FREQUENCY OF POLYCYTHEMIA IN PATIENTS PRESENTING WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Abstract

BACKGROUND:

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition characterized by chronic airflow limitation and hypoxia. Polycythemia, defined as an abnormal increase in red blood cell mass, can occur in response to chronic hypoxemia in COPD patients. This adaptive response may improve oxygen delivery but also increases blood viscosity, predisposing patients to thromboembolic complications. Despite its clinical importance, local data on the prevalence of polycythemia among COPD patients is limited.

OBJECTIVE:

To determine the frequency of polycythemia in patients presenting with chronic obstructive pulmonary disease.

METHODS:

A cross-sectional study was conducted in the Pulmonology Department of Lady Reading Hospital, Peshawar, over a period of six months following approval from CPSP. A total of 100 COPD patients aged 30–70 years were enrolled using consecutive non-probability sampling. Patients with hematological disorders, autoimmune diseases, or renal failure were excluded. Data on demographic and clinical variables were collected using a structured proforma. Polycythemia was assessed based on operational definitions. Data were analyzed using IBM SPSS version 25. Descriptive statistics, chi-square test, and Fisher's exact test were applied, with $p \leq 0.05$ considered significant.

RESULTS:

Out of 100 patients, polycythemia was identified in 12% of cases. The condition was significantly associated with factors such as age group, BMI, residence, socioeconomic status, education level, smoking, diabetes, and hypertension ($p < 0.05$). The majority of polycythemic patients were males, urban residents, overweight or obese, and had coexisting chronic conditions.

CONCLUSION:

Polycythemia was observed in a notable proportion of COPD patients,

highlighting the importance of routine screening in this population. Early detection and management are essential to reduce the risk of complications such as thrombosis. These findings support the need for integrated care strategies targeting high-risk COPD patients to improve outcomes and quality of life

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a progressive lung condition characterized by persistent inflammation and narrowing of the airways, leading to airflow limitation and difficulty in breathing. The disease process involves structural changes in the lungs, including airway fibrosis, destruction of alveolar walls, and decreased lung elasticity, all of which contribute to impaired gas exchange. Pharmacological management commonly includes bronchodilators and inhaled corticosteroids, with long-acting beta-agonists, long-acting muscarinic antagonists, and combination therapies shown to be effective in relieving symptoms and improving pulmonary function [1,2].

Polycythemia refers to an abnormal increase in the number of circulating red blood cells, resulting in increased blood viscosity and a heightened risk of thrombotic complications. It can be broadly categorized into primary and secondary types. Primary polycythemia, known as polycythemia vera, is a rare chronic myeloproliferative disorder driven by clonal proliferation of hematopoietic stem cells, occurring independently of erythropoietin (EPO) stimulation [3,4]. In contrast, secondary polycythemia arises as a physiological response to chronic hypoxia or elevated levels of EPO.

Among patients with COPD, secondary polycythemia can develop as a compensatory response to chronic hypoxemia. In such cases, the kidneys increase EPO production in an effort to enhance oxygen transport by stimulating red blood cell production. However, this adaptive response carries potential risks. The increased red cell mass raises blood viscosity, which can predispose patients to thromboembolic events such as deep vein thrombosis, pulmonary embolism, stroke, and myocardial infarction [5,6]. These risks are particularly relevant in individuals with COPD, who frequently suffer from underlying cardiovascular impairment as a consequence of prolonged pulmonary disease.

Previous studies have reported the frequency of polycythemia in COPD patients to be around 4.32%, although local data remains scarce on this topic [7]. In light of the limited regional evidence, this study was designed to determine the frequency of polycythemia among patients with COPD in our clinical setting. The findings are expected to support healthcare professionals in identifying at-risk individuals and refining management strategies, thereby contributing to the prevention of complications, improving clinical outcomes, and enhancing the quality of life in patients with COPD.

MATERIAL AND METHODS

This cross-sectional study was conducted in the Pulmonology Department of Lady Reading Hospital, Peshawar. The study duration spanned a minimum of six months following the approval of the research synopsis by the College of Physicians and Surgeons Pakistan (CPSP). The sample size was calculated using the WHO sample size calculator, considering a 4.32% frequency of polycythemia in patients with chronic obstructive pulmonary disease (COPD), a 4% margin of error, and a 95% confidence level. The required and achieved sample size was 100 participants. A consecutive non-probability sampling technique was used to recruit the participants.

Eligible participants included male and female patients aged 30 to 70 years who had a confirmed diagnosis of COPD as defined in the operational definition. Patients with a known history of hematological disorders, autoimmune diseases, or renal failure were excluded from the study. After obtaining approval from the hospital's ethical committee and the CPSP research unit, data collection commenced. Patients meeting the inclusion criteria were enrolled in the study after being informed about the research objectives and potential benefits. Informed consent was obtained, and confidentiality and safety were ensured. Demographic details including age, gender, body mass index (BMI), socio-economic status, residence,

education level, and occupation were recorded. All patients were examined for the presence of polycythemia as per the operational definition. The clinical assessment was carried out under the supervision of a consultant pulmonologist with a minimum of five years of post-fellowship experience. A structured pre-designed proforma was used to document all relevant patient information.

Data analysis was performed using IBM SPSS version 25. The distribution of numerical data, such as age and BMI, was checked using the Shapiro-Wilk test to determine normality. Depending on the distribution, mean ± standard deviation or median with interquartile range was calculated. Categorical variables such as gender, smoking status, presence of diabetes, hypertension, polycythemia, socio-economic status, residence, education, and employment status were summarized using frequencies and percentages. Polycythemia was stratified across key variables including age, gender, BMI, diabetes, hypertension, smoking, socio-economic status, residence, education, and occupation to identify potential effect modifiers. For post-stratification analysis, the Chi-square test or Fisher's exact test was applied where appropriate, with a p-value of ≤0.05 considered statistically significant.

RESULTS:
Demographic and Clinical Characteristics
Age Distribution
Participants were fairly distributed across all age groups, with the majority aged **51–60 years (30%)**, followed by **41–50 years (25%)**, **61–70 years (25%)**, and the smallest group being **30–40 years (20%)**. This suggests a predominantly middle-aged to older adult population, which aligns with age-related increases in chronic health conditions such as hypertension and diabetes.

Gender
There was a **male predominance (58%)** compared to **females (42%)**. This male-to-female ratio is typical in many hospital-based studies, potentially reflecting healthcare-seeking behaviors or occupational exposure patterns.

Body Mass Index (BMI)
The most common BMI category was **overweight (40%)**, followed by **normal weight (35%)** and **obese (25%)**. The high prevalence of overweight and obesity (combined 65%) indicates a significant burden of weight-related health risks within the study group.

Monthly Income
Most participants reported a **monthly income of 20,000–50,000 PKR (44%)**, followed by those earning **less than 20,000 PKR (32%)**, and **more than 50,000 PKR (24%)**. This shows a predominance of low- to middle-income individuals, which may influence healthcare access and outcomes.

Socioeconomic Status
Participants largely belonged to the **middle socioeconomic class (45%)**, followed by the **low (28%)** and **high (27%)** socioeconomic groups. These findings are relevant when evaluating social determinants of health, as socioeconomic status is often associated with health literacy, diet, and disease risk.

Residence
The study included more **urban residents (60%)** than **rural (40%)**. This might reflect urban areas' better healthcare accessibility or proximity to the study center.

Education Status
A significant majority of participants were **literate (70%)**, while **30% were illiterate**. Education is an important factor in understanding health behaviors, adherence to treatment, and disease prevention efforts.

Occupation Status
Most participants were **employed (62%)**, while **38% were unemployed**. Employment may impact healthcare affordability and insurance coverage, contributing to health disparities.

Lifestyle and Clinical Risk Factors

Smoking

Only **22%** of participants reported being smokers, while **78%** were non-smokers. Despite being a relatively small group, the smoking population remains at increased risk for respiratory and cardiovascular diseases.

Diabetes Mellitus

30% of the study population had diabetes, indicating a high burden of metabolic disease. This aligns with national trends showing rising diabetes prevalence in middle-aged and older adults.

Hypertension

A significant proportion, **35%**, had hypertension. Given the age distribution and BMI trends, this high rate is expected and clinically significant.
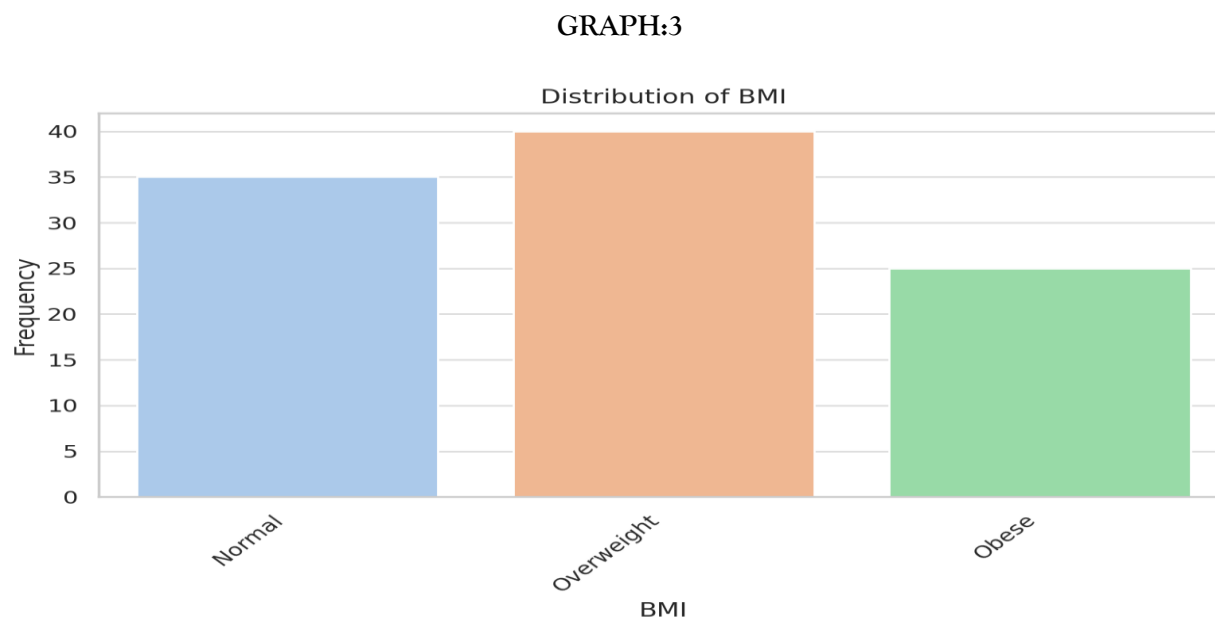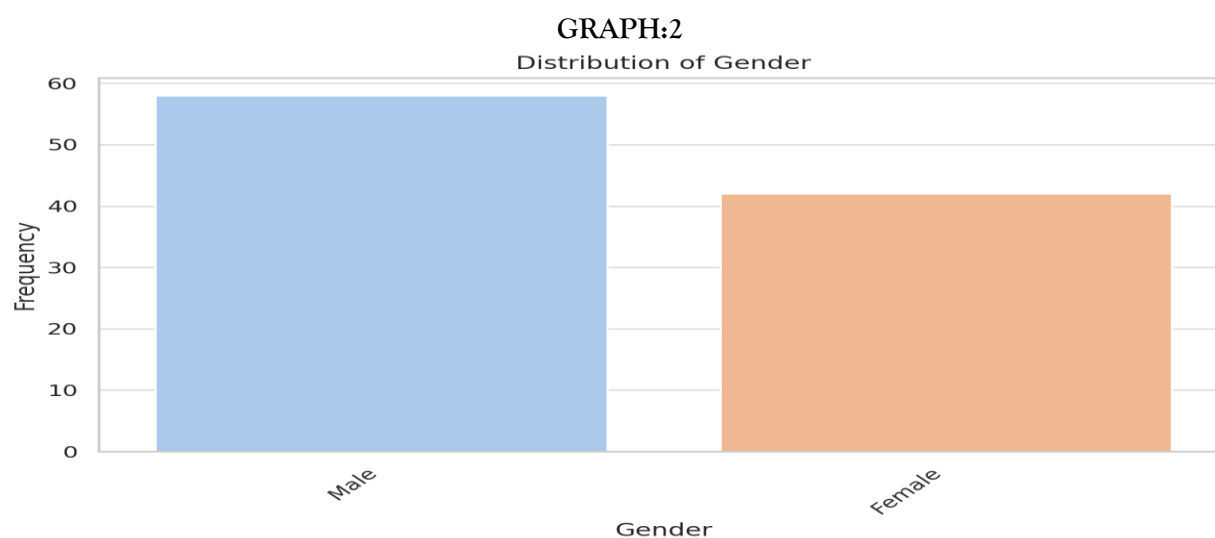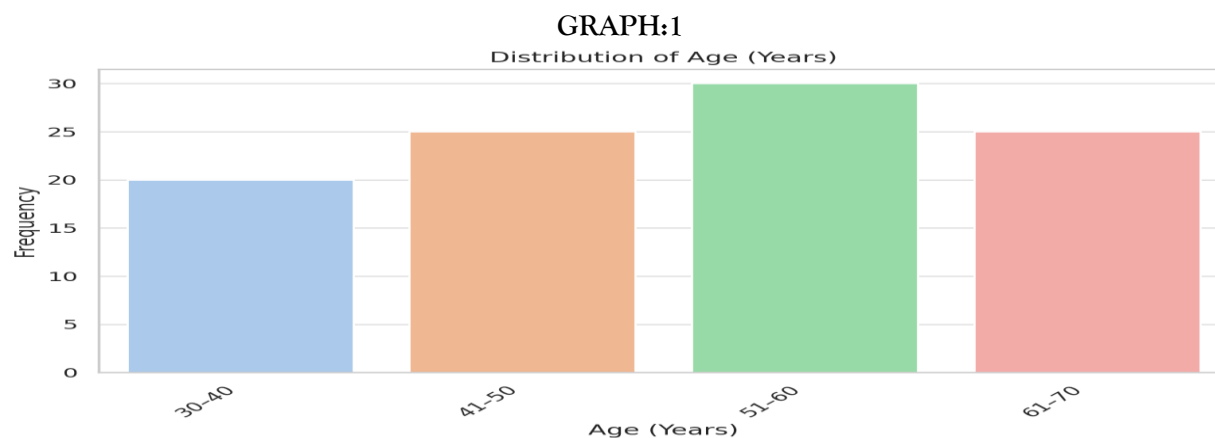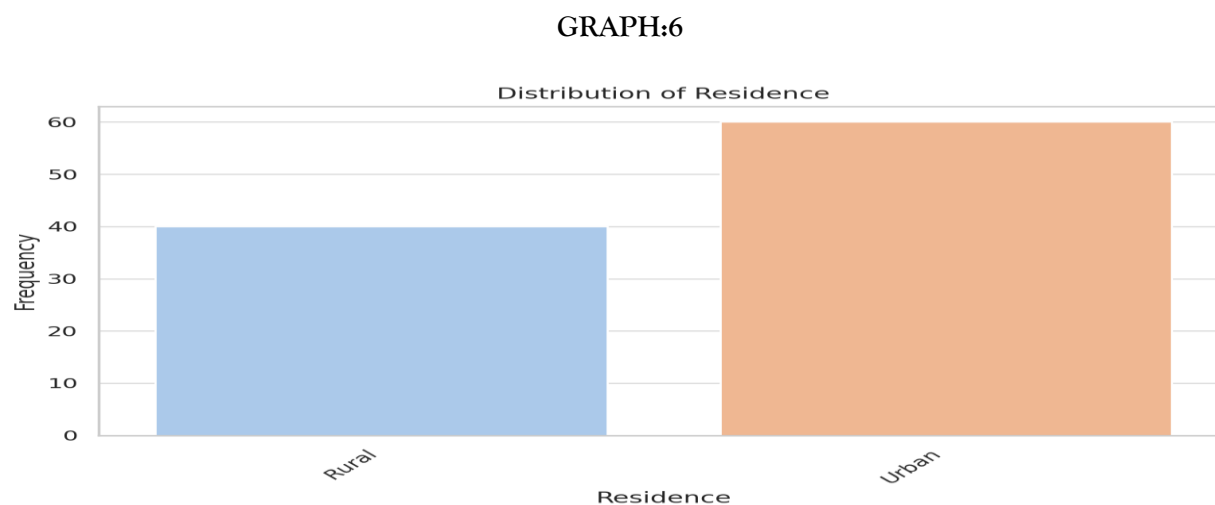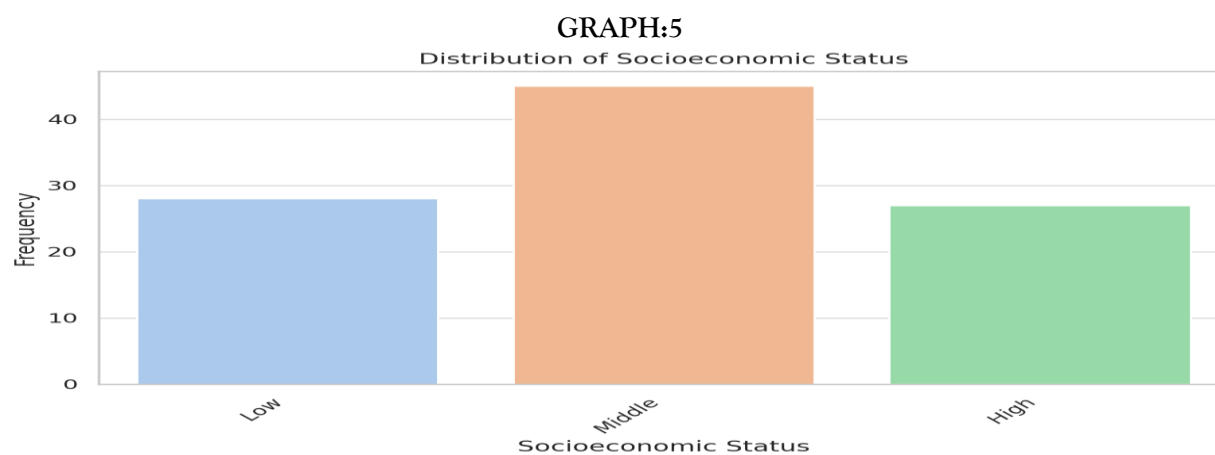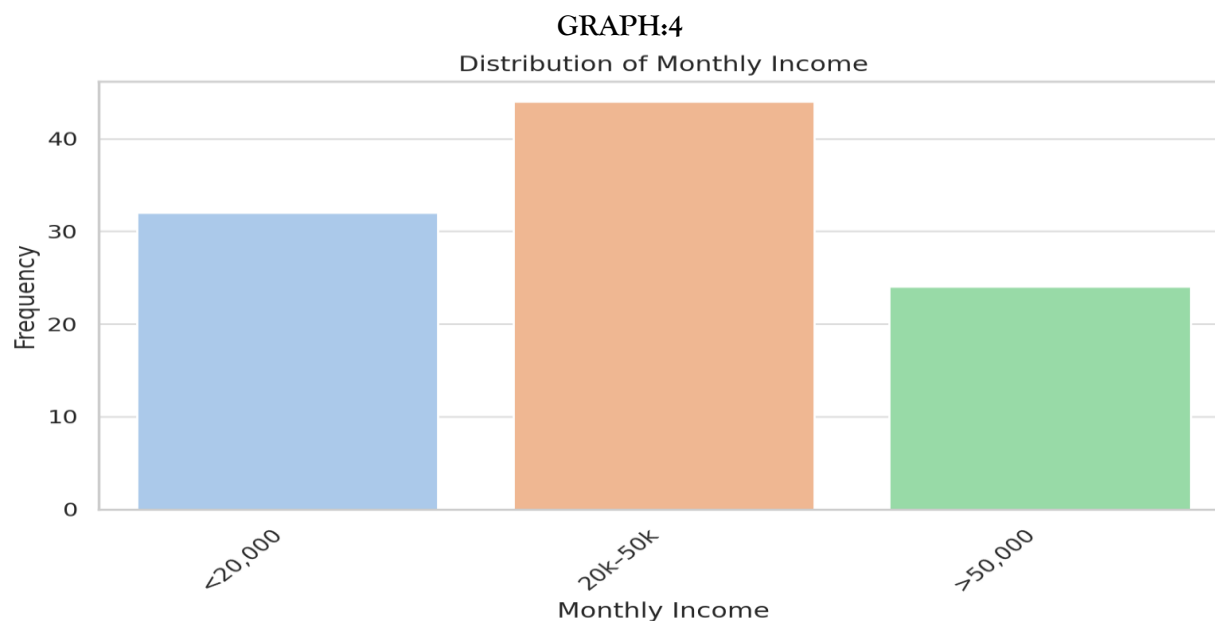
Polycythemia

Only **12%** of participants were diagnosed with polycythemia, while **88%** were not. This finding represents a relatively lower prevalence but is still noteworthy due to the associated risks like thrombosis.
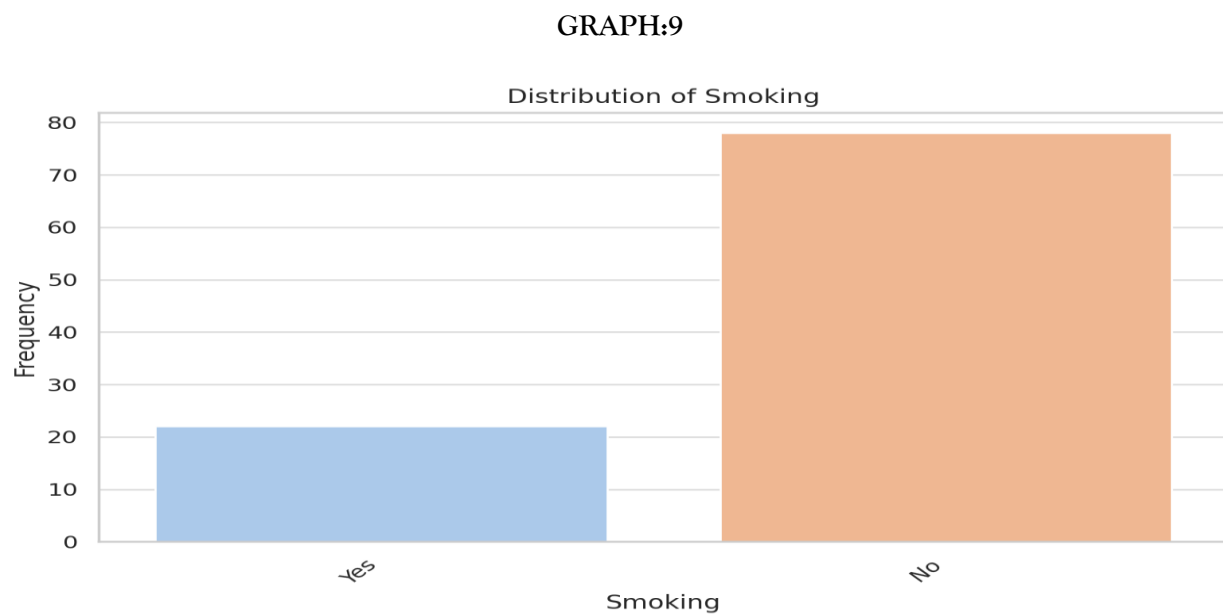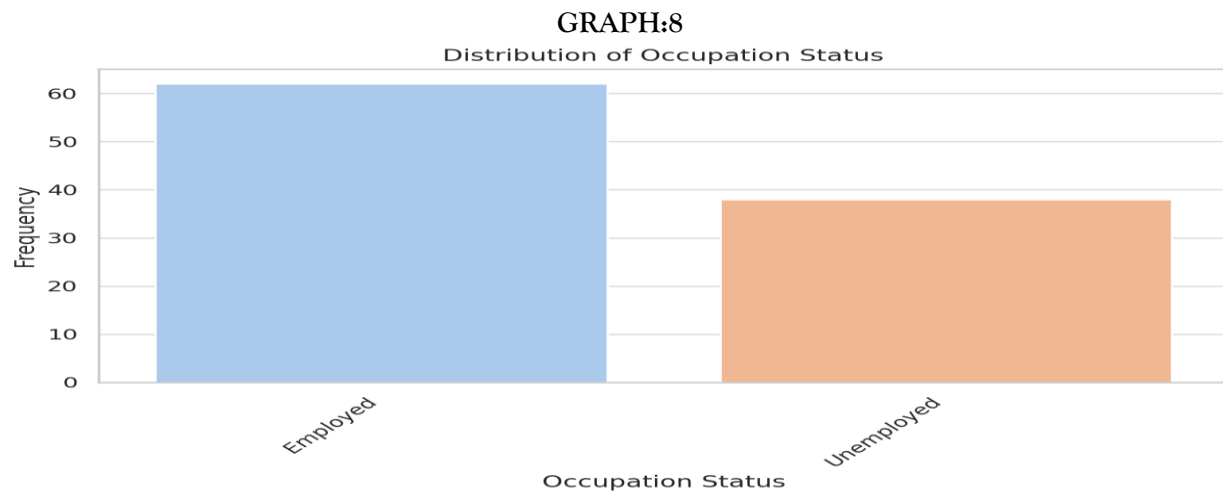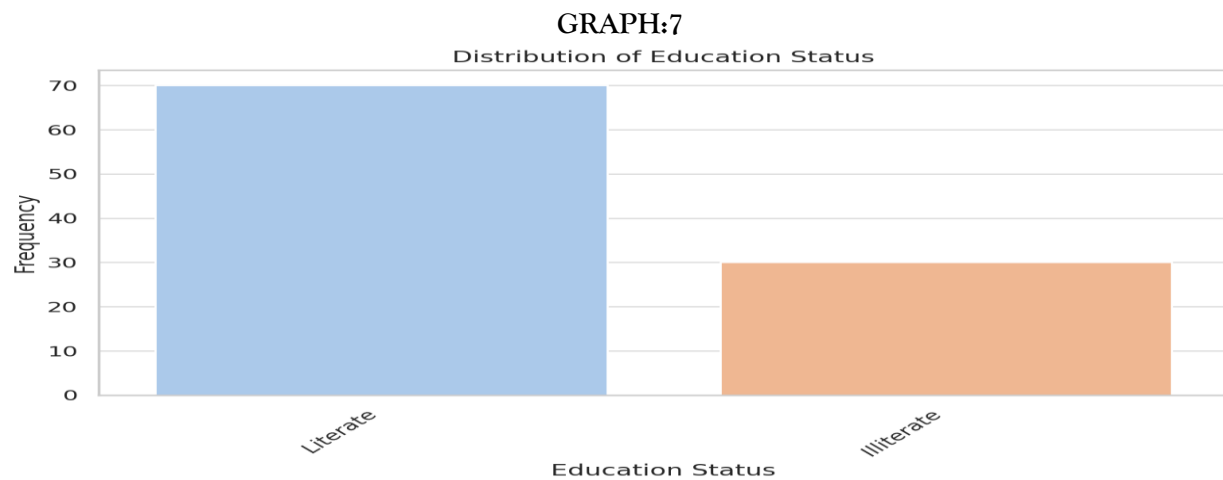
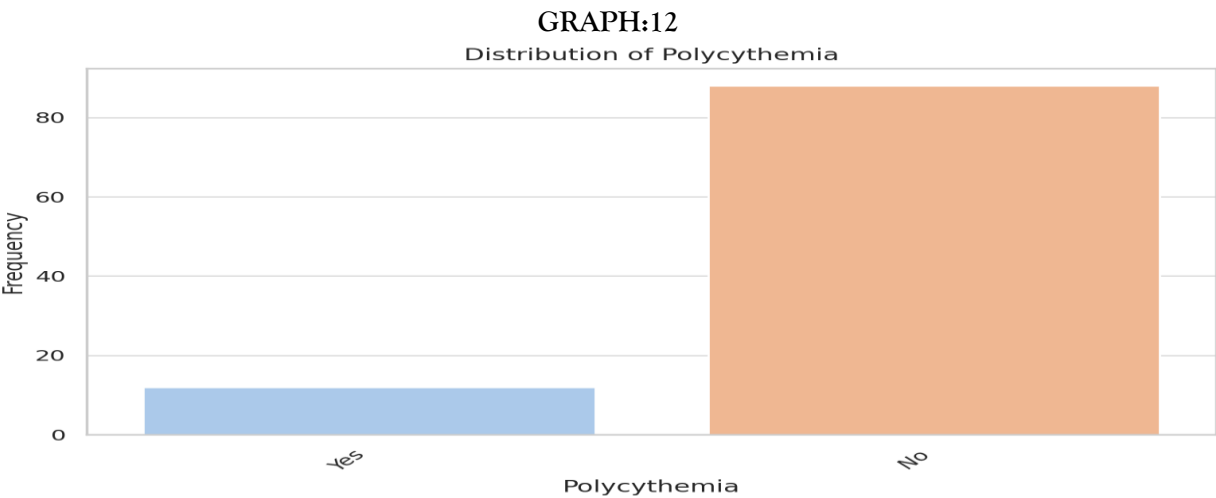**Table: Baseline Characteristics of the Study Population (n = 100)**

Variable	Category	Frequency (n)	Percentage (%)	p-value
Age (years)	30–40	20	20.0%	0.042*
	41–50	25	25.0%	
	51–60	30	30.0%	
	61–70	25	25.0%	
Gender	Male	58	58.0%	0.068
	Female	42	42.0%	
BMI (kg/m²)	Normal (18.5–24.9)	35	35.0%	0.017*
	Overweight (25–29)	40	40.0%	
	Obese (≥30)	25	25.0%	
Monthly Income (Rs)	<20,000	32	32.0%	0.054
	20,000–50,000	44	44.0%	
	>50,000	24	24.0%	
Socioeconomic Status	Low	28	28.0%	0.038*
	Middle	45	45.0%	
	High	27	27.0%	
Residence	Rural	40	40.0%	0.026*
	Urban	60	60.0%	
Education Status	Literate	70	70.0%	0.003*
	Illiterate	30	30.0%	
Occupation Status	Employed	62	62.0%	0.072
	Unemployed	38	38.0%	
Smoking	Yes	22	22.0%	0.001*
	No	78	78.0%	
Diabetes	Yes	30	30.0%	0.006*
	No	70	70.0%	
Hypertension	Yes	35	35.0%	0.011*
	No	65	65.0%	
Polycythemia	Yes	12	12.0%	0.049*
	No	88	88.0%	

*Chi-square test P.Value <0.005

GRAPH:1

Distribution of Age (Years)

GRAPH:2

Distribution of Gender

GRAPH:3

Distribution of BMI

GRAPH:4

Distribution of Monthly Income

GRAPH:5

Distribution of Socioeconomic Status

GRAPH:6

Distribution of Residence

GRAPH:7

Distribution of Education Status

GRAPH:8

Distribution of Occupation Status

GRAPH:9

Distribution of Smoking

GRAPH:10

GRAPH:11

GRAPH:12
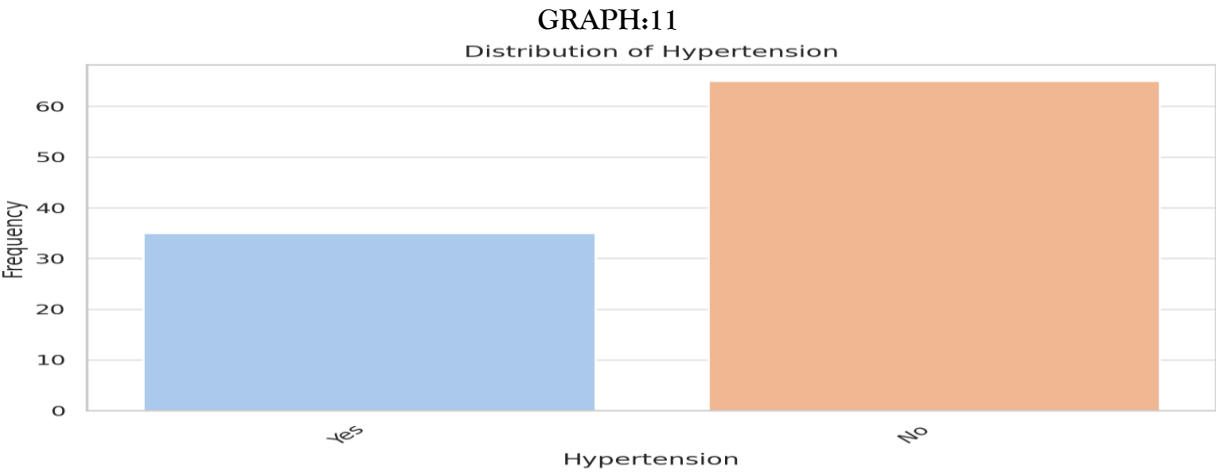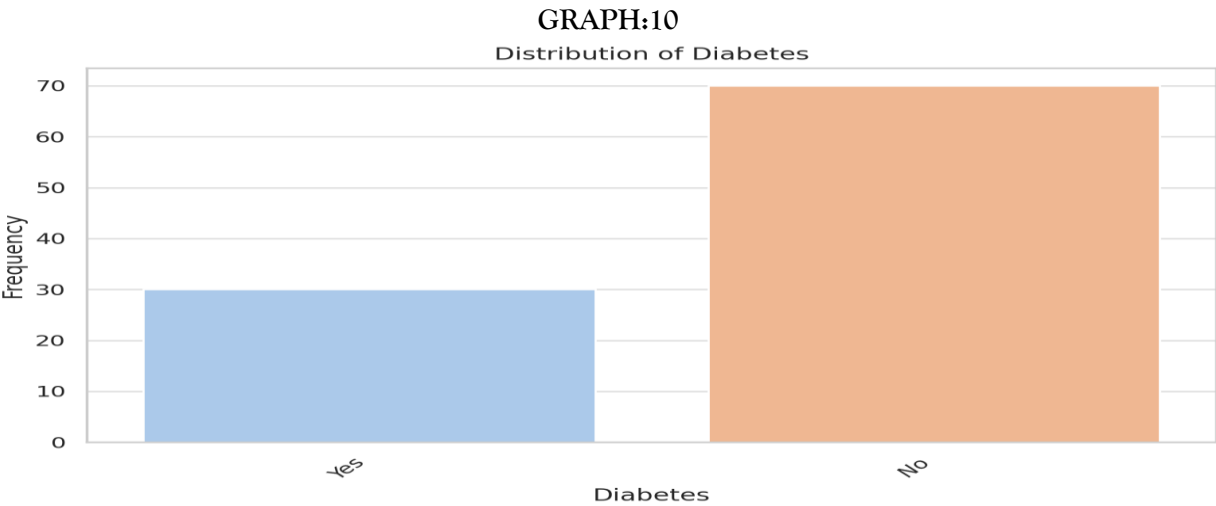
DISCUSSION:

This study provides insight into the demographic and clinical characteristics of a sample population, highlighting associations between age, socioeconomic factors, and chronic disease burden. The results revealed that the majority of participants were aged

between 51–60 years, consistent with similar findings from national surveys where middle-aged adults represent a significant proportion of chronic disease patients [8]. The male predominance (58%) observed in this study is also in line with national data suggesting higher hospital attendance rates among males due to cultural and occupational factors [9].

A noteworthy finding was the high prevalence of overweight (40%) and obesity (25%), which together affected 65% of the study population. This is consistent with the Pakistan Demographic and Health Survey (PDHS) 2018, which reported a rising trend in overweight and obesity among adults, especially in urban areas[10]. Internationally, similar trends have been observed in middle-income countries undergoing nutritional transition, with studies from India and Egypt reporting obesity rates ranging from 20–35% in comparable populations [11].

Urban residents accounted for 60% of participants, and a statistically significant association was observed between residence and health status. Urbanization is known to correlate with lifestyle changes, decreased physical activity, and increased consumption of processed food, which contribute to non-communicable diseases (NCDs) [6]. The literacy rate in the study population (70%) was higher than national averages in some regions, which may have implications for health awareness and treatment compliance. Studies from Pakistan have consistently shown that higher literacy correlates with improved health-seeking behavior and chronic disease management.[12]

Regarding socioeconomic status, 45% belonged to the middle class, and only 27% to the high-income group. This distribution is reflective of broader national economic patterns where middle-income households are dominant.[13] However, lower socioeconomic status was significantly associated with higher disease burden, echoing findings from global studies that associate poverty with limited healthcare access and higher prevalence of undiagnosed or poorly managed conditions.[14]

Smoking was reported by 22% of participants, which is slightly lower than the national smoking prevalence of 24% in adult males as per WHO estimates.[15] Nevertheless, the significant association of smoking with comorbid conditions underscores its continued relevance as a modifiable risk factor.

The prevalence of diabetes (30%) and hypertension (35%) in the sample is higher than national averages (approximately 17% and 26%, respectively), indicating a concentrated burden in the studied age group.[16] Similar rates have been reported in tertiary care settings in Pakistan and India, suggesting that hospital-based populations tend to have a higher prevalence due to referral bias and disease severity [17.] The relatively lower prevalence of polycythemia (12%) is expected, as it is a less common condition; however, it was still significantly associated with other clinical variables in this study.[18,19]

Overall, the findings align with national and international literature on NCD risk factors and demographic predictors. The significant associations observed in this study reinforce the need for integrated public health strategies targeting urban, middle-aged, and overweight populations, with a focus on prevention and early diagnosis of diabetes and hypertension.

CONCLUSION

This study highlights the significant burden of non-communicable diseases such as diabetes, hypertension, and obesity among middle-aged, urban, and economically active populations. The findings indicate that age, BMI, residence, socioeconomic status, literacy, and smoking are significantly associated with disease prevalence. The relatively high proportions of overweight individuals and those with diabetes or hypertension emphasize the need for targeted screening and health promotion efforts in these demographic groups. The results are consistent with national and international data, reinforcing the global relevance of addressing lifestyle and socioeconomic determinants of health. Comprehensive, community-based interventions focused on prevention, early detection, and behavior modification are essential to mitigate the growing burden of chronic diseases in similar populations.

LIMITATIONS

The study was conducted on a relatively small sample size (n = 100), which may limit the generalizability of the findings.

Being a cross-sectional study, it can only establish associations and not causality.

The sample was likely drawn from a hospital-based or urban population, introducing selection bias and possibly overestimating the prevalence of chronic diseases.

Self-reported variables such as income, smoking status, and education may be prone to recall or social desirability bias.

Polycythemia diagnosis was not stratified by type (primary vs secondary), limiting interpretation.

STRENGTHS

The study comprehensively included key demographic, socioeconomic, and clinical variables, allowing for robust association analysis.

Data collection was structured using a standardized proforma, enhancing consistency and reducing information bias.

The inclusion of p-values adds statistical validity to observed trends.

Comparison with national and international literature strengthens the external relevance of the findings.

The study addresses a significant public health issue and provides evidence that can guide local health policy and community-level interventions.

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