

Original Research Article

Drug-related problems and health-related quality of life among chronic disease patients in a rural region of North Cyprus

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Sent for review: 11 April 2022

Revised accepted: 28 September 2022

Abstract

Purpose: To evaluate the various types of drug-related problems (DRPs) and health-related quality of life (HRQoL) among chronic disease patients in a rural region of North Cyprus.

Methods: A cross-sectional study of patients visiting a rural community pharmacy in North Cyprus was conducted. Patient demographic information, quality of life (QoL), laboratory data, adherence, and beliefs about medicine were assessed using standardized tools. Drug-related problems were evaluated using PCNE V.9.1.

Results: Among the 200 screened participants, 97 fulfilled the enrollment criteria and were interviewed. The median age of the participants was 62 years (interquartile range = 15), with 58.8 % women. Only 54 % of hypertensive (HTN) patients reached their target blood pressure level. Over 40 % of type 2 diabetes mellitus (T2DM) patients failed to achieve their target HbA1c level. The majority (71 %) of patients with HTN, T2DM or coronary artery disease were not compliant with lifestyle recommendations and 86.6 % had ≥ 1 DRP. Insufficient dosing and inappropriate indication for a drug were the DRPs associated with failure to achieve target and inappropriate drugs was the DRP type mostly associated with lower quality of life scores. Other factors associated with lower QoL levels included female gender, unemployment status, and high agreement with the statement "medications do more harm than good".

Conclusion: Drug related problems and non-adherence are prevalent, while therapy targets are rarely met in rural Cyprus. Community pharmacists have the potential to improve outcomes in the management of non-communicable diseases (NCDs).

Keywords: Community pharmacists, Primary health care, Non-communicable diseases, Drug-related problems, Quality of life (QoL), Rural health

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Tropical Journal of Pharmaceutical Research is indexed by Science Citation Index (SciSearch), Scopus, Web of Science, Chemical Abstracts, Embase, Index Copernicus, EBSCO, African Index Medicus, JournalSeek, Journal Citation Reports/Science Edition, Directory of Open Access Journals (DOAJ), African Journal Online, Bioline International, Open-J-Gate and Pharmacy Abstracts

INTRODUCTION

Non-communicable diseases (NCDs) are the leading causes of death globally, with a high

prevalence in Turkey, where more than 88 % of total deaths in 2018 were attributed to them [1]. Cardiovascular diseases, diabetes, chronic respiratory diseases, and cancer are the most

prevalent NCDs, with a long duration and slow progression while resulting in significant morbidity and mortality [1]. Such conditions are recognized as both national and global burdens, as they result in social, human, economic, and public health impacts.

According to the World Health Organization (WHO), more than 60 % of all deaths worldwide (more than 36 million people) each year are attributed to NCDs. Among these, 15 million people who die are under the age of 70 [2]. In the eastern Mediterranean region, in 2012, more than 2.2 million deaths (57 % of all deaths) were attributed to NCDs, with 60 % dying before the age of 70 [4]. As the population ages, the number of NCD deaths is expected to rise to 52 million annually in 2030, with the largest increase expected to occur in LMICs (low- and middle-income countries) [2].

Despite multiple initiatives led by state governments and other stakeholders over the last two decades, the burden of chronic disease continues to increase rapidly, with areas that have limited access to health care being affected the most [3,4]. Care of chronically ill patients living in rural communities can be challenging due to shortages of rural physicians and a lack of access to specialists and other health care professionals. There is also evidence that practice guidelines may be poorly implemented in rural communities [5]. Non-adherence to medication and medical advice and drug-related problems (DRPs) also result in significant numbers of preventable deaths among chronic disease patients [6] and may impair patients' health-related quality of life (HRQoL) [7].

The PURE study is a large, comprehensive, ongoing, prospective, international epidemiological study providing data on the health status of populations in different regions and settings around the world in both urban and rural environments [8]. The PURE Turkey reported that the prevalence of hypertension was 41.1 %, and only 34 % of patients achieved BP control [9]. Regarding DM, this study reported an increasing prevalence of DM in Turkey compared to any time before (13.7 %), while only 25 % of DM patients achieved their HBA1c targets. At least 50 % of patients with CVD are estimated to be non-adherent to their medicine globally [6]. Drug-related problems (DRPs) are reported to be prevalent in elderly patients and hospitalized patients [10].

Community pharmacists could play a vital role in combating chronic diseases. Pharmacists can implement public health programs, conduct

preventive measures, screen and refer potential NCD patients, support prescribing, and improve patients' adherence to a safe therapeutic plan, including pharmacological and non-pharmacological therapy [11]. Unfortunately, none of the previous epidemiological studies have assessed the status of care in NCD patients in regards to adherence and DRPs, especially among rural patients with the expected limited access to necessary health care services in these regions. The aim of this study was to evaluate the status of care of NCD patients, especially those in a rural region of North Cyprus, and assess medication-related factors associated with care outcomes among these patients.

METHODS

Study design and setting

This study was conducted at a community pharmacy in the Village of Dilekkaya, North Cyprus. A cross-sectional study involving all eligible patients with NCD was carried out between October and the end of December 2019.

Study participants and recruitment

Eligible patients who attended the study setting (community pharmacy) were invited to participate in the study by the pharmacist. Patients above 18 years of age visiting the study setting with a prior diagnosis of any single or combination of the following non-communicable diseases: hypertension, hyperlipidemia, coronary artery disease, diabetes mellitus (DM), asthma or chronic obstructive pulmonary disease (COPD) were regarded as eligible. Pregnant/lactating patients, severely ill patients, and patients incapable of verbal and written communication were excluded. A pilot test was conducted to determine the feasibility of the study. Data from the pilot study were not included in the final study results.

Ethical considerations

Following ethical approval, written consent forms were obtained from each patient, and the research was conducted in accordance with the Declaration of Helsinki. Patients were informed that only their initials would be used during the study without recording other related nonclinical essential individual data.

Study procedure

The research pharmacist used questionnaires,

medical reports, and the hospital's record system to collect patient data. The data included demographic and disease characteristics, symptom severity, medication regimen, lifestyle measures, fasting blood glucose, HbA1c, and lipid profile. A qualified pharmacist checked and recorded blood pressure, blood sugar, peak flow, and body weight during each visit. Patients were also asked to complete the Beliefs About Medication questionnaire, Morisky Green test and Health-Related Quality of Life (HRQoL) questionnaire (EQ 5D3 L). A review of the prescribed medications included the identification of potential medication-related problems and was categorized using the pharmaceutical care network Europe classification system version 9.1 (PCNE 9.1).

Study tools

Adherence

Medication adherence was assessed using the Morisky-Green test (translated into Turkish and validated) at baseline and at the 12-month follow-up. This test consists of four questions: (1) "Have you ever (do you ever) forgotten to take your medication?" (2) "Are you careless at times about taking your medication?" (3) "When you feel better, do you sometimes stop taking your medication?" and (4) "Sometimes if you feel worse when you take your medication, do you stop taking your medication?" Patients are considered adherent to pharmacotherapy if they answered "no" to all four questions. If a patient answered "yes" to any question, the patient was considered non-adherent.

Beliefs about medications (BMQ)

The BMQ is used to assess patients' beliefs about their own medication. Higher values reflect stronger beliefs. The questionnaire has two sections: the general section, which evaluates the general beliefs about medications, and the specific section, which evaluates specific beliefs about the specific prescriptions the patients are offered. Each section has two scales. The general section scales assess the patient's general beliefs about whether physicians overprescribe medications (General-Overuse scale (BMQ-O)). The second scale of the general section (General-Harm scale (BMQ-H)) evaluates the perceptions of patients regarding whether medications are generally harmful. A high score on the general harm scale reflects a strong belief that medications are harmful and addictive toxins.

The BMQ-specific section has two scales: the specific necessity scale (BMQ-N) and the specific concern scale (BMQ-C). The BMQ-N assesses the patient's beliefs about the need for prescription drugs to control their illness. The BMQ-C evaluates the patient's concerns about the possible side effects from taking their prescribed medications. Patients who score higher on the BMQ-N are more aware of their current and future medication needs. Patients who score higher on the BMQ-C indicate greater concern about possible side effects of the drug.

Patient health-related quality of life (HRQoL)

The European Quality of Life 5 Dimensions 3 Level Version (EQ-5D-3 L) and the European Quality of Life Visual Analog Scale (EQ VAS) were used to evaluate the patients' health-related quality of life (HRQoL) irrespective of their disease. This tool is standardized globally and is applicable to a wide range of health conditions. The EQ-5D-3 L consists of five dimensions: first mobility, second self-care, third usual activities, fourth pain/discomfort, and fifth anxiety/depression. Disability in these dimensions is evaluated using 3 levels. The EQ VAS is a self-rating visual scale that generates a single index value out of 100 for a patient's health-related quality of life.

Statistical analysis

Data analysis was performed for this study using SPSS software (Statistical Package for Social Sciences, IBM, USA, version 22). Patient characteristics are expressed as medians (interquartile range IQR) and frequencies. A Kolmogorov-Smirnov test was performed, showing that the data deviated from a normal distribution. The chi-square test of independence was used to determine associations between categorical variables. A simple linear regression was performed to identify the type of DRP that affects treatment goal attainment and EQ-5D scores. A significant difference between variables was considered when the significance probability (p -value) was less than 0.05.

RESULTS

Response and patient characteristics

The total responders of the study were 97 out of 200 that were eligible and had been approached to participate in the study (48.5 % response rate). The median age of the included patients was 62 (IQR = 15) years, with the youngest patients being 33 years old and the oldest being 87 years. Women made up 58.8 % of the included patients.

The majority of the patients were overweighted (33.94 ± 15.97), and their concerns regarding the safety of the medications were low (15.38 ± 12.9). Table 1 shows the demographic characteristics and patient beliefs about medications.

Table 1: Characteristics of the study population ($n = 97$, 100 %)

Parameter	Number of Respondents (n (%))	Median (IQR)
Gender:	Male	
	Female	
Age:		62 (14.5)
Number of medications:	1-4	61
	≥5	36
Educational level		
	No formal education	12 (12.4)
	Primary education	58 (59.8)
	Intermediate education	4 (4.1)
	Secondary education	21 (21.6)
	University	2 (2.1)
Ethnic group:	Cypriot	94 (96.9)
	Turkish	3 (3.1)
Employment Status:	Yes	24 (24.7)
	No	73 (75.3)
Marital status:	Married	78 (80.4)
	Divorced/unmarried	19 (19.6)
Smoke	Yes	15 (15.5)
	No	82 (84.5)
Alcohol	Yes	25 (25.8)
	No	72 (74.2)
Lifestyle	Compliant	28 (28.9)
	Noncompliant	69 (71.1)
Diagnosis (ICD code)		
	Hypertension (I15)	90 (92.8)
	Diabetes (E11)	37 (38.1)
	Hyperlipidemia (E78.2)	53 (54.6)
	Cardiac disease (I51.9)	14 (14.4)
	Thyroid (E01)	9 (9.3)
	Chronic heart failure (I50)	1 (1)
	Cancer (C80. 1)	2 (2.1)
	Depression (F31.3)	5 (5.2)
Waist circumference (cm)		110 (18)
Weight(kg)		80 (21)
Body mass index		29.20 (26.85-34.70)
BMQ-O total		18 (13)
BMQ-H total		12 (18)
BMQ-N total		40 (27)
BMQ-C total		11 (21)
Duration of diabetes		10 (9.25)
Duration of hypertension		10 (10.25)
Duration of coronary artery disease		9 (12.25)
Duration of dyslipidemia		10 (8)
Medication classifications	Total = 413 (100.0)	
	Alimentary tract and metabolism	74 (17.9)
	Blood and blood forming organs	42 (10.2)
	Cardiovascular system	226 (54.7)
	Musculo-skeletal system	8 (1.9)
	Nervous system	21 (5.1)
	Respiratory system	3 (0.7)
	Systemic hormonal preparations, excel hormones and insulin	25 (6.1)
	Vitamins/minerals	10 (2.4)
	Herbals	4 (1.0)

Chronic conditions and achievement of goals of therapy

The most frequently encountered chronic disease was hypertension (92.8 %), followed by dyslipidemia (54.6 %), type II diabetes mellitus (T2DM) (38.1 %), coronary artery disease (CAD) (14.4 %), thyroid disorder (9.3 %), depression (5.2 %), cancer (2.1 %) and chronic heart failure (1 %). Among patients with only hypertension, only 54 % achieved their target blood pressure (BP) < 140/80. Of those with CAD, 64 % achieved a BP < 140/80, while most patients with DM (51 %) reported a BP >140/80. Regarding HbA1c levels, 40.5 % of the patients did not achieve glycemic targets < 7 %. For dyslipidemia, only 51 % of all patients achieved LDL < 130 mg/dL, approximately 50 % of patients with hypertension, CAD or DM had a LDL > 130 mg/dL, total cholesterol > 200 mg/dL, and 90 % had an HDL < 40 mg/dL. Among DM patients, only 20 % achieved all targets (BP, HbA1c and lipid profile). For CAD patients, only 40 % of patients achieved their BP and lipid targets. Most patients (71 %) with hypertension, T2DM or CAD were not compliant with their recommended lifestyle and diet. Patients reported using 226 (54.7 %) cardiovascular medications, alimentary tract and metabolism 74 (17.9 %) medications, and only 14 (3.4 %) vitamin minerals or herbal therapies.

Adherence, drug-related problems and quality of life

Based on the self-reported patient response, only 26.8 % were classified as completely adherent to medications, while the remaining were identified as slightly adherent (3.1 %) and non-adherent 70.1 %. The prevalence of other drug-related problems in the study sample was 86.6 % (2.1 DRP per patient). In total, 190 different DRPs were identified. The most common type of DRP was untreated symptoms or indications, followed by the effect of drug treatment not being optimal. The most common cause of DRP was no or incomplete drug treatment despite an existing indication. The interventions most commonly needed involved the addition of statin therapy, aspirin or adjusting the antihypertensive medication dosing (Table 2).

The average EQ-5D score for the study participants was -0.1465 (SD: 0.3682; range - 0.594 to 0.779), while the visual scale average score was 54.8 (SD: 17.9; range 0.0 – 95.0 %).

Figure 1 shows the patients' responses to the EQ-5D questionnaire. No significant differences

were seen in HRQoL, frequency of DRP, and target of therapy achievement in different age categories, ethnic groups, marital status, smoking, alcohol use or being a hypertensive patient ($p > 0.05$, Table 3 and Table 4).

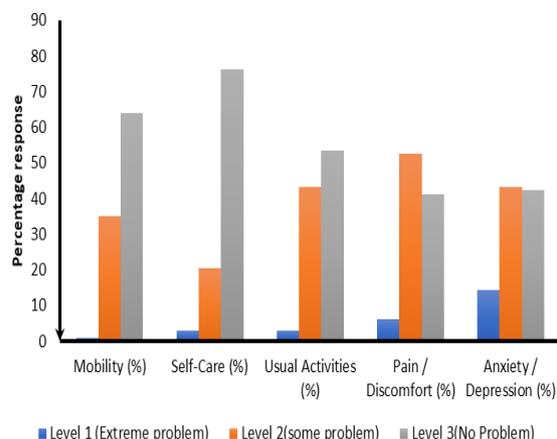


Figure 1: EQ-5D-3 L frequencies (%) reported by dimension and level for the study population (n = 97)

Failure to achieve therapy targets was significantly higher in non-adherent patients who likewise had multiple DRPs than adherent patients ($p < 0.01$). Failure to achieve treatment targets was also higher in patients with multiple DRPs ($p < 0.01$). Patients with lower HRQoL scores agreed with the BMQ statement "Medicines do more harm than good" (BMQ score 5.51 ± 5.01 vs. 1.78 ± 3.32 out of 7, $p = 0.02$), as did those who failed to achieve therapy targets (BMQ score 3.57 ± 4.52 vs. 1.64 ± 3.17 ; $p = 0.01$). Tables 5 and 6 show a regression analysis of DRP subtypes affecting target achievement and quality of life.

DISCUSSION

In the current study, hypertension, dyslipidemia and type II diabetes mellitus (T2DM) were the most prevalent chronic diseases in the studied population. Regardless of being on medication for a median of 10 (10.25) years, only 54 % of hypertension patients reached their target blood pressure. More than 40 % of T2DM patients failed to achieve the target HbA1c level within an average duration of therapy of 10 (9.25) years for the studied patient group, while most patients failed to maintain a blood pressure less than 140/80 or achieve a targeted lipid profile for T2DM patients based on the ADA guidelines [12]. The three targets, HbA1c, blood pressure, and cholesterol level, were only achieved by 20 % of T2DM patients in Dilekkaya village.

Table 2: Drug-related problem types, causes and required interventions (n = 190 DRPs)

Type of drug-related problem	Frequency n (%)
Effect of drug treatment not optimal	43 (22.6)
Untreated symptoms or indications	106 (55.8)
Adverse drug event (possibly) occurring	22 (11.6)
Cause of drug-related problem	
Inappropriate drug according to the guidelines/formulary	6 (3.2)
No indication for the drug	12 (6.3)
No or incomplete drug treatment in spite of existing indication	109 (57.4)
Too many different drugs/active ingredients prescribed for the indication	4 (2.1)
Drug dose too low	39 (20.5)
Drug dose of a single active ingredient too high	1 (0.5)
Duration of treatment too long	17 (8.9)
Patient decides to use unnecessary drug	2 (1.1)
Description of required intervention	
Add aspirin	46 (24.2)
Add statin	43 (22.6)
Increase statin dose	6 (3.2)
Increase metformin dose	14 (7.4)
Increase gliclazide dose	4(2.1)
Stop aspirin	7 (3.7)
Correcting insulin dose	4 (2.1)
Stop domperidone drug	1 (0.5)
Add antihypertensive medication	10 (5.3)
Increase antihypertensive dose	10 (5.3)
Stop antihypertensive drug	6 (3.2)
Add hyperlipidemia drug	1 (0.5)
Change antihyperlipidemia drug	1 (0.5)
Change antihypertensive drug	3 (1.6)
Stop hypertensive drug	4 (2.1)
Stop antacid drug	11 (5.8)
Increase anti-arrhythmic drug dose	1 (0.5)
Stop antihyperlipidemia drug	2 (1.1)
Start digoxin	1 (0.5)
Add antihyperglycemic drug	1 (0.5)
Start metformin	5 (2.6)
Stop pseudoephedrine and cetirizine	1 (0.5)
Stop metformin	1 (0.5)
Stop trimetazidine dihydrochloride (Vastarel)	1 (0.5)
Stop Monoket	1 (0.5)
Stop Plavix	1 (0.5)
Adjust antihypertensive medication dose	1 (0.5)
Change antihyperglycemic drug	1 (0.5)
Stop folic acid	1 (0.5)
Add insulin to therapy	1 (0.5)

The PURE study reported that on average, 32.5 % of the treated patients achieved BP control (40.7 % in high-income countries), compared to 54 % reported in the current study [13]. Blood pressure control remains a major global challenge. A large multinational study also reported control to be less than 25 % in treated patients in 12 high-income countries [14], while it was as low as 10 % in urban and rural areas of 44 low middle-income countries [15]. In Turkey, 34 % of the patients treated for hypertension were reported to achieve BP control in the PURE Turkey study [9]. Other studies demonstrated that only 37.6 % of patients in rural Latin America received medical treatment to achieve BP

control, with higher rates reported in urban areas (39.6 %) [16].

Targets of therapy achievement are also a major global challenge and are rarely achieved in T2DM patients [17]. Only 25 % of DM patients achieved their HbA1c targets in the PURE study compared to 59.5 % in the current study [9]. A population-wide study carried out in rural and urban Malawi showed that approximately 41 % of those who had been treated for T2DM were HbA1c controlled, while fewer proportions were reported in Jordan (39 %) [18] and Ethiopia (29 – 331 %) [19].

Table 3: Patient characteristics by adherence level and target achievement

Variable	Total		Adherence level (n(%))		OR (95 % CI)	P-value	Target achievement		OR (95 % CI)	P-value
	n	%	Non –Adherent	Adherent			Non-target	target		
Age										
< 65	57	58.8	40	17	Reference	0.98	41	16	0.54 (0.20-1.47)	0.22
≥ 65	40	41.2	28	12	1.00 (0.41-2.43)		33	7		
Gender										
Male	40	41.2	31	9	Reference	0.18	32	8	0.70 (0.26-1.85)	0.47
Female	57	58.8	37	20	0.53 (0.21-1.34)		42	15		
Ethnic Group										
Cypriot	94	96.9	66	28	Reference	0.66	72	22	1.63 (0.14-18.91)	0.56
Turkish	3	3.1	2	1	1.17 (0.10-13.5)		2	1		
Educated	85	87.6	60	25	1.20 (0.33-4.34)		66	19		
Marital status										
Married	93	95.9	65	28	Reference	0.65	71	22	0.93 (0.09-9.39)	0.66
Not married	4	4.1	3	1	1.29 (0.12-12.96)		3	1		
Employed	24	24.7	20	4	2.60 (0.80-8.45)		19	5		
Smokes	15	15.5	10	5	0.82 (0.25-2.67)		12	3		
Takes alcohol	25	25.8	17	8	0.87 (0.32-2.33)		20	5		
Hypertensive	90	92.8	63	27	1.07 (0.19-5.86)		67	23		
Diabetic	37	38.1	25	12	1.2 (0.49-2.95)		35	2		
Has heart disease	14	14.4	8	6	1.95 (0.61-6.25)		8	6		
Dyslipidemia	49	50.5	35	14	0.88 (0.36-2.10)		49	0		
No. of medications										
1-4	61	62.9	41	20	Reference	0.41	47	14	1.11 (0.42-2.92)	0.81
> 5	36	37.1	27	9	0.68 (0.27-1.72)		27	9		
Life style noncompliance	69	71.1	51	18	0.54 (0.21-1.38)		61	8		

CI: confidence interval; OR: odds ratio; *p < 0.05 indicates the statistically significant difference between nonadherent and adherent

Table 4: Patient characteristics by prevalence of DRPs and HQoL index

Variable	Total		DRP prevalence		OR (95 % CI)	P-value	QoL index		OR (95 % CI)	P-value
	n	%								
Age										
< 65	57	58.8	18	39	1.21 (0.49-2.96)	0.66	4	53	0.52 (0.13-2.10)	0.36
≥ 65	40	41.2	11	29			5	35		
Gender										
Male	40	41.2	12	28	0.99 (0.41-2.39)	0.98	0	40	0.84 (0.75-0.94)	0.01
Female	57	58.8	17	40			9	48		
Ethnic Group										
Cypriot	94	96.9	27	67	0.20 (0.01-2.31)	0.21	9	85	0.90 (0.84-0.96)	0.74
Turkish	3	3.1	2	1			0	3		
Educated	85	87.6	23	62			6	79		
Marital status										
Married	93	95.9	29	64	1.45 (1.26-1.66)	0.31	9	84	1.10 (1.03-1.18)	0.67
Not married	4	4.1	0	4			0	4		
Employed	24	24.7	8	16			0	24		
Smokes	15	15.5	5	10			0	15		
Takes alcohol	25	25.8	8	17			1	24		
Hypertensive	90	92.8	25	65			9	81		
Diabetic	37	38.1	6	31			1	36		
Has heart disease	14	14.4	5	9			1	13		
Dyslipidemia	49	50.5	14	35			4	45		
No. of medications										
1-4	61	62.9	22	39	2.33 (0.88-6.20)	0.08	3	58	0.25 (0.06-1.10)	0.05
> 5	36	37.1	7	29			6	30		
Life style noncompliance	69	71.1	17	52			6	63		

CI: confidence interval; OR: odds ratio

Table 5: Simple linear regression analysis for actual DRPs affecting HRQoL (EQ-5D) scores

DRP type	Dependent variable: EQ-5D scores				
	B estimate	SE	Beta	R2 %	P-value
Inappropriate drug according to guidelines/formulary	-2.667	1.228	-0.236	0.053	0.033
No indication for drug	-0.043	0.601	-0.011	0.000	0.944
No drug treatment in spite of existing indication	-9.428E-15	1.990	0.000	0.030	1.000
Drug dose too low	-1.200	0.683	-0.248	0.000	0.082
Drug dose too high	-8.095E-15	1.990	0.000	0.025	1.000
Duration of treatment too long	-1.500	0.946	-0.184	0.011	0.117
Patient uses unnecessary drug	-1.000	0.946	-0.123	0.015	0.294

Table 6: Simple linear regression analysis for actual DRPs affecting therapy target achievement

DRP type	Dependent variable: Target achievement				
	B estimate	SE	Beta	R2 %	P-value
Inappropriate drug according to guidelines/formulary	1.128	0.822	0.148	0.015	0.173
No indication for drug	1.079	0.402	0.408	0.003	0.009
No drug treatment in spite of existing indication	2.462	1.332	0.188	0.005	0.068
Drug dose too low	1.012	0.457	0.310	0.000	0.030
Drug dose too high	1.462	1.332	0.112	0.009	0.275
Duration of treatment too long	-0.205	0.633	-0.037	0.015	0.747
Patient uses unnecessary drug	1.128	0.822	0.148	0.015	0.173

Insufficient dosing and inappropriate indications for a drug were the drug-related problems shown to significantly impact target achievement in a linear regression analysis. Inappropriate drugs according to the guidelines/formuli was the DRP type that most affected the quality of life of the studied patients. Previous studies reported that nonadherence to nonpharmacological therapy was associated with poor EQ-5D scores, while indication DRPs were associated with better EQ-5D scores [20].

Other factors associated with worse QoL and lower EQ-5D scores include female gender, unemployment status, and belief that medications do more harm than good". Other researchers reported that medication-related risk factors, female gender, two classes of DRPs, needing additional drug therapy, wrong drugs, and illiteracy were all associated with worse QoL and lower EQ-5D scores, which is comparable to the findings in this study [17-20]. It is important to mention the potential factors that may result in variations between studies, such as the fact that they were conducted in different cultural settings, used different tools for the evaluation of HRQoL and DRP, and considered different patient-related factors.

Drug-related problems (86.6 %) and non-adherence (70.1 %) were prevalent in the current study (2.1 DRP per patient). Being a T2DM patient was associated with a higher chance of having multiple DRPs, similar to previous findings reported in Jordan [20]. Over 190 different DRPs were identified in the current study. The most common type of DRP was untreated symptoms or indication (55.8 %),

followed by the effect of drug treatment not being optimal (22.6 %). The most common cause was 'No or incomplete drug treatment despite existing indication' followed by 'Drug dose being too low'. These were also identified as the most common causes for DRP in large registry studies of patients who received medication therapy management (MTM) [21].

Medications most commonly involved in DRPs identified in 22,694 ambulatory patients included preventive drug therapies required to reduce the risk of developing a new condition, such as aspirin for secondary prevention of cardiovascular diseases and statins for the primary prevention of cardiovascular disease in patients with multiple cardiovascular disease risk factors or diabetes. The most common medications given at a lower than normal dose included hypoglycemic agents (insulin metformin and exenatide), followed by antihypertensive agents (lisinopril) and lipid-lowering agents, mainly statins [21]. In the current study, the interventions most commonly needed also involved the addition of statin therapy and aspirin, adjusting the dose or adding metformin, insulin or antihypertensive medications.

Pharmaceutical care services and MTM can improve clinical outcomes and cost savings while achieving patient satisfaction [22]. For health care delivery in rural areas, maximizing the use of pharmacists is an important strategy to meet the unique health care needs of rural and underserved communities [23]. Likewise, community pharmacists are well suited for the management of patients with chronic diseases [11]. Pharmacists could use their expertise to

deliver services such as preventive measures, screen and refer potential NCD patients, utilize new impactful technologies, support prescribing and improve patients' adherence to a safe therapeutic plan, including pharmacological and non-pharmacological therapy [11]. A previous randomized controlled trial conducted in North Cyprus showed the impact of a pharmacist-led care program on diabetic outpatients in a public hospital [24]. Significant improvements in reducing HbA1c and other secondary outcomes in the 12-month study were seen in the pharmacist-involved group compared to the control. Such services should be implemented in rural areas as well.

The current study has several limitations. The single-center nature of the study and the relatively small sample size means that the findings from this study are not generalizable to the whole country. The cross-sectional nature of the study enables the evaluation of associations between variables—drug-related problem types, adherence, target achievement and quality of life—but cannot explain the directionality of these associations. Therefore, a longitudinal study would provide a more complete picture. The reported blood pressure measures and HbA1c levels in hypertension and T2DM patients were higher than that reported by other studies conducted in Turkey and other places. This could be explained by methodological differences, as in the PURE study, where home visits were adopted for patient data collection, while in the current study, patients routinely visiting the study setting were sampled and interviewed. This study may not represent patients who get their medications from neighboring urban areas and those who do not routinely visit a pharmacy to acquire medications. The latter group of patients is expected to have worse outcomes. Additionally, Dilekkaya village is only 33 km away from the nearest city, and patients in rural areas relatively closer to cities have better access to health services; thus, differences exist between rural areas based on their proximity to urban areas.

CONCLUSION

This study has shown that hypertension, dyslipidemia, and Type II diabetes mellitus (T2DM) are the most prevalent chronic diseases in the studied population and that drug-related problems and non-adherence to medication and medical advice are prevalent. Almost half of the hypertensive patients did not achieve their target blood pressure, while only one-fifth of patients with T2DM achieved their therapy targets (HbA1c, blood pressure and cholesterol level)

but they had significantly more DRPs compared to the other patient groups. Community pharmacists are well suited to identify therapy gaps, and previous studies show pharmaceutical care services are effective in improving clinical outcomes and cost savings in chronic disease patients. Future research should focus on implementing strategies involving community pharmacists to improve outcomes in the management of chronic disease in rural areas.

DECLARATIONS

Acknowledgements

The authors acknowledge the European Society of Clinical Pharmacy for publishing an abstract of this study, which was presented at the 49th ESCP Virtual Symposium on Clinical Pharmacy October 2021 and is available at: 49th ESCP Virtual Symposium on Clinical Pharmacy 19.10.2021–21.10.2021 Clinical pharmacy, working collaboratively in mental health care. *Int J Clin Pharm* 44, 835–836 (2022). <https://doi.org/10.1007/s11096-022-01412-9>.

Funding

None provided.

Ethical approval

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Near East University Hospital, Turkey.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

No conflict of interest associated with this work.

Contribution of Authors

We declare that this work was done by the authors named in this article, and all liabilities pertaining to claims relating to the content of this article will be borne by the authors. Servet Goksin and Abdikarim Abdi were responsible for the design and implementation of the study. Servet Goksin carried out interviews and collected data. Servet Goksin and Louai Alsaloumi carried out data analysis and interpretation. Servet Goksin and Abdikarim Abdi wrote the manuscript. Louai Alsaloumi and

Bilgen Basgut reviewed and improved the manuscript. All authors read and approved the final manuscript. The first two authors contributed equally to this work.

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