ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 03 | March - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

THE EFFECT OF CHRONIC SMOKING ON CARDIOVASCULAR ENDURANCE IN POPULATION OF AHMEDABAD.

Physiotherapy

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ABSTRACT

Introduction: Chronic smoking has well-documented effects on cardiovascular and respiratory health, but its impact on cardiovascular endurance is less clearly defined, particularly in urban populations like Ahmedabad. **Methodology:** A cross-sectional study was conducted on 100 participants aged 18-65 from Ahmedabad, divided into three groups based on smoking intensity: light smokers (3-12 cigarettes/day), moderate smokers (10-20 cigarettes/day), and heavy smokers (18-35 cigarettes/day). **Results:** Across all smoking categories, smokers showed significantly lower RVO2max values compared to non-smokers. Non-smokers had an RVO2max of 52.48 ml/kg/min for ≤5 years of smoking experience compared to 48.41 ml/kg/min for smokers, while in the >10-year category, RVO2max for non-smokers was 48.61 ml/kg/min versus 45.13 ml/kg/min for smokers. **Conclusion:** The findings confirm a negative correlation between chronic smoking and cardiovascular endurance. As smoking intensity and duration increase, RVO2max values decrease, underscoring the cumulative adverse effects of smoking on cardiovascular health.

KEYWORDS

Chronic smoking, cardiovascular endurance, RVO2max, Ahmedabad, smoking intensity, smoking duration

INTRODUCTION

Cardiovascular endurance is a critical component of physical fitness, enabling sustained physical activity by optimizing heart and lung function. However, this endurance can be severely compromised by habitual smoking, which is known to have widespread detrimental effects on cardiovascular health.

These compounds are associated with oxidative stress, inflammation, and structural changes in cardiovascular and pulmonary systems, all of which can markedly reduce endurance levels among smokers.

This increased cardiovascular workload requires the heart to pump harder and faster, particularly during physical exertion, diminishing overall endurance and performance levels over time.

Ahmedabad, a densely populated metropolitan city in India, presents a unique environment for studying the effects of smoking on cardiovascular endurance.

However, despite these well-documented benefits, smoking rates remain substantial in many parts of India, including Ahmedabad. Public health initiatives aimed at reducing smoking prevalence and raising awareness about its impact on cardiovascular health are crucial for mitigating the long-term health consequences for residents of the city.

In India, the prevalence of smoking is widespread, affecting nearly 28.6% of the adult population, with a higher rate among males (42.4%) than females (14.2%).

As these countries work toward improving public health outcomes, understanding the specific impacts of smoking on cardiovascular endurance can aid in tailoring interventions that address the compounded risks of tobacco use, especially in urban areas with additional environmental stressors.

Need Of The Study

This study addresses an urgent need to understand the combined effects of chronic smoking and urban environmental factors on cardiovascular endurance in Ahmedabad. With high smoking prevalence in India and an increasing rate of cardiovascular diseases (CVDs), there is a critical need to examine how smoking exacerbates cardiovascular risks in metropolitan populations. Ahmedabad, like many urban centers, experiences elevated levels of air pollution, which, when combined with smoking, may significantly impair heart and lung function, reducing physical endurance and increasing susceptibility to CVDs.

Objective Of The Study

- To investigate the interaction between smoking and urban environmental factors, particularly air pollution, and their combined effect on cardiovascular endurance in the population of Ahmedabad.
- To compare cardiovascular endurance levels between smokers and nonsmokers in Ahmedabad, aiming to quantify the specific endurance deficits associated with chronic smoking.
- To raise awareness about the compounded health risks of smoking in polluted urban areas, emphasizing the importance of smoking cessation and lifestyle changes for improving cardiovascular endurance and overall health in high-risk populations.

STUDY DESIGN AND STUDY SETTING

Study Design: An Observational cross-sectional Study
Study Duration: 12 months (January to December)
Population: Subject With Smokers and Non Smokers (age 18 to 65).

Selection Criteria:

a. Inclusion Criteria:

1. Self-identify as chronic smokers (smoking daily for at least one year).
2. Non-smokers (never smoked or quit smoking over five years ago).
3. Age from 18 to 65 years.
4. Patient willing to participate.

b. Exclusion Criteria:

1. Individuals with known pre-existing cardiovascular or respiratory conditions.
2. Participants currently on medication that could impact cardiovascular performance.
3. Individuals with physical disabilities or conditions that preclude participation in endurance testing.

Sampling Technique: proportional representation
Sampling Size: A sample size of 200 participants (100 smokers and 100 non-smokers)

Outcome Measures:

1. RVO2max (Relative Maximal Oxygen Uptake): This is the primary measure of cardiovascular endurance, representing the maximum rate at which the body can consume oxygen during intense exercise.
2. Heart Rate Recovery (HRR): This outcome measures the rate at which the heart rate returns to baseline following exercise, given in beats per minute (bpm).

METHODOLOGY

Recruitment: Use advertisements, community outreach, and local health clinics to recruit participants. Obtain informed consent from all participants after explaining the purpose, risks, and benefits of the study.

Demographic Data: Collect information such as age, gender, socioeconomic status, and smoking history (duration, quantity).

Conduct a physical examination to ensure participants meet the inclusion criteria and to assess general health.

Measure height, weight, and calculate Body Mass Index (BMI).

Data Collection: Record VO_2 max results for all participants.
Use statistical software to analyze the data.

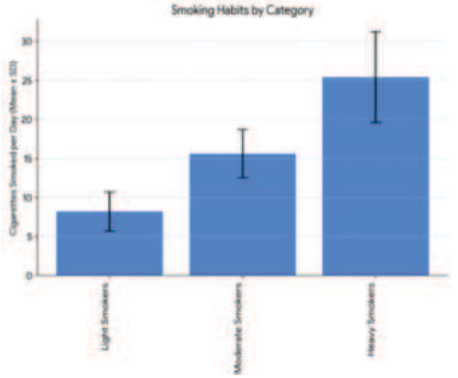
Compare the VO_2 max values between smokers and non-smokers using appropriate statistical tests.

RESULT

The table & graph presents a breakdown of smoking habits among three distinct groups of participants. Group A, categorized as light smokers, consumed an average of 8.2 cigarettes per day, with a range from 3 to 12 cigarettes. Group B, moderate smokers, had a mean consumption of 15.6 cigarettes daily, varying between 10 and 20 cigarettes. Finally, Group C, heavy smokers, exhibited the highest average consumption of 25.4 cigarettes per day, with a range spanning from 18 to 35 cigarettes. These findings highlight the diverse smoking patterns within the study population, with significant variations in both the average consumption and the range of cigarette intake across the three groups.

Table 1. Descriptive Statistics Of The Variables Defining The Smoking Habit In Cigarette Smokers From Each Sub Sample

Group	n	Mean ± SD	Min-Max
Group A (Light Smokers)	35	8.2 ± 2.5	3-12
Group B (Moderate Smokers)	35	15.6 ± 3.1	10-20
Group C (Heavy Smokers)	30	25.4 ± 5.8	18-35

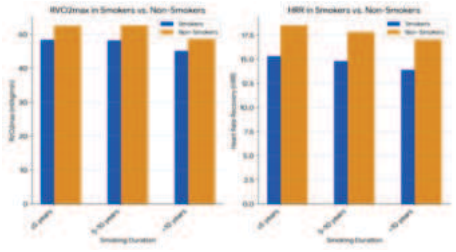


Graph 1. Descriptive Statistics Of The Variables Defining The Smoking Habit In Cigarette Smokers From Each Sub Sample

Table 2. Comparison Of RVO2max And HRR In Smokers Vs. Non-smokers By Smoking Duration

Smoking Duration	Non-Smokers (RVO2max, ml/ kg/ min)	Smokers (RVO2 max, ml/ kg/ min)	Non-Smokers (HRR, beats/ min)	Smokers (HRR, beats/ min)	p- value (RVO2 max)	p-value (HRR)
≤5 years	52.48 ± 4.15	48.41 ± 5.07	18.5 ± 2.1	15.3 ± 2.5	< 0. 05*	< 0. 05*
5-10 years	52.65 ± 4.35	48.22 ± 4.22	17.8 ± 2.3	14.8 ± 2.4	< 0. 05*	< 0. 05*
>10 years	48.61 ± 3.81	45.13 ± 3.61	17.0 ± 2.4	13.9 ± 2.6	< 0. 01**	< 0. 01**

*Significance levels: *p < 0.05, **p < 0.01



Graph: 2 Comparison Of RVO2max And HRR In Smokers Vs. Non-smokers By Smoking Duration

DISCUSSION

The current study aimed to assess the impact of chronic smoking on cardiovascular endurance, measured through RVO2max and heart rate recovery (HRR) across three groups of smokers—light, moderate, and heavy—and compared them with nonsmokers in an urban population of Ahmedabad.

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Further, heart rate recovery (HRR), an important marker of cardiovascular fitness and recovery capacity, was significantly slower in smokers. Non-smokers demonstrated a faster HRR, with values of 18.5 ± 2.1 beats/min (≤5 years), 17.8 ± 2.3 beats/min (5-10 years), and 17.0 ± 2.4 beats/min (>10 years). On the other hand, smokers showed a progressive reduction in HRR with increasing smoking intensity and duration.

CONCLUSION

This study confirms that chronic smoking has a detrimental effect on cardiovascular endurance, as reflected by decreased RVO2max and slower heart rate recovery in smokers across all categories (light, moderate, heavy) compared to non-smokers. The results highlight that both the duration and intensity of smoking negatively influence cardiovascular fitness, with more severe declines seen in heavier and longer-term smokers.

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