. 2. Available from: https://cdn.who.int/media/docs/default-source/country-profiles/hypertension/afg_en.pdf?sfvrsn=8d637bfd_3&download=true

12. World Health Organization. Hypertension Afghanistan 2023 country profile [Internet]. World Health Organization. 2023 p. 1. Available from: https://www.who.int/publications/m/item/hypertension-afg-2023-country-profile

13. Neyazi N, Mosadeghrad AM, AbouZeid A. Non-communicable diseases in Afghanistan: a silent tsunami. Lancet. 2023;401(10393):2035–6.

14. Wasiq AW, Fazli N, Ahadi AN, Amirzada MZ, Hayat MS, Ishaq N, PREVALENCE OF TYPE 2 DIABETES MELLITUS AND ITS ASSOCIATION WITH SOCIOECONOMIC STATUS IN KANDAHAR CITY, et al. A CROSS-SECTIONAL STUDY. Malays J Public Health Med. 2021;21(3):26–35.

15. World Health Organization. Waist circumference and waist-hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008 [Internet]. Geneva: World Health Organization. 2011 p. 47. Available from: https://www.who.int/publications/i/item/9789241501491

16. World Health Organization. Diet, nutrition, and the prevention of chronic diseases: report of a WHO-FAO Expert Consultation [Internet]. Geneva: World Health Organization. 2003 p. 149. Available from: https://apps.who.int/iris/handle/10665/42665

17. World Health Organization, Noncommunicable Diseases and Mental Health Cluster. WHO STEPS surveillance manual: the WHO STEPwise approach to chronic disease risk factor surveillance [Internet]. Geneva: World Health Organization. 2005 [cited 2022 Dec 28]. Report No.: WHO/NMH/CHP/SIP/05.02. Available from: https://apps.who.int/iris/handle/10665/43376

18. IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, International Agency for Research on Cancer, editors. Smokeless tobacco and some tobacco-specific N-nitrosamines [Internet]. Lyon, France: Geneva: World Health Organization, International Agency for Research on Cancer ; distributed by WHO Press., 2007. 626 p. (IARC monographs on the evaluation of carcinogenic risks to humans). Available from: https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Smokeless-Tobacco-And-Some-Tobacco-specific-E m-N-Em--Nitrosamines-2007

19. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International Physical Activity Questionnaire: 12-Country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381–95.

20. Alemi Q, Stempel C, Montgomery S. Prevalence and social determinants of tobacco use in Afghanistan. Int Health. 2021;13(1):3–12.

21. Saeed KMI. Prevalence of Risk Factors for Non-Communicable Diseases in the Adult Population of Urban Areas in Kabul City, Afghanistan. Cent Asian J Glob Health [Internet]. 2014 Jan 3 [cited 2021 May 12];2(2). Available from: http://cajgh.pitt.edu/ojs/index.php/cajgh/article/view/69

22. Luehrs RE, Zhang D, Pierce GL, Jacobs DR, Kalhan R, Whitaker KM. Cigarette smoking and Longitudinal associations with blood pressure: the CARDIA Study. J Am Heart Assoc. 2021;10(9):e019566.

23. Gao N, Liu T, Wang Y, Chen M, Yu L, Fu C, et al. Assessing the association between smoking and hypertension: smoking status, type of tobacco products, and interaction with alcohol consumption. Front Cardiovasc Med. 2023;10:1027988.

24. Ain QU, Regmi K. The effects of smoking in developing hypertension in Pakistan: a systematic review. South East Asia J Public Health. 2015;5(1):4–11.

25. Hajat C, Stein E, Ramstrom L, Shantikumar S, Polosa R. The health impact of smokeless tobacco products: a systematic review. Harm Reduct J. 2021;18(1):123.

26. Asplund K. Smokeless tobacco and cardiovascular disease. Prog Cardiovasc Dis. 2003;45(5):383–94.

27. Katzmarzyk PT, Friedenreich C, Shiroma EJ, Lee IM. Physical inactivity and non-communicable disease burden in low-income, middle-income and high-income countries. Br J Sports Med. 2022;56(2):101–6.

28. World Health Organization. Physical activity Afghanistan 2022 country profile [Internet]. 2022 [cited 2023 May 19]. Available from: https://www.who.int/publications/m/item/physical-activity-afg-2022-country-profile

29. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. Lancet Glob Health. 2018;6(10):e1077–86.

30. Schwingshackl L, Bogensberger B, Hoffmann G. Diet Quality as assessed by the healthy eating index, alternate healthy eating Index, Dietary approaches to stop hypertension score, and Health outcomes: an updated systematic review and Meta-analysis of Cohort studies. J Acad Nutr Diet. 2018;118(1):74–e10011.

31. Ndanuko RN, Tapsell LC, Charlton KE, Neale EP, Batterham MJ. Dietary patterns and blood pressure in adults: a systematic review and Meta-analysis of Randomized controlled trials. Adv Nutr. 2016;7(1):76–89.

32. Razmpoosh E, Moslehi N, Abdollahi S, Soltani S, Mirmiran P, Azizi F. The Mediterranean, DASH, and MIND diets and the incident of hypertension over a median follow-up of 7.4 years in the Tehran Lipid and glucose study. BMC Public Health. 2022;22(1):2374.

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