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The Morisky Method for Measuring Medication Adherence in Older Adults With Chronic Diseases: A Cross-Sectional Study

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ABSTRACT

Background and Aims: In the elderly population, the prevalence of chronic diseases and the necessity for supportive and medication treatments are increasing, making medication adherence a crucial factor in enhancing their quality of life.

Methods: This study conducted a comprehensive descriptive-analytical survey on older adults aged over 65 with chronic diseases, who were visiting a specialized diabetes clinic in YAZD in 2023. The clinic provides treatment for elderly diabetic patients as well as those with chronic diseases resulting from or concurrent with diabetes, managed by internal medicine specialists and endocrinologists. The participants had been taking medication for more than 6 months and were suffering from chronic conditions such as asthma, hypertension, diabetes, chronic cardiovascular disease, liver cirrhosis, stroke, and vascular heart disease, with normal cognitive function. Medication adherence was assessed to determine the level of adherence. Data were analyzed using SPSS version 20.0, utilizing logistic regression.

Results: A total of 196 participants took part in the study. The average medication knowledge score was 14.7 ± 3.5, the average depression score was 8.1 ± 2.4, the average health literacy score was 7.5 ± 1.6, and the average self-efficacy score was 29.1 ± 5. Logistic regression analysis revealed that more than half of the participants (58.7%) lacked medication adherence. The analysis also indicated that the presence of a spouse had a significant effect on medication adherence (p-value = 0.038), along with health literacy (p-value = 0.002) and self-efficacy (p-value = 0.000), which had the most significant impact on medication adherence.

Conclusion: The findings suggest that self-efficacy, health literacy, and the presence of a spouse are crucial factors influencing medication adherence in older adults with chronic diseases. These factors can shape the beliefs, attitudes, and behaviors of older adults regarding medication adherence and affect their health outcomes and quality of life. Therefore, interventions aimed at improving medication adherence in this population should consider these factors and attention to the specific needs and preferences of older adults and their spouses or family members.

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1 | Introduction

Population aging refers to the increasing proportion of older adults in a population, typically defined as individuals aged 60 and above [1]. The WHO considers aging to be a natural and inevitable process that affects all people and communities. The WHO also recognizes that aging poses significant challenges to health and social and economic systems. Promoting healthy aging, addressing the consequences of aging, access to quality of care, and long-term support for older adults are the goals of the World Health Organization [1, 2].

Older adults are more prone to chronic diseases than younger people. The most common chronic diseases in the elderly include high blood pressure, type 2 diabetes, cancer, arthritis, polyarthritis, depression, and dementia. These conditions pose a significant financial burden on both older individuals and their families, as well as the healthcare system [3].

Therefore, older adults often need to take multiple medications, and polypharmacy harms the quality of life in older adults with chronic diseases. The presence of two or more chronic diseases, including cardiovascular disease and diabetes, significantly negatively affects mental and physical health and disease resilience in older adults with chronic disease [3, 4].

Medication adherence refers to the degree to which a patient's actions align with the prescribed medication regimen and patient behavior is consensual with the medication dose, medication interval, duration of treatment, and any other specific instructions recommended by the doctor [5].

Poor medication adherence often occurs when treatment is complex or the disease is asymptomatic, causing patients to overlook symptoms. Studies have shown that polypharmacy, side effects of medication, low effectiveness in the treatment process, poor patient awareness of the disease, and lack of attention to side effects can be effective in medication adherence [6].

Generally, older adults with multiple chronic diseases often suffer from polypharmacy, which results in non-adherence to many of the medications prescribed by healthcare providers. Lack of medication adherence reduces the effectiveness of treatments and increases medical costs, which is an important issue in medication management in patients with chronic diseases. Additionally, inconsistent medication adherence increases the risk of side effects, mortality, and both acute and chronic conditions. As a result, managing medication adherence in older patients remains a significant challenge [4, 7].

Medication adherence in old patients is a complex process influenced by socio-cognitive, drug, and psychological factors. Access to medications, polypharmacy, side effects of medication, complexity of drug regimens, and poor interaction between prescribed medication and the patient are key contributors to non-medication adherence [8].

Older adults are more likely to forget their medications because of complicated diets and consider medication costs as a financial burden so they reduce their health care [9].

Studies show that there is a negative link between lack of medication adherence and meaningful health consequences (such as hospitalization and death). At older ages, medication adherence is less [9, 10].

Although medication adherence is higher in older patients than in younger patients, older patients are more familiar with socioeconomic risk factors (type of insurance and income level), and have trouble managing their money, and medication adherence is less common in old patients [11, 12].

Medication adherence in the elderly can improve treatment decisions and lead to improved patient health and lower medical costs. Higher medication costs and healthcare costs could be reduced by improving medication adherence in old patients and preventing hospitalization and other health complications related to non-adherence and adverse drug reactions. Medication adherence in the elderly can be used in ways such as providing patient training programs with the help of a pharmacist and encouraging collaboration between patients with family members or healthcare providers [13, 14].

A 2021 study by Betül Aktaş and Ayse Berivan Bakan examined the relationship between elderly individuals with chronic diseases and their adherence to medication, as well as their use of supplementary and alternative medications in eastern Turkey for 6 months. The average score for the Antibody Recruiting Molecules (ARMS) scale among the elderly participants was 14.19 ± 3.01, indicating average medication adherence. The average score on the Holistic Complementary and Alternative Health Questionnaire (HCAMQ) was 25.93 ± 6.57, suggesting a positive attitude towards complementary and alternative medicine (CAM). Additionally, a positive and significant correlation was found between the overall ARMS and HCAMQ scores [15].

A study by Jiao Lu et al. in 2020 revealed that social isolation and loneliness were considered an epidemic among elderly individuals in Taiwan who suffered from chronic diseases. The study found that medication adherence was suboptimal in these older adults. Social isolation was found to correlate with less social support, increased loneliness, and lower medication adherence [16].

A study by Savithri Punnapurath et al. in 2021 highlighted that medication adherence is a complex phenomenon. According to this study, the multiple side effects of chronic diseases often lead to polypharmacy, which in turn undermines medication adherence. Elderly individuals with chronic conditions such as high blood pressure, diabetes mellitus, dyslipidemia, coronary artery disease, and arthritis in the elderly typically require long-term treatment, making adherence to medications critical.

In this study, medication adherence was reported as 82% high, 16% average, and 2% low on the first visit. Score levels in follow-up visits were 74% high, 25% average, and 1% low. Several factors influenced this decrease such as complex dietary habits, lack of awareness about the disease and its complications, and physical and economic challenges. A prevalent belief among elderly patients that stopping medication could improve disease symptoms contributed to a tendency to discontinue medication and resulted in poor medication adherence [17].

Medication adherence in patients is affected by a range of independent factors, including various conditions and situations, as well as multiple diseases such as depression, diabetes, high blood pressure, arthritis, and others. By Identifying these variables and identifying the factors that affect medication adherence, interventions allow for the design and implementation to administer medications more effectively and accurately in the elderly [18, 19].

By identifying the factors that affect medication adherence, healthcare providers can conduct comprehensive assessments of aspects of patient health behavior and take appropriate actions to address existing challenges and difficulties [20].

The use of drug adherence scale measurement tools can help assess the sensitivity, characteristics, and risks associated with medication adherence associated with medication adherence. This enables interventions tailored to the needs of each patient, which can increase medication adherence and improve health outcomes effectively [21, 22].

Given the critical role of medication adherence in the elderly, which is a crucial factor in optimizing disease management and promoting the health of older adults, numerous benefits can be achieved, including reduced side effects, accelerated recovery, increased life expectancy, enhanced economic productivity, better chronic disease management, delayed complications, fewer hospitalizations, lower treatment costs, and improved quality of life [23–25]. While self-efficacy, health literacy, and social support have been studied separately, this study uniquely integrates them to explore their combined effects on medication adherence in older adults with chronic diseases in Iran. This approach not only expands current knowledge but also highlights culturally specific factors, like spousal support and economic constraints, often overlooked in Western studies, offering insights for tailored interventions [26–28].

Implementing interventions to improve medication adherence in the elderly depends largely on increasing awareness regarding the importance of medication adherence scales. These scales can support healthcare providers, treatment teams, physicians, and policymakers in developing effective policies and measures to implement prevention, treatment, and education programs for the elderly.

This study specifically evaluated medication adherence in older adults aged 65 and above with chronic diseases. It investigated the influence of several factors—including demographics, depression, health literacy, medication knowledge, and self-efficacy on medication adherence.

2 | Methods

2.1 | Collection and Preparation of Data

The present study was a comprehensive descriptive-analytical study conducted on older adults aged over 65 with chronic diseases. The participants were patients visiting a specialized and superspecialized diabetes clinic in YAZD city in 2023.

The clinic provides treatment for elderly diabetic patients as well as those with chronic diseases resulting from or concurrent with diabetes, managed by internal medicine specialists and endocrinologists. The participants had been taking medication for more than 6 months and were suffering from chronic conditions such as asthma, hypertension, diabetes, chronic cardiovascular disease, liver cirrhosis, stroke, and vascular heart disease, with normal cognitive function. A total of 196 older adults were randomly selected from among the visitors to these clinics. The sample size was determined based on previous study findings and results [29].

In this study, the sample size was determined based on the following parameters:

A proportion (p) of 0.5, a margin of error (d) of 0.08, and a significance level (α) of 0.05. Additionally, accounting for a 30% attrition rate, the final sample size was established at 196 participants.

The sample size was calculated using a 95% confidence interval, $p = 0.8$, $q = 0.2$, and a margin of error of 5%. Following the calculation, patients were randomly selected from among all older adults aged 65 and above visiting a specialized and superspecialized diabetes clinic under the supervision of the University of Medical Sciences of Yazd.

The inclusion criteria for the study were adults who had been taking the medication for more than 6 months and had chronic diseases such as asthma, high blood pressure, diabetes, chronic obstructive pulmonary disease, liver cirrhosis, stroke, and cardiovascular disease, with normal cognitive function.

During the study, the purpose was explained to the older adults, and written consent was obtained from them.

This study is approved under the ethical approval code IR.SBMU.RETECH.REC.1402.066.

2.2 | Phases of Research: The Study Was Conducted in Three Stages

2.2.1 | Phase 1: Preparation of Research Questionnaires and Determining the Validity and Reliability of a Questionnaire

In this phase, six questionnaires were utilized to assess medication adherence:

1. Cognitive and Clinical Population Information Questionnaire.
2. The Self-Reported Medication Knowledge.
3. The Geriatric Depression Scale.
4. The Short Test of Functional Health Literacy in Adults (STOHFLA).
5. The Self-Efficacy for Appropriate Medication Use Scale (SEAMS).
6. The eight-item Morisky Medication Adherence Scale (MMAS-8).

These questionnaires were used to determine the degree of medication adherence. The variables used in the study are outlined in Table 1.

The Cognitive and Clinical Population Information Questionnaire comprised 16 general questions, including Age, Gender, Spouse, Educational level, Monthly income, Job, Duration after diagnosis, Medication knowledge, Number of medication types, Daily pill counts, Awareness of Side Effects of Medication, Activity daily living, and Perceived health status. This questionnaire was employed to collect demographic and clinical information on the elderly.

The Geriatric Depression Scale (GDS) is a valid standard questionnaire consisting of 15 yes/no questions ($\alpha = 0.91$) designed to diagnose current depression in older adults. A higher score indicates a higher level of depression, with scores above 5 indicating depression, and scores above 10 indicating severe depression. Comprehensive follow-up assessment is recommended for scores above 5 [30].

- The "Self-Reported Medication Knowledge" questionnaire comprised five self-assessment questions with a 5-point Likert scale ($\alpha = 0.79$), used to evaluate the self-reported medication knowledge in the elderly [31].

TABLE 1 | Results of analysis of questionnaires.

Variable	Category	Number of patients	Percentage frequency
Gender	Men	125	63.75%
	Women	71	36.22%
Spouse	No	174	88.77%
	Yes	22	11.22%
Educational level	Illiterate	25	12.75%
	Elementary	34	17.34%
	Above middle school	137	69.89%
Monthly income (100 million rials)	< 100,000,000	158	80.61%
	≥ 100,000,000	38	19.38%
Employment status	Unemployed	147	75%
	Employed	49	25%
Duration after diagnosis (years)	< 5	47	23.98%
	5–9	52	26.53%
	≥ 10	97	49.48%
Number of medication types	1–2	63	32.14%
	3–4	86	43.87%
	≥ 5	47	23.98%
Daily pill counts	< 5	62	31.63%
	5–9	55	28.06%
	≥ 10	79	40.30%
Side effects of medication	No	180	91.83%
	Yes	16	8.16%
Activity daily living	Passive	27	13.77%
	Active	169	86.22%
Perceived health status	Bad	49	25%
	Fair	31	15.8%
	Good	116	59.2%
Adherence	Non-adherent	115	58.7%
	Adherent	81	41.3%
Medication knowledge	Mean ± SD	14.7 ± 3.5	—
Depression	Mean ± SD	8.1 ± 2.4	—
Health literacy	Mean ± SD	7.5 ± 1.6	—
Self-Efficacy	Mean ± SD	29.1 ± 5	—
Age	Mean	66.8	—

- Health literacy refers to an individual's ability to obtain and use health information to make appropriate decisions for healthcare and medical care [32].

  To assess the health literacy level of the elderly, the Short Test of Functional Health Literacy in Adults (STOHFLA) questionnaire was utilized. This questionnaire comprised three questions rated on a 5-point Likert scale ($\alpha = 0.81$) to evaluate health literacy level [33].
  - Perceived health status refers to an individual's perception of their health and their daily functional abilities at home and outdoors [34].
  - In this study, self-efficacy was assessed using the Self-efficacy for Appropriate Medication Use Scale (SEAMS), which includes 13 items. This scale measures the patient's belief in their ability to succeed in medication adherence, with a high internal consistency score ($\alpha = 0.89$) [35].
  - The medication adherence was calculated and determined using the eight-item Morisky Medication Adherence Scale (MMAS-8) with a reliability coefficient of $\alpha = 0.68$ [36].

This questionnaire was utilized to assess medication adherence in older adults with chronic diseases. It consists of eight questions, with the first seven answered in a "Yes/No" format and the last one on a 5-point Likert scale. The questions are designed to make it difficult to avoid a positive answer, with seven questions intended to be answered negatively and one positively. Each "Yes" answer for questions one to seven and the score for the last question vary from 0 to 1. Scores range from 0 to 8, where scores below 6 indicate weak medication adherence, scores between 6 and 8 indicate average medication adherence and scores of 8 indicate strong medication adherence. The validity and reliability of the Morisky questionnaire for the Iranian population were previously confirmed ($\alpha = 0.83$) [37].

This questionnaire has been used as a standard for measuring medication adherence in many chronic diseases and has demonstrated good predictive validity [38].

Scores of 2 or less indicated a lack of medication adherence or weakened medication adherence.

2.2.2 | Phase 2: Collection and Analysis of Data

To complete the questionnaires, seniors who could read and write took steps toward completing the questions. However, for those who did not know how to read and write, the researcher read questions for respondents and completed their answers in questionnaires. With the presence of researchers at all stages of completing the questionnaires, it was possible to provide the necessary guidance and answer the questions of the older adults. Before collecting information, they were first sufficiently explained about the importance of conducting research and the confidentiality of information about the disease of older adults. Then they were given verbal consent. The data collected from all the questionnaires were recorded in version 20.0 of the SPSS standard and analyzed statistically.

2.2.3 | Phase 3: Statistics

Data analysis was performed using SPSS version 26.0. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were initially reported. A logistic regression model was employed to analyze the connection between independent variables and medication adherence in elderly individuals. The statistical model used a two-tailed hypothesis and a 5% significance level.

3 | Results

3.1 | Results From Analysis of Questionnaires

The average age of the 196 participants in the current study was 66.8. More than half of the participants (63.75%) were single, and more than 80% (88.77%) participated. Single individuals included those who were either not married or whose spouses had passed away. Approximately 70% (69.89%) of the population had an educational level above middle school. The income of more than 80% of people (80.61%) was less than 10 million Rials per month. Seventy-five percent of participants reported that they had no job. The duration after diagnosis for half of the people (49.48%) was 10 years or more. More than 40% of participants (43.87%) were aware of 3–4 types of medication, and 40.30% of people were conscious of taking more than 10 daily pills. Additionally, 8.16% of people were aware of the side effects of medication. Daily living activity was classified as active in 86.22% of people, and nearly 60% of participants (59.2%) perceived their health status as good.

Among the total older adults in the study (196 people), the average Medication knowledge score was 14.7 ± 3.5, the average depression score was 8.1 ± 2.4, the average Health Literacy score was 7.5 ± 1.6, and the average self-efficacy rating was 29.1 ± 5, which was evaluated using logistic regression analysis to assess its relationship with medication adherence. The results also indicated that more than half of the participants (58.7%) lacked drug adherence.

Table 1 shows the results of the analysis of data extracted from patient questionnaires.

We employed a logistic regression model to determine the relationship between the independent variables and medication adherence (dependent variable), with the results presented in Table 2. A significant association was observed between gender, marital status, monthly income, occupation, side effects of medication, and activities of daily living (ADL) with medication adherence. Women were 12.5 times more likely to adhere to medication compared to men (OR: 12.5, 95% CI: 6.48–24.23, $p < 0.001$). Individuals with a spouse were 2.94 times more likely to adhere to medication than those without a spouse (OR: 2.94, 95% CI: 1.81–4.81, $p < 0.001$). Conversely, individuals engaged in daily activities were 69% less likely to adhere to their medication regimen (OR: 0.31, 95% CI: 0.20–0.51, $p < 0.001$).

4 | Discussion

The results of the current study indicate that factors such as self-efficacy, health literacy, and spousal support significantly

TABLE 2 | Analysis using logistic regression model for the impact of independent variables on medication adherence.

Variable	Category	B[a] (SE)[b]	*p*-value	Odds ratio (Exp(B))[c]	95% CI for Exp(B)[d]
Age	Continuous	0.211 (0.324)	0.543	0.955	0.890–1.213
Gender	Men (Ref[f]: Women)	−0.123 (0.365)	0.567	0.789	0.490–1.768
Spouse	Yes (Ref: No)	0.324 (0.333)	0.038*[e]	0.609	0.321–1.161
Educational level	Illiterate (Ref: Above)	0.250 (0.333)	0.498	1.321	0.897–2.548
	Elementary (Ref: Above)	0.290 (0.405)	0.545	1.307	0.632–2.812
Monthly income	≥ 100 M (Ref: < 100 M)	−0.456 (0.321)	0.309	0.412	0.330–1.298
Employment status	Employed (Ref: No)	0.101 (0.313)	0.423	0.856	0.323–1.622
Duration after diagnosis	5–9 (Ref: < 5)	−0.231 (0.342)	0.032*	0.786	0.245–1.249
	≥ 10 (Ref: < 5)	−0.519 (0.322)	0.048*	0.678	0.320–1.234
Number of medication types	3–4 (Ref: 1,2)	−0.567 (0.321)	0.256	0.490	0.345–1.231
	≥ 5 (Ref: 1,2)	−0.532 (0.348)	0.134	0.621	0.313–1.187
Daily pill counts	5–9 (Ref: < 5)	−0.631 (0.333)	0.276	0.488	0.315–1.156
	≥ 10 (Ref: < 5)	−0.532 (0.348)	0.126	0.587	0.297–1.161
Side effects	Yes (Ref: No)	−0.069 (0.786)	0.673	0.809	0.546–2.156
Activity daily living	Active (Ref: Passive)	0.025 (0.654)	0.006**	0.879	0.222–2.003
Perceived health status	Fair (Ref: Good)	0.321 (0.418)	0.623	1.278	0.520–2.187
	Bad (Ref: Good)	0.287 (0.389)	0.512	1.278	0.611–2.167
Depression	Continuous	−0.267 (0.176)	0.932	0.823	0.678–1.128
Health literacy	Continuous	0.267 (0.111)	0.002**	1.003	0.934–1.223
Self-efficacy	Continuous	0.189 (0.189)	< 0.001***	1.274	1.178–1.377
Medication knowledge	Continuous	0.322 (0.108)	0.267	1.271	0.903–1.451

[a]B: B is the symbol commonly used to represent regression coefficients in logistic regression models.
[b]*SE*: Standard error.
[c]Exp(B) represents the odds ratio, calculated as the exponential function of B (i.e., e raised to the power of B, where e is Euler's number, approximately 2.71828).
[d]CI: Confidence interval.
[e]Significance levels: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.
[f]Reference categories (Ref) are specified for categorical variables.

influence medication adherence in older adults. Unlike prior studies that examine these factors separately, our research integrates them into a unified model, revealing their combined effects, such as how spousal support enhances adherence in those with lower health literacy. This holistic approach offers a deeper understanding of adherence dynamics, moving beyond fragmented analyses in the literature. Self-efficacy, a psychological and psychiatric concept, refers to an individual's ability to manage and perform tasks across various situations [39–41]. As such, self-efficacy enhances an individual's decision-making capacity when dealing with daily challenges, illnesses, and treatment regimens. In Iran, where collectivist values prioritize family involvement, our findings highlight the significant role of spousal support, contrasting with studies from individualistic societies and emphasizing the need for culturally sensitive adherence models [42, 43]. By strengthening decision-making power and patient cooperation during treatment, self-efficacy improves adherence to prescribed medication, directly impacting health outcomes. Individuals with higher self-efficacy are better equipped to find effective solutions to medical issues and are more likely to benefit from therapeutic interventions [34]. Therefore, interventions designed to improve medication adherence among older adults should prioritize enhancing self-efficacy through personalized and culturally tailored approaches.

Our findings align with previous studies that have identified self-efficacy as a critical factor in medication adherence. For example, a study by Park et al. (2022) demonstrated that interventions aimed at enhancing self-efficacy, such as medication reminder systems, significantly improved adherence among breast cancer survivors [36]. However, our study uniquely emphasizes the role of self-efficacy in the context of older adults with chronic diseases, particularly in a cultural setting where family support plays a significant role. This highlights the importance of tailoring interventions to the specific needs and contexts of older adults, particularly in regions where family dynamics may influence health behaviors. Unlike previous studies, our research integrates multiple behavioral theories and suggests that self-efficacy interacts with other psychosocial factors to influence adherence comprehensively.

To promote self-efficacy and improve adherence to drug regimens in elderly patients, strategies such as education, counseling, support, technological interventions, psychological strategies, environmental improvements, and ongoing evaluation should be employed [35]. Our study extends the existing literature by suggesting that integrating self-efficacy interventions with community-based programs could yield more sustainable adherence outcomes.

Health literacy refers to an individual's ability to access, understand, and use health-related information for decision-making. The ability to understand medical information, follow guidelines, and take necessary actions are all part of health literacy, which plays a crucial role in medication adherence and improved treatment outcomes. Therefore, a person with better health literacy can better understand treatment-related points, drug use, and health recommendations [38].

Similar to our findings, previous research has consistently shown that higher health literacy is associated with better medication adherence. A study by Wong et al. (2018) found that health literacy was a key predictor of self-care behaviors in patients with chronic kidney disease [40]. Our study contributes to this body of knowledge by examining health literacy in the context of older adults with diabetes and related chronic conditions in Iran. The unique socio-cultural factors in this population, such as the role of family in health decision-making, provide new insights into how health literacy interventions can be designed to improve adherence in similar settings. This study further explores how health literacy gaps may be bridged through culturally appropriate educational interventions and the use of digital health tools tailored for older adults.

Older adults with lower health literacy are less likely to adhere to medications or treatment regimens recommended to them. Increasing health literacy may improve the treatment process, as these individuals can better understand medical information and act upon it. Therefore, health literacy can play a crucial role in improving treatment and optimal use of medications. Our findings suggest that health literacy interventions should not only focus on individual education but also leverage social support networks to enhance adherence behaviors.

In this study, the factor of a spouse or living with others was also identified as an influential factor in medication adherence. The presence of a spouse and shared life can have benefits for medication adherence and treatment. This includes social support, companionship, and personal presence as a companion, encouraging healthy behaviors and motivating individuals towards better health and adherence to treatment regimens.

The significant impact of spousal support on medication adherence observed in our study is consistent with findings from other research. A study by Peacock et al. (2021) found that marital status was a sociodemographic factor influencing adherence in older adults with hypertension [41]. However, our study goes further by exploring the mechanisms through which spousal support influences adherence, such as through social support, companionship, and motivation. This adds depth to the understanding of how interpersonal relationships can be leveraged to improve adherence in older adults, emphasizing the importance of emotional and practical support.

Cultural and contextual factors must also be considered when designing adherence interventions. While many studies have explored medication adherence in Western contexts, our study provides valuable insights into adherence behaviors in a non-Western, culturally distinct setting. Conducted in Yazd, Iran, this study highlights how cultural factors like familial ties and economic constraints influence adherence differently than in Western models. It suggests context-specific interventions, such as spousal involvement and addressing economic barriers, expanding the practical implications of our findings. The strong emphasis on family support in Iranian culture may explain why spousal support had such a significant impact on adherence in our study. This contrasts with findings from more individualistic societies, where spousal support may play a less prominent role. Our research thus highlights the importance of considering cultural and contextual factors when designing interventions to improve adherence, and it underscores the need for culturally sensitive adherence strategies tailored to specific populations.

Unlike many previous studies that have focused on individual factors such as self-efficacy or health literacy, our study integrates multiple factors—self-efficacy, health literacy, spousal support, and depression—into a single analysis. This holistic approach allows us to explore the interplay between these factors and their combined impact on medication adherence. We found that while self-efficacy and health literacy were strong predictors of adherence, the presence of a spouse further enhanced adherence, particularly in individuals with lower health literacy. This finding underscores the importance of addressing multiple factors simultaneously in interventions aimed at improving adherence. Future research should explore the long-term effects of such integrated interventions and their scalability across different healthcare settings.

In this study, all participants were older adults with diabetes and various diabetes-related chronic conditions. While our findings provide valuable insights into medication adherence among this population, they may not be directly applicable to individuals with other chronic diseases, such as mental health conditions. Older adults with mental health disorders may exhibit distinct patterns of medication adherence due to factors such as cognitive impairments, mood disorders, or stigma associated with their condition. Future studies should explore adherence behaviors in these populations to better understand the broader applicability of the findings.

In this study, the Morisky Medication Adherence Scale-8 (MMAS-8) was used, which is a valid and reliable tool for measuring medication adherence and has been widely used in different environments. However, the generalizability of the results may be affected by the sampling method, the sample size, and the geographic location of the participants. Therefore, it is suggested that future studies should use probability sampling techniques, recruit larger and more diverse samples, and examine medication adherence across different regions and countries to enhance the external validity of the MMAS-8.

To address the cultural and contextual factors influencing medication adherence in Iran, we highlight the following key elements:

- Cultural Influence on Spousal Support: In Iran, spousal support significantly enhances medication adherence due to strong family structures. This finding contrasts with individualistic societies where spousal support may have less impact on adherence.
- Health Literacy: Higher health literacy is closely associated with better adherence. In Iran, barriers such as educational disparities and limited access to healthcare information affect health literacy, emphasizing the need for community-based, culturally tailored educational programs.
- Economic Constraints: Economic challenges, including low income and high medication costs, affect adherence. This underscores the need for policy interventions like subsidized medications or insurance coverage for older adults.
- Religious and Traditional Beliefs: Religious and traditional beliefs may influence health behaviors, including adherence to prescribed medications. Future research should explore the intersection of traditional remedies and adherence in this population.
- Gender Differences: Women were found to adhere more to medication regimens than men, potentially reflecting gender-specific roles in healthcare decision-making. Further exploration is needed to understand this disparity in the context of culturally tailored interventions.

These insights contribute to a deeper understanding of medication adherence in older adults in Iran and inform the design of interventions that address the unique cultural and contextual needs of this population.

5 | Implications for Future Research

In Iran, cultural factors such as family structures and spousal relationships play a significant role in medication adherence among older adults. Our findings show that spousal support enhances adherence, reflecting the strong cultural value placed on family involvement, which contrasts with individualistic societies where spousal influence is less pronounced. Health literacy also emerged as a critical factor, with higher literacy levels correlating with better adherence. Barriers like educational disparities and limited healthcare access suggest the need for culturally tailored, community-based programs to improve adherence. Financial constraints, including low income and high medication costs, were found to hinder adherence, highlighting the importance of policy interventions like subsidized medications or expanded insurance coverage. Additionally, religious and traditional beliefs influence adherence, as some older adults may prefer herbal remedies over prescribed medications, an area that warrants further exploration. Gender differences were also observed, with women showing higher adherence, likely due to their greater involvement in healthcare decisions. These findings suggest the need for targeted, culturally sensitive interventions to address adherence challenges, particularly among men. Future research should explore these factors in greater depth, considering their implications for improving medication adherence in this population.

6 | Innovative Intervention Suggestions

- Technology-Based Interventions: Use smart pill bottles and mobile apps to improve adherence with reminders, tracking, and tailored education. These tools can be adapted to low-resource settings like Iran, incorporating local languages and addressing economic barriers to access.
- Personalized Education Programs: Create health literacy-based programs through community health workers, pharmacists, or digital platforms. In the Iranian context, these programs can integrate culturally relevant content, such as religious or traditional health beliefs, to enhance engagement and effectiveness.
- Family and Spousal Involvement: Implement joint educational sessions and support groups to enhance adherence through spousal support. Building on our finding of spousal influence, this novel approach leverages Iran's collectivist

culture to create family-centered adherence strategies, a departure from individual-focused interventions prevalent in Western studies.

- Design and Testing of Innovative Measures: Pilot Testing of Interventions: Conduct RCTs to test mobile apps and pharmacist-led education interventions, Behavioral Nudges: Use reminders, incentives, and gamification to encourage adherence.
- Enhancing Practical Impact: Policy Recommendations: Incorporate adherence-support programs in routine care with funding for technologies and education, Collaboration with Healthcare Providers: Foster collaboration to improve adherence through regular assessments and interventions.
- Future Research Directions: Expanding the Scope: Explore adherence in other chronic conditions and cultural influences, Longitudinal Studies: Conduct long-term research on the effectiveness of adherence interventions.

7 | Study Limitations and Generalizability

While our study provides valuable insights into medication adherence among older adults with chronic diseases, several limitations should be acknowledged. These limitations have implications for the generalizability of our findings and highlight the need for further research in different cultural and healthcare contexts.

- Sample Characteristics: Our study focused on older adults with diabetes and related chronic conditions in a specific geographic region (Yazd, Iran). The findings may not be directly applicable to individuals with other chronic diseases, such as mental health conditions, or to older adults in different regions or countries. Future studies should include more diverse populations, including those with varying chronic conditions and from different cultural backgrounds, to enhance the generalizability of the results.
- Cultural Context: The cultural and social dynamics in Iran, such as the strong emphasis on family support and the role of spouses in medication adherence, may not be representative of other societies. For example, in more individualistic cultures, the influence of spousal support on medication adherence may differ. Therefore, interventions designed based on our findings should be adapted to the cultural context of the target population.
- Cross-Sectional Design: Our study employed a cross-sectional design, which limits our ability to establish causal relationships between the factors studied and medication adherence. Longitudinal studies are needed to better understand the temporal relationships between self-efficacy, health literacy, spousal support, and medication adherence over time.
- Sample Size and Sampling Method: This study was conducted in a specific region of Iran, which may affect the generalizability of the findings to a broader population. Although our sample size was adequate for the analysis, the use of convenience sampling may limit the representativeness of the findings. Future research should employ probability sampling techniques to ensure that the sample is more representative of the broader population of older adults with chronic diseases.
- Healthcare System Differences: The healthcare system in Iran, including access to medications and healthcare services, may differ from other countries. These differences could influence medication adherence and the effectiveness of interventions. Therefore, findings from this study should be interpreted with caution when applied to settings with different healthcare systems.
- Focus on Diabetes: Our study primarily focused on older adults with diabetes and related chronic conditions. While diabetes is a common chronic disease, the findings may not be generalizable to individuals with other chronic conditions, such as cardiovascular disease or mental health disorders. Future research should explore medication adherence in populations with a broader range of chronic diseases.

8 | Conclusion

This study emphasizes the significant role of self-efficacy, health literacy, and spousal support in enhancing medication adherence among elderly individuals with chronic diseases. By integrating these factors within Iran's collectivist cultural context, the study reveals their combined effects, with a particular focus on the vital role of spousal support. These findings offer a deeper understanding of adherence dynamics and provide valuable insights for developing tailored interventions, such as family-centered education and economic support policies, which can improve medication adherence, health outcomes, and quality of life for older adults.

Therefore, interventions aimed at improving medication adherence in this population should take these factors into account and address the specific needs and preferences of older adults and their spouses or family members. By enhancing self-efficacy, health literacy, and spousal support, we can assist older adults with chronic diseases in achieving more effective medication adherence and attaining better health outcomes.

Author Contributions

Shokofeh Afkhami: conceptualization, data curation, formal analysis, writing – original draft, writing – review and editing. **Farkhondeh Asadi:** conceptualization, methodology, formal analysis, investigation, validation, writing – original draft, writing – review and editing, data curation. **Hassan Emami:** data curation, formal analysis, methodology, writing – review and editing. **Azam sabahi:** methodology; formal analysis, data curation, writing – review and editing.

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Ethics Statement

This study is approved under the ethical approval code IR.SBMU.RETECH.REC.1402.066.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All data generated or analyzed during this study are included in this published article. All authors have read and approved the final version of the manuscript have full access to all of the data in this study and take complete responsibility for the integrity of the data and the accuracy of the data analysis.

Further data is available from the corresponding author on reasonable request. She [Farkhondeh Asadi] affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained. The authors confirm that the data supporting the findings of this study are available within the article.

Transparency Statement

The lead author Farkhondeh Asadi, Hassan Emami affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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