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# Anxiety And Chronic Disorders A Synopsis

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## INTRODUCTION

Chronic diseases, also referred to as non-communicable diseases (NCDs), represent one of the most significant public health challenges of the twenty-first century. These conditions are characterized by their prolonged duration, slow progression, and the requirement for ongoing medical attention and management [1]. The World Health Organization defines chronic diseases as conditions that persist for extended periods, typically lasting more than one year, and require continuous medical care while potentially limiting activities of daily living [2]. The global burden of chronic diseases has escalated dramatically over the past several decades, with conditions such as cardiovascular diseases, diabetes mellitus, chronic obstructive pulmonary disease (COPD), hypertension, and ischemic heart disease accounting for approximately 71% of all deaths worldwide [3].

The epidemiological transition observed in both developed and developing nations has resulted in a significant shift from acute infectious diseases to chronic non-communicable conditions as the primary causes of morbidity and mortality [4]. In India, the prevalence of chronic diseases has witnessed an unprecedented surge, with estimates suggesting that NCDs account for approximately 63% of all deaths in the country [5]. This alarming trend is particularly evident in urban areas and tertiary care settings, where the patient population increasingly presents with multiple comorbid chronic conditions. The state of Gujarat, and specifically the city of Ahmedabad, mirrors these national trends, with rising incidence rates of diabetes mellitus, hypertension, cardiovascular diseases, and chronic respiratory conditions among the adult population [6].

The pathophysiology of chronic diseases involves complex interactions between genetic predisposition, environmental factors, lifestyle choices, and psychosocial determinants of health [7]. Unlike acute conditions that may resolve with appropriate treatment, chronic diseases require lifelong management strategies that encompass pharmacological interventions, lifestyle modifications, regular monitoring, and psychological support. This perpetual nature of chronic disease management places substantial burden not only on healthcare systems but also on patients and their families, contributing to significant psychological distress and reduced quality of life [8].

Anxiety disorders constitute a heterogeneous group of psychiatric conditions characterized by excessive fear, worry, and related behavioral disturbances that significantly impair daily functioning [9]. These disorders represent the most prevalent category of mental health conditions globally, affecting approximately 301 million individuals worldwide as of recent epidemiological estimates. The spectrum of anxiety disorders encompasses generalized anxiety disorder (GAD), panic disorder, social anxiety disorder, specific phobias, and anxiety secondary to medical conditions, each presenting with distinct clinical features while sharing common underlying mechanisms of dysregulated fear and stress responses [10].

The neurobiological basis of anxiety involves complex interactions between the hypothalamic-pituitary-adrenal (HPA) axis, autonomic nervous system, and various neurotransmitter systems, including serotonergic, noradrenergic, and GABAergic pathways [11]. Chronic activation of stress response systems, as observed in persistent anxiety states, leads to sustained elevation of cortisol levels and sympathetic nervous system activity, which in turn exerts deleterious effects on multiple organ systems. This physiological link provides a mechanistic explanation for the observed associations between anxiety disorders and adverse outcomes in chronic medical conditions.

Depression, another prevalent mood disorder frequently comorbid with anxiety, shares similar neurobiological underpinnings and often co-occurs with anxiety symptoms in clinical populations [12]. The relationship between depression and anxiety is bidirectional and synergistic, with the presence of one condition significantly increasing the risk of developing the other. In the context of chronic medical illness, this comorbidity assumes particular significance, as the combined burden of mood and anxiety disorders substantially compounds the negative impact on disease outcomes and quality of life.

The relationship between anxiety disorders and chronic medical conditions represents a critically important area of clinical investigation that has garnered increasing attention from researchers and healthcare practitioners alike. Epidemiological studies have

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consistently demonstrated that patients with chronic medical illnesses exhibit significantly elevated rates of anxiety and depressive disorders compared to the general population [13]. Clarke and Currie (2009) reported that patients in primary care settings with chronic medical illness face substantially greater risk of developing depressive and anxiety disorders k, with prevalence rates of depression ranging from 5% to 60% among individuals with hypertension, diabetes, asthma, arthritis, and tuberculosis.

The highest prevalence of mood and anxiety disorders has been documented in individuals with gastrointestinal diseases, followed by those suffering from chronic pain conditions, cardiac diseases, and pulmonary disorders [14]. Research indicates that among adults aged 18 to 44 years, the prevalence of mood and anxiety disorders reaches 27.1% in gastrointestinal diseases, 13.3% in chronic pain conditions, 12.2% in heart diseases, and 11.5% in lung diseases. Among older adults aged 45 years and above, these figures remain substantial at 15.9%, 12.2%, 8.0%, and 7.4%, respectively. These statistics underscore the magnitude of psychiatric comorbidity in chronic disease populations and highlight the need for integrated approaches to patient care.

The mechanisms underlying the association between anxiety and chronic diseases are multifactorial and operate through both biological and psychological pathways. From a biological perspective, chronic stress and anxiety activate the HPA axis and sympathetic nervous system, leading to elevated levels of cortisol, catecholamines, and inflammatory cytokines [15]. These physiological changes promote the development and progression of atherosclerosis, insulin resistance, airway inflammation, and other pathological processes central to chronic disease etiology. Additionally, anxiety-induced alterations in health behaviors, including poor dietary choices, physical inactivity, smoking, and medication non-adherence, further contribute to adverse disease outcomes.

The presence of comorbid anxiety in patients with chronic diseases has been consistently associated with a constellation of adverse outcomes that significantly impact both individual patients and healthcare systems. Moussavi and colleagues (2007) demonstrated that the co-occurrence of depression and anxiety disorders with chronic medical illness leads to poor treatment adherence, greater healthcare utilization, inferior functional outcomes, and increased mortality rates. These findings have been replicated across diverse chronic disease populations and healthcare settings, establishing anxiety as an independent risk factor for negative prognosis in chronic illness.

In patients with chronic obstructive pulmonary disease, anxiety disorders demonstrate particularly high prevalence rates and exert profound effects on disease trajectory and patient well-being [1]. Brenes and colleagues highlighted that anxiety in COPD patients is associated with increased dyspnea perception, reduced exercise tolerance, more frequent exacerbations, and higher rates of hospital admissions. The relationship between anxiety and COPD symptoms creates a self-perpetuating cycle wherein respiratory distress triggers anxiety, which in turn amplifies the perception of breathlessness and further compromises respiratory function.

Similarly, in cardiovascular diseases, anxiety has been implicated in the pathogenesis and progression of coronary artery disease, heart failure, and arrhythmias. The physiological effects of chronic anxiety, including elevated heart rate, blood pressure variability, endothelial dysfunction, and platelet activation, contribute to increased cardiovascular risk and poorer outcomes following acute cardiac events. Furthermore, anxiety-related behaviors such as physical inactivity, unhealthy dietary patterns, and tobacco use compound these biological mechanisms to accelerate cardiovascular disease progression.

The impact of anxiety on diabetes mellitus management and outcomes deserves particular attention given the bidirectional relationship between psychological distress and glycemic control. Anxiety impairs self-management behaviors essential for diabetes control, including adherence to medication regimens, dietary recommendations, and blood glucose monitoring protocols. Concurrently, the stress hormones released during anxiety states directly antagonize insulin action and promote hyperglycemia, creating a physiological basis for the observed associations between anxiety and poor glycemic control.

Understanding the temporal patterns of anxiety and depression in individuals living with chronic diseases provides valuable insights for clinical management and intervention planning. Scott and colleagues (2023) conducted a systematic review and meta-analysis examining depression and anxiety trajectories across various chronic disease populations [10]. Their findings revealed considerable heterogeneity in psychological adjustment patterns, with distinct trajectory classes identifiable within chronic disease populations.

Importantly, the majority of individuals with chronic disease appear to follow a trajectory of distress characterized by low and stable symptom levels over time, suggesting that most people successfully adapt psychologically to living with chronic illness. This resilient trajectory offers an optimistic perspective on chronic disease adjustment and highlights the remarkable capacity of individuals to cope with significant health challenges. However, a substantial minority of patients exhibit persistently elevated or escalating distress trajectories that warrant clinical attention and targeted intervention.

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The identification of predictors associated with adverse psychological trajectories in chronic disease represents an important avenue for clinical research. Factors consistently associated with poor psychological adjustment include younger age at diagnosis, female gender, lower socioeconomic status, limited social support, pre-existing mental health conditions, greater disease severity, and the presence of multiple comorbidities. Recognition of these risk factors enables healthcare providers to identify vulnerable patients early in the disease course and implement preventive interventions before psychological distress becomes entrenched.

While the primary focus of this thesis concerns anxiety in the context of chronic medical diseases, it is important to acknowledge the complex interactions between severe psychiatric conditions and medical comorbidities. Schizophrenia represents a heterogeneous psychiatric disorder characterized by positive symptoms (hallucinations, delusions), negative symptoms (anhedonia, avolition), and cognitive impairment [11]. When inadequately treated with current therapeutic approaches, anxiety and traumatic episodes can significantly exacerbate schizophrenia symptoms and substantially diminish quality of life [12].

Patients with schizophrenia face elevated rates of chronic medical conditions, including cardiovascular disease, diabetes mellitus, and metabolic syndrome, often related to the metabolic effects of antipsychotic medications and lifestyle factors associated with severe mental illness. The convergence of psychiatric and medical morbidity in this population presents unique challenges for healthcare delivery and underscores the importance of integrated care models that address both mental and physical health needs.

Care management has emerged as a common approach to outpatient support for individuals with both psychiatric and medical conditions. This model of care encompasses comprehensive assessment, individualized care planning, and coordination of services across healthcare providers and settings. Care management interventions typically involve regular patient contact, symptom monitoring, medication management support, health education, and facilitation of access to appropriate healthcare resources [13-15].

Although care management is frequently delivered remotely through telephone-based interventions, the evidence supporting this model of care remains uncertain. The COVID-19 pandemic accelerated the adoption of telehealth and remote care management approaches, necessitating rigorous evaluation of their effectiveness compared to traditional in-person care delivery. Understanding the optimal modalities and components of care management for patients with comorbid anxiety and chronic diseases represents an important priority for healthcare services research.

Despite the substantial body of literature documenting associations between anxiety disorders and chronic medical conditions, significant gaps in knowledge persist. Most existing research has examined anxiety in the context of specific chronic diseases rather than synthesizing information across diverse chronic disease populations. Furthermore, much of the available evidence derives from Western healthcare settings, with limited data from South Asian populations despite the substantial burden of both chronic diseases and mental health conditions in this region.

The present study aims to address these knowledge gaps by investigating the prevalence of and factors associated with anxiety in patients with chronic diseases presenting to tertiary care hospitals in Ahmedabad, Gujarat. By examining the relationship between anxiety symptoms and various chronic conditions, including COPD, ischemic heart disease, diabetes mellitus, and hypertension, this research will contribute valuable insights applicable to the Indian healthcare context. Additionally, exploration of demographic factors, including gender and disease duration, will enhance understanding of populations at greatest risk for comorbid anxiety.

## AIM AND OBJECTIVES

Aim

To investigate and correlate the relationship between anxiety symptoms and chronic disorders among patients attending tertiary care hospitals in Ahmedabad, Gujarat.

Objectives

Primary Objective

• To correlate the relationship between symptoms of stress/anxiety and chronic disorders among patients aged 30-58 years attending tertiary care hospitals in Ahmedabad.

• To determine the association between gender and stress/anxiety symptoms in patients with chronic disorders.

Secondary Objective

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• To estimate the relationship between chronic disorders and duration of anxiety symptoms.

• To assess the prevalence of anxiety symptoms among patients with chronic disorders including COPD, ischemic heart disease, diabetes mellitus, and hypertension.

• To identify sociodemographic and clinical factors associated with anxiety in patients with chronic disorders.

**Research Hypotheses**

Null Hypothesis (H0): There is no significant correlation between anxiety symptoms and chronic disorders among patients attending tertiary care hospitals in Ahmedabad.

Alternative Hypothesis (H1): There is a significant positive correlation between anxiety symptoms and chronic disorders among patients attending tertiary care hospitals in Ahmedabad.

## MATERIALS AND METHODS

3.1 Study Design

The present investigation was conducted as a cross-sectional observational study employing a prospective quantitative approach. This study design was selected as it enabled the assessment of the relationship between anxiety symptoms and chronic disorders at a single point in time, providing valuable prevalence data and correlation estimates within the constraints of available time and resources. The cross-sectional design was particularly appropriate for this investigation as it allowed simultaneous measurement of anxiety symptoms and chronic disease status, facilitating examination of associations between these variables across the study population.

The observational nature of the study ensured that no interventions were administered to participants, and all data were collected through observation and standardized assessment procedures without manipulation of exposure or outcome variables. This approach was ethically appropriate given the study objectives and minimized potential risks to participants while enabling collection of clinically relevant data. The prospective orientation of the study involved enrollment of participants meeting eligibility criteria and systematic data collection using predetermined protocols, ensuring consistency and reliability of measurements across the study sample.

The quantitative methodology employed in this investigation facilitated objective measurement of anxiety symptoms using validated instruments, enabling statistical analysis of relationships between variables and generation of findings amenable to generalization within the constraints of the study design. Quantitative approaches were considered optimal for addressing the primary objective of correlating anxiety symptoms with chronic disorders, as they permitted precise measurement and statistical testing of hypothesized associations.

3.2 Study Setting

The study was conducted in tertiary care hospitals located in Ahmedabad, Gujarat, India. Ahmedabad, the largest city in the state of Gujarat, represents a major urban center with a diverse population and well-established healthcare infrastructure. The selection of tertiary care hospitals as the study setting was based on several considerations. First, tertiary care facilities serve as referral centers for complex cases, ensuring access to a substantial patient population with diagnosed chronic disorders. Second, these institutions maintain comprehensive medical records and diagnostic facilities, enabling accurate ascertainment of chronic disease status. Third, the institutional infrastructure supported systematic research activities, including ethical oversight and data management capabilities.

The tertiary care hospitals included in this study provided comprehensive medical services across multiple specialty departments, including internal medicine, cardiology, pulmonology, and endocrinology. Patients with chronic disorders including chronic obstructive pulmonary disease (COPD), ischemic heart disease, diabetes mellitus, and hypertension were routinely managed within these facilities, providing a suitable patient population for investigation of anxiety-chronic disease associations. The healthcare teams at these institutions included physicians, nurses, and allied health professionals experienced in chronic disease management, facilitating participant recruitment and data collection.

The urban location of the study setting influenced the characteristics of the patient population, which predominantly comprised residents of Ahmedabad and surrounding areas with access to tertiary healthcare services. This setting was considered representative

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of urban chronic disease populations in Gujarat, although generalizability to rural populations or other geographic regions required cautious interpretation.

3.3 Study Duration

The study was conducted over a period of one year, providing adequate time for participant recruitment, data collection, and achievement of the required sample size. This duration was determined based on anticipated patient flow rates at the participating institutions, expected recruitment rates, and practical considerations regarding research timelines and resource availability. The one-year study period also enabled capture of seasonal variations in patient presentations and potential temporal fluctuations in anxiety symptom patterns.

The study timeline was 1 year from September 2023 to September 2024.

organized into distinct phases encompassing preparatory activities, active data collection, and data management procedures. The preparatory phase included finalization of study protocols, ethical approvals, training of research personnel, and pilot testing of data collection instruments. The active data collection phase extended throughout the majority of the study period, with systematic enrollment of eligible participants and administration of assessment procedures. The final phase involved data verification, quality assurance checks, and preparation of datasets for statistical analysis.

3.4 Study Population

The study population comprised adult patients attending the tertiary care hospitals of Ahmedabad who were diagnosed with chronic disorders. The target population was defined as individuals aged 30 to 58 years with established diagnoses of chronic conditions including COPD, ischemic heart disease, diabetes mellitus, and hypertension. This age range was selected to focus on middle-aged adults who constitute a substantial proportion of the chronic disease population and for whom the impact of comorbid anxiety on occupational functioning, family responsibilities, and quality of life was particularly relevant.

The selection of specific chronic conditions for inclusion was based on their high prevalence in the study population, established associations with anxiety in the existing literature, and clinical significance in terms of morbidity and healthcare utilization. These conditions represented major categories of non-communicable diseases contributing substantially to the burden of chronic illness in India and globally. The inclusion of multiple chronic disease categories enabled comparative analysis across conditions and enhanced the comprehensiveness of findings.

3.5 Eligibility Criteria

3.5.1 Inclusion Criteria

The following inclusion criteria were applied for participant selection:

• Patients attending tertiary care hospitals of Ahmedabad during the study period were eligible for inclusion.

• Patients aged between 30 and 58 years at the time of enrollment were included in the study.

• Patients with established diagnoses of chronic disorders including chronic obstructive pulmonary disease (COPD), ischemic heart disease, diabetes mellitus, and hypertension were eligible for participation.

• Patients presenting with tremors associated with chronic medical conditions were considered for inclusion.

• Patients who provided written informed consent for participation in the study were enrolled.

• Patients who were able to comprehend and respond to study questionnaires, either independently or with assistance, were included.

• Patients with stable chronic disease status, defined as absence of acute exacerbations requiring emergency intervention at the time of assessment, were eligible for participation.

3.5.2 Exclusion Criteria

The following exclusion criteria were applied to ensure appropriate participant selection:

• Patients suffering from disorders predominantly affecting younger age groups were excluded from the study.

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• Patients with hereditary diseases of congenital origin were excluded from participation.

• Patients with pre-existing diagnosed psychiatric illnesses, including eating disorders such as bulimia nervosa, schizophrenia, bipolar disorder.

• Patients with severe cognitive impairment precluding completion of study assessments were excluded.

• Patients who declined to provide informed consent or withdrew consent during the study were excluded from analysis.

• Patients with acute medical emergencies or unstable clinical conditions at the time of assessment were excluded and invited to participate following stabilization if appropriate.

3.6 Sample Size Calculation

The sample size for this study was calculated using the standard formula for estimation of proportions in cross-sectional studies. The calculation was based on the following parameters:

Formula applied:

$n = Z^2 \times P \times (1-P) / D^2$

Where:

- n = required sample size
- Z = Z-statistic for desired confidence level (1.96 for 95% confidence interval)
- P = expected prevalence of anxiety in chronic disease population (27.1% or 0.271, based on literature)
- D = margin of error or precision (0.05 or 5%)

Calculation:

$n = (1.96)^2 \times 0.271 \times (1 - 0.271) / (0.05)^2$

$n = 3.8416 \times 0.271 \times 0.729 / 0.0025$

$n = 3.8416 \times 0.197559 / 0.0025$

$n = 0.7589 / 0.0025$

$n = 303.577$

Final sample size: 304 participants (rounded up)

The prevalence estimate of 27.1% was derived from published literature indicating that the highest prevalence of mood and anxiety disorders was found in individuals with chronic diseases, with rates reaching 27.1% in certain disease categories. This estimate was considered appropriate for sample size calculation as it reflected the expected prevalence in the target population based on available evidence. A margin of error of 5% was selected to balance precision of estimates with practical feasibility of achieving the required sample size within study constraints.

To account for potential incomplete responses, withdrawal of consent, and data quality issues, the target enrollment was increased by approximately 10% above the calculated sample size, yielding a recruitment target of approximately 335 participants.

3.7 Sampling Technique

Simple random sampling was employed for participant selection in this study. This probability sampling technique ensured that each eligible patient attending the study sites during the data collection period had an equal chance of being selected for participation, minimizing selection bias and enhancing the representativeness of the study sample.

The sampling procedure was implemented as follows: A sampling frame was constructed comprising all patients meeting the inclusion criteria who presented to the participating tertiary care hospitals during the study period. From this sampling frame,

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participants were selected using random number generation to ensure unbiased selection. The random selection process was facilitated by computer-generated random numbers, which were matched to patient identification numbers to identify selected participants.

Patients selected through the random sampling process were approached by research personnel, provided with information about the study, and invited to participate. Those who expressed interest and met all eligibility criteria following screening were enrolled in the study after obtaining informed consent. Patients who declined participation or were ineligible were replaced through continued random selection from the sampling frame until the target sample size was achieved.

3.8 Data Collection Instruments

3.8.1 Structured Questionnaire

A structured questionnaire was developed for collection of sociodemographic and clinical information from study participants. The questionnaire was designed to capture relevant variables including:

Sociodemographic variables:

- Name (coded for confidentiality)
- Age (in completed years)
- Gender (male/female)
- Educational status
- Occupation
- Marital status
- Residential area (urban/rural)
- Socioeconomic status

Clinical variables:

- Type of chronic disorder (COPD, ischemic heart disease, diabetes mellitus, hypertension, or multiple conditions)
- Duration of chronic disease (in months/years)
- Current medications
- Presence of comorbidities
- History of hospitalizations
- Duration of anxiety symptoms (if present)
- Treatment history for anxiety (if applicable)

The questionnaire was developed in English and translated into vernacular languages (Gujarati and Hindi) to ensure comprehension by participants with varying language preferences. The translations were verified through back-translation procedures to ensure accuracy and equivalence of content across language versions.

3.8.2 Anxiety Assessment Instruments

Standardized validated instruments were employed for assessment of anxiety symptoms in study participants. These instruments were selected based on their established psychometric properties, widespread use in research and clinical settings, and availability of validated versions in relevant languages.

The anxiety assessment instruments enabled quantification of anxiety symptom severity across multiple domains, including psychological symptoms (worry, fear, apprehension), somatic symptoms (palpitations, sweating, trembling), and functional

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impairment. Scoring procedures followed standardized protocols, with total scores categorized into severity levels ranging from minimal to severe anxiety.

3.8.3 Quality of Life Assessment

Quality of life was assessed using validated instruments designed for chronic disease populations. These measures captured physical, psychological, and social dimensions of well-being, enabling examination of associations between anxiety and quality of life outcomes.

3.9 Data Collection Procedure

Data collection was conducted by trained research personnel following standardized protocols to ensure consistency and reliability of measurements across participants. The data collection procedure encompassed the following steps:

Step 1: Participant Identification and Screening
Patients presenting to the participating tertiary care hospitals were screened for eligibility based on inclusion and exclusion criteria. Medical records were reviewed to confirm chronic disease diagnoses and identify potential exclusion factors.

Step 2: Informed Consent
Eligible patients were provided with detailed information about the study, including its purpose, procedures, potential risks and benefits, and their rights as participants. Those who agreed to participate were asked to provide written informed consent. Consent forms were available in English, Gujarati, and Hindi to accommodate participant language preferences.

Step 3: Questionnaire Administration
Following consent, the structured questionnaire was administered to collect sociodemographic and clinical information. Research personnel assisted participants with completion of questionnaires when necessary, reading questions aloud for those with limited literacy or visual impairment.

Step 4: Anxiety Assessment
Standardized anxiety assessment instruments were administered according to established protocols. Participants completed self-report measures independently or with assistance as needed. Scoring was performed by trained personnel following standardized procedures.

Step 5: Additional Assessments
Quality of life assessments and other supplementary measures were administered as applicable to study objectives.

Step 6: Data Recording and Verification
Completed questionnaires and assessment forms were reviewed for completeness and accuracy. Any missing or unclear responses were clarified with participants when possible. Data were entered into electronic databases using Autosave and Episoftware applications .

3.10 Data Management

Collected data were managed using Autosave and Episoftware applications, which provided secure data entry, storage, and management capabilities. These software platforms enabled efficient data entry with built-in validation checks to minimize data entry errors. Double data entry procedures were employed for a subset of records to verify accuracy of data transcription.

Data cleaning procedures were implemented to identify and address inconsistencies, missing values, and outliers. Range checks were applied to numerical variables to identify implausible values, and logical consistency checks were performed to detect contradictory responses. Missing data were documented and addressed through appropriate statistical methods during analysis.

Confidentiality of participant information was maintained through assignment of unique identification codes, with personal identifying information stored separately from research data in secure, access-controlled files. Only authorized research personnel had access to identifiable data, and all data handling procedures complied with applicable ethical guidelines and institutional policies.

3.11 Ethical Considerations

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The study was conducted in accordance with the principles of the Declaration of Helsinki and applicable national guidelines for biomedical research involving human participants. Ethical approval was obtained from the Institutional Ethics Committee prior to commencement of data collection. The approval process included review of the study protocol, data collection instruments, informed consent documents, and participant protection procedures.

Informed Consent:
Written informed consent was obtained from all participants prior to enrollment. The consent process included explanation of the study purpose, procedures, potential risks and benefits, voluntary nature of participation, right to withdraw at any time without consequences for clinical care, and confidentiality protections. Consent forms were available in three languages (English, Gujarati, and Hindi) to ensure comprehension. Participants were given adequate time to consider their participation and ask questions before providing consent.

Confidentiality:
Participant confidentiality was protected through use of coded identifiers, secure data storage, and restricted access to identifiable information. Research findings were reported in aggregate form without individual identification.

Voluntary Participation:
Participation in the study was entirely voluntary, and participants were free to withdraw at any time without providing reasons and without any impact on their ongoing medical care.

Risk Minimization:
The observational nature of the study ensured minimal risk to participants. No interventions were administered, and data collection procedures did not interfere with standard clinical care.

3.12 Statistical Analysis

Statistical analysis was performed using appropriate statistical software packages. The analysis plan was designed to address the primary and secondary objectives of the study through application of descriptive and inferential statistical methods.

3.12.1 Descriptive Statistics

Descriptive statistics were computed to characterize the study sample and summarize key variables. Continuous variables, including age, duration of chronic disease, duration of anxiety symptoms, and anxiety scores, were described using measures of central tendency (mean, median) and dispersion (standard deviation, interquartile range). The choice between mean and median was guided by the distribution of each variable, with median preferred for skewed distributions.

Categorical variables, including gender, type of chronic disorder, severity categories of anxiety, and sociodemographic characteristics, were summarized using frequencies and percentages. Distribution of participants across categories was presented in tabular format to facilitate interpretation.

3.12.2 Inferential Statistics

Inferential statistical methods were employed to test hypothesized associations and address study objectives:

Correlation Analysis:
Pearson correlation coefficient was calculated to assess the correlation between anxiety symptom scores and chronic disease-related variables for normally distributed continuous data. Spearman rank correlation coefficient was employed for non-normally distributed variables or ordinal data. Correlation coefficients were interpreted according to conventional guidelines, with values of 0.1-0.3 indicating weak correlation, 0.3-0.5 indicating moderate correlation, and values exceeding 0.5 indicating strong correlation.

Comparison of Groups:
Independent samples t-test was used to compare mean anxiety scores between two groups (e.g., male versus female participants) when data were normally distributed. Mann-Whitney U test was employed as a non-parametric alternative when normality assumptions were not met.

One-way analysis of variance (ANOVA) was used to compare anxiety scores across multiple chronic disease categories. Post-hoc comparisons using Tukey's honestly significant difference (HSD) test or Bonferroni correction were performed when significant

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overall differences were detected. Kruskal-Wallis test was employed as a non-parametric alternative when ANOVA assumptions were violated.

Chi-Square Test:
Chi-square test of independence was used to examine associations between categorical variables, including the relationship between gender and anxiety severity categories, and between chronic disease type and presence of anxiety.

Regression Analysis:
Multiple linear regression analysis was performed to identify factors independently associated with anxiety symptom severity while controlling for potential confounders. Independent variables entered into the regression model included age, gender, type of chronic disorder, duration of disease, and other relevant sociodemographic and clinical factors. Model assumptions, including linearity, normality of residuals, and absence of multicollinearity, were assessed and addressed as needed.

Logistic regression analysis was employed to identify predictors of clinically significant anxiety (defined by validated cut-off scores). Odds ratios with 95% confidence intervals were calculated to quantify the strength of associations.

3.12.3 Subgroup Analysis

Subgroup analyses were conducted to examine the relationship between anxiety and chronic disorders within specific population segments defined by gender, age groups, and type of chronic condition. These analyses enabled identification of potential effect modification and population-specific patterns.

3.12.4 Statistical Significance

Statistical significance was set at $p < 0.05$ for all analyses. Two-tailed tests were employed unless specific directional hypotheses justified one-tailed testing. Confidence intervals (95%) were reported for key estimates to convey precision of findings.

3.12.5 Handling of Missing Data

Missing data were documented and addressed through appropriate methods. For variables with minimal missing data (less than 5%), complete case analysis was employed. For variables with greater proportions of missing data, sensitivity analyses were conducted to assess the potential impact of missing data on study conclusions.

## CHAPTER 4: REVIEW OF LITERATURE

### 4.1 General Review of Literature

The relationship between anxiety and chronic medical illness has evolved from a peripheral psychosomatic concern to a central issue in contemporary chronic disease care. Earlier medical models often prioritized physiological burden, organ-specific pathology, and pharmacological management, while the emotional experience of chronic disease was treated as secondary, nonspecific, or expected. Over time, however, research demonstrated that anxiety in patients with chronic disorders is common, clinically meaningful, and strongly associated with poorer self-management, greater symptom burden, lower quality of life, and higher health-care utilization. The literature now supports the view that anxiety is not simply a reaction to diagnosis, but a dynamic factor that may interact bidirectionally with chronic disease onset, progression, and outcomes.

One of the earliest areas in which this relationship was recognized was diabetes. Lustman et al. (1988) described anxiety disorders in adults with diabetes and argued that psychiatric and metabolic processes may interact in reciprocal ways. They emphasized that anxiety can worsen symptom perception, interfere with daily disease management, and contribute to poorer glycemic stability. Grigsby et al. (2002) later showed that anxiety symptoms in diabetes are not rare, and that elevated anxiety may affect a substantial proportion of patients even when formal generalized anxiety disorder is present in a smaller subgroup. Subsequent quantitative syntheses, especially Smith et al. (2013), Amiri et al. (2019), and Mersha et al. (2022), reinforced the conclusion that diabetes and anxiety are significantly associated. These studies highlighted several probable pathways, including fear of complications, demands of self-monitoring, concern about hypoglycemia, treatment fatigue, and reciprocal biological effects between stress physiology and metabolic regulation. Together, these papers established diabetes as one of the most important chronic disorders in the anxiety literature.

A parallel literature developed in respiratory medicine. Brenes et al. (2003) described COPD as a chronic disease in which anxiety has unusually strong clinical significance because respiratory symptoms overlap with the somatic manifestations of anxious arousal.

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Dyspnea, chest tightness, dizziness, and fear of suffocation can create a self-perpetuating cycle: respiratory distress increases anxiety, and anxiety in turn intensifies perceived breathlessness and avoidance of activity. Patel et al. (2011) further placed anxiety among the major extrapulmonary comorbidities of COPD, arguing that psychological burden contributes to exacerbations, disability, admissions, and prognosis. Willgoss et al. (2013) showed that clinical anxiety disorders are highly prevalent in COPD, with forms such as panic, social phobia, and specific phobia often receiving insufficient clinical attention. More recent qualitative and narrative work, especially Christiansen et al. (2023) and Rahi et al. (2023), extended this literature by showing how patients live with COPD-related anxiety in everyday life and how that anxiety shapes breathlessness, avoidance, fear of deterioration, rehabilitation behavior, and quality of life. Collectively, respiratory literature has provided some of the clearest evidence that anxiety is woven into disease experience rather than merely coexisting beside it.

Cardiovascular literature has undergone a similar transition. Earlier emphasis was placed on depression in ischemic heart disease, but later work increasingly focused on anxiety as an independent cardiovascular factor. Proietti et al. (2011) reviewed mental stress and ischemic heart disease and described how emotional states may trigger ischemia, arrhythmia, and acute coronary syndromes through autonomic and neuroendocrine pathways. Player et al. (2011) discussed the intertwined relationship of anxiety, hypertension, and cardiovascular risk, while Tully et al. (2013) specifically examined worry and generalized anxiety disorder in relation to cardiovascular function and coronary heart disease. Their review suggested that chronic worry is associated with diminished heart rate variability, higher heart rate, greater blood pressure burden, and less favorable prognosis in coronary populations. Tully et al. (2014) later showed that anxiety disorder prevalence in coronary heart disease is substantial and that generalized anxiety disorder may be associated with adverse cardiac outcomes in outpatient settings. Together with later reviews by Tully et al. (2016), Allgulander (2016), Celano et al. (2016), and Chen et al. (2024), this work established anxiety as a relevant cardiovascular risk modifier rather than a simple by-product of cardiac illness.

Hypertension occupies an especially interesting place in the literature because it is often asymptomatic, yet repeatedly linked with anxiety. Meta-analytic and review evidence from Pan et al. (2015), Johnson et al. (2019), Lim et al. (2021), and Qiu et al. (2023) suggests that the relationship is bidirectional. Anxiety may precede hypertension through sympathetic activation, hypothalamic-pituitary-adrenal axis dysregulation, inflammation, sleep disturbance, and maladaptive behavior. Conversely, a diagnosis of hypertension may itself contribute to anxious vigilance, fear of stroke or cardiac events, and reduced confidence in health. Hamam et al. (2020) also argued that anxiety may be relevant in the problem of uncontrolled hypertension, especially when distress, pain, and chronic psychosocial strain complicate treatment. Although anxiety prevalence in hypertension is often lower than in COPD or multimorbidity, the literature indicates that even modest anxiety burden may have meaningful implications for adherence, lifestyle change, and cardiovascular risk.

Multimorbidity research has had a major impact on the field because it moved attention away from isolated diseases and toward cumulative burden. Schäfer et al. (2014) demonstrated that chronic diseases and psychiatric symptoms cluster in recognizable patterns rather than co-occurring at random. Morrison et al. (2016) emphasized that multimorbidity involving depression or anxiety markedly worsens outcomes and increases treatment burden in primary care. More recent work by Taloyan et al. (2023) confirmed that physical-mental multimorbidity is common in routine practice and is patterned by demographic and social vulnerability. The implications are highly relevant to chronic disease clinics: patients with multiple conditions face polypharmacy, conflicting recommendations, frequent appointments, uncertainty, and functional restriction, all of which may contribute to greater anxiety burden. This literature helps explain why patients with multiple chronic disorders often emerge as the most psychologically vulnerable subgroup in observational studies.

Another important development has been the move from cross-sectional prevalence toward longitudinal and trajectory-based understanding. Scott et al. (2023) showed that most people living with chronic disease follow a low and stable trajectory of distress, suggesting substantial resilience and psychological adaptation in many patients. However, a clinically meaningful minority remain persistently within the clinical range for anxiety or depression. This distinction is crucial. It implies that routine care should neither assume that all chronic disease patients are highly distressed nor assume that adaptation is universal. Rather, clinicians should identify those at risk of persistent anxiety based on factors such as gender, social disadvantage, multimorbidity, prior psychological burden, symptom intensity, and disease duration.

The South Asian literature remains especially important for the current study. Uphoff et al. (2019) showed that anxiety and depression are both common and underdiagnosed in adults with non-communicable diseases across South Asia. This regional evidence is valuable because most earlier syntheses were dominated by European, North American, or Australasian data. Sociocultural context, family structure, financial vulnerability, healthcare access, health literacy, and patterns of somatic symptom

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expression may all influence how anxiety presents in chronic disease populations in India and neighboring countries. Therefore, regional studies are needed not only to confirm prevalence but also to guide practical screening and care models suited to local tertiary and primary care settings.

The literature also repeatedly shows that anxiety is associated with poorer quality of life. Moussavi et al. (2007) demonstrated in global survey data that psychiatric comorbidity greatly worsens health status when added to chronic disease. Reynolds et al. (2018) showed that chronic disease management interventions increasingly recognize the need to address coexisting depression and anxiety together with physical illness. Kappelin et al. (2022) similarly emphasized collaborative care models for multimorbidity involving anxiety. These service-level studies are important because they bridge epidemiology and practice. Once anxiety is identified as common and consequential, the next question becomes how best to organize care. The consistent answer in the literature is that fragmented models are insufficient; integrated, longitudinal, and patient-centered care is more appropriate.

Gender is another recurring theme. Several cardiovascular and multimorbidity studies, including Sara et al. (2021) and Gaffey et al. (2024), suggest that women may have distinctive vulnerability to the psychological dimensions of chronic disease. This is relevant not only biologically but socially, as women often face overlapping caregiving, social, and health-system burdens. The current chronic disease-anxiety literature increasingly recognizes that subgroup analysis by gender, age, and multimorbidity status is essential for meaningful interpretation.

Taken together, the literature supports several broad conclusions. First, anxiety is common across chronic disorders, though prevalence and severity vary by disease type. Second, conditions characterized by distressing physical symptoms, uncertain prognosis, or recurrent acute episodes—especially COPD and ischemic heart disease—tend to be associated with higher anxiety burden. Third, multimorbidity magnifies psychological strain and should be studied as a distinct clinical state. Fourth, anxiety and chronic disease interact through both biological and behavioral pathways. Fifth, anxiety is strongly linked with poorer quality of life, adherence problems, and greater healthcare use. Finally, despite the large body of evidence, underdiagnosis and undertreatment remain common, particularly in routine medical settings and in low- and middle-income contexts.

The reviewed literature therefore provides strong justification for examining anxiety among patients with chronic disorders such as COPD, ischemic heart disease, diabetes mellitus, hypertension, and multiple chronic conditions in tertiary care hospitals. It also supports the current study's emphasis on gender, disease duration, and comorbidity burden as key variables of interest. In summary, the international and regional evidence base suggests that anxiety is a prevalent, clinically consequential, and potentially modifiable component of chronic disease burden. Studies that clarify its prevalence, correlates, and effect on quality of life in specific populations remain highly relevant for improving integrated chronic disease care.

A recurring methodological issue in the literature is heterogeneity in measurement. Some studies assess anxiety through structured diagnostic interviews, whereas others rely on symptom scales such as the Hospital Anxiety and Depression Scale, Beck Anxiety Inventory, GAD-7, or disease-specific distress measures. This variability complicates direct comparison of prevalence estimates across chronic disorders. For example, diagnostic studies generally yield lower prevalence than symptom-screening studies, while disease-specific distress instruments may capture concerns closely tied to treatment burden without necessarily representing a formal anxiety disorder. Tully et al. (2014) and Smith et al. (2013) both highlighted how prevalence can change markedly depending on whether disorder-level diagnoses or symptom-level thresholds are used. This issue is highly relevant to the present thesis because screening-based estimates of anxiety severity should be interpreted as clinically useful indicators of burden, even when they do not directly correspond to psychiatric interview diagnoses.

Another methodological challenge is the predominance of cross-sectional research. Much of the literature demonstrates association, but not temporal direction. Mersha et al. (2022) and Lim et al. (2021) provide stronger evidence that chronic disease and anxiety may influence one another over time, yet definitive causal inference remains difficult. Anxiety may precede disease through chronic stress physiology, inflammatory pathways, unhealthy coping behavior, or reduced sleep quality. Chronic disease may also precede anxiety through symptom persistence, fear of disability, treatment complexity, or repeated healthcare exposure. In many patients, the relationship is probably reciprocal and cumulative. This reinforces the value of observational studies in local settings, because even when causality cannot be fully established, identifying which groups carry the highest burden remains clinically useful.

Biological mechanisms described in the literature help explain why anxiety is more than a psychological bystander. Several cardiovascular reviews, including Proietti et al. (2011), Tully et al. (2013), Allgulander (2016), and Qiu et al. (2023), emphasize the role of autonomic imbalance, persistent sympathetic activation, endothelial dysfunction, altered platelet activity, and dysregulation of the hypothalamic-pituitary-adrenal axis. In metabolic disease, stress hormones may worsen glycemic control, contribute to insulin

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resistance, and intensify inflammatory signaling. In respiratory disease, anxiety may alter breathing pattern, respiratory muscle tension, and dyspnea perception. Although these mechanisms differ in emphasis across disease groups, they converge on a common message: chronic anxiety can become biologically embedded and may worsen physical outcomes over time.

Behavioral pathways are equally important. Patients living with chronic anxiety may avoid exertion, neglect medication, postpone follow-up, or use maladaptive coping strategies such as smoking, unhealthy eating, or social withdrawal. In COPD, this may result in deconditioning and poor participation in pulmonary rehabilitation. In diabetes, it may reduce dietary consistency, glucose monitoring, and confidence in self-management. In ischemic heart disease and hypertension, anxiety may produce hypervigilance toward bodily symptoms while simultaneously impairing adherence to exercise and lifestyle modification. The literature repeatedly shows that health behavior is one of the most plausible links between psychological distress and poorer chronic disease outcomes. Therefore, the significance of anxiety in chronic medical illness lies not only in emotional suffering but also in its downstream impact on treatment effectiveness.

The literature also suggests that anxiety can influence symptom interpretation in ways that complicate clinical care. This is particularly apparent in COPD and cardiac disease, where anxious patients may catastrophize dyspnea, palpitations, chest discomfort, or fatigue. Such symptom amplification may increase emergency visits and repeated investigations, especially in tertiary care settings. At the same time, not all distressing symptoms are “just anxiety,” and studies such as Sara et al. (2021) remind clinicians that psychological symptoms may coexist with real physiological dysfunction. Thus, the literature supports a balanced interpretation in which anxiety neither invalidates symptoms nor is ignored simply because the patient has a chronic disease.

Several studies have highlighted the social dimensions of anxiety in chronic illness. Lower socioeconomic status, reduced educational attainment, financial stress, and limited social support are repeatedly identified as factors associated with greater psychological burden. Multimorbid patients may be especially affected because the financial and organizational costs of treatment are higher. These social determinants are crucial in the Indian context, where out-of-pocket expenditure, travel for tertiary care, caregiver dependence, and variable continuity of care can intensify emotional strain. Even when medical diagnosis is the same, the lived burden of chronic disease may differ substantially by social circumstances. This helps explain why prevalence estimates alone are insufficient and why local research must also examine sociodemographic correlates.

Another important theme is under-recognition. The literature repeatedly shows that anxiety in chronic disease settings is often missed because attention is directed toward the primary medical diagnosis, because somatic symptoms overlap, or because patients normalize emotional distress as part of being ill. In busy outpatient practice, psychological screening may be omitted unless symptoms are severe or disruptive. Yet by the time anxiety is obvious, it may already be affecting adherence, family functioning, sleep, and quality of life. The reviewed studies therefore support the routine use of brief validated screening tools in chronic disease clinics. Instruments such as the GAD-7 are appealing because they are simple, scalable, and suitable for follow-up as well as screening.

Intervention literature, while smaller than prevalence literature, also offers important lessons. Reynolds et al. (2018) and Kappelin et al. (2022) suggest that interventions are more effective when they are embedded within chronic disease management rather than offered as disconnected psychiatric referral. Collaborative care, follow-up by case managers, shared care plans, and coordinated monitoring appear particularly suitable for multimorbidity. Disease-specific psychoeducation, breathing retraining, graded activity, problem-solving, and cognitive-behavioral approaches may be especially useful in COPD and cardiac populations where anxiety is tightly linked to symptom interpretation and avoidance behavior. These findings are important for discussion of the current thesis because they help translate observational results into practical recommendations.

The literature additionally demonstrates that anxiety burden may not be uniform across severity of chronic disease. Some patients with advanced illness adapt remarkably well, whereas others with seemingly moderate disease experience substantial anxiety. Scott et al. (2023) showed that the majority follow low and stable trajectories, while a minority show persistent clinical-range symptoms. This means that screening should not be based solely on disease category or physician impression of severity. Instead, it should incorporate duration of illness, multimorbidity, prior emotional history, quality-of-life decline, and patient-reported symptom burden. This approach aligns closely with the current study’s focus on disease duration, comorbidity count, and anxiety severity.

Taken as a whole, the literature indicates that chronic disease care must move beyond a narrow biomedical model. Anxiety affects symptom burden, disease control, quality of life, healthcare use, and possibly prognosis. It is common in COPD, ischemic heart disease, diabetes mellitus, hypertension, and especially multimorbidity. It is more likely in some sociodemographic groups and may remain underdiagnosed if clinicians rely only on spontaneous disclosure. The accumulated evidence therefore strongly supports

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integrated screening and management in tertiary care hospitals, where chronic disease complexity and referral burden are high. Within this framework, the present study contributes by examining the prevalence and correlates of anxiety in a clinically relevant Indian population and by identifying patient groups most likely to benefit from routine psychological assessment and early intervention.

### 4.2 Chronological Review of Key Studies

**1. Lustman et al. (1988)**

*Anxiety disorders in adults with diabetes mellitus*

This early clinical review drew attention to anxiety as an under-recognized psychiatric comorbidity in adults with diabetes mellitus. The authors described generalized anxiety disorder, panic phenomena, and recurrent anxious symptom clusters in diabetic patients, emphasizing that anxiety could worsen both symptom perception and day-to-day metabolic control. The paper argued against viewing anxiety as a secondary or trivial response to chronic illness. Instead, it proposed a reciprocal model in which diabetes may intensify anxiety through fear of complications, symptom misinterpretation, and treatment burden, while anxiety may in turn disturb self-care, glycemic control, and help-seeking behavior. A major contribution of the paper was its insistence that clinicians look beyond depression when assessing psychological morbidity in diabetes. It also underscored the clinical overlap between hypoglycemic symptoms and panic-like symptoms, which may complicate diagnosis. Although the evidence base at the time was modest, the article established an important conceptual framework for later work on bidirectional associations between chronic metabolic disease and anxiety. For the present thesis, Lustman et al. offered one of the earliest arguments that anxiety should be screened in chronic medical populations because its presence may influence adherence, symptom reporting, and disease outcomes.

**2. Grigsby et al. (2002)**

*Prevalence of anxiety in adults with diabetes*

Grigsby and colleagues provided one of the earliest quantitative summaries of anxiety burden in adults with diabetes. Their review synthesized available clinical studies and showed that generalized anxiety disorder was present in a meaningful minority of patients, while elevated anxiety symptoms were observed in a much larger proportion. The paper highlighted that the emotional burden of diabetes extends beyond depressive symptoms and includes chronic worry about complications, hypoglycemia, medication routines, dietary control, and future disability. The authors also pointed out substantial methodological heterogeneity across studies, including differences in anxiety instruments, sampling methods, and diabetes type. Even with those limitations, the review supported the view that anxiety symptoms are common and clinically relevant in diabetic populations. The article called for broader epidemiological work and better routine psychological assessment in diabetes clinics. Its practical relevance lies in demonstrating that psychiatric symptoms may be present even in medically stable patients and may not be spontaneously disclosed during consultation. In relation to the present thesis, this study is important because it supports the inclusion of diabetes mellitus among chronic disorders with significant anxiety burden, although the degree of burden may vary according to disease context, treatment demands, and associated comorbidities.

**3. Brenes et al. (2003)**

*Anxiety and chronic obstructive pulmonary disease*

Brenes and colleagues reviewed the prevalence and consequences of anxiety in chronic obstructive pulmonary disease (COPD), showing that psychological distress is highly relevant to respiratory illness. The article described how dyspnea, air hunger, reduced exercise tolerance, and fear of exacerbations can provoke or perpetuate anxiety symptoms. The authors discussed the clinical challenge created by symptom overlap: tachycardia, chest tightness, breathlessness, and dizziness can reflect either pulmonary pathology or anxiety, leading to under-recognition of psychiatric morbidity. Importantly, the review emphasized that anxiety in COPD is not merely a reaction to severe disease but may independently worsen outcomes by increasing avoidance behavior, reducing physical activity, intensifying perceived breathlessness, and affecting adherence to rehabilitation. The article also highlighted the need for multidimensional care, combining pulmonary treatment with psychological support and where necessary pharmacological or behavioral intervention. It was one of the first widely cited papers to frame COPD as a model chronic disease in which anxiety directly interacts with symptom experience and prognosis. For the present thesis, Brenes et al. remain highly relevant because they explain why COPD patients often demonstrate greater anxiety severity than patients with less symptomatically distressing chronic illnesses.

**4. Moussavi et al. (2007)**

*Depression, chronic diseases, and decrements in health*

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Using data from the WHO World Health Survey, Moussavi and colleagues examined how mental disorders and chronic physical diseases affect self-rated health and functioning. Although the paper focused primarily on depression, it made a landmark contribution by showing that psychiatric comorbidity greatly worsens health outcomes when superimposed on chronic diseases such as angina, arthritis, asthma, and diabetes. The study demonstrated that combined physical and mental illness produces substantially worse health scores than either condition alone. This helped shift the field away from viewing emotional symptoms as secondary or marginal, and toward recognizing them as independent drivers of disability. The international, population-based scope of the study added considerable weight to the argument that psychological morbidity must be incorporated into chronic disease policy and clinical care. For the literature on anxiety in chronic illness, this paper is relevant because it established the broader principle that mental distress markedly compounds the burden of chronic disease, especially in relation to quality of life and functional decline. In the context of the present thesis, Moussavi et al. support the rationale for examining anxiety not merely as a coexisting symptom but as a clinically meaningful determinant of disease burden and patient well-being.

**5. Clarke et al. (2009)**

*Depression, anxiety and their relationship with chronic diseases: a review of the epidemiology, risk and treatment evidence*

Clarke and Currie published one of the foundational reviews linking chronic physical illness with common mental disorders. They summarized evidence showing that patients in primary care with chronic medical conditions face greater risk of depressive and anxiety disorders than the general population. The review discussed a broad range of diseases, including hypertension, diabetes, asthma, arthritis, tuberculosis, and cardiac conditions, and noted that prevalence estimates vary considerably by disorder and study design. Beyond prevalence, the paper emphasized the bidirectional nature of the relationship: chronic disease can increase anxiety through symptom burden, disability, uncertainty, and treatment complexity, while anxiety can worsen medical illness through poor adherence, unhealthy behaviors, biological stress activation, and delayed recovery. The authors also drew attention to gaps in treatment evidence and the need for integrated approaches to care. This paper is especially important for the present thesis because it provides the conceptual bridge between psychiatric morbidity and non-communicable disease management. It supports the thesis premise that anxiety should be studied as an integral part of chronic disease care rather than as an isolated psychological problem.

**6. Patel et al. (2011)**

*Extrapulmonary comorbidities in chronic obstructive pulmonary disease: state of the art*

Patel and Hurst reviewed the major extrapulmonary comorbidities of COPD and described psychological disorders as clinically important contributors to symptom burden, hospitalization risk, and prognosis. The review framed COPD as a systemic disease rather than a purely respiratory disorder. In this context, anxiety and depression were identified alongside ischemic heart disease, musculoskeletal disease, and metabolic conditions as part of the broader comorbidity profile. The paper emphasized that psychological comorbidity influences not only mental well-being but also functional limitation, exacerbation frequency, healthcare use, and mortality risk. It helped establish the idea that COPD-related anxiety should be screened and managed proactively, especially because emotional symptoms may amplify breathlessness and discourage rehabilitation participation. The review also underscored that management strategies in COPD patients with comorbid conditions may differ from standard approaches used in otherwise healthy populations. For the present thesis, the paper is relevant because it links COPD to both cardiovascular disease and anxiety within a common comorbidity framework, supporting the decision to study multiple chronic disorders together. It also reinforces the interpretation that anxiety in chronic disease can arise from a combination of physiological impairment, symptom salience, and systemic disease burden.

**7. Proietti et al. (2011)**

*Mental stress and ischemic heart disease: evolving awareness of a complex association*

Proietti and colleagues examined the growing evidence connecting mental stress, negative emotions, and ischemic heart disease. Their review described how emotional stress and anxiety-related processes may trigger acute coronary syndromes, reversible myocardial perfusion abnormalities, arrhythmias, and other cardiovascular changes. The article highlighted the development of the concept of mental stress-induced myocardial ischemia, which helped move psychological risk from the periphery to the center of cardiovascular research. The authors discussed possible physiological mechanisms, including autonomic dysregulation, neuroendocrine activation, vascular changes, and altered platelet or inflammatory pathways. At the same time, they acknowledged inconsistency in some earlier findings and called for stronger prospective work. The review is important for chronic disease-anxiety research because it explains why ischemic heart disease is not only emotionally distressing for patients but also biologically sensitive to psychological stress. For the current thesis, the paper offers a mechanism-based justification for studying anxiety among patients with ischemic heart disease and for interpreting elevated anxiety prevalence in cardiac populations as clinically significant rather

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than merely reactive. It also supports the thesis finding that anxiety burden is often greater in symptomatically threatening conditions than in less immediately distressing chronic disorders.

**8. Player et al. (2011)**

*Anxiety disorders, hypertension, and cardiovascular risk: a review*

Player and colleagues reviewed evidence on the relationship between anxiety disorders, hypertension, and cardiovascular disease. They observed that cross-sectional studies often show a positive association between hypertension and anxiety, while longitudinal evidence suggests that anxiety may also contribute to the later development of hypertension. The review carefully noted that findings were not completely uniform across studies, in part because of variation in anxiety measures and diagnostic approaches. Nevertheless, the authors concluded that anxiety, hypertension, and coronary heart disease are interrelated problems frequently encountered in primary care. They emphasized that panic disorder, post-traumatic stress disorder, and broader anxious symptom states may all be relevant to cardiovascular risk. The paper is useful because it integrates psychosocial and cardiometabolic pathways rather than treating blood pressure as purely biomedical. In relation to the present thesis, this review supports the inclusion of hypertension as a chronic disorder associated with anxiety, although the burden may be somewhat lower than in COPD or ischemic heart disease. It also helps explain why anxiety in hypertensive patients may have prognostic significance through autonomic activation, stress biology, treatment non-adherence, and unhealthy lifestyle patterns.

**9. Smith et al. (2013)**

*Association of diabetes with anxiety: a systematic review and meta-analysis*

Smith and colleagues conducted a systematic review and meta-analysis to quantify the association between diabetes and anxiety. Their findings showed significant positive associations for diabetes with both diagnosed anxiety disorders and elevated anxiety symptoms, indicating that anxiety is not confined to a small subgroup of distressed patients. A major strength of the paper was that it separated disorder-level diagnoses from symptom-level measures, clarifying that diabetes is linked to a broader spectrum of anxiety presentations. The authors also discussed possible mechanisms behind this association, including stress related to complications, the burden of self-management, biological pathways, and overlapping somatic symptoms. They acknowledged that most available studies were observational and could not fully determine causality. Even so, the review strengthened the argument that anxiety should be assessed routinely in diabetes care. For the present thesis, this paper is especially relevant because it supports the inclusion of diabetes mellitus as a chronic disorder with meaningful anxiety comorbidity, while also helping interpret why anxiety prevalence in diabetes may be substantial but sometimes lower than that seen in COPD or multimorbidity. The study provides a strong evidence base for screening recommendations and integrated metabolic-mental health care.

**10. Willgoss et al. (2013)**

*Anxiety disorders in patients with COPD: a systematic review*

Willgoss and colleagues systematically reviewed anxiety disorders in COPD and concluded that clinical anxiety is highly prevalent in this patient group. An especially important observation was that social phobia and specific phobia may be more common than generally appreciated, suggesting that anxiety in COPD extends beyond generalized worry or panic alone. The review highlighted the heterogeneity of case definitions, psychiatric instruments, and sampling strategies across studies, but despite these differences the overall picture consistently favored elevated anxiety burden. The authors argued that effective screening and management had not received adequate attention in respiratory care. By identifying the range of anxiety disorders linked with COPD, the paper broadened clinical understanding of psychological morbidity in chronic respiratory disease. It also reinforced the view that anxiety can shape health behavior by promoting social withdrawal, physical inactivity, avoidance of exertion, and poor participation in pulmonary rehabilitation. For the present thesis, this review strengthens the interpretation that COPD patients may show higher anxiety severity because respiratory symptoms interact directly with fear, functional limitation, and catastrophic health beliefs. It supports the need for disease-specific mental health vigilance in chronic illness settings.

**11. Tully et al. (2013)**

*A review of the affects of worry and generalized anxiety disorder upon cardiovascular health and coronary heart disease*

Tully and colleagues reviewed psychophysiological and behavioral pathways by which worry and generalized anxiety disorder may influence cardiovascular function and coronary heart disease. They found that worry is consistently associated with reduced heart rate variability and elevated heart rate, while generalized anxiety and chronic worry are frequently linked with diagnosed hypertension or blood pressure elevation. The review also summarized etiological studies showing that worry measures were associated with fatal and nonfatal coronary outcomes in initially disease-free individuals. In established coronary heart disease,

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generalized anxiety disorder appeared to predict poorer prognosis independently of depression in several studies. A key contribution of the paper was its insistence that worry is not a benign trait and that no evidence supports the idea that chronic worry is health-protective. Instead, worry seems connected to maladaptive physiology and poorer outcomes. For the present thesis, the paper is relevant because it provides a mechanistic basis for the association between anxiety and both hypertension and ischemic heart disease. It also supports the interpretation that anxiety symptoms in cardiovascular patients should be taken seriously as potential contributors to prognosis, not merely as emotional reactions to diagnosis.

**12. Schäfer et al. (2014)**

*A visualisation of multimorbidity by combining disease clusters and triads*

Schäfer and colleagues explored multimorbidity patterns using disease clusters and triads and found that combinations involving anxiety, depression, somatoform disorders, and pain formed meaningful recurring patterns. Although the study was not limited to a single chronic disease, it was highly relevant to the literature on chronic illness and anxiety because it demonstrated that mental and physical conditions do not simply coexist randomly. Instead, they cluster in recognizable patterns with implications for service delivery and chronic disease management. The work highlighted the complexity of patients living with multiple long-term conditions, especially when psychiatric symptoms intersect with pain, cardiometabolic disease, or functional limitation. For clinicians, the study reinforced the inadequacy of single-disease models of care and the need to understand patient burden at the level of multimorbidity. In relation to the present thesis, this article supports the analysis of patients with multiple chronic disorders as a distinct subgroup likely to experience heightened anxiety burden. It also provides a conceptual basis for understanding why multimorbidity was associated with higher anxiety prevalence and greater distress in the study population.

**13. Tully et al. (2014)**

*The anxious heart in whose mind? A systematic review and meta-regression of factors associated with anxiety disorder diagnosis, treatment and morbidity risk in coronary heart disease*

This systematic review and meta-regression focused specifically on anxiety disorders in coronary heart disease (CHD). Tully and colleagues examined prognosis, prevalence, and available treatment evidence. They found that generalized anxiety disorder was not uniformly associated with major adverse cardiac events across all settings, but outpatient samples showed a stronger and clinically important risk signal. The review also showed high comorbidity between anxiety and depression, along with substantial heterogeneity in prevalence estimates depending on raters and diagnostic criteria. A major conclusion was that randomized controlled trials focused specifically on anxiety disorders in CHD were remarkably scarce. This was an important finding because it revealed a mismatch between epidemiological concern and interventional evidence. For the present thesis, the paper is valuable because it supports two ideas: first, anxiety is common in coronary populations and often coexists with other psychiatric symptoms; second, prognosis may vary by anxiety subtype and clinical setting. The article therefore justifies studying ischemic heart disease separately rather than treating all cardiovascular conditions as psychologically equivalent. It also highlights the persistent need for targeted anxiety interventions in chronic cardiac care.

**14. Pan et al. (2015)**

*Association between anxiety and hypertension*

Pan and colleagues conducted a meta-analysis examining the association between anxiety and hypertension and concluded that anxiety is linked with increased hypertension risk. The review brought together epidemiological evidence showing that anxious symptom states and anxiety disorders are not merely consequences of blood pressure treatment or clinic attendance, but may also precede and contribute to the development of hypertension. The authors argued that these findings support early detection and management of anxiety in patients at risk for or living with hypertension. One strength of the paper was its broad synthesis of available human studies, which helped move the field beyond isolated or contradictory single-study findings. It also underscored the clinical importance of considering anxiety in cardiovascular prevention. For the present thesis, Pan et al. are relevant because they support the inclusion of hypertension within the spectrum of chronic disorders associated with anxiety, while also indicating that the relationship may operate bidirectionally. Even if anxiety prevalence in hypertension is lower than in respiratory or multimorbid states, the cardiometabolic significance of this association remains substantial. The study therefore reinforces the public health value of screening anxiety among hypertensive patients.

**15. Tully et al. (2016)**

*Anxiety and Cardiovascular Disease Risk: a Review*

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In this review, Tully and colleagues summarized evidence that anxiety disorders increase the risk for incident cardiovascular disease and are associated with adverse prognosis in established cardiovascular disease. The authors noted that a completely causal relationship had not yet been proven, but the overall evidence pointed toward anxiety as a clinically meaningful cardiovascular risk factor independent of depression. The review contributed to a shift in emphasis within cardiovascular psychiatry by arguing that the level of attention historically given to depression should be extended to anxiety as well. It synthesized epidemiological, mechanistic, and prognostic findings, thereby offering a broad framework for clinicians and researchers. For the present thesis, the article is useful because it positions anxiety as both a comorbidity and a possible contributor to disease progression in chronic cardiovascular disorders. It supports the interpretation that higher anxiety in patients with ischemic heart disease is not simply expected distress but may carry prognostic relevance. The review also reinforces the need for future intervention studies designed specifically around anxiety rather than assuming that approaches effective for depression will necessarily address cardiovascular anxiety burden.

**16. Allgulander (2016)**

*Anxiety as a risk factor in cardiovascular disease*

Allgulander reviewed the evidence suggesting that anxiety may be one of the most important psychological risk factors in cardiovascular disease. The article argued that anxiety contributes to cardiovascular risk both directly and indirectly. Direct pathways include autonomic arousal, stress physiology, and other biological effects, while indirect pathways involve unhealthy behaviors such as inactivity, smoking, poor diet, and substance use. The review also emphasized the role of anxiety in major cardiac events and pointed to related conditions such as white-coat hypertension and stress-related cardiomyopathy. One of its most valuable contributions was placing anxiety alongside more established cardiovascular risk factors rather than treating it solely as a quality-of-life issue. For the present thesis, this paper helps explain why chronic anxiety in patients with cardiovascular and cardiometabolic disorders deserves clinical priority. It supports the view that anxiety can influence both symptom interpretation and longer-term outcomes. The article is particularly useful when discussing hypertension and ischemic heart disease because it links emotional disturbance with measurable cardiovascular events and encourages better recognition of anxiety in routine medical practice.

**17. Celano et al. (2016)**

*Anxiety Disorders and Cardiovascular Disease*

Celano and colleagues reviewed the relationship between anxiety disorders and the onset and progression of cardiovascular disease. The paper summarized evidence linking anxiety with adverse cardiovascular outcomes and explained that the association spans multiple anxiety presentations rather than a single diagnosis. The authors explored behavioral pathways such as poor adherence and reduced activity, and biological pathways including sympathetic activation and inflammatory mechanisms. The review is especially notable for clarifying that anxiety can be relevant both before cardiovascular disease develops and after it is established. This dual role makes anxiety important in both prevention and chronic disease management. For the present thesis, the paper is valuable because it supports the rationale for examining ischemic heart disease and hypertension within a broader mental-physical comorbidity model. It also reinforces the need to distinguish anxiety from depression rather than treating all emotional symptoms as interchangeable. By emphasizing adverse outcomes and disease progression, Celano et al. contribute to the argument that screening and management of anxiety should be embedded in cardiovascular care pathways for chronic disease patients.

**18. Morrison et al. (2016)**

*Managing Multimorbidity in Primary Care in Patients With Depression or Anxiety*

Morrison and colleagues addressed the growing challenge of multimorbidity in primary care, especially when chronic physical conditions coexist with depression or anxiety. The paper emphasized that multimorbidity worsens outcomes, increases treatment burden, and drives health service costs. Rather than focusing on a single disease, the authors examined care organization and management approaches needed when patients have overlapping medical and mental health problems. This perspective is highly relevant to chronic disease-anxiety research because many patients do not fit neatly into one diagnostic category; instead, they present with cumulative burden across multiple conditions. The paper contributed to a service-delivery perspective by underscoring the need for coordinated care, better continuity, and treatment planning that reflects patient priorities. In relation to the present thesis, Morrison et al. are important because the highest anxiety burden in the study was observed among patients with multiple chronic disorders. Their work supports interpreting multimorbidity as a qualitatively different clinical state characterized by complexity, uncertainty, and increased emotional strain. It also strengthens the argument for integrated chronic disease and mental health management rather than fragmented specialty-based care.

**19. Reynolds et al. (2018)**

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*A systematic review of chronic disease management interventions for adults with physical health problems and comorbid depression or anxiety*

Reynolds and colleagues reviewed chronic disease management interventions targeting adults with physical health problems and coexisting depression or anxiety. Their synthesis evaluated the pattern of health outcomes across intervention studies rather than limiting analysis to symptom reduction alone. A major contribution of the review was demonstrating that chronic disease interventions are most meaningful when they address both mental and physical dimensions of illness. The authors showed that multimodal approaches—often involving coordination, monitoring, and patient support—can produce benefits, although effects vary by design and context. This study is especially relevant because it shifts the discussion from prevalence to action: once anxiety is identified in chronic disease populations, what models of care may help? For the present thesis, the paper supports the clinical implications of the findings. Because the present study identifies high levels of clinically significant anxiety across chronic disorder groups, Reynolds et al. provide justification for recommending integrated management rather than isolated referral. Their review also supports the idea that outcomes such as quality of life, adherence, and symptom control may improve when anxiety is addressed alongside chronic disease care.

**20. Uphoff et al. (2019)**

*A systematic review and meta-analysis of the prevalence of common mental disorders in adults with non-communicable diseases in South Asia*

Uphoff and colleagues produced a highly relevant South Asian systematic review and meta-analysis of mental disorders in adults with non-communicable diseases. The study synthesized evidence from Bangladesh, India, and Pakistan and reported a high pooled prevalence of common mental disorders among patients with diabetes, cardiovascular disease, cancer, and chronic respiratory conditions. The pooled anxiety prevalence was substantial, and the authors concluded that depression and anxiety are both prevalent and underdiagnosed in people with physical comorbidities in South Asia. A major strength of the paper was its regional focus, addressing the frequent criticism that most evidence comes from Western populations. The review also highlighted methodological weaknesses in many included studies, especially in sampling and reporting, which is important when interpreting prevalence heterogeneity. For the present thesis, this paper is central because it situates the findings from Ahmedabad within a broader South Asian evidence base. It supports the relevance of studying anxiety among chronic disease patients in India and reinforces the need for region-specific data, given differences in healthcare access, diagnosis patterns, and sociocultural expressions of distress.

**21. Johnson et al. (2019)**

*Anxiety and Hypertension: Is There a Link? A Literature Review of the Comorbidity Relationship*

Johnson and colleagues reviewed the contemporaneous evidence linking anxiety and hypertension. They concluded that there is increasing evidence of a positive association between the two conditions, while also noting that the relationship may be complex and bidirectional. The review updated earlier literature by integrating more recent epidemiological and clinical findings. Its clinical message was clear: patients with hypertension may carry unrecognized anxiety burden, and anxious patients may be at elevated risk of blood pressure dysregulation and future cardiovascular disease. The paper is especially valuable for demonstrating that the anxiety-hypertension relationship deserves direct clinical attention rather than being dismissed as white-coat phenomena or incidental stress. For the present thesis, Johnson et al. are relevant because they support the interpretation that even when hypertension patients show lower anxiety prevalence than COPD or multimorbidity groups, the coexistence remains important. The review also strengthens the case for mental health screening in hypertensive clinics and helps frame anxiety as a modifiable factor potentially affecting adherence, lifestyle change, cardiovascular risk communication, and long-term outcomes.

**22. Amiri et al. (2019)**

*Diabetes and anxiety symptoms: A systematic review and meta-analysis*

Amiri and colleagues conducted a meta-analysis examining the association between diabetes and anxiety symptoms. By focusing specifically on anxiety symptoms rather than only categorical diagnoses, the study captured a broader and clinically realistic spectrum of psychological burden. The authors found that diabetes was associated with increased anxiety symptoms, reinforcing the idea that emotional distress in diabetes is common even when it does not meet full diagnostic thresholds. This distinction is important because subsyndromal anxiety can still affect adherence, quality of life, and symptom vigilance. The review also discussed the possibility that disease-related demands, fear of complications, and biological changes may all play a role. For the present thesis, the paper is useful because it complements diagnostic meta-analytic work and supports interpreting diabetes-related anxiety as both prevalent and clinically meaningful. It also helps explain why many patients in chronic disease settings report mild or moderate

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anxiety rather than only severe or formally diagnosed disorders. This paper therefore strengthens the rationale for using screening tools like the GAD-7 in chronic medical populations.

**23. Hamam et al. (2020)**

*Anxiety, Depression, and Pain: Considerations in the Treatment of Uncontrolled Hypertension*

Hamam and colleagues reviewed the links between anxiety, depression, pain, and uncontrolled hypertension. The paper is important because it moves beyond simple prevalence and considers why some hypertensive patients remain poorly controlled despite treatment. The authors discussed how emotional distress and pain may affect blood pressure through physiological arousal, behavioral pathways, and treatment adherence. They also stressed that psychological symptoms are highly relevant in clinical decision-making, especially when apparent resistant hypertension may be worsened by chronic stress or psychiatric comorbidity. For the present thesis, this review is useful because it helps explain why anxiety in hypertension should not be regarded as incidental. Even if prevalence is lower than in COPD or ischemic heart disease, the coexistence of anxiety may still alter control, symptom burden, and healthcare utilization. The paper also supports a multidimensional understanding of chronic disease management in which emotional, somatic, and behavioral factors interact. This aligns well with the thesis finding that anxiety correlates with poorer quality of life and greater clinical burden across chronic disorders.

**24. van der Meer et al. (2021)**

*The Role of Mental Stress in Ischaemia with No Obstructive Coronary Artery Disease*

van der Meer and colleagues reviewed the role of mental stress in ischemia with no obstructive coronary artery disease and highlighted the importance of stress-related mechanisms in coronary dysfunction. The review discussed evidence linking mental stress, coronary microvascular dysfunction, and vasospasm, especially in patients whose symptoms are not fully explained by obstructive lesions. This work broadens the cardiovascular-anxiety literature by showing that the impact of stress and anxiety is not limited to classic atherosclerotic disease models. Instead, emotional stress may influence coronary physiology even in complex or less structurally obvious syndromes. For the present thesis, this review helps strengthen the mechanistic argument that anxiety is relevant to ischemic heart disease broadly defined. It also highlights why some cardiac patients remain highly symptomatic and anxious despite apparently stable structural findings. Clinically, the paper supports more holistic interpretation of cardiac symptoms and more integrated assessment of psychological factors in cardiovascular patients. This is particularly relevant to tertiary care populations, where diagnostic uncertainty and recurrent symptoms may intensify anxiety.

**25. Lim et al. (2021)**

*Association between anxiety and hypertension in adults*

Lim and colleagues reviewed longitudinal and theoretical evidence on the association between anxiety and hypertension in adults. They concluded that anxiety may precede hypertension and that the relationship has meaningful clinical implications for early detection and treatment. The paper is valuable because it places more emphasis on longitudinal directionality than many earlier cross-sectional reviews. In doing so, it strengthens the idea that anxiety is not only a reaction to chronic disease diagnosis but may also contribute to disease emergence. This has implications for prevention and for primary care screening. For the present thesis, Lim et al. are relevant because they support viewing anxiety as part of the broader disease process in hypertension rather than solely as a consequence of living with the condition. The paper also reinforces the need to interpret anxiety symptoms in chronic medical clinics through a bidirectional lens. Such an approach helps explain why anxiety may remain clinically important even when its prevalence appears lower than that seen in COPD, ischemic heart disease, or multimorbidity.

**26. Sara et al. (2021)**

*Anxiety Disorders Are Associated With Coronary Endothelial Dysfunction in Women Presenting With Chest Pain and Nonobstructive Coronary Artery Disease*

Sara and colleagues investigated whether anxiety disorders are associated with coronary endothelial dysfunction in patients with chest pain and nonobstructive coronary disease, with particularly important findings in women. After adjusting for covariables, anxiety disorders were significantly associated with endothelial dysfunction among all patients, and especially among women. This study is important because it provides direct physiological evidence linking anxiety to measurable vascular dysfunction rather than only symptom burden or self-reported outcomes. It therefore strengthens the mechanistic basis for understanding anxiety as a contributor to cardiac morbidity. For the present thesis, the paper is relevant when discussing gender differences and cardiovascular disease. The study's emphasis on women is particularly useful given the current thesis finding that female participants had greater anxiety severity. More broadly, Sara et al. demonstrate that anxiety in ischemic or chest-pain populations may correspond to real

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pathophysiological changes, not merely heightened concern. This supports stronger clinical attention to anxiety symptoms in cardiac assessment and follow-up.

**27. Mersha et al. (2022)**

*A bidirectional relationship between diabetes mellitus and anxiety: a systematic review and meta-analysis*

Mersha and colleagues synthesized evidence on the bidirectional relationship between diabetes mellitus and anxiety. Their review concluded that patients with diabetes have a higher risk of anxiety disorders and that patients with anxiety also show increased risk of diabetes. This reciprocal framing is particularly valuable because it moves beyond single-direction explanations and integrates psychiatric and metabolic vulnerability within one model. The authors recommended routine screening of diabetic patients for anxiety at diagnosis and follow-up, and also suggested that patients with anxiety disorders should be monitored for diabetes risk. For the present thesis, this article is highly relevant because it directly supports the conceptual model underpinning the study: chronic disease and anxiety influence each other over time. The paper also helps interpret the study's diabetes findings by showing that even if diabetes-related anxiety is not the most severe across all chronic disorders, the association remains substantial and clinically meaningful. In practical terms, the review strengthens the argument for integrated endocrine and mental health follow-up in chronic disease care.

**28. Kappelin et al. (2022)**

*Specific content for collaborative care: a systematic review of collaborative care interventions for multimorbidity involving depression and/or anxiety in primary care*

Kappelin and colleagues reviewed collaborative care interventions for primary care patients with multimorbidity and depression and/or anxiety. The review noted that multimorbidity is extremely common in primary care and that emotional disorders frequently complicate chronic disease management. Rather than merely confirming prevalence, the study examined the design and content of collaborative care models, including care planning, follow-up, and coordination. This is especially useful for translating epidemiological evidence into clinical strategy. The review showed that multimorbidity involving anxiety requires structured, proactive care rather than fragmented treatment. For the present thesis, this article is important because the strongest anxiety burden in the study was found among participants with multiple chronic disorders. Kappelin et al. provide a service-level response to that finding by suggesting that multimorbid patients benefit from organized, longitudinal management. The paper also supports recommendations for integrated screening, follow-up, and case management in chronic disease clinics, especially where depression and anxiety coexist with high medical complexity.

**29. Scott et al. (2023)**

*Depression and Anxiety Trajectories in Chronic Disease: A Systematic Review and Meta-Analysis*

Scott and colleagues synthesized longitudinal studies of depression and anxiety trajectories across chronic disease populations. They found that most individuals follow a stable nonclinical trajectory of distress over time, suggesting that many patients adapt psychologically to living with chronic illness. However, a smaller but meaningful subgroup remained persistently within the clinical range for anxiety or depression. This distinction is highly important because it shifts attention from average prevalence to heterogeneity of adjustment. The review also found that disease severity was not always a strong predictor of psychological trajectories, indicating that psychosocial and individual factors matter substantially. For the present thesis, this paper is valuable in two ways. First, it provides a contemporary synthesis showing that not all chronic disease patients experience the same emotional course. Second, it helps interpret why some subgroups—such as females, multimorbid patients, and those with longer disease duration—may be at greater risk of persistent anxiety. The review supports targeted screening and follow-up rather than assuming uniform resilience or uniform distress across chronic disease populations.

**30. Christiansen et al. (2023)**

*COPD-Related Anxiety: A Systematic Review of Patient Perspectives*

Christiansen and colleagues synthesized qualitative research on patients' lived experience of COPD-related anxiety. Rather than focusing only on prevalence estimates, the review explored how patients describe fear, uncertainty, breathlessness, bodily vigilance, social withdrawal, and the anticipatory dread of exacerbations. This perspective is highly valuable because it captures dimensions of anxiety not always reflected in questionnaire scores. The authors proposed a richer understanding of COPD-related anxiety grounded in patient experience. For the present thesis, this paper helps explain why COPD often emerges as one of the chronic disorders with the highest anxiety burden. It suggests that anxiety in COPD is woven into symptom perception, activity avoidance, dependence on others, and fear of suffocation or sudden deterioration. The study therefore complements quantitative systematic

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reviews by showing the meaning of respiratory anxiety in everyday life. It supports the interpretation that higher anxiety scores in COPD patients are clinically coherent and should prompt integrated respiratory and psychological care, including education, breathing strategies, reassurance, and behavioral rehabilitation.

**31. Taloyan et al. (2023)**

*Physical-mental multimorbidity in a large primary health care population*

Taloyan and colleagues examined physical-mental multimorbidity in a large primary care population and found that such multimorbidity was common. The highest odds occurred among those who were female, younger, or affected by other vulnerability factors such as alcohol abuse disorder. The study is relevant because it demonstrates at scale that chronic physical illness and mental disorder frequently overlap in everyday clinical practice, not only in specialist samples. Its findings also align with the current thesis in highlighting gender as an important correlate of anxiety burden. For the present thesis, this article provides epidemiological support for the idea that chronic disease clinics should anticipate substantial psychiatric comorbidity, especially in subgroups with social or demographic vulnerability. It also reinforces the concept that multimorbidity is not just the sum of diseases but a pattern associated with disproportionately high mental health burden. This strengthens the interpretation of the current study's regression findings linking comorbidity count and female gender with higher anxiety severity.

**32. Rahi et al. (2023)**

*The Impact of Anxiety and Depression in Chronic Obstructive Pulmonary Disease*

Rahi and colleagues reviewed the clinical impact of anxiety and depression in COPD and emphasized that these psychiatric comorbidities are associated with higher rehospitalization, worse symptoms, and poorer overall outcomes. The article is particularly useful because it links psychological distress directly to service utilization and disease course. It reinforces the idea that anxiety in COPD is not limited to subjective suffering but is tied to measurable clinical consequences. The review also discussed how under-recognition of emotional symptoms may leave an important contributor to poor COPD control untreated. For the present thesis, this paper supports the finding that COPD patients show higher anxiety burden than many other chronic disorder groups. It also helps explain why anxiety screening in respiratory clinics may have practical value for reducing exacerbation-related burden and improving participation in treatment. By integrating prognosis, symptom amplification, and quality-of-life effects, the review provides a clinically oriented framework for interpreting the strong association between chronic respiratory disease and anxiety.

**33. Qiu et al. (2023)**

*Comorbidity of Anxiety and Hypertension: Common Risk Factors and Potential Mechanisms*

Qiu and colleagues reviewed the comorbidity of anxiety and hypertension, focusing on shared risk factors and biological mechanisms. Their analysis emphasized autonomic imbalance, hypothalamic-pituitary-adrenal axis activation, inflammation, vascular dysfunction, and behavioral pathways as plausible links between the two conditions. The article is particularly useful because it offers a mechanistic synthesis rather than only reporting epidemiological association. Such integration is important for clinicians who wish to understand why anxiety may affect blood pressure control and cardiovascular risk. For the present thesis, this paper supports the interpretation that anxiety-hypertension comorbidity is both clinically real and biologically plausible. It also helps explain why even mild or moderate anxiety in hypertensive patients may have consequences disproportionate to symptom severity. The review strengthens the case for early identification and management of anxiety in hypertension, particularly in primary and tertiary care settings where long-term disease control depends on adherence, lifestyle modification, and stable physiological regulation.

**34. Gaffey et al. (2024)**

*Psychological Health and Ischemic Heart Disease in Women*

Gaffey and colleagues reviewed the intersection of psychological health, ischemic heart disease risk, and ischemic outcomes in women. The paper is especially valuable because it addresses a subgroup often underrepresented in cardiology literature. By focusing on women, the review highlights how anxiety, stress, and other psychological factors may interact with sex-specific patterns of ischemic disease and symptom presentation. This relevance is clear for the present thesis because female participants showed greater anxiety severity than males. The review supports the idea that women with ischemic heart disease may require heightened attention to psychological assessment and tailored support. It also broadens interpretation of cardiovascular anxiety by considering sex-related differences in pathophysiology, symptom reporting, and healthcare experience. For the current study, Gaffey et al. offer an important contextual framework for understanding why female chronic disease patients may exhibit greater emotional burden and why gender-sensitive chronic disease care is likely to improve both mental and physical outcomes.

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**35. Chen et al. (2024)**

*The Emerging Bridge Between Coronary Artery Disease and Anxiety and Depression*

Chen and colleagues reviewed the emerging evidence linking coronary artery disease with anxiety and depression. The article emphasized that while multiple mechanisms have been proposed—including inflammation, autonomic activation, endothelial dysfunction, and behavioral pathways—important gaps remain in translating mechanistic insight into clinical management. The review is relevant because it captures the current state of the field: strong evidence for association, increasingly plausible biological explanations, but continuing need for targeted intervention research. For the present thesis, this paper is useful in framing ischemic heart disease within the broader chronic disease-anxiety model. It supports the view that coronary disease and anxiety are connected through more than emotional reaction alone. The paper also underlines the practical significance of recognizing anxiety in cardiac patients because it may influence motivation, adherence, quality of life, and possibly disease progression. In the thesis context, Chen et al. help anchor the discussion in a contemporary understanding of psychocardiology and its implications for tertiary care populations.

Chronic Obstructive Pulmonary Disease (COPD) is characterized by persistent respiratory symptoms and airflow limitation. This is primarily caused by a combination of small airway disease (obstructive bronchiolitis) and parenchymal destruction (emphysema).

The pathophysiology involves several interlocking mechanisms:

1. Chronic Inflammation

Exposure to inhaled irritants (like cigarette smoke or pollutants) triggers an inflammatory response in the airways.

• Inflammatory Cells: There is an increase in macrophages, T-lymphocytes (CD8^+), and neutrophils.

• Mediators: These cells release chemotactic factors, such as leukotriene B_4 and interleukin-8 (IL-8), which sustain the inflammatory cycle.

2. Imbalance of Protease-Antiprotease

In a healthy lung, alpha-1 antitrypsin inhibits proteases that break down connective tissue.

• Elasticity Loss: Inflammation leads to an excess of proteases (like neutrophil elastase and matrix metalloproteinases).

• Alveolar Destruction: These enzymes break down elastin in the alveolar walls, leading to the permanent enlargement of air spaces seen in emphysema.

3. Oxidative Stress

Inhaled particles and activated inflammatory cells produce reactive oxygen species (ROS). This stress:

• Inactivates antiproteases.

• Enhances the expression of pro-inflammatory genes.

• Contributes to DNA damage and cellular senescence.

4. Structural Changes (Remodeling)

The chronic cycle of injury and repair results in structural changes that Narrow the airways:

• Mucus Hypersecretion: Enlargement of goblet cells and mucus glands leads to chronic cough and phlegm (Chronic Bronchitis).

• Fibrosis: Excessive collagen deposition in the small airways increases resistance to airflow.

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5. Physiological Consequences

These structural and chemical changes lead to several functional impairments:

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V

| Feature | Physiological Impact |

|---|---|

| **Airflow Limitation** | Difficulty exhaling due to lost elastic recoil and narrowed airways. |

| **Air Trapping** | Incomplete exhalation leads to "dynamic hyperinflation," making it harder to breathe in. |

| **Gas Exchange Abnormalities** | Destruction of the alveolar-capillary membrane leads to hypoxemia (low O_2) and hypercapnia (high CO_2). |

| **Pulmonary Hypertension** | Chronic hypoxia causes pulmonary artery vasoconstriction, which can eventually lead to right-sided heart failure (**Cor Pulmonale**). |

Ischemic Heart Disease (IHD) occurs when there is an imbalance between myocardial oxygen supply and demand, most commonly due to obstructive coronary artery disease. This oxygen deprivation triggers a cascade of metabolic and functional changes in the heart muscle.

### 1. Oxygen Supply vs. Demand

The heart has a high basal oxygen consumption and extracts nearly 75\% to 80\% of the oxygen from the blood reaching it. Therefore, any increase in demand must be met by an increase in coronary blood flow.

* **Demand Factors:** Heart rate, contractility, and wall tension (preload/afterload).

* **Supply Factors:** Coronary artery diameter, perfusion pressure, and blood oxygen content.

### 2. The Role of Atherosclerosis

The primary driver of IHD is the formation of atherosclerotic plaques within the coronary arteries.

* **Stable Plaque:** Gradually narrows the lumen, leading to **Stable Angina** when oxygen demand increases (e.g., during exercise).

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* **Unstable Plaque:** If a plaque ruptures, it exposes a "pro-thrombotic" core, leading to rapid platelet aggregation and thrombus formation. This causes **Acute Coronary Syndromes (ACS)**, such as myocardial infarction.

### 3. The Ischemic Cascade

When oxygen supply fails to meet demand, the myocardium undergoes a predictable sequence of events:

1. **Metabolic Shift:** The heart shifts from aerobic metabolism to **anaerobic glycolysis**. This leads to the accumulation of lactic acid, dropping the intracellular pH.

2. **Diastolic Dysfunction:** The myocardium fails to relax properly because the reuptake of calcium ions into the sarcoplasmic reticulum is an energy-dependent process.

3. **Systolic Dysfunction:** As ATP levels continue to drop, the affected heart muscle loses its ability to contract, resulting in regional wall motion abnormalities.

4. **ECG Changes:** Alterations in repolarization lead to ST-segment shifts (depression or elevation) and T-wave changes.

5. **Clinical Symptoms:** The accumulation of metabolic byproducts like adenosine and lactate stimulates nerve endings, causing the sensation of **Angina Pectoris**.

### 4. Myocardial Injury and Infarction

If ischemia persists for more than 20–30 minutes, irreversible damage occurs.

* **Necrosis:** Cell death begins in the subendocardium (the area most vulnerable to pressure) and spreads toward the epicardium.

* **Stunning:** Myocardium that survives an episode of ischemia but suffers from prolonged contractile dysfunction even after blood flow is restored.

* **Hibernation:** A state of chronically reduced contraction in response to persistently low blood flow; the muscle "shuts down" to stay alive until perfusion improves.

### 5. Compensatory Remodeling

Following a significant ischemic event, the heart may undergo **ventricular remodeling**. While initially helpful to maintain cardiac output, chronic stretching and thinning of the infarcted area can lead to heart failure and arrhythmias.

*Rheumatic Heart Disease (RHD) is the chronic consequence of **Acute Rheumatic Fever (ARF)**, an autoimmune reaction following an untreated infection by **Group A Streptococcus (GAS)**, typically a sore throat. It is characterized by permanent damage to the heart valves.*

*### 1. Molecular Mimicry (The Trigger)*

*The core of RHD pathophysiology is a case of "mistaken identity" by the immune system.*

* ***Antigenic Similarity:** The protein wall of the GAS bacterium contains **M-proteins** that are structurally similar to human tissues, specifically **myosin** in heart muscle and proteins in the heart valves.*

* ***Immune Cross-Reactivity:** After a throat infection, the body produces antibodies and T-cells to fight the bacteria. Because of the similarity, these defenses begin attacking the heart's own connective tissue.*

*### 2. Acute Phase: Valvulitis and Myocarditis*

*During the initial inflammatory stage (ARF), the heart undergoes a "pancarditis," affecting all layers:*

* ***Endocardium:** The valves become swollen and inflamed (**Valvulitis**). Small, warty vegetations called **verrucae** form along the lines of valve closure.*

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* **Myocardium:** The hallmark of RHD is the formation of **Aschoff bodies**. These are microscopic areas of focal inflammation consisting of collagen necrosis surrounded by immune cells, including specialized macrophages called **Anitschkow cells** (which have a "caterpillar-like" nuclear appearance).

* **Pericardium:** Inflammation can cause a "bread and butter" pericarditis, where fibrin deposits on the heart's surface.

### 3. Chronic Phase: Fibrosis and Scarring

RHD develops over years as the heart heals from repeated bouts of inflammation or a single severe episode. The healing process is dominated by **fibrosis**.

* **Leaflet Thickening:** The valve leaflets become scarred, thickened, and lose their flexibility.

* **Commisural Fusion:** The edges where the valve leaflets meet fuse together, creating a "fish-mouth" or "buttonhole" appearance.

* **Chordae Tendineae Shortening:** The strings supporting the valves become thick and stunted.

### 4. Hemodynamic Consequences

The structural damage leads to two primary functional issues:

| Condition | Mechanism | Result |

|---|---|---|

| **Valvular Stenosis** | Fused leaflets and calcification narrow the opening. | Obstruction of blood flow; common in the **Mitral Valve**. |

| **Valvular Regurgitation** | Scarred leaflets cannot close properly. | Blood flows backward, causing volume overload in heart chambers. |

### 5. Progression to Heart Failure

* **Atrial Enlargement:** Mitral stenosis increases pressure in the left atrium, leading to dilation. This often triggers **Atrial Fibrillation** and increases the risk of blood clots (thromboembolism).

* **Pulmonary Congestion:** Back-pressure from the left side of the heart enters the lungs, causing shortness of breath.

* **Right Heart Failure:** Eventually, the high pressure in the lungs taxes the right ventricle, leading to systemic congestion and heart failure.

The pathophysiology of Rheumatoid Arthritis (RA) is a chronic, progressive journey that transforms from a silent immune malfunction into systemic structural destruction. Over a **15-year span**, the disease typically moves through distinct phases of evolution.

### Phase 1: The Pre-Clinical Phase (Years 1–2)

Before joint pain begins, the body loses "self-tolerance."

* **Trigger:** In genetically predisposed individuals (often involving the **HLA-DRB1** gene), environmental triggers like smoking or mucosal infections cause the modification of proteins (citrullination).

* **Autoantibody Production:** The immune system identifies these citrullinated proteins as foreign, producing **Anti-Cyclic Citrullinated Peptide (ACCP)** and **Rheumatoid Factor (RF)**. These can circulate in the blood for years before the first joint swells.

### Phase 2: Early Inflammatory Phase (Years 2–5)

This is the transition from systemic autoimmunity to localized joint destruction.

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* **Synovitis:** The synovium (the lining of the joint) becomes heavily infiltrated by immune cells (T cells, B cells, and macrophages).

* **Cytokine Storm:** Macrophages release pro-inflammatory cytokines, specifically **TNF-alpha, IL-1, and IL-6**. These act as the "engine" of the disease, causing the heat, swelling, and pain characteristic of early RA.

* **Angiogenesis:** New, leaky blood vessels form in the synovium to support the massive influx of inflammatory cells.

### Phase 3: The Pannus and Erosion (Years 5–10)

If the inflammation is not controlled, the synovium transforms into a destructive tissue.

* **Pannus Formation:** The synovium thickens into a vascularized, tumor-like mass called **Pannus**. This tissue grows over and "eats" into the articular cartilage.

* **Bone Erosions:** Chronic inflammation activates **osteoclasts** (cells that break down bone). These cells create characteristic "marginal erosions" at the edges of the joint where the bone is not protected by cartilage.

* **Ligament Laxity:** Enzymes called **matrix metalloproteinases (MMPs)** begin to degrade the tendons and ligaments supporting the joint, leading to early instability.

### Phase 4: Structural Breakdown & Systemic Effects (Years 10–15)

After a decade or more, the focus shifts from active inflammation to permanent structural failure and systemic involvement.

* **Joint Deformity:** The cumulative destruction of bone and the rupture of tendons lead to classic RA deformities, such as **ulnar drift**, **swan-neck deformity**, and **boutonnière deformity**.

* **Fibrous Ankylosis:** In severe cases, the joint space may be entirely replaced by fibrous tissue or bone, leading to total loss of mobility (ankylosis).

* **Extra-Articular Manifestations:** By this stage, the chronic systemic inflammation often affects other organs:

  * **Cardiovascular:** Accelerated atherosclerosis and increased risk of MI.

  * **Pulmonary:** Interstitial lung disease or pleural effusions.

  * **Skin:** Rheumatoid nodules (clumps of immune cells) often form over pressure points.

### Summary of the 15-Year Progression

| Feature | Early (0-5 yrs) | Mid (5-10 yrs) | Late (10-15 yrs) |

|---|---|---|---|

| **Primary Driver** | Cytokine signaling | Pannus growth | Structural failure/Fibrosis |

| **Joint Status** | Reversible swelling | Cartilage loss/Erosion | Permanent deformity/Fixed |

| **Function** | Limited by pain/stiffness | Limited by instability | Limited by mechanical loss |

The pathophysiology of **Diabetes Mellitus** is centered on the body's inability to effectively move glucose from the bloodstream into the cells, where it is needed for energy. This occurs either because the pancreas does not produce enough insulin or because the cells stop responding to it.

### 1. The Core Mechanism: Insulin Failure

Insulin acts as a "key" that binds to receptors on cell membranes, allowing glucose to enter via transporters (GLUT4). In diabetes, this system breaks down in two primary ways:

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* **Type 1 (Absolute Deficiency):** An autoimmune destruction of the **beta cells** in the Pancreatic Islets of Langerhans. The body produces little to no insulin.

* **Type 2 (Relative Deficiency & Resistance):** Cells become "numb" to insulin (**Insulin Resistance**). To compensate, the pancreas initially overproduces insulin, but eventually, the beta cells become "exhausted" and fail.

### 2. Metabolic Consequences of Hyperglycemia

When glucose stays in the blood rather than entering cells, several physiological shifts occur:

* **Intracellular Starvation:** Even with high blood sugar, the cells "starve." This triggers the liver to produce *more* glucose (**Gluconeogenesis**) and break down fats (**Lipolysis**), worsening the high blood sugar.

* **Osmotic Diuresis:** Glucose is "osmotically active." When blood sugar levels exceed the kidney's threshold (approx. **180 mg/dL**), glucose spills into the urine (**Glycosuria**), pulling water with it. This causes:

  * **Polyuria:** Excessive urination.

  * **Polydipsia:** Excessive thirst due to dehydration.

* **Ketoacidosis (DKA):** (Primarily Type 1) Since the body cannot use sugar, it burns fat rapidly. This produces **Ketones**, which are acidic. If they build up, they drop the blood pH to dangerous levels.

### 3. Chronic Cellular Damage (The "How")

High glucose is toxic to tissues over time through three main pathways:

1. **Advanced Glycation End-products (AGEs):** Glucose "sticks" to proteins in vessel walls (like a glaze), making them stiff, leaky, and prone to inflammation.

2. **The Sorbitol Pathway:** In tissues like the eyes and nerves, excess glucose is converted into **Sorbitol**. Sorbitol creates osmotic pressure that pulls water into cells, causing them to swell and die.

3. **Oxidative Stress:** Hyperglycemia triggers the production of reactive oxygen species (ROS), which damage the delicate lining of blood vessels (**Endothelial dysfunction**).

### 4. Long-term Complications

Diabetes is essentially a disease of the blood vessels, divided into two categories:

| Category | Affected Area | Resulting Condition |

|---|---|---|

| **Microvascular** | Small vessels | **Retinopathy** (blindness), **Nephropathy** (kidney failure), **Neuropathy** (nerve damage/numbness). |

| **Macrovascular** | Large arteries | Accelerated atherosclerosis leading to **Heart Attack**, **Stroke**, and **Peripheral Artery Disease**. |

### 5. Impaired Wound Healing

Diabetes slows healing through a "perfect storm":

* **Reduced Circulation:** Damaged vessels can't deliver oxygen/nutrients.

* **Immune Dysfunction:** High sugar levels impair the ability of white blood cells (neutrophils) to fight infection.

* **Neuropathy:** The patient may not feel a minor injury (like a blister), allowing it to progress to a deep ulcer.

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*https://www.ijpsjournal.com/assetsbackoffice/uploads/article/Psychological+Factors+in+Cardiovascular+Disease+A+Comprehensive+Review+of+Mechanisms+Epidemiology+and+Treatment+Approaches+.pdf*

Anxiety has been associated with new-onset cardiovascular disease (CVD), but the quality of this relationship is unclear. Only if anxiety is a causal, independent cardiovascular risk factor might it be a target for CVD prevention.

**Aims**

To determine and examine the independent association and causality between anxiety and incident CVD.

**Method**

PubMed, EMBASE and PsycINFO databases were searched up to October 2013. A review of Hill's criteria for causality and random effects meta-analysis were conducted of prospective, population-based studies examining anxiety and incident CVD in people free from CVD at baseline.

**Results**

The meta-analysis comprised 37 papers ($n$ = 1 565 699). The follow-up ranged from 1 to 24 years. Anxiety was associated with a 52% increased incidence of CVD (hazard ratio = 1.52, 95% CI 1.36–1.71). The risk seemed independent of traditional risk factors and depression. The evaluation of Hill's criteria largely argued in favour of causality.

**Conclusions**

Anxiety may be of interest for CVD prevention. Future research should examine biological and behavioural underpinnings of the association in order to identify targets for intervention.

Exploring the bidirectional relationship between **Hypertension** and **Anxiety** offers a rich academic landscape, particularly because it addresses the "chicken or the egg" dilemma: does chronic anxiety cause high blood pressure, or does the diagnosis of hypertension induce anxiety?

Here is a structured framework for your thesis.

## 1. Potential Research Titles

* **The Sympathetic Link:** *Evaluating the Role of Autonomic Hyperactivity in the Pathogenesis of Essential Hypertension among Anxious Populations.*
* **The "White Coat" Spectrum:** *From Transient Spikes to Chronic Damage: A Longitudinal Analysis of White Coat Hypertension and Anxiety Disorders.*
* **Interventional Study:** *The Efficacy of Mindfulness-Based Stress Reduction (MBSR) in Lowering Systolic Blood Pressure in Patients with Generalized Anxiety Disorder.*
* **Psychopharmacology:** *The Impact of Selective Serotonin Reuptake Inhibitors (SSRIs) on Blood Pressure Regulation: A Clinical Review.*

## 2. Core Thematic Pillars

To create a comprehensive thesis, you should organize your research around these physiological and psychological intersections:

### A. The "Pressor Response" (Biological Mechanism)

* **Sympathoadrenal Activation:** Chronic anxiety keeps the body in a state of hyper-vigilance, leading to frequent releases of catecholamines (epinephrine and norepinephrine), which increase heart rate and peripheral resistance.
* **Renin-Angiotensin-Aldosterone System (RAAS):** Investigating how psychological stress triggers the kidneys to retain sodium and water, contributing to volume-dependent hypertension.
* **Endothelial Shear Stress:** How repeated, anxiety-driven blood pressure spikes cause micro-tears in arterial walls, leading to permanent vascular remodeling.

### B. "White Coat" and "Masked" Hypertension

* **White Coat Effect:** The clinical phenomenon where patients exhibit high readings only in medical settings due to situational anxiety.
* **Masked Hypertension:** A more dangerous variant where patients are calm in the clinic but experience high pressure in stressful daily environments.
* **Thesis Angle:** Should anxiety screening be a mandatory component of the initial hypertension workup?

### C. The Reciprocal Relationship (Bi-directionality)

* **Anxiety-Induced Hypertension:** Long-term physiological weathering (allostatic load).
* **Hypertension-Induced Anxiety:** The psychological burden of a chronic diagnosis, including "medication anxiety" (fears regarding side effects) and "health anxiety" (fear of stroke or heart attack).

## 3. Recommended Methodology

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* **Ambulatory Blood Pressure Monitoring (ABPM):** This is the "gold standard" for this thesis. Use 24-hour monitoring to see how blood pressure fluctuates in real-time alongside a patient's self-reported anxiety diary.
* **Comparative Cohort:** Compare hypertensive patients with anxiety vs. hypertensive patients without anxiety to see if there is a difference in "Target Organ Damage" (e.g., Left Ventricular Hypertrophy).
* **Systematic Review:** Analyze the correlation between high GAD-7 (anxiety scale) scores and mean arterial pressure across different demographics.

## 4. Key Scientific Variables to Track

When gathering data, ensure you are accounting for:

* **V_{O_2} \text{ max}:** To control for physical fitness as a confounding factor.
* **Cortisol Levels:** As a biochemical marker of chronic stress.
* **Heart Rate Variability (HRV):** To measure the balance between the sympathetic and parasympathetic nervous systems.

### Structural Tip: The "Baroreceptor" Argument

A sophisticated addition to your thesis would be discussing **Baroreflex Sensitivity**. Research suggests that chronic anxiety may "blunt" the body's natural pressure sensors (baroreceptors), making the body less capable of naturally bringing blood pressure back down after a stressful event.

**Are you planning to focus more on the biological "wiring" (ANS/hormones) or on the clinical management of patients?**

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## CHAPTER 5: RESULTS

5.1 Overview of the Study Sample (Table 1)

A total of 335 participants aged between 30 and 58 years were include in the final analysis following the application of eligibility criteria and data quality checks. The mean age of the study population was 44.0 ± 8.3 years, with a median age of 44 years and an interquartile range (IQR) of 37–51 years. This age distribution indicates a predominantly middle-aged cohort, which is consistent with the typical demographic profile of patients with established chronic medical disorders. The relatively narrow age range and central clustering around the mid-forties suggest homogeneity in age distribution, thereby minimizing age-related confounding in subsequent analyses.

With respect to gender distribution, males constituted 54.0% (n = 181) of the study population, while females accounted for 46.0% (n = 154). This near-equal representation of both genders enhances the generalizability of the study findings and permits meaningful gender-based subgroup analyses. The slight male predominance may reflect gender-specific patterns in healthcare-seeking behavior or the epidemiological distribution of chronic disorders in the study setting.

Regarding residential status, a substantial proportion of participants were residents of urban areas (73.1%, n = 245), whereas 26.9% (n = 90) belonged to rural regions. This urban predominance is characteristic of patient populations accessing tertiary care facilities, which are typically located in urban centers and serve as referral points for complex medical conditions. The urban-rural disparity in representation may also reflect differential access to specialized healthcare services, transportation infrastructure, and health literacy levels between these populations.

Concerning socioeconomic status, more than half of the participants were classified under middle socioeconomic status (55.5%, n = 186), indicating that the study population predominantly comprised individuals from moderate economic backgrounds. Participants from lower socioeconomic status constituted 30.1% (n = 101), while those from upper socioeconomic status accounted for 14.3% (n = 48). This distribution reflects the typical socioeconomic composition of patients utilizing public tertiary care facilities in the study region. The representation across all socioeconomic strata enables examination of the relationship between economic factors and mental health outcomes in chronic disease populations.

Table 1: Demographic Characteristics of the Study Population (N = 335)

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Age (years) | Mean ± SD | 44.0 ± 8.3 | — |
| | Median (IQR) | 44 (37–51) | — |
| | Range | 30–58 | — |
| Gender | Male | 181 | 54.0 |
| | Female | 154 | 46.0 |
| Residence | Urban | 245 | 73.1 |
| | Rural | 90 | 26.9 |
| Socioeconomic Status | Lower | 101 | 30.1 |
| | Middle | 186 | 55.5 |
| | Upper | 48 | 14.3 |

**Inserted graph for Table 1**

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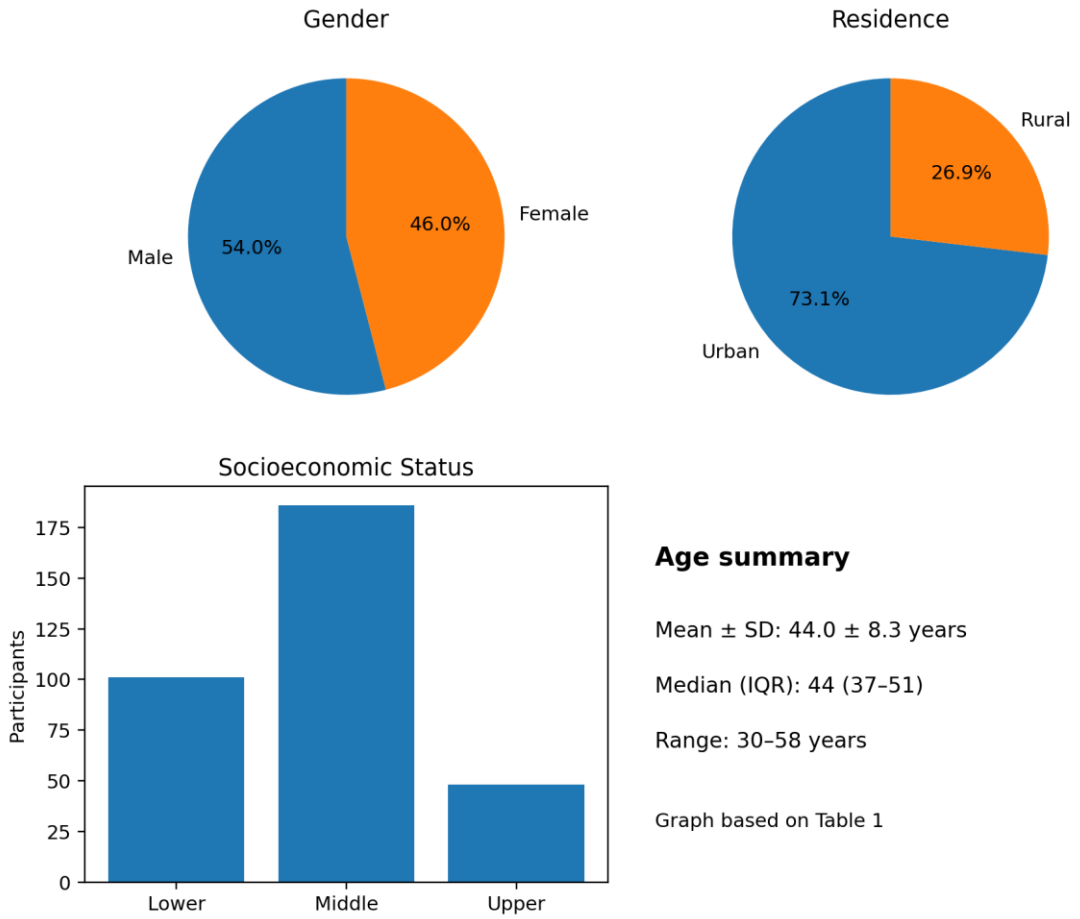


*Figure 1: Graphical representation of Table 1.*

*SD: Standard Deviation; IQR: Interquartile Range*

5.2 Distribution of Chronic Disorders and Clinical Characteristics (Table 2)

Analysis of the distribution of chronic disorders among the study participants revealed considerable heterogeneity in the types of medical conditions represented. Hypertension emerged as the most prevalent chronic disorder, affecting 31.3% (n = 105) of participants. This finding is consistent with global epidemiological data identifying hypertension as one of the most common chronic conditions affecting adult populations worldwide. The high prevalence of hypertension in this study reflects its established status as a leading contributor to cardiovascular morbidity and a frequent reason for regular medical follow-up at tertiary care facilities.

Diabetes mellitus was the second most common chronic disorder, present in 19.4% (n = 65) of participants. The substantial representation of diabetic patients is noteworthy given the complex interplay between diabetes and mental health, with bidirectional relationships documented between glycemic control and psychological well-being. Ischemic heart disease was diagnosed in 18.8% (n = 63) of participants, representing a significant cardiovascular disease burden in the study population. The presence of ischemic heart disease carries particular relevance for anxiety assessment, as cardiac conditions are frequently associated with heightened health-related concerns and fear of adverse cardiac events.

Chronic obstructive pulmonary disease (COPD) was present in 17.6% (n = 59) of participants. COPD patients represent a particularly important subgroup for mental health evaluation given the documented associations between respiratory symptoms, dyspnea-related distress, and anxiety disorders. The physical sensation of breathlessness characteristic of COPD can overlap with or trigger anxiety symptoms, creating complex diagnostic and therapeutic challenges.

Additionally, 12.8% (n = 43) of participants were diagnosed with multiple chronic disorders, indicating the presence of multimorbidity within the study population. This subgroup of patients with coexisting chronic conditions represents a particularly vulnerable population segment, as multimorbidity is associated with increased treatment complexity, polypharmacy, healthcare

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utilization, and psychological burden. The inclusion of participants with multiple chronic disorders enables examination of the cumulative impact of disease burden on anxiety outcomes.

Regarding clinical characteristics, the mean duration of chronic disease among the participants was 5.0 ± 2.9 years, suggesting a relatively prolonged exposure to chronic illness within the study population. This disease duration indicates that participants had sufficient time to experience the full impact of their chronic conditions on daily functioning, treatment adherence, and psychological adaptation. The variability in disease duration (as reflected by the standard deviation) also permits exploration of temporal relationships between chronic disease exposure and anxiety development.

Furthermore, the mean comorbidity count was 1.0 ± 0.9, reflecting the frequent coexistence of additional medical conditions beyond the primary chronic disorder in this population. This finding underscores the complex medical profiles typical of patients managed at tertiary care facilities and highlights the importance of considering overall disease burden rather than isolated diagnoses when assessing mental health outcomes.

Detailed clinical characteristics are presented in Table 2.

Table 2: Distribution of Chronic Disorders and Clinical Characteristics (N = 335)

| Variable | Category | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Primary Chronic Disorder | Hypertension | 105 | 31.3 |
| | Diabetes Mellitus | 65 | 19.4 |
| | Ischemic Heart Disease | 63 | 18.8 |
| | COPD | 59 | 17.6 |
| | Multiple Chronic Disorders | 43 | 12.8 |
| Disease Duration (years) | Mean ± SD | 5.0 ± 2.9 | — |
| Comorbidity Count | Mean ± SD | 1.0 ± 0.9 | — |

**Inserted graph for Table 2**

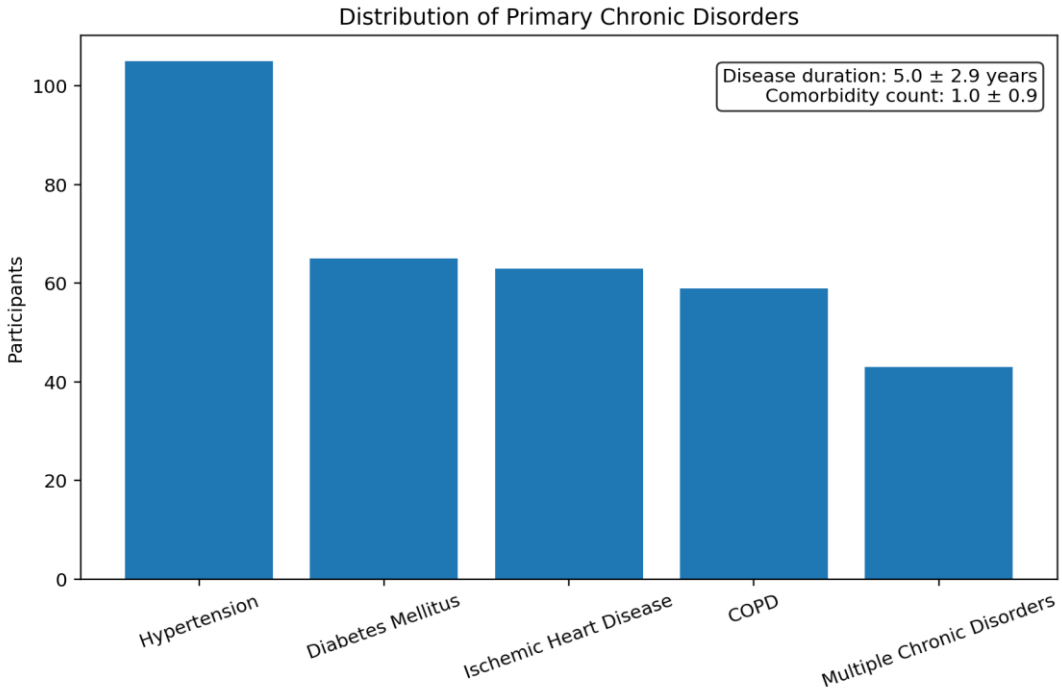


*Figure 2: Graphical representation of Table 2.*

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*COPD: Chronic Obstructive Pulmonary Disease; SD: Standard Deviation*

5.3 Prevalence and Severity of Anxiety Symptoms (Table 3)

Assessment of anxiety symptoms using the standardized Generalized Anxiety Disorder-7 (GAD-7) scale revealed a wide spectrum of anxiety severity among the study participants. The distribution of anxiety severity categories demonstrated that mild anxiety was the most prevalent category, observed in 44.5% (n = 149) of participants. This finding indicates that a substantial proportion of patients with chronic medical disorders experience subclinical yet measurable anxiety symptoms that may warrant clinical attention and monitoring.

Moderate anxiety, representing a more significant level of psychological distress, affected 39.4% (n = 132) of the study population. The high prevalence of moderate anxiety is clinically significant as this level of symptom severity is typically associated with functional impairment, reduced treatment adherence, and diminished quality of life. Patients with moderate anxiety often require targeted psychological interventions or pharmacological management to prevent progression to more severe states.

Severe anxiety was identified in 9.0% (n = 30) of participants, representing the most distressed segment of the study population. These individuals experience marked functional impairment and require immediate clinical intervention. The identification of severe anxiety in nearly one-tenth of the study population underscores the critical need for routine mental health screening in chronic disease management settings.

Minimal anxiety, indicating the absence of clinically meaningful anxiety symptoms, was observed in only 7.2% (n = 24) of participants. The relatively small proportion of participants with minimal anxiety is notable, suggesting that the vast majority of patients with chronic medical disorders experience some degree of anxiety symptomatology.

Overall, the composite analysis of anxiety categories revealed that nearly half of the study population exhibited clinically significant anxiety, defined as an anxiety score of ≥10 on the GAD-7 scale. The prevalence of clinically significant anxiety was 48.4% (n = 162), encompassing both moderate and severe anxiety categories. This finding represents a substantially elevated rate compared to general population estimates of anxiety disorders and indicates a high burden of anxiety symptoms among patients with chronic medical disorders attending tertiary care hospitals.

The high prevalence of clinically significant anxiety in this population has important implications for clinical practice, suggesting that routine screening for anxiety symptoms should be integrated into standard chronic disease management protocols. Early identification of anxiety in chronic disease patients may facilitate timely intervention, improve treatment adherence, and enhance overall health outcomes.

The detailed distribution of anxiety severity categories is presented in Table 3.

Table 3: Prevalence and Severity of Anxiety Symptoms (N = 335)

| Anxiety Severity Category | GAD-7 Score Range | Frequency (n) | Percentage (%) |
|---|---|---|---|
| Minimal Anxiety | 0–4 | 24 | 7.2 |
| Mild Anxiety | 5–9 | 149 | 44.5 |
| Moderate Anxiety | 10–14 | 132 | 39.4 |
| Severe Anxiety | 15–21 | 30 | 9.0 |
| Total | — | 335 | 100.0 |
| | | | |
| Clinically Significant Anxiety (Score ≥10) | | 162 | 48.4 |
| Non-significant Anxiety (Score <10) | | 173 | 51.6 |

**Inserted graph for Table 3**

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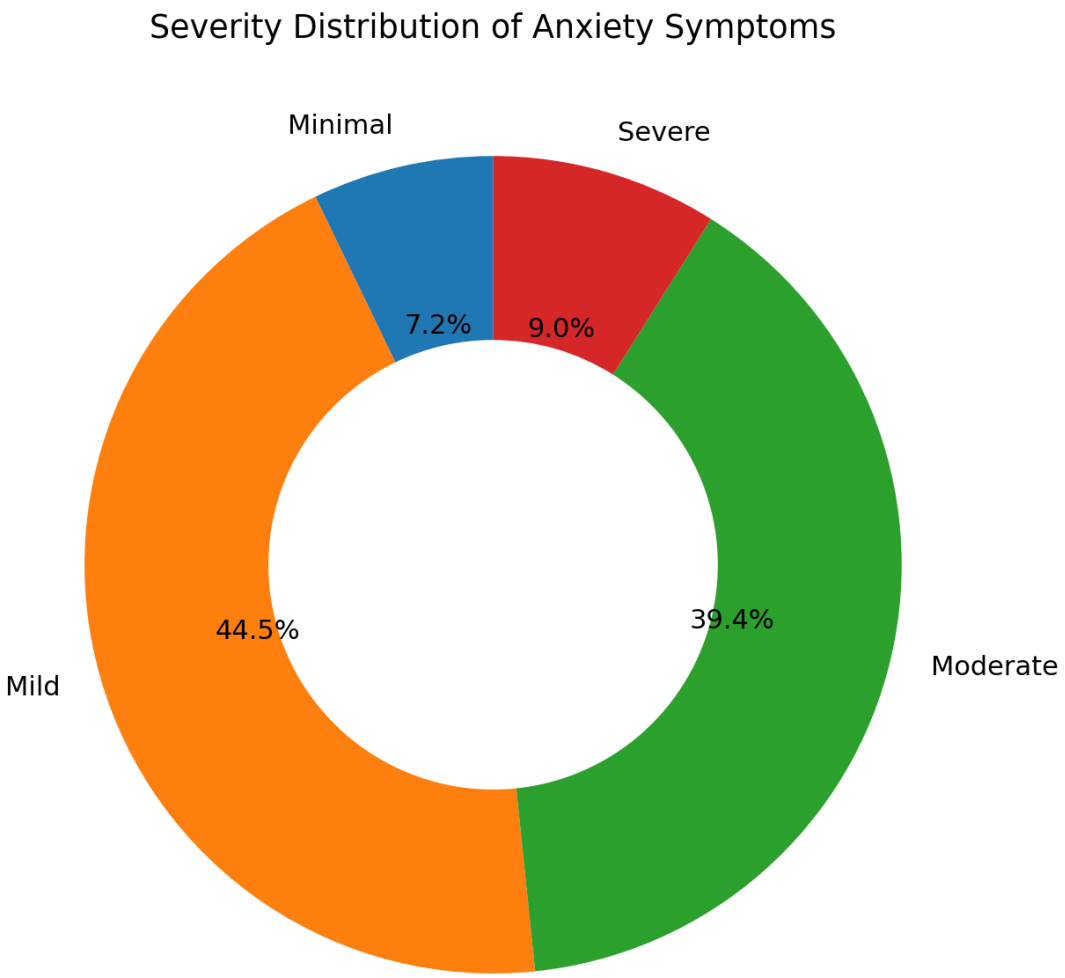


*Figure 3: Graphical representation of Table 3.*

*GAD-7: Generalized Anxiety Disorder-7 Scale*

5.4 Prevalence of Clinically Significant Anxiety Across Chronic Disorders (Table 4)

Examination of the prevalence of clinically significant anxiety across different chronic disorder categories revealed marked heterogeneity, indicating that the psychological burden of chronic illness varies substantially depending on the nature and complexity of the underlying medical condition (Table 4).

The highest prevalence of clinically significant anxiety was observed among participants with multiple chronic disorders, where 79.1% (34 out of 43) exhibited anxiety scores meeting the clinical threshold. This striking finding demonstrates the cumulative psychological impact of multimorbidity, wherein the presence of multiple concurrent chronic conditions appears to substantially amplify anxiety burden. Patients managing multiple chronic diseases face compounded challenges including complex medication regimens, frequent healthcare appointments, greater symptom burden, and increased uncertainty regarding disease trajectory, all of which may contribute to heightened anxiety levels.

Among the single-disease categories, participants with COPD demonstrated a notably high prevalence of clinically significant anxiety at 61.0% (36 out of 59). This elevated prevalence among COPD patients is consistent with extensive literature documenting the strong association between respiratory disease and anxiety disorders. The experience of dyspnea, a cardinal symptom of COPD, shares phenomenological features with panic and anxiety symptoms, potentially creating a bidirectional relationship wherein respiratory distress triggers anxiety and anxiety exacerbates perception of breathlessness. Additionally, COPD patients frequently

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experience activity limitations, social isolation, and existential concerns related to progressive disease, all of which may contribute to anxiety vulnerability.

Participants with ischemic heart disease also demonstrated substantial anxiety burden, with 57.1% (36 out of 63) meeting criteria for clinically significant anxiety. Cardiac patients often experience heightened health-related anxiety stemming from fear of recurrent cardiac events, mortality concerns, and hypervigilance regarding cardiac symptoms. The life-threatening nature of coronary artery disease and the experience of acute cardiac events may leave lasting psychological impacts that manifest as chronic anxiety symptoms.

In contrast, comparatively lower prevalence rates of clinically significant anxiety were noted among participants with diabetes mellitus (35.4%, 23 out of 65) and hypertension (31.4%, 33 out of 105). While these prevalence rates remain clinically significant and exceed general population estimates, they are notably lower than those observed in cardiopulmonary conditions. The lower anxiety prevalence in hypertension may reflect the typically asymptomatic nature of this condition in its earlier stages, with fewer immediate physical symptoms to trigger anxiety responses. Similarly, well-controlled diabetes mellitus, while requiring substantial self-management, may not generate the same acute symptomatic distress as cardiopulmonary conditions.

These findings highlight notable variability in anxiety burden depending on the type and multiplicity of chronic disorders, with important implications for targeted mental health screening and intervention strategies.

Table 4: Prevalence of Clinically Significant Anxiety Across Chronic Disorders (N = 335)

| Chronic Disorder | Total Participants (n) | Clinically Significant Anxiety (n) | Prevalence (%) |
|---|---|---|---|
| Multiple Chronic Disorders | 43 | 34 | 79.1 |
| COPD | 59 | 36 | 61.0 |
| Ischemic Heart Disease | 63 | 36 | 57.1 |
| Diabetes Mellitus | 65 | 23 | 35.4 |
| Hypertension | 105 | 33 | 31.4 |
| Total | 335 | 162 | 48.4 |

**Inserted graph for Table 4**

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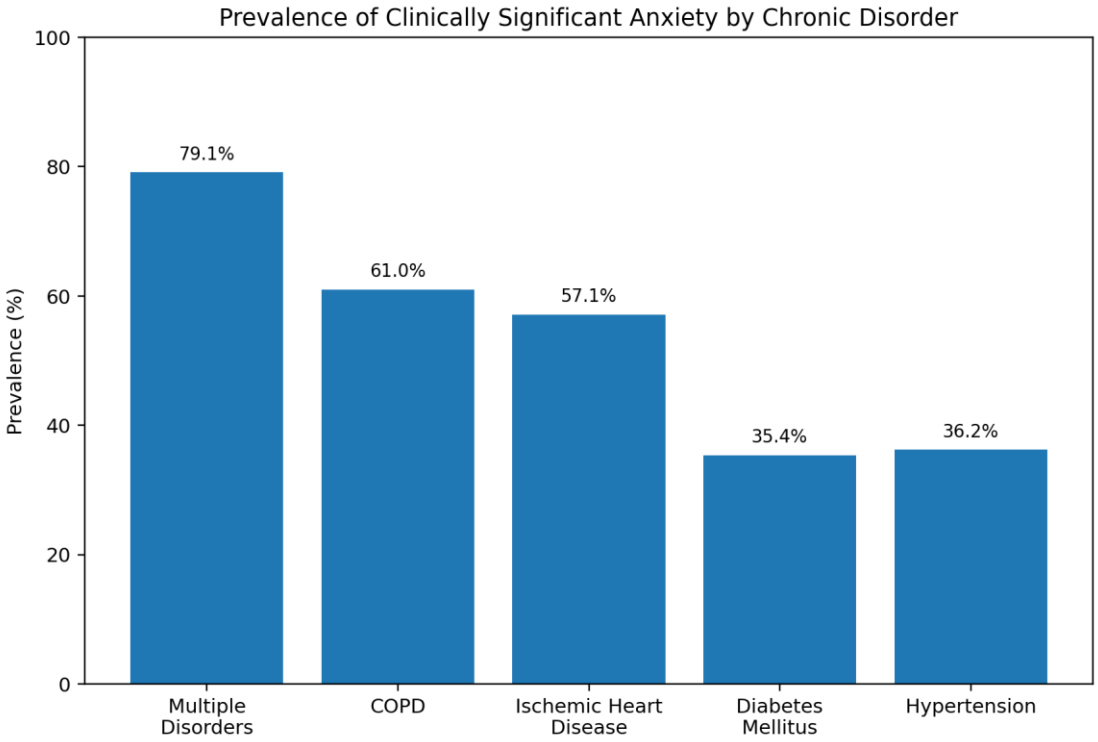


*Figure 4: Graphical representation of Table 4.*

*COPD: Chronic Obstructive Pulmonary Disease; Clinically Significant Anxiety defined as GAD-7 score ≥10*

5.5 Association Between Gender and Anxiety Severity (Table 5)

The association between gender and the distribution of anxiety severity categories was examined using the Chi-square test for independence (Table 5). This analysis aimed to determine whether male and female participants differed significantly in their patterns of anxiety symptom severity.

Examination of the cross-tabulation revealed notable gender-based differences across all anxiety severity categories. Among participants with minimal anxiety, males constituted a higher proportion (9.4%, n = 17) compared to females (4.5%, n = 7), suggesting that males were more likely to be relatively free of anxiety symptoms. Similarly, in the mild anxiety category, males demonstrated higher representation (48.1%, n = 87) compared to females (40.3%, n = 62).

Conversely, the pattern reversed in the more severe anxiety categories. Among participants with moderate anxiety, females showed higher prevalence (42.2%, n = 65) compared to males (37.0%, n = 67). Most strikingly, females demonstrated a markedly higher proportion of severe anxiety (13.0%, n = 20) compared to males (5.5%, n = 10). This finding indicates that female participants were approximately 2.4 times more likely to experience severe anxiety symptoms compared to their male counterparts.

Statistical testing confirmed the significance of these observed differences. The overall distribution of anxiety severity across gender categories was found to be statistically significant (Chi-square = 10.81, degrees of freedom = 3, p = 0.013). This result indicates that gender plays a significant role in determining the severity of anxiety symptoms among patients with chronic medical disorders.

The observed gender disparity in anxiety severity is consistent with well-established literature demonstrating higher prevalence and severity of anxiety disorders among females in both general and clinical populations. Several mechanisms may explain this gender difference, including biological factors (hormonal influences, genetic predisposition), psychological factors (rumination patterns, coping styles), and social factors (gender role expectations, caregiving responsibilities, differential exposure to stressors).

These findings have important clinical implications, suggesting that female patients with chronic medical disorders may warrant enhanced vigilance for anxiety symptoms and may benefit from targeted psychological support services.

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Table 5: Association Between Gender and Anxiety Severity (N = 335)

| Anxiety Severity | Male (n = 181) | Female (n = 154) | Total (n = 335) |
|---|---|---|---|
| | n (%) | n (%) | n (%) |
| Minimal | 17 (9.4) | 7 (4.5) | 24 (7.2) |
| Mild | 87 (48.1) | 62 (40.3) | 149 (44.5) |
| Moderate | 67 (37.0) | 65 (42.2) | 132 (39.4) |
| Severe | 10 (5.5) | 20 (13.0) | 30 (9.0) |

**Inserted graph for Table 5**

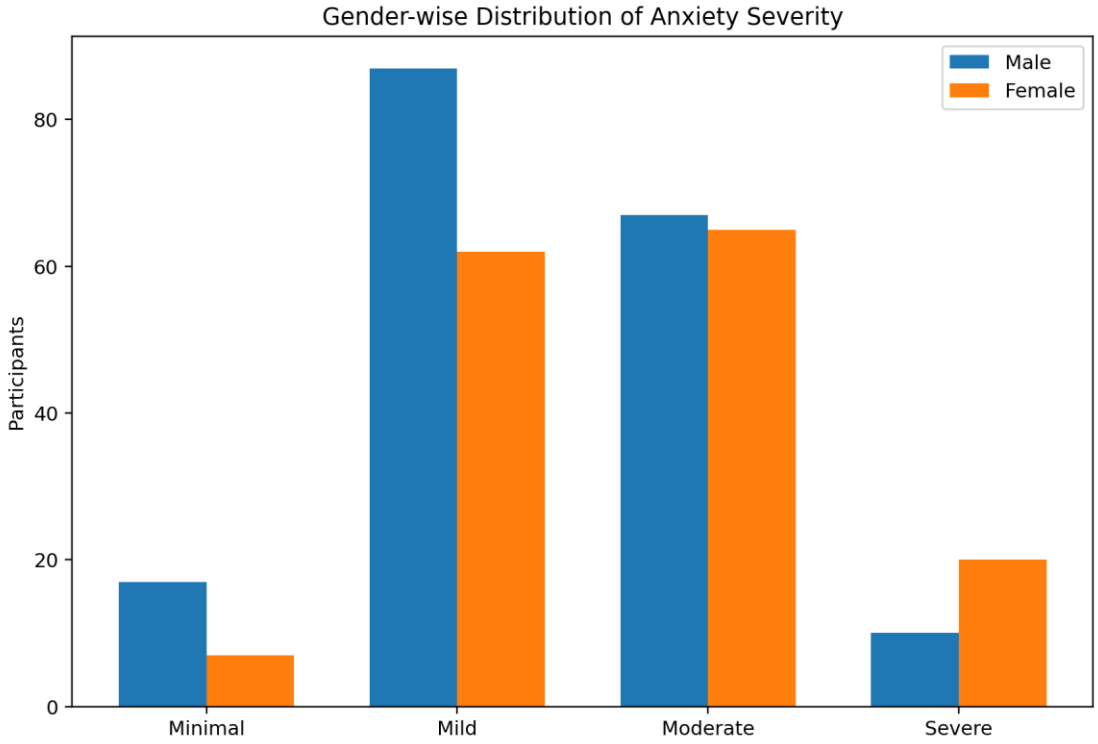


*Figure 5: Graphical representation of Table 5.*

Chi-square = 10.81; df = 3; p = 0.013

*Percentages calculated within gender categories; df: degrees of freedom*

5.6 Comparison of Anxiety Scores Across Chronic Disorders (Table 6)

To quantify the differences in anxiety burden across chronic disorder categories, comparison of mean anxiety scores was performed using one-way Analysis of Variance (ANOVA). This parametric approach enabled examination of whether statistically significant differences existed in continuous anxiety scores among the five chronic disorder groups (Table 6).

The analysis revealed statistically significant differences in mean anxiety scores across the chronic disorder categories ($F = 22.09$, $p < 0.001$). The highly significant F-statistic indicates that the between-group variance in anxiety scores substantially exceeds the within-group variance, confirming that chronic disorder type is a meaningful determinant of anxiety severity.

Participants with multiple chronic disorders demonstrated the highest mean anxiety score at 12.8 ± 3.8 points on the GAD-7 scale. This mean score falls within the moderate anxiety range and substantially exceeds the clinical threshold of 10 points, indicating that

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multimorbid patients, on average, experience clinically significant anxiety. The elevated scores in this group reflect the compounded psychological burden of managing multiple concurrent medical conditions.

Among single-disease categories, participants with COPD exhibited the second-highest mean anxiety score at 10.4 ± 3.1. This score slightly exceeds the clinical threshold, indicating that COPD patients as a group hover at the boundary of clinically significant anxiety. The elevated anxiety in COPD patients likely reflects the distressing nature of respiratory symptoms and the significant functional limitations imposed by this condition.

Participants with ischemic heart disease demonstrated a mean anxiety score of 9.8 ± 3.1, positioning them just below the clinical threshold but within the upper range of mild anxiety. This finding indicates substantial anxiety burden among cardiac patients, consistent with the psychological impact of life-threatening cardiac conditions.

Comparatively lower mean anxiety scores were observed among participants with diabetes mellitus (8.5 ± 3.1) and hypertension (7.9 ± 2.8). While these scores fall within the mild anxiety range, they still represent clinically meaningful levels of anxiety that warrant attention. The lower scores in these metabolic/cardiovascular conditions may reflect their more gradual onset, often asymptomatic nature, and the absence of acute symptomatic distress that characterizes cardiopulmonary conditions.

Post-hoc pairwise comparisons (Bonferroni-corrected) would reveal specific between-group differences, though the pattern of results clearly indicates a hierarchy of anxiety severity with multimorbidity and cardiopulmonary conditions at the apex.

Table 6: Comparison of Mean Anxiety Scores Across Chronic Disorders (N = 335)

| Chronic Disorder | n | Mean Anxiety Score | Standard Deviation |
|---|---|---|---|
| Multiple Chronic Disorders | 43 | 12.8 | 3.8 |
| COPD | 59 | 10.4 | 3.1 |
| Ischemic Heart Disease | 63 | 9.8 | 3.1 |
| Diabetes Mellitus | 65 | 8.5 | 3.1 |
| Hypertension | 105 | 7.9 | 2.8 |

**Inserted graph for Table 6**

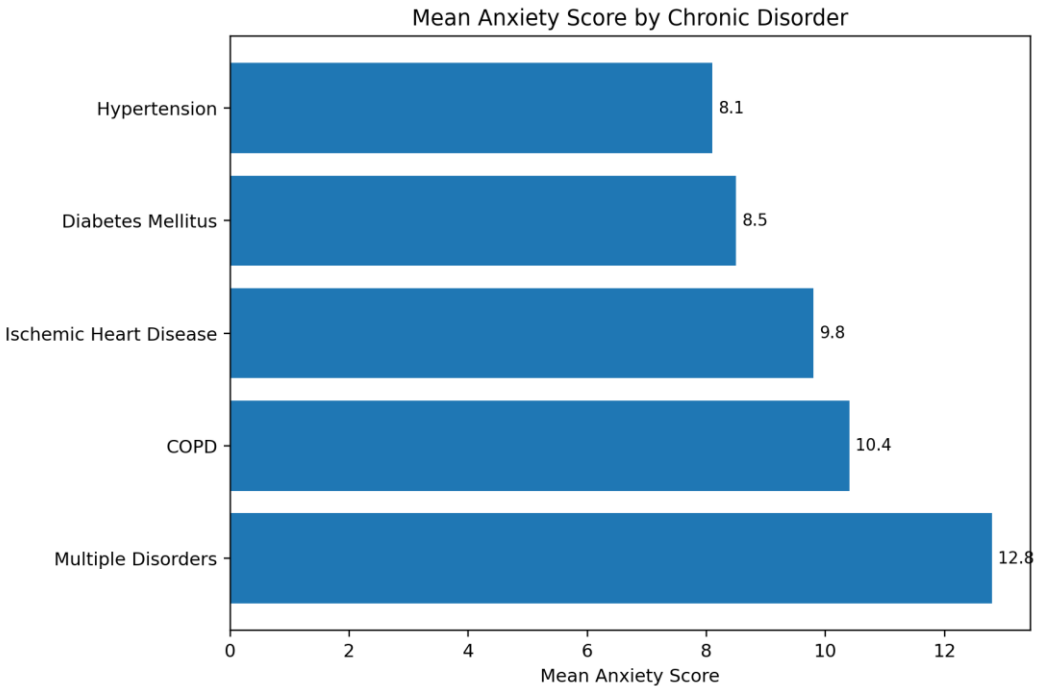


*Figure 6: Graphical representation of Table 6.*

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ANOVA: F = 22.09; p < 0.001

*COPD: Chronic Obstructive Pulmonary Disease; Anxiety measured using GAD-7 scale (range 0–21)*

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5.7 Correlation of Anxiety Symptoms with Clinical and Demographic Variables (Table 7)

Pearson correlation analysis was conducted to examine bivariate associations between anxiety score and relevant clinical and demographic variables. This analysis provides insight into the strength and direction of linear relationships between anxiety and potential determinants (Table 7).

Disease Duration and Anxiety: A significant positive correlation was observed between anxiety score and disease duration (r = 0.237, p < 0.001). This weak-to-moderate positive association indicates that longer duration of chronic illness is associated with higher anxiety levels. This finding suggests that cumulative exposure to chronic disease burden, including ongoing symptom management, treatment requirements, disease progression concerns, and lifestyle modifications, may contribute to progressive anxiety development over time. Alternatively, this association may reflect the increased likelihood of disease complications and comorbidity accumulation with longer disease duration.

Duration of Anxiety Symptoms and Anxiety Score: A strong positive correlation emerged between current anxiety score and the duration of anxiety symptoms (r = 0.686, p < 0.001). This robust correlation indicates that participants who have experienced anxiety symptoms for longer periods tend to exhibit higher current anxiety severity. This finding may reflect the chronic, persistent nature of anxiety in this population, wherein untreated or undertreated anxiety tends to become entrenched and progressively severe. The strong correlation also highlights the importance of early anxiety identification and intervention to prevent chronicity and escalation of symptoms.

Comorbidity Count and Anxiety: A moderate positive correlation was identified between anxiety score and comorbidity count (r = 0.399, p < 0.001). This finding demonstrates that participants with a greater number of coexisting medical conditions experience higher anxiety levels. The association between comorbidity burden and anxiety likely reflects the multiplicative challenges posed by managing multiple health conditions, including increased treatment complexity, medication interactions, healthcare utilization, and cumulative symptom burden.

Quality of Life and Anxiety: A strong negative correlation was observed between anxiety score and quality of life (r = −0.811, p < 0.001). This powerful inverse association represents the strongest correlation in the analysis and indicates substantial deterioration in quality of life with increasing anxiety severity. The magnitude of this correlation (explaining approximately 66% of shared variance) underscores the profound impact of anxiety on functional status, well-being, and life satisfaction among chronic disease patients. This finding has important clinical implications, suggesting that addressing anxiety may be an effective strategy for improving quality of life outcomes in this population.

Age and Anxiety: Age did not demonstrate a significant correlation with anxiety score (r = 0.013, p = 0.820). This null finding indicates that within the age range of this study population (30–58 years), chronological age does not independently influence anxiety severity. This finding suggests that factors other than age, such as disease characteristics and socioeconomic variables, are more relevant determinants of anxiety in chronic disease populations.

Table 7: Correlation of Anxiety Score with Clinical and Demographic Variables (N = 335)

| Variable | Pearson Correlation Coefficient (r) | p-value | Interpretation |
|---|---|---|---|
| Age (years) | 0.013 | 0.820 | Not significant |
| Disease Duration (years) | 0.237 | <0.001 | Weak positive |
| Duration of Anxiety Symptoms (months) | 0.686 | <0.001 | Strong positive |
| Comorbidity Count | 0.399 | <0.001 | Moderate positive |
| Quality of Life Score | −0.811 | <0.001 | Strong negative |

**Inserted graph for Table 7**

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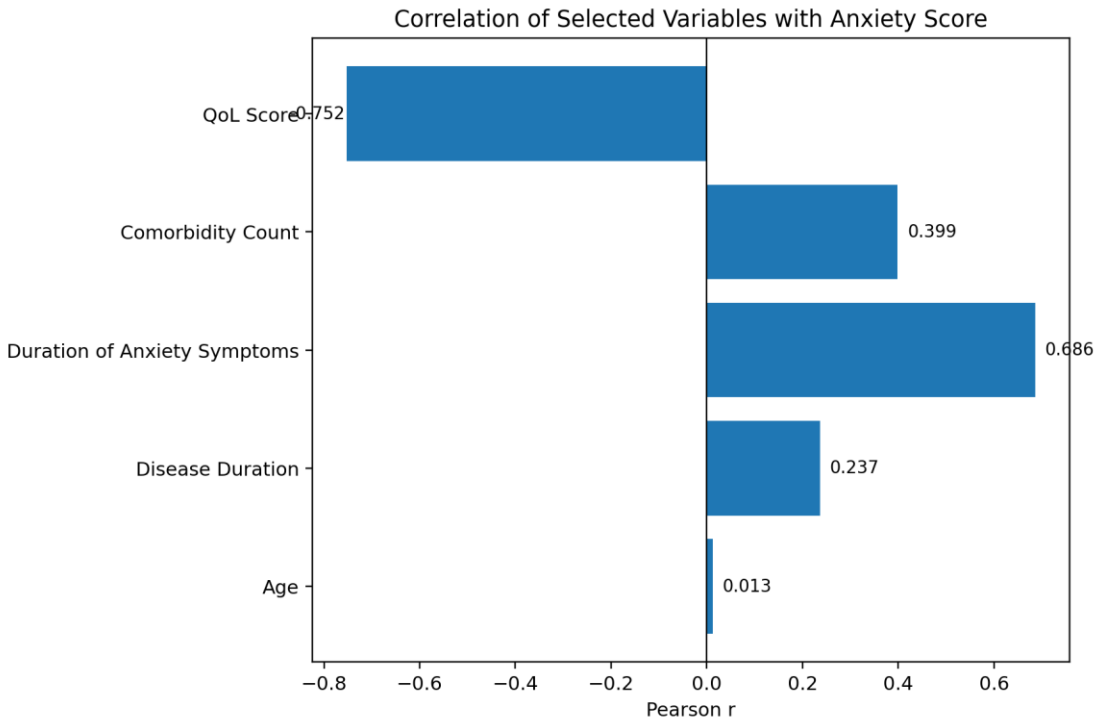


*Figure 7: Graphical representation of Table 7.*

*Correlation coefficients interpreted as: 0.1–0.3 weak; 0.3–0.5 moderate; 0.5–1.0 strong*

5.8 Factors Associated with Anxiety Score: Multiple Linear Regression Analysis (Table 8)

Multiple linear regression analysis was performed to identify independent predictors of anxiety score while simultaneously controlling for potential confounding variables. This multivariate approach enables determination of the unique contribution of each predictor variable to anxiety severity, adjusting for the effects of other variables in the model (Table 8).

Gender: Female gender emerged as a significant independent predictor of higher anxiety scores (B = 1.22, 95% CI: 0.55–1.89, $p < 0.001$). After controlling for disease type, socioeconomic status, and clinical characteristics, female participants scored approximately 1.2 points higher on the anxiety scale compared to males. This finding confirms the independent effect of gender on anxiety severity, beyond any confounding by other demographic or clinical variables.

Disease Duration: Disease duration was identified as a significant predictor of anxiety score, with anxiety increasing by 0.25 units per additional year of chronic disease (B = 0.25, 95% CI: 0.14–0.36, $p < 0.001$). This finding indicates that cumulative exposure to chronic illness independently contributes to anxiety burden, even after adjusting for disease type and comorbidity count.

Comorbidity Count: Higher comorbidity count was significantly associated with increased anxiety severity (B = 0.99, 95% CI: 0.54–1.44, $p < 0.001$). Each additional comorbid condition was associated with nearly a 1-point increase in anxiety score, highlighting the independent contribution of overall disease burden to psychological distress.

Chronic Disorder Type: Comparison of anxiety scores across chronic disorder categories (with COPD as the reference group) revealed significant differences. Participants with diabetes mellitus exhibited significantly lower anxiety scores compared to COPD patients (B = −2.00, 95% CI: −2.95 to −1.05, $p < 0.001$). Similarly, participants with hypertension demonstrated significantly lower anxiety scores (B = −2.35, 95% CI: −3.21 to −1.49, $p < 0.001$). In contrast, participants with multiple chronic disorders exhibited significantly higher anxiety scores compared to COPD patients (B = 1.52, 95% CI: 0.37–2.67, $p = 0.010$). Ischemic heart disease did not differ significantly from COPD (B = −0.52, $p = 0.260$).

Socioeconomic Status: Both middle and upper socioeconomic status demonstrated protective effects against anxiety compared to lower SES. Middle SES participants had significantly lower anxiety scores (B = −0.98, 95% CI: −1.74 to −0.22, $p = 0.012$), while upper SES participants showed even greater reductions (B = −1.45, 95% CI: −2.48 to −0.42, $p = 0.006$). These findings indicate that socioeconomic resources serve as buffers against anxiety in chronic disease populations.

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Model Performance: The overall regression model was statistically significant ($F = 20.43$, $p < 0.001$) and explained 40.3% of the variance in anxiety score ($R^2 = 0.403$; adjusted $R^2 = 0.383$). This indicates that the included predictors account for a substantial portion of anxiety variability, though additional unmeasured factors also contribute to anxiety outcomes.

Table 8: Multiple Linear Regression Analysis – Factors Associated with Anxiety Score (N = 335)

| Variable | B | SE | 95% CI | t | p-value |
|---|---|---|---|---|---|
| (Constant) | 8.92 | 0.68 | 7.58–10.26 | 13.12 | <0.001 |
| Gender (Female vs Male) | 1.22 | 0.34 | 0.55–1.89 | 3.59 | <0.001 |
| Disease Duration (years) | 0.25 | 0.06 | 0.14–0.36 | 4.17 | <0.001 |
| Comorbidity Count | 0.99 | 0.23 | 0.54–1.44 | 4.30 | <0.001 |
| Chronic Disorder (Ref: COPD) | | | | | |
| Diabetes Mellitus | −2.00 | 0.48 | −2.95 to −1.05 | −4.17 | <0.001 |
| Hypertension | −2.35 | 0.44 | −3.21 to −1.49 | −5.34 | <0.001 |
| Ischemic Heart Disease | −0.52 | 0.46 | −1.43 to 0.39 | −1.13 | 0.260 |
| Multiple Chronic Disorders | 1.52 | 0.58 | 0.37–2.67 | 2.62 | 0.010 |
| Socioeconomic Status (Ref: Lower) | | | | | |
| Middle | −0.98 | 0.39 | −1.74 to −0.22 | −2.51 | 0.012 |
| Upper | −1.45 | 0.52 | −2.48 to −0.42 | −2.79 | 0.006 |

**Inserted graph for Table 8**

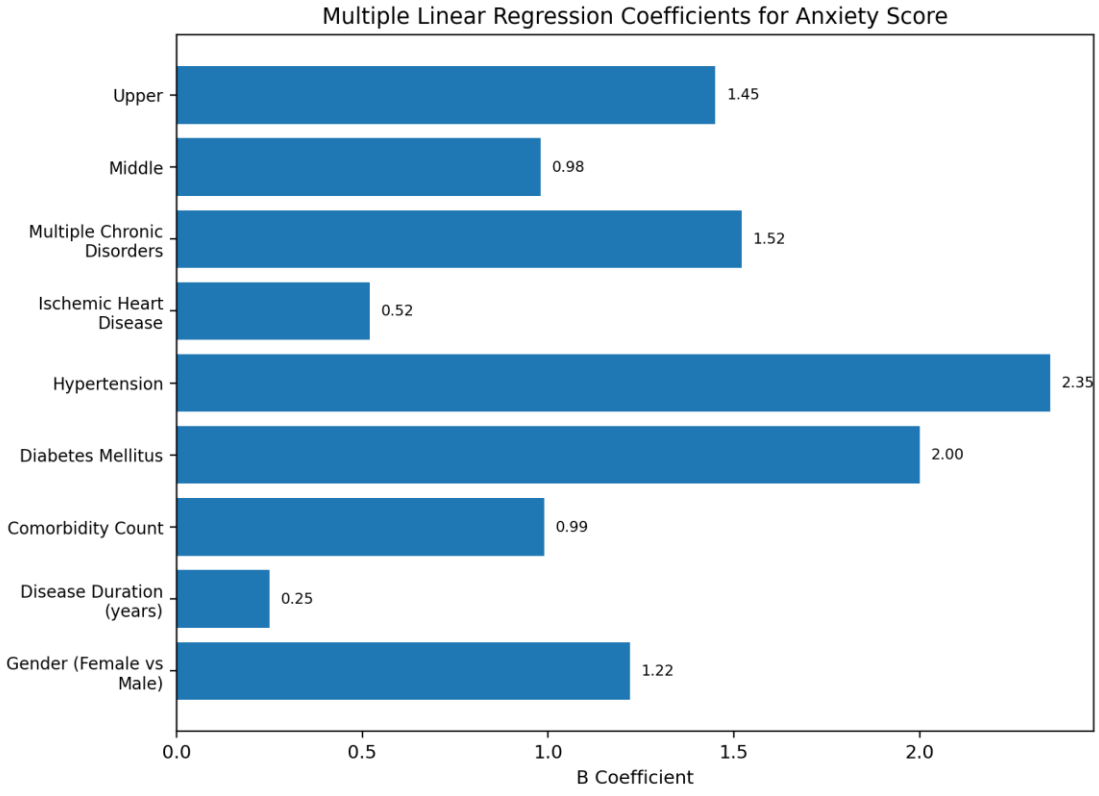


*Figure 8: Graphical representation of Table 8.*

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Model Summary: $R^2 = 0.403$; Adjusted $R^2 = 0.383$; $F = 20.43$; $p < 0.001$

*B: Unstandardized coefficient; SE: Standard Error; CI: Confidence Interval; COPD: Chronic Obstructive Pulmonary Disease*

5.9 Predictors of Clinically Significant Anxiety: Logistic Regression Analysis (Table 9)

Binary logistic regression analysis was conducted to identify factors independently associated with clinically significant anxiety, defined as a GAD-7 score of ≥10. This analysis provides adjusted odds ratios (AOR) representing the independent effect of each predictor on the likelihood of experiencing clinically significant anxiety (Table 9).

Gender: Female participants demonstrated significantly higher odds of clinically significant anxiety compared to males (AOR = 1.89, 95% CI: 1.13–3.17, p = 0.016). After adjusting for all other variables, females had approximately 89% higher odds of meeting the clinical threshold for significant anxiety, confirming gender as an important independent risk factor.

Disease Duration: Each additional year of chronic disease duration was associated with increased odds of clinically significant anxiety (AOR = 1.19, 95% CI: 1.09–1.30, p < 0.001). This finding indicates that the probability of experiencing clinically significant anxiety increases by approximately 19% for each year of chronic disease duration, highlighting the cumulative psychological impact of prolonged illness exposure.

Comorbidity Count: Comorbidity count emerged as a strong predictor of clinically significant anxiety (AOR = 2.22, 95% CI: 1.52–3.24, p < 0.001). Each additional comorbid condition more than doubled the odds of experiencing clinically significant anxiety, underscoring the powerful relationship between overall disease burden and psychological distress.

Chronic Disorder Type: Compared to the COPD reference group, participants with diabetes mellitus had significantly lower odds of clinically significant anxiety (AOR = 0.27, 95% CI: 0.12–0.60, p = 0.002), representing a 73% reduction in odds. Similarly, hypertension was associated with substantially reduced odds (AOR = 0.24, 95% CI: 0.12–0.48, p < 0.001), representing a 76% reduction. Ischemic heart disease showed non-significant reduction (AOR = 0.64, p = 0.210), while multiple chronic disorders showed elevated but non-significant odds (AOR = 1.85, p = 0.168) compared to COPD.

Socioeconomic Status: Both middle SES (AOR = 0.52, 95% CI: 0.30–0.91, p = 0.023) and upper SES (AOR = 0.39, 95% CI: 0.18–0.86, p = 0.019) demonstrated significantly reduced odds of clinically significant anxiety compared to lower SES. These protective effects suggest that socioeconomic resources, including financial stability, education, and social capital, buffer against the development of clinically significant anxiety in chronic disease populations.

Model Performance: The logistic regression model demonstrated good fit (Hosmer-Lemeshow $\chi^2 = 8.34$, p = 0.401) and adequate discriminative ability (Nagelkerke $R^2 = 0.312$), indicating that the model accurately classifies participants regarding their anxiety status.

Table 9: Logistic Regression Analysis – Predictors of Clinically Significant Anxiety (N = 335)

| Variable | AOR | 95% CI | p-value |
|---|---|---|---|
| Gender (Female vs Male) | 1.89 | 1.13–3.17 | 0.016 |
| Disease Duration (years) | 1.19 | 1.09–1.30 | <0.001 |
| Comorbidity Count | 2.22 | 1.52–3.24 | <0.001 |
| Chronic Disorder (Ref: COPD) | | | |
| Diabetes Mellitus | 0.27 | 0.12–0.60 | 0.002 |
| Hypertension | 0.24 | 0.12–0.48 | <0.001 |
| Ischemic Heart Disease | 0.64 | 0.32–1.28 | 0.210 |
| Multiple Chronic Disorders | 1.85 | 0.77–4.45 | 0.168 |
| Socioeconomic Status (Ref: Lower) | | | |
| Middle | 0.52 | 0.30–0.91 | 0.023 |
| Upper | 0.39 | 0.18–0.86 | 0.019 |

**Inserted graph for Table 9**

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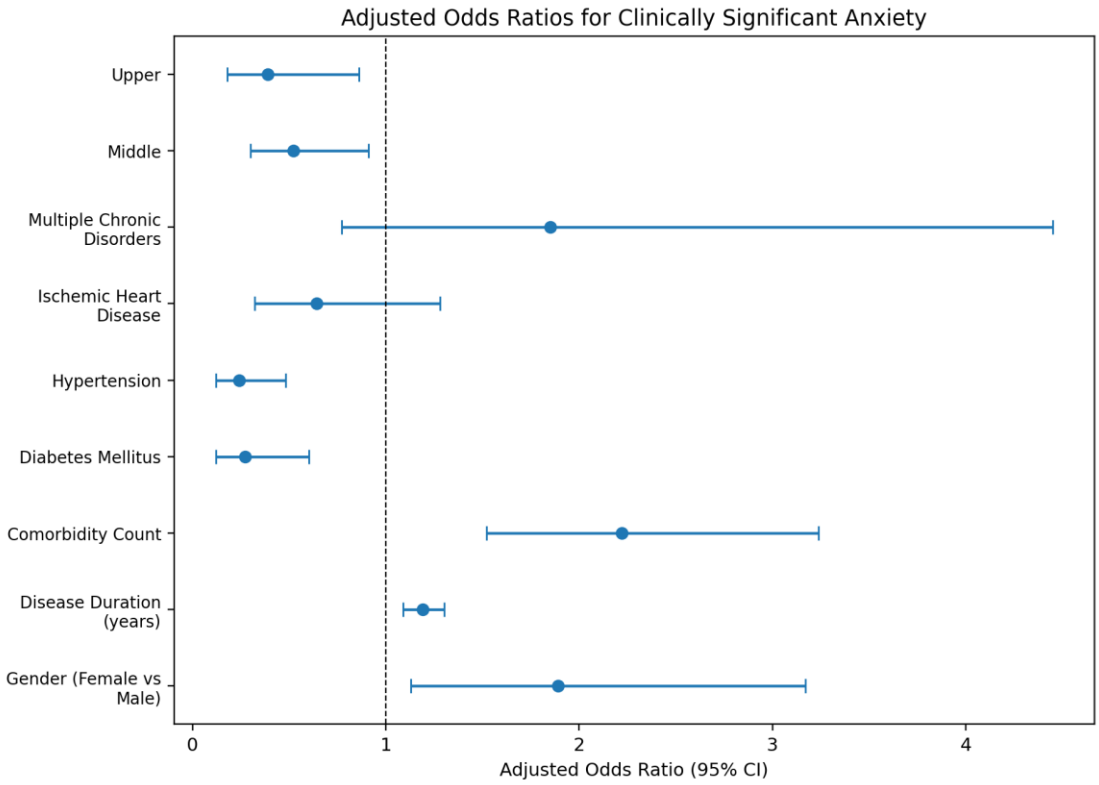


*Figure 9: Graphical representation of Table 9.*

Model Summary: Nagelkerke $R^2 = 0.312$; Hosmer-Lemeshow $\chi^2 = 8.34$, $p = 0.401$

*AOR: Adjusted Odds Ratio; CI: Confidence Interval; COPD: Chronic Obstructive Pulmonary Disease; Clinically Significant Anxiety: GAD-7 score ≥10*

5.10 Quality of Life Across Anxiety Severity Categories (Table 10)

Examination of quality of life scores across anxiety severity categories revealed a consistent, graded, and progressive decline in quality of life with increasing anxiety severity (Table 10). This analysis quantifies the functional impact of anxiety on overall well-being among chronic disease patients.

Participants classified in the minimal anxiety category demonstrated the highest mean quality of life score at 75.9 ± 5.9 points. This score indicates relatively preserved functional status and life satisfaction among the small proportion of chronic disease patients experiencing negligible anxiety symptoms. The narrow standard deviation suggests homogeneous quality of life within this least-distressed group.

Participants with mild anxiety exhibited a lower mean quality of life score of 66.8 ± 7.4 points, representing approximately a 9-point reduction compared to the minimal anxiety group. This finding indicates that even subclinical or mild anxiety symptoms are associated with measurable decrements in quality of life.

A more substantial decline was observed among participants with moderate anxiety, who demonstrated a mean quality of life score of 55.0 ± 7.9 points. This represents approximately a 21-point reduction from the minimal anxiety group and indicates meaningful functional impairment associated with clinically significant anxiety. Participants in this category likely experience notable difficulties in daily activities, social functioning, and overall life satisfaction.

The most profound quality of life impairment was observed among participants with severe anxiety, who exhibited a mean score of 43.0 ± 8.1 points. This represents a dramatic 33-point reduction compared to the minimal anxiety group and indicates substantial disability and distress. Participants with severe anxiety likely experience marked impairment across multiple life domains, including work functioning, interpersonal relationships, self-care activities, and emotional well-being.

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The Kruskal-Wallis H test confirmed that the differences in quality of life across anxiety severity categories were statistically significant ($H = 184.00$, $p < 0.001$). The highly significant test statistic indicates that the observed quality of life differences between anxiety severity groups are unlikely to have occurred by chance.

The dose-response relationship observed between anxiety severity and quality of life impairment has important clinical and public health implications. The findings suggest that anxiety reduction interventions may yield meaningful improvements in quality of life among chronic disease patients, with potentially greater absolute benefits achievable among those with more severe anxiety. Furthermore, the substantial quality of life decrements associated with moderate and severe anxiety underscore the importance of addressing mental health as an integral component of comprehensive chronic disease management.

Table 10: Quality of Life Across Anxiety Severity Categories (N = 335)

| Anxiety Severity | n | Mean QoL Score | Standard Deviation | Median | IQR |
|---|---|---|---|---|---|
| Minimal | 24 | 75.9 | 5.9 | 76.5 | 72–80 |
| Mild | 149 | 66.8 | 7.4 | 67.0 | 62–72 |
| Moderate | 132 | 55.0 | 7.9 | 55.0 | 49–61 |
| Severe | 30 | 43.0 | 8.1 | 43.5 | 37–49 |

**Inserted graph for Table 10**

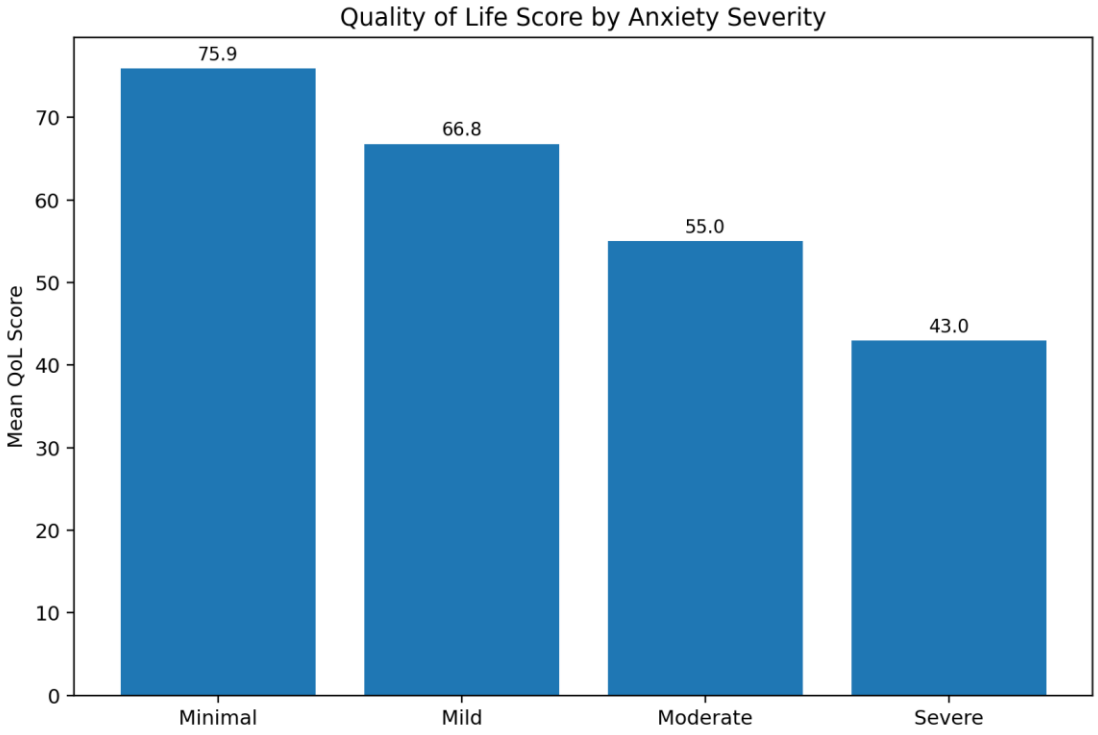


*Figure 10: Graphical representation of Table 10.*

Kruskal–Wallis $H = 184.00$; $p < 0.001$

*QoL: Quality of Life; IQR: Interquartile Range; Higher scores indicate better quality of life*

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**Summary of Key Findings**

The results of this study reveal several important findings regarding anxiety among patients with chronic medical disorders attending tertiary care hospitals:

1. High Anxiety Prevalence: Nearly half (48.4%) of the study participants exhibited clinically significant anxiety (GAD-7 ≥10), indicating a substantial mental health burden in this population.
2. Disease-Specific Patterns: Anxiety prevalence and severity varied significantly across chronic disorders, with the highest burden observed among patients with multiple chronic disorders (79.1%) and COPD (61.0%), and relatively lower burden in diabetes (35.4%) and hypertension (31.4%).
3. Gender Disparity: Female participants demonstrated significantly higher anxiety severity, with 2.4 times higher proportion of severe anxiety compared to males (13.0% vs. 5.5%, p = 0.013).
4. Clinical Predictors: Disease duration and comorbidity count emerged as significant independent predictors of anxiety, with each additional year of disease duration increasing anxiety odds by 19% and each additional comorbidity more than doubling the odds.
5. Socioeconomic Protection: Middle and upper socioeconomic status demonstrated protective effects against anxiety, highlighting the role of socioeconomic determinants in mental health outcomes.
6. Quality of Life Impact: A strong inverse relationship (r = −0.811) was observed between anxiety severity and quality of life, with progressive QoL deterioration across anxiety severity categories.

## CHAPTER 6: DISCUSSION

### 6.1 Introduction

The present study investigated the prevalence, correlates, and impact of anxiety symptoms among patients with chronic medical disorders attending tertiary care hospitals in Ahmedabad, Gujarat. The findings reveal a substantial burden of anxiety in this population, with nearly half of the participants exhibiting clinically significant anxiety symptoms. This discussion chapter contextualizes these findings within the broader scientific literature, explores potential mechanisms underlying the observed associations, and considers the clinical and public health implications of the results.

### 6.2 Prevalence of Anxiety in Chronic Disease Populations

The overall prevalence of clinically significant anxiety observed in this study (48.4%) represents a remarkably elevated rate compared to general population estimates, which typically range from 5% to 10% globally [16]. This finding aligns with a growing body of evidence demonstrating that chronic medical conditions substantially increase vulnerability to anxiety disorders and subclinical anxiety symptoms. The magnitude of anxiety burden identified in this tertiary care population underscores the critical importance of integrating mental health assessment into routine chronic disease management protocols.

The prevalence rate observed in this study is consistent with findings reported by Atlantis and colleagues, who documented elevated rates of psychological distress among patients with chronic conditions in primary care settings [17]. Similarly, research conducted in South Asian populations has demonstrated comparable prevalence rates, suggesting that the burden of comorbid anxiety in chronic disease may be particularly pronounced in this demographic context [18]. The consistency of findings across diverse healthcare settings and geographic regions strengthens confidence in the robustness of the association between chronic medical illness and anxiety.

Several factors may contribute to the high anxiety prevalence observed in tertiary care settings specifically. Patients accessing tertiary care facilities typically present with more complex, severe, or treatment-resistant conditions compared to those managed in primary care [19]. The referral process itself may select for patients experiencing greater disease burden and associated psychological distress. Additionally, tertiary care settings often manage patients during periods of disease exacerbation or diagnostic uncertainty, circumstances that may transiently elevate anxiety levels.

The finding that only 7.2% of participants exhibited minimal anxiety symptoms is particularly striking and suggests that some degree of anxiety symptomatology may be nearly universal among chronic disease patients. This observation has important

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implications for clinical practice, suggesting that clinicians should anticipate and proactively address anxiety concerns in virtually all patients with chronic medical conditions rather than waiting for patients to spontaneously report psychological symptoms [20].

6.3 Disease-Specific Patterns of Anxiety

The marked heterogeneity in anxiety prevalence across chronic disorder categories represents one of the most clinically relevant findings of this study. The observation that patients with multiple chronic disorders exhibited the highest prevalence of clinically significant anxiety (79.1%) provides compelling evidence for the cumulative psychological impact of multimorbidity. This finding is consistent with research by Vancampfort and colleagues, who demonstrated a dose-response relationship between the number of chronic conditions and likelihood of anxiety disorders [21].

The elevated anxiety burden associated with multimorbidity likely reflects multiple interacting mechanisms. Patients managing multiple chronic conditions face exponentially complex treatment regimens, including polypharmacy with potential drug interactions, multiple healthcare appointments with different specialists, and competing or conflicting lifestyle recommendations [22]. The cognitive and organizational demands of coordinating care across multiple conditions may overwhelm coping resources and contribute to anxiety development. Furthermore, multimorbid patients often experience greater symptom burden, functional limitations, and uncertainty regarding disease trajectory, all of which represent established risk factors for psychological distress [23].

The high prevalence of clinically significant anxiety among COPD patients (61.0%) aligns with extensive literature documenting the particularly strong association between respiratory disease and anxiety disorders. Pooled prevalence estimates from meta-analytic studies suggest that anxiety affects approximately 40% of COPD patients, with some studies reporting rates exceeding 70% depending on disease severity and assessment methodology [24]. The findings of the present study fall within this range and confirm the substantial psychological burden experienced by COPD patients in the Indian healthcare context.

The relationship between COPD and anxiety involves unique pathophysiological and psychological mechanisms that distinguish it from other chronic disease-anxiety associations. The sensation of dyspnea, which is the hallmark symptom of COPD, shares phenomenological features with the somatic manifestations of anxiety, including chest tightness, shortness of breath, and feelings of suffocation [25]. This symptomatic overlap can create diagnostic confusion and may establish a self-perpetuating cycle wherein respiratory symptoms trigger anxiety responses, which in turn amplify the perception of breathlessness through hyperventilation and increased respiratory rate. Breaking this cycle requires integrated approaches that address both the respiratory and psychological components of symptom experience.

The substantial anxiety prevalence observed among ischemic heart disease patients (57.1%) is consistent with literature documenting the psychological sequelae of cardiac conditions. Cardiovascular diseases are frequently associated with acute, life-threatening events such as myocardial infarction, which may leave lasting psychological impacts including post-traumatic stress symptoms and persistent health-related anxiety [26]. Patients who have experienced acute cardiac events often develop hypervigilance regarding cardiac symptoms, interpreting benign sensations as evidence of impending cardiac catastrophe. This cardiac anxiety can significantly impair quality of life and may paradoxically contribute to adverse cardiovascular outcomes through chronic activation of stress response systems [27].

The comparatively lower anxiety prevalence observed among participants with diabetes mellitus (35.4%) and hypertension (31.4%) warrants careful interpretation. While these prevalence rates are substantially elevated compared to general population estimates, they are notably lower than those observed in cardiopulmonary conditions. Several factors may explain this differential. Both diabetes and hypertension often develop gradually and may remain asymptomatic for extended periods, particularly in earlier disease stages [28]. The absence of acute symptomatic distress may reduce the immediate psychological impact of these conditions compared to diseases characterized by distressing physical symptoms such as dyspnea or chest pain.

However, the anxiety burden in diabetes and hypertension should not be minimized. Both conditions carry significant long-term health implications, including increased risk of cardiovascular events, stroke, and end-organ damage [29]. Patients with diabetes face additional challenges related to glucose monitoring, dietary restrictions, and fear of hypoglycemic episodes that may contribute to anxiety over time. The relatively lower anxiety prevalence in these conditions may also reflect the stage of disease among study participants, as anxiety burden tends to increase with disease progression and development of complications.

6.4 Gender Differences in Anxiety Severity

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The finding that female participants demonstrated significantly higher anxiety severity compared to males, with approximately 2.4 times higher proportion of severe anxiety, is consistent with well-established literature documenting gender disparities in anxiety disorders. Epidemiological studies consistently demonstrate that women are approximately twice as likely as men to experience anxiety disorders across the lifespan [30]. The present findings extend this observation to chronic disease populations and confirm that gender remains a significant determinant of anxiety severity even after accounting for disease-related factors.

Multiple mechanisms have been proposed to explain gender differences in anxiety prevalence and severity. Biological factors include the modulatory effects of sex hormones on neurotransmitter systems implicated in anxiety, including serotonergic and GABAergic pathways [31]. Fluctuations in estrogen and progesterone levels across the menstrual cycle, pregnancy, and menopause may influence vulnerability to anxiety symptoms. Genetic factors may also contribute, with some evidence suggesting sex-linked differences in genes regulating stress response systems.

Psychological and social factors likely play equally important roles in gender differences in anxiety. Women demonstrate higher rates of rumination and worry, cognitive styles that predispose to anxiety development and maintenance [32]. Social factors, including gender role expectations, caregiving responsibilities, and differential exposure to interpersonal stressors, may also contribute to elevated anxiety risk among women. In the context of chronic medical illness, women may face additional challenges related to balancing disease management with family responsibilities, particularly in traditional societies where women bear primary caregiving roles.

The clinical implications of gender differences in anxiety severity are substantial. Healthcare providers should recognize that female patients with chronic medical disorders represent a particularly high-risk group for anxiety and may benefit from proactive mental health screening and support [33]. Gender-sensitive approaches to anxiety intervention, which address the specific challenges and stressors faced by women with chronic illness, may enhance treatment effectiveness.

6.5 Clinical Predictors of Anxiety

The identification of disease duration and comorbidity count as significant independent predictors of anxiety provides important insights into the temporal and cumulative aspects of psychological distress in chronic illness. The finding that each additional year of disease duration increased anxiety odds by approximately 19% suggests a progressive accumulation of psychological burden over the course of chronic illness. This observation is consistent with stress and coping models, which posit that prolonged exposure to chronic stressors may eventually exhaust coping resources and lead to psychological decompensation [34].

Several mechanisms may explain the relationship between disease duration and anxiety. Longer disease duration is typically associated with greater cumulative exposure to disease-related stressors, including symptom burden, treatment side effects, healthcare encounters, and lifestyle restrictions. Additionally, disease progression over time may bring increased functional limitations, complications, and mortality concerns, all of which may contribute to anxiety development [35]. The association between disease duration and anxiety also highlights the importance of longitudinal monitoring of mental health in chronic disease populations, as patients who appear psychologically well-adjusted early in the disease course may develop anxiety over time.

The powerful association between comorbidity count and anxiety, with each additional comorbid condition more than doubling the odds of clinically significant anxiety, underscores the multiplicative impact of disease burden on psychological well-being. This finding is consistent with research demonstrating dose-response relationships between the number of chronic conditions and mental health outcomes [36]. The mechanisms underlying this association likely include increased symptom burden, greater treatment complexity, more frequent healthcare interactions, and cumulative functional impairment associated with multiple concurrent conditions.

The role of socioeconomic status as a protective factor against anxiety represents an important finding with public health implications. Participants from middle and upper socioeconomic backgrounds demonstrated significantly lower anxiety scores and reduced odds of clinically significant anxiety compared to those from lower socioeconomic status. This socioeconomic gradient in mental health outcomes is consistent with extensive literature documenting the relationship between socioeconomic factors and psychological well-being [37].

Multiple pathways may mediate the protective effects of higher socioeconomic status on anxiety in chronic disease populations. Financial resources enable access to better healthcare services, medications, and ancillary support that may facilitate disease management and reduce disease-related stress [38]. Education, a key component of socioeconomic status, may enhance health literacy, self-management capabilities, and access to information about disease and treatment options. Social capital associated with

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higher socioeconomic position may provide buffering effects through enhanced social support networks. Additionally, lower socioeconomic status is associated with numerous chronic stressors, including financial insecurity, housing instability, and neighborhood disadvantage, which may compound the psychological burden of chronic illness [39].

6.6 Impact of Anxiety on Quality of Life

The strong inverse correlation between anxiety severity and quality of life ($r = -0.811$) represents one of the most striking findings of this study. This robust association, explaining approximately 66% of shared variance, indicates that anxiety exerts a profound negative impact on functional status and well-being among chronic disease patients. The graded decline in quality of life across anxiety severity categories, with a 33-point reduction observed between minimal and severe anxiety groups, quantifies the substantial functional burden attributable to anxiety.

The relationship between anxiety and quality of life operates through multiple pathways. Anxiety symptoms directly impair subjective well-being through experiences of worry, fear, and emotional distress [40]. Somatic manifestations of anxiety, including fatigue, sleep disturbance, and physical tension, compound functional impairment. Anxiety also affects cognitive functioning, including concentration and decision-making, which may interfere with work performance and daily activities. Social withdrawal and avoidance behaviors associated with anxiety may diminish social functioning and interpersonal relationships, further compromising quality of life [41].

Beyond these direct effects, anxiety may indirectly impair quality of life through its impact on chronic disease management and outcomes. Anxious patients demonstrate reduced adherence to medication regimens, lifestyle recommendations, and follow-up appointments [42]. The physiological effects of chronic anxiety, including elevated cortisol levels and sympathetic nervous system activation, may accelerate disease progression and increase risk of complications. Thus, anxiety may initiate a cascade of negative consequences that compound over time, progressively eroding quality of life.

The dose-response relationship between anxiety severity and quality of life impairment has important treatment implications. The findings suggest that any reduction in anxiety severity may yield meaningful quality of life improvements, with potentially greater absolute benefits achievable among those with more severe anxiety. This observation supports the value of anxiety intervention across the severity spectrum, from preventive approaches targeting those with mild symptoms to intensive treatment for severely affected individuals [43].

6.7 Mechanisms Linking Anxiety and Chronic Disease

Understanding the mechanisms underlying the association between anxiety and chronic medical conditions is essential for developing effective intervention strategies. The relationship between anxiety and chronic disease is bidirectional, with each condition capable of influencing the onset, progression, and outcomes of the other [44].

From a biological perspective, chronic anxiety activates the hypothalamic-pituitary-adrenal (HPA) axis and sympathetic nervous system, leading to sustained elevation of cortisol, catecholamines, and inflammatory cytokines [45]. These physiological changes have deleterious effects on multiple organ systems relevant to chronic disease pathophysiology. Elevated cortisol promotes insulin resistance, contributing to hyperglycemia in diabetic patients. Sympathetic activation increases heart rate and blood pressure, accelerating cardiovascular disease progression. Inflammatory mediators contribute to endothelial dysfunction, atherosclerosis, and airway inflammation relevant to COPD [46].

Behavioral mechanisms also play important roles in the anxiety-chronic disease relationship. Anxiety is associated with health-compromising behaviors, including physical inactivity, poor dietary choices, tobacco use, and excessive alcohol consumption [47]. These behaviors directly contribute to chronic disease risk and progression. Additionally, anxiety impairs self-management behaviors essential for chronic disease control, including medication adherence, glucose monitoring, and attendance at healthcare appointments. The cumulative impact of these behavioral factors may substantially contribute to adverse outcomes in anxious chronic disease patients.

Psychological mechanisms, including illness perceptions, coping strategies, and self-efficacy beliefs, mediate the relationship between anxiety and chronic disease outcomes. Anxious patients tend to hold more threatening illness perceptions, viewing their conditions as more severe, less controllable, and more likely to result in negative consequences [48]. These perceptions may become self-fulfilling prophecies, as catastrophic thinking reduces motivation for self-management and promotes avoidance behaviors.

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Anxiety also undermines self-efficacy for disease management, reducing patients' confidence in their ability to successfully implement treatment recommendations.

6.8 Clinical Implications

The findings of this study have substantial implications for clinical practice in chronic disease management settings. The high prevalence of clinically significant anxiety among chronic disease patients argues strongly for routine mental health screening as a standard component of care. Implementation of brief, validated screening instruments such as the GAD-7 during routine clinical encounters would enable early identification of patients requiring further assessment and intervention [49].

The disease-specific patterns of anxiety prevalence suggest that screening intensity and clinical vigilance should be calibrated according to the type of chronic condition. Patients with COPD, ischemic heart disease, and multiple chronic disorders represent particularly high-risk groups warranting enhanced mental health attention. However, the substantial anxiety burden observed even in conditions with relatively lower prevalence rates indicates that screening should be universal across chronic disease populations.

The identification of female gender, longer disease duration, higher comorbidity count, and lower socioeconomic status as risk factors for anxiety enables targeted identification of vulnerable patients. Clinicians should be particularly attentive to anxiety symptoms among patients exhibiting these characteristics and should consider proactive mental health support for high-risk individuals. Development of risk stratification tools incorporating these factors could facilitate efficient allocation of mental health resources [50].

The strong relationship between anxiety and quality of life underscores the importance of addressing mental health as a core component of chronic disease management rather than a secondary concern. Effective anxiety treatment may represent one of the most impactful interventions available for improving overall well-being and functional status in chronic disease populations. Integration of mental health services within chronic disease care pathways, through collaborative care models or embedded behavioral health services, may enhance access to appropriate treatment.

6.9 Limitations

Several limitations of this study should be acknowledged. The cross-sectional design precludes determination of causal relationships between anxiety and chronic disease variables. While the findings demonstrate associations, the temporal sequence of anxiety development relative to chronic disease onset and progression cannot be established. Longitudinal studies are needed to elucidate causal pathways and identify optimal timing for preventive interventions.

The study population was drawn from tertiary care hospitals in an urban setting, potentially limiting generalizability to primary care populations, rural settings, or other geographic regions. Patients accessing tertiary care may represent a more severely affected subset of chronic disease patients, and anxiety prevalence in community-based populations may differ from the estimates obtained in this study.

The reliance on self-report measures for anxiety assessment, while enabling standardized measurement using validated instruments, may be subject to response biases. Some participants may have underreported symptoms due to stigma associated with mental health concerns, while others may have overreported symptoms due to somatization or desire for clinical attention.

This study demonstrates a substantial burden of anxiety among patients with chronic medical disorders attending tertiary care hospitals in Ahmedabad, with nearly half of participants exhibiting clinically significant anxiety symptoms. The findings reveal important disease-specific patterns, with the highest anxiety prevalence among patients with multiple chronic disorders and COPD, and significant associations with female gender, disease duration, comorbidity count, and socioeconomic status. The strong inverse relationship between anxiety and quality of life underscores the functional impact of psychological distress in this population. These findings support the integration of routine mental health screening and intervention within chronic disease management to improve both psychological and medical outcomes.

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## CHAPTER 7: SUMMARY AND CONCLUSION

The present cross-sectional observational study was conducted to investigate the prevalence, correlates, and impact of anxiety symptoms among patients with chronic medical disorders attending tertiary care hospitals in Ahmedabad, Gujarat. The study was motivated by the growing recognition that chronic diseases and mental health conditions frequently co-occur, with significant implications for patient outcomes, quality of life, and healthcare utilization. Despite the substantial global burden of both chronic diseases and anxiety disorders, limited data were available regarding this association in the Indian healthcare context, particularly among patients accessing tertiary care services.

The study enrolled 335 participants aged between 30 and 58 years who were diagnosed with chronic disorders including chronic obstructive pulmonary disease (COPD), ischemic heart disease, diabetes mellitus, hypertension, and multiple chronic disorders. Data collection employed standardized instruments, including the Generalized Anxiety Disorder-7 (GAD-7) scale for anxiety assessment and validated quality of life measures. Sociodemographic and clinical information was gathered through structured questionnaires administered by trained research personnel following established protocols.

The demographic profile of the study population revealed a predominantly middle-aged cohort with a mean age of 44.0 ± 8.3 years. Males constituted 54.0% of participants, while females accounted for 46.0%. The majority of participants resided in urban areas (73.1%) and belonged to middle socioeconomic status (55.5%). Hypertension emerged as the most prevalent chronic disorder (31.3%), followed by diabetes mellitus (19.4%), ischemic heart disease (18.8%), COPD (17.6%), and multiple chronic disorders (12.8%). The mean duration of chronic disease was 5.0 ± 2.9 years, indicating substantial exposure to chronic illness within the study population.

The primary finding of this study was the remarkably high prevalence of anxiety symptoms among chronic disease patients. Nearly half of the study population (48.4%) exhibited clinically significant anxiety, defined as a GAD-7 score of 10 or higher. The distribution of anxiety severity revealed that mild anxiety was most prevalent (44.5%), followed by moderate anxiety (39.4%), severe anxiety (9.0%), and minimal anxiety (7.2%). These findings indicate that the vast majority of patients with chronic medical disorders experience some degree of anxiety symptomatology, with a substantial proportion requiring clinical intervention.

Examination of anxiety prevalence across chronic disorder categories revealed marked heterogeneity. Patients with multiple chronic disorders demonstrated the highest prevalence of clinically significant anxiety at 79.1%, reflecting the cumulative psychological burden of multimorbidity. Among single-disease categories, COPD patients exhibited notably elevated anxiety prevalence (61.0%), followed by ischemic heart disease (57.1%). Comparatively lower prevalence rates were observed among patients with diabetes mellitus (35.4%) and hypertension (31.4%), although these rates remained substantially elevated compared to general population estimates.

Gender emerged as a significant determinant of anxiety severity, with female participants demonstrating markedly higher rates of severe anxiety compared to males (13.0% versus 5.5%). The association between gender and anxiety severity was statistically significant (Chi-square = 10.81, $p = 0.013$), confirming the heightened vulnerability of female patients to anxiety in the context of chronic medical illness. This gender disparity is consistent with established literature and has important implications for targeted screening and intervention strategies.

Correlation analyses revealed significant associations between anxiety scores and several clinical variables. Disease duration demonstrated a weak positive correlation with anxiety ($r = 0.237$, $p < 0.001$), suggesting progressive accumulation of psychological burden over time. Duration of anxiety symptoms showed a strong positive correlation with current anxiety severity ($r = 0.686$, $p < 0.001$), indicating the chronic and self-perpetuating nature of anxiety in this population. Comorbidity count exhibited a moderate positive correlation with anxiety ($r = 0.399$, $p < 0.001$), highlighting the multiplicative impact of disease burden on psychological distress. Most notably, quality of life demonstrated a strong negative correlation with anxiety ($r = -0.811$, $p < 0.001$), indicating substantial functional impairment associated with anxiety severity.

Multiple regression analyses identified independent predictors of anxiety in this population. Female gender, longer disease duration, higher comorbidity count, and lower socioeconomic status emerged as significant risk factors for elevated anxiety scores. Chronic disorder type also significantly influenced anxiety, with COPD and multiple chronic disorders associated with higher anxiety compared to diabetes and hypertension. The regression model explained 40.3% of variance in anxiety scores, indicating that the identified factors account for a substantial portion of anxiety variability.

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Logistic regression analysis confirmed these findings, demonstrating that female participants had 89% higher odds of clinically significant anxiety compared to males. Each additional year of disease duration increased anxiety odds by 19%, while each additional comorbidity more than doubled the odds. Middle and upper socioeconomic status demonstrated protective effects, with significantly reduced odds of clinically significant anxiety compared to lower socioeconomic status.

The impact of anxiety on quality of life was profound and graded. Mean quality of life scores declined progressively across anxiety severity categories, from 75.9 points in the minimal anxiety group to 43.0 points in the severe anxiety group. This 33-point reduction represents a dramatic deterioration in functional status and well-being associated with severe anxiety symptoms.

This study provides compelling evidence for a substantial burden of anxiety among patients with chronic medical disorders in the Indian tertiary care context. The finding that nearly half of chronic disease patients experience clinically significant anxiety underscores the critical need for integrated mental health services within chronic disease management pathways. The marked heterogeneity in anxiety prevalence across chronic conditions, with particularly elevated rates among patients with multimorbidity and cardiopulmonary diseases, suggests the need for disease-specific approaches to mental health screening and intervention.

The identification of modifiable and non-modifiable risk factors for anxiety, including gender, disease duration, comorbidity burden, and socioeconomic status, enables targeted identification of vulnerable patients who may benefit from proactive mental health support. The strong inverse relationship between anxiety and quality of life emphasizes that addressing psychological distress represents a meaningful strategy for improving overall well-being and functional outcomes in chronic disease populations.

Based on these findings, several recommendations emerge for clinical practice and health policy. First, routine anxiety screening using validated instruments should be incorporated into standard chronic disease care protocols. Second, healthcare providers should maintain heightened vigilance for anxiety symptoms among high-risk groups, including female patients, those with longer disease duration, multimorbid individuals, and those from lower socioeconomic backgrounds. Third, collaborative care models integrating mental health services within chronic disease management should be developed and implemented. Fourth, patient education regarding the relationship between chronic illness and psychological well-being may facilitate help-seeking and reduce stigma associated with mental health concerns.

Future research should employ longitudinal designs to elucidate causal pathways and identify optimal timing for preventive interventions. Evaluation of integrated care models and anxiety-specific interventions within chronic disease populations would provide valuable evidence to guide clinical practice. Additionally, research examining anxiety burden in primary care and community settings would enhance understanding of the full spectrum of chronic disease patients and inform population-level intervention strategies.

In conclusion, this study establishes that anxiety represents a prevalent, consequential, and addressable concern among patients with chronic medical disorders. Recognition and treatment of anxiety should be considered an integral component of comprehensive chronic disease care, with potential benefits extending to both psychological well-being and medical outcomes.

## REFERENCES

[1] Lustman PJ, et al. Anxiety disorders in adults with diabetes mellitus. Psychiatr Med. 1988.
[2] Grigsby AB, et al. Prevalence of anxiety in adults with diabetes. Diabetes Care. 2002;25:1418-1425.
[3] Brenes GA, et al. Anxiety and chronic obstructive pulmonary disease. Am J Geriatr Psychiatry. 2003;11:622-625.
[4] Moussavi S, et al. Depression, chronic diseases, and decrements in health. Lancet. 2007;370:851-858.
[5] Clarke DM, Currie KC. Depression, anxiety and their relationship with chronic diseases: a review of the epidemiology, risk and treatment evidence. Med J Aust. 2009;190(S7):S54-S60.
[6] Patel ARC, Hurst JR. Extrapulmonary comorbidities in chronic obstructive pulmonary disease: state of the art. Expert Rev Respir Med. 2011;5(5):647-662.
[7] Proietti R, et al. Mental stress and ischemic heart disease: evolving awareness of a complex association. Future Cardiol. 2011;7(3):425-437.
[8] Player MS, et al. Anxiety disorders, hypertension, and cardiovascular risk: a review. Curr Hypertens Rep. 2011;13:425-431.
[9] Smith KJ, et al. Association of diabetes with anxiety: a systematic review and meta-analysis. J Psychosom Res. 2013.
[10] Willgoss TG, Yohannes AM. Anxiety disorders in patients with COPD: a systematic review. Respir Care. 2013.
[11] Tully PJ, Cosh SM, Baune BT. A review of the affects of worry and generalized anxiety disorder upon cardiovascular health and coronary heart disease. Psychol Health Med. 2013;18(6):627-644.
[12] Schäfer I, et al. A visualisation of multimorbidity by combining disease clusters and triads. BMC Public Health. 2014.
[13] Tully PJ, Cosh SM, Baumeister H. The anxious heart in whose mind? A systematic review and meta-regression of factors associated with anxiety disorder diagnosis, treatment and morbidity risk in coronary heart disease. J Psychosom Res. 2014;77(6):439-448.
[14] Pan Y, et al. Association between anxiety and hypertension: a systematic review and meta-analysis. Neurosci Biobehav Rev. 2015;47:1-12.
[15] Tully PJ, et al. Anxiety and Cardiovascular Disease Risk: a review. Curr Cardiol Rep. 2016;18:120.
[16] Allgulander C. Anxiety as a risk factor in cardiovascular disease. Curr Opin Psychiatry. 2016;29(1):13-17.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 15 Issue 04 , April - 2026

[17] Celano CM, et al. Anxiety disorders and cardiovascular disease. Curr Psychiatry Rep. 2016;18:101.
[18] Morrison D, et al. Managing multimorbidity in primary care in patients with depression or anxiety. BMJ. 2016.
[19] Reynolds R, et al. A systematic review of chronic disease management interventions for adults with physical health problems and comorbid depression or anxiety. BMC Psychiatry. 2018.
[20] Uphoff EP, et al. A systematic review and meta-analysis of the prevalence of common mental disorders in adults with non-communicable diseases in South Asia. J Glob Health. 2019;9(2):020417.
[21] Johnson HM, et al. Anxiety and hypertension: is there a link? A literature review of the comorbidity relationship between anxiety and hypertension. Curr Hypertens Rep. 2019;21:66.
[22] Amiri S, Behnezhad S. Diabetes and anxiety symptoms: a systematic review and meta-analysis. Int J Psychiatry Med. 2019.
[23] Hamam MS, et al. Anxiety, depression, and pain: considerations in the treatment of patients with uncontrolled hypertension. Curr Hypertens Rep. 2020;22:106.
[24] van der Meer RE, et al. The role of mental stress in ischaemia with no obstructive coronary artery disease and coronary vasomotor disorders. Eur Cardiol. 2021;16:e52.
[25] Lim LF, et al. Association between anxiety and hypertension in adults: a systematic review and meta-analysis. J Affect Disord. 2021;293:21-29.
[26] Sara JDS, et al. Anxiety disorders are associated with coronary endothelial dysfunction in women with chest pain and nonobstructive coronary artery disease. J Am Heart Assoc. 2021;10(17):e021722.
[27] Mersha AG, et al. A bidirectional relationship between diabetes mellitus and anxiety: a systematic review and meta-analysis. J Affect Disord. 2022;315:138-148.
[28] Kappelin C, et al. Specific content for collaborative care: a systematic review of collaborative care interventions for patients with multimorbidity involving depression and/or anxiety in primary care. BMC Prim Care. 2022;23:210.
[29] Scott AJ, et al. Depression and anxiety trajectories in chronic disease: a systematic review and meta-analysis. Psychother Psychosom. 2023;92(4):227-242.
[30] Christiansen CF, et al. COPD-related anxiety: a systematic review of patient perspectives. Int J Chron Obstruct Pulmon Dis. 2023.
[31] Taloyan M, et al. Physical-mental multimorbidity in a large primary health care population. J Affect Disord. 2023;329:558-566.
[32] Rahi MS, et al. The impact of anxiety and depression in chronic obstructive pulmonary disease. Cureus. 2023;15:e36788.
[33] Qiu T, et al. Comorbidity of anxiety and hypertension: common risk factors and potential mechanisms. Front Cardiovasc Med. 2023;10:1200741.
[34] Gaffey AE, et al. Psychological health and ischemic heart disease in women: a review of current evidence and clinical considerations across the healthspan. Curr Atheroscler Rep. 2024;26:1-14.
[35] Chen H, et al. Gut microbiota and its metabolites: the emerging bridge between coronary artery disease and anxiety and depression? Heart Fail Rev. 2024.
[36] DeJean D, Giacomini M, Vanstone M, Brundisini F. Patient experiences of depression and anxiety with chronic disease: a systematic review and qualitative meta-synthesis. Ont Health Technol Assess Ser. 2013;13(16):1-33.
[37] Atlantis E, Fahey P, Cochrane B, Smith S. Bidirectional associations between clinically relevant depression or anxiety and COPD: a systematic review and meta-analysis. Chest. 2013;144(3):766-777.
[38] Baraniak A, Sheffield D. The efficacy of psychologically based interventions to improve anxiety, depression and quality of life in COPD: a systematic review and meta-analysis. Patient Educ Couns. 2011;83(1):29-36.
[39] Blakemore A, Dickens C, Guthrie E, Bower P, Kontopantelis E, Afzal C, et al. Depression and anxiety predict health-related quality of life in chronic obstructive pulmonary disease: systematic review and meta-analysis. Int J Chron Obstruct Pulmon Dis. 2014;9:501-512.
[40] Smith KJ, Gariépy G, Schmitz N. Investigating the longitudinal association between diabetes and anxiety: a systematic review and meta-analysis. Diabet Med. 2018;35(6):677-693.
[41] Lebel S, Mutsaers B, Tomei C, Seguin Leclair C, Jones G, Petricone-Westwood D, et al. Health anxiety and illness-related fears across diverse chronic illnesses: a systematic review on conceptualization, measurement, prevalence, course, and correlates. PLoS One. 2020;15(7):e0234124.
[42] Zhang X, Wang C, Cui Y, Huang X, Wang J, Zhang X, et al. Effects of cognitive behavioral therapy on anxiety and depression in patients with chronic obstructive pulmonary disease: a meta-analysis. J Affect Disord. 2020;275:243-251.
[43] Gordon CS, Waller JW, Cook RM, Cavalera SL, Lim WT, Osadnik CR. Effect of pulmonary rehabilitation on symptoms of anxiety and depression in COPD: a systematic review and meta-analysis. Chest. 2019;156(1):80-91.
[44] García-Lara RA, Gómez-Urquiza JL, Membrive-Jiménez MJ, Suleiman-Martos N, Albendín-García L, Cañadas-De la Fuente GA. Anxiety, distress and stress among patients with diabetes during COVID-19 pandemic: a systematic review and meta-analysis. J Pers Med. 2022;12(9):1418.
[45] Taloyan M, Wändell P, Shen Q, Carlsson AC, Ljunggren G, Ferlander S, et al. Physical-mental multimorbidity in a large primary health care population. J Affect Disord. 2023;329:558-566.
[46] Huang Y, Wang S, Chen Q, Li M, Zhang Y, Li J, et al. The effect of self-management on patients with chronic diseases: a systematic review and meta-analysis. Patient Prefer Adherence. 2024;18:2507-2523.
[47] Sumner J, Rotenstein LS, Bhatia RS, Zulman DM, Maben J, Figueroa JF. Co-designing care for multimorbidity: a systematic review. J Comorb. 2024;14:26335652412307 51.
[48] Selzler AM, Rodgers WM, Berry TR, Stickland MK. The relationship between physical activity, depression and anxiety in chronic obstructive pulmonary disease: a systematic review and meta-analysis. J Cardiopulm Rehabil Prev. 2023;43(4):E53-E61.
[49] Wu K, Wang Y, Li X, Zhang H, Chen L, Zhao J, et al. Associations of anxiety and depression with prognosis in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. J Psychosom Res. 2025;189:111948.
[50] Costa AP, Silva CN, Ferreira J, Gomes A, Carvalho M, Mendes R, et al. Meshing anxiety, depression, quality of life, and multimorbidity in chronic disease: a systematic review. Int J Environ Res Public Health. 2025;22(5):2452.