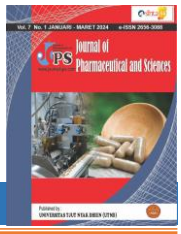
Journal of Pharmaceutical and Sciences
Electronic ISSN: 2656-3088 DOI: https://doi.org/10.36490/journal-jps.com
Homepage: https://journal-jps.com
REVIEW ARTICLE JPS. 2025, 8(3), 1901-1915



Exploration of the Relationship Between Quality of Life and Medication Beliefs with Non-Adherence in Hemodialysis Patients

Eksplorasi Kualitas Hidup dan Kepercayaan Obat terhadap Ketidakpatuhan Pasien Hemodialisis

Sulistia Suryaman [a], Zakky Cholisoh [a]*

[a] *Faculty of Pharmacy, Universitas Muhammadiyah Surakarta, Sukoharjo, Central Java, Indonesia.*

**Corresponding Authors: zakkycholisoh@ums.ac.id*

Abstract

Background: Poor medication adherence is common among hemodialysis patients and is associated with adverse clinical outcomes. However, factors such as health-related quality of life (QoL) and medication beliefs remain underexplored as determinants of non-adherence in this population. **Objective:** This systematic review aims to synthesise the evidence regarding the relationship between QoL, medication beliefs, and pharmacological non-adherence in patients undergoing hemodialysis (HD). **Methods:** A comprehensive literature search was conducted using electronic databases (PubMed, Scopus, and Google Scholar) for observational studies published between January 2015 and July 2, 2025. Studies were included if they involved adult hemodialysis patients and examined QoL and/or medication beliefs concerning pharmacological non-adherence. **Results:** Six observational studies, encompassing 1,698 hemodialysis patients from various countries, met the inclusion criteria. The synthesised evidence indicated that poorer QoL (particularly depression and poor sleep quality), higher burden of physical symptoms, and specific medication beliefs (e.g., concerns about side effects and low perceived necessity of medications) were significantly associated with increased non-adherence. **Conclusion:** Non-adherence among hemodialysis patients is influenced by the complex interaction of psychosocial factors, including QoL and individual medication beliefs. To improve adherence, interventions should be developed to target these factors through health education, psychological support, and patient-centred care. Further integrative and contextual research is needed to strengthen understanding and develop more effective interventions.

Keywords*: *Quality of life, Beliefs, Non-adherence, Adherence, Hemodialysis

Abstrak

Latar Belakang: Kepatuhan pengobatan yang buruk banyak terjadi pada pasien hemodialisis dan dikaitkan dengan hasil klinis yang tidak diinginkan. Namun, faktor-faktor seperti kualitas hidup terkait kesehatan (QoL) dan keyakinan terhadap pengobatan masih kurang diteliti sebagai penentu ketidakpatuhan pada populasi ini.**Tujuan:** Tinjauan sistematis ini bertujuan untuk mensintesis bukti mengenai hubungan antara kualitas hidup, keyakinan terhadap pengobatan, dan ketidakpatuhan farmakologis pada pasien yang menjalani hemodialisis (HD). **Metode:** Penelusuran literatur komprehensif dilakukan menggunakan database elektronik (PubMed, Scopus, dan Google Scholar) untuk studi observasional yang diterbitkan dari Januari 2015 hingga 2 Juli 2025. Studi dimasukkan jika melibatkan pasien hemodialisis dewasa dan mengkaji QoL dan/atau keyakinan terhadap pengobatan dalam kaitannya dengan ketidakpatuhan farmakologis. **Hasil:** Enam studi observasional, yang mencakup total 1.698 pasien hemodialisis dari berbagai negara, memenuhi kriteria inklusi. Bukti yang disintesis menunjukkan bahwa kualitas hidup yang lebih buruk (khususnya depresi dan kualitas tidur yang buruk), beban gejala fisik yang lebih tinggi, dan keyakinan spesifik terhadap pengobatan (misalnya, kekhawatiran akan efek samping dan persepsi rendah tentang kebutuhan pengobatan)

secara signifikan terkait dengan peningkatan ketidakpatuhan. **Kesimpulan:** Ketidakpatuhan pada pasien hemodialisis dipengaruhi oleh interaksi kompleks faktor-faktor psikososial, termasuk QoL dan keyakinan individu terhadap pengobatan. Untuk meningkatkan kepatuhan, intervensi perlu dikembangkan untuk menargetkan faktor-faktor ini melalui edukasi kesehatan, dukungan psikologis, dan perawatan yang berpusat pada pasien. Penelitian lanjutan dengan pendekatan integratif dan kontekstual sangat diperlukan untuk memperkuat pemahaman dan mengembangkan intervensi yang lebih efektif.

Kata Kunci: Kualitas hidup, Kepercayaan, Ketidakpatuhan, Kepatuhan, Hemodialisa

Article History:
Received: 19/08/2025,
Revised: 03/09/2025,,
Accepted: 04/09/2025,
Available Online: 04/09/2025.
QR access this Article

https://doi.org/10.36490/journal-jps.com.v8i3.1029

Introduction

Chronic kidney disease (CKD) is a growing global health concern. It is estimated that 850 million people are affected by CKD worldwide, and nearly 4 million people undergo hemodialysis (HD) therapy [1,2]. The incidence of new kidney disease cases continues to exhibit an annual increase, driven by risk factors such as diabetes, hypertension, and lifestyle changes. This phenomenon places a significant economic and social burden on global healthcare systems. Patients undergoing HD face not only the physical challenges of their disease and treatment but also profound clinical impacts on various psychological dimensions, including anxiety and depression, which substantially diminish their quality of life [3,4]. These psychological disorders have the potential to exacerbate patients' social, economic, and family conditions, and they are strongly associated with reductions in both physical and mental QoL scores [4].

The quality of life for individuals living with hemodialysis is a multifaceted construct reflecting their self-perception regarding their health status. This construct encompasses three dimensions: physical, mental, and social aspects [5]. The quality of life (QoL) assessment is paramount because it encompasses not only the physical health status of the subject, but also the psychological and social well-being. Several studies have been conducted over the past two decades that have examined the relationship between QoL and HD. Many factors have been identified as contributing to this relationship, including but not limited to fatigue, chronic pain, sleep disturbances, and others. As posited by Rustandi *et al* and Sritheran *et al* [5,6]Medical complexity and physical limitations are the most significant impediments to enhancing patients' quality of life. The subsequent text aims to furnish a comprehensive overview of the subject matter. Furthermore, psychological factors, including anxiety and depression, have been demonstrated to have a substantial impact on the deterioration of quality of life (QoL). Consequently, comprehensive interventions are necessary to address these multifaceted challenges [5,7].

A critical factor influencing disease progression and treatment outcomes in hemodialysis (HD) patients is their beliefs and perceptions regarding treatment. These factors impact their motivation to adhere to therapeutic regimens and self-care engagement. Emotional states, including anxiety, depression, and uncertainty, often shape these cognitive frameworks. Practical concerns about the complexity of medication regimens, which typically involve multiple prescriptions and strict dosing schedules, also play a role. Systematic reviews and meta-analyses consistently demonstrate that patients with HD exhibit elevated levels of psychological distress, including anxiety and depression, when compared to the general population [3] [6].

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Treatment non-adherence is central to patients' quality of life and beliefs about medication. Patients' psychological conditions and perceptions of their illness greatly influence their non-adherence to treatment, diet, and dialysis schedules [8]. A conceptual model known as the necessity-concerns framework is used to understand patients' perspectives on prescribed medications. This model evaluates patients' beliefs about the necessity of treatment and their concerns about medication side effects or risks [9]. Systematic reviews and recent studies indicate that long-term non-adherence rates among hemodialysis (HD) patients have remained variable and generally low over the past decade, with high non-adherence rates observed in only a small proportion of patients [10]. Furthermore, depression and poor quality of life have been consistently associated with lower treatment non-adherence, thereby increasing the risk of complications, hospitalisation, and mortality in HD patients [11]. However, further investigation is needed into the factors contributing to non-adherence in the HD patient population. This is particularly important since aspects such as quality of life and perceptions or beliefs about treatment have not been extensively studied. Recent studies underscore the importance of exploring psychosocial factors and patient perceptions to understand non-adherence. They also highlight the need for further research on the dimensions of perception and belief in therapy, as these can significantly impact the quality of life of HD patients [12,13].

This paper comprehensively reviews observational studies examining two factors contributing to non-adherence among hemodialysis patients: quality of life and medication-related perceptions or beliefs. Drawing upon empirical evidence, the review aims to identify and analyse the influence of quality of life and patients' perceptions or beliefs regarding pharmacological treatment on non-adherence in hemodialysis patients.

Methods

Literature Search

The literature search was conducted through three central electronic databases: PubMed, Scopus, and Google Scholar, and it lasted from the beginning of 2015 to July 2, 2025.

Search Strategy

The search strategy or search terms used are as follows: ("quality of life") OR ("medication beliefs") AND ("non-adherence") AND ("hemodialysis"). The keywords were entered into the "PubMed Advanced Search Builder" system. The following keywords and Boolean operators were generated: ((("quality of life"[All Fields]) OR ("medication beliefs"[All Fields]) AND ("non-adherence"[All Fields]) AND ("hemodialysis"[All Fields]). The keywords and Boolean operators were then used to search the PubMed, Scopus, and Google Scholar databases.

Study Screening

The literature search results were saved in "RIS" format and managed using Mendeley software. Duplicate articles were removed and selected based on title, abstract, and full-text eligibility.

This review will include studies that meet all of the following criteria:

a. Conducted on patients over 18 years old undergoing hemodialysis therapy
b. Covering quality of life variables and/or beliefs or perceptions about medication with clinical outcomes of treatment adherence or non-adherence.
c. All methods of measuring quality of life variables are included, such as the KDQOL/EQ-5D.
d. Perception measurements connected with adherence or non-adherence, such as self-report, MARS, or MMAS, are also included as long as they are associated with reported adherence or non-adherence.
e. Both observational and cross-sectional studies are included.
f. Studies are excluded if they report on non-adherence unrelated to patients' quality of life, perceptions, or beliefs, or if they are review articles, study protocols, dissertations, or e-books.
g. Publication language is limited to English.

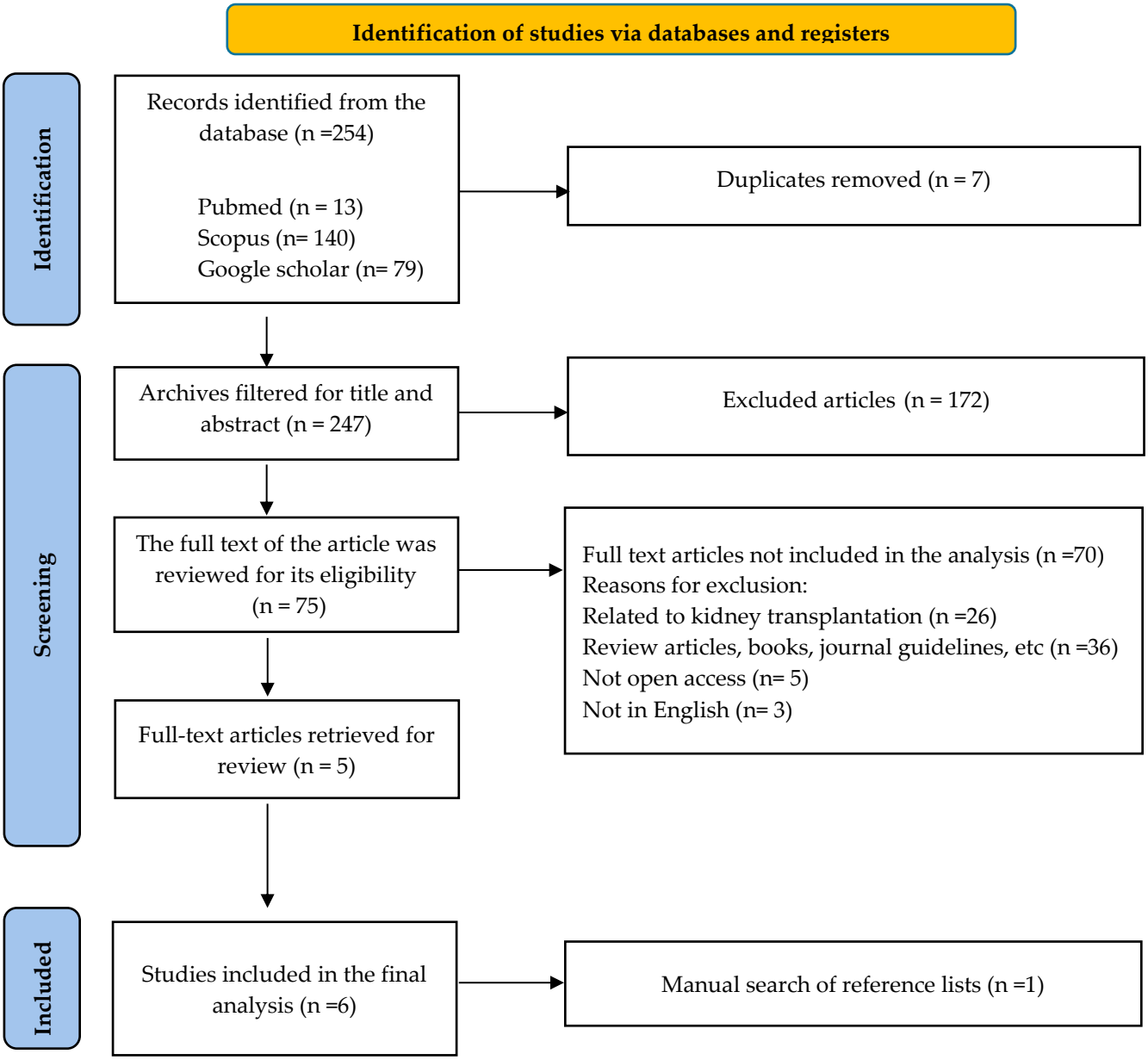
Data Extraction and Analysis

The following information was extracted from each study: author name, year of publication, country of origin, cross-sectional study design, respondent characteristics, number of patients, age range or average age, and gender. The following questionnaire instruments assessed quality of life, beliefs/perceptions related to

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

treatment, and non-adherence: research results on the relationship between quality of life factors and/or beliefs/perceptions related to treatment and non-adherence.

Data analysis was conducted through a descriptive summary of the included studies. We present tabulated data on factors such as quality of life, perceptions or beliefs about medication, sociodemographic characteristics, and factors related to non-adherence.



Description: The PRISMA flow diagram depicts the process of study selection. A total of 247 records were initially identified through electronic databases. After screening titles and abstracts, 172 records were excluded. Subsequently, 75 full-text articles were assessed for eligibility, with 70 excluded for not meeting the inclusion criteria. Ultimately, five studies were included. An additional study was identified through manual reference searching, resulting in a total of 6 studies incorporated into the review.

Figure 1. PRISMA Flow Diagram of the Study Selection Process for the Systematic Review

Results

Description of Included Studies

The literature selection process was conducted in stages to ensure alignment with the study objectives. Of the 247 studies identified, 172 were excluded at the initial stage after screening titles and abstracts due to irrelevance to the study focus. A total of 75 studies were evaluated at the full-text assessment stage. Of those, 70 were eliminated because they did not meet the inclusion criteria. These criteria included discussing kidney transplantation, being review articles or books, being published in guideline journals, not being available in

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

open access, or not being written in English. After a thorough selection process, five studies met all the inclusion criteria. An additional manual search was performed by reviewing the reference lists of all eligible articles and relevant review articles identified during the screening process. This manual search yielded one additional study that met the inclusion criteria, resulting in six studies analysed in this systematic review.

Characteristics of the Included Studies

The six research articles varied in analytical methods, patient populations, and instruments to measure quality of life, perceptions/beliefs related to treatment, and non-adherence. Table 1 summarises six studies, including the authors, year of research, country, study design, patient population, age, gender, assessment instruments, and results. A total of 1,698 patients with kidney disease were included in the systematic review. The average age range was 24–83 years. Two studies were conducted in Pakistan[14,15]One study each was conducted in Japan [16], Iran [17], Malaysia [18], and Denmark [19].

Table 1. Characteristics of Inclusion Studies

Author and Country	Study Design	Patient population	Age (years)	Gender	Education Level	Instruments used	Results
Nagasawa et al., (2018) [16], Japan	Cross-sectional	92 dialysis patients	Mean: 67 ± 11.6	77.2% Male (n= 72), 22.8% Female (n=21)	Elementary or junior high school graduates 28.3% (n= 26), High school graduates or university entrance exam 43.5% (n= 40). Engineering school graduate or dropout 13.0% (n= 12). University graduate 15.2% (n= 14)	EQ-5D, Kidney Disease Quality of Life, + Medication Adherence Tool	Patients with good sleep quality (average or higher) were 3.36 times more likely to adhere to treatment (95% confidence interval: 1.26-8.96; P = 0.016).
Kaneez et al., (2021) [15], Pakistan	Cross-sectional	188 hemo-dialysis	Median: 55 years (24-83)	60.63% male (n= 114), 39.37% Female (n=74)	Not available	PHQ-9, PSQI, + DAI-10	As many as 60.01% of depressed patients showed low medication adherence, and 72.87% had poor sleep quality.
Hamza et al., (2025) [14], Pakistan	Observational cross-sectional, multisite	390 hemodialysis patients	31% are aged between 46 and 60	47.2% Male (n=184), 52.8% Female (n= 206)	No education 25.1% (n= 98) Secondary education 41.5% (n= 162) Higher education 33.3% (n=130)	HLQ, Illness perception questionnaire + MMAS- 8.	45.1% had low health literacy, 46.7% had negative perceptions of disease, and 41.8% had low adherence. The correlations between literacy and disease perception (r = -0.080), literacy and adherence (r = 0.024), and perception and adherence (r = -0.061) were weak and insignificant.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Bazraf-shan et al. (2023) [20], Iran	Descriptive correlation	218 hemodialysis patients	Mean: 54.11 ± 14.78	60.4% Male (n= 131), 39.6% Female (n=86)	Junior high/high school graduates 65.6% (n= 143) Diploma 20.6% (n= 45) Bachelor 11.9% (n= 26)	General Procrastina-tion Scale, DPS, DERS + ESRD-AQ	A weak and significant association was found between attendance and general delay ($p < 0.05$; $p < 0.01$), but there was no significant association between non-adherence, general delay, and decision delay ($p > 0.05$). Multivariate regression showed a significant association between age and cause of kidney failure with non-adherence ($p = 0.01$; $p = 0.02$).
Lee & Chong (2022) [21], Malaysia	Cross-sectional multisite	325 Hemo-dialysis patients	Mean: 60.18 ± 21.54	54.8% Male (n= 178), 45.2% Female (n=147)	Basic education or no formal education 40% (n= 116) Secondary education 55.1% (n=179) Higher education 4.9% (n= 16)	BMQ + MARS-5	The average number of medications per prescription was 9 (95% CI: 8.0–11.0) daily. The MARS-5 score was 23.41 ± 1.81. 88.0% of patients believed that medication prevented worsening of their condition, while 36.3% were concerned about side effects. *The mean average concern was* 5.26 ± 3.91; 67.1% were receptive to treatment.
Mechta Nielsen et al. (2023) [19], Denmark	Cross-sectional multisite	385 hemodialysis patients	Median: 67, (IQR=18)	66.5% male (n= 256), 33.5% Female (n=129)	Elementary school 54% (n=208) Secondary school 11.9% (n= 46) University 29.1% (n= 112)	DSI, BMQ + MARS-5	Non-adherence prevalence was 32% (95% CI: 27–37%) with a cut-off score 23. More than one-third were concerned about medication, and one-third believed doctors were overprescribing medications—these beliefs increased the risk of non-adherence by 18%.

Notes: Euro Qol 5-dimensional questionnaire (EQ-5D); Kidney Disease Quality of Life (KDQOL); Patient Health Questionnaire-9(PHQ-9); Pittsburgh Sleep Quality Index (PSQI); Drug Attitude Inventory-10 (DAI-10); Health Literacy Questionnaire(HLQ); Morisky Medication Adherence Scale-8 (MMAS-8); End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ); Decisional Procrastination Scale (DPS); Difficulty in Emotion Regulation Scale (DERS); Medication Adherence Rating Scale-5 (MARS-5); Beliefs about Medicines Questionnaire (BMQ); Dialysis Symptom Index (DSI).

Questionnaires Used to Measure Quality of Life, Perception, Knowledge, and Beliefs about Medication

Various questionnaire instruments have been used to assess psychosocial factors and patients' quality of life. Euro Qol 5-dimensional questionnaire (EQ-5D) and Kidney Disease Quality of Life (KDQOL) used by Nagasawa et al [16] to assess various aspects of a patient's life, including sleep quality. This also includes the Pittsburgh Sleep Quality Index (PSQI), which is used by Kaneez et al [15] To measure sleep quality more

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

specifically, Kaneez et al. used the Patient Health Questionnaire-9 (PHQ-9) to assess the patient's personal characteristics and psychological condition. [15] The General Procrastination Scale and Decisional Procrastination Scale (DPS) measure procrastination tendencies and decision-making difficulties, and the Emotion Regulation Scale (DERS) measures the challenges in managing emotions. In addition, aspects of knowledge and ability to manage health information were calculated using the Health Literacy Questionnaire (HLQ) conducted by Hamza et al. [14], which assesses a patient's ability to find, understand, and use health information for decision-making. Hamza et al. evaluated patients' illness perceptions using the Illness Perception Questionnaire. [14], which includes perceptions regarding the disease's cause, duration, impact, and control. In two of the six studies, patient beliefs about treatment were measured using the Beliefs about Medicines Questionnaire (BMQ) used by Lee & Chong and Mechta Nielsen et al. [18,19] This assesses explicitly the perception of the need for medication (necessity) and concerns about the adverse effects of drugs (concern). Other research shows that positive perceptions of treatment can have a positive impact on non-adherence [22].

Questionnaires Used to Measure Non-adherence

In various studies, the tools used to assess patient non-adherence and their perceptions of treatment are crucial to determine the extent to which patients adhere to treatment and the factors that influence it. The Morisky Medication Adherence Scale-8 (MMAS-8) used by Hamza et al [14]It is one of the most common questionnaires globally for assessing medication adherence. Meanwhile, the Medication Adherence Report Scale-5 (MARS-5) [21], as used by Lee & Chong and Mechta Nielsen et al [18,19] Offers a shorter version and prioritises patient self-reports of their non-adherence behaviour.

In addition, the Drug Attitude Inventory-10 (DAI-10) was used by Kaneez et al. [15] Measuring patient attitudes toward medications, where the results are directly correlated with non-adherence levels, and negative attitudes toward medications often lead to poor non-adherence. For patients with end-stage renal disease, the End-Stage Renal Disease Adherence Questionnaire (ESRD-AQ) is used by Bazrafshan & Banijamali SS [20] Specifically designed to assess various aspects of non-adherence, including medication, diet, and fluid intake. The Medication Adherence Tool is a medication non-adherence questionnaire developed by Nagasawa et al. [16] Designed to measure patient adherence with treatment.

Quality of Life, Perception, Knowledge, and Beliefs, and Patient Non-adherence with Treatment

Quality of life is a crucial factor influencing treatment non-adherence in hemodialysis patients. Several studies have shown that physical and psychological symptom burden, sleep quality, and depression play significant roles in determining patient non-adherence. A survey by Nagasawa et al and Mechta Nielsen et al [16,19] provides empirical evidence that the higher the burden and severity of symptoms experienced by patients, the greater the risk of treatment non-adherence, with a significant odds ratio (OR around 1.08–1.09; $p < 0.001$). Symptoms such as fatigue, itching, and impaired concentration contribute to decreased patient motivation to undergo therapy regularly. This is in line with findings in other literature that confirm that various factors, ranging from demographic aspects, disease conditions, to psychosocial variables, significantly influence the symptom burden experienced by hemodialysis patients [24]. In addition, sleep quality has also been shown to be an essential determinant of non-adherence; patients with good sleep quality were reported to be 3.36 times more likely to adhere to treatment [16]. A study by Kaneez et al [15] added that poor sleep quality is negatively correlated with patient perceptions of treatment and is closely linked to levels of depression. Depression itself is a psychological factor that significantly contributes to non-adherence and worsening sleep quality while simultaneously reducing positive attitudes toward therapy. Interestingly, the aetiology of kidney failure also appears to influence medication non-adherence. A study by Bazrafshan & Banijamali SS [20] found that patients with hypertension as the cause of kidney failure had significantly different levels of non-adherence ($p = 0.02$), indicating that the origin of the disease may influence how patients perceive and undergo therapy. However, not all aspects of quality of life are consistently associated with non-adherence, such as the burden of kidney disease, as shown in Table 2 according to [15], which shows insignificant results (OR = 0.55; $p = 0.251$), which may reflect subjective adaptation and patient perception of chronic conditions.

Furthermore, patient perceptions and beliefs regarding medications represent significant psychological factors that influence medication non-adherence, particularly among individuals diagnosed with chronic diseases, such as kidney failure, who are undergoing hemodialysis. A multitude of studies have demonstrated that unfavourable perceptions concerning illness and medications have the potential to diminish non-adherence. However, the magnitude of this relationship is subject to variation. Research by Hamza et al [14]

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Demonstrated that negative perceptions of the disease exhibited a very weak negative correlation with non-adherence (r = –0.061; p = 0.229), suggesting that these perceptions were not significant determinants, although they remained relevant.

Table 2. Summary of Factors and Their Relationship to Hemodialysis Patient Non-adherence

Researcher (Year)	Factors studied	Results/OR/Correlation	Significance	Interpretation
1. Quality of life				
Nagasawa et al., (2018) [16]	Symptom burden	OR = 1.09 (95% CI: 1.05–1.13)	p < 0.001	High symptom burden increases the risk of non-adherence
	Sleep quality (≥mean)	OR = 3.36 (1.26–8.96)	p = 0.016	Good sleep is 3.36 times more likely to be compliant
	Burden of kidney disease	OR = 0.55 (0.198–1.53)	p = 0.251	Not significant
Kaneez et al., (2021) [15]	Depression with sleep quality	Positive correlation (r= 0.61)	p = 0.002	High depression, poor sleep quality
	Sleep quality	Significant negative correlation (r = -0.54)	p < 0.001	High depression, negative perception of treatment
	Depression	Significant negative correlation (r = -0.58)	p < 0.001	Poor sleep leads to more negative attitudes towards medication
Mechta Nielsen et al. (2023) [19]	Symptom severity	OR = 1.02 (95% CI: 1.01–1.03)	p < 0.001	Symptom severity risk of non-adherence increases
	Symptom burden	OR = 1.08 (95% CI: 1.05-1.12)	p < 0.001	Symptoms of disease burden risk of non-adherence increases
2. Perception or Belief in Medicine				
Hamza et al., (2025) [14]	Illness perception	Very weak negative correlation (r = –0.061)	p = 0.229	Poor perception, low adherence
Bazrafshan & Banijamali SS., (2023) [20]	General Procrastination	Moderate negative correlation (r = −0.22)	p < 0.01	High procrastination, low adherence
	Decisional procrastination	Weak negative correlation (r = −0.16)	p < 0.05	High procrastination, low adherence
Lee & Chong, (2022) [21]	Trust in medicine *"Without medicine, I would be very sick."*	Significant (β = 0.344)	p = 0.004	High trust increased adherence
	Concerns about medication *"becoming too dependent on medication"*	Significant (β = −0.264)	p = 0.012	High concern, low adherence
Mechta Nielsen et al. (2023) [19]	Concerns about drug "Overuse"	OR = 1.18 (95% CI: 1.09–1.27)	p < 0.001	Perception of overuse is associated with a higher risk of non-adherence

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

3. Sociodemographic factors and other factors				
Bazrafshan & Banijamali SS., (2023) [20]	Age	Significant (r = 0.21)	p = 0.01	Age affects adherence
	Emotional regulation	The correlation is very weak and not significant (r = 0.02)	p > 0.05	There is no relationship between emotional regulation and medication non-adherence.
	Causes of kidney failure (hypertension)	Not available	p = 0.02	Etiological factors influence adherence
Lee & Chong, (2022) [21]	Age	The highest significance was at age >65 years (23.77 ± 1.37)	p = 0.004	Older age is associated with high adherence to medication
Hamza et al., (2025) [14]	*Health literacy*	Very weak positive correlation (r = 0.024)	p = 0.631	There is no strong correlation

Concurrently, a study by Bazrafshan & Banijamali SS [20] found that procrastination, in both its general form (r = –0.22; p < 0.01) and its manifestation in decision-making (r = –0.16; p < 0.05), exhibited a negative correlation with non-adherence. This finding indicates that the propensity to postpone or vacillate in health-related decision-making can diminish patient non-adherence to therapeutic regimens. Moreover, beliefs about medication also play a significant role. The study by Lee & Chong [21] Showed demonstrated that positive beliefs, such as "without medication, I would be very sick," were significantly associated with increased non-adherence (β = 0.344; p = 0.004). Conversely, concerns such as "becoming too dependent on medication" were associated with decreased non-adherence (β = –0.264; p = 0.012). This finding suggests that patients who comprehend the benefits of medication demonstrate higher levels of non-adherence to the prescribed regimen. Conversely, patients who are preoccupied with concerns regarding the potential long-term effects or the development of dependence are more likely to deviate from the prescribed therapy. The findings of this study corroborate the concept of "necessity-concern." BMQ has been demonstrated to be a reliable instrument for predicting drug non-adherence behaviours among hemodialysis patients [10,25]. In accordance with this observation, a study by Mechta Nielsen *et al* reported that the utilisation of medication for the treatment of overuse symptoms was associated with an elevated risk of non-adherence, as indicated by an odds ratio of 1.18 (95% confidence interval: 1.09–1.27; p < 0.001) [19].

Age, Gender, Education Level, and adherence

Age

Several studies have shown that age plays a vital role in influencing the level of medication non-adherence in hemodialysis patients. Studies according to Bazrafshan & Banijamali SS [17] A positive correlation between age and medication non-adherence was found, with a correlation coefficient of r = 0.21 and a p-value of 0.01. These results indicate that as patients age, they tend to demonstrate higher levels of non-adherence to their medication. Although the correlation strength is relatively weak, the finding remains statistically significant and provides relevant clinical insights into patient behaviour.

Similar findings were also expressed by Lee & Chong. [18] Reported the highest non-adherence rates in the elderly patient group, particularly those over 65 years, with a mean score of 23.77 ± 1.37 and a significance value of p = 0.004. These data support the understanding that elderly patients have greater motivation to adhere to medication regimens consistently. This is likely influenced by a deeper awareness of the importance of medication for their health and more stable and structured lifestyle habits, which also strengthen their non-adherence routines.

Gender

The demographic variable of gender on medication adherence in hemodialysis patients is still inconsistent, as studied by Kaneez et al. [15] Reported that of 188 patients with moderate to severe depression, the majority were male (114 males vs. 74 females), and the non-adherent group showed significantly higher

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

depression scores (PHQ-9). Although a direct relationship between gender and non-adherence was not analysed, these findings indicate a potential link between gender, psychological conditions, and non-adherence [14,19,20] Included gender as a demographic variable, but did not highlight its specific influence on adherence. Study by Hamza et al [14] Explicitly states that the effect of gender is not statistically significant. [16], also reported no association between gender and medication non-adherence. Meanwhile, another study with the same population showed that male patients were more non-adherence than female patients. [26].

Level of Education

Among the six studies related to non-adherence in hemodialysis patients, only one provided information on the relationship between education level and non-adherence [20] Reported that most patients had education below diploma level, which can hinder understanding of treatment protocols and affect patients' cognition and awareness of their health condition, thus negatively impacting adherence. Meanwhile, another study by Hamza et al. 2025 [14] Found that 66.6% of patients had minimal or no education. This contributed to low health literacy and negative perceptions of the disease. These factors could potentially reduce adherence, as shown in Table 1. Another study found that education significantly improves patient knowledge and non-adherence [27].

Discussion

This systematic review examined the role of quality of life factors and patient perceptions and beliefs about treatment in influencing non-adherence. The analysis showed that both factors play a significant role, although relatively little research has focused on this.

Synthesis of Findings by Theme

To deepen the analysis, findings from the six studies were synthesised and grouped into three interrelated themes: (1) Psychological Factors and Symptoms, (2) Beliefs and Perceptions about Medication, and (3) Demographic Factors and Health Literacy.

1. Psychological Factors and Physical Symptom Burden

This theme consistently demonstrated a strong association with non-adherence. Depression, poor sleep quality, and a higher burden of physical symptoms (such as fatigue and pruritus) emerged as significant barriers to adherence. [28–37]. Nagasawa et al. (2018) and Mechta Nielsen et al. (2023) provided empirical evidence that greater symptom burden significantly increased the risk of non-adherence (OR ≈ 1.08–1.09) [16,19]. These findings were reinforced by Kaneez et al. (2021), who identified strong positive correlations between depression, poor sleep quality, and negative attitudes toward medication. [15]. The synthesis indicates that the psychophysical burden is not merely a comorbidity but a direct driver that reduces patients' energy and motivation to engage in complex health behaviours, including adherence to medication regimens. [31,38–41].

2. Beliefs and Perceptions about Medication

Patients' beliefs regarding the necessity of their medications and concerns about potential harms represent essential predictors of adherence behaviour, although results are more heterogeneous. Lee & Chong (2022) and Mechta Nielsen et al. (2023) supported the necessity-concerns framework, whereby stronger beliefs in medication necessity and lower concerns were associated with better adherence. [19,21]. However, Hamza et al. (2025) reported a weak and non-significant correlation between illness perception and adherence (r = -0.061). Such weak correlations, as seen in Hamza et al., may reflect the complexity of this relationship, which is likely mediated or moderated by other variables. [14]. For example, patients may hold negative illness perceptions but remain adherent due to strong family support or fear of immediate consequences. Conversely, positive beliefs may be undermined by practical barriers such as polypharmacy or distressing side effects. The implication is that interventions should not only target belief modification but simultaneously address external barriers and provide practical support to translate positive intentions into sustained adherence.

3. Demographic Factors, Health Literacy, and Procrastination

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Older age was consistently associated with better adherence (Bazrafshan & Banijamali, 2023; Lee & Chong, 2022), potentially reflecting greater acceptance of chronic conditions and more structured routines. In contrast, low health literacy (Hamza et al., 2025) [14]A tendency to procrastinate in health-related decisions (Bazrafshan & Banijamali, 2023) contributed to non-adherence. The findings on procrastination offer novel insights, suggesting that non-adherence is not always a matter of deliberate refusal but may also represent avoidance or difficulty in managing illness-related tasks. [20].

Non-adherence Assessment

We found interesting findings related to non-adherence assessment in two of the six studies analysed [16] A simple, contextual, self-report-based measurement tool was used to evaluate medication non-adherence, which was then significantly associated with patient sleep quality. Meanwhile, by Mechta Nielsen et al [19] Assessed patient non-adherence using the MARS-5 instrument, with a score <23 categorised as non-adherent. This approach is attractive because it provides a clear quantitative threshold, thus facilitating further research in classifying compliant and non-compliant patients. This finding also aligns with a similar strategy used by Oever et al. [42].

Quality of life factors on non-adherence

Study by Kaneez et al [15] Revealed that the prevalence of moderate to severe depression was very high among hemodialysis patients, at 65.27% of 188 patients. This finding is highly relevant, considering that depression has long been identified as an independent risk factor for worsening morbidity and mortality in patients with end-stage renal disease (ESRD). The study showed that higher levels of depression, as measured by the PHQ-9, were significantly correlated with decreased medication non-adherence ($p = 0.002$). Furthermore, poor sleep quality was found to be associated with higher depression scores ($p = 0.017$) and also lower non-adherence, as measured by the Drug Attitude Inventory (DAI-10) and the Pittsburgh Sleep Quality Index (PSQI). This confirms that patient psychological well-being and sleep quality play a significant role in medication non-adherence behaviour [15].

This finding is reinforced by studies by Nagasawa et al [16] This showed that patients with good sleep quality were 3.36 times more likely to adhere to treatment than those with sleep disturbances (OR 3.36; 95% CI 1.26–8.96; $p = 0.016$). In univariate analysis, the group with high non-adherence also had significantly better sleep quality scores ($p = 0.043$). Kaneez et al. found a negative correlation between depression and non-adherence. [15], is consistent with previous literature showing that depression inhibits motivation and disrupts emotional regulation, making it difficult for patients to maintain treatment routines [28]. Motivational and educational programs may help improve these psychological and emotional factors, making patients better manage fluid intake, diet, and medication consistently. This, in turn, improves satisfaction and quality of life related to kidney health. [44].

The relationship between perceived physical symptoms and non-adherence levels was also studied. The study of Mechta Nielsen et al. [19] involves measuring symptom burden using the Dialysis Symptom Index (DSI). The results of the study showed that the severity of symptoms (symptom severity) (OR = 1.02; 95% CI: 1.01–1.03) and total symptom burden score (OR = 1.09; 95% CI: 1.05–1.13) were significantly associated with an increased risk of non-adherence. This means that the more severe the symptoms experienced by patients, the higher the likelihood of non-adherence to treatment. These three studies [15,16,19] synergistically clarify that psychological factors (such as depression), sleep quality, and perception of physical symptoms collectively contribute to patient non-adherence behaviour. This is in line with the findings in this study, which show that various factors, such as poor quality of life and high pain scores, influence patient non-adherence in undergoing hemodialysis [16].

Factors of drug perception and belief towards non-adherence

Treatment non-adherence in hemodialysis patients is a crucial aspect that directly impacts long-term clinical outcomes, such as reduced hospitalisation rates, improved quality of life, and survival. However, non-adherence is not a single entity in itself. Still, it is influenced by various interacting factors, ranging from beliefs about treatment to perceptions of the disease, health literacy, symptom burden, and demographic characteristics. [31].

One of the main approaches to understanding non-adherence is through patient beliefs about treatment, which is evaluated with instruments such as the Beliefs about Medicine Questionnaire (BMQ). Research by Lee & Chong [18] Most hemodialysis patients in Malaysia (88%) believed that their medications could prevent

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

their condition from worsening, while 36.3% expressed concern about side effects. These results were reflected in the differential scores. Necessity–concern positive (5.26 ± 3.91), and 67.1% of patients showed an accepting attitude towards treatment. The relatively good level of non-adherence (MARS-5 score = 23.41 ± 1.81) indicates that belief in the benefits of medication accompanied by minimal worry is a protective factor against non-adherence.

Recent literature shows a strong relationship between stress and procrastination, which is considered an emotional regulation response to stress. According to the stress context vulnerability model, stress increases vulnerability to procrastination as a form of emotional avoidance. [47]. This study found a weak yet significant negative correlation between medication non-adherence and general procrastination and decision-making. A similar pattern was found between patient attendance and general procrastination. However, multivariate analysis did not reveal a significant overall relationship, suggesting that factors such as social support and health literacy may influence the relationship [20].

However, aspects of health literacy and perception of disease also play an essential role, as shown in the study by Hamza et al. [14] Using HLQ, the Illness Perception questionnaire, found that nearly half of patients (45.1%) had inadequate health literacy, and 46.7% viewed their illness negatively. This resulted in low non-adherence (41.8% were non-adherent based on the MMAS-8). The study also noted that poor medication recall was a significant challenge, reinforcing the link between understanding health information and behavioural non-adherence. Other studies have found that patient knowledge may have a substantial impact on non-adherence in this population [48]

To gain a more comprehensive understanding of non-adherence, it is also important to consider emotional factors and the burden of symptoms patients feel. In this context, a study by Mechta Nielsen et al [19] Provides essential insights by combining assessments from the BMQ, MARS-5, and Dialysis Symptom Index (DSI). The study found that although most patients perceived their medications as necessary, more than one-third experienced medication-related concerns, and approximately 35% believed their doctors prescribed medications too frequently, which correlated with an 18% increased likelihood of non-adherence. Furthermore, non-adherence prevalence reached 32% (95% CI 27–37%), with MARS-5 scores.

Conclusion

In conclusion, this systematic review confirms that pharmacological non-adherence in hemodialysis patients is a complex, multifactorial issue. The key findings reveal that poor quality of life—particularly the presence of depression, sleep disturbances, and a high burden of physical symptoms—as well as negative medication beliefs (such as concerns about side effects and low perceived necessity of medication) are significant psychosocial determinants. Therefore, interventions to improve adherence must be integrative and patient-centred, simultaneously addressing psychological support, behavioural strategies, and health education designed to reshape beliefs and improve health literacy. Moving forward, research should prioritise the development of culturally adapted and validated measurement instruments to accurately capture medication beliefs and quality of life across diverse population contexts. Furthermore, longitudinal and multinational studies are essential to understand non-adherence's long-term dynamics and evaluate the efficacy of interventions tailored to unique cultural norms, healthcare systems, and social determinants.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgment

The authors would like to acknowledge the financial support provided by DPPM Kemdiktisaintek through the 2025 Thesis Research Grant with contract number 007/LL6/PL/AL.04/2025; 168.93/A.3-III/LRI/VI/2025.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

References

[1] Bello AK, Okpechi IG, Osman MA, Cho Y, Htay H, Jha V, et al. Epidemiology of haemodialysis outcomes. Nat Rev Nephrol 2022;18:378 95. https://doi.org/10.1038/s41581-022-00542-7.

[2] Francis A, Harhay MN, Ong ACM, Tummalapalli SL, Ortiz A, Fogo AB, et al. Chronic kidney disease and the global public health agenda: an international consensus. Nat Rev Nephrol 2024;20:473–85. https://doi.org/10.1038/s41581-024-00820-6.

[3] Miftakhul A, Bosniawan A, Ayatulloh D, Fahmi N, Laily R. Relationship Between Anxiety, Depression, And Quality Of Life Among Hemodialysis Patients: A Systematic Review Abstrak Times new roman :11 Spasi 1. vol. 1. 2024.

[4] Rikos N, Kassotaki A, Frantzeskaki C, Fragiadaki M, Mpalaskas A, Vasilopoulos G, et al. Investigation of Perception of Quality of Life and Psychological Burden of Patients Undergoing Hemodialysis—Quality of Life of Hemodialysis Patients. Nurs Rep 2023;13:1331–41. https://doi.org/10.3390/nursrep13030112.

[5] Rustandi H, Sofais DAR, Hasanuddin Y. Analysis of Risk Factors Related to Quality of Life in Kidney Failure Patients Undergoing Hemodialysis: A Single-Centre Observational Study at Besemah Regional Hospital, Pagaralam, Indonesia. Archives of The Medicine and Case Reports 2024;5:907–19. https://doi.org/10.37275/amcr.v5i4.611.

[6] Sritheran G, Id P, Kwing L, Kenneth C, Aftab RA, Sirisinghe RG, et al. PLOS ONE Enhancing medication management in hemodialysis patients : Exploring the impact of patient-centred pharmacist care and motivational interviewing 2024:1–13. https://doi.org/10.1371/journal.pone.0300499.

[7] Wahyuni NWS, Kamaryati NP, Rismawan M, Suantika PIR. The Determining Factors of Quality of Life in Chronic Kidney Disease Patients with Hemodialysis in Hospitals: A Literature Review. Babali Nursing Research 2025;6:212–25. https://doi.org/10.37363/bnr.2025.61454.

[8] Barello S, Anderson G, Acampora M, Bosio C, Guida E, Irace V, et al. The effect of psychosocial interventions on depression, anxiety, and quality of life in hemodialysis patients: a systematic review and a meta-analysis. Int Urol Nephrol 2023;55:897–912. https://doi.org/10.1007/s11255-022-03374-3.

[9] Tao WW, Tao XM, Wang Y, Bi SH. Psycho-social and educational interventions for enhancing adherence to dialysis in adults with end-stage renal disease: A meta-analysis. J Clin Nurs 2020;29:2834–48. https://doi.org/10.1111/jocn.15301.

[10] Horne R, Chapman SCE, Parham R, Freemantle N, Forbes A, Cooper V. Understanding patients' adherence-related beliefs about medicines prescribed for long-term conditions: a meta-analytic review of the Necessity-Concerns Framework. PLoS One 2013;8:e80633.

[11] Ghimire S, Castelino RL, Lioufas NM, Peterson GM, Zaidi STR. Nonadherence to medication therapy in haemodialysis patients: a systematic review. PLoS One 2015;10:e0144119.

[12] Ossareh S, Tabrizian S, Zebarjadi M, Joodat RS. Prevalence of Depression in Maintenance Hemodialysis Patients and Its Correlation With Adherence to Medications. Vol. 8. 2014.

[13] Huertas-vieco MP, Pérez-garcía R, Albalate M, Sequera P De, Ortega M, Puerta M, et al. Psychosocial factors and adherence to drug treatment in patients on chronic haemodialysis 2014:737–42. https://doi.org/10.3265/Nefrologia.pre2014.Jul.12477.

[14] Hamza MA, Ullah S, Ahsan H, Ali W, Masud M, Ahmed A. Health literacy, illness perception, and their association with medication adherence in end-stage renal disease. Int Urol Nephrol 2025:1–16.

[15] Kaneez M, Zaidi SMJ, Zubair A Bin, Rehan M, Hassan A, Sarwar Z, et al. Sleep quality and compliance to medical therapy among hemodialysis patients with moderate-to-severe depression: a cross-sectional study. Cureus 2021;13.

[16] Nagasawa H, Tachi T, Sugita I, Esaki H, Yoshida A, Kanematsu Y, et al. The effect of quality of life on medication compliance among dialysis patients. Front Pharmacol 2018;9. https://doi.org/10.3389/fphar.2018.00488.

[17] FD B, Darvizeh Z, SS. B. The relationship between hemodialysis patients' treatment adherence, procrastination, and difficulty in emotion regulation: A cross-sectional study in southeast Iran. Front Psychol 2023. https://doi.org/10.3389/fpsyg.2022.1041912 PM - 36726495 PMC - PMC9885004.

[18] Lee SF, Chong CP. Association of Necessity-Concerns Framework with medication adherence among Malaysian hemodialysis patients: A multicenter cross-sectional study. J Appl Pharm Sci 2022;12:61–8.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

[19] Mechta Nielsen T, Marott T, Hornum M, Feldt-Rasmussen B, Kallemose T, Thomsen T. Non-adherence, medication beliefs and symptom burden among hemodialysis patients: a cross-sectional study. BMC Nephrol 2023;24. https://doi.org/10.1186/s12882-023-03371-3.

[20] FD B, Darvizeh Z, SS. B. The relationship between hemodialysis patients' treatment adherence, procrastination, and difficulty in emotion regulation: A cross-sectional study in southeast Iran. Front Psychol 2023. https://doi.org/10.3389/fpsyg.2022.1041912 PM - 36726495 PMC - PMC9885004.

[21] Lee SF, Chong CP. Association of Necessity-Concerns Framework with medication adherence among Malaysian hemodialysis patients: A multicenter cross-sectional study. J Appl Pharm Sci 2022;12:61–8.

[22] Belhmer FS, Al Amad MA, Albitahi MH, Babattah FK. Adherence to Treatment Regimens Among End-Stage Renal Disease Patients : A Cross-Sectional Study 2025:143 50.

[23] Chan AHY, Horne R, Hankins M, Chisari C. The Medication Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. Br J Clin Pharmacol 2020;86:1281–8. https://doi.org/10.1111/bcp.14193.

[24] Lu Y, Zhai S, Liu Q, Dai C, Liu S, Shang Y, et al. Correlates of symptom burden in renal dialysis patients: a systematic review and meta-analysis. Ren Fail 2024;46:2382314.

[25] Foot H, La Caze A, Gujral G, Cottrell N. The necessity–concerns framework predicts adherence to medication in multiple illness conditions: A meta-analysis. Patient Educ Couns 2016;99:706–17.

[26] Alzahrani AMA. Prevalence of Non-adherence to Prescribed Medications among Hemodialysis Patients in Makkah City. Saudi Journal of Kidney Diseases and Transplantation 2022;33:526–34. https://doi.org/10.4103/1319-2442.388187.

[27] Aggarwal HK, Jain D, Meel S. Impact of patient education and knowledge on medication adherence in chronic kidney disease patients. Journal, Indian Academy of Clinical Medicine 2018;19:166 74.

[28] DiMatteo MR, Lepper HS, Croghan TW. Depression is a risk factor for noncompliance with medical treatment meta-analysis of the effects of anxiety and depression on patient adherence. Archives of Internal Medicine 2000;160:2101–7. https://doi.org/10.1001/archinte.160.14.2101.

[29] Spernak SM, Moore PJ, Hamm LF. Depression, constructive thinking and patient satisfaction in cardiac treatment adherence. Psychology, Health and Medicine 2007;12:172–89. https://doi.org/10.1080/10556790500465631.

[30] Hooper LM, Tomek S, Roter D, Carson KA, Mugoya G, Cooper LA. Depression, patient characteristics, and attachment style: Correlates and mediators of medication treatment adherence in a racially diverse primary care sample. Primary Health Care Research and Development 2016;17:184–97. https://doi.org/10.1017/S1463423615000365.

[31] Amato L, Giannetta N, Taborri S, Dionisi S, Panattoni N, Di Simone E, et al. Sleep Quality and Medication Adherence in Older Adults: A Systematic Review. Clocks and Sleep 2024;6:488–98. https://doi.org/10.3390/clockssleep6030032.

[32] Riegel B, Moelter ST, Ratcliffe SJ, Pressler SJ, De Geest S, Potashnik S, et al. Excessive daytime sleepiness is associated with poor medication adherence in adults with heart failure. Journal of Cardiac Failure 2011;17:340–8. https://doi.org/10.1016/j.cardfail.2010.11.002.

[33] Rosenthal TC, Majeroni BA, Pretorius R, Malik K. Fatigue: An overview. American Family Physician 2008;78:1173–9.

[34] Sarzi-Puttini P, Batticciotto A, Talotta R, Atzeni F. Differential diagnosis of vasovagal syncope: Myalgic encephalomyelitis/chronic fatigue syndrome. Vasovagal Syncope, 2015, p. 197–211. https://doi.org/10.1007/978-3-319-09102-0_16.

[35] Horne CE, Abel WM, Crane PB. Fatigue, Stress, and Blood Pressure Medication Adherence by Race After Myocardial Infarction. Journal for Nurse Practitioners 2023;19. https://doi.org/10.1016/j.nurpra.2023.104757.

[36] Soltani S, Hollstein MM, Berliner D, Buhl T, Bauersachs J, Werfel T, et al. Symptom severity reflected by NYHA grade is independently associated with pruritus in chronic heart failure patients. Journal of the European Academy of Dermatology and Venereology 2024;38:1410–8. https://doi.org/10.1111/jdv.19931.

[37] Schneider G. Diagnosis of psychological aspects in chronic pruritus. Hautarzt 2020;71:506–10. https://doi.org/10.1007/s00105-020-04596-1.

[38] Shiyanbola OO, Pigarelli DLW, Unni E, Smith PD, Maurer MA, Huang Y. Design and Rationale of a Mixed Methods Randomized Control Trial: ADdressing Health Literacy, bEliefs, adheRence and Self-

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com

Efficacy (ADHERE) Program to Improve Diabetes Outcomes. Contemporary Clinical Trials Communications 2019;14:100326. https://doi.org/10.1016/j.conctc.2019.100326.

[39] Rasmussen SEVP, Ferzola A, Cooney CM, Shores JT, Lee WPA, Goldman EO, et al. Psychosocial Factors and Medication Adherence Among Recipients of Vascularized Composite Allografts. Sage Open Medicine 2020;8. https://doi.org/10.1177/2050312120940423.

[40] Huang Y, Shiyanbola OO, Smith PD. Association of Health Literacy and Medication Self-Efficacy With Medication Adherence and Diabetes Control. Patient Preference and Adherence 2018;Volume 12:793–802. https://doi.org/10.2147/ppa.s153312.

[41] Shiyanbola OO, Unni E, Huang Y, Lanier C. Using the Extended Self-Regulatory Model to Characterise Diabetes Medication Adherence: A Cross-Sectional Study. BMJ Open 2018;8:e022803. https://doi.org/10.1136/bmjopen-2018-022803.

[42] Oever FJ Van Den, Vasbinder EC, Schrama YC, Koster ES, Visscher BB, Bemt PMLA Van Den, et al. Patient Education and Counselling Medication-related health literacy in patients on hemodialysis assessed with the RALPH interview guide. Patient Educ Couns 2025;138:109203. https://doi.org/10.1016/j.pec.2025.109203.

[43] Mirzaei-alavijeh M, Hamzeh B, Omrani H, Esmailli S, Khakzad S. Determinants of medication adherence in hemodialysis patients : a cross-sectional study based on capability-opportunity-motivation and behaviour model 2023:1–8.

[44] Yangöz ŞT, Özer Z. Effects of motivational interviewing and an education programme based on Watson's theory of human caring on adults receiving haemodialysis: randomised controlled trial. Journal of Research in Nursing 2025;30:80–99.

[45] Kaneez M Zubair AB, Rehan M, Hassan A, Sarwar Z, Bibi A, Azhar M, Kinza K, Sabir M. ZSMJ. Sleep Quality and Compliance to Medical Therapy Among Hemodialysis Patients With Moderate-to-Severe Depression: A Cross-Sectional Study. Cureus 2021. https://doi.org/10.7759/cureus.13477.

[46] Zhang Z, Liang X, He X, Zhang X, Tang R, Fang R, et al. Enhancing treatment adherence in dialysis patients through digital health interventions : a systematic review and meta-analysis of randomised controlled trials. Ren Fail 2025;47. https://doi.org/10.1080/0886022X.2025.2482885.

[47] Sirois FM. Procrastination and Stress : A Conceptual Review of Why Context Matters 2023.

[48] Alikari V, Matziou V, Tsironi M, Theofilou P, Giannakopoulou N, Tzavella F, et al. Patient knowledge, adherence to the therapeutic regimen, and quality of life in hemodialysis: knowledge, adherence, and quality of life in hemodialysis. GeNeDis 2020: Geriatrics, Springer; 2021, p. 259–72. https://doi.org/10.1007/978-3-030-78771-4_29.

Electronic ISSN : 2656-3088
Homepage: https://www.journal-jps.com