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ORIGINAL PAPER

A cross-sectional study of psychosocial variables associated with medication burden among type 2 diabetes mellitus with multiple comorbidities in geriatric patients

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ABSTRACT

Introduction and aim. As the population ages, the management of type 2 diabetes mellitus in older adults with multiple comorbidities becomes more complex. Geriatric patients often face a medication burden, impacting their quality of life and adherence. Psychosocial variables such as depression, anxiety, social support, and health literacy may influence how patients cope with their medications. This study explores the relationship between these variables and the burden in geriatric patients with type 2 diabetes and comorbidities, offering insight into improving care and outcomes.

Material and methods. The cross-sectional survey was carried out from April to September 2024. 250 patients were included. The demographics of the participants, the burden of the disease, polypharmacy, the burden of the medication, and the psychosocial variables were evaluated. Univariate and multivariate linear regression analyzes assessed the variables associated with the burden of medications.

Results. There was a positive correlation between the belief in medication, depression, disease burden, number of medications, number of comorbidities, and medication burden ($p<0.05$). Knowledge about medications was not significantly correlated with the burden ($p>0.05$).

Conclusion. Low self-efficacy, depression, polypharmacy, high disease burden, and decreased medication satisfaction can all contribute to medication burden. Comprehending these factors helps identify patients with geriatric diabetes and enables personalized treatment to ease their burden.

Keywords. geriatric patients, medication burden, multiple comorbidities, psychosocial variables, type 2 diabetes mellitus

Introduction

The global prevalence of type 2 diabetes is increasing, with 25.2 million adults affected by impaired glucose tolerance (IGT) today expected to rise to 35.7 million by 2045. India is second after China, with 77 million people living with diabetes, particularly older adults over 60, due to aging, urbanization, poor lifestyle choices and lack of physical activity. To maintain this glycemic target and prevent long-term problems, type 2 diabetes frequently requires a gradual increase in pharmaceutical therapy in addition to lifestyle modifications.[1] The geriatric cohort, often burdened with multiple comorbidities such as hypertension, cardiovascular disease, osteoarthritis, and dyslipidemia, faces unique challeng-

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es in the management of type 2 diabetes mellitus, all of which put diabetes patients at high risk of polypharmacy. According to a national population-based survey, more than 80% of older adults in India were prescribed at least one drug and over one-third were taking at least five prescription drugs at the same time.[2]

Polypharmacotherapy and high pill load are caused by microvascular and macrovascular problems related to diabetes, as well as the risk of linked comorbidities such as hypertension and hyperlipidemia in many patients with type 2 diabetes. These challenges are not only medical but also psychosocial, and the complexities of managing multiple chronic diseases frequently leading to medication burden that significantly impacts quality of life.[3]

Geriatric patients with type 2 diabetes with multiple comorbidities are particularly vulnerable to the negative impacts of medication burden, which may manifest itself as increased difficulty in adhering to treatment, a higher risk of drug interactions, and the potential for adverse drug reactions. The psychosocial aspects of managing chronic diseases, such as mental health problems, social support, cognitive function, and health literacy, can significantly influence how elderly patients perceive and manage their medication regimens.[4] These psychosocial variables can either exacerbate or alleviate the challenges associated with medication burden.

Medication adherence is complicated by aging-related physiological changes, such as altered drug metabolism and declining cognitive functions, which make it difficult for older adults to comply with multidose schedules. Different physical conditions, such as arthritis or a lack of financial resources, can also contribute to the difficulty of drug intake. Research conducted in Spain indicates that the more chronic diseases accumulated by older people, the more medicine-related problems appeared: drug interactions and inappropriate prescriptions.[5]

The medication burden is the time and effort required to manage chronic diseases, which is especially high in older patients with multiple comorbid conditions. A significant part of this is the medication burden, which is the workload and burden associated with medication use.[5] Maidment et al. defined five types of medication burden: ambiguity (unclear medication management), concealment (lack of information sharing), unfamiliarity (inconsistent care providers), fragmentation (difficulty navigating fragmented healthcare services), and exclusion (lack of participation in decision making). These factors significantly affect the ability of older adults to manage their health effectively.[6]

Overuse of medications can result in poor social functioning, noncompliance, suboptimal treatment outcomes, and a lower quality of life.[7] The burden depends on both the individual's ability to manage the burden and the workload associated with taking medications. According to the cumulative complexity model, an adaptive balance between burden and capacity is necessary for the successful self-management of chronic disease.[8]

Managing pharmaceutical loads and their impact on health results from internal resources of the patient (functional and cognitive abilities) combined with external support, including the healthcare system and the family.[9] The term "medication self-management capacity" refers to the skills and knowledge needed to correctly follow a prescribed regimen, including the filling, organizing, taking and monitoring medications. Demographic factors, including age, education level, and financial background, influence these abilities, while some patient attitudes and external support could further facilitate or hinder medication management. "Understanding the competence of patients in medication self-management is relevant because difficulties faced by patients with respect to the control of their prescription indicate areas of intervention".[10]

Attributes are factors directly affecting patient satisfaction of the patient on medication, which makes their satisfaction dependent on treatment expectations, side effects, ease of use, and efficiency. Patients report discontent primarily due to a lack of perceived benefits, side effects, or inconvenience. Negative perceptions about medication often evolve from dissatisfaction. Patients dissatisfied with their treatment are less effective at managing side effects and are even less likely to incorporate medications into their daily lives.[11]

Most research on the burden is qualitative, focusing on drug use, with some studies examining the impact of clinical and demographic factors. Univariate analyses often produce incomplete data due to the interdependence of these factors. Limited literature exists on psychosocial influences that contribute to medication burden among patients with type 2 diabetes mellitus (T2DM). Previous studies observe that healthcare providers are prone to overestimate patients' ability to handle their medication and management issues; therefore, knowledge of psychological factors associated with medication burden becomes imperative for implementing suitable treatment plans for improved compliance and self-management.[12]

However, older adults with T2DM and multimorbidity are most susceptible to medication burden and low self-management. Therefore, understanding these psychosocial variables is paramount in patient-centered care strategies to promote adherence, reduce complications, and improve quality of life.

Aim

Given the increasing burden of T2DM globally and, particularly, in India, this study aims to evaluate psychosocial variables related to the medication burden among elderly T2DM patients with comorbidities.

Material and methods

Study design and participants

Considering that geriatric patients may face challenges in terms of mobility, cognitive function, and participation in long-term studies, we conducted a cross-sectional study at the tertiary healthcare center from April to September 2024. The single proportion sample size formula was used; therefore, the proportion was taken as 50%, with a margin of error of 6% and a confidence interval of 95%. $n=z^2 p(1-p)/w^2$, where n=sample size, p=proportion (50%), z=1.96 confidence level, w=margin error (6%) and $n=1.96^2(0.5(1-0.5)/(0.06)^2=267.89$. Therefore, n=268. In that 12 patients were not interested in participating in the study. And 6 patients had missing data, and their responses were unclear. Hence, 18 patients were excluded. And based on the G* power analysis with a medium effect size (Cohen's d=0.5), assuming 80% power and a 0.05 alpha level, the sample size of 250 patients is sufficient to detect the observed effects. Finally, a total of 250 patients were recruited in this study.

Inclusion and exclusion criteria

Patients with type 2 diabetes mellitus 60 years or above with multiple comorbidities, prescribed with one or more medications and able to self-administer medications were included in the study, and the exclusion criteria were having type 1 or gestational diabetes, cognitive impairment, severe mental illness, deafness and not willing to participate in the study.

Data collection tools

Demographic characteristics

The first section assesses demographic characteristics, including age, sex, marital status, education level, monthly income and type of multimorbidity.

Medication knowledge

The second section of the survey assesses the patient's knowledge of medications. Medication knowledge was assessed using the Patient's Perceived Knowledge in Medication Use Questionnaire (PKMUQ).[13] The assessment includes five items that assess the knowledge of medication use and drug interactions. The survey uses a 5-point Likert scale, with 1 representing severe disagreement and 5 representing strong agreement. The scores for each item are added together to create a total score that ranges from 5 to 25. A higher score denotes greater awareness of medications. Cronbach's alpha for the scale in the current study was 0.738.

Medication beliefs

The Beliefs About Medication Questionnaire (BMQ), which included 18 items, was used to assess medication beliefs.[14] The BMQ consists of two sections with two subscales each. (1) BMQ-Specific assesses beliefs about the necessity and concerns (5 items), while (2) BMQ-General assesses beliefs about pharmaceutical damage and overuse by physicians (4 items). The items were evaluated on a 5-point Likert scale, with 1 indicating strong disagreement and 5 indicating strong agreement. A higher overall score suggests greater trust in the relevant notions of each subscale. The current study had a Cronbach's alpha of 0.702 for the BMQ.

Treatment satisfaction

The Treatment Satisfaction Questionnaire Version II (TSQM-II) was used to assess medication treatment satisfaction.[15,16] Four dimensions are included in the 11-item survey: global satisfaction, side effects, effectiveness, and convenience. A five- or seven-point Likert scale is used to rate each item. The scores of the components that make up each dimension are added together to determine the composite score, which is then converted into a number between 0 and 100. This study evaluated participants' satisfaction with pharmacological treatments using the global satisfaction score. A higher score denotes greater contentment with the use of medications. The scale's Cronbach's alpha in the current study was 0.643.

Depression

The nine-item Patient Health Questionnaire (PHQ) was used to measure depression.[17] The purpose of this scale is to collect information about a person's depressive episodes during the last two weeks. The Likert scale has four points (0 being not at all and 3 being almost daily). A higher score denotes a stronger depression; the total score ranges from 0 to 27. In the current investigation, the scale's Cronbach's alpha was 0.759.

Polypharmacy and disease burden

Furthermore, participants were questioned about the quantity of medications they were currently using. If an elderly person took five or more medications, it was considered that they had polypharmacy. The Cumulative Illness Rating Scale-Geriatric (CIRS-G) was used to evaluate the burden of disease in 14 bodily systems in an individual.[18-20] The severity of each condition and its effects on the individual are scored on this scale in addition to chronic disorders. Each body system is assessed on a 5-point Likert scale, with 0 denoting no problem and 4 denoting extremely severe. The sum of each system's severity scores yields the overall score. The burden of the disease is higher when the total score (which can vary from 0 to 56) is higher. Salvi et al. devised a set of guidelines that were followed to score the scale. Elderly individuals have validated this scale.

Medication burden

The third section of the survey assesses the burden of medication. The first four items assessed the burden of medication. The 15-item self-reported scale assesses the behavioral and emotional burden associated with treatment procedures. The tool assesses an individual's perceived burden from pharmaceutical use, lifestyle modifications, and treatment-related social and economic consequences.[21,22] On the Likert scale, 0 represents "not a problem" and 10 represents "large problem". The greater hardship experienced is indicated by a higher score. The scale employed in this study had a Cronbach's alpha of 0.865. The first four items assess drug burden, including discomfort, daily medication schedules, reminders, and necessary precautions. The pharmaceutical burden was calculated by adding their scores on four questions, resulting in a total score ranging from 0 to 40.

Data collection procedure

The entire survey took around 15 to 20 minutes to complete. Data collection for this study was divided into three phases. In phase 1, the patient's demographic and clinical characteristics were gathered from records or through face-to-face interaction with the patient. Phase 2, the patient's knowledge (PKMUQ), belief (BMQ), treatment satisfaction (TSQM-II), depression (PHQ), disease burden (CIRS-G), polypharmacy (number of medications) and phase 3, medication burden (TBQ) these were obtained from face-to-face interviews using questionnaires. Each participant gave their informed consent before the study.

Data analysis

The characteristics were summarized using means and standard deviations for continuous data and frequencies and percentages for categorical data. The student's t-test, one-way ANOVA, and Pearson's 2 test assessed medication burden across demographics and clinical features. Pearson correlation identified correlations between variables, while univariate and multivariate linear regression models identified variables linked to medication burden. Variables with $p<0.05$ in the univariate analysis were included in multivariate models and multicollinearity was assessed using the Pearson's correlation coefficient. Additional analysis considered psychosocial factors and significant variables, with IBM SPSS statistics (Armonk, NY, USA) version 25.0 used for all analyses. A $p<0.05$ was considered significant.

Ethical considerations

The institutional ethics committee approved an ethical authorization for the study (approval number 1056/2024). The ethical criteria of the national and/or institutional research committee, the Declaration of Helsinki of 1964 and its subsequent modifications or comparable standards were adhered to by every procedure used in this study involving human subjects.

Table 1. Sociodemographic and clinical characteristics among 250 type 2 diabetes mellitus patients

Characteristics	n (%)	Medication burden, mean (SD)	t	p
Age (years)				
60–70	158 (63.2)	8.19 (9.46)	0.40	0.852
>70	92 (36.8)	7.32 (8.21)		
Gender				
Male	112 (44.8)	6.67 (7.09)	-0.20	0.537
Female	138 (55.2)	7.44 (8.87)		
Education level				
Literate	154 (61.6)	6.34 (8.06)	-1.05	0.449
Illiterate	96 (38.4)	7.90 (9.85)		
Marital status				
Married	178 (71.2)	6.83 (9.50)	-1.32	0.248
Single/Widow/Divorces	72 (28.8)	7.16 (8.44)		
Monthly income (Rupees)				
≤10000	198 (79.2)	7.48 (11.14)	-0.09	0.654
>10000	52 (20.8)	6.68 (8.64)		
HbA1c (%)				
<7	60 (24)	5.6(1.21)	2.86	<0.001
≥7	190 (76)	9.7 (0.39)		
Hypertension				
Yes	187 (74.8)	7.59 (8.62)	1.09	0.131
No	63 (25.2)	8.84 (9.42)		
Lipid disorder				
Yes	62 (24.8)	8.53 (10.67)	-1.28	0.007
No	188 (75.2)	4.58 (6.48)		
Coronary heart disease				
Yes	122 (48.8)	6.46 (8.58)	-0.54	0.279
No	128 (51.2)	7.47 (9.44)		
Glaucoma/cataract				
Yes	54 (21.6)	9.87 (10.34)	-0.67	0.020
No	196 (78.4)	5.97 (6.78)		
Kidney problems				
Yes	95 (38)	10.67(9.84)	0.20	0.045
No	155 (62)	4.33 (5.90)		
Any chronic painful condition				
Yes	181 (72.4)	10.45 (10.98)	2.07	0.009
No	69 (27.6)	5.72 (7.24)		
Polypharmacy				
Yes	98 (39.2)	11.46 (10.89)	0.001	0.001
No	152 (60.8)	4.52 (6.34)		

Results

This analysis includes 250 T2DM patients. Sociodemographic and clinical characteristics are shown in Table 1. Most of the participants were in the age group – 60–70 years (63.2%); gender – female (55.2%); educational level – literate (61.6%); marital status – married (76%). Chronic illnesses with >30% prevalence included hypertension (74.8%), lipid disorders (24.8%), coronary heart disease (48.8%), glaucoma/cataracts (21.6%), kidney problems (38%), and chronic painful conditions (72.4%). The average number of prescription drugs was 3.78 (SD: 2.48). More than one-third (39.2%) of the subjects. Individuals with chronic painful conditions, poly-

pharmacy and kidney problems had considerably high medication burdens (all p<0.05).

Relationships between continuous variables and medication burden

The associations between the number of chronic illnesses, the burden of disease, the psychosocial variables and medication burden are shown in Table 2. The findings demonstrated a statistically significant negative relationship between medication knowledge, social support, self-efficacy, and treatment satisfaction (r ranged from -0.12 to -0.96, p<0.05). Additionally, there was a positive correlation between medication belief, depression, disease burden, number of medications, number of comorbidities, and medication burden (r ranged from 0.01 to 0.57, p<0.05).

Table 2. Association between the number of chronic diseases, disease burden, psychosocial variables, and medication burden

Variable	Mean (SD)	Correlation with medication burden	
		r	p
Medication Knowledge	9.74 (1.83)	-0.12	0.023
Medication beliefs			
i. Necessity of medication	12.17 (2.35)	0.01	0.064
ii. Concerns about medication	19.28 (5.01)	0.02	0.016
iii. Overuse of medication	14.34 (3.15)	0.01	0.006
iv. Harm of medication	10.06 (4.92)	0.45	0.001
Medication social support	1.37 (0.47)	-0.26	0.046
Medication self-efficacy	22.64 (3.05)	-0.48	0.009
Treatment satisfaction	72.37 (8.39)	-0.96	<0.001
Depression	3.05 (2.65)	0.20	<0.001
Disease burden	7.34 (1.53)	0.57	0.01
Number of medications	4.70 (1.65)	0.18	0.004
Number of comorbidities	3.90 (1.73)	0.52	<0.001
Medication burden	8.18 (5.38)	1.4	–

Univariate linear regression analysis for the burden of medication

A univariate linear regression analysis (Table 3) revealed a statistically significant correlation between mediation burden and age (β=0.08, p=0.008), monthly income (β=0.07, p=0.11), HbA1c (β=-0.01, p=0.005), coronary heart disease (β=-0.23, p=0.029), glaucoma/cataract (β=0.19, p=0.002), kidney problems (β=0.12, p=0.03), polypharmacy (β=0.51, p=0.004), medication knowledge (β=-0.17, p=0.002), medication belief [necessity of medication (β=-0.12, p<0.001); concerns about medication (β=0.45, p<0.001); overuse of medication (β=0.06, p<0.001) and harm of medication (β=0.34, p=0.007)], medication self-efficacy (β=-0.28, p=0.011), treatment satisfaction (β=-0.63, p=0.062), depression (β=0.47, p <0.001), disease burden (β=0.42, p<0.001), and number of comorbidities (β=0.31, p<0.001).

Table 3. Variables associated with medication burden using univariate linear regression analysis

Variables	Unstandardized coefficients		Standardised coefficients	t	p	95% CI
	B	Standard error	Beta			
Age	0.12	0.06	0.08	-0.13	0.008	-1.352 to 1.142
Gender	0.56	1.17	0.05	1.68	0.539	-0.115 to 1.277
Educational level	-0.46	1.42	-0.09	-1.46	0.308	-3.667 to 1.359
Marital status	1.29	1.84	-0.05	-0.03	0.689	-1.756 to 1.358
Monthly income	-0.78	1.47	0.07	-0.32	0.011	-2.014 to 3.270
HbA1c	-0.27	1.96	-0.01	1.02	0.005	4.926 to 6.016
Hypertension	-2.5	1.65	-0.02	0.47	0.824	-2.361 to 3.552
Lipid disorder	-1.86	1.59	-0.06	-0.83	0.625	-1.045 to 2.464
Coronary heart disease	2.43	1.47	-0.23	-0.74	0.029	-2.048 to 4.846
Glaucoma/Cataract	2.05	1.35	0.19	1.06	0.002	-0.541 to 1.237
Kidney problems	1.92	1.08	0.12	-0.12	0.03	-1.686 to 2.571
Any chronic painful condition	3.97	1.36	0.51	2.86	0.004	2.110 to 4.096
Polypharmacy	2.45	1.25	-0.17	1.45	0.002	5.017 to 1.146
Medication knowledge	-1.56	0.19	0.03	-0.54	0.014	-1.680 to 2.502
Medication belief						
i. Necessity of medication	1.42	0.20	-0.12	1.86	<0.001	-0.131 to 1.288
ii. Concerns about medication	0.12	0.64	0.45	-0.19	<0.001	-0.214 to 1.702
iii. Overuse of medication	-1.58	0.34	0.06	-0.46	<0.001	-1.078 to 3.781
iv. Harm of medication	0.37	0.11	0.34	1.41	0.007	3.140 to 0.055
Medication social support	-1.10	0.22	-0.22	0.08	0.721	-0.788 to 1.003
Medication self-efficacy	-0.18	0.33	-0.28	1.05	0.011	-1.155 to 1.990
Treatment satisfaction	3.79	0.20	-0.63	-0.07	0.062	-1.085 to 1.588
Depression	3.03	0.76	0.47	2.48	<0.001	5.217 to 6.305
Disease burden	1.00	0.14	0.42	5.53	<0.001	7.952 to 10.544
Number of comorbidities	6.02	0.32	0.31	4.45	<0.001	6.271 to 8.246

Multivariate linear regression analysis for the burden

In Table 4, the results of the multivariate analysis also showed that age (β=0.16, p=0.001), monthly income (β=0.45, p=0.003), HbA1c (β=0.13, p=0.041), any chronic pain condition (β=0.15, p<0.001), polypharmacy (β=0.34, p=0.001), medication [necessity of medication (β= -0.09, p<0.001); concerns about medication (β= -0.32, p=0.007); overuse of medication (β=0.14, p=0.016) and harm of medication (β=0.03, p<0.001)], medication self-efficacy (β=0.54, p≤0.001), treatment satisfaction (β= -0.13, p<0.001), depression (β=0.02, p≤0.001), and disease burden (β=0.12, p=0.04) have statistically significant associations with medication burden. Medication knowledge and social support are not significantly associated with medication burden (β=0.04, p=0.524). Variables like glaucoma/cataract and the number of comorbidities also show no significant impact on medication burden in this analysis. In general, 36.8% of the variation was explained by this model [F (11, 410) = 19.24, p <0.001]. VIF values <5 for all variables indicate the absence of multicollinearity.

Table 4. Variables associated with medication burden using multiple linear regression analysis

Variables	Unstandardized coefficients		Standardized coefficients Beta	t	p	95% CI
	B	Standard error				
Age	1.20	0.03	0.16	-0.43	0.001	-1.685 to 1.906
Monthly income	0.92	0.17	0.45	-1.34	0.003	-1.467 to 2.291
HbA1c	-1.58	0.52	0.13	3.47	0.041	-2.441 to 5.070
Glaucoma/Cataract	-0.08	1.01	-0.23	-0.12	0.20	-1.550 to 2.456
Kidney problems	1.87	0.12	0.14	-1.67	0.02	-3.125 to 4.380
Any chronic painful condition	1.22	0.46	0.15	-2.69	<0.001	5.463 to 8.431
Polypharmacy	2.38	1.98	0.34	1.57	0.001	-2.464 to 3.012
Medication knowledge	0.13	1.06	0.04	-1.01	0.524	-1.464 to 2.464
Medication belief						
i. Necessity of medication	0.48	0.16	-0.09	-0.73	<0.001	-7.993 to 4.552
ii. Concerns about medication	-0.10	0.05	-0.32	-0.504	0.007	-15.632 to 8.024
iii. Overuse of medication	1.35	0.78	0.14	-0.18	0.016	-5.135 to 9.465
iv. Harm of medication	-0.17	0.41	0.03	-1.14	<0.001	-1.664 to 2.707
Medication social support	0.67	0.06	-0.26	-0.79	0.489	-5.210 to 2.348
Medication self-efficacy	0.15	0.24	0.54	-1.09	<0.001	-4.777 to 2.146
Treatment satisfaction	-0.84	0.13	-0.13	-1.35	<0.001	-9.134 to 11.235
Depression	1.16	0.43	0.02	2.45	<0.001	-1.054 to 2.684
Disease burden	0.91	0.29	0.12	-1.92	0.04	10.362 to 12.450
Number of comorbidities	0.24	1.19	0.00	1.27	0.721	4.124 to 7.668

Discussion

The delivery of patient-centered care has become an understanding of people's experiences and difficulties related to medication use.[23] This study assessed the variables related to drug burden in older adults with multiple comorbidities living with type 2 diabetes mellitus. Positively, this study also includes the majority with higher HbA1c values, which tended to show favorable results. Our study shed light on how different personal and psychological aspects influence the burden from a multifaceted point of view. According to the findings, older adults with multiple comorbidities who also experienced depression, polypharmacy, low self-efficacy of medications, high disease burden, and poor satisfaction with medication treatment were more likely to perceive the burden of medication treatments as high. Similar studies by Mostafavi et al. in Iran and Gonzalez et al. in America demonstrated that polypharmacy, disease burden, and depression have a greater perceived burden of medications among elderly patients with type 2 diabetes.[24,25]

The study highlighted the association of polypharmacy with the burden of medications, which increases the risk of drug interaction, adverse effects and non-adherence and negatively affects psychosocial well-being by causing cognitive decline and anxiety due to side effects. According to studies by Bourgeois et al. and Kirkman et al., multiple medication management has been associated with worse glycemic control in older adults. Scott et al. suggested that the de-prescribing and streamlining of drug schedules may lead to better outcomes and a higher standard of living.[26]

In general, the burden in our study was minimal. The first four items had an average score somewhat lower than what had been found in the study by Bekalu et al. in Ethiopia.[27] The multivariate analysis revealed that the variables entered into the model could account for about half of the variation in the burden of medications. Compared to the study by Akshatha et al., which solely considered the demographic and clinical characteristics of the participants, the percentage of explained variance was higher (range: 12% to 47.9%). This disparity could be explained by the addition of psychological variables to the account of the medicine load.[28]

Treatment satisfaction, with the highest regression coefficient in our model, significantly impacts the burden by influencing how patients view and use pharmaceuticals, ultimately affecting their decisions and outcomes. Previous research by Yang in China and Sendekie in Northwest Ethiopia has documented a bivariate relationship between medication burden and satisfaction with medication treatment.[29]

Self-efficacy, a key factor in change and disease management, is strongly linked to lower medication burden. Our research shows that higher self-efficacy in older adults with type 2 diabetes helps them manage challenges such as side effects, daily integration, and medication use, leading to better adherence to treatment and a reduced sense of medication burden. Similarly, Borson et al. have demonstrated that the burden of treatment burden was predicted by their level of self-efficacy in the treatment of chronic illnesses.[30] Our investigation further illustrated their strong correlations about drug treatments. To reduce the detrimental effects of the drug burden on patients' lives and health, healthcare providers should assist patients in developing medication self-efficacy. Consequently, influencing medication self-efficacy, social support, beliefs, and information about medications can have an impact on medication burden. Future studies may be necessary to confirm the possible indirect impacts of these variables on the burden on medicine, as they have not been examined in previous research.

Type 2 diabetic geriatric patients who have a high disease burden are more likely to find it difficult to manage the demands of multiple healthcare services. In addition to impairing mental and physical functioning, multimorbidity can further reduce an older person's ability to control his health. It is not unexpected that the

multivariate analysis showed a substantial positive correlation between the burden and disease burden. A similar study by Horne et al., Rayana et al. and Okere et al. shows that more chronic diseases, longer duration, higher severity, and low self-rated health have all been linked to higher perceived treatment burdens.[30-32]

Furthermore, our research revealed that not all individual physical conditions were substantially correlated with drug burden, except depression. A similar study by Lalwani RK in India indicated that the burden of treatment of a patient was correlated significantly with depression, dementia or severe mental health issues, but not with any specific medical condition.[33] This result would suggest that mental health issues play a significant part in exacerbating the need for medicines. However, in Morocco, research found that a significant increase in drug or overall treatment burden was predicted by having diabetes, atrial fibrillation, or hypertension.[34,35] Therefore, more research is needed to determine whether a person's physical state may be a contributing factor to their high drug burden.

The demographic characteristics of the patients and their drug burden were not found to be related in our study. The findings of earlier research are contradictory. Numerous research studies have shown a correlation between medication burden of medications and specific demographic characteristics, such as age, gender, marital and employment status. However, according to a recent study in East Uganda, the of patients of medication burden was the same regardless of their demographic characteristics. Additionally, the authors suggested that demographic characteristics could moderate the impact of patients' ability to manage their care on treatment burden.[36]

Previous findings by Fisher et al. and van Bastelaar et al. demonstrated that HbA1c (>7%) levels and medication burden had a significant positive correlation similar to our study. According to previous international reports by Aikens et al., the influence of DM medication regimens on the level of medication burden was statistically significant at ($p<0.05$).[37] Previous quantitative research suggested that insulin-treated patients have experienced a significantly higher burden of diabetes medications, which may directly affect the psychosocial variables.[38] Therefore, more research is required to determine the exact role of these components.

Study limitations

First, this is a cross-sectional study, making it difficult to determine the causal relationships. A longitudinal data set would be valuable to better understanding the causal relationships between psychosocial factors and medication burden. Future research should investigate the possible relationships between study characteristics and medication burden because it is a dynamic process that changes when new medicines are developed or chronic diseases develop. Second, the study's conclusions may be limited because the individuals were chosen from a single tertiary care facility. Third, elderly people with type 2 diabetes who have a high disease or medication burden may not be included in our study because they are unlikely to have the energy or time to participate in the volunteer study. Fourth, we excluded institutional / infrastructure factors, including continuity of care and quality of healthcare service, as well as interpersonal factors such as family concerns and consultation methods. For a more complete understanding of drug burden, these elements must be included in future research. Additionally, the study relied on self-reported data, which may have introduced biases in assessing adherence to medication and psychosocial variables. Objective measures, such as pill counts, electronic medication monitoring, or pharmacy refill data, could be used in future studies to obtain more accurate data.

Conclusion

The study shows that in elderly patients with type 2 diabetes who had multiple comorbidities, greater self-efficacy for medications and satisfaction with treatment were independently related to a lower drug burden, while depression, polypharmacy, and a higher disease burden were associated with a higher drug burden. It may be possible to identify geriatric patients who feel overwhelmed by their drug treatments by identifying the psychological aspects linked to the burden of medications. Type 2 diabetic geriatric patients with multiple comorbidities should receive support in medication self-management and personalized psychosocial therapies to reduce drug burden, improve medication adherence, and alleviate depression, potentially reducing the need for medication.

Declarations

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Author contributions

Conceptualization, H.W. and S.R.; Methodology, H.W.; Software, H.W.; Validation, H.W.; Formal Analysis, H.W.; Investigation, H.W.; Resources, H.W.; Data Curation, H.W.; Writing – Original Draft Preparation, H.W.; Writing – Review & Editing, H.W.; Visualization, H.W.; Supervision, H.W. and S.R.; Project Administration, H.W.

Conflicts of interest

The authors reveal no conflicts of interest.

Data availability

The datasets can be obtained on request from the corresponding author.

Ethical approval

This work was approved by the Institutional Review Board of Bhaarath Medical College and Hospital. The study was carried out from April to September 2024 (approval number 1056/2024).

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