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Original Research Article

Impact of Lifestyle Factors: Smoking and Alcohol on Blood Pressure and Anthropometric Characteristics

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Abstract:

Background: Lifestyle factors such as smoking and alcohol consumption are major contributors to cardiovascular disease and obesity. Both habits have been shown to affect blood pressure and anthropometric parameters, but their combined effects remain underexplored in the Indian population. Understanding these impacts is essential for preventive health strategies.

Aim: To assess the impact of smoking and alcohol consumption on blood pressure and anthropometric parameters among adults.

Methods: A hospital-based cross-sectional study was conducted at Patna Medical College and Hospital, Bihar, from February 2025 to July 2025. A total of 95 participants were enrolled and divided into smokers (n = 30), alcohol consumers (n = 28), and controls (n = 37). Blood pressure was measured using a standardized sphygmomanometer, and anthropometric parameters including height, weight, BMI, and waist circumference (WC) were recorded. Data were analyzed using SPSS version 23.0, with ANOVA and Pearson correlation applied as appropriate; $p < 0.05$ was considered statistically significant.

Results: Smokers had significantly higher mean systolic (136.4 ± 12.5 mmHg) and diastolic blood pressure (88.5 ± 8.6 mmHg) compared to controls (SBP 126.3 ± 10.9 mmHg; DBP 80.7 ± 7.2 mmHg; $p < 0.01$). Alcohol consumers exhibited higher BMI (25.7 ± 3.6 kg/m²) and (WC) (92.8 ± 7.2 cm) compared to smokers and controls ($p < 0.05$). Positive correlations were observed between pack-years of smoking and systolic blood pressure ($r = 0.42$, $p = 0.011$), and between duration of alcohol intake and (WC) ($r = 0.39$, $p = 0.014$).

Conclusion: Smoking is correlated primarily with elevated blood pressure, whereas alcohol consumption is linked to increased BMI and central obesity. Both habits adversely impact cardiovascular and metabolic health through different mechanisms.

Recommendations: Lifestyle modification programs targeting smoking cessation and reduction of alcohol consumption should be implemented to prevent hypertension and obesity-related complications. Public health interventions and educational campaigns are essential to raise awareness about these risks.

Keywords: Smoking, Alcohol Consumption, Blood Pressure, Body Mass Index, Waist Circumference

Introduction

Hypertension and obesity are leading contributors to cardiovascular morbidity and mortality worldwide. Lifestyle factors, particularly smoking and alcohol consumption, are well-established determinants influencing these health outcomes. Despite extensive research, the combined effects of these habits on blood pressure and anthropometric parameters remain inadequately understood, especially in the Indian context [1,2].

Smoking introduces nicotine and other harmful chemicals into the body, which can cause an immediate increase in heart rate and blood pressure. Chronic exposure leads to endothelial dysfunction, increased sympathetic nervous system activity, and arterial stiffness, all of which contribute to sustained hypertension [3]. Studies have shown that smoking is correlated with higher systolic and diastolic blood pressure, with the number of cigarettes smoked per day and pack-years serving as significant predictors of elevated blood pressure levels [4].

Alcohol consumption, on the other hand, has a dose-dependent relationship with blood pressure. While moderate alcohol intake may have some cardiovascular benefits, excessive consumption is a well-known risk factor for hypertension [2]. Alcohol can increase blood pressure by stimulating the sympathetic nervous system, promoting sodium retention, and inducing vascular inflammation. The

relationship between alcohol intake and blood pressure is complex, with both acute and chronic effects contributing to the overall risk [5].

The interaction between smoking and alcohol consumption may have synergistic effects on blood pressure and body composition. Combined use of these substances has been linked to higher blood pressure levels and adverse changes in anthropometric parameters such as (BMI) and (WC) [3,6]. These combined effects may exacerbate the risk of developing cardiovascular diseases, highlighting the need for comprehensive lifestyle interventions.

In India, where the prevalence of smoking and alcohol consumption is rising, understanding the impact of these habits on blood pressure and anthropometric parameters is crucial [1,3]. The findings from this study aim to provide insights into the physiological and metabolic mechanisms underlying the effects of smoking and alcohol consumption, thereby informing public health strategies and clinical practices aimed at reducing the burden of hypertension and obesity.

Methodology

Study Design: This study was a hospital-based, observational, cross-sectional study.

Study Setting: The study was carried out at Patna Medical College and Hospital, Patna, Bihar, a tertiary care teaching hospital that caters to a diverse patient population. The hospital provides an appropriate setting for conducting observational studies due to the availability of patients from varied demographic and socioeconomic backgrounds.

Study Duration: The duration of the study was six months, extending from February 2025 to July 2025. This period was chosen to allow adequate recruitment of participants and ensure representative sampling within the given timeframe.

Participants: A total of 95 participants were enrolled in the study. The participants included both smokers and alcohol consumers as well as individuals without such habits to serve as comparison groups. All participants were adults, and their demographic, anthropometric, and clinical parameters were recorded using a structured proforma.

Inclusion Criteria

1. Adults aged 18–65 years.
2. Individuals who provided informed consent to participate.
3. Participants with a history of smoking, alcohol consumption, or both.
4. Non-smokers and non-alcohol consumers who agreed to act as controls.

Exclusion Criteria

1. Patients with known cardiovascular, renal, hepatic, or endocrine disorders.
2. Individuals on antihypertensive, lipid-lowering, or weight-modifying medications.
3. Pregnant or lactating women.
4. Participants unwilling to comply with study procedures or provide consent.

Bias: To minimize selection bias, consecutive eligible participants visiting the hospital during the study period were included. Information bias was reduced by using standardized questionnaires and measurement techniques. Observer bias was addressed by training the investigators to follow uniform procedures while recording blood pressure and anthropometric measurements.

Data Collection: Data collection was performed using a pretested semi-structured questionnaire. Demographic information, smoking and alcohol consumption history, and relevant medical history were recorded. Blood pressure was measured using a standardized sphygmomanometer in a seated position, with two readings taken five minutes apart and the average recorded. Anthropometric measurements, including height, weight, (BMI), and WC, were obtained using standardized instruments.

Procedure: After obtaining written informed consent, each participant underwent a detailed interview and clinical examination. Smoking history was quantified in pack-years, while alcohol consumption was documented in terms of frequency, duration, and average units consumed per week. Blood pressure and anthropometric parameters were recorded systematically. All data were entered into a secure database for subsequent analysis.

Statistical Analysis: Data were entered and analyzed using (SPSS) version 23.0. Descriptive statistics such as mean, standard deviation, and percentages were used to summarize baseline characteristics. Independent t-tests and one-way ANOVA were applied to compare continuous variables, while Chi-square tests were used for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 95 participants were included in the study. Of these, 56 (58.9%) were males and 39 (41.1%) were females, with a mean age of 42.7 ± 10.8 years (range 19–64 years). The participants were divided into three groups based on lifestyle habits: smokers (n = 30), alcohol consumers (n = 28), and non-smokers/non-alcohol consumers (control group, n = 37).

Blood Pressure Findings

The mean (SBP) among smokers was 136.4 ± 12.5 mmHg, significantly higher than alcohol consumers

(132.7 ± 11.8 mmHg) and controls (126.3 ± 10.9 mmHg) (p = 0.003, ANOVA). Similarly (DBP) was highest among smokers (88.5 ± 8.6 mmHg) compared to alcohol consumers (85.1 ± 7.9 mmHg) and controls (80.7 ± 7.2 mmHg) (p = 0.005).

Table 1. Blood Pressure among Study Groups

Group	n	SBP (mmHg, Mean ± SD)	DBP (mmHg, Mean ± SD)
Smokers	30	136.4 ± 12.5	88.5 ± 8.6
Alcohol consumers	28	132.7 ± 11.8	85.1 ± 7.9
Controls	37	126.3 ± 10.9	80.7 ± 7.2
Total (n = 95)	95	131.8 ± 12.2	84.6 ± 8.1
ANOVA p-value		**0.003**	**0.005**

Table 1 shows that smokers had the highest mean SBP and DBP, with statistically significant differences compared to controls ($p < 0.05$).

Anthropometric Parameters: The mean (BMI) was 24.9 ± 3.4 kg/m² among controls, 25.7 ± 3.6 kg/m² among alcohol consumers, and 23.1 ± 3.1 kg/m² among smokers (p = 0.041). (WC) was highest in alcohol consumers (92.8 ± 7.2 cm) compared to smokers (88.4 ± 6.5 cm) and controls (86.9 ± 7.0 cm) (p = 0.012).

Table 2. Anthropometric Parameters among Study Groups

Group	n	BMI (kg/m², Mean ± SD)	WC (cm, Mean ± SD)
Smokers	30	23.1 ± 3.1	88.4 ± 6.5
Alcohol consumers	28	25.7 ± 3.6	92.8 ± 7.2
Controls	37	24.9 ± 3.4	86.9 ± 7.0
Total (n = 95)	95	24.6 ± 3.5	89.3 ± 7.0
ANOVA p-value		**0.041**	**0.012**

Table 2 demonstrates that alcohol consumers had significantly higher BMI and waist circumference, suggesting greater central adiposity compared to smokers and controls.

Correlation Analysis: Pearson's correlation analysis revealed a positive correlation between pack-years of smoking and systolic blood pressure (r = 0.42, p = 0.011). Similarly, duration of alcohol intake was positively correlated with (WC)(r = 0.39, p = 0.014). No significant correlation was observed between BMI and duration of smoking.

Table 3. Correlation between Lifestyle Factors and Clinical Parameters

Variable	Correlated Parameter	r-value	p-value
Pack-years of smoking	Systolic BP	0.42	0.011
Pack-years of smoking	BMI	0.18	0.162
Duration of alcohol intake	Waist circumference	0.39	0.014
Duration of alcohol intake	Diastolic BP	0.21	0.087

Table 3 indicates that smoking intensity is correlated with higher SBP, while long-term alcohol consumption is linked to increased waist circumference.

Summary of Findings

- **Smokers had significantly higher SBP and DBP compared to controls.**
- **Alcohol consumers had the highest BMI and waist circumference, indicating higher central obesity.**
- **Smoking intensity correlated with elevated systolic blood pressure, while alcohol consumption duration correlated with waist circumference.**
- **Both smoking and alcohol consumption were correlated with adverse cardiovascular** and anthropometric parameters compared to controls.

Discussion

In this cross-sectional study of 95 participants, we observed significant differences in blood pressure and anthropometric parameters across smokers, alcohol consumers, and control groups. The mean age of the study population was 42.7 years, with a predominance of males (58.9%). Blood pressure analysis revealed that smokers had the highest systolic and diastolic blood pressure compared to alcohol consumers and controls. The mean systolic blood pressure among smokers was 136.4 mmHg, which was significantly higher than controls (126.3 mmHg, p = 0.003). Similarly, diastolic pressure was also elevated in smokers (88.5 mmHg) relative to controls (80.7 mmHg, p = 0.005). This trend

suggests that smoking is strongly correlated with elevated blood pressure, possibly due to nicotine-induced sympathetic stimulation and vascular changes.

Anthropometric evaluation showed a different pattern. Alcohol consumers exhibited higher BMI (25.7 kg/m²) and (WC) (92.8 cm) compared to smokers and controls ($p < 0.05$). While smokers had lower BMI (23.1 kg/m²), they demonstrated higher blood pressure values, suggesting that weight status alone did not account for elevated cardiovascular risk in this group. The increased (WC) among alcohol consumers highlights the role of chronic alcohol intake in promoting central obesity, a well-established risk factor for metabolic and cardiovascular disorders.

Correlation analysis provided further insights. Pack-years of smoking were positively correlated with systolic blood pressure ($r = 0.42$, $p = 0.011$), strengthening the evidence that prolonged smoking contributes to hypertension. Conversely, duration of alcohol consumption was positively correlated with (WC) ($r = 0.39$, $p = 0.014$), indicating that longer exposure to alcohol use increases central adiposity. Interestingly, smoking did not correlate significantly with BMI, reinforcing the finding that its primary impact is on vascular parameters rather than body weight.

Alcohol consumption has consistently been linked with elevated blood pressure and adverse anthropometric outcomes. Yang et al. reported that alcohol intake was correlated with poorer blood pressure control among hypertensive adults, increasing mean arterial pressure [7]. Similarly, Eren et al. found that alcohol use significantly increased the risk of obesity, especially among postmenopausal women [8]. In a large Korean cohort, Kim et al. observed that high alcohol consumption correlated with central obesity and higher systolic blood pressure, highlighting the synergistic risks of excessive drinking on cardiometabolic health [9].

The role of smoking appears more complex. Eren et al. suggested that smoking was correlated with lower BMI, likely due to appetite suppression, though not directly related to blood pressure [8]. Sunjaya et al. supported this, showing through Mendelian randomization that smoking behavior was linked to lower body weight but did not consistently predict hypertension [10]. However, a multi-cohort study by Chen et al. indicated that smoking, especially when combined with alcohol consumption, contributed to metabolic disturbances and anthropometric changes unfavorable to cardiovascular health [11].

When lifestyle factors were examined in combination, the evidence showed stronger detrimental effects. Loef et al. demonstrated that clustering of unhealthy behaviors—including smoking and alcohol use—was correlated with worsened anthropometric profiles and higher cardiometabolic risk [12]. Consistently, Alkerwi et al. showed that combined unhealthy lifestyle factors (smoking, alcohol, poor diet, inactivity) predicted both hypertension and obesity prevalence, underscoring the cumulative impact of multiple behaviors [13].

Conclusion

The results highlight distinct but complementary health risks of smoking and alcohol consumption. Smoking predominantly impacts blood pressure, increasing cardiovascular risk through hemodynamic changes, while alcohol consumption primarily affects anthropometric measures, particularly central adiposity, which predisposes to metabolic syndrome. Both habits, therefore, contribute adversely to cardiovascular health, though via different mechanisms.

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