

## ORIGINAL ARTICLE

**GENDER DISPARITIES IN DIETARY AND ADDICTION-ASSOCIATED RISK FACTORS OF HYPERTENSION: INSIGHTS FROM KARACHI****Sulhera Khan<sup>1</sup>, Shabnam Naveed<sup>1</sup>, Zeeshan Ali<sup>1</sup>, Wajeaha Batool<sup>1</sup>, Syed Masroor Ahmed<sup>1</sup>, Marium Fatima<sup>1</sup>**<sup>1</sup>Jinnah Post Graduate Medical College (JPMC), Karachi, Pakistan

**Objectives:** This study aimed to investigate the dietary and addictive risk factors associated with hypertension and assess their gender-specific patterns.

**Methodology:** Conducted at the Outpatient Department of Medicine, Jinnah Postgraduate Medical Centre, Karachi, from July to December 2022, this descriptive cross-sectional study enrolled diagnosed hypertensive patients with a history of elevated blood pressure lasting more than six months, using a nonpurposive convenient sampling technique. Detailed histories of addictive and dietary risk factors were obtained, and blood pressure was measured. Dietary risk factors included excessive salt and fat intake, along with a diet rich in saturated fatty acids. Addictive risk factors assessed included tobacco and areca nut addiction.

**Results:** Of the 960 patients included, 588 (61.2%) were male, and 372 (38.8%) were female. Males exhibited poorer hypertension control (42.0%) compared to females (33.7%). The most prevalent dietary risk factor was excessive fat intake (76.7%), followed by excessive salt intake (66.7%). Smoking was reported in 66 (11.2%) males and 4 (1.0%) females, while areca nut addiction was observed in 51 (8.5%) males and 15 (4.0%) females.

**Conclusion:** Our findings underscored a significant association between male gender and inadequate hypertension control, coupled with a higher prevalence of dietary and addiction-related risk factors. These findings highlight the importance of targeted interventions aimed at mitigating these modifiable risk factors, particularly among males, to reduce the burden of hypertension-related morbidity and mortality.

**Keywords:** Hypertension; Gender Disparities; Dietary Risk Factors; Addiction

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**INTRODUCTION**

Hypertension stands as a formidable global health challenge, exacting a heavy toll in terms of both mortality and morbidity, with an alarming 10.4 million deaths annually.<sup>1</sup> This dire impact stems from its insidious nature, quietly damaging vital organs such as the brain, heart, kidneys, and blood vessels, thus becoming the predominant driver of cardiovascular and cerebrovascular mortality worldwide.<sup>2</sup> The burden of hypertension is not evenly distributed, with significant disparities observed between high-income countries (HIC) and low-middle-income countries (LMIC).<sup>3</sup> Recent data reveal a shifting landscape, with LMIC bearing the brunt, accounting for a staggering 1.04 billion cases compared to 349 million in HIC.<sup>4</sup> This transition is fraught with challenges, including diminished awareness, lack of local guidelines,

resource constraints, paucity of research data, inadequately trained healthcare professionals, and limited access to blood pressure monitoring devices in clinical settings.

South Asian nations like Pakistan find themselves at the epicenter of this global health crisis, with hypertension prevalence rates of 23.32% and 27.44% reported in local and international literature, respectively.<sup>5</sup> Alarming, the bulk of cardiovascular mortality, estimated at 80-86%, occurs in LMIC, further underscoring the urgent need for effective hypertension management strategies tailored to the specific challenges faced in these regions.<sup>6</sup> Recognizing this imperative, the International Society of Hypertension (ISH) released comprehensive guidelines in 2020, aimed at enhancing hypertension control and mitigating its devastating consequences across diverse socioeconomic settings.<sup>7</sup>

Gender disparities in hypertension prevalence and related outcomes remain a pivotal yet underexplored aspect, particularly in Pakistan.<sup>8</sup> While hypertension is generally more prevalent in males, paradoxically, cardiovascular-related deaths are three times higher in males compared to females. The underlying reasons for this gender discrepancy are multifaceted, involving genetic, chromosomal, and hormonal influences that confer a degree of protection against hypertension in women. However, the intricate interplay of modifiable risk factors cannot be overlooked. Notably, approximately half of hypertensive patients exhibit additional risk factors, some of which are amenable to intervention.<sup>9</sup>

Behavioral and lifestyle factors, including dietary habits and exposure to addictive substances like areca nut and tobacco smoke, significantly exacerbate hypertension and contribute to its associated mortality and morbidity. A holistic approach to hypertension management mandates thorough patient assessment, encompassing a comprehensive evaluation of dietary habits, addictive behaviors, and other cardiovascular risk factors. Lifestyle modification emerges as the cornerstone of hypertension management, underscoring the importance of identifying gender-specific patterns in these risk factors to tailor interventions and optimize outcomes.<sup>10-12</sup>

Against this backdrop, this research endeavors to elucidate the dietary and addictive risk factors associated with hypertension, with a particular focus on delineating gender-associated patterns. By unraveling these intricate relationships, we aim to inform targeted interventions, foster awareness, and empower individuals to mitigate hypertension-associated end-organ damage, ultimately contributing to improved cardiovascular health outcomes in the population.

## METHODOLOGY

**Study Design:** This study adopts a descriptive cross-sectional design, providing a snapshot of the prevalence and associated risk factors of hypertension among patients attending the Outpatient Department (OPD) of Medicine at Jinnah Postgraduate Medical Centre (JPMC), Karachi.

**Setting:** The study is conducted at the JPMC, Karachi, over a six-month period from July 2022 to December 2022. This timeframe ensures a comprehensive representation of patient demographics and clinical presentations.

**Participants:** Patients with previously diagnosed hypertension, aged 18 years and above, attending the

OPD of Medicine at JPMC, are included in the study. Informed and written consent is obtained from all participants. Patients with hypertension for over six months and receiving treatment are considered eligible. Exclusion criteria include patients with new onset hypertension or secondary hypertension, as well as those denying consent or having missing data.

**Variables:** The primary outcome variable is hypertension, defined as blood pressure consistent with  $\geq 130/\geq 80$  mm Hg, in accordance with the American Heart Association (AHA) guidelines. Additional variables include addictive risk factors such as smoking status and areca nut addiction, as well as diet-associated risk factors like excessive salt and fat intake, and the use of saturated fats for cooking.

**Data Sources/Measurement:** Blood pressure measurements are obtained using a digital sphygmomanometer by trained medical professionals. Measurements are taken after participants have rested for at least 10 minutes, with three consecutive readings taken 5 minutes apart on the right arm, while the participant is in a seated position with their arm resting on a table and feet flat on the ground. Dietary assessments are conducted using established guidelines, including the Dietary Approaches to Stop Hypertension (DASH) diet, to evaluate salt and fat intake.

**Bias:** To minimize selection bias, a non-purposive convenient sampling technique is employed, ensuring representation of patients attending the OPD at JPMC. Trained medical professionals conduct measurements using standardized procedures to minimize measurement bias. Additionally, exclusion criteria are defined to mitigate potential confounding factors.

**Study Size:** The study aims to include a representative sample of patients attending the OPD of Medicine at JPMC during the study period. Sample size determination is based on a convenient non-probability sampling technique, utilizing Open Epi version 3.03, with a 95% confidence interval.

**Quantitative Variables:** Quantitative variables include blood pressure measurements, sodium intake (in milligrams), fat intake (in grams), and other demographic and clinical characteristics of participants.

**Ethics:** Ethical approval is obtained from the Institutional Review Board (IRB) Ethics Committee of Jinnah Postgraduate Medical Centre (JPMC), Karachi (IRB# F.2-81/2022-GENL/340/JPMC), and all participants provide written informed consent. Direct identifiers are removed from patient data before analysis to ensure confidentiality and anonymity.

**Statistical Methods:** Descriptive statistics were employed to summarize the demographic characteristics and study variables of the 960 participants. Continuous variables such as age were presented as means with standard deviations ( $\pm$ ). Categorical variables such as gender, level of education, monthly income, and family history were expressed as frequencies and percentages. To assess the association between various factors and blood pressure control status, chi-square tests were conducted. The p-values obtained from these tests were used to determine the significance of associations. A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using the Statistical Package for Social Sciences for Windows (SPSS)<sup>TM</sup> version 23.0.

## RESULTS

**Participants:** The study included a total of 960 participants, with a mean age of 46 years ( $\pm 6$ ). The majority of participants had no formal/religious education (28.7%) and belonged to a lower socioeconomic class, with a monthly income of less than 15,000 PKR (67.8 USD) (75.6%). Males constituted 61.2% of the sample, with a higher proportion demonstrating poorer control of hypertension compared to females (42.0% vs. 33.7%), Table 1.

**Descriptive Data:** Among participants with inadequate blood pressure control (n=385), 51.1% had

a family history of heart disease, 46.2% had a family history of hypertension, and 2.5% had a family history of both conditions.

**Outcome Data:** The most common risk factor observed among participants was excessive intake of fats (76.7%), followed by excessive salt intake (66.7%). Male participants exhibited a higher prevalence of smoking (11.2% vs. 1.0%), areca nut addiction (8.5% vs. 4.0%), and excessive dietary salt intake (71.9% vs. 58.6%) compared to females. However, there was a higher prevalence of excessive dietary fat intake among male participants (81.4% vs. 69.3%).

**Main Results:** Males demonstrated a higher prevalence of risk factors such as smoking, areca nut addiction, and excessive dietary fat intake, while females showed a higher prevalence of adequate blood pressure control. A significant proportion of participants had no formal education and belonged to a lower socioeconomic class, which may contribute to the observed patterns of risk factors and blood pressure control. Participants with inadequate blood pressure control frequently reported a family history of heart disease and hypertension, emphasizing the role of genetic predisposition in hypertension management. The high prevalence of risk factors such as excessive fat and salt intake underscores the importance of lifestyle modifications in hypertension management.

**Table 1: Baseline characteristics of participants**

Baseline Characteristics	Overall	Control of BP		P-value
		Adequate (<140/90 mmHg)	Poor (>140/90 mmHg)	
<b>Total (N)</b>	<b>960</b>	<b>575</b>	<b>385</b>	-
<b>Gender</b>				
Male	588 (61.2%)	333 (57.9%)	255 (66.2%)	0.002
Female	372 (38.8%)	242 (42.0%)	130 (33.7%)	
<b>Level of education</b>				
No formal education	276 (28.7%)	159 (27.6%)	117 (30.3%)	0.238
Primary	122 (12.7%)	57 (9.9%)	65 (16.8%)	
Middle school	101 (10.5%)	66 (11.4%)	35 (9.0%)	
Secondary	202 (21.0%)	143 (24.8%)	59 (15.3%)	
Graduate	60 (6.2%)	45 (7.8%)	15 (3.8%)	
Quran Education	199 (20.7%)	105 (18.2%)	94 (24.4%)	
<b>Monthly income</b>				
<15,000 PKR	726 (75.6%)	455 (79.1%)	274 (71.1%)	0.014
15,000-59,000 PKR	197 (20.5%)	104 (18.0%)	93 (24.1%)	
60,000-149,000 PKR	25 (2.6%)	14 (2.4%)	11 (2.8%)	
>150,000 PKR	12 (1.2%)	5 (0.86%)	7 (1.8%)	
<b>Family history</b>				
Hypertension	610 (63.5%)	432 (75.1%)	178 (46.2%)	<0.001
Heart disease	319 (33.2%)	122 (21.2%)	197 (51.1%)	
Both	31 (3.2%)	21 (3.6%)	10 (2.5%)	

**Table 2: Risk factors and their Gender-Associated Patterns**

Risk Factors	Total	Gender		P-value
		Male	Female	
<b>Total (N)</b>	<b>960</b>	<b>588</b>	<b>372</b>	-
<b>Smoking</b>				
Yes	70 (7.3%)	66 (11.2%)	4 (1.0%)	<0.001
No	890 (92.7%)	522 (88.7%)	368 (99.0%)	
<b>Areca nut (Betel nut) addiction</b>				
Yes	66 (6.9%)	51 (8.5%)	15 (4.0%)	0.004
No	894 (93.1%)	537 (91.3%)	357 (96.0%)	
<b>Excessive dietary salt intake</b>				
Yes	641 (66.8%)	423 (71.9%)	218 (58.6%)	<0.001
No	319 (33.2%)	165 (18.1%)	154 (41.3%)	
<b>Excessive dietary fat intake</b>				
Yes	737 (76.8%)	479 (81.4%)	258 (69.3%)	<0.001
No	223 (23.2%)	109 (18.6%)	114 (30.7%)	
<b>Use of saturated fats (ghee/butter) for cooking</b>				
Yes	490 (51%)	303 (51.5%)	187 (50.2%)	0.818
No	470 (49%)	285 (48.5%)	185 (49.8%)	

The p-values indicate the significance of the associations between different variables. A p-value less than 0.05 suggests a statistically significant association.

## DISCUSSION

The recent paradigm shift in hypertension management underscores the importance of reducing its global burden.<sup>12</sup> Addressing the multifaceted nature of hypertension risk factors is pivotal in this endeavor, with lifestyle modifications and dietary interventions assuming a central role. These non-pharmacological approaches not only represent the cornerstone of hypertension management but also hold promise for curbing the escalating tide of hypertension-related morbidity and mortality.<sup>13</sup> Our study sought to delve into the gender-specific patterns of dietary and addictive risk factors associated with hypertension, shedding light on a relatively unexplored aspect of hypertension epidemiology.

Consistent with existing literature, our findings underscored the disproportionate burden of hypertension borne by males, with a notable prevalence of inadequate blood pressure control among male participants compared to their female counterparts. This observation aligns with previous studies highlighting higher systolic and diastolic blood pressure levels among males, particularly in middle-aged populations.<sup>14</sup> Despite the well-established association between male gender and hypertension risk,<sup>15</sup> our study serves as a novel contribution by elucidating the differential distribution of dietary and addictive risk factors between genders in our population.

Interestingly, our study identified excessive fat intake (>50 grams per day) as the predominant dietary risk factor, followed by salt intake exceeding recommended levels (>2300 mg/day). This underscores the urgent need for targeted interventions aimed at mitigating these modifiable risk factors,

particularly among males who exhibited a higher prevalence of these behaviors. Notably, hormonal factors traditionally thought to confer protection against hypertension in pre-menopausal women may partly account for the observed gender disparity in risk factor prevalence.<sup>16</sup>

The lower prevalence of smoking and areca nut consumption in our study cohort compared to previous reports may reflect the impact of counseling initiatives targeting hypertensive patients in clinical settings.<sup>17</sup> However, the significant health implications associated with these addictive behaviors necessitate ongoing efforts to promote smoking cessation and discourage areca nut consumption, especially among males who exhibited a higher propensity for these habits.<sup>18</sup> The association between excessive sodium intake and hypertension is well-established,<sup>19-21</sup> highlighting the importance of dietary modifications aimed at reducing sodium consumption. Similarly, the detrimental effects of excessive fat intake, particularly saturated fatty acids, on cardiovascular health underscore the importance of adopting heart-healthy dietary patterns to mitigate hypertension risk.<sup>22-24</sup>

Moving forward, a multidisciplinary approach encompassing healthcare professionals from diverse backgrounds, including physicians, dietitians, and lifestyle coaches, is imperative for effectively addressing the modifiable risk factors identified in this study. Moreover, future research endeavors should aim to overcome the limitations of our study, including its single-center design and focus on a select set of risk factors, by conducting large-scale studies encompassing a broader array of modifiable risk factors and their prevalence across genders.

## LIMITATION

Our study is not without its limitations. Firstly, the single-center design may limit the generalizability of our findings to broader population demographics. Additionally, the focus on a select set of risk factors may overlook other potential contributors to hypertension prevalence. Future research endeavors should strive to overcome these limitations by conducting multicenter studies encompassing a comprehensive array of modifiable risk factors, thus offering a more nuanced understanding of hypertension epidemiology and informing targeted interventions accordingly.

## CONCLUSION

The findings of our study underscore the significant association between male gender and inadequate control of hypertension, coupled with a heightened prevalence of dietary and addiction-related risk factors. This highlights the urgent need for targeted interventions aimed at mitigating these modifiable risk factors, particularly among males, to curb the escalating burden of hypertension-related morbidity and mortality.

## AUTHORS' CONTRIBUTION

SK and SN: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. SK, SN, ZA, WB, SMA, and MF: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

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