

Research Article

Changes in Frailty and Depressive Symptoms Among Middle Aged Group of Local Community of Lahore.

Muhammad Ahmad¹, Muhammad Abdullah², Inam Ullah³, Fareha Janjua⁴, Hussain Mehmood⁵, Umer Sadat⁶

¹⁻⁵Department of Community Medicine, Kind Edward Medical University, Lahore.

⁶School of Clinical Medicine, University of Cambridge, United Kingdom.

Abstract

Frailty is a common yet unrecognized elderly syndrome that reflects an increased vulnerability to shocks due to the depletion of physiological reserves in multiple body systems. Although frailty has traditionally been associated with old age, recent studies have shown that middle-aged individuals can also suffer it, particularly if they have chronic illnesses. It has detrimental effects that include falls, hospitalization, disability, poor quality of life, and early mortality. The study employs the FRAIL index and Patient Health Questionnaire-9 (PHQ-9) to assess these conditions.

Objectives: The aim of study is to determine the correlation of frailty and depression among middle-aged individuals (45-65 years) in local community of Lahore, Pakistan, and to explore the effects of gender and age on this relationship.

Methods: This cross sectional study conducted in Lahore from Jan 2024 to Oct 2024. A total of 332 participants were selected using non-probability convenience sampling from Lahore. Inclusion criteria included middle-aged individuals (45-65 years) exhibiting depressive symptoms and signs of frailty. Data collection involved administering FRAIL index to measure frailty and the Patient Health Questionnaire-9 (PHQ-9) to gauge depressive symptoms. Statistical analysis was performed using python (version 3.12), employing descriptive statistics and Pearson's correlation coefficient to examine associations.

Results: The study found that a significant proportion of the middle-aged local community of Lahore exhibited both frailty and depressive symptoms. A notable association was found between the severity of depressive symptoms and the degree of frailty. Socio-demographic factors such as age and gender had considerable impact on this association.

Conclusion: This study emphasizes the critical need for integrated treatment and early screening for depression and frailty in middle-aged individuals in Pakistan. Given that they are disproportionately affected, women should be given more consideration. Providing psychological support and encouraging physical activity are two examples of community-based preventive strategies that may be highly successful. These findings can guide future health initiatives that target the mental and physical well-being of this vulnerable population

Keywords: Frailty, FRAIL Index, Depressive Symptoms, Middle-Aged.

Corresponding Authors: Hussain Mehmood **Email:** hussain14136@gmail.com

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Introduction

Frailty is a common yet unrecognized elderly syndrome that reflects an increased vulnerability to shocks due to the depletion of physiological reserves in multiple body systems. Although frailty has traditionally been associated with old age, recent studies have shown that middle-aged individuals can also suffer it, particularly if they have chronic illnesses. It has detrimental effects that include falls, hospitalization,

disability, poor quality of life, and early mortality. Despite the serious health repercussions, frailty is largely ignored in community settings, especially in low- and middle-income countries like Pakistan¹. Secondly depression is a significant cause of emotional suffering in middle aged people which is characterized by a low mood or loss of pleasure or interest in activities for longer periods of time². The understanding of progression of frailty and depression among middle aged and older population is essential both locally and globally.

The FRAIL index is a useful instrument for quick forecasts to screen population prevalence and proposal to effectively address this issue because it serves as a reliable indicator of frailty, including fatigue, resistance, ambulation, illnesses and loss of weight³. PHQ-9 is a



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questionnaire used for assessing depressive symptoms; this instrument quantifies the severity of depression experienced by the patient over the past 2 weeks based on self-reported depressive symptoms⁴.

Literature review shows that both frailty and depression are common in older populations⁵. At the same time, their co-occurrence rate significantly exceeds than would be expected by chance, supporting the idea of a bidirectional relationship; suggesting that depressive symptoms can increase the aggravation of frailty while the latter can also exacerbate depressive state and symptoms⁶.

Existing research has tried to define the causal pathways and the nature of these interactions⁷. Many of the existing studies have been cross-sectional, limiting the ability to conclude the causality and the dynamic understanding of how these conditions cause and influence each other over time⁸. In addition, many of the previous research programs have targeted extremely elderly cohorts, with the younger cohorts remaining less studied. This is crucially relevant since interventions at this age may be more efficient to significantly improve the quality of life and to prevent further aggravation of these symptoms⁹.

Despite the indispensability of understanding frailty and depressive symptoms on a global scale, few localized studies accord this issue on the local population. Research into how these conditions affect middle-aged and older adults at a community level in Punjab is sparse. Local studies are crucial for developing targeted interventions that address the specific needs of Punjab's aging population because this region is characterized by unique socio-economic and cultural characteristic which may differ significantly from those derived from broader national or international studies. The aim of this study is to determine the interrelationship of depression and frailty among middle-aged local community of Lahore, Pakistan; and identifies the socio-demographic factors associated with these conditions.

Methods

Sample size of 332 patients is estimated by using 95% confidence level, 4% absolute precision with expected percentage prevalence of Frailty and Depressive Symptoms Among Middle Aged Group of Local Community of Lahore; as 1.4%.⁶

$$n = \frac{Z_{1-\alpha/2}^2 pq}{d^2}$$

$Z_{1-\alpha/2}$ = confidence level 95% = 1.96

P = prevalence = 1.4%

q = 1 - p

d = absolute precision = 4%

Included in study:

- Middle aged people, older than 45 years and younger than 65 years old.

- Individuals with depressive symptoms
- Individuals exhibiting signs of frailty

Excluded from the study were:

- Individuals with acute or terminal physical illnesses.
- Non-residents of Lahore.
- Individuals unable to provide informed consent.

Study Design:

Descriptive Cross-sectional study.

Study Setting and Duration:

Lahore and 9 months duration.

Data Collection Procedure:

The study employed non-probability convenience sampling to select participants from Lahore aged 45-65. Participants completed the PHQ-9 and FRAIL index questionnaires. For PHQ-9, participants were asked 9 questions to assess depression with their resulting sum ranging 0-27. FRAIL index included 5 questions to assess frailty among patients, with sum of resultant values ranging 0.0-1.0.

Data Analysis:

All collected data was analyzed using python (version 3.12). Correlation of PHQ-9 and Frailty was determined and relationship of age, gender with such correlation also analyzed.

Results

There were a total of 332 participants aged 45-65; with a mean age of 52 years.

Of these, 193 (58%) were male and 139 (42%) were female.

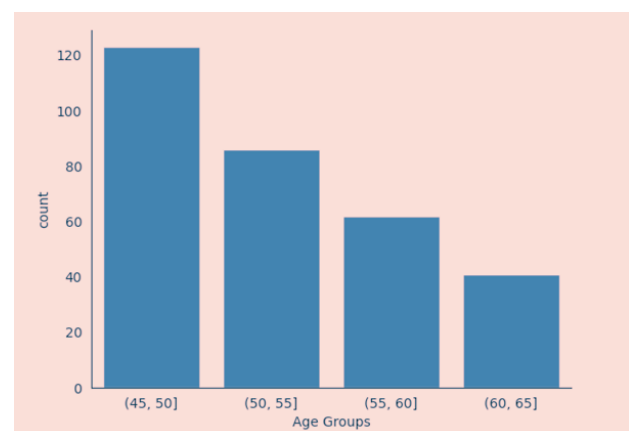


Fig. 1 Frequency of age groups

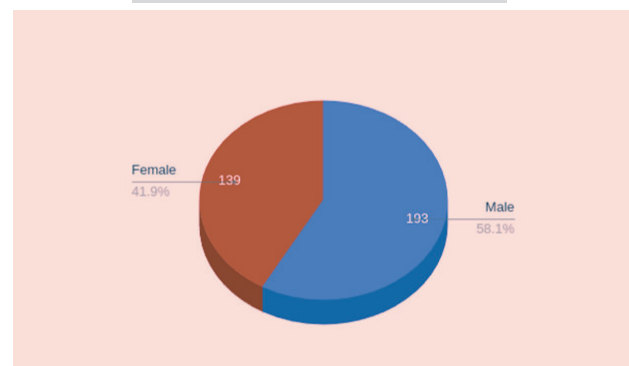


Fig. 2 Pie Chart of gender distribution

Table 1: Descriptive statistics of PHQ-9 and FRAIL

	PHQ-9			FRAIL		
	Both	Male	Female	Both	Male	Female
Mean	8.84	8.46	9.38	0.27	0.26	0.28
Median	7	6	8	0.2	0.2	0.2
Mode	6	6	6	0.2	0.2	0.2
S.D	6.59	6.55	6.63	0.26	0.27	0.26

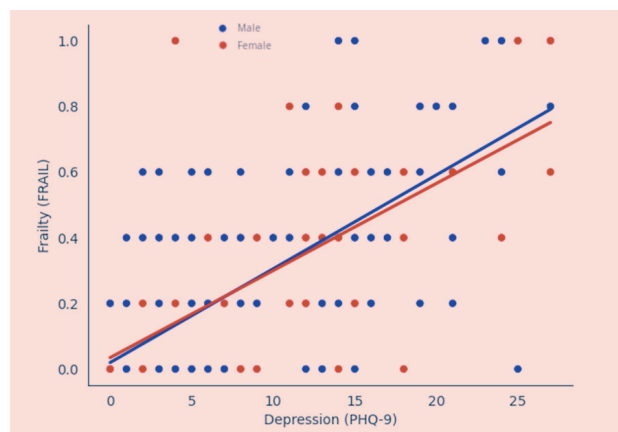
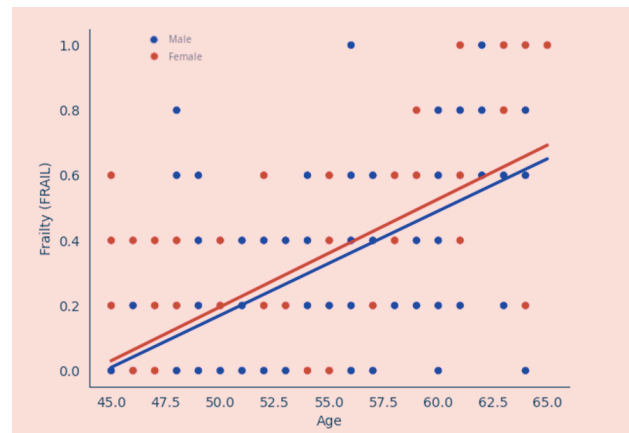
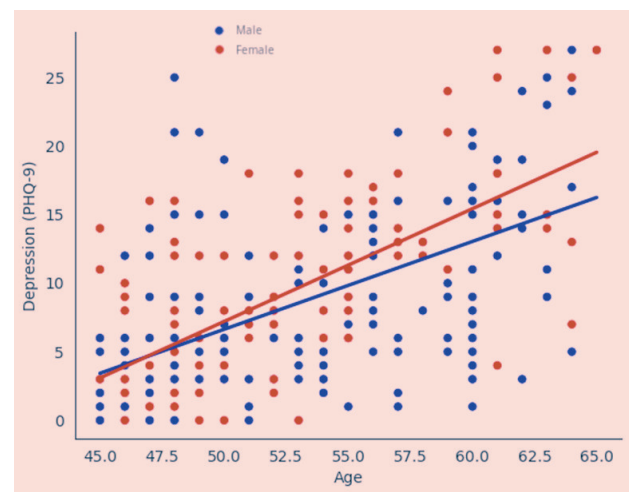
Correlation of Frailty And Depression:

The analysis revealed a positive correlation between frailty and depressive symptoms among the participants, with a Pearson correlation coefficient of 0.69 ($p < 0.001$). This indicates a strong association where individuals with higher frailty scores tend to report more severe depressive symptoms. The strength of this correlation highlights the interconnected nature of physical and mental health in this population, suggesting that as frailty increases, so does the burden of depression.

Relationship With Age:

Frailty vs Age: A strong positive correlation was found between frailty and age ($r = 0.69$, $p < 0.001$); suggesting that frailty significantly increases as individuals move from the younger to the older end of the middle-aged spectrum. The linear increase in frailty with advancing age underscores the progressive nature of this syndrome. The strong correlation also indicates that age is a critical factor in the onset and progression of frailty, likely due to the cumulative effects of aging on physiological reserves and overall health.

Depression vs Age: Depression and age also showed a positive correlation, though slightly weaker than the frailty-age correlation ($r = 0.61$, $p < 0.001$). This moderate correlation suggests that depressive symptoms tend to increase with age among middle-aged individuals.

**Fig. 3:** scatter plot of Frailty(FRAIL) and Depression(PHQ-9)**Fig. 4:** Scatterplot of Frailty (FRAIL) and Age**Fig. 5:** Scatterplot of Depression(PHQ-9) and Age**Gender Preponderance:**

Female gender was associated with more depression and frailty in middle ages (Table 1).

Depression and Frailty correlation difference: The correlation between Depression and Frailty was similar in females ($r = 0.69$, $p < 0.001$) compared to males ($r = 0.69$, $p < 0.001$), indicating that as frailty increases, depression also increases regardless of gender. **Age and Depression correlation difference:** The correlation

between Age and Depression was stronger in females ($r = 0.68$, $p < 0.05$) compared to males ($r = 0.56$, $p < 0.05$), suggesting that older age is somewhat more closely associated with depression among females.

Age and Frailty correlation difference: A significant difference between correlation of age and frailty in females ($r = 0.86$, $p < 0.005$) and males ($r = 0.68$, $p < 0.005$) was observed, hinting that advancing age in females is more correlated with frailty.

Discussion

Our study positively correlated frailty and depression in middle-aged individuals ($r = 0.69$, $p < 0.001$). Additionally, frailty increased with age ($r = 0.69$, $p < 0.001$), while depressive symptoms also demonstrated a moderate increase with age ($r = 0.61$, $p < 0.001$). Gender analysis revealed that while both males and females experienced frailty and depression, it was more marked in females than in males. Advancing age was more correlated with both these conditions in females than in males.

Frailty increases with age due to the cumulative impact of age-related diseases and the physiological decline of various body systems. One such cause is Osteoporosis, particularly in postmenopausal women, as it weakens bones, making them more susceptible to fractures and leading to physical disability. Osteoporosis contributes to frailty through decreased bone density and fractures, significantly affecting mobility and independence. This long-term loss of mobility results in decreased physical resilience, worsening frailty over time¹⁰.

Arthritis, particularly osteoarthritis, also significantly contributes to frailty by causing chronic pain and reduced joint mobility. One Study identified osteoarthritis as a prominent cause of physical impairment worldwide, increasing frailty due to functional impairment. Persistent pain leads to reduced physical activity, muscle atrophy, and diminished capacity for daily activities, thus accelerating frailty¹¹.

Hypertension (HTN) is another major factor contributing to frailty. Over time, chronic HTN damages blood vessels, leading to increased incidence of heart diseases, strokes, and kidney problems. This vascular damage reduces cardiovascular efficiency, leading to frailty. HTN accelerates the decline in physical function and frailty by limiting endurance and exercise capacity¹².

Similarly, diabetes can potentially exacerbate frailty by causing complications such as neuropathy, vision loss, and cardiovascular disease. Diabetes-related frailty has been examined in a study indicating that diabetic patients experience more functional decline and increased frailty as opposed to non-diabetic individuals, attributed to both microvascular and macrovascular complications¹³.

Lastly, sarcopenia, loss of muscle mass and strength with

advancing age, is a primary factor in exacerbating frailty. Research has shown that sarcopenia leads to decreased mobility, higher risk of falls, and reduced functional independence, all of which contribute to the onset of frailty¹⁴.

Depression also increases with age, partly due to a variety of biological, social, and psychological changes. One significant contributing factor is chronic disease burden. As people age, they are more likely to develop multiple chronic diseases, such as osteoporosis, heart disease, diabetes, and arthritis, all of which have been linked to increased rates of depression. One study found that chronic illnesses not only reduce quality of life but also increase psychological stress, contributing to the onset and progression of depression in aging populations¹⁵.

Social isolation is a major aggravator of depression in older population; loneliness and lack of social interaction increase depressive symptoms, especially in older populations. Social isolation is exacerbated by reduced mobility, retirement and loss of loved ones¹⁶.

The decline in cognitive function with age also contributes to depression. Cognitive decline, particularly in memory and executive functioning, is associated with increased depressive symptoms, as individuals struggle with daily tasks and experience feelings of helplessness¹⁷.

The relationship between frailty and depression is multifactorial and bidirectional. Frail individuals are at increased risk of developing depression due to their physical limitations, decreased social engagement, and increased dependency on others. In turn, individuals with depression may become less physically active, worsening frailty. This correlation was explored in a study which highlighted that depressive symptoms often lead to reduced mobility and physical inactivity, creating a cycle that perpetuates frailty¹⁸.

Our study found that females exhibited more frailty and depression than males. One explanation is hormonal changes, particularly postmenopausal decreases in estrogen, which have been linked to both frailty and depression. Estrogen plays a protective role in bone density and mood regulation, and its decline contributes to both osteoporosis and increased risk of depression¹⁹. Women are also more likely to assume caregiver responsibilities, which increases physical and emotional stress. This added burden may contribute to both frailty and the development of depressive symptoms, particularly among middle-aged women²⁰.

Socioeconomic factors also play a role, as women in lower-income households may experience greater financial stress, contributing to both depression and frailty. Women with lower socioeconomic status experienced higher rates of frailty and depression compared to men in similar economic conditions. Gender disparities in access to healthcare and social support

further exacerbate these issues²¹.

Our findings align with global studies that show a strong correlation between frailty and depression. One longitudinal study on middle-aged and older Chinese population also reported a significant correlation between frailty and depressive symptoms⁸. Similarly, extensive research from Western populations confirms the bidirectional relationship between these two conditions²². However, most global studies focus on older populations²³, whereas our study adds valuable insight into middle-aged adults, particularly within the Pakistani context.

Local studies on frailty and depression are sparse in Pakistan, especially in middle-aged individuals. However, one local research explored the prevalence of depression in Pakistani women, highlighting the high rates of depressive symptoms due to sociocultural stressors²⁴. Our findings extend this knowledge by linking these symptoms with physical frailty, particularly in middle-aged women, a demographic that has not been extensively studied in Pakistan.

The results of this study have significant implications for healthcare policy in Pakistan. Given the high prevalence of both frailty and depression among middle-aged individuals, particularly women, there is a need for integrated healthcare interventions that focus on both the physical and mental aspects of health. Screening for frailty and depression in middle-aged adults, especially those with chronic diseases, could help in early intervention.

Community health programs should also focus on preventive measures, such as promoting physical activity and social engagement, which reduce the risk of both frailty and depression. Gender-specific programs that provide social support for women, particularly those in caregiving roles, could alleviate some of the stressors contributing to these conditions.

Moreover, public health awareness campaigns could improve outcomes in both frailty and depression by destigmatizing mental health issues and creating a positive environment for seeking help for depression. Healthcare providers should consider gender and socioeconomic factors when designing interventions for this population.

There are a few limitations in this study. Cross-sectional design limits the ability to track temporal progression of depression and frailty. Moreover, the reliance on self-reported measures for depressive symptoms and frailty may introduce response biases. Future longitudinal studies are needed to explore the directionality and causality of these relationships. Additionally, the lack of local studies in Pakistan on frailty and depression in middle-aged individuals limits the comparability of our findings, necessitating more research in this area.

Conclusion

This study emphasizes the critical need for integrated treatment and early screening for depression and frailty in middle-aged individuals in Pakistan. Given that they are disproportionately affected, women should be given more consideration. Providing psychological support and encouraging physical activity are two examples of community-based preventive strategies that may be highly successful. These findings can guide future health initiatives that target the mental and physical well-being of this vulnerable population.

Conflict of interest: Authors declare no conflict of interest.

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Ethical Approval: Ethical approval was obtained from King Edward Medical University, Lahore.

Authors' Contributions:

MA, MA, IU: Involved in conceptualization of study and writing original draft

FJ, HM, : Involved in data extraction, analysis and final review

HM, US: final review and editing

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