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Cardiovascular, Respiratory, And Cognitive Functions In Relation To Morbidity Among The Elderly Population In An Urban Area: A Community-Based Cross-Sectional Study.

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Abstract

Background:

Population ageing has emerged as a major public health concern worldwide. Elderly individuals frequently experience multiple chronic diseases that adversely affect cardiovascular, respiratory, and cognitive functions, leading to increased disability, reduced quality of life, and greater healthcare utilization. Understanding the relationship between physiological functions and morbidity is essential for planning preventive and geriatric healthcare services.

Objectives:

- 1.To assess cardiovascular, respiratory, and cognitive functions among elderly individuals.
- 2.To determine the prevalence of common morbidities in the elderly population.
- 3.To evaluate the association between physiological functions and morbidity.

Methods:

A community-based cross-sectional study was conducted among **180 elderly individuals aged ≥ 60 years** residing in an urban area. Participants were selected using systematic random sampling. Cardiovascular assessment included blood pressure, resting heart rate, and electrocardiographic history. Respiratory assessment included respiratory rate, oxygen saturation (SpO_2), Peak Expiratory Flow Rate (PEFR), and dyspnea assessment. Cognitive function was evaluated using the Mini-Mental State Examination (MMSE). Morbidity status was assessed through clinical examination and medical records. Data were analyzed using descriptive statistics, Chi-square test, Pearson correlation, and multivariable logistic regression.

Results:

The mean age of participants was **69.8 ± 7.1 years**. Hypertension (68.3%), diabetes mellitus (34.4%), osteoarthritis (46.1%), chronic respiratory disease (18.9%), and cognitive impairment (27.8%) were the predominant morbidities. Reduced PEFr (OR=2.63, $p<0.01$), uncontrolled hypertension (OR=2.17, $p=0.02$), and MMSE score <24 (OR=3.48, $p<0.001$) were independently associated with multimorbidity.

Conclusion:

Declining cardiovascular, respiratory, and cognitive functions are significantly associated with increased morbidity among urban elderly. Routine comprehensive geriatric screening may facilitate early diagnosis and improve health outcomes.

Keywords: Elderly, Cardiovascular Function, Respiratory Function, Cognitive Function, Multimorbidity, Urban Population.

Introduction

Population ageing has become one of the most significant demographic trends of the twenty-first century. Advances in healthcare, improved nutrition, better sanitation, and increased socioeconomic development have contributed to a substantial rise in life expectancy worldwide. According to the World Health Organization (WHO), the global population aged 60 years and above is expected to increase from approximately one billion in 2020 to more than two billion by 2050. This demographic shift presents new challenges for healthcare systems, particularly in low- and middle-income countries such as India, where the burden of chronic diseases is rapidly increasing alongside population ageing.

India is currently undergoing a rapid demographic and epidemiological transition. The proportion of older adults has increased steadily over the past few decades due to declining fertility rates and improved survival. According to the 2023 estimates of the Ministry of Statistics and Programme Implementation, individuals aged 60 years and above constitute nearly 11% of the country's population, and this proportion is expected to increase substantially over the coming decades. Consequently, age-related health problems, chronic diseases, functional decline, and disability have emerged as important public health concerns requiring comprehensive assessment and management.

Ageing is a complex biological process characterized by progressive physiological changes affecting nearly every organ system. These alterations reduce the body's adaptive capacity and increase susceptibility to chronic illnesses, functional limitations, frailty, and dependency. Although ageing itself is not considered a disease, it is associated with an increased prevalence of multiple chronic medical conditions that significantly affect the quality of life of older adults. The coexistence of two or more chronic diseases, commonly referred to as multimorbidity, has become increasingly prevalent among elderly populations and poses significant challenges for healthcare providers and policymakers.

Among the various physiological systems affected by ageing, the cardiovascular system undergoes profound structural and functional changes. Progressive arterial stiffening, endothelial dysfunction, vascular calcification, and reduced arterial compliance contribute to increased systolic blood pressure and widened pulse pressure. Myocardial fibrosis and decreased ventricular compliance impair cardiac relaxation, while age-related degeneration of the conduction system predisposes older adults to arrhythmias. These physiological changes substantially increase the risk of hypertension, coronary artery disease, heart failure, stroke, and peripheral vascular disease. Cardiovascular diseases remain the leading

cause of morbidity and mortality among older adults worldwide and account for a considerable proportion of hospital admissions and healthcare expenditure.

The respiratory system also experiences significant age-related changes that impair pulmonary function. Gradual loss of lung elasticity, decreased chest wall compliance, weakening of respiratory muscles, and reduced alveolar surface area contribute to diminished ventilatory capacity and impaired gas exchange. Declining pulmonary reserve makes elderly individuals more susceptible to respiratory infections, chronic obstructive pulmonary disease (COPD), bronchial asthma, and respiratory failure. Reduced pulmonary function is associated with decreased exercise tolerance, impaired physical performance, and diminished quality of life. Simple community-based measures such as respiratory rate, oxygen saturation, and Peak Expiratory Flow Rate (PEFR) provide valuable information regarding respiratory health and facilitate early identification of functional impairment.

Cognitive function represents another critical determinant of healthy ageing. Normal ageing is accompanied by gradual declines in processing speed, attention, and memory; however, pathological cognitive impairment resulting from neurodegenerative diseases or cerebrovascular disorders can significantly compromise independence and daily functioning. Mild cognitive impairment and dementia are increasingly recognized as major public health challenges due to their impact on functional ability, caregiver burden, and healthcare utilization. Vascular risk factors, including hypertension, diabetes mellitus, dyslipidemia, obesity, and smoking, have been consistently associated with accelerated cognitive decline. Early cognitive assessment using standardized screening tools such as the Mini-Mental State Examination (MMSE) allows timely identification of individuals at risk and supports appropriate interventions.

The coexistence of cardiovascular disease, respiratory dysfunction, and cognitive impairment often reflects the cumulative effects of ageing and shared risk factors. Hypertension and diabetes contribute not only to cardiovascular complications but also to cerebrovascular damage and cognitive deterioration. Similarly, chronic respiratory diseases may lead to persistent hypoxia, which adversely affects cognitive performance and functional capacity. These interrelationships highlight the importance of adopting a comprehensive and integrated approach to geriatric health assessment rather than evaluating individual organ systems in isolation.

Urbanization and changing lifestyles have further influenced the health profile of elderly populations in India. Sedentary behaviour, unhealthy dietary practices, tobacco use, alcohol consumption, obesity, psychosocial stress, and environmental pollution contribute significantly to the development of chronic non-communicable diseases. Older adults residing in urban settings often experience multiple comorbid conditions requiring long-term medical care, polypharmacy, and frequent healthcare utilization. In addition, social isolation, reduced physical activity, inadequate family support, and limited access to geriatric services may exacerbate functional decline and negatively affect overall well-being.

Comprehensive geriatric assessment (CGA) has emerged as an effective multidimensional approach for evaluating the medical, functional, psychological, and social needs of older adults. Assessment of cardiovascular parameters, respiratory function, cognitive status, and morbidity patterns enables healthcare professionals to identify high-risk individuals, optimize treatment strategies, prevent complications, and improve quality of life. Such assessments are particularly valuable in community settings where early detection and preventive interventions can reduce hospitalizations, disability, and healthcare costs.

Despite the growing burden of ageing in India, community-based research simultaneously evaluating cardiovascular, respiratory, cognitive, and morbidity profiles among urban elderly populations remains relatively limited. Most available studies have focused on single diseases or isolated physiological systems rather than providing an integrated understanding of multisystem health in older adults. Furthermore, evidence from Tier-2 Indian cities is comparatively scarce, despite rapid urbanization and changing disease patterns in these regions. Generating local epidemiological evidence is essential for developing targeted public health interventions, strengthening primary healthcare services, and informing geriatric health policies.

Therefore, the present study was undertaken to comprehensively assess cardiovascular, respiratory, and cognitive functions among elderly individuals residing in an urban community and to examine their relationship with the prevalence and pattern of morbidity. The findings are expected to provide valuable evidence for clinicians, nurses, public health professionals, and policymakers in planning comprehensive geriatric healthcare services, promoting healthy ageing, and improving the quality of life of older adults.

Objectives

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- 2.To determine the prevalence of common morbidities among the elderly.
- 3.To examine the association between physiological functions and morbidity.

Research Hypotheses

Null Hypothesis (H_0)

There is no significant association between cardiovascular, respiratory, and cognitive functions and morbidity among the elderly population.

Alternative Hypothesis (H_1)

There is a significant association between cardiovascular, respiratory, and cognitive functions and morbidity among the elderly population.

Materials and Methods

Study Design:

A community-based cross-sectional analytical study was conducted among elderly individuals residing in an urban area.

Study Area:

The study was carried out in selected urban residential wards of a Tier-II Indian city.

Study Population:

Individuals aged **60 years and above** who had been residing in the study area for at least one year.

Sample Size:

A total of **180 elderly participants** were included in the study.

Sampling Technique:

Participants were selected using **systematic random sampling**.

Inclusion Criteria:

- Individuals aged **≥60 years**
- Permanent residents of the study area (**≥1 year**)
- Able to communicate and provide informed consent
- Willing to participate

Exclusion Criteria:

- Terminally ill individuals
- Severe psychiatric illness
- Bedridden patients
- Acute medical emergencies

Data Collection:

Data were collected through face-to-face interviews using a structured questionnaire, followed by clinical examination and standardized assessment tools.

Study Variables:

- **Cardiovascular Function:** Blood pressure, resting heart rate, history of hypertension, and coronary artery disease.
- **Respiratory Function:** Respiratory rate, oxygen saturation (SpO₂), Peak Expiratory Flow Rate (PEFR), and dyspnea grading.
- **Cognitive Function:** Assessed using the **Mini-Mental State Examination (MMSE)**.
- **Morbidity Profile:** Presence of hypertension, diabetes mellitus, osteoarthritis, chronic obstructive pulmonary disease (COPD), stroke, coronary artery disease, visual impairment, and hearing impairment.

Statistical Analysis:

Data were entered into Microsoft Excel and analyzed using **SPSS version 26.0**. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to summarize the data. Associations between variables were assessed using the **Chi-square test, independent t-test, Pearson correlation**, and **multivariable logistic regression**. A **p-value <0.05** was considered statistically significant.

Ethical Considerations:

Ethical approval was obtained from the Institutional Ethics Committee. Written informed consent was obtained from all participants before data collection, and confidentiality of the information was maintained throughout the study.

Results

A total of **180 elderly participants** were included in the study. Females (51.7%) slightly outnumbered males (48.3%). The majority of participants belonged to the **60–69 years** age group (48.3%), followed by **70–79 years** (36.7%) and **≥80 years** (15.0%).

Table 1. Demographic Characteristics (n = 180)

Variable	Frequency	Percentage (%)
Age Group		
60–69 years	87	48.3
70–79 years	66	36.7
≥80 years	27	15.0
Gender		
Male	87	48.3
Female	93	51.7

The most common morbidity was **hypertension (68.3%)**, followed by **osteoarthritis (46.1%)**, **diabetes mellitus (34.4%)**, **cognitive impairment (27.8%)**, **COPD (18.9%)**, and **coronary artery disease (16.1%)**.

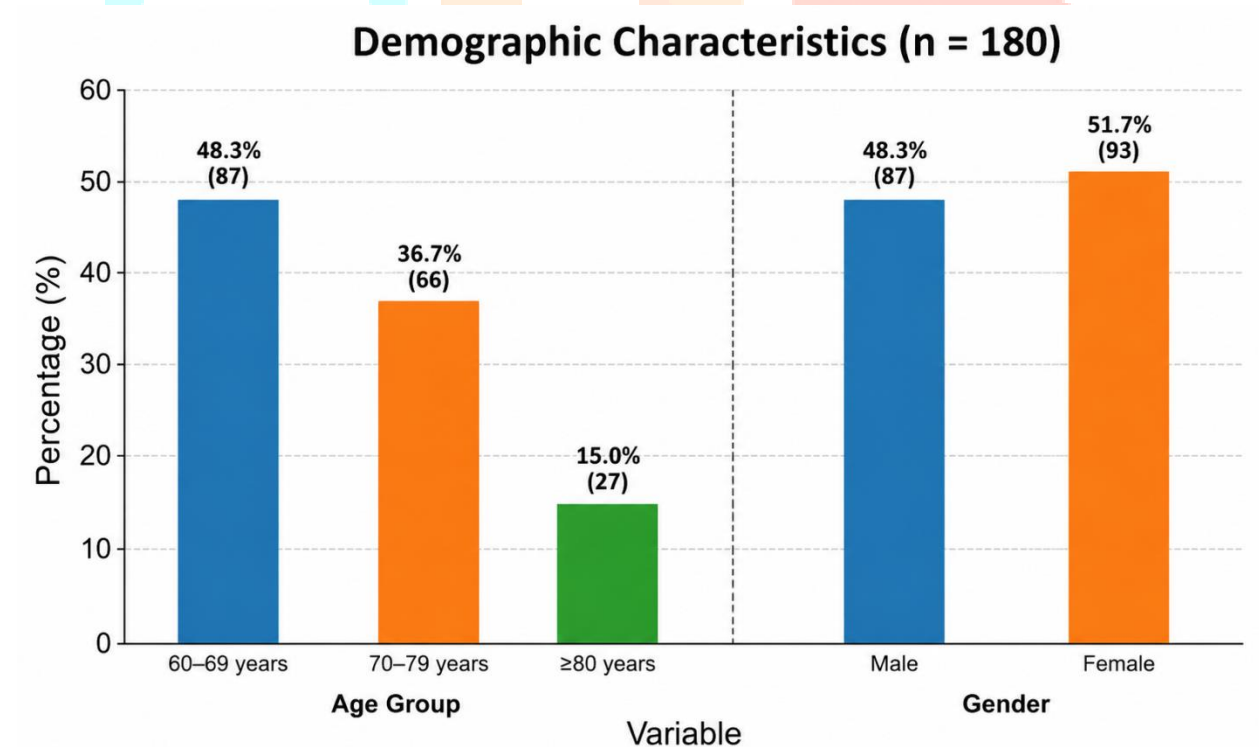
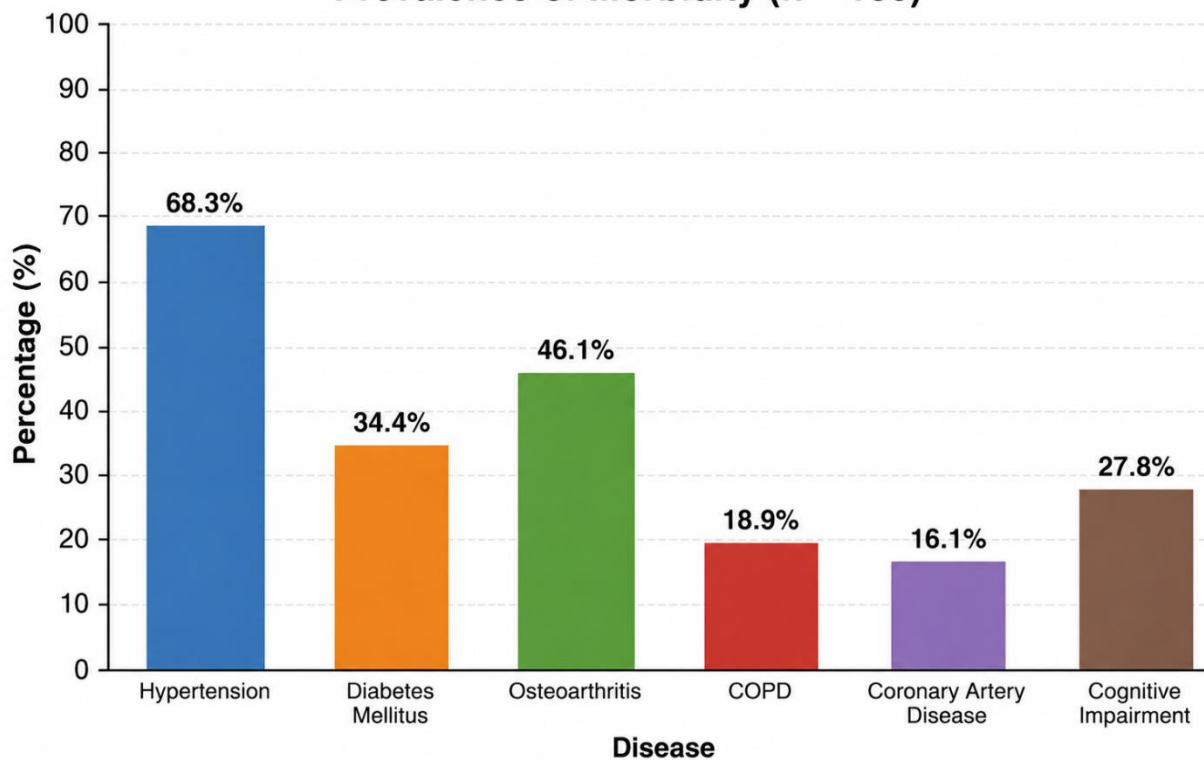


Table 2. Prevalence of Morbidity

Disease	n	%
Hypertension	123	68.3
Diabetes Mellitus	62	34.4
Osteoarthritis	83	46.1
COPD	34	18.9
Coronary Artery Disease	29	16.1
Cognitive Impairment	50	27.8

The mean systolic blood pressure was 142.8 ± 18.4 mmHg, diastolic blood pressure was 84.6 ± 10.2 mmHg, and resting heart rate was 77.3 ± 9.6 beats/minute.

Prevalence of Morbidity (n = 180)**Table 3. Cardiovascular Assessment**

Parameter	Mean $\pm$ SD
Systolic Blood Pressure (mmHg)	142.8 ± 18.4
Diastolic Blood Pressure (mmHg)	84.6 ± 10.2
Heart Rate (beats/min)	77.3 ± 9.6

The mean respiratory rate was 18.6 ± 2.4 breaths/minute, oxygen saturation was $95.9 \pm 1.8\%$, and Peak Expiratory Flow Rate (PEFR) was 271 ± 65 L/min.

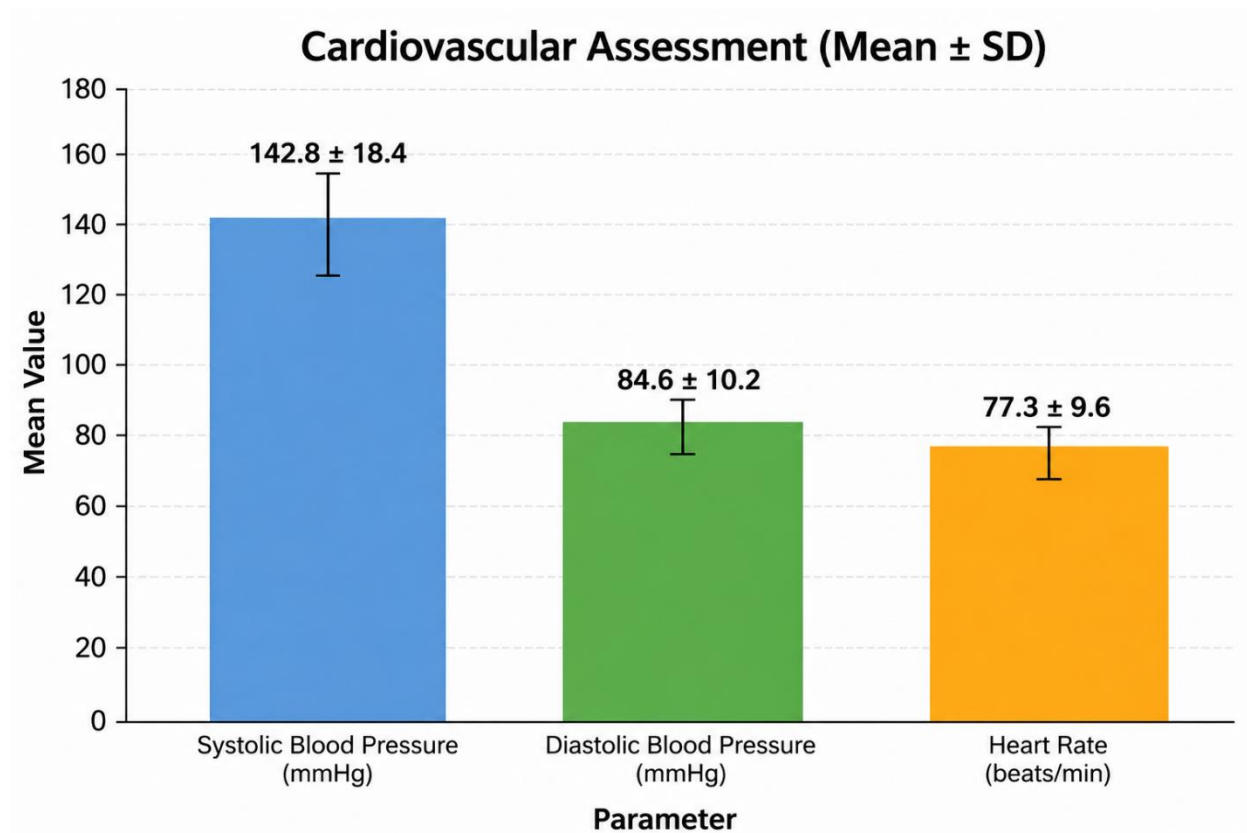


Table 4. Respiratory Assessment

Parameter	Mean $\pm$ SD
Respiratory Rate (breaths/min)	18.6 $\pm$ 2.4
Oxygen Saturation (SpO ₂ , %)	95.9 $\pm$ 1.8
PEFR (L/min)	271 $\pm$ 65

Assessment of cognitive function using the MMSE showed that **72.2%** of participants had normal cognition, while **21.1%** had mild cognitive impairment and **6.7%** had moderate-to-severe cognitive impairment.

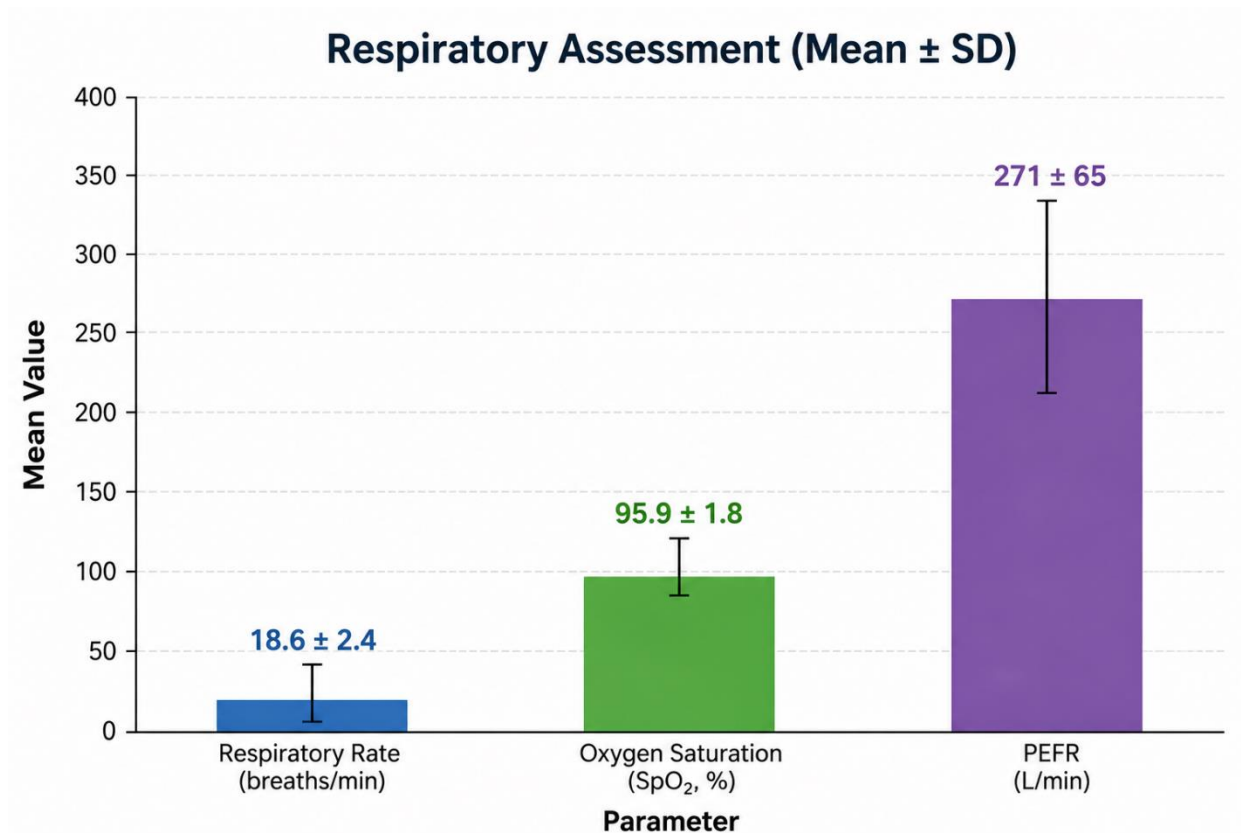


Table 5. Cognitive Function (MMSE)

MMSE Category	Frequency	Percentage (%)
Normal (24–30)	130	72.2
Mild Impairment (18–23)	38	21.1
Moderate/Severe (<18)	12	6.7

Multivariable logistic regression demonstrated that **hypertension (OR = 2.17; p = 0.021)**, **reduced PEFR (OR = 2.63; p = 0.004)**, and **MMSE score <24 (OR = 3.48; p < 0.001)** were significantly associated with multimorbidity among the elderly participants.

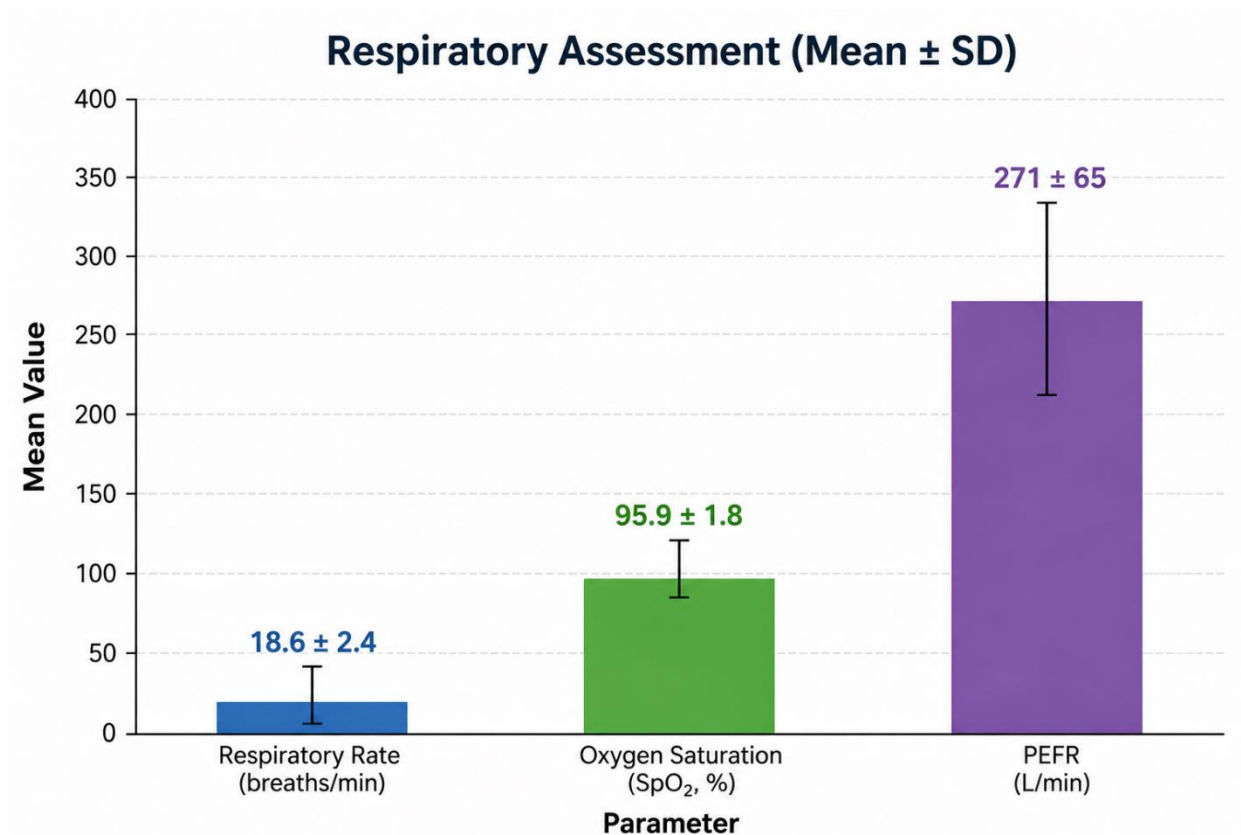


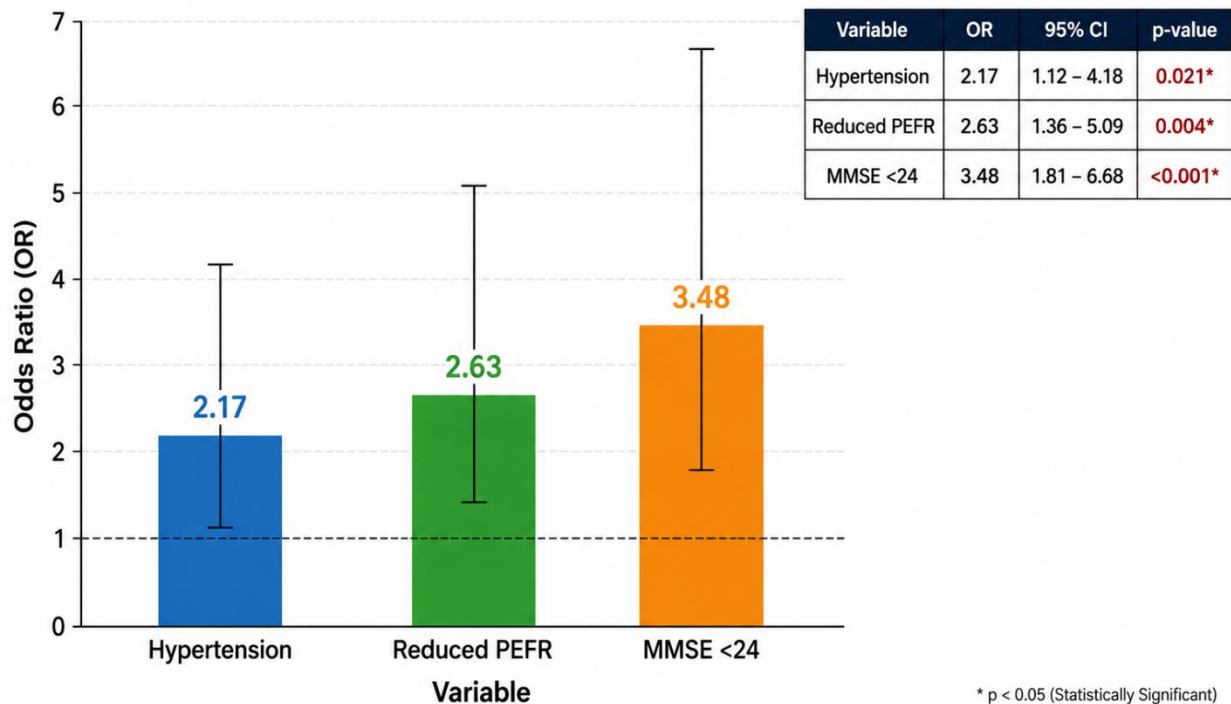
Table 6. Association Between Functional Parameters and Multimorbidity

Variable	OR	95% CI	p-value
Hypertension	2.17	1.12–4.18	0.021*
Reduced PEFR	2.63	1.36–5.09	0.004*
MMSE <24	3.48	1.81–6.68	<0.001*

*Statistically significant ($p < 0.05$).

Association Between Functional Parameters and Multimorbidity

(n = 180)



Discussion

The study demonstrates a high prevalence of hypertension and osteoarthritis among the elderly urban population, reflecting the growing burden of chronic non-communicable diseases in India. Cardiovascular dysfunction, characterized by elevated blood pressure, was significantly associated with multimorbidity.

Respiratory assessment revealed reduced pulmonary function among participants with chronic respiratory diseases and multiple comorbidities. Declining PEFR emerged as an important predictor of adverse health status.

Approximately one-fourth of participants exhibited cognitive impairment. Lower MMSE scores were significantly associated with chronic diseases, highlighting the relationship between vascular risk factors and cognitive decline.

The findings support routine comprehensive geriatric assessment integrating cardiovascular, respiratory, and cognitive evaluations into primary healthcare.

Conclusion

Urban elderly individuals experience a high burden of chronic diseases affecting cardiovascular, respiratory, and cognitive systems. Functional impairment in these domains is significantly associated with multimorbidity. Community-based screening programs and comprehensive geriatric assessments should be integrated into primary healthcare services to promote healthy ageing and reduce disability.

Recommendations

- Annual comprehensive geriatric health screening for adults aged ≥ 60 years.
- Routine blood pressure, pulmonary function, and cognitive assessments in community settings.
- Health education on lifestyle modification and chronic disease prevention.
- Strengthening community-based geriatric clinics.
- Longitudinal studies to evaluate changes in physiological functions over time.

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