Journal of Clinical Nursing

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Journal of Clinical Nursing

META-ANALYSIS OPEN ACCESS

The Association Between Self-Care and Health Literacy in Patients With Chronic Diseases: A Systematic Review and Meta-Analysis

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Received: 31 May 2025 | **Revised:** 12 February 2026 | **Accepted:** 3 March 2026

Keywords: chronic disease | chronic illness | health literacy | meta-analysis | self-care | systematic review

ABSTRACT

Background: Chronic diseases are a major global health burden, contributing to morbidity, mortality and healthcare costs. Self-care is essential for effective disease management, with health literacy (HL) and digital health literacy (eHL) playing a role in enabling individuals to engage in health-promoting behaviours. However, the relationship between HL and self-care remains inconclusive, necessitating further investigation to clarify its impact.

Objective: To synthesise evidence on the association between HL and self-care in chronic diseases and identify mediating and moderating factors influencing this relationship.

Information Sources: A systematic search was conducted across PubMed, CINAHL, PsycINFO, Embase, Web of Science and Cochrane CENTRAL, supplemented by manual reference checks and author correspondence.

Methods: This systematic review and meta-analysis followed PRISMA guidelines, including observational studies and RCTs assessing HL and self-care. Meta-analyses were performed using Fisher's Z transformation. Risk of bias was assessed using ROBINS-E and certainty of evidence was evaluated through GRADE.

Results: A total of 138 studies were included, with 52 meta-analysed. Higher HL was associated with improved self-care behaviours, including medication adherence, disease monitoring and lifestyle modifications across chronic diseases, including type 2 diabetes, heart failure, hypertension, chronic kidney disease, asthma, coronary artery disease, arthritis and COPD. Psychological (self-efficacy, empowerment), cognitive (disease knowledge, decision-making) and social (healthcare communication, social support) factors mediated this relationship, while distress and depression moderated it. Meta-analysis revealed a moderate positive association between HL and self-care ($r = 0.29$, 95% CI: 0.26–0.31, $p < 0.001$). Subgroup analyses showed consistent positive effects across conditions. No significant publication bias was detected (Egger's test, $p = 0.294$). Risk of bias was high in 62 studies, while certainty of evidence ranged from very low to moderate.

Conclusions: HL positively influences self-care in chronic diseases, with its impact shaped by multiple mediators and moderators. Future interventions should integrate tailored education, digital tools and mental health support to enhance HL effectiveness.

Registration: PROSPERO (CRD42024488061, registered 20.01.2024).

What Does This Paper Contribute to the Wider Global Clinical Community?

- There is a moderate positive association between health literacy and self-care, demonstrating its broad relevance across chronic diseases.
- Psychological variables, cognitive abilities, patient engagement, disease knowledge and social and environmental factors mediate this relationship.
- Distress and depression moderate the health literacy-self-care link, weakening its impact in vulnerable populations.
- Enhancing health literacy through digital tools, structured adherence support and integrated mental health strategies could maximise self-care effectiveness in chronic disease management.

Key Points

1. This systematic review and meta-analysis found a moderate positive association between health literacy and self-care behaviours in people with chronic diseases, highlighting health literacy as a key determinant of effective chronic disease management in clinical nursing practice.
2. The relationship between health literacy and self-care is influenced by psychological, cognitive and social mechanisms, including self-efficacy, empowerment, disease knowledge, patient engagement and healthcare communication, which represent important targets for nursing interventions.
3. Findings suggest that nursing-led strategies aimed at improving health literacy, such as tailored patient education, digital health tools and integrated psychological support, may strengthen patients' capacity to engage in self-care across chronic conditions.

1 | Background

Chronic diseases, such as cardiovascular diseases, chronic respiratory diseases and diabetes, are the leading causes of morbidity and mortality worldwide, accounting for over 70% of global deaths. These conditions result from intricate interactions among genetic predispositions, physiological factors, environmental influences and behavioural determinants (Joo 2023). The prolonged course of chronic diseases leads to adverse outcomes such as extended hospitalizations, heightened mortality rates, frailty, disability, reduced quality of life and escalating healthcare expenditures (Deng et al. 2023; Isvoranu et al. 2021; Jones and Dolsten 2024). In the perspective of reducing the burden on individuals and health services (Ansah and Chiu 2023), effective management is paramount, with self-care emerging as a crucial component for empowering patients to take an active role in managing health and well-being (Hickmann et al. 2022; Narasimhan et al. 2019).

The Middle-Range Theory of Self-Care of Chronic Illness (Riegel et al. 2012) conceptualises self-care as a dynamic and multidimensional process encompassing self-care maintenance, which involves adherence to health-promoting behaviours and routines; self-care monitoring, which enables the recognition and interpretation of symptoms; and self-care management, which entails decision-making and responsive actions to address health challenges and optimise outcomes. Self-care is shaped by various factors, including patient experience, intrinsic motivation and external support systems. Active engagement in self-care practices has been associated with illness stability, improved overall well-being, increased quality of life, reduced symptom burden and decreased mortality rates (Riegel et al. 2021; Torres-Soto et al. 2022).

Health literacy (HL) is essential for engaging in self-care and internalising effective health practices. It encompasses the ability to access, understand, appraise and apply health information (Sørensen et al. 2012). Electronic health literacy (eHL) extends HL by focusing on skills to find, evaluate and use digital health information, such as online resources (Busse et al. 2022). Furthermore, mobile health literacy (mHL) highlights the role of mobile technologies, such as apps, for accessing and applying health information (Paige et al. 2018). Nutbeam's framework identifies functional HL, involving basic reading and writing skills, interactive HL, which enables the application of information in changing contexts and critical HL, which involves advanced cognitive and social skills to analyse and use information for advocacy (Nutbeam 2000). Expanding on these concepts in the digital sphere, the transactional model of eHL outlines four levels: functional eHL, involving basic reading, writing and typing skills to navigate online health information; communicative eHL, which enables users to collaborate, adapt and control health communication in digital social environments; critical eHL, which involves advanced cognitive and social skills to evaluate the credibility, relevance and risks of online health information; and translational eHL, which enables the application of health knowledge gained online across diverse real-world contexts (Paige et al. 2018). These frameworks highlight the multidimensional nature of HL and its digital extensions, underscoring their importance in supporting chronic disease management (Atanasova and Kamin 2022; Urstad et al. 2022).

Higher levels of HL are generally linked to improved health outcomes, such as self-care behaviours and better treatment adherence (Cabellos-García et al. 2018; Lu et al. 2023; Tsai et al. 2022). However, the existing literature on the relationship between HL and self-care is fragmented and at times contradictory, with some studies reporting no significant or even negative associations (Chen et al. 2024; Wong et al. 2018). The mechanism underlying these relationships remains unclear and factors such as self-efficacy, empowerment, engagement, education and resource accessibility, which could act as potential mediators and moderators, are not fully elucidated (Cengiz et al. 2022; Du et al. 2023; Kim 2021; Shin and Lee 2018). There is the need for a comprehensive synthesis of the evidence to understand how HL and its subset influence self-care in chronic disease management, identify relevant mediators and moderators and ultimately guide the development of targeted interventions to enhance patient outcomes (Choi 2020; Mazzucca et al. 2021).

Thus, this systematic review and meta-analysis aimed to investigate the available evidence on the association between HL levels and self-care behaviours in individuals with chronic diseases. Namely, we seek to determine the nature and strength of this relationship across various chronic diseases, as well as identify potential mediating and moderating factors of this association. Our research question is framed using the PEO methodology: Population (P) refers to patients with chronic diseases; Exposure (E) encompasses HL; and Outcome (O) involves self-care behaviours.

2 | Methods

This systematic review and meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al. 2021) and other guidelines specific to review of exposures (Dekkers et al. 2019; Paul and Leeflang 2021). The protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO; CRD42024488061) and subsequently published (Magi et al. 2024).

2.1 | Eligibility Criteria

Studies were included based on the following criteria: (i) involving adults (≥ 18 years) diagnosed with at least one chronic disease, including hypertension (HTN), coronary artery disease (CAD), arthritis, chronic kidney disease (CKD), heart failure (HF), stroke, asthma, chronic obstructive pulmonary disease (COPD) and type 2 diabetes mellitus (T2DM) according to the list of the Office of the Assistant Secretary for Health (OASH) (Goodman et al. 2013), which identifies a standardised set of prevalent and high-impact chronic disease based on their public health significance, long-term burden and potential for prevention and intervention, these conditions serve as key indicators for policy development, healthcare resource allocation and epidemiological surveillance; (ii) focusing on HL and/or eHL as the primary exposure, defined as the ability to access, understand, evaluate and apply health information to make informed decisions and maintain health (Sørensen et al. 2012); (iii) operationalising self-care according to the Middle-Range Theory of Self-Care of Chronic Illness (Riegel et al. 2012), as a multidimensional construct encompassing self-care maintenance, monitoring and management, assessed through validated self-care or self-management measures rather than requiring the explicit reporting of individual behaviours as standalone outcomes (e.g., smoking avoidance or decision-making); (iv) observational studies (e.g., cohort, case–control, or cross-sectional designs) and experimental studies (e.g., randomised controlled trials (RCTs) and quasi-experimental designs), provided that they reported association data between HL and self-care. For experimental studies, only baseline or observational analyses were considered eligible, whereas intervention effect estimates were excluded, as the aim of this review was to synthesise associative rather than causal evidence; and (v) mixed-methods studies with quantitative data that could be extracted. Studies were excluded if: (i) they focused on asymptomatic conditions (e.g., hyperlipidaemia), psychiatric disorders (e.g., schizophrenia), acute illnesses, or conditions with minimal potential for self-care improvement (e.g., dementia); or (ii) they were grey, secondary and tertiary literature. Only studies published in English or Italian were considered, with no restrictions on publication year, to gather a diverse body of evidence relevant to understanding the interplay between HL and self-care across different time periods and in different contexts.

2.2 | Information Sources

A comprehensive search from databases inception to March 2024 was conducted on PubMed (via NLM), CINAHL (via EBSCOhost), APA PsycINFO (via EBSCOhost), Embase (via Ovid), Web of Science (via Clarivate Analytics) and the Cochrane Central Register of Controlled Trials (via CENTRAL). We also hand-searched the reference lists of included studies and other relevant literature and in case of any missing data, the authors of eligible studies were contacted.

2.3 | Search Strategy

The search strategy for PubMed is provided in the Supporting Information (Table S1). No filters were applied to the search string. Given the multidimensional nature of self-care, a construct-based search strategy was adopted using comprehensive umbrella terms (e.g., self-care, self-management, adherence, empowerment) rather than behaviour-specific keywords. This approach was chosen to maximise sensitivity and capture studies in which behaviours such as decision-making or smoking avoidance are operationalised as subcomponents of self-care instruments rather than reported as isolated outcomes.

2.4 | Selection Process

The selection process was conducted by performing title and abstract screening and full text review. Rayyan software (Ouzzani et al. 2016) was used to facilitate blind screening and record management. Titles and abstracts were screened independently by two reviewers (CEM and KEA) after duplicates removal. Articles meeting the eligibility criteria were reviewed in full text and disagreements were resolved through discussion or arbitration by a third reviewer (PI).

2.5 | Data Items (Extraction)

Data extraction was independently performed by two authors (CEM and KEA), collecting information on study characteristics (i.e., first author, publication year, country; study design; aim(s); sample characteristics; type of chronic disease; main findings). Studies with mixed populations were included only if relevant data were reported separately.

2.6 | Synthesis Methods

Given the substantial clinical and methodological heterogeneity across the studies, a mixed synthesis approach was adopted. Quantitative synthesis (meta-analysis) was conducted only when studies were sufficiently comparable in terms of study design, exposure (HL), outcome (self-care) and effect size metrics. When heterogeneity in the conceptualization or measurement of HL and self-care, or in statistical reporting, precluded meaningful quantitative pooling, findings were synthesised narratively.

2.6.1 | Qualitative Synthesis

The qualitative synthesis followed a structured narrative approach, whereby studies were grouped by chronic condition and patterns of association, as well as mediating and moderating factors formally tested in the original studies were systematically identified. This approach enabled the integration of quantitative results with contextual and theoretical information, ensuring a comprehensive interpretation of the evidence despite heterogeneity.

2.6.2 | Quantitative Synthesis

Quantitative studies exploring the association between HL and self-care were analysed using meta-analytic techniques. Meta-analyses were performed with Fisher's Z transformation method using R Studio (v. 3.5.2) (Allaire 2012) with the 'metacor' (Schwarzer 2007) and 'dmetar' (Harrer et al. 2019) package. Pearson's r was used as the effect size, based on unadjusted bivariate correlations where possible, or estimated from other metrics (e.g., Spearman's r) with conversion formulas (Rupinski and Dunlap 1996; Peterson and Brown 2005). When multiple measures were reported (e.g., subscales), an average effect was computed to reduce statistical dependence (Scammacca et al. 2014). Studies were pooled collectively and by disease groups. Heterogeneity was assessed using Cochrane Q and I^2 statistics, with fixed-effects models applied for heterogeneity below 25% and random-effects models otherwise (Pigott 2012). Sensitivity analyses were conducted with the 'find. outliers' function in 'dmetafor' in order to detect and remove outlier studies that could bias the pooled effect size. The 'non-overlapping confidence intervals approach' was used in which a study is defined as an outlier when the 95% confidence interval of its effect size lies outside the 95% confidence interval of the pooled effect (Harrer et al. 2021). Funnel plots were generated if the pooled studies were 10 or more (Higgins 2019), along with Egger's regression test to investigate the presence of significant publication bias and the Trim and Fill method was used to estimate the effect size in the hypothetical event of no publication bias.

2.7 | Study Risk of Bias Assessment

The risk of bias for each study was assessed by three independent reviewers (CEM, KEA and YL) using the Risk Of Bias In Non-Randomised Studies of Exposures (ROBINS-E) tool (Higgins et al. 2024), adapted for observational studies. The ROBINS-E tool evaluates seven domains: (i) bias due to confounding, (ii) participant selection, (iii) exposure classification, (iv) deviations from intended exposures, (v) missing data, (vi) outcome measurement and (vii) selection of the reported result. Each domain was assessed and the overall risk of bias categorised as low, some concerns, high, or very high.

2.8 | Certainty in the Findings Assessment

The certainty of study findings was evaluated by three independent reviewers (CEM, KEA and YL) using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach (GRADE Working Group 2004). The GRADE system assesses five key domains: (i) risk of bias, (ii) imprecision, (iii) inconsistency, (iv) indirectness and (v) publication bias. The quality of evidence was classified into four levels: high, moderate, low and very low. For observational studies, moderate-quality evidence was the highest attainable level, reflecting robust findings from studies with minimal bias.

3 | Results

3.1 | Study Selection

A total of 17,376 records were identified from the six databases. Following the removal of 4850 duplicates, 12,526 records remained for screening. After title and abstract review, 11,932 additional records were excluded. Full-text evaluation of 594 articles was conducted and 138 studies meeting the eligibility criteria were included in the systematic review, of which 52 were meta-analysed. The selection process is summarised in the PRISMA flow diagram (Figure 1).

3.2 | Study Characteristics

The studies were published between 1998 and 2024, with a marked increase in publications from 2016 onwards. These studies spanned six continents, predominantly from Asia (n = 72, 52.2%) and North America (n = 49, 35.5%), with smaller contributions from Europe (n = 11, 8.0%), South America (n = 3, 2.2%), Oceania (n = 2, 1.4%) and Africa (n = 1, 0.7%). Most studies were cross-sectional (n = 124, 89.9%), followed by prospective cohort studies (n = 11, 8.0%), secondary analyses of RCTs (n = 2, 1.4%) and one mixed-methods study (n = 1, 0.7%). The total sample size consisted of 39,677 patients with chronic disease, with a mean study sample size of 287 (range: 34–1714) and a mean age of 59.79 years (range: 42–85). Women represented 54.2% of the total sample (21,514 women vs. 18,163 men). Chronic disease included T2DM (n = 61, 45.0%; Ajuwon and Insel 2022; Almigbal et al. 2019; ALSharit and Alhalal 2022; Bains and Egede 2011; Bohanny et al. 2013; Cengiz et al. 2022; Chen et al. 2019; Chin et al. 2021; Dalal et al. 2020; Eyüboğlu and Schulz 2016; Fan et al. 2016; Finbråten et al. 2020; Gaffari-fam et al. 2020; Garcia et al. 2019; Guo et al. 2021; Hahn et al. 2015; Huang et al. 2020; Huang, Shiyanbola, and Chan 2018; Huang, Shiyanbola, and Smith 2018; Huang and Shiyanbola 2021; Hussain et al. 2020; İlhan et al. 2021; Jafari et al. 2024; Juul et al. 2018; Kim 2021; Kim et al. 2004; Lael-Monfared et al. 2019; Lai et al. 2013; Lee, Lee, and Moon 2016; Lee et al. 2021, 2024; Lee, Shin, et al. 2016; Leung et al. 2014; Maleki Chollou et al. 2020; McCleary-Jones 2011; Niknami et al. 2018; Nugent et al. 2023; Ong-Artborirak et al. 2023; Osborn et al. 2010; Park and Seo 2022; Reisi et al. 2016; Rocha et al. 2019; Sarkar et al. 2006; Schinckus et al. 2018; Shin and Lee 2018; Shiyanbola et al. 2018; Suksatan et al. 2021; Tang

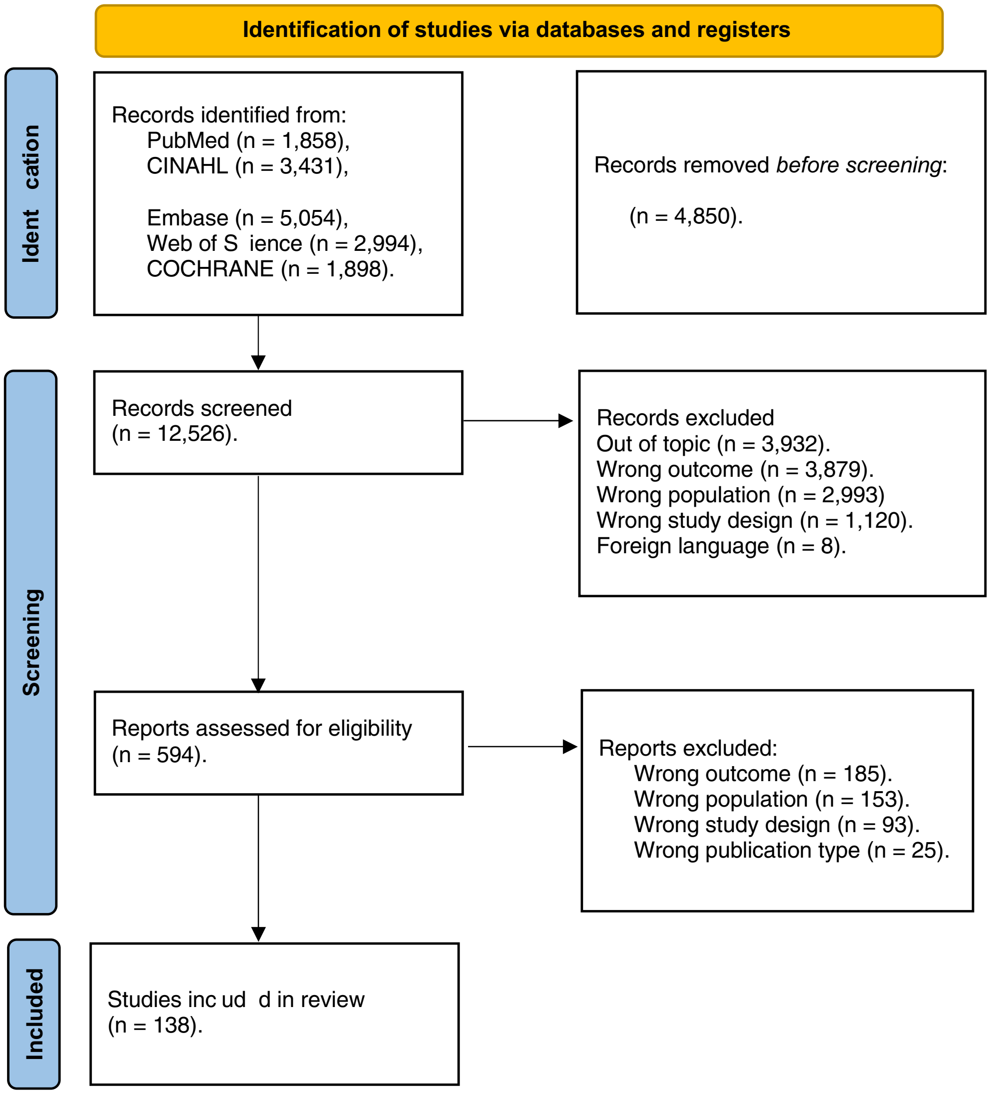

FIGURE 1 | PRISMA flow diagram. [Colour figure can be viewed at wileyonlinelibrary.com]

et al. 2008; Tavakoly Sany et al. 2020; Tavares et al. 2023; Tefera et al. 2020; Thurston et al. 2015; Ueno et al. 2019; Van Der Heide et al. 2014; Vieira et al. 2021; Wang, Xia, et al. 2020; Wang, Lin, et al. 2020; White et al. 2013; Yarmohammadi et al. 2019; Yeh et al. 2018; Zhao et al. 2024), HF (n = 26, 19.0%; Ahmadzadeh et al. 2020; Bakhshayesh et al. 2023; Chen et al. 2011, 2013, 2014, 2020; Como 2018; Dennison et al. 2011; Erünal and Mert 2020; Jacobson et al. 2018; Jo et al. 2020; Kim and Son 2023; Lee et al. 2017; León-González et al. 2018; Levin et al. 2014; Lin et al. 2020; Macabasco-O'Connell et al. 2011; Matsuoka et al. 2016; Meraz, Caldwell, and McGee 2023; Meraz, McGee, et al. 2023; Murray et al. 2009; Oscalices et al. 2019; Rezaei et al. 2022; Son et al. 2018; Wang, Xia, et al. 2020; Wu et al. 2017), HTN (n = 19, 14.0%; Ahn and Ham 2016; Ainiyah et al. 2023; Al-Ali and Telfah 2023; Alreshidi 2023; Darvishpour et al. 2022; Esen and Kolcu 2024; Hall et al. 2016; Ingram and Ivanov 2013; Kilic and Dag 2020; Larki et al. 2018, 2021; Lor et al. 2019; Náfrádi et al. 2016; Nagarjuna et al. 2023; Nam and Yoon 2021; Park et al. 2018; Qiu et al. 2020; Shen et al. 2020; Wannasirikul et al. 2016), CKD (n = 12, 9.0%; Ahn et al. 2022; Chen et al. 2018; Elisabeth Størner et al. 2020; Ho et al. 2024; Ibelo et al. 2022; Lohrasbi et al. 2021; Schrauben et al. 2020; Suarilah and Lin 2022; Tsai et al. 2022; Wong et al. 2018; Xie et al. 2023; Yu et al. 2021), asthma (n = 9, 7.0%; Apter et al. 2013; Federman et al. 2010, 2013; Londoño and Schulz 2015; O'Conor et al. 2015; Perez et al. 2016; Salim et al. 2021; Soones et al. 2017; Williams et al. 1998), CAD (n = 5, 4.0%; Liu et al. 2023; Lu et al. 2019; Lu, Hravnak, et al. 2020; Lu, Xia, et al. 2020; Suhail et al. 2021), arthritis (n = 3, 2.0%; Hunter et al. 2023; Liu et al. 2024; Quinlan et al. 2013) and COPD (n = 3, 2.0%; O'Conor et al. 2019; Stellefson et al. 2019; Yadav et al. 2020). A more detailed summary of study characteristics is available in Table S2.

3.3 | Qualitative Findings

Higher HL seems to be associated with improved self-care behaviours across various chronic diseases. In musculoskeletal and respiratory conditions (arthritis, asthma, COPD), HL is linked to better medication adherence and self-management behaviours, including inhaler technique, diet and blood pressure monitoring. In cardiovascular diseases (CAD, HF, HTN), HL is related to adherence to self-care behaviours, such as medication taking. In T2DM, HL is associated with improved medication adherence and glycaemic control, with critical and communicative HL having the strongest impact. The magnitude and strength of the relationship between HL and self-care can vary depending on a range of different mediators and moderators. Mediators include psychological aspects (i.e., self-efficacy, empowerment, distress, acceptance of illness and learned helplessness), cognitive ability, patient engagement (i.e., patient activation and decision-making skills), disease knowledge and awareness (i.e., health risk perception and health-related beliefs) and social and environmental factors (i.e., healthcare communication, social connectedness and perceived barriers). Distress and depression have been found as key moderators of the HL-self-care relationship.

3.3.1 | Mediators

3.3.1.1 | Psychological Aspects. Self-efficacy (i.e., confidence in one's ability to manage health-related tasks) was the most frequently identified mediator ($n=23$, 17%). Across the included studies, higher HL was associated with greater self-efficacy, which in turn facilitated engagement in self-care behaviours. In patients with cardiovascular diseases (CAD, HF, HTN; $n=10$), self-efficacy mediated the relationship between HL and medication adherence, physical activity, dietary modifications, symptom monitoring, weight control, stress management and reductions in smoking and alcohol consumption (Ahn and Ham 2016; Chen et al. 2014; Darvishpour et al. 2022; Larki et al. 2018, 2021; Lu, Xia, et al. 2020; Macabasco-O'Connell et al. 2011; Náfrádi et al. 2016; Nam and Yoon 2021; Shen et al. 2020). Similarly, in patients with T2DM ($n=13$), higher HL was associated with greater self-efficacy, which mediated adherence to medication, dietary control, physical activity, glucose monitoring, foot care and the management of glycaemic imbalances (Bohanny et al. 2013; Huang et al. 2020; Huang, Shiyanbola, and Chan 2018; Huang, Shiyanbola, and Smith 2018; Lael-Monfared et al. 2019; Lee, Lee, and Moon 2016; Lee et al. 2021, 2024; Lee, Shin, et al. 2016; Ong-Artborirak et al. 2023; Reisi et al. 2016; Tavakoly Sany et al. 2020; Ueno et al. 2019; Wang, Lin, et al. 2020).

Empowerment (i.e., perceived control and autonomy in health-related decision-making) emerged as a mediator ($n=5$, 4%). Higher HL was associated with greater empowerment, which in turn facilitated engagement in self-care behaviours. In patients with asthma ($n=1$), empowerment mediated the association between HL and appropriate medication use (e.g., correct inhaler technique, adherence to prescribed treatments), trigger avoidance and timely healthcare seeking (Londoño and Schulz 2015). In patients with T2DM ($n=4$), empowerment mediated the relationship between HL and self-care behaviours, specifically by facilitating active participation in health communication, dietary adherence, physical activity and glucose monitoring (Cengiz et al. 2022; Finbråten et al. 2020; Shin and Lee 2018; Wang, Lin, et al. 2020).

Other psychological mediators were less frequently examined and were each reported in single studies, including psychological distress (i.e., emotional suffering; $n=1$, 1%), illness acceptance (i.e., psychological adjustment to the disease and its implications; $n=1$, 1%) and learned helplessness (i.e., a sense of powerlessness arising from repeated failure; $n=1$, 1%). In patients affected by HF, psychological distress mediated the association between HL and medication adherence, such that higher HL was associated with lower distress, which in turn facilitated better adherence (Lin et al. 2020). In patients affected by HTN, illness acceptance mediated the association between functional HL and self-care behaviours, while communicative and critical HL showed both direct and indirect effects on self-care (Qiu et al. 2020). In patients affected by CKD, lower HL was associated with greater learned helplessness, which mediated poorer adherence to dietary restrictions (e.g., restricted sodium, phosphorus and protein intake), fluid management, medication adherence, physical activity and vascular access care (Xie et al. 2023).

3.3.1.2 | Cognitive Abilities. Cognitive abilities (i.e., mental capacity to process information and make decisions) were identified as mediators ($n=4$, 3%). Higher HL was associated with better cognitive processing, which subsequently supported effective self-care behaviours. In patients with respiratory diseases (COPD, asthma; $n=2$), cognitive abilities mediated the relationship between HL and medication adherence and inhaler technique (O'Conor et al. 2015, 2019). Similar mediation pathways were observed in patients affected by HTN ($n=1$) (Wannasirikul et al. 2016) and T2DM ($n=1$) (Chin et al. 2021), where improved cognitive processing facilitated medication management and adherence.

3.3.1.3 | Patient Engagement. Patient engagement, including patient activation (i.e., knowledge, skills and confidence in managing one's health; $n=1$, 1%) and autonomous motivation (i.e., intrinsic motivation in managing one's health; $n=1$, 1%) mediated the relationship between HL and self-care in T2DM. Higher HL was associated with greater activation and intrinsic motivation, which in turn supported adherence to diet, medication, glucose monitoring, foot care and physical activity (Juul et al. 2018; Kim 2021). Additionally, decision-making skills (i.e., abilities to assess risks, benefits and outcomes in health contexts; $n=3$, 2%) mediated the HL-self-care relationship in patients with asthma (Londoño and Schulz 2015) and T2DM (Maleki Chollou et al. 2020; Reisi et al. 2016) by enabling more effective evaluation of risks, benefits and treatment options.

3.3.1.4 | Disease Knowledge. Disease knowledge (i.e., understanding the nature, management and implications of a condition) was identified as a mediator ($n=12$, 9%). Higher HL was associated with greater disease-specific knowledge, which in turn facilitated self-care behaviours. In cardiovascular diseases (CAD, HF, HTN; $n=6$), disease knowledge mediated adherence to heart-healthy lifestyles, medication use, weight and blood pressure monitoring and physical activity (Hall et al. 2016; Larki et al. 2018, 2021; Lu, Xia, et al. 2020; Macabasco-O'Connell et al. 2011; Nam and Yoon 2021). In T2DM ($n=6$), diabetes knowledge mediated medication adherence, glucose monitoring and smoking reduction (Bains and Egede 2011; Chin et al. 2021; Guo et al. 2021; Kim 2021; Tavakoly Sany et al. 2020; Van Der Heide et al. 2014).

3.3.1.5 | Disease Awareness. Health risk perception (i.e., perception of vulnerability to health risks and condition severity; $n = 2$, 1%) and health-related beliefs (i.e., perceptions and attitudes about illness, treatments and medications; $n = 5$, 4%) were identified as mediators of the relationship between HL and self-care across HTN, T2DM, asthma and CKD. In patients with HTN ($n = 1$), higher HL was associated with greater perceived susceptibility and severity, which in turn mediated adherence to dietary recommendations, smoking cessation and medication use (Larki et al. 2018). Similarly, in patients with T2DM ($n = 1$), higher HL was associated with greater risk perception, which mediated better engagement in self-care behaviours (Tavakoly Sany et al. 2020). Health-related beliefs also mediated the HL-self-care relationship. In patients with asthma ($n = 3$), CKD ($n = 1$) and T2DM ($n = 1$) lower HL was associated with maladaptive beliefs and greater concerns about medications, which in turn mediated poorer medication adherence. In patients with asthma, incorrect beliefs and concerns about medication side effects or dependency mediated non-adherence to controller therapies (Federman et al. 2010, 2013; Soones et al. 2017). In patients with CKD ($n = 1$) and T2DM ($n = 1$) fears related to medication safety and dependence similarly mediated reduced adherence (Huang et al. 2020; Suarilah and Lin 2022).

3.3.1.6 | Social and Environmental Factors. Healthcare communication (i.e., the quality of exchanges between patients and healthcare providers; $n = 4$, 3%) and social connectedness (i.e., the presence or absence of meaningful social relationships and support; $n = 4$, 3%) were identified as mediators of the relationship between HL and self-care in HTN, T2DM and HF. In patients with HTN ($n = 1$), higher HL was associated with more effective patient-provider communication, which in turn mediated improvements in self-care behaviours (Nam and Yoon 2021). In patients with T2DM ($n = 3$), higher HL was associated with better healthcare communication, which mediated greater medication adherence (Huang et al. 2020; Leung et al. 2014; Ueno et al. 2019). Social connectedness also mediated the HL-self-care relationship. In patients with T2DM ($n = 3$), lower HL was associated with reduced social support, which in turn mediated poorer self-care, whereas stronger support networks mediated better glycaemic control and blood glucose monitoring (Lee et al. 2021, 2024; Osborn et al. 2010). In patients with HF ($n = 1$), higher perceived social support mediated the association between HL and improved medication adherence, dietary management, symptom monitoring and timely healthcare seeking (Jo et al. 2020). In addition, perceived barriers ($n = 1$, 1%) mediated the association between HL and medication adherence in patients affected by T2DM, as lower HL was associated with greater logistical, financial and cognitive barriers, which in turn mediated reduced medication adherence (Huang et al. 2020).

3.3.2 | Moderators

3.3.2.1 | Psychological Aspects. Psychological distress and depression were identified as moderators ($n = 1$, 1%) of the relationship between HL and self-care in patients with T2DM. Specifically, higher HL was associated with better diabetes self-care behaviours; however, this association was significantly attenuated among individuals experiencing elevated levels of diabetes-related distress or depressive symptoms (Schinckus et al. 2018).

3.3.3 | Instruments Used in the Studies

The instruments used to assess HL, eHL and self-care varied across studies. HL was evaluated in 133 (96.4%) studies, eHL in four (2.8%) and only one (0.8%) study measured both HL and eHL. Across the included studies, 53 different tools were used to measure HL, three for eHL and 92 for self-care. Among the 53 HL tools, most assessed either one-dimension ($n = 27$, 50.9%) or two dimensions ($n = 24$, 45.3%), with only two (3.8%) tools addressing all three dimensions. Functional HL was the most assessed ($n = 52$, 98.1%), followed by critical HL ($n = 27$, 50.9%) and interactive HL ($n = 24$, 45.3%). In addition, all the three eHL tools assessed four dimensions ($n = 3$, 100%): functional, interactive, critical and translational. Regarding self-care, the 92 tools primarily measured one ($n = 39$, 42.4%) or two dimensions ($n = 38$, 41.3%), with only a minority assessing all three dimensions ($n = 15$, 16.3%). Self-care maintenance behaviours were evaluated in 83 (90.3%) tools, monitoring behaviours in 41 (45.2%) tools and management behaviours in 36 (38.7%) tools. Detailed information on HL, eHL and self-care tools is available in Tables S3–S4.

3.4 | Metanalysis Findings

The random fixed-effects analysis of 84 studies showed a very high level of heterogeneity ($p < 0.001$, $I^2 = 95.7\%$) and a medium positive association between HL and self-care ($p < 0.001$, $r = 0.32$, 95% CI, 0.27–0.37; $n = 23{,}469$). Given this substantial heterogeneity, a prespecified sensitivity analysis was conducted to assess the robustness of the findings. Effect sizes whose 95% CI did not overlap with the pooled 95% CI were identified as extreme values and excluded for sensitivity purposes only. After exclusion of these 32 studies, the pooled effect size remained positive and of similar magnitude ($r = 0.29$, 95% CI: 0.26–0.31; $p < 0.001$; $n = 11{,}784$), with heterogeneity reduced to a moderate level ($p < 0.001$, $I^2 = 56.3\%$). Influence analyses indicated high robustness of the results, with a maximum variation of 3.1% in the pooled estimate. Consistent findings were also observed using the Trim-and-Fill method ($r = 0.29$, 95% CI: 0.26–0.31; $p < 0.001$). Further information is provided in Figures 2 and 3. Egger's regression test did not indicate significant publication bias ($p = 0.294$; Figure 4). Subgroup analysis stratified by chronic disease type (Table 1) showed positive associations across all conditions, with effect sizes ranging from $r = 0.23$ in asthma to $r = 0.37$ in COPD. Heterogeneity was minimal among asthma studies and medium-to-high in the remaining conditions. No statistically significant differences in effect sizes between disease subgroups were detected ($p = 0.369$).

3.5 | Risk of Bias

The risk of bias assessment revealed varying degrees of bias across the included studies ($n = 138$), particularly in confounding, participant selection, missing data and outcome

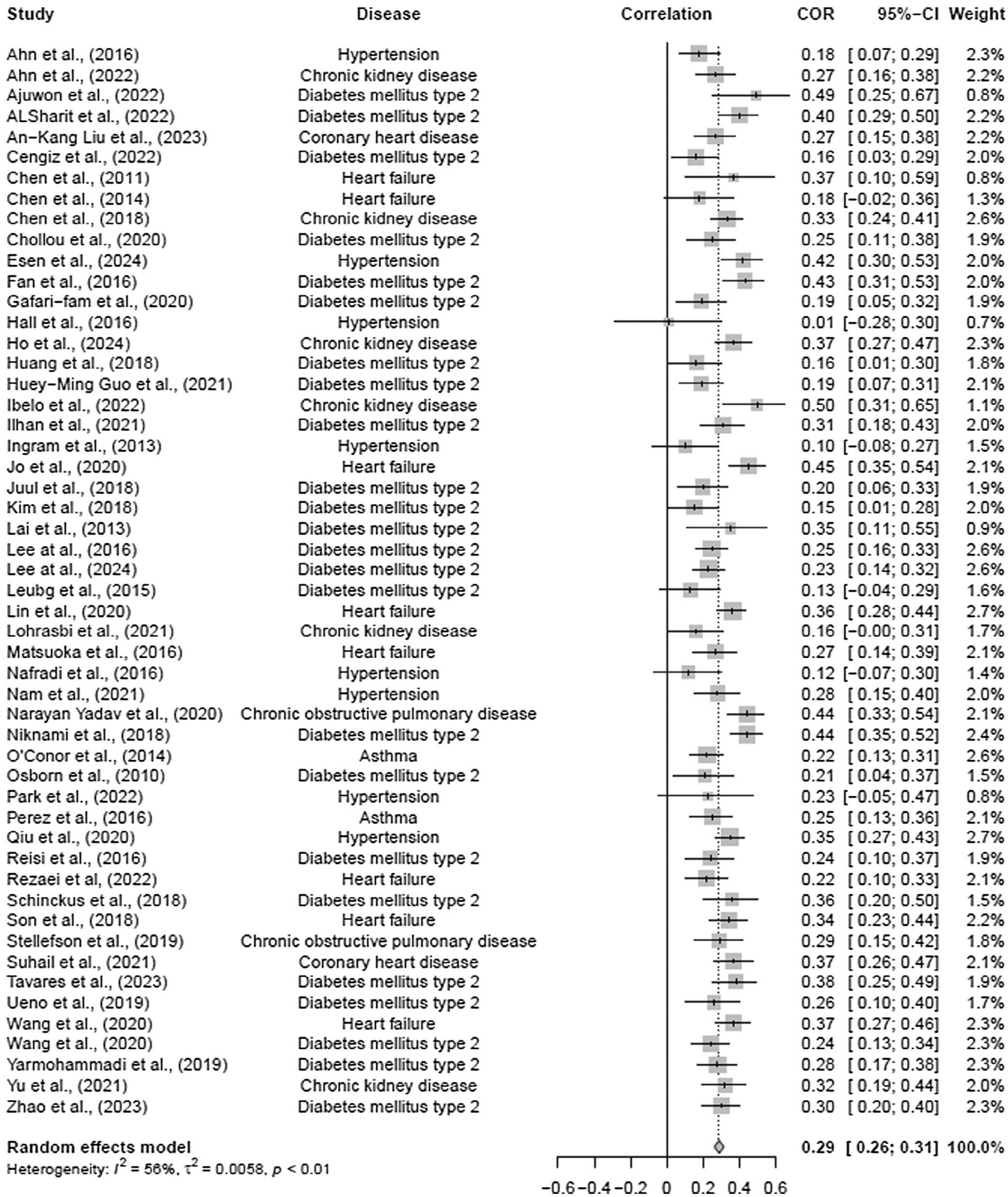

FIGURE 2 | Metanalysis of included studies ($n = 84$).

measurement. Confounding was a significant concern, especially in studies on T2DM, HTN, asthma and HF, affecting up to half of the studies. For instance, Alreshidi (2023) identified high confounding bias in a study on HL and medication adherence in hypertension due to unmeasured clinical variables and self-reported data. Selection bias was widespread across conditions, notably in T2DM, HTN and asthma and was present in all arthritis studies. Liu et al. (2024) reported high selection bias in a study on HL and RA, where convenience sampling from a single hospital and exclusions for severe comorbidities limited generalizability. Missing data was another common issue, particularly in T2DM and HTN. For example,

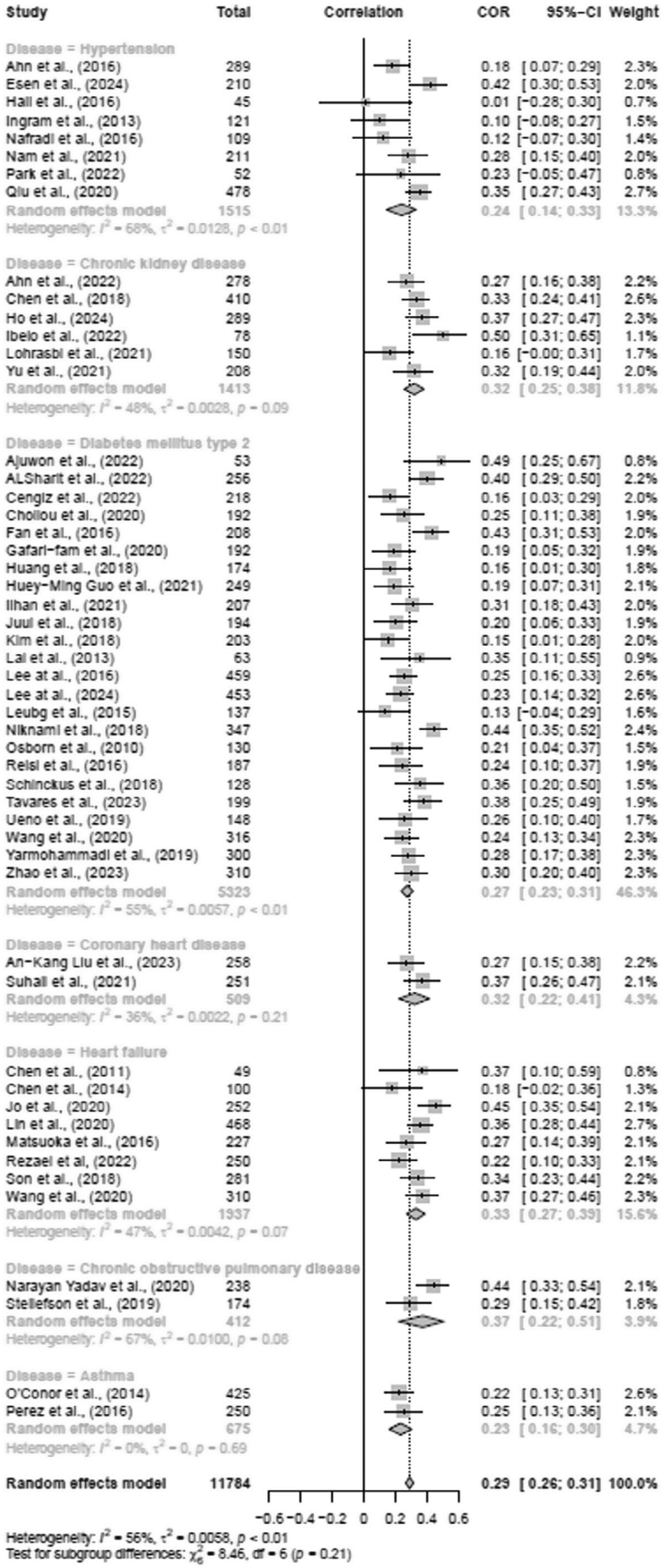

FIGURE 3 | Secondary metanalysis of included studies without outliers ($n = 52$).

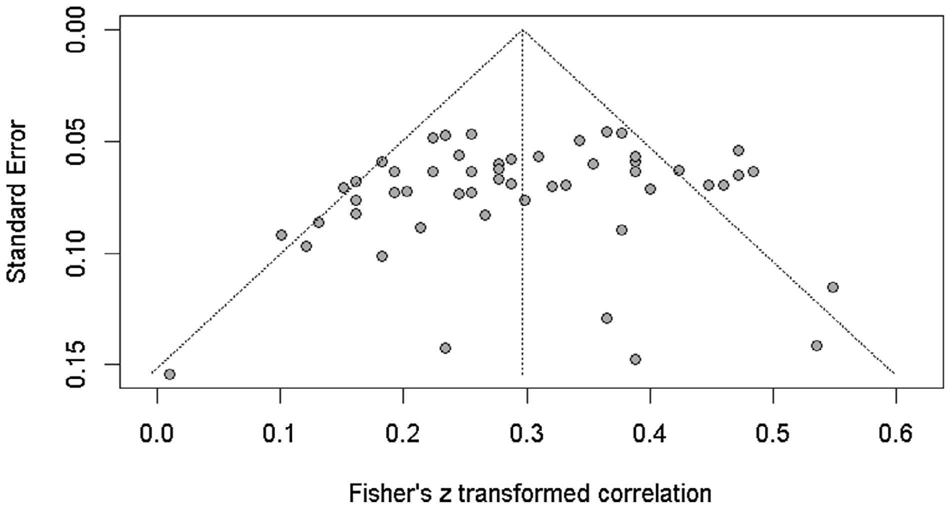

FIGURE 4 | Funnel plot.

TABLE 1 | Subgroup analysis.

Chronic disease	*n*	*r*	95% CI	*p*	I^2
All conditions	52	0.29	0.26–0.31	<0.01	56%
Asthma	2	0.23	0.16–0.30	0.69	0%
CKD	6	0.32	0.25–0.38	0.09	48%
COPD	2	0.37	0.22–0.51	0.08	67%
CAD	2	0.32	0.22–0.41	0.21	36%
HF	8	0.33	0.27–0.39	0.07	47%
HTN	8	0.24	0.14–0.33	<0.01	68%
T2DM	24	0.27	0.23–0.31	<0.01	55%

Abbreviations: CAD, coronary artery disease; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; HF, heart failure; HTN, hypertension; T2DM, type 2 diabetes mellitus.

(ALSharit and Alhalal 2022) had a high risk of bias due to participant exclusions without assessing their impact or applying statistical corrections, potentially distorting findings. Outcome measurement bias was most prevalent in T2DM and HTN but absent in arthritis studies. (Lael-Monfared et al. 2019), for instance, relied exclusively on self-reported questionnaires for self-care and HL, increasing the risk of misclassification and social desirability bias. Overall, 44.9% of studies ($n=62$) were classified as having a high risk of bias. Further details on bias assessment are provided in Figure S1.

3.6 | Certainty of the Evidence

The certainty of the evidence was assessed across the 52 observational studies included in the meta-analysis. This evaluation was conducted separately for each chronic disease (i.e., asthma, COPD, CAD, HTN, CKD, HF and T2DM), resulting in seven distinct GRADE assessments. The overall certainty of the evidence was categorised as very low ($n=2$, 30%), low ($n=2$, 30%) and moderate ($n=3$, 40%), reflecting variations in risk of bias, inconsistency and imprecision. Studies of conditions such as asthma, COPD, CAD and HTN demonstrated low to very low certainty, primarily due to serious concerns about risk of bias, high heterogeneity and imprecision. Conversely, studies regarding patients CKD, HF and T2DM achieved moderate certainty, benefiting from robust sample sizes, consistent findings and narrow confidence intervals, warranting one level of upgrade. Further information on the certainty of the evidence assessment is provided in Table S5.

4 | Discussion

This systematic review and meta-analysis aimed to synthesise the available evidence on the relationship between HL and self-care in chronic disease while identifying related mediating and moderating factors. Our findings confirm a positive association between HL and self-care across various chronic diseases, with psychological aspects, cognitive abilities, engagement, disease knowledge and awareness, as well as social and environmental factors emerging as key mediators. Psychological aspects such as distress and depression were identified as key moderators. To the best of our knowledge, this is the first systematic review and meta-analysis to comprehensively examine this association across multiple chronic diseases. By integrating findings from diverse studies, this work provides an overarching perspective on the nature and strength of the HL-self-care relationship.

Our qualitative findings suggest that HL plays a pivotal role in shaping self-care behaviours, aligning with existing literature that identifies HL as a core determinant of health (Shao et al. 2023). However, its effect is not uniform, as psychological, cognitive, behavioural and social factors mediate or moderate its influence on self-care. These mechanisms highlight the need to consider broader individual and contextual factors when designing HL-based interventions. The role of self-efficacy and empowerment as mediators suggests that HL fosters self-care by enhancing individuals' confidence and perceived control over health decisions (Dinh and Bonner 2023; Du et al. 2023). However, psychological distress, learned helplessness and illness acceptance disrupt this process, indicating that emotional burden may impair motivation and adherence (Jiang et al. 2022). Notably, distress functions both as a mediator, affecting engagement and as a moderator, reducing the effectiveness of HL when persistent. Cognitive ability also mediated the HL-self-care relationship, as individuals with higher HL demonstrated improved comprehension and adherence. However, cognitive decline may constrain these benefits, suggesting that HL interventions should be tailored to different cognitive capacities, particularly in aging populations and those with neurocognitive impairments (Al Otaibi et al. 2019; Chin et al. 2017; Uchmanowicz et al. 2025). Beyond knowledge acquisition, HL influences self-care through motivational and decision-making mechanisms. Patient activation and autonomous motivation played a mediating role, reinforcing the idea that HL interventions must extend beyond information provision to actively promote self-regulation and engagement (Fitzpatrick 2023). While increased disease knowledge and risk perception supported self-care behaviours, cognitive biases sometimes led to distorted interpretations of health risks, underscoring the importance of addressing misconceptions within HL interventions (Savioni and Triberti 2020). HL does not operate in isolation but is shaped by social and environmental contexts. Effective patient-provider communication mediated self-care, emphasising the importance of enhancing interaction quality to improve comprehension and shared decision-making. Likewise, social connectedness reinforced adherence, highlighting the need for interventions that leverage social support structures. Additionally, HL played a role in overcoming logistical and financial barriers, further underscoring its relevance in addressing social determinants of health (Heller et al. 2021; Thimm-Kaiser et al. 2023). While mediation mechanisms are well-documented, moderation effects remain underexplored, with only one study explicitly assessing them (Schinckus et al. 2018). Psychological distress and depression may attenuate HL's impact by undermining motivation and self-efficacy, suggesting that HL interventions alone may be insufficient for psychologically vulnerable populations unless integrated with mental health support (Larsen et al. 2022). Future research should clarify these interactions to refine intervention strategies and enhance the role of HL in improving self-care across diverse patient populations.

The quantitative findings confirm a moderate positive association between HL and self-care, reinforcing the role of HL as a key facilitator of self-care across chronic diseases. While variation in effect sizes was observed among conditions, subgroup analysis found no statistically significant differences. This suggests that the HL-self-care relationship is broadly consistent across the diseases, highlighting HL as a general determinant of self-care rather than one specific to certain conditions. However, differences in self-care complexity, perceived risk and external support systems likely contribute to the observed variations. The strongest association was observed in patients affected by COPD, reflecting the demanding nature of self-care in this condition. Effective COPD management requires active engagement with health information to optimise inhaler technique, manage exacerbations and sustain smoking cessation. Additionally, COPD's frequent exacerbations and severe symptom burden heighten the perceived urgency of self-care, which may strengthen the role of HL in disease management (Schrijver et al. 2022). In contrast, patients with lower HL may struggle to process and apply health-related information, leading to poorer outcomes (Poureslami et al. 2022). Moreover, psychological distress and anxiety may further amplify the role of HL in supporting both medical and emotional self-care (Rahi et al. 2023). Moderate associations were observed in patients affected by HF, CAD and CKD, where self-care requires continuous adaptation. HF management involves monitoring weight, restricting sodium and fluids and managing complex medication regimens, all demanding strong comprehension and decision-making (Jaarsma et al. 2021). Similarly, CAD and CKD require long-term adherence to treatment and dietary modifications, with CKD adding phosphorus and fluid control challenges (Alkhatib et al. 2023; Kanemitsu et al. 2024). While HL enhances adherence and reduces complications, structured medical guidance, social support and intrinsic motivation also contribute to self-care success. In patients with T2DM, the association was weaker, likely due to structured education programs that standardise glycemic monitoring and treatment adherence, reducing dependence on HL (Vandenbosch et al. 2018). However, HL remains crucial for managing non-routine situations such as glycaemic fluctuations. Additionally, the perception of diabetes as a manageable condition may lower the urgency of self-care, further limiting HL's impact. The weakest associations were found in asthma and HTN, likely due to simpler self-care requirements and lower perceived risk. Asthma management is primarily guided by provider instructions on medication adherence and trigger avoidance (Alyas et al. 2024), while HTN, often asymptomatic, may not elicit strong self-care motivation, with adherence largely influenced by structured treatment plans and physician oversight (Tan et al. 2022). These findings suggest that while HL consistently facilitates self-care, its impact varies based on the complexity of disease management and the availability of external support mechanisms.

The initial heterogeneity in the meta-analysis was substantially reduced after outlier removal, suggesting that measurement variability (e.g., different tools for measuring HL and self-care), sample characteristics (e.g., age, education level) and healthcare settings contributed to differences among studies. Although subgroup analyses based on patient characteristics such as age, education, or socioeconomic status could have provided additional insights into sources of heterogeneity, these analyses were not feasible because the primary studies rarely reported stratified effect estimates or sufficient data to allow consistent subgroup-specific extraction and patient characteristics were most often treated as covariates rather than effect modifiers. Sensitivity analyses confirmed the robustness of findings, with only minimal variation in effect sizes and no significant publication bias detected. These findings highlight HL as a robust, cross-cutting determinant of self-care across chronic conditions. However, its impact is modulated by psychological, cognitive and social factors, such as distress, cognitive limitations and socioeconomic barriers, which can either amplify or attenuate the role of HL in self-care. While the association between HL and self-care suggests potential clinical benefits, such as fewer complications and hospitalizations, these remain hypothetical, as this meta-analysis did not directly assess clinical outcomes. Future research should prioritise longitudinal studies to explore causal relationships between HL, self-care and clinical outcomes, while also standardising HL and self-care measurement tools to further reduce heterogeneity.

Our findings reveal that methodological limitations, particularly confounding and measurement inconsistencies, complicate the interpretation of the HL-self-care relationship. Despite these biases, the robustness of the meta-analysis supports HL as a key determinant of self-care. The variation in GRADE certainty, from moderate in CKD, HF and T2DM to low in COPD and HTN, highlights the need for caution in interpreting findings for certain conditions. These results emphasise the importance of rigorous study designs and tailored HL interventions, ensuring evidence-based approaches that address condition-specific challenges and variability in certainty.

4.1 | Limitations

Several limitations of this study should be considered. First, although the Middle-Range Theory of Self-Care of Chronic Illness informed the conceptual framework of this review, the primary objective was to synthesise the overall association between HL and self-care across chronic diseases, rather than perform systematic dimension-by-dimension analyses between specific HL domains and individual self-care components. Such fine-grained analyses were not consistently feasible due to substantial heterogeneity in the conceptualisation, measurement instruments and reporting of both HL and self-care across studies. Second, some chronic diseases, such as stroke, were underrepresented or absent, limiting the generalizability of the findings to these populations. Expanding future research to include a broader range of diseases would provide more comprehensive evidence of the relationship between HL and self-care. Third, many tools used to assess HL and self-care lack multidimensionality, as they often focus on only one dimension, limiting their ability to capture the complexity of these constructs. Additionally, there is an imbalance in how different HL dimensions are evaluated, with critical and interactive HL assessed far less frequently than functional HL. Similarly, self-care tools predominantly measure maintenance behaviours, placing less emphasis on monitoring and management, which restricts the knowledge of the HL-self-care association. Fourth, the predominance of cross-sectional studies restricts causal interpretations, emphasising the need for more longitudinal and experimental research. Finally, the minimal focus on eHL across studies restricts the possibility to understand the role of digital competencies in self-care, particularly as currently, digital tools are becoming increasingly important to chronic disease management. This review also has one notable strength, due to its comprehensive scope, which led to the inclusion of a large number of studies and participants across diverse regions, providing broad evidence of the relationship between HL and self-care.

4.2 | Implications for Clinical Practice and Research

This review highlights key implications for clinical practice and research. In clinical practice, integrating HL-enhancing strategies into chronic disease management is essential. Healthcare providers should prioritise improving self-efficacy and disease knowledge through tailored education, clear communication and structured adherence support. Digital tools such as mobile apps and telemedicine can enhance accessibility and engagement, particularly for remote or underserved populations. HL interventions should be tailored to disease-specific needs rather than adopting a one-size-fits-all approach. In COPD and HF, interventions should emphasise practical skill development and risk perception to help patients recognise and manage symptom exacerbations. In HTN and asthma, where HL has a smaller impact, structured adherence support and awareness-building can reinforce long-term self-care. In CKD and CAD, where the association between HL and self-care was observed but supported by lower or moderate certainty of evidence, a multidisciplinary approach integrating dietary counselling, pharmacological management and symptom monitoring may help contextualise and support the application of HL skills within complex care pathways. Addressing psychological barriers, such as distress, motivation deficits and decision fatigue, is also critical, as these factors influence both adherence and the ability to apply health information effectively.

For research, more attention is needed on underrepresented conditions to expand understanding of HL's impact across diseases. The use of standardised, validated tools is crucial to ensure comparability across studies, while longitudinal research could better capture how HL influences self-care over time. Future studies should focus on high-risk populations, including older adults, individuals with lower socioeconomic status and those with cognitive impairments, to identify targeted intervention strategies. Evaluating digital health interventions in diverse healthcare contexts is essential to optimising HL strategies and reducing disparities in self-care support.

5 | Conclusions

The results of this systematic review and meta-analysis indicate that HL and self-care have a positive moderate association. This association can be mediated by several factors such as psychological aspects, cognitive abilities, engagement, disease knowledge and awareness, as well as social and environmental factors. In addition, psychological moderators influence the strength of this relationship, potentially reducing HL's impact in more vulnerable populations. These findings underscore the need for targeted interventions that not only enhance HL but also mitigate limiting factors and strengthen mediating mechanisms. Cognitive training can enhance information processing and application, improving self-care in individuals with reduced cognitive capacity. Motivational interviewing and behavioural coaching can enhance self-efficacy and intrinsic motivation, improving self-care adherence. Tailored education programs that incorporate digital health tools, structured adherence support and patient-provider communication strategies could optimise HL's impact, particularly for conditions requiring complex management, such as CKD, HF and COPD. Additionally, addressing psychological moderators, such as distress, depression and decision fatigue, through integrated mental health support may further enhance the effectiveness of HL-based interventions. Future interventions should integrate mental health support, digital tools and tailored education to maximise HL's impact on self-care across chronic diseases.

Acknowledgements

The authors have nothing to report. Open access publishing facilitated by Universita degli Studi di Firenze, as part of the Wiley - CRUI-CARE agreement.

Funding

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **Figure S1:** Distribution of Risk of Bias across domains using ROBINS-E (n = 138). **Figure S2:** ROBINS-E for Asthma (n = 9). **Figure S3:** ROBINS-E for CKD (n = 12). **Figure S4:** ROBINS-E for COPD (n = 3). **Figure S5:** ROBINS-E for CAD (n = 5). **Figure S6:** ROBINS-E for HF (n = 26). **Figure S7:** ROBINS-E for HTN (n = 19). **Figure S8:** ROBINS-E for arthritis (n = 3). **Figure S9:** ROBINS-E for T2DM (n = 61). **Table S1:** Pubmed search string strategy. **Table S2:** Characteristics of included studies (n = 138). **Table S3:** Self-care tools and dimensions. **Table S4:** HL tools and dimensions. **Table S5:** GRADE evidence profile (n = 52 studies).