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MULTIMORBIDITY BURDEN AND HEALTHCARE-SEEKING BEHAVIOR AMONG ADULTS WITH COEXISTING DIABETES AND HYPERTENSION IN A COMMUNITY SETTING OF LAHORE, PAKISTAN

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ABSTRACT

Background: Multimorbidity is the presence of two or more concurrent chronic diseases in a person. Diabetes and hypertension often coexist and cause a complex situation with treatment in low- and middle-income countries (LMICs). The main purpose of our study was to assess the number and type of additional chronic conditions among these patients. The patients' healthcare-seeking behavior, service utilization, medication adherence, and perceived barriers were the focus of our research, which took place in Lahore, Pakistan.

Methods: For this community-based cross-sectional study, 430 individuals living with diabetes and hypertension, who reported a physician diagnosis of both conditions, were recruited. The survey was conducted in the area served by Pak Red Crescent Medical and Dental College, Lahore. Questionnaires were filled in by the community workers who were specially trained for the purpose. The topics covered in the survey were sociodemographic, 18 other chronic diseases, healthcare utilization, medication adherence, and barriers to care. Participants were selected by consecutive sampling between March 2024 and April 2025. Associations were tested with the chi-square test.

Results: Of the 430 participants, 389 (90.5%) had at least one additional chronic condition and 263 (61.2%) had four or more chronic conditions in total. Dyslipidemia (32.8%) and obesity (30.0%) were the most common additional conditions. Most participants used private hospitals or clinics as their usual source of care (53.5%), and 88.1% usually consulted a doctor. Poor medication adherence was reported by 26.0% of participants for diabetes and 20.7% for hypertension, and 235 (54.7%) reported at least one major barrier to care. High multimorbidity (two or more additional conditions, four or more in total) was more common in participants aged 60 years or older than in younger participants (71.7% vs 54.1%, chi-square (1) = 13.47, p = 0.0002).

Conclusion: Adults with coexisting diabetes and hypertension in this community carry a high burden of additional chronic conditions and face multiple barriers to care, including family responsibilities, limited knowledge, negative previous experiences, and cost-related delays. Affordable, integrated primary care is recommended to improve the management of these patients.

KEYWORDS: Multimorbidity; Diabetes Mellitus; Hypertension; Health Services Accessibility; Patient Acceptance of Health Care; Medication Adherence; Pakistan.

INTRODUCTION

Multimorbidity is a state where an individual has two or more coexisting chronic conditions. Academic circles and public health policy now pay increasing attention to this state [1]. The concept matters. The health care and economic implications exceed the sum of the individual diseases. Multimorbidity patients have a higher burden of prescription medications, limited specialist care, frequent hospitalization, and reduced well-being compared to patients with an isolated disease [1, 2].

Background

The multimorbidity rate is high and rising [1, 2]. A scoping review of 76 studies from low- and middle-income countries showed prevalence estimates for multimorbidity ranging from 3.2 percent to 90.5 percent. Variations in age groups and measurement methods caused this range [3]. A systematic review and meta-analysis of 39 studies provided data on more than 1.2 million adults and reported a pooled prevalence of 36.4 percent [4]. A review of 193 international

studies found no significant difference between low- and middle-income countries (36.8 percent) and high-income countries (44.3 percent) [5]. In the scoping review, diabetes and hypertension were the conditions most frequently reported in multimorbidity patterns [3]. Multimorbidity is common in both low- and middle-income and high-income settings [3, 4, 5]. It rises with age [1]. National surveys in LMICs, such as the nationwide survey in The Gambia, also report a high burden of hypertension, diabetes and multimorbidity [6].

Hypertension and diabetes are two of the most important noncommunicable diseases worldwide. In 2019, an estimated 1.28 billion adults aged 30-79 years had hypertension worldwide, and nearly half (about 580 million) were unaware of their condition [7].

The IDF estimated that 537 million adults aged 20-79 years were living with diabetes worldwide in 2021. Low- and middle-income regions have seen the most increases in such cases [8]. Pakistan follows this global trend. A combination of prospective surveys revealed a type 2 diabetes pooled prevalence in Pakistani adults at the 13.7 percent level [9]. A community survey of adults aged 30 years or older in urban Lahore reported a prevalence of hypertension and diabetes of 40.1 and 15.8 percent, respectively [10]. Noncommunicable disease-related deaths in Pakistan amount to 58 percent of the total number of deaths in the country [10].

Diabetes and hypertension often co-occur. Their combination is common. They share common mechanisms, including insulin resistance, endothelial dysfunction, and chronic inflammation. Their combination significantly increases the risk of heart, kidney, and retinal diseases [11]. Handling this duo requires regular medical care, managed medication, and personal effort in health-related activities. The healthcare systems of Pakistan still focus on individual diseases. Most patients pay for services out of pocket [11, 12].

Significance of the Research

Information on multimorbidity at the community level in Pakistan is limited. This makes the big picture hard to see. Recent Pakistani studies often draw on hospital and clinic attendees [12, 13]. Hospital-based samples may therefore misrepresent the community burden of disease. Those studies often exclude people who delay care or avoid care altogether. The real impact remains somewhat hidden. Understanding how additional conditions cluster around a baseline of diabetes and hypertension is essential. Understanding how patients seek care is also essential for designing integrated primary care. Vertical programs targeting diabetes or hypertension alone are unlikely to meet the needs of multimorbid patients without such evidence [2, 4].

Scope of the Research

This study is primarily restricted to adults aged 18 years or older with a self-reported physician diagnosis of diabetes and hypertension. These individuals live within the community catchment area of Pak Red Crescent Medical and Dental College in Lahore. The study aims to determine how many other long-term chronic conditions are present. The study also measures healthcare use and the paths people choose when looking for care. The study asks about medication adherence and day-to-day self-management practices. The study also asks about perceived barriers to care. The study does not estimate population prevalence of diabetes or hypertension. The study does not follow patients over time.

Research Objectives

The study had four purposes. First, the study determined the additional types and number of chronic conditions among adults with both diabetes and hypertension. Second, the study described the level of healthcare use and care-seeking pathways. Participants were asked about their usual facility, the type of provider consulted, outpatient visits in the previous 12 months, and hospital admissions in the same period. Third, the study listed the barriers delaying care. These barriers include financial, structural, and sociocultural aspects. Fourth, the study evaluated the extent of medication adherence and self-management practices. This evaluation includes home monitoring of blood sugar and blood pressure.

Problem Statement

A gap remains in the evidence. Published work has established the burden of noncommunicable diseases in Pakistan [9, 10] and the financial strain of diabetes care [12]. To our knowledge, few community-based studies in Pakistan have measured how multimorbidity clusters around coexisting diabetes and hypertension. Few studies have measured how the burden shapes healthcare-seeking behavior and adherence in the same population. This study addresses the gap.

Taken together, the evidence suggests that dual diabetes and hypertension management in Pakistani communities is fragmented, costly, and dominated by out-of-pocket spending [11, 12]. The rationale for this research is practical. The research aims to map the true disease burden carried by these patients. The research aims to identify the modifiable barriers separating patients from effective, continuous care. The findings intend to inform integrated noncommunicable disease services at the primary care level.

LITERATURE REVIEW

The literature on multimorbidity has grown rapidly over the past decade. Barnett and colleagues established the foundational pattern. Multimorbidity is common. The condition appears a decade earlier in deprived populations. The prevalence rises steeply with age [1]. In low- and middle-income countries, the emphasis has shifted from counting

single diseases to describing disease clusters. Diabetes and hypertension emerge consistently as a core cardiometabolic dyad. Dyslipidemia, obesity, chronic kidney disease, and depression frequently join the dyad [2, 3].
Healthcare-seeking patterns in South Asia reflect economic constraints. Patients with hypertension often first contact informal providers. Younger men, rural residents, and those with low education are most likely to do so. Cost, distance, and a preference for informal care shape the first step of the care pathway [11]. In Pakistan, most health expenditure is out of pocket. Medicines account for the largest share [11, 12]. A cross-sectional study of 307 patients at one diabetes clinic in Rawalpindi reported a mean annual direct medical cost of 55,113 Pakistani rupees. About 42 percent of participants cited financial constraints as the primary barrier [12].

Medication adherence is poor across the region. Self-reported adherence to antihypertensive therapy is low in several Pakistani and South Asian studies, and many patients stop their tablets when they feel better [11]. In a cross-sectional study across primary, secondary, and tertiary facilities in Islamabad, 37.7 percent of patients with hypertension were non-adherent on the eight-item Morisky scale [14]. A systematic review and meta-analysis of self-care among South Asian adults with type 2 diabetes also found suboptimal practice. Pooled adherence was 48 percent for diet, 53 percent for physical activity, and 65 percent for blood glucose monitoring. In the five Pakistani studies that reported physical activity, adherence was 35 percent [15]. Qualitative work in urban Lahore identified financial constraints, job demands, and knowledge gaps as the main barriers to diabetes self-care [16].

Integrated care has emerged as the recommended response. In a cluster-randomised trial in sub-Saharan Africa, integrated care for HIV, diabetes and hypertension kept patients in care at a rate similar to standard care (89.0 percent vs 89.8 percent) and did not worsen HIV outcomes [17]. A systematic review of integrated models of care for diabetes and hypertension in low- and middle-income countries found only five studies. It reported little or no difference in mortality or blood pressure control, and the certainty of the evidence was very low [18]. The evidence is therefore thin and does not yet show clear gains. It supports testing integrated primary care for multimorbid patients, rather than relying on vertical disease programs alone.

THEORETICAL FRAMEWORK

This study uses the Andersen behavioral model. The model examines why people use health services. The model organizes the determinants of healthcare use into three categories. The categories are predisposing factors, enabling factors, and need factors. Predisposing factors include age, sex, and education. Enabling factors include income, insurance, proximity, and availability. Need factors include perceived and evaluated illness. Andersen developed the model in 1968 [19] and later refined it [20, 21]. The model has been widely used to explain why people with equal disease burden use services differently [20, 21]. The model suits this study. Healthcare-seeking in diabetes and hypertension depends on individual predisposition, household resources, and the perceived severity of the disease.

CONCEPTUAL FRAMEWORK

The conceptual model translates the Andersen categories into measurable constructs for this population. Predisposing factors include age, sex, education, and occupation. Enabling factors include monthly household income, health insurance, distance to facility, and doctor availability. The model includes self-rated health. The model includes perceived symptom severity and the overall burden across multiple conditions. These factors shape patient actions. The factors determine whether patients seek care and how patients use health services. Measures include the usual place where patients go for care. Use measures include provider type, visit frequency, care wait times, and hospital admissions. Researchers also assess outcomes. Outcomes include medication adherence and home self-monitoring. Not all constructs were measured in this study; the framework guided the selection of variables. Figure 1 presents the framework.

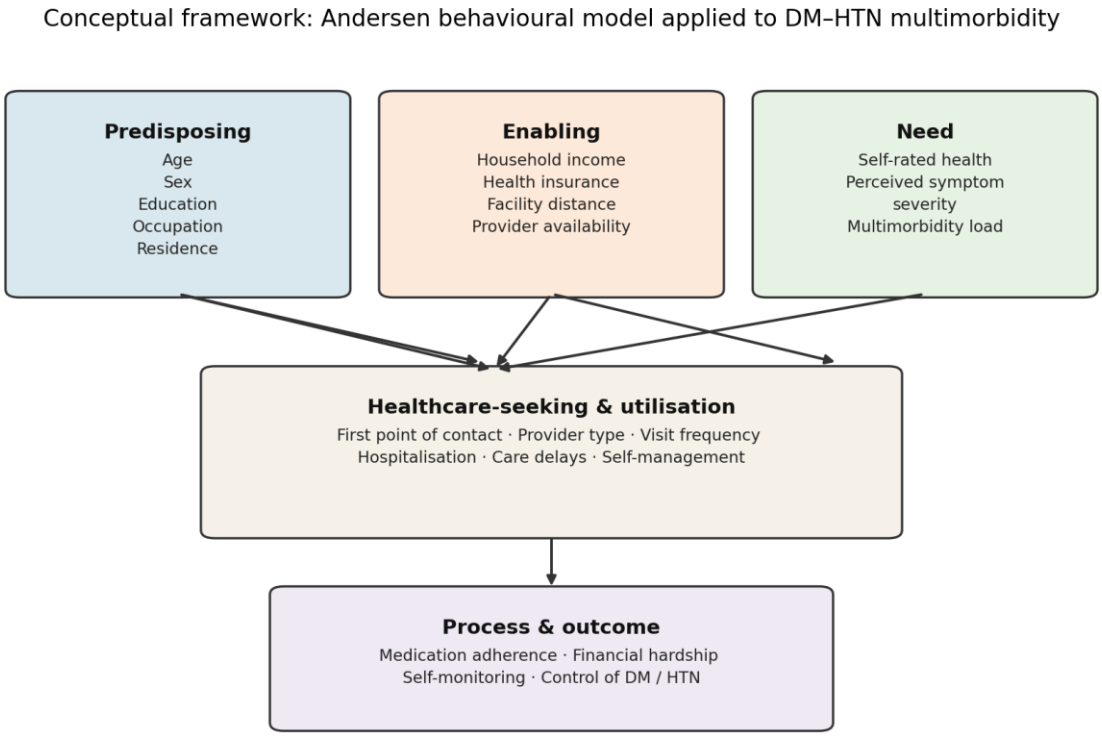


Figure 1. Conceptual framework: Andersen behavioral model applied to diabetes–hypertension multimorbidity. Source: Constructed by the authors for this study.

MATERIAL AND METHODS

Study design and setting

This community-based, cross-sectional epidemiological study was conducted in the Dina Nath catchment area served by Pak Red Crescent Medical and Dental College, Lahore, Punjab, Pakistan. Data collection took place from March 2024 to April 2025.

Study population and sample

The study population comprised adults aged 18 years or older residing in the study area who reported a previous physician diagnosis of both diabetes mellitus and hypertension. A total of 430 participants were enrolled.

Sample size

The sample size was calculated using the single-population proportion formula, assuming a 95% confidence level, an expected proportion of 50%, and a margin of error of 5%. The minimum required sample size was approximately 385 participants. After allowing for a 10% nonresponse rate, the target sample size was approximately 428 participants. A total of 430 participants were enrolled in the study.

Sampling technique

Participants were selected by consecutive sampling between March 2024 and April 2025.

Selection criteria

Eligible participants were aged 18 years or older, lived in the study area, reported a healthcare professional's diagnosis of both diabetes mellitus and hypertension, and provided informed consent. Individuals who were unable to complete the interview because of significant language or cognitive difficulties, or who were critically ill, were excluded. Diagnoses were based on participant report and were not verified against medical records. Individuals who declined participation or withdrew were not included.

Data collection and instruments

Trained field staff administered a standardized, structured questionnaire in a fixed order. The questionnaire captured sociodemographic details and the duration of diabetes and hypertension. It recorded the presence or absence of 18 additional chronic conditions, based on self-report. The 12 most frequent are shown in Figure 3. Obesity was defined as a body mass index (BMI) of ≥30 kg/m², calculated from measured height and weight. Healthcare-seeking was assessed through the usual facility, the type of provider usually consulted, distance to the facility, the main reason for choosing it, outpatient visits and hospital admissions in the previous 12 months, and care delays for cost reasons. Medication adherence for diabetes mellitus and hypertension was assessed using the structured questionnaire. Self-management items covered home glucose and blood pressure monitoring, self-medication, and stopping medicines

without a doctor. Barriers to care were rated on a four-point scale (none, minor, moderate, major). A barrier was considered present if rated moderate or major. Additional chronic conditions were counted to give a total multimorbidity score, defined as the baseline two conditions plus the number of additional conditions. High multimorbidity was defined as two or more additional conditions (four or more in total).

Statistical analysis

Data were entered and analyzed with Python (SciPy) and verified against the survey records. Categorical variables are shown as counts and percentages. Continuous variables are shown as averages with standard deviations. To assess bivariate associations, we used the chi-square test of independence without continuity correction, with p-values < 0.05 considered significant. Participants with missing data were excluded from the relevant analysis. The study is reported according to the STROBE statement for cross-sectional studies [22].

Ethical considerations

This study followed the Declaration of Helsinki. The institutional research ethics committee at Pak Red Crescent Medical and Dental College in Lahore approved the study (approval no. 9, dated 01 January 2024). All participants provided informed consent before participation. Anonymity and confidentiality of responses were maintained throughout.

RESULTS

Baseline characteristics

The sample group consisted of 430 adults who enrolled willingly in this study. The age of participants averaged 57.5 years (standard deviation: 10.7 years; youngest was 18, the oldest 85). Among the participants, 54.9% were male, 45.1% were female, and 55.6% of participants lived in urban areas. Few of them had health insurance. Just 14.7% of them had some form of health insurance. The majority of participants (62.1%) were given only oral glucose-lowering agents, and most of them also took antihypertensive medications (86.5% taking antihypertensive medication, with or without lifestyle modification). Among the 430 participants, 391 were able to report their income; 39 (9.1%) chose not to or were not able to report it. Table 1 provides more details on the characteristics of the baseline profile.

Table 1. Baseline sociodemographic and clinical characteristics of the study sample (N = 430).

Characteristic	Category/level	n (%)
Sex	Male	236 (54.9)
	Female	194 (45.1)
Age group (years)	18–39	11 (2.6)
	40–59	246 (57.2)
	≥60	173 (40.2)
	Mean ± SD	57.5 ± 10.7
Residence	Urban	239 (55.6)
	Rural	191 (44.4)
Education	No formal education	35 (8.1)
	Primary/secondary	192 (44.7)
	Higher secondary / graduate+	203 (47.2)
Monthly income (PKR)	< 30,000	78 (18.1)
	30,000–59,999	123 (28.6)
	60,000–99,999	121 (28.1)
	≥ 100,000	69 (16.0)
	Missing / not reported	39 (9.1)
Health insurance	Covered	63 (14.7)
	Not covered	359 (83.5)
	Don't know	8 (1.9)
Household size	Mean ± SD	5.4 ± 2.1
Diabetes duration (years)	< 1	7 (1.6)
	1–5	178 (41.4)
	6–10	158 (36.7)
	> 10	87 (20.2)
Diabetes treatment	Diet/lifestyle only	48 (11.2)
	Oral agents	267 (62.1)
	Insulin	30 (7.0)
	Oral + insulin	70 (16.3)

	None	15 (3.5)
Hypertension treatment	Medication	295 (68.6)
	Lifestyle only	44 (10.2)
	Medication + lifestyle	77 (17.9)
	None	14 (3.3)
Smoking	Never	228 (53.0)
	Former	77 (17.9)
	Current	125 (29.1)

Source: PRCMDC primary survey dataset (N = 430).

Multimorbidity burden

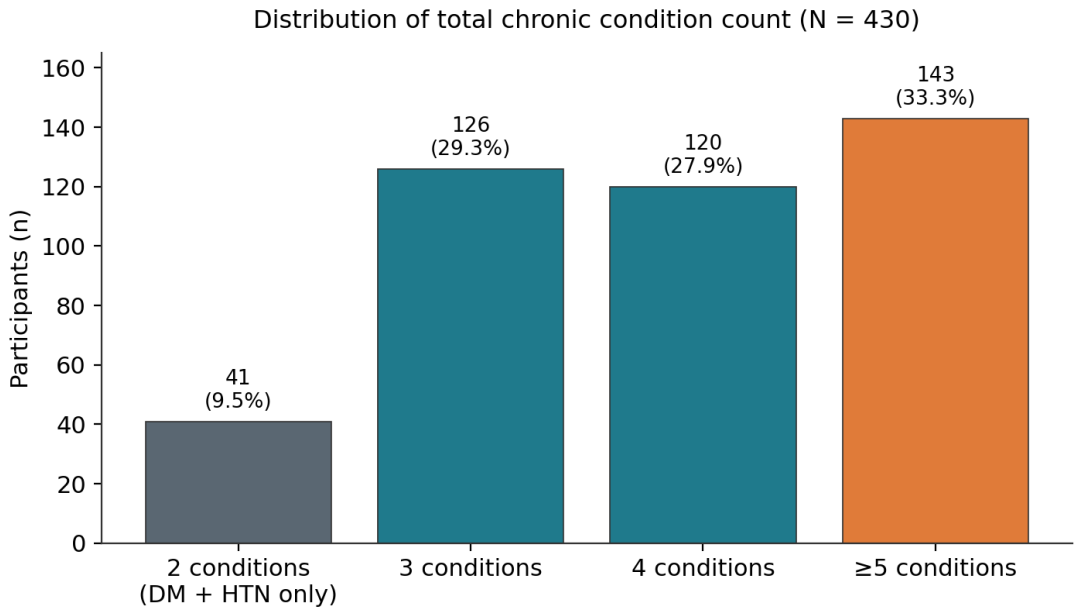
All participants met the baseline of two conditions (diabetes and hypertension). After that point, 389 people had an additional long-term condition. This equals 90.5% of the group. The distribution was skewed toward the heavier burden. One extra condition was seen in 126 participants (29.3%). Two additional conditions were identified among 120 participants (27.9%). Three or more extra conditions were reported by 143 participants (33.3%). In total, 263 participants (61.2%) were living with four or more chronic conditions. Table 2 and Figure 2 show this distribution.

Table 2. Multimorbidity burden among participants (N = 430).

Total conditions	Category	n (%)
2 (baseline only)	0 additional conditions	41 (9.5)
3	1 additional condition	126 (29.3)
4	2 additional conditions	120 (27.9)
≥5	≥3 additional conditions	143 (33.3)
≥3 total	Any additional condition	389 (90.5)
≥4 total	Two or more additional conditions	263 (61.2)

Source: PRCMDC primary survey dataset (N = 430).

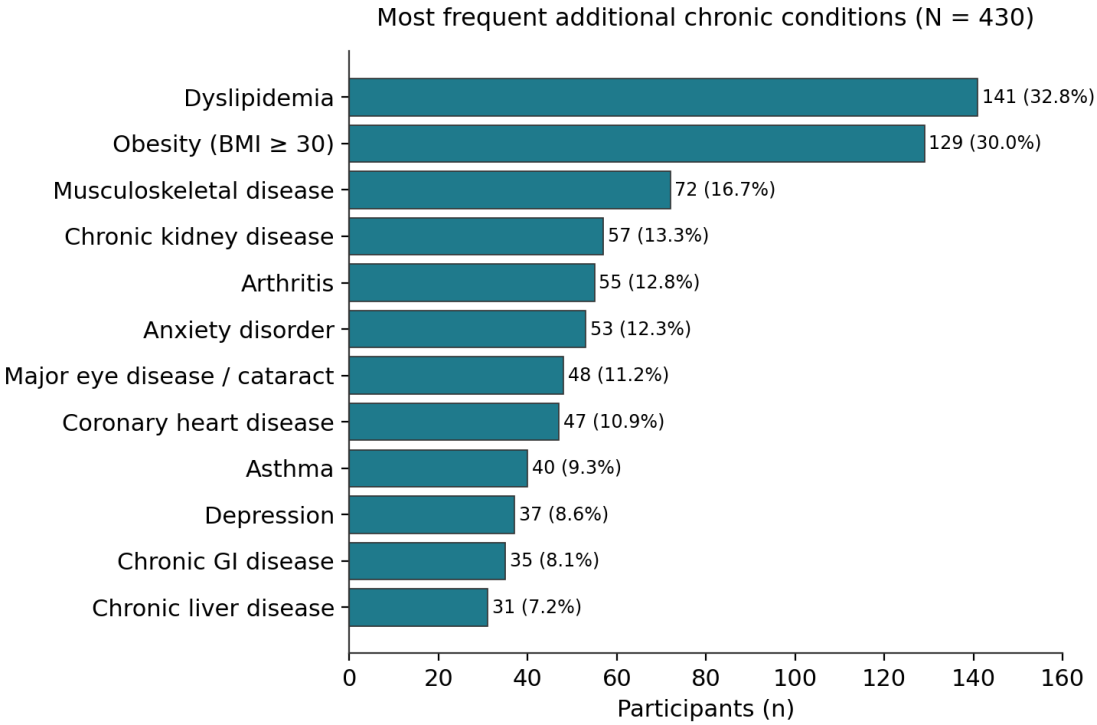
Figure 2. Distribution of total chronic condition count among adults with coexisting diabetes and hypertension.



Source: PRCMDC primary survey dataset (N = 430).

The most common coexisting condition was dyslipidemia. It was noted in 32.8% of the group. Obesity was found in 30.0%. Other issues were also common. Musculoskeletal disease was reported in 16.7% of cases. Chronic kidney disease was reported in 13.3%. Arthritis was reported in 12.8%. Anxiety occurred in 12.3%. Eye problems were not rare either. Major eye disease or cataract was recorded in 11.2% of cases. Coronary heart disease (10.9%), asthma (9.3%), and depression (8.6%) were also reported. Figure 3 lists the leading additional conditions.

Figure 3. Most frequent additional chronic conditions among participants (N = 430).



Source: PRCMDC primary survey dataset (N = 430).

Healthcare-seeking and utilization

Most participants sought care in the private sector. A total of 230 participants used private hospitals or clinics as their usual source of care (53.5%), while 174 others relied on public hospitals or basic health units (40.5%). Those who did not fall into these groups would often go to the pharmacy or might speak with another health practitioner. Most (88.1%) usually consulted a doctor, specialist or general practitioner. Their average frequency of outpatient visits within the last year was 2.43 (standard deviation, 1.38). In the previous 12 months, 56 participants (13.0%) were hospitalized. Affordability was the most common reason for choosing a facility (39.3%), followed by accessibility (17.9%); 41 participants (9.5%) gave no reason. Most (60.2%) resided within 5 kilometers of their usual facility. In addition, 112 participants (26.0%) reported postponing or skipping treatment for financial reasons. Table 3 summarizes these findings.

Table 3. Healthcare-seeking behavior and utilization in the preceding 12 months (N = 430).

Domain	Category	n (%)
Usual facility	Public hospital / BHU / RHC	174 (40.5)
	Private hospital/clinic	230 (53.5)
	Pharmacy / medical store	17 (4.0)

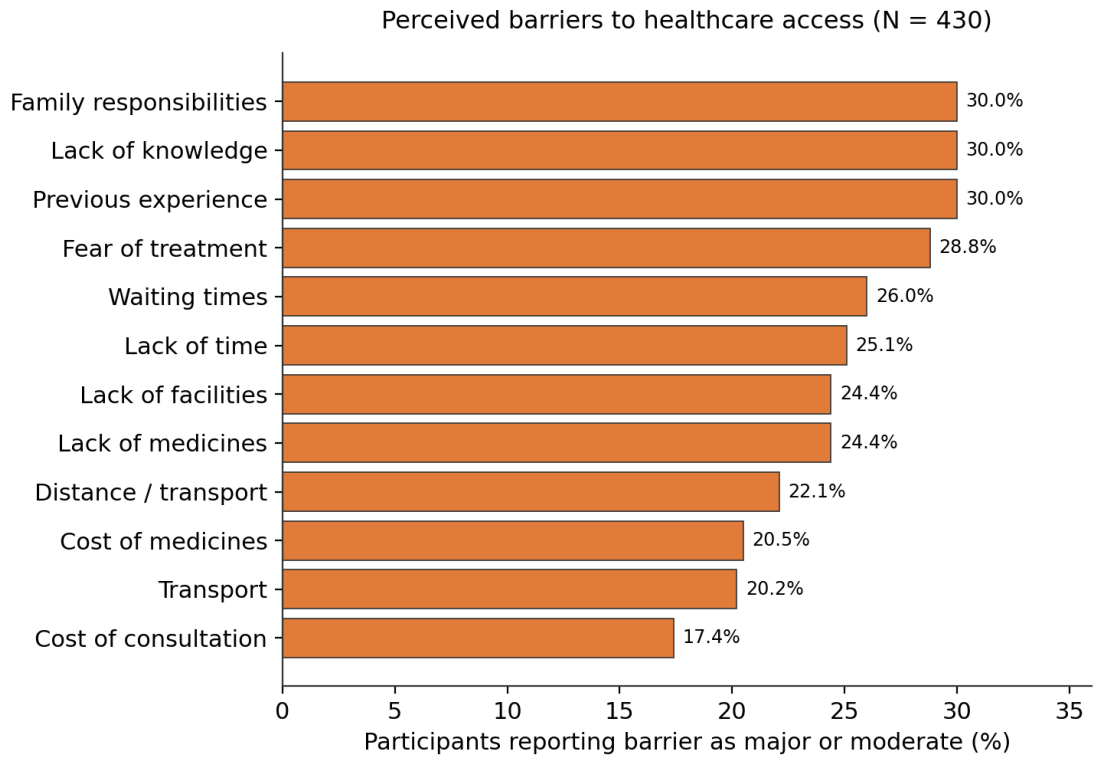
	Other	9 (2.1)
Usual provider	Doctor/specialist / GP	379 (88.1)
	Pharmacist/health worker	28 (6.5)
	Traditional practitioner	15 (3.5)
	Other	8 (1.9)
Facility distance	< 5 km	259 (60.2)
	5–10 km	126 (29.3)
	> 10 km	45 (10.5)
Main reason for facility choice	Affordability	169 (39.3)
	Accessibility	77 (17.9)
	Doctor availability	50 (11.6)
	Quality	35 (8.1)
	Previous experience	26 (6.0)
	Other	32 (7.4)
	No response	41 (9.5)
Outpatient visits / 12 months	Mean ± SD	2.43 ± 1.38
Hospitalization / 12 months	At least one admission	56 (13.0)
Cost-related care delay	Yes	112 (26.0)

Source: PRCMDC primary survey dataset (N = 430).

Medication adherence, self-management, and barriers

Poor adherence to prescribed medicines was reported by 112 participants (26.0%) for diabetes and 89 (20.7%) for hypertension. Percentages use all 430 participants as the denominator, including 15 participants with no diabetes treatment and 14 with no hypertension treatment. Home blood pressure monitoring was reported by 188 participants (43.7%) and home glucose monitoring by 151 (35.1%). Self-medication without a professional was reported by 84 participants (19.5%). Sixty-two participants (14.4%) stopped their medicines without consulting a doctor. Barriers to care were widespread. At least one major barrier was reported by 235 participants (54.7%), and at least one moderate or major barrier by 415 (96.5%). Family responsibilities, limited knowledge, and negative previous experience were each rated moderate or major by 129 participants (30.0%). Fear of treatment (28.8%) and long waiting times (26.0%) followed. Lack of time (25.1%), lack of facilities (24.4%), and lack of medicines (24.4%) were also common. Distance or transport (22.1%), cost of medicines (20.5%), and cost of transport (20.2%) and cost of consultation (17.4%) were reported less often. Figure 4 and Table 4 show the distribution of barriers.

Figure 4. Perceived barriers to healthcare access, reported as major or moderate (N = 430).



Source: PRCMDC primary survey dataset (N = 430).

Table 4. Medication adherence, self-management, and barriers to care (N = 430).

Domain	Measure	n (%)
Medication adherence	Poor diabetes adherence	112 (26.0)
	Poor hypertension adherence	89 (20.7)
Self-management	Home blood glucose monitoring	151 (35.1)
	Home blood pressure monitoring	188 (43.7)
	Self-medication (sometimes)	84 (19.5)
	Stopped medicine without a doctor	62 (14.4)
Barriers	Any major barrier	235 (54.7)
	Any moderate or major barrier	415 (96.5)
	Family responsibilities (major/mod)	129 (30.0)
	Lack of knowledge (major/mod)	129 (30.0)
	Negative previous experience (major/mod)	129 (30.0)
	Fear of treatment (major/mod)	124 (28.8)
	Long waiting times (major/mod)	112 (26.0)

	Lack of time (major/mod)	108 (25.1)
	Lack of facilities (major/mod)	105 (24.4)
	Lack of medicines (major/mod)	105 (24.4)
	Distance/transport (major/mod)	95 (22.1)
	Cost of medicines (major/mod)	88 (20.5)
	Transport (major/mod)	87 (20.2)
	Cost of consultation (major/mod)	75 (17.4)

Source: PRCMDC primary survey dataset (N = 430).

Associations

High multimorbidity (two or more additional conditions, four or more in total) was more common in participants aged 60 years or older than in younger participants (71.7% vs 54.1%; chi-square(1) = 13.47, p = 0.0002). It did not differ by sex (p = 0.19) or by household income (p = 0.99). Cost-related barriers were not associated with low income (p = 0.82). Income data were available for 391 participants, so the two income analyses used that number. Poor diabetes adherence was not associated with cost barriers (p = 0.35) or with high multimorbidity (p = 0.99). Hospitalization was numerically higher in the high multimorbidity group (14.8% vs 10.2%). The difference was not statistically significant (chi-square (1) = 1.95, p = 0.16).

DISCUSSION

In this community-based study, nearly nine in ten adults with diabetes and hypertension (90.5%) had at least one additional chronic condition, and six in ten (61.2%) had four or more conditions in total. The pattern matches global and regional evidence. Diabetes and hypertension frequently co-occur with other cardiometabolic problems. Dyslipidemia, obesity, and kidney disease appear as well [2, 3]. The prevalence of any additional condition here (90.5 percent) is at the upper end of the ranges reported in low- and middle-income country settings [3, 4]. This finding is expected because the sample was selected to include two established cardiometabolic diseases from the outset.

Interpretation of the burden

High multimorbidity was significantly more common in participants aged ≥60 years (71.7% vs 54.1%, p = 0.0002), consistent with the age gradient reported previously [1, 3]. Coronary heart disease (10.9%) and chronic kidney disease (13.3%) were also frequent, underscoring the cardiovascular and renal risk in this population.

Each additional condition adds medications, monitoring, and specialist referrals. The additions increase the risk of poor control and complications [1, 11]. Obesity and dyslipidemia are the two most common coexisting conditions. The conditions are modifiable and share lifestyle determinants with diabetes and hypertension. Their high frequency signals that risk factor control must anchor the care model [11].

Healthcare seeking and financial strain

The finding that most participants used private facilities aligns with the broader Pakistani picture. Public health spending is low in Pakistan. Medicines dominate household health costs [11, 12]. Affordability was the leading reason for choosing a facility. One in four participants delayed or avoided care because of cost. Cost influenced facility choice and care-seeking, although cost items were reported less often as barriers than family responsibilities, limited knowledge, or negative previous experiences. A study of 307 patients at one hospital diabetes clinic in Rawalpindi, selected by convenience sampling, reported financial constraints as the primary barrier in about 42 percent of patients. That figure is not directly comparable with ours. It comes from a single clinic sample of patients with diabetes. Our figures (17.4% to 20.5%) are the share of all community participants who rated a cost barrier as moderate or major.

Adherence and self-management

Poor adherence was reported by roughly one in four participants for diabetes and one in five for hypertension. A facility-based Pakistani study reported higher non-adherence. In Islamabad, 37.7% of hypertensive patients across primary, secondary, and tertiary facilities were non-adherent on the eight-item Morisky scale [14]. The tools and settings differ, so the rates cannot be compared directly. The lower rates here may reflect community sampling and self-report. The rates remain clinically important [11]. Home glucose (35.1%) and blood pressure (43.7%) monitoring were uncommon, which reinforces the need for structured self-management education. Qualitative evidence from Lahore has identified cost, time, and knowledge as the central obstacles to diabetes self-care [16]. Our results suggest that similar barriers may apply to people with hypertension and multimorbidity.

Systemic barriers

The breadth of barriers is striking. Family responsibilities, low knowledge, negative prior experience, and fear of treatment were each reported by about three in ten participants. These are not simply affordability problems. They may also reflect gaps in health literacy and trust. A medicine subsidy policy alone may not be sufficient. This aligns with the Andersen model. In the model, enabling resources and predisposing beliefs jointly determine whether perceived need becomes action [20, 21].

Comparison with best practice

The dominant single-disease model may be poorly suited to these patients. Our descriptive findings are consistent with calls for integrated care. A trial in sub-Saharan Africa showed that integrated management of HIV, diabetes and hypertension achieved high retention in care without worsening HIV outcomes [17]. A systematic review of integrated models in low- and middle-income countries found very low certainty evidence on mortality and blood pressure control [18]. International guidance recommends shifting chronic care to coordinated primary care teams. It also recommends ensuring access to affordable essential medicines [23]. Our findings are consistent with testing this model in Pakistani community settings. Overburdened public facilities and costly private clinics currently fragment care in Pakistan [11].

Critical analysis and methodological notes

Several associations in this study were weak or absent. Cost barriers did not differ by income. Poor adherence was not significantly associated with cost or disease load. This may reflect limited statistical power, the self-reported nature of the barriers, or shared financial pressures across income groups. Non-adherence is also driven more by behavior and beliefs than by cost alone [11, 16]. The lack of a significant association between high multimorbidity and hospitalization ($p = 0.16$) should be interpreted cautiously in a cross-sectional sample of this size.

STRENGTHS AND LIMITATIONS

The study has clear strengths. It used a community-based sample of 430 participants and a structured instrument. The instrument used the same fixed items for each person. The study also screened for 18 additional chronic conditions. There are limitations. This was a cross-sectional study, so it cannot show cause and effect. Participants were chosen by consecutive, non-probability sampling in one catchment area of Lahore. This may cause selection bias, and the results may not apply to other parts of Pakistan. Medical history and adherence were self-reported, so recall and social desirability bias are possible. Diabetes, hypertension, and the additional conditions were not verified against medical records. We had no HbA1c or blood pressure data, so we could not assess disease control. Adherence was not checked against pharmacy refill data. Obesity was defined as a BMI of 30 kg/m² or more. Asian-specific action points (23.0 and 27.5 kg/m²) are lower, so our estimate may be conservative [24]. Some categories, such as arthritis and musculoskeletal disease, may overlap and could inflate the condition count. The sample size gave limited power to detect small differences, so null findings should be read with caution. Finally, the analysis is descriptive and bivariate. Multivariable modeling would be needed to separate the independent effects of the many interrelated barriers.

CONCLUSIONS

Adults living with coexisting diabetes and hypertension in the surrounding community of Lahore carry a heavy multimorbidity burden. The burden extends well beyond dual metabolic control. Most people manage four or more chronic conditions or long-term ailments simultaneously. Substantial proportions of participants delayed care because of cost (26.0%), self-medicated (19.5%), or stopped their medicines without medical advice (14.4%). Multiple barriers, including family responsibilities, limited knowledge, and cost, may hinder effective care. Reorienting care toward affordable, integrated, and person-centered primary care deserves priority. The reorientation is backed by reliable supplies of essential medicines and structured self-management education. The reorientation may offer a promising approach to better outcomes. These findings are consistent with this reorientation. They also provide a community baseline against which future interventions can be measured.

RECOMMENDATIONS

Based on the findings, there are five next steps. First, establish integrated noncommunicable disease clinics in community teaching hospitals, such as Pak Red Crescent Medical and Dental College. These clinics should cover metabolic, heart, and renal risk factors under one roof. Second, standardize task-shifting protocols in place. Let nurses and community health workers check blood pressure and glucose as routine work. The workers should also give adherence counselling and help with triage. Third, secure a constant stock of low-cost generic medicines at primary sites. The stock includes antihypertensive drugs, tablets for blood sugar, statins, and antiplatelet drugs. Fourth, start a clear self-care education program. The program should focus on home checks, food choices, movement, and taking medicines every day. The goal is steady care, not quick relief from symptoms. Fifth, improve financial protection by expanding health insurance coverage, which only 14.7% of participants had, and by reducing out-of-pocket costs for essential medicines and consultations.

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ETHICS, CONSENT, AND DECLARATIONS
Ethics Statement: The study was approved by the institutional ethics committee of Pak Red Crescent Medical and Dental College, Lahore (approval no. 9, dated 01 January 2024) and was conducted in accordance with the Declaration of Helsinki.
Informed Consent: Written informed consent was obtained from each participant.
Conflict of Interest: None of the authors have any conflicting interests to disclose.
Data Availability: The figures and data provided in this paper were directly derived from the 430-recorded primary survey data set, which contains all the raw results of the survey and which the corresponding author holds and can provide upon reasonable request.
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