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Knowledge of Avoidable Risk Factors of Hypertension and Their Association with Hypertension Status Among University Students in The United Kingdom

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ABSTRACT

Hypertension remains a leading contributor to cardiovascular morbidity and premature mortality worldwide, with increasing prevalence observed among younger populations. Although avoidable lifestyle factors account for a substantial proportion of hypertension risk, prevention efforts depend heavily on adequate awareness and understanding of these factors. This study examines the level of knowledge of avoidable risk factors of hypertension among university students in England and evaluates the relationship between these factors and hypertension status. A cross-sectional quantitative design was employed using a structured questionnaire administered to students at a large English university. Descriptive statistics, chi-square analysis, and multinomial logistic regression were used to analyse the data. Findings indicate a high level of knowledge of avoidable risk factors, including alcohol consumption, obesity, high salt intake, and junk food consumption. Despite this, significant associations were observed between several avoidable risk factors and hypertension status, particularly alcohol use, body mass index, salt intake, and frequent consumption of junk food. The results highlight a clear disjunction between knowledge and health behaviour, suggesting that awareness alone is insufficient to reduce hypertension risk among university students. The study underscores the need for prevention strategies that extend beyond information provision to address behavioural, social, and environmental drivers of risk.

Keywords: Hypertension, avoidable risk factors, knowledge, university students, lifestyle behaviours

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INTRODUCTION

Hypertension remains one of the most significant global public health challenges because of its strong links with cardiovascular disease, stroke, renal impairment, and premature mortality. Recent estimates from the World Health Organization (WHO) indicate that approximately 1.4 billion adults aged 30 to 79 years live with hypertension, and the global burden continues to rise as populations age and lifestyle patterns shift (WHO, 2023). Although hypertension has long been associated with older adults, recent research has highlighted a worrying increase among younger populations. Studies have shown that elevated blood pressure is becoming more common among university students, reflecting broader lifestyle transitions that place young adults at heightened risk (Lopez et al., 2025; Mahalakshmi et al., 2025). This pattern raises important concerns because early onset hypertension increases the likelihood of long-term cardiovascular complications and may contribute to a prolonged disease trajectory across adulthood.

Avoidable risk factors remain central to the development and progression of hypertension. High salt intake, excessive alcohol consumption, tobacco use, physical inactivity, obesity, and unhealthy dietary patterns have been consistently identified as major contributors in epidemiological and clinical research (Kario et al., 2024; Datt & Sharma, 2025). These behaviours are particularly common among university students, whose routines are shaped by academic pressures, social expectations, and limited access to healthy food environments. Evidence from international studies suggests that students often engage in irregular eating patterns, consume high-calorie convenience foods, and experience disrupted sleep, all of which may elevate blood pressure over time (Adetunji et al., 2025; Alahmad et al., 2025). Understanding these behavioural risks is therefore essential for designing effective prevention strategies.

Research exploring students' knowledge of hypertension risk factors has produced varied findings. Some studies report relatively strong awareness among students in health-related programmes, while others identify substantial gaps in understanding, particularly regarding diet, alcohol intake, and the cumulative effects of lifestyle behaviours (Lopez et al., 2025; Mahalakshmi et al., 2025). In the United Kingdom, evidence focusing specifically on university students remains limited, despite growing recognition that early prevention efforts must be grounded in an accurate understanding of young adults' knowledge and behaviours. The wider research that informed this study highlighted the need for a more detailed examination of how students interpret avoidable risk factors and how this knowledge relates to their measured blood pressure status.

This paper contributes to public health research by linking knowledge assessment with empirical analysis of behavioural exposure and hypertension outcomes among students in an English university. The approach moves beyond treating awareness as a standalone indicator and instead considers whether knowledge aligns with healthier behavioural choices. This perspective offers a more realistic understanding of the strengths and limitations of knowledge-based prevention strategies within young adult populations. It also provides insight into how universities and public health practitioners might design interventions that address both behavioural risks and the contextual factors that shape students' health practices. The study, therefore, aims to support more effective prevention efforts by clarifying the relationship among knowledge, behaviour, and measured hypertension in a population often overlooked in national health strategies.

CONCEPTUAL BACKGROUND

Hypertension continues to be understood through the distinction between unavoidable and avoidable risk factors, a distinction that shapes both epidemiological research and prevention strategies. Unavoidable factors such as age, genetic predisposition, sex, and ethnicity influence baseline vulnerability and cannot be altered through behavioural change. These determinants have been consistently highlighted in recent clinical research, which shows that inherited traits and age-related vascular changes contribute significantly to hypertension development across the life course (Carey et al., 2018). Avoidable factors, in contrast, arise from lifestyle and environmental conditions that can be modified. These include alcohol intake, smoking, unhealthy dietary patterns, excessive salt consumption, physical inactivity, and obesity. Recent studies have reinforced the central role of these behaviours in shaping hypertension risk among young adults, who are increasingly exposed to lifestyle patterns that elevate long-term cardiovascular risk (Li et al., 2023; Zahid et al., 2024).

Public health approaches have often relied on education and awareness as core components of hypertension

prevention. This emphasis reflects behavioural theories such as the Health Belief Model and Social Cognitive Theory, which propose that individuals are more likely to adopt healthier behaviours when they recognise personal risk and believe that change will lead to meaningful benefits (Bandura, 2001; Champion et al., 2008). These frameworks highlight perceived susceptibility, perceived severity, and self-efficacy as important influences on behaviour. However, recent research has shown that knowledge alone does not reliably lead to sustained behavioural change. Young adults often report awareness of health risks yet continue to engage in behaviours that increase their vulnerability to chronic disease. Studies have shown that stress, social expectations, and environmental constraints frequently override health knowledge, particularly in university settings where competing demands shape daily routines (Kessler & Rayman, 2024; Tang et al., 2025).

University students represent a population in which this disconnect between knowledge and behaviour is especially visible. Although many students understand the risks associated with alcohol use, poor diet, and physical inactivity, these behaviours remain widespread. Research has documented high levels of sedentary behaviour, frequent consumption of energy-dense foods, and episodic heavy drinking among students across different regions (Li et al., 2023; Niu et al., 2025). These patterns contribute to elevated blood pressure and may increase the likelihood of early-onset hypertension. The persistence of these behaviours, even among students who recognise their risks, raises important questions about the limits of knowledge-based interventions.

The wider research that informed this study highlighted the need to examine knowledge and behaviour within the same population rather than treating them as separate domains. Understanding whether students who possess stronger knowledge of avoidable risk factors actually engage in healthier behaviours is essential for designing effective prevention strategies. This study builds on this conceptual foundation by linking awareness, lifestyle practices, and measured hypertension status. This approach provides a more complete understanding of how knowledge interacts with behaviour in young adults and offers insight into the extent to which educational interventions can realistically influence hypertension risk in university settings.

METHODS

Study Design and Participants

The study adopted a cross-sectional quantitative design, which is widely used in public health research to examine associations between behavioural factors and health outcomes at a single point in time (Setia, 2016; Wang & Cheng, 2020). The target population consisted of full-time registered students aged 18 years and above at a university in England. This population was selected because young adults in higher-education settings often experience lifestyle transitions that may influence hypertension risk. Data were collected using an online structured questionnaire hosted on a secure digital platform, a method that has been shown to enhance accessibility and reduce respondent burden in university-based research (Evans & Mathur, 2018).

Sampling and Data Collection

A convenience sampling approach was used due to time constraints and the practical need to reach students efficiently. Convenience sampling is commonly employed in health-behaviour studies involving university populations, particularly when rapid data collection is required (Etikan et al., 2016). A total of 392 questionnaires were distributed, and 351 were fully completed and included in the analysis, resulting in a response rate of 89.5 percent. Online distribution supported wider reach across student groups and has been shown to improve participation rates in similar studies (Sax et al., 2003).

Measures

The questionnaire comprised five sections: demographic characteristics, knowledge of hypertension risk factors, knowledge of avoidable risk factors, lifestyle behaviours, and hypertension status. Knowledge items assessed awareness of established risk factors using structured response options informed by current hypertension guidelines (National Institute for Health and Care Excellence, 2023). Lifestyle behaviours included alcohol use, smoking, dietary patterns, salt consumption, physical activity, and body mass index. These behaviours were selected because they represent well-documented modifiable contributors to hypertension in young adults (Mills et al., 2020; Whelton et al., 2018).

Hypertension status was categorised into normal, pre-hypertension, stage one hypertension, and stage two

hypertension based on reported blood pressure values. Classification followed internationally recognised thresholds that are widely applied in epidemiological research (Unger et al., 2020). Although self-reported blood pressure may introduce measurement limitations, previous studies have shown that self-report can provide reasonably accurate estimates in young adult populations when respondents have recent readings (Piri et al., 2023).

Data Analysis

Data were analysed using SPSS version 21. Descriptive statistics summarised demographic characteristics, knowledge levels, and lifestyle behaviours. Chi-square tests were used to examine associations between avoidable risk factors and hypertension status, consistent with recommended practice for analysing categorical variables in cross-sectional studies (Kim, 2017). Multinomial logistic regression was employed to assess the strength and direction of relationships between behavioural risk factors and hypertension outcomes. This analytical approach is appropriate when the dependent variable has more than two unordered categories and allows for the estimation of relative risk across multiple hypertension classifications (Stoltzfus, 2011). Statistical significance was set at the 0.05 level.

RESULTS

Knowledge of Avoidable Risk Factors

Most respondents demonstrated strong awareness of avoidable risk factors for hypertension. A large proportion correctly identified stress, obesity, high-salt intake, physical inactivity, high-fat diets, and alcohol consumption as contributors to hypertension (Table 1). Knowledge was lower for less frequently discussed factors, such as low potassium intake and the influence of ethnicity on hypertension risk (Table 2). Although overall awareness was high, the variation across specific items indicates that some aspects of hypertension prevention remain less well understood among students.

Table 1: Students' Knowledge Level on Risk Factors of Hypertension

Risk Factors	Yes	No	I Don't Know
Stress causes hypertension	301 (85.8%)	26 (7.4%)	24 (6.8%)
Obesity increases the risk of having hypertension	310 (88.3%)	17 (4.8%)	24 (6.8%)
Eating too much salt can trigger hypertension	257 (73.2%)	66 (18.8%)	28 (8%)
Lack of exercise and reduced physical activities can predispose people to hypertension	243 (69.2%)	63 (17.9%)	45 (12.8%)
A person's family history can predispose him/her to hypertension	274 (78.1%)	23 (6.5%)	54 (15.4%)
Smoking tobacco increases the chances of developing hypertension	200 (57.0%)	43 (12.3%)	108 (30.8%)
Eating too much of a high-fat diet can cause hypertension	234 (66.7%)	45 (12.8%)	72 (20.5%)
Alcohol consumption increases the likelihood of having hypertension	230 (65.5%)	50 (14.3%)	71 (20.2%)
The risk of having high blood pressure increases as age increases	275 (78.3%)	33 (9.4%)	43 (12.3%)
The black people are more prone to hypertension than white people	157 (44.7%)	57 (16.2%)	137 (39.0%)
Low levels of potassium in the body can aid the occurrence of hypertension	127 (36.2%)	51 (14.5%)	173 (49.3%)
Underlying health conditions such as kidney disease, sleep disorder, and diabetes predispose people to hypertension	194 (55.3%)	47 (13.4%)	110 (31.3%)

Table 2: Students' Knowledge Level on Avoidable Risk Factors of Hypertension

Risk Factors	Avoidable	Unavoidable	Maybe
Stress	303(86.3%)	17 (4.8%)	31(8.8%)
Obesity	286(81.5%)	28 (8.0%)	37 (10.5%)
High Salt Consumption	286 (81.5%)	24(6.8%)	41(11.7%)
Lack of exercise and reduced physical activities	281 (80.1%)	32(9.1%)	38(10.8%)
Family history	123(35.0%)	187(53.3%)	41(11.7%)
Smoking of tobacco	208(59.3%)	37(10.5%)	106(30.2%)
High-fat diet consumption	250(71.2%)	40(11.4%)	61(17.4%)
Alcohol consumption	280(79.8%)	34(9.7%)	37(10.5%)
Age	117(33.3%)	199(56.7%)	35(10.0%)
Race or Ethnicity	98 (27.9%)	199 (56.7%)	54 (15.4%)
Low levels of potassium in the body	162(46.2%)	74(21.1%)	115(32.8%)
Chronic health conditions such as kidney disease, sleep disorders, and diabetes	176(50.1%)	72(20.5%)	103(29.3%)

Lifestyle Behaviours and Hypertension Status

Despite high levels of knowledge, engagement in avoidable risk behaviours was common. A substantial proportion of students reported current alcohol use and frequent consumption of energy-dense or highly processed foods. Chi-square analysis showed statistically significant associations between hypertension status and alcohol consumption, body-mass index, smokeless tobacco use, and junk-food intake (Table 3).

Table 3: Chi-Square Distribution Showing Association of Students' Hypertension Status and Avoidable Risk Factors

Avoidable Risk Factors	Non-hypertensive 112 n (%)	Pre-hypertensive 100 n (%)	Hypertensive 51 n (%)	I Don't Know 88 n (%)	Total	df	$\chi 2$ (p-value)
Smoking							
Current User	31 (27.7)	25 (25)	19 (37.3)	25 (28.4)	100	3	2.557
Non-user	81 (72.3)	75 (75)	32 (62.7)	63 (71.6)	251		(0.465)
Alcohol							
Current User	75 (67)	69 (69)	38 (74.5)	68 (77.3)	250	3	9.287
Non-User	37 (33)	31 (39)	13 (25.5)	20 (22.7)	101		(0.026)**
Smokeless Tobacco							
Current User	33 (29.5)	23 (23)	23 (45.1)	24 (27.3)	103	3	8.229
Non-User	79 (70.5)	77 (77)	28 (54.9)	64 (72.7)	248		(0.042)**
Consumption of Fruits and Vegetables							
> 5 Servings per Day	44 (39.3)	46 (46)	30 (58.8)	39 (44.3)	152	3	5.453
< 5 Servings per Day	68 (60.7)	54 (54)	21 (41.2)	49 (55.7)	192		(0.141)
Physical Activity							
> 150-300 mins/week	63 (56.3)	50 (50)	25 (49.0)	43 (48.9)	181	3	1.472

< 150-300 mins/week	49 (43.7)	50 (50)	26 (51.0)	45 (51.1)	170		(0.689)
BMI							
Normal	84 (75)	79 (79)	44 (86.3)	75 (85.2)	282	3	18.739
Underweight	2 (1.8)	0 (0)	1 (1.9)	0 (0)	3		(0.028)**
Overweight	26 (23.2)	19 (19)	3 (5.9)	12 (13.6)	60		*
Obese	0 (0)	2 (2)	3 (5.9)	1 (1.1)	6		
Salt Consumption							
High	27 (24.1)	12 (12)	15 (29.4)	25 (28.4)	79	3	7.210
Low	85 (75.9)	88 (88)	36 (70.6)	63 (71.6)	272		(0.066)
Junk Food							
Frequent Consumer	61 (54.5)	55 (55)	41 (80.4)	49 (55.7)	206	3	11.622
Non-Consumer	51 (45.5)	45 (45)	10 (19.6)	39 (44.3)	145		(0.009)**

Note: ** denotes significance at 5%, and * denotes significance at 1%**

Multinomial Logistic Regression

Multinomial logistic regression was used to examine the relationship between behavioural risk factors and hypertension status (Table 4). Alcohol consumption significantly increased the odds of being hypertensive. Higher body mass index was also associated with an elevated risk. Frequent junk-food consumption and high-salt intake emerged as significant predictors of hypertension status. Smoking and physical inactivity showed positive but non-significant associations, suggesting that their effects may be present but less pronounced within this sample. The regression model provided a clearer understanding of how specific behaviours contribute to hypertension risk when considered simultaneously.

Table 4: Multinomial Logistic Regression Showing Correlates of Hypertension

Avoidable Risk Factors	Odds Ratio (OR) (95% Confidence Interval) CI	(p-value)
Smoking Current User Non-user	1.024 (0.440-2.384)	(0.956)
Alcohol Current User Non User	4.652 (1.702-12.715)	(0.003)***
Smokeless Tobacco Current User Non-User	2.238 (0.962-5.211)	(0.062)
Consumption of Fruits and Vegetables > 5 Servings per Day < 5 Servings per Day	1.938 (0.907-4.142)	(0.088)

Physical Activity > 150-300 mins/week < 150-300 mins/week	0.833 (0.392-1.772)	(0.636)
BMI Obese Overweight Normal Underweight	1.066 (0.04-1.158) 0.440 (0.052-1.354) 0.189 (0.014-2.472)	(0.043) ** (0.204) (0.997)
Salt Consumption High Low	1.256 (0.093-0.705)	(0.008) ***
Junk Food Frequent Consumer Non-Consumer	4.993 (2.069-12.052)	(0.000) ***

Note: ** denotes significance at 5%, and * denotes significance at 1%**

DISCUSSION

The findings from this study show that most university students demonstrated strong awareness of avoidable hypertension risk factors, yet this awareness did not consistently translate into healthier behaviour or reduced risk. This pattern reflects a wider body of research showing that knowledge alone rarely produces meaningful behavioural change in young adults. Recent studies have shown that students often understand the health implications of their choices but continue to engage in behaviours that elevate cardiovascular risk, suggesting that awareness is only one part of a much broader behavioural landscape (Peltzer & Pengpid, 2018; Tran, Dingley & Arenas, 2021; Samakosky, Crouch & Norris, 2025). The results from this study, therefore, reinforce the idea that health knowledge, while necessary, is not sufficient to drive sustained lifestyle modification.

Alcohol consumption emerged as one of the strongest predictors of hypertension status. This finding aligns with research showing that alcohol use among university students is shaped by social expectations, peer influence, and the normalisation of drinking within campus culture (Steers et al., 2019). These social dynamics can make it difficult for students to reduce alcohol intake even when they are aware of its health consequences. The association between body-mass index and hypertension further highlight the influence of dietary habits and weight management during early adulthood. Evidence suggests that weight gain during university years is common and often linked to irregular eating patterns, convenience-driven food choices, and limited access to healthier options (Sprake et al., 2017; Almoraie et al., 2024; Aydin, 2025). The significant relationship between junk-food consumption and hypertension status in this study reinforces the role of food environments in shaping student behaviour, particularly when inexpensive, energy-dense foods are readily available.

The findings also highlight the complexity of behavioural decision-making among young adults. Although students may recognise the long-term risks associated with unhealthy behaviours, immediate pressures such as academic workload, stress, financial constraints, and social belonging often take precedence.

Research has shown that perceived invulnerability, time scarcity, and the desire for convenience can undermine health-promoting intentions, particularly in populations that do not yet experience symptoms of chronic disease (Sogari et al., 2023; Alothman et al., 2024). The asymptomatic nature of hypertension may further reduce motivation to adopt healthier behaviours, as students may not perceive themselves to be at immediate risk.

These findings challenge the assumption that educational interventions alone are sufficient to reduce hypertension risk. Although awareness is an important foundation for prevention, behavioural choices are shaped by a complex interplay of social, psychological, and environmental influences. Interventions that focus solely on information dissemination may therefore have limited impact. Instead, prevention strategies should address the broader context in which behaviours occur. This includes tackling social drinking norms, improving access to healthier food options, and creating environments that support regular physical activity. Evidence from recent public health research suggests that multi-component interventions, which combine education with environmental and behavioural supports, are more effective in promoting healthier lifestyles among young adults (Faghy et al., 2021). Such approaches recognise that behaviour change is not simply a matter of knowledge but requires supportive structures that make healthier choices more accessible and appealing.

The results from this study also point to the importance of tailoring interventions to the realities of student life. Strategies that acknowledge the pressures and constraints faced by university students are more likely to be effective than those that rely solely on individual motivation. For example, campus-based initiatives that reduce the availability of high-salt or high-fat foods, provide affordable, healthier alternatives, or offer social activities that do not revolve around alcohol may help shift behavioural patterns. Similarly, interventions that address stress management and time-planning skills may indirectly support healthier lifestyle choices.

In the end, the findings highlight the need for a more holistic approach to hypertension prevention among university students. Knowledge remains an essential component, but it must be complemented by interventions that address the social and environmental factors that shape behaviour. By recognising the complexity of lifestyle decision-making in young adults, public health practitioners and universities can design more effective strategies to reduce early cardiovascular risk.

CONCLUSION

This study shows that university students in England generally possess a strong understanding of avoidable hypertension risk factors, yet this awareness does not consistently shape their everyday choices. Students were able to identify behaviours such as high-salt intake, alcohol use, poor dietary patterns, and physical inactivity as contributors to elevated blood pressure. However, the persistence of these behaviours within the same population highlights a clear gap between what students know and how they act. This gap is particularly important in the context of hypertension, a condition that often develops silently and may go unnoticed until later adulthood.

The findings point to several behaviours that appear especially influential. Alcohol consumption stood out as a strong predictor of hypertension status, reflecting the social role that drinking often plays in university life. The association between body-mass index and hypertension reinforce the importance of dietary habits and weight management during early adulthood, a period when many students experience changes in routine, independence, and food access. The link between junk-food consumption and hypertension further illustrate how convenience, cost, and availability shape dietary choices in ways that may undermine long-term health.

These patterns challenge the assumption that education alone is enough to reduce hypertension risk. Knowledge is clearly necessary, but it does not operate in isolation. Behaviour is shaped by social expectations, environmental conditions, stress, and the immediate rewards associated with certain choices. For many students, these influences carry more weight than distant health outcomes.

AUTHOR CONTRIBUTION

All authors played a substantive role in shaping this study and developing the manuscript. F.N.I. conceptualised the work and designed the overall study framework, with supervision from K.O.O. Data analysis, interpretation of data and validation of findings were carried out

collaboratively, with each author contributing to the discussions that informed the final results. G.M.Y., C.O. and K.O.O. prepared the initial manuscript draft, covering the introduction, methods, results and discussion. Co-authors strengthened the analysis, offered detailed revisions and enhanced the clarity and coherence of the final document. Every author reviewed the complete manuscript, approved the final version and accepted responsibility for the integrity of the work.

ETHICS

Ethical approval for this study was granted by the University of Sunderland's Ethics Committee.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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