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Research Article

Eight in Ten Multimorbid Patients Experience High Treatment Burden: A Cross-sectional Survey in an Outpatient Setting

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Abstract

Background: Multimorbidity is linked with poor patient outcomes, polypharmacy, and treatment burden. Treatment burden is the workload needed by patients to manage their multiple chronic conditions. We aimed to assess treatment burden and its predictors in patients with multimorbidity at the internal medicine clinic of the Omdurman Teaching Hospital.

Methods: This was a descriptive, cross-sectional study. Patients were eligible for inclusion if they were aged ≥55 years and had ≥2 self-reported chronic conditions. Treatment burden was measured through the Multimorbidity Treatment Burden Questionnaire (MTBQ). Multivariable logistic regression was used to predict the factors associated with a high treatment burden. SPSS V.26 was used for statistical analysis.

Results: A total of 256 participants were recruited (the median age was 64 years, and 39.1% were men). About 47% of participants had more than three chronic conditions, with hypertension (89.5%) and diabetes (82.0%) being the most common. Eighty-one percent of the participants had a high treatment burden with a median score of 40.4 (28.8–51.9). Arranging appointments (83.7%), seeing several health professionals (83.5%), and collecting prescription medicines (83.2%) were were perceived as difficult tasks. Aspects related to treatment (collection of, taking, and paying for medicines) were the most difficult as perceived by participants. Low education (OR = 10.46; CI 3.01–36.39; *P* = 0.000), living outside Khartoum (OR = 4.24; CI 1.22–14.73; *P* = 0.023), having more chronic conditions (OR = 1.75; CI 1.03-2.97; *P* = 0.038), and taking more regular medications (OR = 1.32; CI 1.09–1.61; *P* = 0.004) were independently associated with high treatment burden.

Conclusion: A high treatment burden was common and was primarily incurred by difficulties in interacting with many healthcare providers and obtaining prescribed medicines. More attention should be given to assessing and supporting patients with multimorbidity to reduce the burden through organized and integrated healthcare services.

Keywords: chronic conditions, multimorbidity, outpatient, polypharmacy, treatment burden

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1. Introduction

Multimorbidity is the coexistence of two or more chronic conditions in one person [1]. It is highly prevalent in the adult population. A recent systematic review estimated that 37.2% of the population worldwide lived with multimorbidity [2]. The prevalence increases with age–more than half of people aged >60 years are affected [2]. Over the last decade, the rise in multimorbidity has been driven by demographic changes, urbanization, and enhanced disease diagnostic abilities. In low- and middle-income countries, there has been a transition from communicable to noncommunicable diseases. A high prevalence of 36.4% has been reported in these countries, although estimates vary from 0.7% to 81.3% [3].

Multimorbidity has many negative consequences. It puts pressure on health systems because of increased utilization of services with high incurred costs (I$800–I$150,000 per person per year) [4]. In countries without universal health coverage, individuals are burdened by out-of-pocket costs due to frequent health visits and multiple treatments. Multimorbidity is associated with poor outcomes, including increased mortality and lower quality of life [2]. Polypharmacy is well linked with multimorbidity, and as a result, patients may experience adverse effects and drug interactions and struggle with medication adherence [5].

Management of multimorbidity is complex and challenging, leading to a significant treatment burden on patients [6]. Treatment burden refers to the efforts exerted by patients in managing their long-term diseases and the resultant impact on their lives. Treatment burden encompasses aspects of patient role, medications, the organization of healthcare, and interactions with healthcare providers [7]. Some activities appear to particularly burden patients, including arranging frequent appointments, commuting and time spent on accessing care, making lifestyle modifications such as diet and exercise, self-monitoring of health conditions, taking many medications, and knowledge of health conditions [8]. Financial burden is an issue that is more likely to be experienced by disadvantaged patients [8]. As treatment burden can make patients unable to cope with their disease, healthcare providers need to assess and consider treatment burden as part of their treatment plans [6]. Strategies such as multidisciplinary consultations, coordinated appointments, and regular medication reviews are recommended [6].

Like other low- and middle-income countries, noncommunicable diseases are placing a substantial burden on public health in Sudan [9]. Nevertheless, there is a scarcity in research about multimorbidity and its impact on patients. Most research has focused on specific noncommunicable diseases. For example, one study reported that about 17% of women with newly diagnosed breast cancer had multimorbidity, with obesity, hypertension, and diabetes being the most common [10]. Treatment burden has not been sufficiently explored; however, several factors can contribute to a high workload on Sudanese multimorbid patients, including excessive out-of-pocket expenses, disconnected and disorganized health services, limited use of information technology in the provision of care, chronic drug shortages, and financial hardship [11, 12]. Since treatment burden has implications for patients, healthcare providers, and policymakers, we aimed to assess the treatment burden in older patients with multimorbidity and identify the factors associated with a high

treatment burden at Omdurman Teaching Hospital, Sudan.

2. Methods

2.1. Study design and setting

This was a descriptive cross-sectional study carried out in the outpatient clinic of internal medicine at Omdurman Teaching Hospital. Established in 1898, Omdurman Teaching Hospital is a large public hospital located in Khartoum with a high frequency of patients and a large number of beds. The internal medicine clinic covers many specialties, including general internal medicine, cardiovascular medicine, endocrinology, nephrology, diabetes and metabolism, rheumatology, and immunology.

2.2. Study population

All adult patients (aged ≥55 years) who had multimorbidity and attended the internal medicine clinic during the study period were included. Multimorbidity was defined as the patient-reported presence of ≥2 chronic conditions in one person at the same time. Chronic conditions included hypertension, diabetes, atrial fibrillation, heart failure, chronic kidney disease, chronic obstructive pulmonary disease, coronary heart disease, peripheral arterial disease, depression, inflammatory bowel disease, osteoporosis, rheumatoid arthritis, stroke, cancer, or transient ischemic attack. We excluded pregnant women and patients who were severely ill or diagnosed with dementia.

2.3. Sample size and sampling method

The sample size was determined using the formula ($n = X * N/(X + N - 1)$), where n is the required sample size, N is the population size (average 800 patients/month), with 50% prevalence, 5% margin of error, and 95% confidence level. The yield was a sample size of 260 patients. Participants were selected using simple random sampling during their routine visits to the outpatient clinic.

2.4. Data collection

Data were collected through a structured questionnaire that was pretested for clarity and understandability with 10 patients. The pretest has resulted in the addition of one question. The outpatient clinic operated from Sunday to Thursday every week from 8 am to 1 pm. The questionnaire was filled by the researchers by interviewing participants during their waiting time without interrupting their visit. The interview lasted an average of 10–15 mins.

The questionnaire was divided as follows:

- Part one: Sociodemographic characteristics and clinical information (chronic conditions and number of regular medications).
- Part two: Treatment burden as measured by the Multimorbidity Treatment Burden Questionnaire (MTBQ). MTBQ is a 10-item Likert-type scale with three additional optional questions [13].

Two participants did not complete the interview because their consultation started, and another two were excluded from the analysis due to data inconsistencies, ending up with 256 participants.

2.5. Statistical analysis

Data were analyzed using MS Excel version 13 and IBM Statistical Package for the Social Sciences (SPSS) version 26. Categorical variables were described using frequencies and percentages.

Continuous variables were tested for normality using Kolmogorov–Smirnov test and reported using the median and interquartile range (IQR). Each item was scored on the MBTQ scale as follows: 0 for "not difficult" or "does not apply," 1 for "a little difficult," 2 for "quite difficult," 3 for "very difficult," and 4 for "extremely difficult." The global score (ranging from 0 to 100) was calculated and categorized into: no burden (score 0), low burden (< 10), medium burden (10–22), and high burden (>22) [13]. The burden was then grouped into "high burden" and "not high burden" (no, low, and medium burden). The linearity between continuous variables (number of chronic conditions and regular medications) and the dependent variable (binary burden) was tested using the Box-Tidwell test to ensure that all assumptions were met. Next, binary logistic regression was run to identify the predictors of high treatment burden. A *P*-value of <0.05 was considered statistically significant.

3. Results

3.1. Sociodemographic and clinical characteristics of the participants

A total of 256 patients participated in the study, of which 39.1% were male and aged 55–64 years (51.0%). Only 13.7% of participants had graduate/postgraduate degrees. The majority were married (82.4%), of moderate socioeconomic status (73.4%), and living in Khartoum (78.4%). More than half of the participants had health insurance (64.7%). The sociodemographic characteristics of participants are displayed in Table **1**.

Participants used an average of eight (5–11) medications regularly and had an average of three (3–4) chronic conditions. About 47.0% of them had more than three diseases, with hypertension (89.5%) and diabetes mellitus (82.0%) being the most common. Most participants (81.3%) had a high treatment burden, as shown in Table **2**.

3.2. Multimorbidity treatment burden

Participants thought that arranging appointments with health professionals (83.7%), seeing several health professionals (83.5%), and collecting prescription medication (83.2%) were particularly difficult (ranging from extreme to little difficulty). Of the extremely difficult aspects, collecting prescription medication (16.8%), taking lots of medications (14.8%), and paying for medicines or equipment (9.4%) were the most reported. On the other hand, getting support from family and friends was perceived as not difficult by the majority (97.7%; Figure **1**).

3.3. Predictors of high treatment burden

Multivariable logistic regression revealed that a high burden of treatment is associated with a lower level of education, living outside Khartoum, having more chronic conditions, and taking more medications (Table **3**).

4. Discussion

This study found that eight of ten multimorbid patients were experiencing a high treatment burden. Most of the burden was pertinent to arranging appointments, visiting many health professionals, and collecting prescription drugs. The collection of, taking, and paying for many medications were the top sources of extreme difficulty. On the other hand, the majority of patients considered getting support from family and friends as not difficult.

Table 1: Sociodemographic characteristics of participants (*n* = 256).

Characteristic	***n* (%)/Median (IQR)**
Age (yrs), missing *n* = 3 (1.2%)	64 (60–70)
55–64	129 (51.0)
65–74	78 (30.8)
75–84	35 (13.8)
≥85	11 (4.3)
Male Gender	100 (39.1)
Education	
Illiterate/no formal education	107 (41.8)
School level	114 (44.5)
University level	35 (13.7)
Marital status, missing = 1 (0.4%)	
Married	210 (82.4)
Unmarried (divorced, widowed, single)	45 (17.6)
Socioeconomic status, missing *n* = 4 (1.6%)	
Low	64 (25.4)
Moderate	185 (73.4)
High	3 (1.2)
Residence, missing *n* = 1 (0.4%)	
Khartoum	200 (78.4)
Other states	55 (21.6)
Health insurance (Yes)	165 (64.7)

IQR, interquartile range

Low socioeconomic status, low education, living outside Khartoum, and taking more medications were associated with a high treatment burden.

Numerous studies have reported rise in treatment burden with the number of chronic conditions [14–16]. In this study, almost half of the patients were living with more than three long-term conditions, which might partly explain why a large proportion were overly burdened. Hypertension (88.8%) and diabetes mellitus (82.2%) were the most commonly coexisting conditions, as reported recently in Ethiopia [17], South Africa [18], and India [14]. In Denmark, cardiovascular diseases and hypertension were the most prevalent in a large population survey [19]. The characterization of multimorbidity is important for health decision-makers to prioritize chronic disease combinations – in this case, hypertension and diabetes – in their efforts to ameliorate the treatment burden.

In 81% of participants, the burden of treatment was rated high. A comparable burden was reported in China (73.3%) [20], whereas in developed countries such as the United Kingdom (18%) [16], Germany (7.3%) [21], and Denmark (39%) [19], estimates are much lower. Some of this variation could be attributed to methodological differences between the studies (e.g., the inclusion of younger ages [>25 years], the definition of multimorbidity, and chronic conditions) [19, 21]. However, the finances, organization, and performance of the health system have a determining effect on

Table 2: Clinical characteristics of participants (*n* = 256).

Responses	*n*	%
Average number of medications used, median (IQR)	8 (5–11)	
Average number of chronic conditions, median (IQR)	3 (3–4)	
Chronic condition groups		
2.0	58	22.7%
3.0	78	30.5%
>3	120	46.9%
Chronic conditions		
Hypertension	229	89.5%
Diabetes mellitus	210	82.0%
Dyslipidemia	117	45.7%
Rheumatoid arthritis	108	42.2%
Inflammatory bowel diseases	92	35.9%
Stroke or transient ischemic attack	61	23.8%
Coronary heart disease	22	8.6%
Chronic kidney disease	21	8.2%
Cancer	15	5.9%
Pulmonary artery disease	13	5%
Chronic obstructive pulmonary disease	10	3.9%
Osteoporosis	7	2.7%
Depression	6	2.3%
Heart failure	2	0.8%
Atrial fibrillation	2	0.8%
Epilepsy	0	0.0%
Peripheral arterial disease	13	5.1
Treatment burden, median (IQR)	40.4 (28.8–51.9)	
No burden	22	8.6
Low burden	13	5.1
Medium burden	13	5.1
High burden	208	81.3

*Missing *n* = 1 (0.4%); IQR, interquartile range

individuals' ability to deal with their multimorbidity and the extent of the burden they shoulder as a result.

Making recommended lifestyle changes is the aspect with greatest difficulty [16, 19–21], followed by obtaining up-to-date health information [19, 20], relying on help from family and friends [21], and arranging appointments [16]. In the present study, organizing appointments and seeing many health professionals were the most difficult tasks. This is probably because of the fragmented and uncoordinated specialist care and the dysfunctional referral system [12] in Sudan which force patients to navigate the health system on their own and juggle multiple medical appointments. These health system limitations are common in low- and middle-income countries [22].

In this study, patients were taking an average of eight medications and were extremely burdened by activities related to the medication domain,

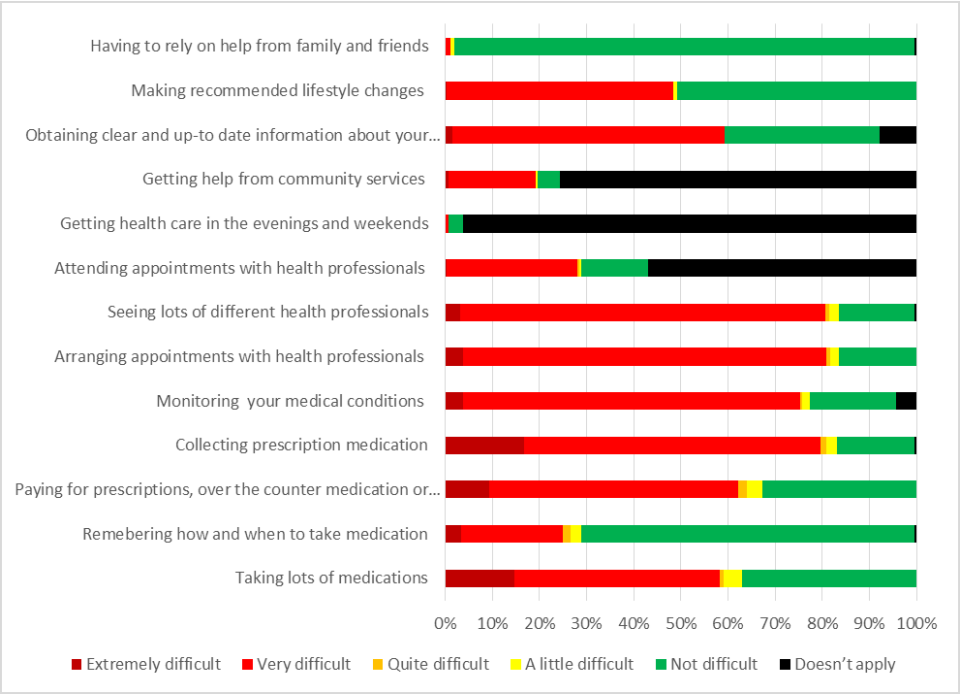

Figure 1: The treatment burden of multimorbidity (*n* = 256).

Table 3: Multivariable analysis of factors associated with high treatment burden.

Variable	Burden, *n* (%)		Multivariable analysis		
	Not high	High	OR	CI	*P*-value
Sex					
Male (ref)	21(21.0)	79 (79.0)			
Female	27 (17.3)	129 (82.7)	0.76	0.32–1.80	0.540
Age (yrs)					
55–64 (ref)	34 (26.4)	95 (73.6)			
≥65	14 (11.3)	110 (88.7)	1.53	0.66–3.81	0.307
Marital status					
Married (ref)	45 (21.4)	165 (78.6)			
Unmarried	3 (6.7)	42 (93.3)	1.95	0.48–7.92	0.349
Education					
Illiterate/no formal education	8 (7.5)	99 (92.5)	10.46	3.01–36.39	0.000
School	23 (20.2)	91 (79.8)	4.72	1.67–13.32	0.003
University (ref)	17 (48.6)	18 (51.4)			
Living area					
Khartoum (ref)	43 (21.5)	157 (78.5)			
Other states	5 (9.1)	50 (90.9)	4.24	1.22–14.73	0.023
Health insurance (yes)	34 (20.6)	131 (79.4)	1.34	0.53–3.40	0.542
Number of chronic conditions	–	–	1.75	1.03–2.97	0.038
Number of regular medications	–	–	1.33	1.09–1.61	0.004

OR, odd ratio; CI, confidence interval

including obtaining, taking, and paying for prescription and nonprescription drugs. In the last few years, Sudan has witnessed severe drug shortages

coupled with inflated prices [11]. This has led to unnecessarily huge efforts spent on searching for medicines in pharmacies, sometimes in a large geographical area, and allocating a significant budget to drug purchases, even for those who are enrolled in the National Health Insurance Fund, as costs are not fully subsidized [23]. As a result, patients may find themselves unable to adhere to their treatment plan, as reported in Ethiopia [17]. Therefore, there is an ever-increasing need to support multimorbid patients and develop services that would improve their accessibility to medicines and the quality of care they are receiving.

Studies have investigated the factors affecting or contributing to treatment burden. High treatment burden was found to be associated with inadequate health literacy [16]. The present study did not investigate health literacy; however, those who were less educated were more likely to have a high treatment burden when adjusted for other variables. Moreover, living outside Khartoum, having more chronic conditions, and taking more medications increased the odds of a high treatment burden. Unlike previous reports, sex and age were not associated with a high treatment burden [19].

As far as we know, this is the first study to shed light on the burden experienced by multimorbid patients because of their treatment. This issue is serious for patients, caregivers, and healthcare delivery and can greatly affect the quality of life and treatment outcomes. Strengths include the high response rate and the use of simple and validated measures of treatment burden. We recommend further translation and validation of the MTBQ in the local context. Moreover, the findings also show that two of the optional questions on the scale are also irrelevant in Sudan. One limitation is that the study has been conducted in a single center; therefore, it is difficult to extrapolate the results to the general population. In addition, all chronic conditions were patient-reported, so the accuracy of the results might be reduced.

5. Conclusion

The burden of treatment was high for most patients with multimorbidity and was primarily incurred by difficulties in interacting with many healthcare providers and obtaining prescribed medicines. Aspects related to medications, including the collection of, taking, and paying for medicines, were perceived as extremely difficult. Low education, living in states other than Khartoum, having more chronic conditions, and taking more medications were associated with a high burden. This study extends the limited literature on the treatment burden of multimorbidity in low- and middle-income countries. More attention should be given to identifying, assessing, and supporting patients with multimorbidity through organized and integrated healthcare services.

Declarations

Acknowledgements

None.

Ethical Considerations

Approval was granted by the Research Ethics Committee of the Khartoum State Ministry of Health (44-2022). Omdurman Teaching Hospital provided permission to conduct the study. All participants provided informed consent before participation.

Competing Interests

The authors declare that there is no conflict of interest.

Availability of Data and Material

All data collected and analyzed during this study are displayed in this article.

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Abbreviations and Symbols

MTBQ: Multimorbidity Treatment Burden Questionnaire

SPSS: Statistical package for the social sciences

IQR: Interquartile range

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