

PREVALENCE AND DETERMINANTS OF CHRONIC RESPIRATORY DISEASES, DIABETES, AND CARDIOVASCULAR DISEASES IN ABBOTTABAD, PAKISTAN

Malik Niaz Ahmed^{*1}, Tehmina Yousaf², Fida Muhammad³, Tahir Khan⁴, Bibi Riffat⁵

^{*1}Associate Professor and Principal, Nursing College, HITEC Institute of Medical Sciences (HITEC IMS), Taxila Cantonment, Pakistan

²Assistant Professor and Principal, Khyber Pakhtunkhwa Institute of Medical Sciences, Peshawar, Pakistan

³MScN, BHMS, RN Officer, King Abdullah Teaching Hospital, Mansehra, Pakistan

⁴MSN Scholar, Institute of Nursing Sciences (INS), Khyber Medical University (KMU), Khyber Pakhtunkhwa, Pakistan

⁵Nursing Superintendent, King Abdullah Teaching Hospital, Mansehra, Pakistan

¹malikniazahmed@gmail.com, ²tehminakhan592@gmail.com, ³fida2040276@gmail.com, ⁴2012tahir458@gmail.com, ⁵danielhisham3075@gmail.com

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Corresponding Author: *
Malik Niaz Ahmed

Abstract

Background: Chronic non-communicable diseases (NCDs), including diabetes mellitus, cardiovascular diseases (CVD), and chronic respiratory diseases, represent a growing public health burden in low- and middle-income countries such as Pakistan. Evidence on their combined prevalence and determinants at the community level remains limited.

Objective: To estimate the prevalence and identify the determinants of chronic respiratory diseases, diabetes mellitus, and cardiovascular diseases among adults in Abbottabad, Pakistan.

Methods: A community-based cross-sectional study was conducted among 422 participants. Sociodemographic and behavioral data were collected, including age, gender, smoking status, physical activity, and body mass index (BMI). Disease outcomes were based on self-reported physician diagnoses. Bivariate associations were assessed using chi-square tests, and multivariable logistic regression analyses were performed to identify independent predictors of each condition. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported.

Results: The mean age of participants was 41.8 years (SD = 13.6), and 54.3% were male. The prevalence of diabetes mellitus, CVD, and chronic respiratory diseases was 25.8%, 22.0%, and 16.6%, respectively. In multivariable analyses, age ≥ 40 years (AOR = 2.91, 95% CI [1.82, 4.64]) and obesity (AOR = 2.36, 95% CI [1.45, 3.85]) were significantly associated with diabetes. For CVD, significant predictors included age ≥ 40 years (AOR = 2.48, 95% CI [1.55, 3.98]), obesity (AOR = 1.97, 95% CI [1.19, 3.27]), and physical inactivity (AOR = 1.89, 95% CI [1.17, 3.04]). Smoking was the strongest determinant of chronic respiratory diseases (AOR = 3.84, 95% CI [2.25, 6.56]).

Conclusions: The findings indicate a substantial burden of chronic diseases in Abbottabad, with modifiable risk factors such as obesity, physical inactivity, and smoking playing a significant role. Targeted public health

interventions focusing on lifestyle modification and early screening are essential to reduce the burden of NCDs in this population.

INTRODUCTION

Non-communicable diseases (NCDs) are the leading cause of mortality globally, accounting for approximately 74% of all deaths, with cardiovascular diseases (CVD), diabetes mellitus, and chronic respiratory diseases representing the largest contributors (World Health Organization [WHO], 2023). The burden of these conditions is disproportionately higher in low- and middle-income countries (LMICs), where nearly 77% of NCD-related deaths occur (WHO, 2023). Recent global estimates further highlight that the prevalence of metabolic and cardiovascular risk factors continues to rise, driven by demographic transitions, urbanization, and lifestyle changes (GBD 2021 Risk Factors Collaborators, 2024). South Asia is undergoing a rapid epidemiological transition characterized by a shift from communicable to non-communicable diseases. Pakistan, in particular, faces a substantial and increasing burden of NCDs, with recent national and regional evidence indicating high prevalence rates of diabetes, hypertension, and cardiovascular conditions (NCD Risk Factor Collaboration [NCD-RisC], 2021). According to the International Diabetes Federation (2021), Pakistan ranks among the top countries globally for diabetes prevalence, with projections suggesting a continued increase in disease burden. Similarly, cardiovascular diseases remain a leading cause of premature mortality, while chronic respiratory diseases—such as chronic obstructive pulmonary disease (COPD) and asthma—are prevalent due to widespread exposure to tobacco smoke and environmental pollutants (WHO, 2023). The etiology of NCDs is multifactorial, involving both non-modifiable and modifiable risk factors. Age is a well-established determinant, with the risk of chronic diseases increasing significantly after the fourth decade of life (GBD 2021 Risk Factors Collaborators, 2024). Among modifiable factors, tobacco use remains a major contributor to chronic respiratory diseases and CVD, while physical inactivity and unhealthy dietary patterns are strongly associated with obesity, diabetes, and cardiovascular morbidity (WHO, 2023).

Obesity, in particular, has emerged as a critical metabolic risk factor, contributing to insulin resistance, hypertension, and dyslipidemia, thereby increasing the likelihood of both diabetes and cardiovascular diseases (NCD-RisC, 2021).

Recent evidence also underscores the growing importance of multimorbidity—the coexistence of two or more chronic conditions—which poses additional challenges for healthcare systems and patient management (Academy of Medical Sciences, 2018; Violan et al., 2021). Individuals with multimorbidity often experience poorer health outcomes, increased healthcare utilization, and reduced quality of life. Despite its significance, there remains limited empirical evidence on the co-occurrence and shared determinants of multiple chronic diseases within community-based populations in Pakistan.

Furthermore, most existing studies in Pakistan have focused on single-disease outcomes or hospital-based samples, limiting their generalizability to broader populations. There is a need for region-specific, community-based studies that simultaneously examine the prevalence and determinants of multiple NCDs to inform integrated prevention strategies. Abbottabad, a rapidly urbanizing district in Khyber Pakhtunkhwa, presents a relevant context for such investigation due to ongoing lifestyle transitions, including reduced physical activity, dietary changes, and increased exposure to behavioral risk factors. However, empirical data on the burden and determinants of chronic diseases in this region remain scarce.

Therefore, the present study aims to estimate the prevalence of chronic respiratory diseases, diabetes mellitus, and cardiovascular diseases, and to identify their associated risk factors among adults in Abbottabad, Pakistan. By generating locally relevant evidence, this study seeks to contribute to the understanding of NCD epidemiology and support the development of targeted public health interventions in similar settings.

METHODS

Study Design and Setting

A facility-based cross-sectional study was conducted to assess the prevalence and determinants of chronic respiratory diseases, diabetes mellitus, and cardiovascular diseases among adults in Abbottabad, Pakistan. Cross-sectional designs are appropriate for estimating disease prevalence and examining associations between risk factors and outcomes within a defined population (Wang & Cheng, 2020).

Data were collected at Shafeeq Plaza, Abbottabad, a healthcare setting that hosts multiple consultant clinics and serves patients from both local communities and surrounding distant areas. This setting provided access to a diverse patient population with varying sociodemographic and health profiles.

Study Population and Sampling

The study included adult individuals aged ≥ 18 years who visited consultant clinics at Shafeeq Plaza during the data collection period. A total of 422 participants were enrolled.

A non-probability convenience sampling technique was employed, whereby eligible participants present at the facility during the study period were invited to participate.

Inclusion criteria included adults aged ≥ 18 years who were willing to participate and able to provide informed consent. **Exclusion criteria** included individuals who declined participation or had incomplete responses on key study variables.

Data Collection

Data were collected using a structured and pre-tested questionnaire administered through face-to-face interviews. The instrument captured information on:

- Sociodemographic characteristics (age, gender)
- Behavioral factors (smoking status, physical activity)
- Anthropometric measures (body mass index [BMI])
- Self-reported physician-diagnosed chronic conditions

Smoking status was categorized as smoker or non-smoker. Physical activity was classified as active or inactive based on participant self-report. BMI was calculated using the standard

formula (kg/m^2) and categorized according to World Health Organization guidelines (WHO, 2023).

Study Variables

Outcome Variables

The primary outcomes were the presence of:

1. Diabetes mellitus
2. Cardiovascular diseases (CVD)
3. Chronic respiratory diseases

All outcomes were based on self-reported physician diagnoses obtained during patient interviews.

Independent Variables

Independent variables included:

- Age group (18–39 years, ≥ 40 years)
- Gender (male, female)
- Smoking status (smoker, non-smoker)
- Body mass index (non-obese, obese)
- Physical activity (active, inactive)

Statistical Analysis

Data were analyzed using statistical software (e.g., SPSS). Descriptive statistics were computed to summarize participant characteristics. Categorical variables were presented as frequencies and percentages, while continuous variables were summarized using means and standard deviations.

Bivariate associations between independent variables and disease outcomes were assessed using the chi-square (χ^2) test. Variables with statistical significance ($p < .05$) were further examined in multivariable analysis.

Multivariable logistic regression models were applied to identify independent predictors of diabetes, cardiovascular diseases, and chronic respiratory diseases. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Logistic regression is widely used in epidemiological studies for binary outcome modeling and risk estimation (Tolles & Meurer, 2016).

Ethical Considerations

Formal institutional ethical approval was not obtained for this study. However, ethical principles for human subject research were observed. Informed verbal consent was obtained from all participants prior to data collection. Participants were informed about the purpose of

the study, voluntary nature of participation, and their right to withdraw at any time without consequence.

Confidentiality and anonymity of participants were maintained by not recording personal identifiers and by using aggregated data for analysis and reporting. The study adhered to general ethical standards for research involving human participants as outlined in international guidelines (World Medical Association, 2018).

RESULTS

Participant Characteristics

A total of $N = 422$ participants were included in the analysis. The mean age of participants was 41.8 years ($SD = 13.6$), with nearly half (48.6%, $n = 205$) aged ≥ 40 years. Males comprised 54.3% ($n = 229$) of the sample, while females accounted for 45.7% ($n = 193$).

Regarding behavioral characteristics, 32.5% ($n = 137$) of participants were current smokers, and 46.9% ($n = 198$) were physically inactive. Based on body mass index (BMI), 24.4% ($n = 103$) of participants were categorized as obese. Detailed characteristics are presented in Table 1.

Table 1
Sociodemographic and Behavioral Characteristics of Study Participants ($N = 422$)

Variable	Category	n	%
Gender	Male	229	54.3
	Female	193	45.7
Age group (years)	18–39	217	51.4
	≥ 40	205	48.6
Smoking status	Smoker	137	32.5
	Non-smoker	285	67.5
Physical activity	Active	224	53.1
	Inactive	198	46.9
BMI	Normal	181	42.9
	Overweight	138	32.7
	Obese	103	24.4

Note. Values are presented as frequencies and percentages. BMI classification is based on WHO criteria.

Prevalence of Chronic Diseases

The prevalence of chronic diseases was considerable. Diabetes mellitus was the most prevalent condition, affecting 25.8% ($n = 109$) of participants. Cardiovascular diseases (CVD)

were reported in 22.0% ($n = 93$), while chronic respiratory diseases were present in 16.6% ($n = 70$). A proportion of participants reported more than one condition, indicating potential multimorbidity.

Table 2
Prevalence of Chronic Diseases Among Study Participants ($N = 422$)

Disease	n	%
Diabetes mellitus	109	25.8
Cardiovascular diseases	93	22.0
Chronic respiratory diseases	70	16.6

Note. Prevalence is based on self-reported physician diagnoses.

Bivariate Analysis of Risk Factors

Participants aged ≥ 40 years had significantly higher prevalence of diabetes and cardiovascular diseases compared with younger participants. Smoking was significantly associated with

chronic respiratory diseases. Obesity showed strong associations with both diabetes and CVD, while physical inactivity was significantly related to CVD.

Table 3

Bivariate Associations Between Risk Factors and Chronic Diseases

Variable	Category	Diabetes (%)	CVD (%)	Respiratory (%)	χ^2 (p-value)
Age group	18-39	13.1	12.8	9.7	< .001
	≥40	38.5	31.2	24.4	
Smoking status	Smoker	28.5	24.1	29.9	< .001
	Non-smoker	24.6	20.9	10.2	
BMI	Non-obese	20.1	17.6	13.4	< .001
	Obese	41.7	34.0	25.2	
Physical activity	Active	19.6	15.3	12.1	< .01
	Inactive	32.8	29.8	21.2	

Note. CVD = cardiovascular diseases; χ^2 = chi-square test.

Multivariable Logistic Regression Analysis

Multivariable logistic regression analysis identified independent predictors of each disease outcome after adjusting for age, gender, smoking status, BMI, and physical activity.

For diabetes mellitus, age ≥40 years and obesity were significant predictors. For cardiovascular diseases, age ≥40 years, obesity, and physical inactivity remained independently associated. Smoking was the strongest predictor of chronic respiratory diseases.

Table 4

Multivariable Logistic Regression Analysis of Determinants of Chronic Diseases

Variable	Outcome	AOR	95% CI	p-value
Age ≥40 years	Diabetes	2.91	1.82-4.64	< .001
Obesity	Diabetes	2.36	1.45-3.85	.001
Age ≥40 years	Cardiovascular disease	2.48	1.55-3.98	< .001
Obesity	Cardiovascular disease	1.97	1.19-3.27	.008
Physical inactivity	Cardiovascular disease	1.89	1.17-3.04	.010
Smoking	Respiratory disease	3.84	2.25-6.56	< .001

Note. AOR = adjusted odds ratio; CI = confidence interval. Models adjusted for age, gender, smoking status, BMI, and physical activity.

Summary of Key Findings

The study revealed a substantial burden of chronic diseases, particularly diabetes and cardiovascular diseases. Age ≥40 years and obesity were consistent predictors of diabetes and CVD. Physical inactivity contributed significantly to CVD risk, while smoking emerged as the strongest determinant of chronic respiratory diseases.

DISCUSSION

The present study examined the prevalence and determinants of chronic respiratory diseases, diabetes mellitus, and cardiovascular diseases (CVD) among adults in Abbottabad, Pakistan. The findings indicate a substantial burden of non-communicable diseases (NCDs), with diabetes emerging as the most prevalent

condition, followed by CVD and chronic respiratory diseases. These results are consistent with recent global and regional evidence demonstrating the growing impact of NCDs in low- and middle-income countries (World Health Organization [WHO], 2023; GBD 2021 Risk Factors Collaborators, 2024).

Interpretation of Key Findings

The observed prevalence of diabetes (25.8%) is notably high and aligns with recent estimates indicating that Pakistan is among the countries with the highest diabetes burden worldwide (International Diabetes Federation [IDF], 2021). This high prevalence may be attributable to increasing rates of obesity, sedentary lifestyles, and dietary transitions associated with urbanization. Similarly, the prevalence of CVD

(22.0%) reflects the ongoing epidemiological shift toward cardiovascular morbidity in South Asian populations, where risk factors such as hypertension, obesity, and physical inactivity are increasingly common (NCD Risk Factor Collaboration [NCD-RisC], 2021).

Chronic respiratory diseases were reported in 16.6% of participants, which is consistent with evidence linking respiratory morbidity to tobacco use and environmental exposures in Pakistan and similar settings (WHO, 2023). The presence of multimorbidity among participants further highlights the complexity of NCD burden and the need for integrated healthcare approaches.

Determinants of Chronic Diseases

Age emerged as a strong and consistent predictor of both diabetes and CVD. Participants aged ≥ 40 years had significantly higher odds of these conditions, which is in line with established epidemiological evidence demonstrating increased NCD risk with advancing age due to cumulative exposure to risk factors and physiological changes (GBD 2021 Risk Factors Collaborators, 2024).

Obesity was independently associated with both diabetes and CVD, reinforcing its role as a key metabolic risk factor. The findings support existing literature indicating that excess adiposity contributes to insulin resistance, dyslipidemia, and hypertension, thereby increasing the likelihood of cardiometabolic diseases (NCD-RisC, 2021).

Physical inactivity was significantly associated with CVD, consistent with global evidence identifying insufficient physical activity as a major modifiable risk factor for cardiovascular morbidity and mortality (WHO, 2023). This underscores the importance of promoting active lifestyles as part of NCD prevention strategies.

Smoking was identified as the strongest determinant of chronic respiratory diseases, with smokers having nearly fourfold higher odds of respiratory conditions. This finding is well supported by extensive literature demonstrating the causal relationship between tobacco use and respiratory diseases, including chronic obstructive pulmonary disease (COPD) (WHO, 2023).

Public Health Implications

The findings of this study have important implications for public health policy and practice. The high prevalence of NCDs and the strong association with modifiable risk factors highlight the urgent need for preventive interventions. Strategies should focus on:

- Promoting healthy lifestyles, including increased physical activity and improved dietary habits
- Implementing tobacco control measures to reduce smoking prevalence
- Strengthening early screening and detection programs, particularly for high-risk groups (e.g., individuals aged ≥ 40 years and those with obesity)
- Developing integrated care models to address multimorbidity

At the local level, healthcare facilities such as those in Abbottabad can serve as critical points for screening, counseling, and management of chronic diseases.

Strengths and Limitations

This study has several strengths. It provides region-specific data on multiple chronic diseases and their determinants within a single population, contributing to the limited evidence base in Pakistan. Additionally, the use of multivariable logistic regression allowed for the identification of independent predictors of disease outcomes.

However, certain limitations should be acknowledged. First, the cross-sectional design precludes causal inference between risk factors and disease outcomes. Second, the use of convenience sampling from a healthcare facility may limit the generalizability of findings to the broader population. Third, disease status was based on self-reported physician diagnoses, which may introduce reporting bias. Finally, formal ethical approval was not obtained, which may be a consideration for publication in some journals.

Conclusion

In conclusion, this study demonstrates a high burden of diabetes, cardiovascular diseases, and chronic respiratory diseases among adults in Abbottabad, Pakistan. Age, obesity, physical inactivity, and smoking were identified as key determinants. These findings underscore the

need for targeted, multifaceted public health interventions focusing on modifiable risk factors to reduce the growing burden of NCDs in this setting.

CONCLUSION

This study demonstrates a substantial burden of chronic non-communicable diseases among adults in Abbottabad, Pakistan, with diabetes mellitus, cardiovascular diseases, and chronic respiratory diseases affecting a considerable proportion of the population. The findings highlight that both non-modifiable and modifiable risk factors contribute significantly to disease occurrence.

Advancing age emerged as a strong determinant of diabetes and cardiovascular diseases, while obesity was independently associated with increased risk of both conditions. Physical inactivity was identified as an important contributor to cardiovascular diseases, and smoking was the most significant predictor of chronic respiratory diseases. These results underscore the critical role of lifestyle-related factors in shaping the burden of chronic diseases in this population.

From a public health perspective, the study emphasizes the need for comprehensive prevention and control strategies targeting modifiable risk factors. Interventions should prioritize smoking cessation, promotion of physical activity, and weight management, alongside early screening and timely diagnosis, particularly among high-risk groups such as older adults.

In conclusion, addressing behavioral and metabolic risk factors through integrated, community-based interventions is essential to reduce the growing burden of non-communicable diseases in Abbottabad and similar settings. Future research should employ longitudinal designs and broader population-based sampling to better establish causal relationships and enhance generalizability.

LIMITATIONS

Several limitations of this study should be considered when interpreting the findings.

First, the cross-sectional design limits the ability to establish causal relationships between identified risk factors and disease outcomes. While associations were observed, temporal

sequencing cannot be determined, and therefore causality cannot be inferred.

Second, the use of a facility-based convenience sampling approach may limit the generalizability of the findings. Participants were recruited from a single healthcare setting (Shafeeq Plaza, Abbottabad), which may not fully represent the broader community population, particularly individuals who do not seek healthcare services. Third, the reliance on self-reported physician diagnoses for diabetes, cardiovascular diseases, and chronic respiratory diseases introduces the possibility of reporting and recall bias. Some participants may have underreported or been unaware of their health conditions, potentially leading to misclassification.

Fourth, key behavioral variables such as physical activity and smoking status were also self-reported, which may be subject to social desirability bias. Objective measurements of these variables were not obtained.

Fifth, the absence of detailed clinical and laboratory assessments (e.g., blood glucose levels, lipid profiles, spirometry) limits the precision of disease classification and risk estimation.

Finally, formal institutional ethical approval was not obtained for this study. Although informed consent was secured and participant confidentiality was maintained, this may be considered a methodological limitation, particularly for publication in journals with strict ethical requirements.

RECOMMENDATIONS

Based on the findings and limitations of this study, several recommendations can be proposed:

- Future studies should employ longitudinal or cohort designs to better establish causal relationships between risk factors and chronic diseases.
- Population-based sampling strategies should be used to enhance the representativeness and generalizability of findings.
- Incorporation of objective clinical and laboratory measurements is recommended to improve diagnostic accuracy.
- Public health interventions should focus on modifiable risk factors, particularly smoking cessation,

promotion of physical activity, and obesity prevention.

- Community-based awareness programs and screening initiatives should be implemented to facilitate early detection and management of chronic diseases.
- Future research should also explore multimorbidity patterns and their impact on healthcare utilization and quality of life in the Pakistani context.

Authors' Contributions

All authors made substantial contributions to the conception, design, execution, and reporting of the study and approved the final version of the manuscript.

- **Malik Niaz Ahmed:** Conceptualization and overall supervision of the study; contributed to study design, critical revision of the manuscript, and final approval for submission.
- **Tehmina Yousaf:** Contributed to study design, methodological guidance, and critical review of the manuscript for important intellectual content.
- **Fida Muhammad:** Participated in data collection, coordination at the study site, and initial data organization; contributed to manuscript drafting.
- **Tahir Khan:** Performed data analysis and interpretation of results; contributed significantly to manuscript writing and preparation of tables and statistical outputs.
- **Bibi Riffat:** Assisted in data collection, participant coordination, and contributed to manuscript review and refinement.

All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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