

Unmasking the Mental Health Burden of Hypertension: Examining Psychological Distress, And Cognitive Function, Impact on Quality of Life in Patients Undergoing Treatment in a Tertiary Care Hospital

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Background and Aim: A major global public health concern is hypertension, particularly in low- and middle-income countries like Pakistan. Despite the fact that its physical manifestations are widely recognized, little is known about its psychological effects and how they impact patients' quality of life (QoL) in clinical practice and research. The current study examined the relationship between the quality of life of patients with hypertension and psychological distress, including stress, anxiety, and depression.

Methods: A total of 385 patients were recruited from a tertiary care facility in Lahore using a cross-sectional approach. The Depression, Anxiety, and Stress Scale (DASS-21) was used to measure psychological distress, and the 12-item Short Form Health Survey (SF-12) was used to measure quality of life. The Physical Component Summary (PCS-12) and the Mental Component Summary (MCS-12) are the two summary scores that are produced by the SF-12. Non-parametric tests like the Kruskal–Wallis *H*-test and the Mann–Whitney *U*-test were used in the statistical analysis.

Results: The findings showed substantial levels of psychological discomfort, with the most common severities being very severe anxiety (50.1%), severe depression (31.2%), and severe stress (46.8%). More significantly, there was a high association ($p < 0.001$) between lower PCS-12 and MCS-12 scores and depression, anxiety, and stress, indicating a substantial negative impact of psychological distress on both the mental and physical aspects of quality of life. Psychological health and QoL results were also predicted by sociodemographic characteristics, including age, gender, income, education, and work status.

Conclusion: These findings highlight the value of integrating psychological evaluation and psychiatric assistance into the management of hypertension for enhanced overall health outcomes as well as patient quality of life.

Keywords: hypertension, quality of life, depression, anxiety, stress, hypertensive patients, PCS-12, MCS-12 QoL, psychological factors, psychological distress, DASS-2, SF-12

Introduction

Hypertension is a major public health issue and a leading cause of morbidity and mortality worldwide, Responsible for approximately 30% of all cardiovascular-related deaths.^{1,2} It affects nearly 25% of the general population and 65% of the elderly.³ A recent review shows that hypertension is more prevalent in low- and middle-income countries (LMICs) (31.5%) compared to high-income countries (28.5%).⁴ Over 1.2 billion people worldwide suffer from hypertension,

making it one of the most serious public health issues, and it is projected to be the leading cause of disability by 2030.^{5,6} Hypertension contributes significantly to decreased disability-adjusted life years (DALYs) and is one of the most common complaints in primary care.^{7,8} Hypertension increases the risk of death, cardiovascular disease, stroke, and early disability.^{9,10} Beyond physical complications, hypertension is associated with psychological distress, including depression, anxiety, and stress, particularly among individuals with comorbid conditions or limited social support.¹¹

Quality of life (QoL) as defined by WHO is

an individual's subjective assessment of their standing in society, considering the cultural and value systems of their environment, and about their objectives, expectations, standards, and worries.^{3,12}

QoL is a multidimensional concept encompassing physical, emotional, and social well-being. Patients with chronic conditions such as hypertension often report diminished QoL due to both physical symptoms and psychological factors.¹³ Previous studies have shown that QoL in hypertensive patients can be influenced by factors including age, education, marital status, duration of diagnosis, type of medications, and mental health comorbidities.¹² Mental health disorders are more frequently reported among hypertensive individuals than in the general population.¹⁴ Screening for mental illnesses in elderly patients could help identify targets for preventive interventions and improve healthcare outcomes.^{15–17} Depression contributes not only to emotional distress but also to fatigue and increased mortality in patients with cardiovascular disease.^{18,19} When coexisting with hypertension, depression and anxiety heighten cardiovascular risk exponentially.^{9,19,20} Anxiety often accompanies hypertension and depression, manifesting as tension, chest pain, and gastrointestinal discomfort. It is associated with autonomic overactivation, leading to elevated blood pressure.²¹ Although hypertension has known modifiable (eg, diet, sodium, obesity) and non-modifiable (eg, genetics) risk factors, the direct causality between anxiety and hypertension remains debated.^{22,23}

Stress is also a critical factor in the onset and progression of hypertension. It can induce physiological changes, including elevated heart rate and blood pressure, and is associated with long-term complications such as psychiatric, autoimmune, and cardiovascular disorders.²⁴ A study showed young adults who show heightened BP responses to stress may be at a higher risk of developing hypertension as they age.^{25,26} This complex interplay of mental health issues and hypertension is reflected in the healthcare challenges in Pakistan, where a predominantly private healthcare system leaves 73% of the population without comprehensive health insurance, forcing them to pay out-of-pocket for medical expenses.⁴ According to WHO's STEPwise approach, implemented in Punjab and Sindh, stage I hypertension (SBP >140 mmHg and DBP >90 mmHg) is prevalent in 37% of the population, while stage II hypertension (SBP >160 mmHg and DBP >100 mmHg) affects 15.9%.²⁷ Although hypertension's physical complications are well documented, its psychological impact particularly in LMICs such as Pakistan, remains underexplored. Limited studies have examined how psychological distress affects QoL in hypertensive populations in this context. Our study addresses this gap by assessing the association between depression, anxiety, stress, and QoL in Lahore. The current study aims to explore the impact of psychological factors on QoL in patients with hypertension. By examining these factors, the study aims to promote more integrated treatment strategies that consider both mental and physical health to improve overall health outcomes.

Materials and Methods

Study Design

The study employed a cross-sectional research design, collecting data from participants representing hypertension.

Study Setting

It was conducted at the University of Lahore Teaching Hospital, which provided the necessary setup for the investigation. The study took place from January 2024 to August 2024.

Inclusion and Exclusion Criteria

The study participants were adults with confirmed hypertension who were at least 18 years of age. This group was selected to align with the study's focus on this medical condition. Participants were required to complete a questionnaire

and, therefore, had to be mentally stable and capable of understanding the questions in order to provide written informed consent. Patients with serious comorbidities, such as cancer, advanced renal disease, or heart failure, were excluded because these conditions could affect both hypertension and psychological outcomes. Additionally, pregnant patients were not included, as pregnancy-related physiological changes can impact blood pressure and psychological aspects. To maintain data quality, patients unable to understand the questionnaire due to cognitive disability or a language barrier were also excluded.

Sampling Method

Participants were chosen by using a convenient sampling method, which was used due to its practicality and ease of access to the study population.

Variables

The DASS-21 was used to quantify the psychological values of stress, anxiety, and depression as exposure variables in this study. This well-known self-report survey has 21 items that are evenly split into three subscales. Each item is evaluated on a 4-point Likert scale, with 0 representing “did not apply to me at all” and 3 representing “applied to me very much or most of the time.” More severe symptoms in each area result in higher scores. The outcome measure was QoL, which was measured by the SF-12. SF-12 produces two component scores, the PCS-12 and the MCS-12, both of which indicate respondents’ self-reported physical and mental health status. Further, sociodemographic and clinical factors—such as age, gender, marital status, education, working status, income per month, residential area (urban/rural), years with hypertension, number of times visited the doctor per month, controlled blood pressure, dietary habit, cholesterol level, and impacts on activities of daily living were included as covariates in the analysis to determine their impact on the relationship between psychological distress and quality of life.

Data Collection and Tools Used

The data collection tools were designed with the utmost sensitivity and care to clearly and properly explain the study’s objectives to the participants. For patients with linguistic challenges, validated DASS-21 and SF-12 scale questionnaires were employed in both English and Urdu versions. To enhance data quality across various literacy levels, qualified experts fluent in both languages were present during the data collection process. These experts were trained and available to answer any questions the patients might have and provide translations as necessary, especially for the assistance of the illiterate participants via interviewer-administered questionnaires. Recognizing the importance of a favourable environment in healthcare studies, as frequently highlighted in the research, the data collection setting was made comfortable and private. This setup encouraged respondents to provide honest and open responses. To ensure ethical standards were met, written informed consent was obtained from each participant.

DASS-21 Scale

The DASS-21 (Depression Anxiety Stress Scales-21) is a self-assessment tool designed to measure depression, anxiety, and stress levels. It comprises 21 items, with each item assessing one of these three emotional states. Participants rate their experiences on a scale over a defined time frame, often the past week. This tool is valuable in both clinical and research settings for measuring psychological distress. The DASS-21 includes three self-report scales used to assess the emotional states of stress, anxiety, and depression. Each of these scales contains 7 items, which are divided into subscales. The details of these scales are as follows:²⁸ The details of these scales are as follows:

Q3, 5, 10, 13, 16, 17, 21 (Depression)

Q1, 6, 8, 11, 12, 14, 18S (Stress)

Q2, 4, 7, 9, 20, 19, and 15 (Anxiety)

For scoring purposes, each factor is multiplied by a factor of 2 to determine the final score for depression (D), anxiety (A), and stress (S). Specifically:

Depression = D score x 2.

Stress = S score x 2

Table 1 Detail of Levels of Depression, Stress, and Anxiety

Psychological Factor	Level				
	Normal	Mild	Moderate	Severe	Extremely Severe
Depression	0-9	1-13	14-20	21-27	28+
Anxiety	0-7	8-9	10-14	15-19	20+
Stress	0-14	15-18	19-25	26-33	34+

$$\text{Anxiety} = A \times 2$$

The DASS-21 provides a detailed breakdown of the severity levels for each psychological factor, as shown in [Table 1](#). These levels help to categorize the intensity of depression, anxiety, and stress in the participants:

SF-12 Scale

The SF-12 questionnaire, used to assess the quality of life (QoL) of participants, consists of 12 items divided into 8 subscales. These subscales evaluate various health aspects, including role physical (2 items), physical functioning (2 items), general health (1 item), vitality (1 item), bodily pain (1 item), role emotional (2 items), mental health (2 items), and social functioning (1 item). The Mental Component Summary (MCS-12) score is derived from the raw scores of the mental health, social functioning, role emotional, and vitality sub-dimensions. In contrast, the Physical Component Summary (PCS-12) score is derived from the raw scores of the physical functioning, role physical, general health, and bodily pain sub-dimensions. The raw results from the PCS-12 and MCS-12 are then standardized on a scale from 0 to 100, with higher scores indicating better health. This comprehensive approach allows for a nuanced understanding of the participant's overall health and well-being.²⁹

Sample Size

To ensure the statistical reliability and generalizability of the data, the sample size calculation was crucial. The sample size was determined using Daniel's sample size formula:

$$\frac{Z\left(\frac{\alpha}{2}\right)^2 \cdot P(1 - P)}{d^2}$$

Where,

n' = sample size

$Z(\alpha/2)$ = Statistic for the level of confidence

P = Anticipated prevalence

d = Margin of error

A 95% confidence level ($Z = 1.96$) was used. The expected proportion (anticipated prevalence) was considered 50% ($P = 0.5$), and 5% precision (margin of error) will be considered ($d=0.05$).

$$n = \frac{(1.96)^2 \times 0.5(1 - 0.5)}{(0.05)^2}$$

$$n = 384.16$$

The calculated sample size was 384.

Pilot Study

A pilot study was conducted with 20 participants to evaluate the comprehensibility, clarity, and appropriateness of the questionnaire for the target study population. During this pilot testing phase, researchers identified aspects of the questionnaire that might need clarification or adjustment. Following pilot testing, a thorough reliability and validity analysis was performed on the questionnaire, which assessed the psychological well-being of hypertension patients. The reliability analysis indicated a high level of internal consistency, with Cronbach's alphas based on pilot data for stress,

anxiety, and depression being 0.892, 0.815, and 0.863, respectively, and for SF-12, 0.784. The construct validity of the questionnaire was further supported by the Content Validity Index (CVI) scores. The CVI was assessed by 10 experts who reviewed the tool. The experts rated each item on a 4-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). The CVI was determined on the basis of the proportion of items rated 3 or 4 by experts, which were 0.94 for stress, 0.91 for anxiety, 0.96 for depression, and 0.92 for SF-12. These findings demonstrate the validity and reliability of this questionnaire as a tool for evaluating psychological factors and QoL of hypertensive patients.

Statistical Analysis

SPSS version 27 was used for data analysis. Initially, the Shapiro–Wilk test was employed to determine if the data could be considered normally distributed. To outline the overall characteristics of the sample population, sociodemographic information was summarised for each patient based on age, gender, income level, and education level, using frequencies and percentages. The central tendencies and variability of the data were summarised by performing descriptive statistics, including medians and interquartile ranges (IQR), along with frequencies and percentages. QoL and psychological factors related to stress, anxiety, and depression levels were also presented as frequencies and percentages to show the distribution of these symptoms within the sample. For two-group comparisons, such as examining associations between dependent variables and independent variables with two categories, like gender, the Mann–Whitney *U*-test was used. The Kruskal–Wallis *H*-test was employed to assess associations between psychological and demographic factors or psychological factors and QoL for independent variables with more than two ordinal categories (eg, income ranges or educational attainment). All statistical tests were conducted at a significance level of $p < 0.05$ to ensure that only results with a high probability of statistical relevance were considered significant.

Results

Demographic Characteristics of Participants

Results from the current study showed that females represented a larger proportion of the study population at 55.6%, compared to males, who accounted for 44.4% (Table 2). The largest share of subjects, 42.9%, was above 55 years old, whereas those aged between 18–24 years formed the smallest category at only 9.6%. A considerable percentage, 51.2%

Table 2 Demographic Characteristics of the Participants (n=385)

Demographic characteristics	Variables	n	%
Gender	Male	171	44.4
	Female	214	55.6
Age	18-24	37	9.6
	25-34	26	6.8
	35-44	67	17.4
	45-54	90	23.4
	55 and above	165	42.9
Weight	40-60	61	15.8
	61-80	197	51.2
	81-100	102	26.5
	100 and above	25	6.5

(Continued)

Table 2 (Continued).

Demographic characteristics	Variables	n	%
Region	Urban	253	65.7
	Rural	132	34.3
Marital Status	Single	43	11.2
	Married	289	75.1
	Widow	51	13.2
	Divorced	2	0.5
Employment Status	Employed (full-time)	53	13.8
	Employed (part-time)	19	4.9
	Self-employed	37	9.6
	Unemployed	237	61.6
	Student	22	5.7
	Retired	17	4.4
Current Level of Education	Illiterate	133	34.5
	Primary education	99	25.7
	Secondary education	53	13.8
	Graduation	72	18.7
	Post-Graduation	28	7.3
Monthly Income	Less than 10,000 PKR	25	6.5
	10,000–20,000 PKR	78	20.3
	20,000–50,000 PKR	146	37.9
	50,000–1,00,000 PKR	75	19.5
	More than 100,000 PKR	61	15.8
Diagnosis of Hypertension	Less than 6 months ago	41	10.6
	6 months to 1 year ago	14	3.6
	1 to 2 years ago	39	10.1
	2 to 5 years ago	86	22.3
	More than 5 years ago	205	53.2
BP Check-ups	Monthly	147	38.2
	Every 3–4 months	115	29.9
	Every 6 months	78	20.3
	Once a year	45	11.7

(Continued)

Table 2 (Continued).

Demographic characteristics	Variables	n	%
Last BP Reading	<120/80 mmHg (Normal)	18	4.7
	120-139/80-80mmHg	97	25.2
	140-159/90-99 mmHg (stage 1)	140	36.4
	>160/100mmHg (Stage 2)	106	27.5
	Do not know	24	6.2
High BP effect on daily activities	Yes	322	83.6
	No	50	13
	Do not know	13	3.4
Diet	No sugar	45	11.7
	Low carbohydrate/sugar	3	0.8
	Low cholesterol	4	1
	Low salt	103	26.8
	Weight reduction	4	1
	Vegetarian	4	1
	No special diet	93	24.2
	No sugar + Low salt	53	13.8
	No sugar +Low salt + Low cholesterol	17	4.4
	Low salt + Low cholesterol	57	14.8
	No sugar + Renal	2	0.5
Cholesterol Level	Less than 200 mg/dL	118	30.6
	More than 200 mg/dL	68	17.7
	More than 250 mg/dL	27	7
	Do not know	172	44.7

of respondents, had a weight range of 61–80 kg, indicating that this was the most common weight group among them. Out of all respondents, 65.7% lived in urban areas, compared to 34.3% who lived in rural areas. Married individuals constituted the majority, making up close to three-quarters of the sample at 75.1%, while divorced individuals represented a very small segment at only 0.5%. The largest proportion of participants, 61.6%, were unemployed, whereas only 13.8% were working full-time. Most of the participants, 34.5%, had no schooling background. Primary education comprised nearly 25.7%, while post-graduate degree holders made up about 7%. The most frequently reported levels were extremely severe anxiety (50.1%), severe stress (46.8%), and severe depression (31.2%). Moderate depression (21.8%), anxiety (25.5%), and stress (17.4%) were also reported [Supplementary Figure-1](#).

Prevalence and Severity of Psychological Factors Among Study Participants

The level of depression, anxiety, and stress among the participants was measured using the DASS-21 scale, as outlined in [Supplementary Table 1](#). Difficulty winding down was reported at severe levels by 20.5% of the participants, and 43.4% found it hard to get going to some extent. Overreaction was extremely common, with 53.5% finding it at severe levels.

Touchiness was also commonly reported, where 49.6% found it at severe levels. Intolerance was experienced by 58.4% of the subjects. Also, 39% used nervous energy often, and 33% experienced moderate difficulty breathing. Hopelessness was experienced by 22.3% at a severe degree, while 35.8% experienced a severe lack of self-worth. Changes in heart rate were experienced moderately by 33.8%, and 25.7% indicated that they often experienced them. Fear with no apparent cause was experienced by 37.9%, with 6.5% indicating it was severe. These results underscore the extreme psychological distress that a high percentage of the participants endured.

Association of Depression, Anxiety, and Stress with Demographics

The analysis of psychological variables across various demographic groups revealed several key findings (Table 3). Females had higher mean ranks for depression (211.06, $p<0.001$), anxiety (199.57, $p=0.194$), and stress (208.04,

Table 3 Association of Depression, Anxiety, and Stress with Demographics

		Depression		Anxiety		Stress	
		Mean Rank	Median (IQR)	Mean Rank	Median (IQR)	Mean Rank	Median (IQR)
Gender	Male	170.4	22 (14)	184.77	20 (14)	174.18	26 (10)
	Female	211.06	24 (10)	199.57	20 (10)	208.04	28 (8)
	p-value	0.001***		0.194		0.003**	
Region	Urban	181.97	22 (14)	181.97	20 (12)	192.59	28 (10)
	Rural	214.14	24 (10)	214.14	22 (12)	193.79	28 (10)
	p-value	0.12		0.007**		0.919	
Age	18-24	120.34	14 (22)	115.23	14 (14)	112.74	14 (24)
	25-34	158.5	18 (15)	193.56	22 (11)	168.17	26 (15)
	35-44	201.29	24 (16)	204.04	20 (14)	208.99	28 (12)
	45-54	210.34	24 (12)	206.13	22 (11)	195.66	28 (10)
	55 and above	201.91	24 (10)	198.7	20 (10)	206.97	28 (8)
	p-value	0.001***		0.001***		0.001***	
Weight	40-60	159.58	20 (16)	191.38	20 (17)	170.72	26 (20)
	61-80	195.47	24 (12)	185.65	20 (12)	191.8	28 (10)
	81-100	211.11	24 (10)	202.58	22 (12)	211.13	28 (8)
	100 and above	181.14	22 (13)	215.76	22 (7)	182.82	28 (9)
	p-value	0.035*		0.442		0.143	
Marital Status	Married	200.54	24 (10)	198.03	20 (10)	202.71	28 (8)
	Single	108.26	14 (16)	122.91	14 (14)	106.13	14 (20)
	Widow	220.39	24 (10)	219.52	22 (12)	210.81	28 (8)
	Divorced	226.75	24 (0)	297.5	28 (0)	203	28 (0)
	p-value	0.001***		0.001***		0.001***	

(Continued)

Table 3 (Continued).

		Depression		Anxiety		Stress	
		Mean Rank	Median (IQR)	Mean Rank	Median (IQR)	Mean Rank	Median (IQR)
Employment status	Employed (full-time)	139.33	18 (21)	124.77	14 (13)	144.63	24 (22)
	Employed (part-time)	210.08	24 (16)	190.45	20 (14)	198.84	28 (6)
	Self-employed	154.12	20 (13)	178.3	20 (14)	158.55	24 (16)
	Unemployed	223	26 (10)	220.14	22 (10)	223.17	30 (6)
	Student	90.73	14 (16)	84.61	12 (13)	64.02	11 (16)
	Retired	140.03	18 (11)	202.44	18 (13)	158.56	26 (5)
	p-value	0.001***		0.001***		0.001***	
Current level of education	illiterate	232.12	26 (8)	236.93	24 (8)	222.62	30 (6)
	Primary education	220.59	24 (8)	213.85	22 (12)	226.01	30 (8)
	Secondary education	165.97	18 (14)	164.85	18 (15)	159.45	26 (11)
	Graduation	129.35	16 (19)	129.6	14 (10)	140.7	22 (17)
	Post-Graduation	124.48	14 (20)	126.93	15 (12)	133.57	21 (20)
	p-value	0.001***		0.001***		0.001***	
Monthly income	Less than 10,000 PKR	168.32	20 (14)	189.4	20 (11)	163.88	24 (18)
	10,000–20,000 PKR	219.1	24 (9)	225.84	22 (8)	222.24	30 (8)
	20,000–50,000 PKR	197.38	24 (12)	203.76	22 (12)	202.3	28 (10)
	50,000–1,00,000 PKR	189.95	24 (16)	164.93	18 (10)	185.59	28 (10)
	More than 100,000 PKR	163	20 (17)	161.24	18 (11)	154.39	26 (16)
	p-value	0.036*		0.001***		0.003**	
Diagnosed with hypertension	Less than 6 months ago	163.59	18 (12)	146.5	18 (12)	147.27	24 (16)
	6 months to 1 year ago	179.79	23 (11)	154.36	20 (13)	178.25	26 (9)
	1 to 2 years ago	203.45	26 (14)	175.69	18 (14)	210.22	28 (10)
	2 to 5 years ago	213.02	24 (14)	195.37	22 (12)	209.59	29 (7)
	More than 5 years ago	189.4	24 (10)	207.24	22 (12)	192.92	28 (10)
	p-value	0.169		0.010**		0.039*	
BP check-ups	Monthly	187.32	22 (12)	200.77	22 (14)	197.27	28 (10)
	Every 3–4 months	208.38	24 (12)	211.24	22 (12)	202.6	28 (10)
	Every 6 months	218.78	24 (9)	193.4	20 (10)	212.06	28 (6)
	Once a year	127.57	14 (19)	120.29	14 (12)	121.49	18 (19)
	p-value	0.001***		0.001***		0.001***	

(Continued)

Table 3 (Continued).

		Depression		Anxiety		Stress	
		Mean Rank	Median (IQR)	Mean Rank	Median (IQR)	Mean Rank	Median (IQR)
Last BP Reading	<120/80 mmHg (Normal)	135.5	18 (19)	117.19	15 (15)	126.44	20 (23)
	120-139/80-89mmHg (Prehypertension)	204.09	24 (16)	187.43	20 (12)	196.8	28 (10)
	140-159/90-99 mmHg (stage 1)	202.58	24 (12)	208.1	22 (12)	193.31	28 (10)
	>160/100mmHg (Stage 2)	195.25	24 (11)	199.88	20 (10)	219.87	29 (8)
	Do not know	125.48	14 (19)	153.92	16 (14)	107.04	14 (19)
	p-value	0.003**		0.006**		0.001***	
Effect on daily activities	Yes	205.33	24 (10)	208.85	22 (12)	204.36	28 (8)
	No	137.49	18 (19)	116.99	15 (11)	147.5	24 (17)
	Do not know	101	14 (12)	92.73	14 (13)	86.58	14 (13)
	p-value	0.001***		0.001***		0.001***	
Diet	No sugar	195.4	22 (9)	194.08	20 (13)	185.84	26 (10)
	Low carbohydrate/sugar	180.83	24 (0)	295.33	30 (0)	230.67	30 (0)
	Low cholesterol	110.5	15 (7)	181.38	18 (23)	90.38	16 (11)
	Low salt	222.68	24 (10)	215.35	22 (12)	215.25	30 (8)
	Weight reduction	147.5	17 (21)	111.88	16 (14)	120.13	18 (23)
	Vegetarian	167.38	20 (26)	105.13	10 (21)	112.75	21 (25)
	No special diet	149.83	18 (22)	127.36	14 (10)	151.44	24 (20)
	No sugar + Low salt	224.66	24 (10)	223.76	22 (10)	229.27	30 (6)
	No sugar +Low salt + Low cholesterol	151.26	18 (17)	200.76	22 (19)	175.71	26 (10)
	Low salt + Low cholesterol	201.66	24 (8)	234.94	24 (9)	214.62	30 (7)
	No sugar + Renal	212.25	23 (0)	201	21 (0)	165.25	25 (0)
	p-value	0.001***		0.001***		0.001***	
Cholesterol Level	Less than 200 mg/dL	201.71	24 (12)	181.06	20 (10)	206.48	28 (8)
	More than 200 mg/dL	158.04	20 (14)	185.38	20 (16)	176.26	26 (10)
	More than 250 mg/dL	168.13	22 (10)	228.5	24 (12)	169.83	26 (10)
	Do not know	204.75	24 (14)	198.63	20 (10)	194	28 (12)
	p-value	0.013*		0.18		0.213	

Notes: Mann Whitney test, Kruskal Wallis test, Significance value *p<0.1; **p<0.01; ***p <0.001 Bold values indicate statistically significant results at p < 0.05.

$p=0.003$) compared to males. Participants from rural areas reported slightly higher mean ranks for depression (214.14, $p=0.120$) and anxiety (214.14, $p=0.007$), though no significant differences were found in stress. Age played a significant role, with patients aged 45–54 having the highest mean rank for depression (210.34, $p<0.001$), those aged 55+ for anxiety (198.70, $p<0.001$), and individuals aged 35–44 for stress (208.99, $p<0.001$). Employment status significantly impacted psychological outcomes, with unemployed individuals having the highest mean ranks for stress (223.17, $p<0.001$), depression (223.00, $p<0.001$), and anxiety (220.14, $p<0.001$). Education level also influenced psychological variables; illiterate participants had the highest mean ranks for depression (232.12, $p<0.001$) and anxiety (236.93, $p<0.001$), while those with a primary education had the highest mean rank for stress (226.01, $p<0.001$). Marital status was another important factor, with widowed individuals having the highest mean rank for stress (210.81, $p<0.001$) and divorced individuals for depression (226.75, $p<0.001$) and anxiety (297.50, $p<0.001$). Regarding weight, patients weighing 81–100 kg had significantly higher mean ranks for depression (211.11, $p<0.035$). Monthly income had a notable effect, with individuals earning 10,000–20,000 PKR showing the highest mean ranks for depression (219.10, $p<0.036$), anxiety (225.84, $p<0.001$), and stress (222.24, $p<0.003$), while those earning more than 100,000 PKR had lower psychological distress scores. Participants with longer hypertension duration (more than five years) had higher anxiety (207.24, $p<0.010$), while those with only 1–2 years of hypertension experienced higher stress (210.22, $p<0.039$). Doctor visit frequency also played a role, with those making yearly visits reporting lower mean rankings for stress (121.49, $p<0.001$), depression (127.57, $p<0.001$), and anxiety (120.29, $p<0.001$). Hypertension stage impacted psychological well-being; stage I patients had the highest mean rank for anxiety (208.10, $p<0.006$), while stage II patients had the highest stress rankings (219.87, $p<0.001$). Prehypertensive patients had significantly higher depression levels (204.09, $p<0.003$). Participants who reported that hypertension interfered with their daily activities had the highest ratings for anxiety (208.85, $p<0.001$), depression (205.33, $p<0.001$), and stress (204.36, $p<0.001$). Dietary habits also influenced psychological health; those following a low-salt/no-sugar diet showed the highest depression levels (224.66, $p<0.001$), while those on a low carbohydrate/sugar diet had higher anxiety (295.33, $p<0.001$) and stress (230.67, $p<0.001$). Lastly, cholesterol levels were associated with psychological outcomes; participants who did not know their cholesterol levels had higher depression (204.75, $p<0.013$), while those with cholesterol levels above 250 mg/dL had higher anxiety (228.50, $p<0.180$), and those with cholesterol below 200 mg/dL had the highest stress (206.48, $p<0.213$).

Overview of Health and Functional Limitations From the SF-12 Survey

The SF-12 Health Survey results provided an overview of the limitations and views of health that the respondents indicated, as shown in [supplementary Table 2](#). Most respondents rated their health as excellent (30.1%) or very good (34.5%), while a small proportion assessed it as poor (2.9%) or fair (6.0%). Physical limitations were common, with 62.3% reporting difficulty climbing multiple flights of stairs, 55.3% struggling with moderate activities, and 55.6% unable to perform desired tasks due to physical health. These limitations impacted daily functioning, as 77.7% reported restrictions in job or activity types. Emotional problems impacted daily life; 59.2% claimed to have reduced achievements, while 74.5% of them reported being less attentive at work. The pain also acted as a mediator, with 17.7% having important interference and 32.7% having some interference in work. Although 35.6% felt lively most of the time and 28.3% felt peaceful, 30.1% were often downhearted and hopeless, showing the emotional impact on QoL.

Demographic Variations in QoL Scores

The study showed demographic differences in QoL scores ([Table 4](#)). Gender did not differ significantly, but QoL decreased with age; PCS-12 scores were much lower for those aged 55+ (43.4%) compared to the 18–24 age group (8.7%), and MCS-12 scores also declined significantly with age. QoL did not differ by weight categories. Urban respondents had a good physical QoL (65.0%) than rural respondents (35.0%), but mental QoL did not differ between urban and rural. Marital and employment statuses affected QoL, with married respondents having poorer physical QoL and poorer mental QoL (74.1%) than singles (11.5%). Full-time employees had better physical QoL (13.6% poor) than unemployed individuals (63.4%). Education level also affected physical QoL, with poor scores more common among illiterates (35.5%) than postgraduates (6.5%). Lastly, participants with stage I or II hypertension had consistently poor PCS-12 and MCS-12 scores.

Table 4 Demographic Variations in QoL Scores

		n	QoL			
			PCS-12		MCS-12	
			Poor	Good	Poor	Good
			n (%)	n (%)	n (%)	n (%)
Gender	Male	171	164 (44.4)	7 (43.8)	122 (43.9)	49 (45.8)
	Female	214	205 (55.6)	9 (56.3)	156 (56.1)	58 (54.2)
Age	18-24	37	32 (8.7)	5 (31.3)	27 (9.3)	10 (9.3)
	25-34	26	23 (6.2)	3 (18.8)	20 (5.6)	6 (5.6)
	35-44	67	65 (17.6)	2 (12.5)	55 (11.2)	12 (11.2)
	45-54	90	89 (24.1)	1 (6.3)	70 (18.7)	20 (18.7)
	55 and above	165	160 (43.4)	5 (31.3)	106 (55.1)	59 (55.1)
Weight	40-60	61	57 (15.4)	4 (25.0)	47 (16.9)	14 (13.1)
	61-80	197	188 (50.9)	9 (56.3)	147 (52.9)	50 (46.7)
	81-100	102	101 (27.4)	1 (6.3)	68 (24.5)	34 (31.8)
	100 and above	25	23 (6.2)	2 (12.5)	16 (5.8)	9 (8.4)
Region	Urban	253	240 (65)	13(81.3)	185 (66.5)	68 (63.6)
	Rural	132	129 (35)	3 (18.8)	93 (33.5)	39 (36.4)
Marital Status	Single	43	280 (75.9)	9 (56.3)	206 (74.1)	83 (77.6)
	Married	289	36 (9.8)	7 (43.8)	32 (11.5)	11 (10.3)
	Widow	51	51 (13.8)	0 (0.0)	39 (14.0)	12 (11.2)
	Divorced	2	2 (0.5)	0 (0.0)	1 (0.4)	1 (0.9)
Employment Status	Employed (full-time)	53	50 (13.6)	3 (18.8)	43 (15.5)	10 (9.3)
	Employed (part-time)	19	18 (4.9)	1 (6.3)	17 (6.1)	2 (1.9)
	Self-employed	37	36 (9.8)	1 (6.3)	30 (10.8)	7 (6.5)
	Unemployed	237	234 (63.4)	3 (18.8)	167 (60.1)	70 (65.4)
	Student	22	17 (4.6)	5 (31.3)	14 (5.0)	8 (7.5)
	Retired	17	14 (3.8)	3 (18.8)	7 (2.5)	10 (9.3)
Current Level of Education	Illiterate	133	131 (35.5)	2 (12.5)	92 (33.1)	41 (38.3)
	Primary education	99	97 (26.3)	2 (12.5)	73 (26.3)	26 (24.3)
	Secondary education	53	50 (13.6)	3 (18.8)	40 (14.4)	13 (12.1)
	Graduation	72	67 (18.2)	5 (31.3)	48 (17.3)	24 (22.4)
	Post-Graduation	28	24 (6.5)	4 (25.0)	25 (9.0)	3 (2.8)

(Continued)

Table 4 (Continued).

		n	QoL			
			PCS-12		MCS-12	
			Poor	Good	Poor	Good
			n (%)	n (%)	n (%)	n (%)
Monthly Income	Less than 10,000 PKR	25	23 (6.2)	2 (12.5)	20 (7.2)	5 (4.7)
	10,000–20,000 PKR	78	77 (20.9)	1 (6.3)	53 (19.1)	25 (23.4)
	20,000–50,000 PKR	146	142 (38.5)	4 (25.0)	111 (39.9)	35 (32.7)
	50,000–1,00,000 PKR	75	71 (19.2)	4 (25.0)	52 (18.7)	23 (21.5)
	More than 100,000 PKR	61	56 (15.2)	5 (31.3)	42 (15.1)	19 (17.8)
Diagnosis of Hypertension	Less than 6 months ago	41	38 (10.3)	3 (18.8)	35 (12.6)	6 (5.6)
	6 months to 1 year ago	14	13 (3.5)	1 (6.3)	9 (3.2)	5 (4.7)
	1 to 2 years ago	39	36 (9.8)	3 (18.8)	25 (9.0)	14 (13.1)
	2 to 5 years ago	86	82 (22.2)	4 (25.0)	65 (23.4)	21 (19.6)
	More than 5 years ago	205	200 (54.2)	5 (31.3)	144 (51.8)	61 (57.0)
BP checkups	Monthly	147	143 (38.8)	4 (25.0)	108 (38.8)	39 (36.4)
	Every 3–4 months	115	112 (30.4)	3 (18.)	87 (31.3)	28 (26.2)
	Every 6 months	78	76 (20.6)	2 (12.5)	50 (18.0)	28 (26.2)
	Once a year	45	38 (10.3)	7 (43.8)	33 (11.9)	12 (11.2)
BP	<120/80 mmHg (Normal)	18	17 (4.6)	1 (6.3)	12 (4.3)	6 (5.6)
	120-139/80-89mmHg (Prehypertension)	97	93 (25.2)	4 (25.0)	75 (27.0)	22 (20.6)
	140-159/90-99 mmHg (stage 1)	140	137 (37.1)	3 (18.8)	95 (34.2)	45 (42.1)
	>160/100mmHg (Stage 2)	106	103 (27.9)	3 (18.8)	77 (27.7)	29 (27.1)
	Do not know	24	19 (5.1)	5 (31.3)	19 (6.8)	5 (4.7)
Effect on daily activities	Yes	322	315 (85.4)	7 (43.8)	236 (84.9)	86 (80.4)
	No	50	46 (12.5)	4 (25.0)	33 (11.9)	17 (15.9)
	Do not know	13	8 (2.2)	5 (31.3)	9 (3.2)	4 (3.7)
Diet	No sugar	45	44 (11.9)	1 (6.3)	26 (9.4)	19 (17.8)
	Low carbohydrate/sugar	3	3 (0.8)	0 (0.0)	2 (0.7)	1 (0.9)
	Low cholesterol	4	4 (1.1)	0 (0.0)	3 (1.1)	1 (0.9)
	Low salt	103	99 (26.8)	4 (25.0)	74 (26.6)	29 (27.1)
	Weight reduction	4	4 (1.1)	0 (0.0)	4 (1.4)	0 (0.0)
	Vegetarian	4	3 (0.8)	1 (6.3)	3 (1.1)	1 (0.9)
	No special diet	93	85 (23.0)	8 (50.0)	72 (25.9)	21 (19.6)
	No sugar + Low salt	53	52 (14.1)	1 (6.3)	39 (14.0)	14 (13.1)

(Continued)

Table 4 (Continued).

		n	QoL			
			PCS-12		MCS-12	
			Poor	Good	Poor	Good
			n (%)	n (%)	n (%)	n (%)
	No sugar +Low salt + Low cholesterol	17	16 (4.3)	1 (6.3)	13 (4.7)	4 (3.7)
	Low salt + Low cholesterol	57	57 (15.4)	0 (0.0)	40 (14.4)	17 (15.9)
	No sugar + Renal	2	2 (0.5)	0 (0.0)	2 (0.7)	0 (0.0)
Cholesterol Level	Less than 200 mg/dL	118	113 (30.6)	5 (31.3)	78 (28.1)	40 (37.4)
	More than 200 mg/dL	68	67 (18.2)	1 (6.3)	51 (18.3)	17 (15.9)
	More than 250 mg/dL	27	26 (7.0)	1 (6.3)	19 (6.8)	8 (7.5)
	Do not know	172	163 (44.2)	9 (56.3)	130(46.8)	42 (39.3)

Median Scores of the Depression, Anxiety, Stress, PCS-12, and MCS-12

The patient's median levels of anxiety, stress, and depression were all moderate (Table 5). The reported median scores for anxiety and depression were 20.00 (IQR: 12) and 24.00 (IQR: 12), respectively, out of a possible 40. The median stress score was slightly higher, at 28.00 (IQR:10) out of 42. The participant's psychological distress was found to be significantly elevated. The physical QoL was generally low, with scores ranging from a minimum of 20 to a maximum of 58 on the PCS-12, whose median was 34.92, IQR 11. In comparison, the MCS-12 performed better than the physical component, whose scores ranged from 24 to 65. The median score was 46.51, IQR 9. Although mental health is generally better than physical health, there are still notable variations amongst participants, according to the scores.

Impact of Depression, Anxiety, and Stress on Physical and Mental Quality of Life Scores

The analysis showed significant declines in PCS-12 scores with increasing severity of depression, anxiety, and stress ($p<0.001$) (Table 6). Participants with severe and extremely severe depression (mean ranks 166.18 and 161.94) had lower scores than those with normal and mild depression (239.75 and 246.50). Similarly, anxiety impacted PCS-12, with normal anxiety having the highest mean rank (258.59) and extremely severe anxiety the lowest (161.08). Stress also decreased the physical QoL, where severe and extremely severe stress scored 183.23 and 158.15, respectively, compared

Table 5 Median Scores of the Depression, Anxiety, Stress, PCS-12 and MCS-12

	Median (IQR)	Min	Max
Depression	24.00 (12)	0	40
Anxiety	20.00 (12)	0	40
Stress	28.00 (10)	0	42
PCS-12	34.92 (11)	20	58
MCS-12	46.51 (9)	24	65

Table 6 Impact of Depression, Anxiety, and Stress on Physical and Mental Quality of Life

	Variables	PCS-2			MCS-12		
		Mean Rank	Median (IQR)	P value	Mean Rank	Median (IQR)	P value
Depression	Normal	239.75	38.37 (11)	<0.001***	159.13	44.27 (11)	0.027*
	Mild	246.5	41.53 (9)		217.95	48.81 (7)	
	Moderate	228.85	36.84 (14)		188.72	45.78 (10)	
	Severe	166.18	33.51 (8)		214.08	47.30 (7)	
	Extremely Severe	161.94	33.19 (8)		183.81	45.22 (8)	
Anxiety	Normal	258.59	42.55 (13)	<0.001***	142.79	42.58 (12)	0.015*
	Mild	278.91	43.30 (14)		234.09	47.42 (13)	
	Moderate	221.7	37.37 (13)		175.42	44.94 (10)	
	Severe	202.29	36.17 (11)		204.1	46.24 (7)	
	Extremely Severe	161.08	33.10 (8)		204.02	47.16 (8)	
Stress	Normal	245.02	40.10 (13)	<0.001***	142.22	42.31 (11)	<0.001***
	Mild	246.03	38.63 (11)		212.91	47.28 (9)	
	Moderate	200.02	34.92 (10)		201.62	47.16 (9)	
	Severe	183.23	34.49 (10)		210.7	47.30 (8)	
	Extremely Severe	158.15	32.80 (7)		173.29	45.0 (7)	

Notes: Kruskal Wallis test, significance value * $p < 0.1$; *** $p < 0.001$ Bold values indicate statistically significant results at $p < 0.05$.

to normal stress (245.02). There was a significant relationship ($p < 0.027$) between the MCS-12 scores and depression severity according to the current study. Compared to participants with mild depression, whose median score was 48.81, those with moderate depression had a lower median score of 45.78. This illustrates the tendency for the mental QoL to decline with increasing depression severity. The MCS-12 scores were also strongly influenced by anxiety levels ($p < 0.015$). The mean rank MCS-12 score for those with moderate anxiety was 175.42, which was higher than the score of 142.79 for participants with normal anxiety, demonstrating the detrimental impact of lower levels of anxiety had poor mental health. In addition to this, the MCS-12 scores showed significant levels of stress ($p < 0.001$). Severe stress had a mean rank score of 210.70, whereas those with moderate and mild stress had mean rank values of 201.62 and 212.91, respectively. This shows that there might be a connection between increased stress levels and mental health. Additionally, it was discovered that there was a relation between MCS-12 scores ($p < 0.027$).

Post Hoc Analysis of Health Scores in Varying Levels of Depression and Stress

Post hoc analysis revealed significantly poorer physical health (lower PCS-12 scores) in those with severe and extremely severe depression, anxiety, and stress compared to those with milder levels (Table 7). Extremely severe depression and anxiety had the poorest scores, which were significantly different from moderate, mild, and normal levels ($p < 0.001$). Severe and extremely severe stress also had significantly poorer physical health compared to normal and mild stress ($p < 0.045$). Higher severity of depression, anxiety, and stress has a high correlation with lower physical health. Similarly, the post hoc analysis for depression levels and MCS-12 scores showed that individuals with normal depression have significantly better mental health compared to those with severe depression ($p < 0.031$), suggesting that severe depression notably impacts mental health compared to normal depression. Furthermore, the post hoc analysis for stress levels and MCS-12 scores reveals that individuals with normal stress have significantly better mental health compared to those with

Table 7 Post-Hoc Analysis Between Depression, Anxiety, and Stress Levels with PCS-12 and MCS-12

Depression Level		p-value	Adjusted p-value
Extremely severe	Moderate	<0.001	<0.001
Extremely severe	Normal	<0.001	<0.001
Extremely severe	Mild	<0.001	0.012
Severe	Moderate	<0.001	0.001
Severe	Normal	<0.001	0.001
Severe	Mild	0.002	0.019
Anxiety Level			
Extremely severe	Moderate	<0.001	<0.001
Extremely severe	Normal	<0.001	<0.001
Extremely severe	Mild	0.001	0.006
Stress Level			
Extremely severe	Normal	<0.001	<0.001
Extremely severe	Mild	0.004	0.045
Severe	Normal	<0.001	0.003
Post-hoc analysis between depression, anxiety, and stress levels with MCS-12			
Normal	Severe	0.003	0.031
Stress Level			
Normal	Moderate	0.004	0.035
Normal	Severe	<0.001	<0.001

Notes: Significance value $p < 0.1$; $p < 0.01$; $p < 0.001$ Significance values have been adjusted using the Bonferroni correction for multiple tests.

moderate ($p < 0.035$) and severe stress ($p < 0.001$). However, no significant differences were found between normal and extremely severe, mild, or between other stress levels (extremely severe vs moderate, severe vs moderate, etc.) after adjustment, indicating that extreme levels of stress do not significantly impact mental health compared to moderate or mild levels.

Discussion

The present study uniquely explores the psychological and QoL impacts of hypertension treatment in a tertiary care hospital in Lahore and this study, to the best of our knowledge, is the first of its kind conducted with the specific objectives outlined. Our findings indicate that levels of depression ($p < 0.001$), anxiety ($p < 0.194$), and stress ($p < 0.003$) were significantly higher among females compared to males. However, in terms of Quality of Life (QoL), males exhibited higher PCS-12 scores, while females had higher MCS-12 scores. Additionally, the severity of psychological factors increased with age, with significant correlations observed for depression ($p < 0.001$), anxiety ($p < 0.001$), and stress ($p < 0.001$). Widowed, illiterate, and unemployed patients demonstrated poorer psychological states and QoL.

Supporting our findings, a similar study conducted in Turkey reported higher rates of depression ($p < 0.025$), anxiety ($p < 0.069$), and stress ($p < 0.024$) among females. Furthermore, men in the Turkish study showed better PCS-12 ($p < 0.001$)

and MCS-12 ($p < 0.400$) scores compared to females. Married, educated, and employed participants in both studies exhibited better psychological well-being and QoL.²⁹ The disparity in MCS-12 scores may reflect societal norms and cultural standards. Men may be discouraged from seeking help in Pakistan due to social norms, impacting their QoL scores. In Turkey, changing societal norms, support networks, or healthcare accessibility may contribute to higher MCS-12 scores for males. Economic hardship in Pakistan may also impact men's mental health, lowering their MCS-12 scores. One of the possible causes could be Pakistan's financial difficulties. Men's mental health may be more impacted by economic hardship and instability, which could lower their MCS-12 score. In the present study, depression was also significantly related to inadequate blood pressure (BP) control ($p < 0.006$), whereas anxiety was related to increased age ($p < 0.001$), working status ($p < 0.001$), and high BP ($p < 0.006$). Stress also had significant correlations with age ($p < 0.001$) and suboptimal BP control ($p < 0.001$). These results concur with a Malaysian study, which identified similar trends. Depression and stress were more prevalent in those with uncontrolled BP, and anxiety was strongly correlated with greater age and employment status.³⁰ The study findings showed that most patients had severe (31.2%) or extremely severe (28.1%) depression symptoms. In contrast, an Indian study found that the majority were normally depressive (80%).²⁸ However, a meta-analysis performed by Dutta et al, which included studies solely from India, also reported a high prevalence of depression at 39.8%.³¹ In contrast, A study performed in Ethiopia found that only 5.2% of hypertension patients reported depression, while 34.8% experienced anxiety.³² This disparity may be due to variations in the source population, study period, and socioeconomic status. Additionally, the use of different assessment tools may also contribute to this difference. An Iranian study also reported lower prevalence rates, with most participants experiencing moderate or severe generalized anxiety disorder (GAD).³³ Despite these differences, the Iranian study supported the current findings by identifying increasing age and uncontrolled blood pressure as significant predictors of higher anxiety scores, emphasizing shared risk factors across populations. The higher prevalence of severe psychological disorders in the current study may be linked to economic stress and inadequate health resources in Pakistan. The current study's findings align with a previous study that identified a link between psychological distress and increased odds of hypertension, even after controlling for other risk factors. Similarly, a study conducted in the United States of America (USA) reported similar findings, but the authors used the K6 evaluator to assess general psychological distress.³⁴ In contrast, the current study employed the DASS-21, which provides a more detailed evaluation of stress, anxiety, and depression levels in patients. The current study found that being a woman, divorced, or widowed was strongly associated with symptoms of depression and anxiety in individuals with hypertension. These demographic factors also predicted comorbid anxiety, reinforcing the patterns observed in our research. Similarly, a study conducted in Ethiopia reported that these same demographic factors were associated with depression and anxiety in hypertensive individuals.³⁵ The current study also observed higher rates of major depression, anxiety, and perceived stress among a sample largely composed of married women. This finding is supported by another study conducted in China, which noted that a longer duration since the diagnosis of hypertension was linked to higher perceived stress.³⁶ However, it is important to note that their study focused on patients with pulmonary arterial hypertension, which may have contributed to differences in psychological outcomes. In contrast, a study by Liu et al, with a majority of male participants, found that those with anxiety or depression were younger, employed, and had a shorter duration of hypertension.³⁷ Despite these differences, their finding that patients with higher blood pressure had higher levels of anxiety and depression supports our results. Additionally, our study aligns with a prior study also conducted in China, which found an independent correlation between depression and uncontrolled hypertension in a predominantly male hypertensive population.³⁸ In contrast, in another study, the prevalence of depression among patients with hypertension in Ghana and Nigeria showed that depression was associated with younger age.³⁹ This difference may reflect social, cultural, and demographical influences on mental health across different regions. In a similar vein to the current study, another study found that hypertension patients had high levels of both trait and state anxiety, with a clear relationship between anxiety and depression. However, the study also highlighted gender disparities, with women exhibiting more severe anxiety and depression symptoms, which led to a more marked decline in life quality, particularly in cases with mixed anxiety-depressive illness.⁴⁰ Consistent with the current study's findings, a study by Asmare Y. et al also demonstrated significant relationships between depression and female sex and the duration of hypertension. Both studies indicate a complex interplay of various demographic, medical, and lifestyle factors in the continuation of depression among hypertensive patients.⁴¹ The current study found that patients with more

severe pain, lower socioeconomic status, and women were more likely to experience anxiety and depression. These findings align with an American study, which also reported that these factors were associated with higher levels of anxiety and depression.⁴² This supports our focus on health and demographic characteristics as primary causes of psychological discomfort in hypertension patients. Additionally, our study found that depression is more common in older hypertensive patients and those in poor health are particularly at risk. This is consistent with a study conducted in Ghana, which emphasized the impact of age, marital status, and perceived health on depression in hypertensive patients.⁴³ While our findings found a strong correlation between hypertension and psychological discomfort, including depression and anxiety, the Ghanaian study did not find a significant correlation between generalized anxiety symptoms and depression in older individuals.⁴⁴ However, it did find a substantial correlation between depression and hypertension. These discrepancies may result from variations in the instruments used to measure symptoms or differences in demographic characteristics. According to the current study, stress was common among hypertensive patients. Similarly, a study conducted on males in Jordan revealed that high levels of stress were due to a lack of resources, unemployment, and unstable finances, exacerbated by cultural pressures to provide for their families. Therefore, socioeconomic factors and cultural responsibilities play a significant role in amplifying stress.⁴⁵ Moreover, the current study found that urban participants had better physical QoL, while rural participants had better mental QoL. In contrast, a study in Thailand and Saudi Arabia reported that urban residents had better overall QoL than rural residents.^{11,46} While, the findings of the current study are consistent with those of a Chinese study, which reported that women living in rural areas with lower education levels and average monthly incomes were more likely to experience hypertension along with higher probabilities of anxiety and depression.⁴⁷ These differences may be due to factors such as lifestyle, health access, and culture, which impact physical and mental QoL differently in urban and rural areas. Methodological differences in measuring QoL, as the other study used different tools, may also contribute to these opposite findings. The current study underscores the significant impact of demographic and socioeconomic factors on the psychological well-being of hypertensive patients. Our findings, consistent with studies from various regions, highlight that women, older individuals, and those with lower socioeconomic status are particularly vulnerable to depression, anxiety, and stress. These psychological factors significantly impact the QoL of hypertensive patients, with higher levels of distress correlating with poorer physical and mental health outcomes. The role of cultural and societal norms, further emphasizes the need for culturally sensitive approaches in managing psychological distress in hypertensive patients. Moreover, the discrepancies observed between our study and others suggest that methodological differences and varying health infrastructures can influence the prevalence and severity of psychological disorders. These variations underscore the importance of using standardized tools and considering local contexts in future research.

Limitations

This study has several limitations. Firstly, the sample was collected from a tertiary care hospital in Lahore, which limits the representativeness and generalizability of the findings to a larger population. Additionally, patients might have masked their true thoughts and emotions. One limitation of the study is that some participants were illiterate, which may have influenced how well they understood and answered the questions, potentially affecting the reliability of their responses. There are also unmeasured factors, such as co-existing medical conditions or medications, that could influence psychological distress or QoL outcomes. The study was conducted in a specific cultural context, which might affect psychological factors differently than in other settings. Furthermore, the study did not include data on patients' physical exercise routines, which is a limitation. The scope of the study was limited, excluding additional relevant variables that could have provided further insights. Lastly, comparing the results with other studies was challenging due to the use of different tools to assess psychological well-being and QoL in hypertensive patients.

Conclusion

This study reveals the serious psychological distress among hypertensive patients in Lahore, Pakistan, with severe levels of depression, anxiety, and stress. Stress emerged as the predominant factor, reflecting a significant psychological burden. Women and those with more advanced hypertension were more impacted. Stress, anxiety, and depression had strong negative correlations with both physical and mental quality of life (QoL) components. These results emphasize the need

for stage-specific and gender-specific psychological intervention in the management of hypertension. Screening for mental health as part of standard hypertension care may assist in enhancing QoL and overall health outcomes for this group.

Future Implications

Managing depression, anxiety, and stress in hypertensive patients requires a comprehensive and integrated approach to improve their quality of life (QoL). Health policies should incorporate mental health care services into conventional hypertension treatments to identify and manage psychological disorders early, thereby enhancing both mental health and QoL. This approach should include support programs specifically tailored for hypertensive patients, particularly those in advanced stages and women, who exhibit higher distress levels and lower QoL. Community-based mental health awareness initiatives are essential to educate patients about the importance of mental well-being and the availability of resources. These initiatives can promote help-seeking behaviour and reduce the stigma associated with mental health issues. Further research on psychosocial factors influencing depression, anxiety, and QoL in hypertensive patients is necessary to develop customized treatment approaches that address the unique needs of this population. Additionally, educating healthcare personnel on recognizing and managing psychological comorbidities will foster a more comprehensive care model. Training programs should focus on the integration of mental health assessments into routine hypertension care, ensuring that psychological distress is identified and treated promptly. Exploring sociocultural factors such as cultural beliefs, family dynamics, and societal attitudes toward hypertensive patients and their psychological challenges can help create culturally sensitive care plans. Understanding these factors will enable healthcare providers to offer more personalized and effective interventions. Moreover, implementing regular mental health screenings and providing access to counselling services within hypertension clinics can ensure continuous support for patients. Collaborative care models that involve multidisciplinary teams, including psychologists, social workers, and dietitians, can address the multifaceted needs of hypertensive patients. These efforts will ensure that hypertension care addresses both medical and psychological needs, ultimately improving patients' QoL. By adopting a holistic approach, healthcare systems can better support hypertensive patients, leading to improved health outcomes and overall well-being.

Data Sharing Statement

The data underlying this article will be shared at a reasonable request by the corresponding author (Dr Wajid).

Ethical Approval

Ethical approval was obtained from the Institutional Research and Ethics Committee at the University of Lahore (Protocol Number: IREC-2024-6H). This study was conducted in accordance with the principles of the Declaration of Helsinki. All participants provided written informed consent before enrolment.

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Disclosure

The authors declare that they have no conflicts of interest.

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