



RJGP

— RESEARCH JOURNAL OF —

GENERAL PRACTICE

Evidence • Practice • Better Health

Volume 1, Number 1, August 2026



eISSN 0000-0000

 PEER-REVIEWED
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 OPEN ACCESS
JOURNAL

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Publisher. Self-published

Page Setter. Mahdi Akbarzadeh, graphicnegareh.group@gmail.com

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RJGP 2026; 1: 1-2

www.rjgp.orgDOI: [10.66224/rjgp.v1i1.1](https://doi.org/10.66224/rjgp.v1i1.1)

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It is our great pleasure to welcome you to the inaugural issue of the *Research Journal of General Practice (RJGP)*. The launch of this journal marks the beginning of an exciting journey dedicated to advancing high-quality research, promoting innovation, and strengthening evidence-based practice in general practice and primary care.

Primary care is the cornerstone of every effective healthcare system. General practitioners and family physicians provide comprehensive, continuous, coordinated, and person-centered care that addresses the health needs of individuals, families, and communities throughout the lifespan. As healthcare systems continue to evolve in response to demographic changes, increasing multimorbidity, technological innovation, and emerging global health challenges, the role of primary care has never been more important (Figure).

The mission of the *Research Journal of General Practice* is to provide an international, peer-reviewed platform for the dissemination of high-quality scientific research that contributes to the advancement of general practice and primary healthcare. We are committed to publishing rigorous, innovative, and clinically relevant research that improves patient care, informs health policy, and supports evidence-based decision-making.

RJGP welcomes contributions from researchers, clinicians, educators, healthcare professionals, nurses, and policymakers working across the broad spectrum of primary care. We encourage interdisciplinary collaboration and recognize that addressing today's healthcare challenges requires integrating clinical expertise with advances in public health, digital health, epidemiology, behavioral sciences, health services research, and medical education.

The scope of the journal encompasses a wide range of topics, including primary care epidemiology, disease prevention, early diagnosis, pharmacological

and non-pharmacological interventions, chronic disease management, multimorbidity, mental health, palliative care, patient-centered care, shared decision-making, quality improvement, patient safety, interprofessional collaboration, health systems research, digital health, artificial intelligence, machine learning, telemedicine, implementation science, and innovations in medical education and training. We also welcome quantitative, qualitative, and mixed-methods research that advances the science and practice of general practice.

In an era of rapid digital transformation, primary care is undergoing profound change. Emerging technologies—including electronic health records, telemedicine, artificial intelligence, machine learning, remote patient monitoring, and mobile health applications—are reshaping healthcare delivery and creating new opportunities to improve access, quality, efficiency, and patient engagement. At the same time, these developments present important challenges related to equity, ethics, data privacy, interoperability, and workforce preparedness. RJGP seeks to provide a forum for critical discussion and scientific evaluation of these evolving areas while maintaining a strong focus on the core values of primary care: continuity, accessibility, comprehensiveness, coordination, and compassion.

Our editorial philosophy is founded on scientific integrity, methodological rigor, transparency, and fairness. Every manuscript submitted to the journal undergoes an independent peer-review process designed to ensure the highest standards of academic quality and ethical publication practice. We are committed to supporting authors through constructive peer review and to fostering



Please cite this article as: Alipour Abedi B. Welcome to the *Research Journal of General Practice*. RJGP. 2026;1(1):1-2.



Conceptual illustration of comprehensive general practice, highlighting the integration of patient-centered care, preventive medicine, family health, global health, chronic disease management, and evidence-based primary care as the foundation of sustainable healthcare systems.

an inclusive environment that values diverse perspectives and international collaboration.

As an open forum for scientific exchange, RJGP aims to bridge the gap between research and clinical practice. We believe that research should not only generate new knowledge but also improve patient outcomes, strengthen healthcare systems, and address the priorities of clinicians, patients, and communities. We therefore encourage submissions that have clear clinical relevance, practical implications, and the potential to influence everyday practice.

The inaugural issue reflects our vision of embracing both traditional strengths and emerging opportunities within primary care. The contributions published in this issue highlight the diversity of contemporary primary care research and demonstrate the growing importance of innovation, digital technologies, multidisciplinary collaboration, and patient-centered approaches in addressing current and future healthcare needs.

We sincerely thank our Editorial Board members, reviewers, authors, and readers for their confidence

and support during the establishment of the *Research Journal of General Practice*. Their expertise, dedication, and commitment to scientific excellence have been instrumental in making this inaugural issue possible.

We warmly invite researchers from around the world to submit their work to RJGP and join us in building a vibrant international community dedicated to advancing primary care research. Together, we can generate knowledge that improves healthcare, informs policy, and ultimately enhances the health and well-being of populations worldwide.

We hope that you find this inaugural issue informative, inspiring, and valuable to your research and clinical practice. We look forward to your continued engagement as readers, authors, reviewers, and partners in the ongoing development of the *Research Journal of General Practice*.

On Behalf of Editorial Team
Behrang Alipour Abedi, MD
Editor-in-Chief, *RJGP*

Received August 2026

Challenges and Opportunities for Digital Transformation in Primary Care

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RJGP 2026; 1: 3-6

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DOI: [10.66224/rjgp.v1i1.2](https://doi.org/10.66224/rjgp.v1i1.2)

Keywords. primary care, digital health, artificial intelligence, machine learning, telemedicine, electronic health records, digital transformation

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Primary care is internationally recognized as the foundation of effective healthcare systems, providing accessible, comprehensive, coordinated, and continuous care for individuals and communities. Strong primary care systems are associated with improved population health, reduced healthcare expenditures, enhanced equity, and better patient experiences.¹⁻³ As healthcare systems face increasing demands arising from population aging, multimorbidity, chronic disease, workforce shortages, and rising healthcare costs, the need for innovative approaches to healthcare delivery has become increasingly urgent.^{2,3}

The digital transformation of healthcare has emerged as one of the most significant developments in modern medicine. Advances in information and communication technologies have fundamentally changed the way healthcare professionals collect, analyze, share, and utilize clinical information. Digital technologies now support nearly every aspect of healthcare delivery, from electronic documentation and remote consultations to predictive analytics and personalized clinical decision support.^{4,6} In primary care, where clinicians manage diverse patient populations across a broad spectrum of health conditions, these innovations offer unprecedented opportunities to improve efficiency, quality, and accessibility of care.^{4,5}

Over the past two decades, widespread adoption of electronic health records (EHRs) has provided the digital infrastructure necessary for integrating advanced technologies into routine clinical practice. EHRs have enabled healthcare organizations to transition from paper-based documentation to comprehensive digital information systems capable of supporting clinical decision-making, quality improvement initiatives, and population health management.^{7,8} The increasing availability of structured healthcare data has also facilitated the rapid growth of artificial intelligence and machine learning applications capable of identifying complex patterns that may not be readily apparent through conventional statistical methods.⁷⁻¹⁰

Artificial intelligence has become a major driver of digital innovation within healthcare. Machine learning algorithms can analyze large and complex datasets to predict disease risk, identify patients requiring preventive interventions, optimize treatment recommendations, and support diagnostic decision-making.⁹⁻¹¹ Recent advances in deep learning and natural language processing have further expanded opportunities



Please cite this article as: Hajnasrollah G. Challenges and Opportunities for Digital Transformation in Primary Care. RJGP. 2026;1(1):3-6.

to analyze unstructured clinical notes, medical images, laboratory reports, and patient-generated health data.^{9,10} In primary care, these technologies have demonstrated potential applications across numerous clinical domains, including cardiovascular disease, diabetes, chronic kidney disease, respiratory disorders, mental health, cancer detection, medication safety, and multimorbidity management (Figure).⁹⁻¹¹

The COVID-19 pandemic accelerated digital transformation at an unprecedented pace. Public health restrictions and the need to reduce face-to-face interactions rapidly expanded the use of telemedicine, virtual consultations, remote patient monitoring, and mobile health applications.^{12,13} Healthcare providers who previously relied almost exclusively on traditional office visits were required to adopt digital platforms within a remarkably short period. This rapid transition demonstrated that digital healthcare could substantially improve access to care while maintaining continuity of

services during public health emergencies.^{12,13} More importantly, it highlighted the long-term potential of hybrid models of care combining in-person and virtual consultations according to individual patient needs.

Remote patient monitoring has become another important component of digital primary care. Wearable sensors, home blood pressure monitors, continuous glucose monitoring systems, pulse oximeters, and smartphone-connected diagnostic devices now enable patients to collect health information outside traditional clinical settings. These technologies facilitate continuous monitoring of chronic conditions, early identification of clinical deterioration, and proactive disease management while encouraging patient engagement and self-management.^{14,15} Such approaches are particularly valuable for patients with hypertension, diabetes, heart failure, chronic respiratory diseases, and other long-term conditions commonly managed within primary care.



Conceptual overview of primary care epidemiology, illustrating its core functions, research methodologies, clinical applications, current challenges, and future directions. Primary care epidemiology integrates routine clinical data, electronic health records, and population-based research to support evidence-based practice, disease prevention, healthcare planning, and improved patient outcomes.

The emergence of mobile health technologies has further expanded opportunities for patient-centered care. Thousands of health-related smartphone applications now support medication adherence, lifestyle modification, chronic disease education, symptom monitoring, mental health management, and preventive health behaviors.^{16,17} Combined with wearable technologies and cloud-based digital platforms, these applications generate large volumes of patient-generated health data that may complement traditional clinical information and contribute to more personalized healthcare delivery.^{16,17}

Despite these remarkable advances, digital transformation also presents considerable challenges. Healthcare systems continue to struggle with fragmented digital infrastructures, limited interoperability between information systems, cybersecurity threats, data privacy concerns, workforce training needs, and financial barriers to implementation.^{4,18,19} Furthermore, unequal access to digital technologies may exacerbate existing health disparities among older adults, rural populations, socioeconomically disadvantaged communities, and individuals with limited digital literacy.^{4,18,19} These issues underscore the importance of ensuring that technological innovation enhances rather than undermines equitable access to healthcare.

Ethical considerations have also become increasingly prominent. Artificial intelligence algorithms trained using incomplete or unrepresentative datasets may inadvertently perpetuate bias, leading to unequal healthcare recommendations across different population groups.^{11,20,21} The increasing complexity of machine learning models raises additional concerns regarding transparency, explainability, accountability, and clinician trust.^{11,20,21} Addressing these issues requires robust governance frameworks, transparent reporting standards, multidisciplinary collaboration, and ongoing evaluation of algorithm performance in real-world clinical settings.^{20,21}

Digital transformation should not be viewed solely as the adoption of new technologies but rather as a comprehensive reorganization of healthcare delivery that integrates digital innovations into patient-centered clinical practice. Successful implementation depends not only on technological

capability but also on organizational readiness, professional acceptance, patient engagement, supportive policy environments, and sustainable investment in digital infrastructure.^{2,4}

This commentary examines the opportunities and challenges associated with digital transformation in primary care, with particular emphasis on artificial intelligence, telemedicine, electronic health records, remote monitoring, and digital health equity. It also discusses future priorities for ensuring that digital innovation strengthens primary care while preserving the core values of accessibility, continuity, comprehensiveness, coordination, and person-centered care.

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Received July 2026

Primary Care Epidemiology: Bridging Population Health and Clinical Practice, A Mini Review

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Keywords. primary care, epidemiology, general practice, public health, disease surveillance, electronic health records, population health

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Primary care epidemiology is the application of epidemiological principles and methods to the prevention, diagnosis, management, and evaluation of health problems encountered in primary care. As the first point of contact for most patients, primary care provides a unique setting for understanding disease occurrence, identifying risk factors, monitoring health trends, and evaluating healthcare interventions. Advances in electronic health records (EHRs), disease surveillance systems, and data analytics have expanded the role of primary care epidemiology from describing disease patterns to informing evidence-based clinical decision-making, health policy, and resource allocation. This mini-review summarizes the concept, scope, methodologies, current applications, challenges, and future directions of primary care epidemiology.

RJGP 2026; 1: 7-10

www.rjgp.org

DOI: [10.66224/rjgp.v1i1.3](https://doi.org/10.66224/rjgp.v1i1.3)

INTRODUCTION

Primary care serves as the foundation of healthcare systems worldwide by providing accessible, comprehensive, continuous, and coordinated care.¹⁻⁴ Because general practitioners (GPs) manage patients across all age groups and disease spectrums, primary care generates valuable epidemiological information that reflects the health status of communities.^{2,5} Unlike hospital-based research, which often focuses on severe or referred cases, primary care epidemiology captures the natural history of disease from its earliest presentation, making it particularly useful for prevention, early diagnosis, and long-term disease management.⁵⁻⁷

Primary care epidemiology integrates clinical medicine with population health by applying epidemiological methods to everyday practice. It enables clinicians to understand disease frequency, identify determinants of illness, evaluate interventions, and improve healthcare delivery for defined populations.^{3,5,8}

SCOPE OF PRIMARY CARE EPIDEMIOLOGY

The scope of primary care epidemiology extends beyond disease surveillance. It encompasses:

- Measurement of disease incidence and prevalence within registered practice populations^{5,8,9}
- Identification of demographic, behavioral, environmental, and socioeconomic risk factors⁸⁻¹⁰
- Monitoring infectious and chronic disease trends¹¹⁻³
- Evaluation of screening and preventive programs¹⁴⁻⁶
- Assessment of treatment effectiveness and healthcare utilization^{8,17}
- Health services research and quality improvement¹⁷⁻⁹

Modern primary care also supports population-



Please cite this article as: Entezarmahdi K, Alipour Abedi B. Primary Care Epidemiology: Bridging Population Health and Clinical Practice, A Mini Review. RJGP. 2026;1(1):7-10.

based management through longitudinal patient records, allowing researchers to examine disease progression and outcomes over extended periods.^{18–21}

COMMON EPIDEMIOLOGICAL STUDY DESIGNS IN PRIMARY CARE

Several study designs are commonly employed:

- Cross-sectional studies estimate disease prevalence and healthcare utilization.^{8,9}
- Cohort studies investigate disease incidence, prognosis, and treatment outcomes.^{8,22}
- Case-control studies identify associations between exposures and relatively uncommon diseases.^{8,22}
- Practice-based surveillance detects seasonal disease patterns and emerging outbreaks.^{11–3}
- Routine database analyses using electronic health records enable real-world evidence generation.^{18–21,23}

Primary care databases are particularly valuable because they contain comprehensive information on symptoms, diagnoses, prescriptions, referrals, laboratory investigations, and long-term follow-up.^{18–21}

APPLICATIONS IN GENERAL PRACTICE

Infectious Disease Surveillance

General practice frequently serves as the first location where infectious diseases present. Monitoring consultation patterns enables early recognition of influenza outbreaks, respiratory infections, gastrointestinal illnesses, and emerging infectious diseases.^{11–3} Sentinel surveillance systems based in primary care contribute substantially to national public health monitoring.^{12,13}

Chronic Disease Epidemiology

Primary care manages most patients with hypertension, diabetes mellitus, asthma, chronic obstructive pulmonary disease, cardiovascular disease, and mental health disorders.^{2,14–6} Epidemiological analyses identify disease burden, treatment gaps, medication adherence, and risk factors, thereby informing prevention strategies.^{15–7}

Preventive Care

Primary care epidemiology evaluates vaccination

programs, cancer screening, cardiovascular risk assessment, smoking cessation, obesity prevention, and lifestyle interventions.^{14–6,24} These activities contribute directly to reducing morbidity and mortality at the population level.^{1,14}

Health Services Research

Practice-based epidemiological studies examine healthcare access, continuity of care, referral patterns, prescribing behavior, patient satisfaction, and healthcare equity.^{17–9} Such evidence informs policy decisions and quality improvement initiatives.^{17,19}

Emerging Role of Electronic Health Records

The widespread adoption of electronic health records has transformed primary care epidemiology.^{18–21,23} Large-scale anonymized databases enable researchers to:^{18–21,23–5}

- Conduct real-world observational studies
- Detect adverse drug reactions
- Monitor chronic disease management
- Evaluate healthcare quality indicators
- Develop clinical prediction models
- Support precision medicine initiatives

Integration of artificial intelligence and machine learning with EHR data is further expanding opportunities for predictive analytics and personalized healthcare.^{25–7}

CHALLENGES

Despite its importance, primary care epidemiology faces several challenges:

- Variable data quality and completeness^{20,21}
- Differences in diagnostic coding systems²⁰
- Missing socioeconomic and behavioral information^{9,20}
- Selection bias due to healthcare-seeking behavior^{8,22}
- Privacy and ethical concerns regarding patient data^{23,28}
- Limited research infrastructure in low- and middle-income countries^{1,29}

Addressing these challenges requires standardized data collection, improved interoperability, clinician engagement, and robust governance frameworks.^{20,23,28}

FUTURE PERSPECTIVES

The future of primary care epidemiology lies in integrating clinical data with genomics, environmental exposures, wearable devices, and patient-reported outcomes.^{25–7} Artificial intelligence, digital health technologies, and interoperable health information systems will enhance disease prediction, early diagnosis, and personalized preventive care.^{25–7,30} Strengthening collaboration between general practitioners, epidemiologists, public health professionals, and policymakers will maximize the contribution of primary care to improving population health.^{2,3,17}

CONCLUSIONS

Primary care epidemiology is an essential discipline that links individual patient care with population health. By applying epidemiological methods within general practice, clinicians can identify disease patterns, evaluate interventions, improve healthcare quality, and guide evidence-based decision-making. As digital health technologies continue to evolve, primary care epidemiology will play an increasingly important role in disease surveillance, preventive medicine, health services research, and the development of resilient healthcare systems.

CONFLICT OF INTEREST

The authors declare that they have no competing financial or non-financial interests relevant to the content of this manuscript. However, it is noted that the authors are members of the editorial board of the journal to which this manuscript is submitted. This affiliation has not influenced the design, analysis, interpretation, or writing of this review, and the manuscript has undergone standard independent peer review in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the authors used ChatGPT (OpenAI), Claude (Anthropic), Gemini (Google)] to assist with language editing, grammar improvement, formatting, and/or text refinement. The authors carefully reviewed, verified, and edited all AI-generated content and accept full responsibility

for the accuracy, integrity, originality, and final content of the manuscript.

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- Received April 2026
Revised June 2026
Accepted July 2026

Non-Pharmacological Interventions in Primary Care: From Evidence to Practice

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Keywords. non-pharmacological interventions, primary care, lifestyle modification, behavioral interventions, patient-centered care, implementation science, health promotion, social prescribing

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Non-pharmacological interventions (NDIs) have become increasingly important components of contemporary primary care, reflecting a broader shift from disease-centered management toward more comprehensive and patient-centered models of care. Health outcomes are shaped not only by biological mechanisms but also by behavioral, psychological, environmental, and social determinants of health.

Although pharmacotherapy remains fundamental in the management of many acute and chronic conditions, medication-based approaches alone may not adequately address the complex factors underlying disease development, progression, and quality of life. Consequently, evidence-based NDIs—including lifestyle modification, physical activity, nutritional interventions, behavioral therapies, and social interventions—have gained recognition as essential components of disease prevention, treatment, rehabilitation, and long-term management.

Despite the growing evidence supporting their effectiveness, integrating NDIs into routine primary care remains challenging. Unlike pharmacological therapies, many NDIs require sustained behavioral change, active patient participation, multidisciplinary collaboration, and adaptation to individual circumstances. Successful implementation therefore depends not only on clinical evidence but also on clinician competence, healthcare system support, resource availability, and consideration of social determinants of health.

General practitioners and primary care teams are uniquely positioned to facilitate the implementation of NDIs because of their longitudinal relationships with patients, comprehensive understanding of individual health contexts, and ability to coordinate multidisciplinary and community-based care.

This narrative review examines the principles, major categories, clinical applications, evidence base, implementation challenges, and future directions of non-pharmacological interventions in primary care, with particular emphasis on translating evidence into routine clinical practice.

RJGP 2026; 1: 11-8

www.rjgp.org

DOI: [10.66224/rjgp.v1i1.4](https://doi.org/10.66224/rjgp.v1i1.4)

INTRODUCTION

Primary care has traditionally emphasized whole-person care rather than disease-focused treatment alone.¹ Contemporary healthcare increasingly



Please cite this article as: Arab A. Non-Pharmacological Interventions in Primary Care: From Evidence to Practice. RJGP. 2026;1(1):11-8.

recognizes that health outcomes are shaped by interactions between biological, behavioral, psychological, environmental, and social factors.² Consequently, effective patient care requires approaches that extend beyond pharmacological treatment alone.

Although pharmacotherapy remains a cornerstone of medical management, many conditions commonly encountered in primary care are substantially influenced by modifiable lifestyle and psychosocial factors.¹ Evidence-based non-pharmacological interventions (NDIs) have therefore become integral components of disease prevention, treatment, rehabilitation, and long-term management.²

Clinical guidelines increasingly recommend interventions such as lifestyle modification, structured physical activity, nutritional counseling, behavioral therapies, and self-management support for a broad range of conditions, including cardiovascular disease, type 2 diabetes, obesity, chronic musculoskeletal disorders, anxiety, and depression.³⁻⁵ However, their effectiveness depends not only on clinical efficacy but also on individualized care planning, patient-centered communication, sustained engagement, and appropriate organizational support.

Despite their expanding evidence base, NDIs remain challenging to implement consistently in routine primary care.⁶ Unlike medication-based treatments, which generally follow standardized prescribing pathways, non-pharmacological interventions frequently require long-term behavioral adaptation, multidisciplinary collaboration, and responsiveness to individual patient circumstances.⁶ As a result, successful implementation depends on both evidence of effectiveness and practical strategies that facilitate their integration into everyday clinical practice.⁶

Primary care professionals play a central role in this process because of their continuity of care, comprehensive understanding of patients' medical and social contexts, and ability to coordinate multidisciplinary and community-based services.¹ However, maximizing the benefits of NDIs requires appropriate professional training, supportive healthcare policies, and healthcare systems capable of sustaining long-term implementation.²

The aim of this review is to examine the principles, major categories, clinical applications, evidence base, implementation challenges, and future directions of non-pharmacological interventions in primary care, with particular emphasis on their practical integration into routine healthcare delivery.

DEFINITION AND SCOPE OF NON-PHARMACOLOGICAL INTERVENTIONS

Non-pharmacological interventions (NDIs) are structured therapeutic strategies that do not primarily rely on medications and aim to improve health outcomes by modifying behaviors, physical function, psychological well-being, or social determinants of health.^{1,2} Rather than representing a single therapeutic modality, NDIs encompass a broad spectrum of interventions targeting different contributors to health and disease.²

Within primary care, NDIs can be broadly classified according to their principal therapeutic targets. Lifestyle and behavioral interventions aim to modify health-related behaviors through dietary improvement, physical activity, smoking cessation, alcohol reduction, sleep optimization, and stress management.³⁻⁵ Psychological interventions address cognitive, emotional, and behavioral factors using approaches such as cognitive behavioral therapy (CBT), motivational interviewing, mindfulness-based interventions, and problem-solving strategies.⁷⁻¹⁰

Functional and rehabilitative interventions include exercise therapy, physiotherapy, and rehabilitation programs designed to improve physical capacity, mobility, and functional independence. Finally, patient empowerment and social interventions, including patient education, self-management support, and social prescribing, seek to strengthen patients' active participation in care while addressing broader social determinants of health.^{2,12,13}

Most NDIs are intended to complement rather than replace pharmacological therapy.¹ Their effectiveness depends not only on the intrinsic efficacy of the intervention but also on patient characteristics, clinical context, accessibility of resources, and the ability to sustain behavioral change over time.⁶ Although NDIs encompass

a broad range of therapeutic approaches, several categories constitute the foundation of contemporary primary care and are supported by the strongest evidence base.

MAJOR TYPES OF NON-PHARMACOLOGICAL INTERVENTIONS

Lifestyle Modification

Lifestyle modification represents one of the broadest and most fundamental categories of non-pharmacological interventions in primary care.^{1,2} It encompasses coordinated changes in health-related behaviors, including dietary habits, physical activity, smoking cessation, alcohol reduction, sleep optimization, and stress management.³⁻⁵ Rather than isolated recommendations, effective lifestyle interventions typically involve individualized goal setting, patient education, regular follow-up, and ongoing behavioral support.^{3,6}

Lifestyle interventions are particularly important because many chronic conditions commonly managed in primary care are strongly influenced by modifiable behavioral risk factors.^{2,9} Their effectiveness, however, depends not only on the recommendations provided but also on patients' motivation, readiness for change, and the availability of continuous clinical and community support.^{6,7}

Exercise Prescription and Physical Activity

Exercise prescription is increasingly recognized as a therapeutic intervention rather than simply a preventive health recommendation.^{5,11} Structured exercise programs have demonstrated benefits across multiple clinical domains, including cardiovascular health, metabolic control, physical function, mental well-being, and maintenance of functional independence.¹¹⁻⁵

In primary care, exercise should be prescribed using the same individualized principles that guide other therapeutic interventions.¹¹ Recommendations should consider patients' age, baseline physical activity, functional capacity, comorbidities, personal preferences, and potential barriers to participation.^{5,11} The clinician's role extends beyond recommending exercise to supporting realistic goal setting, monitoring progress, and facilitating referral to rehabilitation or community-based exercise programs when appropriate.^{6,11}

Nutritional Counseling

Nutritional counseling involves individualized dietary assessment and evidence-based guidance aimed at promoting sustainable improvements in eating behaviors.^{16,17} Contemporary nutritional care emphasizes overall dietary quality, balanced eating patterns, cultural preferences, and long-term adherence rather than focusing exclusively on calorie restriction or weight reduction.¹⁷

Within primary care, nutritional interventions are integrated into the management of obesity, diabetes, cardiovascular disease, chronic kidney disease, and other chronic conditions.^{14,16,17} Collaboration with dietitians and other healthcare professionals can enhance both the feasibility and effectiveness of individualized nutritional care.

Behavioral and Psychological Interventions

Behavioral and psychological interventions target the cognitive, emotional, and motivational factors that influence health behaviors, treatment adherence, and long-term disease management.⁷⁻¹⁰ Common approaches include motivational interviewing, cognitive behavioral therapy (CBT), goal setting, self-monitoring, problem-solving strategies, and mindfulness-based interventions.⁷⁻¹⁰

These interventions are particularly valuable in conditions where successful outcomes depend on behavioral change, adaptive coping, and psychological resilience.⁹ Their effectiveness is closely related to therapeutic relationships, patient readiness for change, and integration within individualized, patient-centered care plans.^{6,7}

Patient Empowerment, Self-Management, and Social Interventions

Patient empowerment has become a central principle of modern primary care. Educational interventions, self-management support, and shared decision-making aim to improve patients' knowledge, confidence, and ability to participate actively in managing their own health.^{1,2}

Social interventions, particularly social prescribing, extend this approach by connecting patients with community resources such as physical activity programs, peer-support groups, volunteering opportunities, educational services, and other non-clinical resources that address social

determinants of health. Although the evidence base continues to evolve, these interventions appear to improve patient engagement, social connectedness, psychological well-being, and, in selected populations, health-related quality of life.^{12,13}

EVIDENCE BASE AND CLINICAL EFFECTIVENESS OF NON-PHARMACOLOGICAL INTERVENTIONS

A substantial body of evidence supports the effectiveness of non-pharmacological interventions (NDIs) across a broad spectrum of conditions encountered in primary care.¹⁸⁻²⁰ Systematic reviews, randomized controlled trials, and evidence-based clinical guidelines consistently demonstrate that interventions such as physical activity, lifestyle modification, nutritional counseling, behavioral therapies, and self-management support can improve clinical outcomes, functional capacity, and health-related quality of life.¹⁸⁻²⁰

However, the evidence base for NDIs is inherently heterogeneous.²¹ Interventions differ considerably in their components, intensity, duration, target populations, and outcome measures, making direct comparisons challenging. While some approaches, including structured exercise programs and cognitive behavioral therapy, are supported by robust evidence across multiple clinical settings, other interventions require further investigation regarding long-term effectiveness, scalability, implementation, and cost-effectiveness.^{9,11,21}

Importantly, the real-world impact of NDIs depends on more than clinical efficacy alone.⁶

Their effectiveness is strongly influenced by implementation factors, including patient engagement, clinician communication skills, organizational support, healthcare infrastructure, and access to multidisciplinary and community-based services.⁶ Consequently, interventions that demonstrate efficacy under controlled research conditions may produce different outcomes in routine clinical practice.^{6,21}

For this reason, evaluation of NDIs should consider both clinical effectiveness and implementation feasibility.^{6,21} The central challenge is therefore not merely establishing efficacy, but translating heterogeneous evidence into feasible, patient-centered and sustainable interventions that can be integrated into everyday primary care. Achieving this translation is essential for maximizing their long-term impact on patient and population health.⁶

CLINICAL APPLICATIONS OF NON-PHARMACOLOGICAL INTERVENTIONS IN PRIMARY CARE

Non-pharmacological interventions have broad applications throughout primary care, extending beyond disease-specific treatment to include prevention, risk reduction, functional improvement, symptom management, and long-term self-management.¹⁻³ Rather than functioning as isolated therapies, NDIs are most effective when incorporated into individualized care plans that consider patients' clinical characteristics, preferences, psychosocial circumstances, and available resources (Table).⁴

Clinical Applications of Non-Pharmacological Interventions in Primary Care^{14,18,22-5,27-32}

Clinical domain	Key interventions	Main objectives	Primary care focus
Cardiometabolic conditions (hypertension, type 2 diabetes, obesity, cardiovascular risk)	Lifestyle modification, physical activity, nutritional counseling, weight management, self-management support	Risk reduction, improved metabolic control, prevention of disease progression	Individualized goal setting, longitudinal follow-up, behavior change support, multidisciplinary care
Musculoskeletal conditions (chronic low back pain, osteoarthritis)	Exercise therapy, physiotherapy, rehabilitation, patient education, self-management	Pain reduction, improved physical function, reduced disability	Tailored rehabilitation, patient education, active participation in recovery
Mental health conditions (anxiety, depression, stress-related disorders)	Psychological interventions, CBT, physical activity, mindfulness, social prescribing	Symptom improvement, enhanced coping, psychological well-being	Preference-based care, early identification, access to psychological and community resources
Prevention and health promotion	Smoking cessation, alcohol reduction, lifestyle counseling, sleep optimization, patient education	Risk reduction and improved population health	Preventive counseling integrated into routine primary care

Cardiometabolic Conditions

Cardiometabolic disorders represent one of the most extensively studied applications of NDIs in primary care.^{14,17,27,28} Lifestyle modification, structured physical activity, nutritional counseling, weight management, and self-management support contribute to improved cardiovascular risk profiles, glycemic control, metabolic health, and prevention of disease progression.^{3,6,14,19}

In conditions such as hypertension, type 2 diabetes, obesity, and elevated cardiovascular risk, the principal challenge is often not identifying effective interventions but supporting patients in achieving and maintaining long-term behavioral change. Primary care teams play a pivotal role in risk assessment, individualized goal setting, regular follow-up, and coordination of multidisciplinary care.^{6,18}

Musculoskeletal Conditions

Musculoskeletal disorders, particularly chronic low back pain and osteoarthritis, represent another major area in which NDIs are recommended as first-line management. Exercise therapy, physiotherapy, rehabilitation, patient education, and self-management strategies not only reduce pain but also improve physical function, preserve mobility, and reduce long-term disability.^{22,23,26}

Successful management requires individualized rehabilitation plans that account for functional capacity, patient expectations, and active participation throughout the recovery process.^{22,26}

Mental Health Conditions

Many common mental health conditions managed in primary care also benefit from non-pharmacological interventions. Psychological therapies, physical activity, sleep optimization, mindfulness-based interventions, and social prescribing may improve symptoms, coping strategies, psychological well-being, and overall quality of life, particularly among individuals with mild to moderate anxiety or depressive disorders.^{9,10,24,25}

Optimal outcomes depend on matching interventions to patients' preferences, ensuring timely access to psychological and community-based services, and integrating these approaches within

a broader biopsychosocial model of care.^{24,25,30}

Prevention and Long-Term Health Management

Beyond disease management, NDIs are fundamental to preventive care and health promotion. Smoking cessation, alcohol reduction, healthy lifestyle counseling, sleep optimization, and patient education contribute to reducing modifiable risk factors and improving long-term population health.^{5,31,32}

Patient empowerment and self-management support further strengthen this preventive approach by enabling individuals to develop the knowledge, confidence, and skills required for active participation in their own care. These strategies are increasingly recognized as essential components of sustainable chronic disease management within primary care.^{31,32}

BARRIERS TO IMPLEMENTATION OF NON-PHARMACOLOGICAL INTERVENTIONS IN PRIMARY CARE

Despite the growing evidence supporting non-pharmacological interventions (NDIs), their integration into routine primary care remains inconsistent.³³ Unlike pharmacological treatments, which are often delivered through well-established prescribing pathways, NDIs require sustained behavioral change, active patient participation, multidisciplinary collaboration, and supportive healthcare environments. Consequently, successful implementation depends on factors that extend beyond the effectiveness of the intervention itself.³³

Clinician and Healthcare System Barriers

Primary care professionals play a central role in delivering NDIs; however, several clinician- and system-level factors may limit their routine implementation.³³ Limited training in behavior change techniques, insufficient confidence in counseling skills, competing clinical priorities, and unfamiliarity with referral pathways can all reduce the use of evidence-based non-pharmacological approaches. Healthcare systems may present additional challenges, including limited consultation time, inadequate reimbursement, restricted access to allied health professionals, and poor integration of community-based services. Unlike medication

prescribing, many NDIs require repeated follow-up, interdisciplinary collaboration, and long-term support, making organizational commitment essential for sustainable implementation.^{33,34}

Patient and Social Barriers

The effectiveness of NDIs depends heavily on patients' ability and willingness to adopt and maintain behavioral change.³³ Motivation, health literacy, psychological well-being, socioeconomic circumstances, cultural factors, and access to supportive environments all influence adherence and long-term outcomes.^{2,35} These observations emphasize that implementation strategies should move beyond standardized recommendations and instead adopt individualized, patient-centered approaches that acknowledge the influence of social determinants of health.^{2,35}

MOVING FROM EVIDENCE TO IMPLEMENTATION

Overcoming these barriers requires coordinated action at multiple levels. Clinician education, multidisciplinary teamwork, implementation frameworks, supportive healthcare policies, improved reimbursement models, and stronger partnerships with community organizations all contribute to facilitating the routine integration of NDIs into primary care.^{33,34}

Ultimately, improving implementation is likely to have as great an impact on patient outcomes as the development of new non-pharmacological interventions themselves.³³

FUTURE DIRECTIONS FOR NON-PHARMACOLOGICAL INTERVENTIONS IN PRIMARY CARE

The future of non-pharmacological interventions will depend not only on expanding the evidence base but also on improving their accessibility, personalization, implementation, and sustainability within routine primary care. Future developments should focus on delivering the right intervention to the right patient within the appropriate clinical and social context.

Personalized Care

Responses to non-pharmacological interventions

vary considerably among individuals.^{2,35} Future research should therefore prioritize personalized approaches that consider patients' clinical characteristics, behavioral patterns, personal preferences, health literacy, and social circumstances. Tailoring interventions to individual needs may improve adherence, long-term sustainability, and overall clinical effectiveness.³³

Digital Health and Artificial Intelligence

Digital health technologies—including telemedicine, mobile health applications, wearable devices, remote monitoring systems, and artificial intelligence (AI)-assisted decision support—offer new opportunities to expand access to NDIs and enhance long-term patient engagement.^{35,36}

Rather than replacing clinician-patient relationships, these technologies should be viewed as tools that complement personalized care by supporting communication, monitoring, behavioral coaching, and self-management.³⁵

Implementation Science and Health Equity

Future research should increasingly focus on implementation science, identifying practical strategies that improve adoption, sustainability, cost-effectiveness, and integration of NDIs into routine primary care.^{33,34}

At the same time, reducing health inequalities should remain a central priority. Ensuring equitable access to effective non-pharmacological interventions will require healthcare policies that address social determinants of health while strengthening collaboration between healthcare organizations, public health services, and community resources.^{2,37}

Ultimately, the future challenge is not simply developing additional interventions but creating healthcare systems capable of delivering evidence-based non-pharmacological care consistently, efficiently, and equitably.^{33,34}

CONCLUSION

Non-pharmacological interventions have become essential components of contemporary primary care, extending healthcare beyond disease treatment toward prevention, functional improvement, and patient-centered long-term management. A growing

body of evidence supports their effectiveness across diverse clinical domains, including cardiometabolic disease, musculoskeletal disorders, mental health conditions, and preventive care.

However, demonstrating clinical effectiveness alone is insufficient. The broader impact of NDIs depends on their successful implementation within routine primary care. Achieving this goal requires not only evidence-based interventions but also clinician competence, patient engagement, multidisciplinary collaboration, supportive healthcare systems, and equitable access to community resources.

Primary care is uniquely positioned to integrate non-pharmacological interventions because of its continuity of care, comprehensive understanding of patients' needs, and coordinating role within healthcare systems. Strengthening implementation strategies, expanding multidisciplinary collaboration, and addressing social determinants of health will be critical for maximizing the benefits of NDIs in everyday clinical practice. As healthcare increasingly shifts toward preventive, person-centered, and value-based models of care, non-pharmacological interventions are likely to become an increasingly integral component of comprehensive primary care rather than an adjunct to pharmacological treatment.

CONFLICT OF INTEREST

The author declares that there are no competing financial or non-financial interests relevant to the content of this manuscript. The author is, however, a member of the Editorial Board of the journal to which this manuscript is submitted. This editorial affiliation has not influenced the design, conduct, analysis, interpretation, or writing of the manuscript. The manuscript has been submitted to the journal's standard editorial and peer-review process, with appropriate measures taken to ensure an independent editorial assessment in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the author used artificial intelligence tools, including ChatGPT (OpenAI), Claude (Anthropic), and Gemini (Google), to assist with language editing, grammar

improvement, formatting, and text refinement. The author carefully reviewed, verified, and edited all AI-assisted content and accepts full responsibility for the accuracy, integrity, originality, and final content of the manuscript. The AI tools were not used to make scientific, methodological, or interpretive decisions, and the author independently verified the scientific content and references.

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Received April 2026

Revised June 2026

Accepted July 2026

Vaccination in Pregnancy: A Systematic Review of Maternal and Neonatal Outcomes

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Keywords. pregnancy, maternal
vaccination, influenza vaccine, Tdap,
COVID-19 vaccine, RSV vaccine, primary
care

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Introduction. Vaccination during pregnancy is one of the most effective preventive interventions in maternal healthcare. Immunization protects pregnant individuals against vaccine-preventable infections while providing passive immunity to newborns. Current international guidelines recommend routine maternal vaccination against influenza, tetanus-diphtheria-pertussis (Tdap), COVID-19, and respiratory syncytial virus (RSV) in appropriate settings. Nevertheless, vaccine uptake remains suboptimal worldwide because of concerns regarding safety, limited awareness, and vaccine hesitancy. To systematically review the evidence regarding the effectiveness, safety, and clinical outcomes of vaccination during pregnancy.

Methods. Electronic databases including PubMed/MEDLINE, Scopus, WoS, Embase, and the Cochrane Library were searched for studies published from January 2015 to March 2026. Randomized controlled trials, cohort studies, systematic reviews, and meta-analyses evaluating maternal vaccination during pregnancy were eligible. Outcomes included maternal infection, obstetric complications, neonatal infection, hospitalization, mortality, antibody transfer, and adverse events.

Results. Evidence consistently demonstrated that maternal vaccination significantly reduces maternal morbidity and severe infection while providing effective neonatal protection during the first months of life. Influenza vaccination reduced laboratory-confirmed influenza among mothers and infants. Tdap vaccination markedly reduced infant pertussis before primary immunization. COVID-19 vaccination lowered severe maternal disease and neonatal hospitalization without increasing adverse pregnancy outcomes. Recent evidence also supports maternal RSV vaccination for preventing severe lower respiratory tract infections in early infancy. Serious vaccine-related adverse events were rare.

Conclusions. Maternal vaccination is a safe and highly effective preventive strategy that improves both maternal and neonatal health. General practitioners play a pivotal role in counseling pregnant individuals, addressing vaccine hesitancy, and implementing evidence-based immunization recommendations.

RJGP 2026; 1: 19-30

www.rjgp.org

DOI: [10.66224/rjgp.v1i1.5](https://doi.org/10.66224/rjgp.v1i1.5)



Please cite this article as: Mohammadi KLS E. Vaccination in Pregnancy: A Systematic Review of Maternal and Neonatal Outcomes. RJGP. 2026;1(1):19-30.

INTRODUCTION

Pregnancy is associated with physiological alterations in the cardiovascular, respiratory, and immune systems that increase susceptibility to several infectious diseases and their complications. Infections acquired during pregnancy may result in maternal morbidity, preterm birth, stillbirth, congenital infection, neonatal hospitalization, and infant mortality.^{1,2}

Vaccination during pregnancy represents one of the most successful preventive interventions in modern obstetric care. Beyond protecting pregnant individuals, maternal immunization facilitates active transplacental transfer of immunoglobulin G antibodies, providing passive immunity to newborns during the first months of life when infants are most vulnerable and are either too young or incompletely immunized.^{3,4}

Current recommendations from the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and numerous national professional organizations support routine maternal vaccination against seasonal influenza and tetanus-diphtheria-acellular pertussis (Tdap). More recently, COVID-19 vaccination has become an essential component of antenatal care, while maternal vaccination against respiratory syncytial virus (RSV) has emerged as an additional strategy to reduce severe respiratory infections in infants.⁵⁻⁸

Despite strong evidence supporting vaccine effectiveness and safety, maternal vaccination coverage remains below recommended targets in many countries. Factors contributing to low uptake include inadequate healthcare provider recommendation, concerns regarding fetal safety, misinformation, socioeconomic disparities, and vaccine hesitancy.^{9,10}

Because general practitioners frequently provide preconception counseling, antenatal care, and preventive health services, they play a critical role in promoting maternal immunization. Understanding current evidence regarding vaccine effectiveness and safety is therefore essential for evidence-based primary care.

The objective of this systematic review was to evaluate current evidence regarding the effectiveness, safety, and clinical outcomes

associated with vaccination during pregnancy, with particular emphasis on vaccines routinely recommended in primary care.

MATERIALS AND METHODS

Protocol and Reporting

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement.¹¹

Search Strategy

Electronic literature searches were performed in: PubMed/MEDLINE; Scopus; Web of Science; Embase; and Cochrane Library.

Studies published in English between January 2015 and March 2026 were searched using combinations of the following keywords: pregnancy; maternal vaccination; influenza vaccine; pertussis vaccine; Tdap; COVID-19 vaccine; SARS-CoV-2 vaccination; RSV vaccine; maternal immunization; neonatal outcomes; and vaccine safety.

Reference lists of eligible studies and relevant systematic reviews were also screened to identify additional publications.

Risk-of-Bias Assessment

Risk of bias was independently assessed by two reviewers using study-design-appropriate tools. Randomized controlled trials were evaluated using the Cochrane Risk of Bias 2 (RoB 2) tool across five domains: randomization, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Observational cohort and case-control studies were assessed using the Newcastle–Ottawa Scale (NOS), considering participant selection, comparability, and outcome/exposure assessment. Disagreements were resolved through discussion and consensus, with a third reviewer consulted when necessary. Risk-of-bias judgments were considered when interpreting the overall findings.

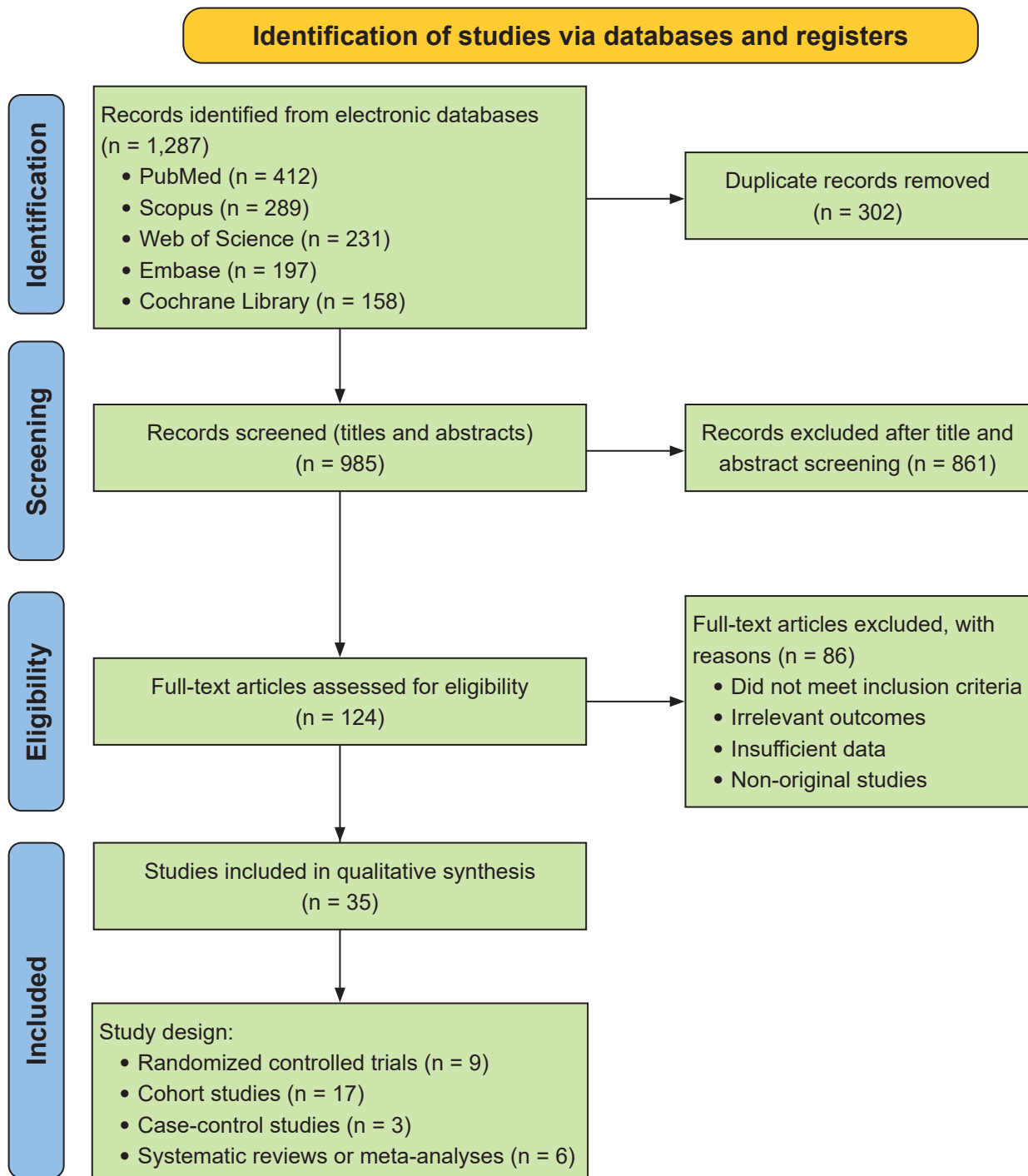
RESULTS

Study Selection

The electronic database search identified 1,287 potentially relevant records. After removal of 302 duplicate records, 985 titles and abstracts were

screened. Of these, 124 full-text articles were assessed for eligibility. Eighty-six articles were excluded because they did not meet the predefined inclusion criteria. Ultimately, 35 studies were

included in the qualitative synthesis, comprising 9 randomized controlled trials, 17 cohort studies, 3 case-control studies, and 6 systematic reviews or meta-analyses (Figure).



Note: PRISMA 2020 flow diagram.

PRISMA 2020 flow diagram of study selection. PRISMA 2020 flow diagram illustrating the literature search and study selection process. Of 1,287 records identified, 35 studies met the eligibility criteria and were included in the qualitative synthesis.

Characteristics of Included Studies

The included studies represented data from more than 4 million pregnancies across North America, Europe, Asia, Australia, Africa, and South America. Most investigations evaluated one or more of the following maternal vaccines: Seasonal influenza vaccine; Tetanus-diphtheria-acellular pertussis (Tdap) vaccine; COVID-19 vaccines (mRNA and viral vector platforms); and Respiratory syncytial virus (RSV) vaccine.

Primary outcomes included: Laboratory-confirmed maternal infection; Maternal hospitalization; Intensive care unit admission; Preterm birth; Stillbirth; Neonatal infection; Infant hospitalization; Infant mortality; and Maternal and neonatal adverse events. Secondary outcomes included antibody transfer, vaccine immunogenicity, breastfeeding outcomes, and vaccine acceptance.

Overall, study quality was moderate to high. Most cohort studies adequately controlled for major maternal confounding factors, while systematic reviews demonstrated low risk of bias according to AMSTAR-2 criteria (Table 1).

Risk of Bias Assessment

Overall, the methodological quality of the primary studies was moderate to high. The randomized controlled trials evaluating influenza, Tdap, and RSV vaccination generally demonstrated a low risk of bias across the major RoB 2 domains. Observational cohort and case-control studies generally showed good methodological quality according to the Newcastle–Ottawa framework, particularly with respect to participant selection, outcome ascertainment, and adjustment for major confounding factors. The principal potential limitations were residual confounding, differences in healthcare-seeking behavior, selection bias, and variation in exposure and outcome ascertainment. These limitations were considered when interpreting the findings. Overall, the consistency of evidence across randomized and well-designed observational studies supports the conclusion that recommended vaccination during pregnancy has a favorable maternal safety profile and provides important protection to newborns and young infants (Table 2,3, and 4).

Influenza Vaccination During Pregnancy

Seasonal influenza remains one of the most extensively studied maternal vaccines.

Pregnant individuals have an increased risk of severe influenza because physiological changes during pregnancy affect pulmonary function, cardiovascular adaptation, and immune responses.^{1,33} Influenza infection during pregnancy has been associated with: Pneumonia; Hospitalization; Intensive care admission; Preterm birth; Low birth weight; and Fetal loss.

Multiple randomized trials and observational studies consistently demonstrate that influenza vaccination substantially reduces laboratory-confirmed influenza among both mothers and infants.

A Cochrane review reported that maternal influenza vaccination significantly reduced laboratory-confirmed influenza infection during pregnancy without increasing adverse maternal or neonatal outcomes.³⁴

Similarly, pooled analyses demonstrated reductions in: Maternal influenza illness; Influenza-related hospitalization; Neonatal influenza during the first six months of life; and Influenza-associated healthcare utilization.

Protection of infants results primarily from efficient transplacental transfer of maternal immunoglobulin G antibodies during the third trimester, together with antibody transfer through breast milk after delivery.

The World Health Organization therefore recommends seasonal influenza vaccination during any trimester of pregnancy.⁵

Tetanus-Diphtheria-Acellular Pertussis (Tdap) Vaccination

Pertussis remains an important cause of infant morbidity and mortality, particularly during the first two months of life before completion of the primary vaccination series.

Maternal Tdap vaccination administered between 27 and 36 weeks' gestation results in high concentrations of pertussis antibodies crossing the placenta, providing effective passive protection during early infancy.

Several large population-based studies have demonstrated remarkable effectiveness.

Table 1. Characteristics of Primary Studies Included in the Systematic Review

Study	Year	Country/ Region	Design	Vaccine	Population	Main outcomes	Principal findings
Rasmussen et al. ¹	2012	International	Review	Influenza	Pregnant women/ infants	Maternal immunization	Reviewed safety, effectiveness, and implementation
Kourfis et al. ²	2014	International	Review	Maternal infection/ immunization	Pregnant women	Pregnancy Care	Prevention of infectious during pregnancy , maternal and fetal care
Munoz et al. ³	2019	International	Review	Multiple	Pregnant women	Maternal immunization	Reviewed safety, effectiveness, and implementation
Omer et al. ¹²	2011	USA	Retrospective cohort	Influenza	Pregnant women	Preterm birth, SGA	Vaccination was associated with reduced risk of prematurity and SGA
Zaman et al. ¹³	2008	Bangladesh	RCT	Influenza	Pregnant women and infants	Maternal and infant influenza	Maternal vaccination reduced influenza illness in mothers and provided protection to infants
Madhi et al. ¹⁴	2014	South Africa	RCT	Influenza	Pregnant women and infants	Infant influenza	Maternal vaccination reduced laboratory- confirmed influenza in infants
Steinboff et al. ¹⁵	2017	Nepal	RCT	Influenza	Pregnant women/ infants	Maternal/infant influenza	Maternal immunization provided protection against influenza
Tapia et al. ¹⁶	2016	Mali	RCT	Influenza	Pregnant women/ infants	Infant influenza	Maternal vaccination provided protection against infant influenza
Nunes et al. ¹⁷	2017	South Africa	RCT	Influenza	Pregnant women/ infants	Infant respiratory hospitalization	Maternal vaccination reduced infant respiratory morbidity
Shuaib et al. ¹⁸	2015	USA	Observational study	Influenza	Pregnant women	Birth outcomes	No major adverse birth-outcome signal associated with vaccination
Mohammed et al. ¹⁹	2020	Australia	Prospective cohort	Influenza	1,253 pregnant women	Pregnancy/birth outcomes	No major adverse pregnancy outcome; evidence of maternal benefit
Mohammed et al. ²⁰	2021	Australia	Prospective cohort	Tdap	1,272 pregnant women	Pregnancy/birth outcomes	No major adverse maternal or neonatal safety signal
Amirthalingam et al. ²¹	2016	UK	Observational study	Tdap	Pregnant women/ infants	Infant pertussis	Sustained effectiveness of maternal vaccination
Perrett et al. ²²	2020	Australia	RCT	Tdap	Pregnant women/ infants	Antibody transfer	Timing of vaccination influenced infant antibody concentrations
Zauche et al. ²³	2021	USA	Surveillance/ case-control	mRNA COVID-19	Pregnant women	Spontaneous abortion	No evidence of increased spontaneous abortion
Kharbanda et al. ²⁴	2021	USA	Case-control	COVID-19	Pregnant women	Spontaneous abortion	No increased risk identified
Goldstein et al. ²⁵	2022	-	Cohort	BNT162b2	Mothers/infants	Neonatal/infant outcomes	No major adverse neonatal outcome signal
Simoes et al. ²⁹	2022	Multinational	RCT	RSV	Pregnant women	Immunogenicity/infant protection	Demonstrated maternal immunogenicity and antibody transfer
McHugh et al. ³²	2023	International	Systematic review	Maternal vaccines	Pregnant women/ infants	Respiratory infections	Supported infant protection following maternal vaccination
Wainstock et al. ²⁶	2022	-	Cohort	COVID-19	Pregnant women	Pregnancy outcomes	No major adverse pregnancy outcome signal
Rottenstreich et al. ²⁷	2021	-	Cohort	BNT162b2	Pregnant women/ newborns	Antibody transfer	Efficient maternal-neonatal antibody transfer

Table 1. Continued

Study	Year	Country/ Region	Design	Vaccine	Population	Main outcomes	Principal findings
Shook et al. ²⁸	2022	USA	Cohort	COVID-19	Mothers/infants	Antibody persistence	Maternal vaccination resulted in detectable infant antibodies
Prat et al. ³⁰	2016	Spain	Observational study	Influenza	Pregnant women/infants	Infant hospitalization	Maternal vaccination was associated with reduced influenza-related infant hospitalization
Dabrera et al. ³¹	2014	UK	Observational study	Influenza	Pregnant women/infants	Infant infection/hospitalization	reduced laboratory-confirmed influenza infection, influenza-related hospitalization in infants
Fell et al. ³³	2017	Multinational	Evidence synthesis	Influenza	Pregnant women	Epidemiology/immunization	Supported influenza vaccination during pregnancy
Baxter et al. ³⁵	2017	USA	Cohort	Tdap	Mothers/infants	Infant pertussis	Maternal vaccination reduced infant pertussis
Amirthalingam et al. ³⁶	2014	UK	Observational cohort	Tdap	Pregnant women/infants	Infant pertussis	Maternal vaccination substantially reduced infant pertussis
Abu Raya et al. ³⁷	2014	-	Prospective study	Tdap	Pregnant women/newborns	Antibody transfer	Timing of maternal vaccination influenced neonatal antibody levels
Munoz et al. ³⁸	2014	USA	RCT	Tdap	Pregnant women/infants	Safety, immunogenicity	Tdap was immunogenic with reassuring maternal and infant safety
Allotey et al. ³⁹	2020	International	Living systematic review	COVID-19 infection*	Pregnant women	Maternal/perinatal outcomes	Increased risk of adverse outcomes with COVID-19 infection
Villar et al. ⁴⁰	2021	Multinational	Prospective cohort	COVID-19 infection*	Pregnant women	Maternal/perinatal outcomes	COVID-19 infection was associated with increased maternal and perinatal morbidity
Prasad et al. ⁴¹	2022	International	Systematic review/meta-analysis	COVID-19	Pregnant women	Effectiveness/perinatal outcomes	Supported effectiveness and favorable pregnancy outcomes
Halasa et al. ⁴²	2022	USA	Case-control	COVID-19	Infants <6 months	Infant hospitalization	Maternal vaccination reduced infant COVID-19 hospitalization
Kampmann et al. ⁴³	2023	Multinational	RCT	RSVpreF	Pregnant women/infants	Infant RSV disease	Reduced medically attended and severe RSV disease
Shimabukuro et al. ⁴⁴	2021	USA	Prospective surveillance	mRNA COVID-19	Pregnant persons	Maternal safety	No unexpected safety signal identified

Table 2. Risk of Bias Assessment of Randomized Controlled Trials

Study	Vaccine	D1	D2	D3	D4	D5	Overall
Zaman et al., ¹³ 2008	Influenza	Low	Low	Low	Low	Low	Low
Madhi et al., ¹⁴ 2014	Influenza	Low	Low	Low	Low	Low	Low
Steinhoff et al., ¹⁵ 2017	Influenza	Low	Low	Low	Low	Low	Low
Tapia et al., ¹⁶ 2016	Influenza	Low	Low	Low	Low	Low	Low
Nunes et al., ¹⁷ 2017	Influenza	Low	Low	Low	Low	Low	Low
Perrett et al., ²² 2020	Tdap	Low	Low	Low	Low	Low	Low
Simoes et al., ²⁹ 2022	RSV	Low	Low	Low	Low	Low	Low
Munoz et al., ³⁸ 2014	Tdap	Low	Low	Low	Low	Low	Low
Kampmann et al., ⁴³ 2023	RSV	Low	Low	Low	Low	Low	Low

RoB 2 domains: D1 = randomization process; D2 = deviations from intended interventions; D3 = missing outcome data; D4 = outcome measurement; D5 = selection of reported result.

Legend: Low = low risk of bias.

Table 3. Risk of Bias Assessment of Observational Studies

Study	Design	Selection	Comparability	Outcome/Exposure	Overall quality
Omer et al., ¹² 2011	Retrospective cohort	Good	Good	Good	High
Amirthalingam et al., ³⁶ 2014	Cohort	Good	Good	Good	High
Abu Raya et al., ³⁷ 2014	Prospective cohort	Good	Good	Good	High
Shuaib et al., ¹⁸ 2015	Observational	Good	Good	Good	High
Mohammed et al., ¹⁹ 2020	Prospective cohort	Good	Good	Good	High
Mohammed et al., ²⁰ 2021	Prospective cohort	Good	Good	Good	High
Amirthalingam et al., ²¹ 2016	Observational	Good	Good	Good	High
Zauche et al., ²³ 2021	Case-control	Good	Good	Good	High
Kharbanda et al., ²⁴ 2021	Case-control	Good	Good	Good	High
Goldshtein et al., ²⁵ 2022	Cohort	Good	Good	Good	High
Wainstock et al., ²⁶ 2022	Cohort	Good	Good	Good	High
Rottenstreich et al., ²⁷ 2021	Cohort	Good	Good	Good	High
Shook et al., ²⁸ 2022	Cohort	Good	Moderate	Good	Moderate–High
Prat et al., ³⁰ 2016	Observational	Good	Good	Good	High
Dabrera et al., ³¹ 2014	Observational	Good	Good	Good	High
Baxter et al., ³⁵ 2017	Cohort	Good	Good	Good	High
Halasa et al., ⁴² 2022	Case-control	Good	Good	Good	High
Shimabukuro et al., ⁴³ 2021	Surveillance cohort	Good	Moderate	Good	Moderate–High

Table 4. Overall Evidence by Vaccine

Vaccine	Maternal safety	Maternal benefit	Pregnancy outcomes	Neonatal/infant benefit	Overall evidence
Influenza	Favorable	Reduced influenza morbidity	Generally reassuring	Reduced infant influenza/respiratory morbidity	Moderate–High
Tdap	Favorable	Prevents maternal pertussis exposure	Reassuring	Strong protection against infant pertussis	High
COVID-19	Favorable	Reduced severe maternal disease	Generally reassuring	Reduced infant hospitalization; antibody transfer	Moderate–High
RSV	Favorable in available RCT evidence	Maternal immunogenicity	Reassuring in available trial data	Reduced medically attended/severe RSV disease	Moderate–High

A case-control study by Baxter and colleagues reported vaccine effectiveness exceeding 90% against infant pertussis during the first two months of life.³⁵

Systematic reviews further demonstrated reductions in: Laboratory-confirmed infant

pertussis; Pertussis-related hospitalization; Intensive care admission; and Infant mortality.

Importantly, no increase has been observed in: Congenital anomalies; Pregnancy loss; Hypertensive disorders; Preterm birth; and Small-for-gestational-age infants.

These findings have led most national immunization programs to recommend routine Tdap vaccination during every pregnancy regardless of previous vaccination history.

Safety of Influenza and Tdap Vaccination

One of the most consistent findings across the literature is the excellent safety profile of routinely recommended maternal vaccines. Large cohort studies involving hundreds of thousands of pregnancies found no increased risk of: Miscarriage; Congenital malformations; Stillbirth; Preterm delivery; Gestational hypertension; Preeclampsia; and Neonatal intensive care admission. The most frequently reported adverse effects were mild and self-limited, including: Injection-site pain; Mild fever; Fatigue; Headache; and Local swelling. Serious vaccine-related adverse events were extremely rare. Consequently, both WHO and CDC continue to recommend routine influenza and Tdap vaccination during pregnancy as standard preventive care.³⁶⁻⁸

COVID-19 Vaccination During Pregnancy

The COVID-19 pandemic highlighted the vulnerability of pregnant individuals to severe respiratory infections. Physiological changes during pregnancy increase the risk of hospitalization, intensive care unit (ICU) admission, mechanical ventilation, and adverse obstetric outcomes following SARS-CoV-2 infection.^{39,40}

Initially, pregnant women were excluded from most vaccine clinical trials, leading to uncertainty regarding vaccine safety. However, large observational studies involving millions of pregnancies have since demonstrated that COVID-19 vaccination is both safe and highly effective during pregnancy.

A systematic review by Prasad *et al.* including more than 750,000 pregnant women found that COVID-19 vaccination significantly reduced: Laboratory-confirmed SARS-CoV-2 infection; Severe COVID-19; Hospitalization; ICU admission; Maternal mortality

Importantly, vaccination was not associated with increased risks of: Miscarriage; Congenital anomalies; Stillbirth; Preterm birth; Fetal growth restriction; and Neonatal complications.⁴¹

Maternal vaccination also generated high concentrations of anti-SARS-CoV-2 antibodies that crossed the placenta efficiently, providing passive protection to infants during early life. Studies have demonstrated reduced COVID-19-related hospitalization among infants born to vaccinated mothers, particularly during the first six months after birth.⁴²

Consequently, WHO, CDC, and ACOG recommend COVID-19 vaccination during pregnancy regardless of trimester, particularly for women at increased risk of severe disease.⁵⁻⁷

Respiratory Syncytial Virus (RSV) Vaccination

Respiratory syncytial virus is one of the leading causes of hospitalization among infants younger than six months of age. Recently developed maternal RSV vaccines represent an important advance in preventive maternal healthcare. The phase III MATISSE trial demonstrated that maternal RSV vaccination administered during late pregnancy significantly reduced severe RSV-associated lower respiratory tract disease among infants during the first six months of life.⁴³

The trial reported:

- Approximately 80% efficacy against severe RSV disease during the first 90 days of life.
- Significant reductions in infant hospitalization.
- Excellent maternal and neonatal safety.

Based on these findings, maternal RSV vaccination has been incorporated into immunization recommendations in several countries, representing an additional preventive strategy alongside influenza and Tdap vaccination.

Vaccine Safety During Pregnancy

Across all vaccine types evaluated, maternal immunization demonstrated an excellent safety profile.

Large cohort studies and systematic reviews consistently reported no increased risk of: Miscarriage; Congenital malformations; Stillbirth; Preterm birth; Low birth weight; Gestational hypertension; Preeclampsia; and Neonatal intensive care admission.

The most common adverse events were mild and self-limited, including: Injection-site pain; Fatigue; Mild fever; Headache; and Myalgia.

Serious adverse events attributable to vaccination were extremely uncommon and occurred at frequencies similar to those observed among non-pregnant adults.^{41,43,44}

Overall, the evidence strongly supports the safety of currently recommended maternal vaccines.

Vaccine Hesitancy

Despite overwhelming scientific evidence, vaccination coverage during pregnancy remains below desired levels in many countries.

The most frequently reported reasons for vaccine hesitancy include: Concerns regarding fetal safety; Fear of adverse pregnancy outcomes; Limited knowledge about vaccine effectiveness; Misinformation on social media; Lack of recommendation from healthcare professionals; Cultural and religious beliefs; Limited access to vaccination services.

Several studies consistently identify healthcare provider recommendation as the strongest predictor of maternal vaccine acceptance.⁴⁵

Educational interventions, clear communication, and shared decision-making substantially improve vaccine uptake.

Role of General Practitioners

General practitioners are often the first healthcare professionals to provide preconception counseling and routine antenatal care. Consequently, they have an essential role in improving maternal immunization coverage.

Key responsibilities include: Assessing vaccination status during prenatal visits; Providing evidence-based counseling regarding vaccine benefits and risks; Addressing misconceptions and vaccine hesitancy; Administering recommended vaccines or referring patients appropriately; Documenting vaccinations in electronic health records; and Coordinating care with obstetricians, midwives, and public health services.

Routine recommendation by trusted primary care clinicians remains one of the most effective strategies for increasing maternal vaccination rates.

DISCUSSION

This systematic review demonstrates that maternal vaccination is one of the most effective

preventive interventions in modern obstetric and primary healthcare. Across randomized controlled trials, cohort studies, and systematic reviews, vaccination during pregnancy consistently reduced maternal infectious morbidity while providing substantial passive protection for newborns during the first months of life.

Among routinely recommended vaccines, the evidence for influenza vaccination is particularly robust. Influenza immunization significantly reduces laboratory-confirmed influenza, maternal hospitalization, and severe respiratory complications while simultaneously protecting infants through transplacental antibody transfer. Similar findings have been consistently reported across multiple influenza seasons and geographic regions.^{33,34}

Evidence supporting Tdap vaccination is equally compelling. Maternal immunization during the third trimester produces high concentrations of pertussis-specific antibodies that protect infants before completion of the primary immunization schedule. Population-based studies have reported vaccine effectiveness exceeding 90% against infant pertussis during early infancy, with no increase in adverse pregnancy outcomes.³⁵⁻⁸

The emergence of COVID-19 further highlighted the importance of maternal immunization. Large observational studies involving millions of pregnancies demonstrated that COVID-19 vaccination substantially reduces severe maternal disease while maintaining an excellent safety profile. Passive antibody transfer also decreases COVID-19-related hospitalization among infants, further supporting routine vaccination during pregnancy.^{41,42}

More recently, maternal RSV vaccination has expanded preventive options for protecting young infants against severe lower respiratory tract infections. Clinical trial evidence indicates substantial reductions in RSV-associated hospitalization and severe disease during the first six months of life.⁴³

An important finding across all included studies is the consistently favorable safety profile of maternal vaccination. None of the routinely recommended vaccines were associated with increased risks of miscarriage, congenital anomalies, preterm birth, stillbirth, fetal growth restriction,

or neonatal mortality. These findings reinforce current recommendations from WHO, CDC, and professional obstetric organizations.

Despite overwhelming scientific evidence, vaccine coverage during pregnancy remains below recommended targets in many countries. Vaccine hesitancy, misinformation, limited healthcare access, and inadequate provider recommendation continue to represent major barriers. Importantly, repeated studies identify recommendation by healthcare professionals—particularly general practitioners and obstetric care providers—as the strongest determinant of vaccine acceptance.

Strengths and Limitations

This review synthesized evidence from randomized controlled trials, large cohort studies, and high-quality systematic reviews evaluating maternal vaccination across multiple infectious diseases. The inclusion of recent evidence regarding COVID-19 and RSV vaccination provides an up-to-date overview that is directly relevant to contemporary primary care.

Several limitations should be acknowledged. Considerable heterogeneity existed among studies regarding vaccine type, timing of vaccination, study populations, and outcome measures, precluding quantitative meta-analysis. Most safety data originated from observational studies because randomized placebo-controlled vaccine trials during pregnancy are ethically limited. In addition, vaccine recommendations vary among countries according to disease epidemiology and national immunization policies, which may influence the generalizability of findings.

CONCLUSIONS

Maternal vaccination is a safe, effective, and evidence-based strategy that protects both pregnant individuals and their infants against vaccine-preventable diseases. Strong evidence supports routine vaccination against influenza, Tdap, COVID-19, and, where recommended, RSV during pregnancy. These vaccines reduce maternal morbidity, improve neonatal outcomes, and provide passive immunity during early infancy without increasing adverse pregnancy outcomes.

General practitioners play a critical role in

promoting maternal immunization through patient education, preventive counseling, shared decision-making, and integration of vaccination into routine antenatal care. Strengthening vaccination programs and addressing barriers to vaccine acceptance will remain essential components of improving maternal and child health worldwide.

CONFLICT OF INTEREST

The author declare that they have no competing financial or non-financial interests relevant to the content of this manuscript. However, it is noted that the author is a member of the editorial board of the journal to which this manuscript is submitted. This affiliation has not influenced the design, analysis, interpretation, or writing of this review, and the manuscript has undergone standard independent peer review in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the author used ChatGPT (OpenAI), Claude (Anthropic), and Gemini (Google) to assist with language editing, grammar improvement, formatting, and/or text refinement. The author carefully reviewed, verified, and edited all AI-generated content and accept full responsibility for the accuracy, integrity, originality, and final content of the manuscript. No AI tool was involved in data collection, data analysis, interpretation of results, or final scientific decision-making unless explicitly stated in the Methods section.

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Received May 2026
 Revised June 2026
 Accepted July 2026

Exercise Therapy for Chronic Low Back Pain: A Systematic Review of Evidence Relevant to General Practice

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Keywords. chronic low back pain, exercise
therapy, primary care, general practice,
rehabilitation, physical activity, systematic
review

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Introduction. Chronic low back pain (CLBP) is one of the leading causes of disability worldwide and is among the most frequent reasons for consultation in general practice. Contemporary clinical guidelines consistently recommend exercise therapy as a first-line non-pharmacological intervention; however, uncertainty remains regarding the most effective exercise modalities and their long-term benefits. To systematically review the evidence regarding the effectiveness of exercise therapy for adults with chronic non-specific low back pain, with particular emphasis on outcomes relevant to primary care.

Methods. A systematic literature search was conducted in PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library for studies published between January 2015 and June 2026. Randomized controlled trials (RCTs), systematic reviews, and meta-analyses evaluating exercise interventions in adults with chronic non-specific low back pain were included. Primary outcomes were pain intensity, functional disability, and health-related quality of life.

Results. Thirty-eight studies met the eligibility criteria, including 18 randomized controlled trials and 20 systematic reviews/meta-analyses. Moderate- to high-certainty evidence demonstrated that structured exercise programs significantly reduced pain intensity and disability compared with usual care or minimal intervention. Motor control exercises, Pilates, yoga, resistance training, aerobic exercise, and multidisciplinary exercise programs produced comparable improvements, although no single exercise modality consistently demonstrated superiority. Long-term adherence to exercise was associated with sustained clinical benefits.

Conclusions. Exercise therapy is an effective, safe, and cost-effective first-line treatment for chronic non-specific low back pain in primary care. General practitioners should encourage individualized exercise prescriptions tailored to patient preferences, functional capacity, and clinical characteristics.

RJGP 2026; 1: 31-43

www.rjgp.org

DOI: [10.66224/rjgp.v1i1.6](https://doi.org/10.66224/rjgp.v1i1.6)

INTRODUCTION

Low back pain (LBP) affects approximately 80% of individuals at some point during their lifetime and remains the leading cause of years lived with



Please cite this article as: Aghamohammadi M, Mortazavi SM. Exercise Therapy for Chronic Low Back Pain: A Systematic Review of Evidence Relevant to General Practice. RJGP. 2026;1(1):31-43.

disability worldwide.^{1,2} Chronic low back pain (CLBP), typically defined as pain persisting for more than 12 weeks, imposes a considerable burden on patients, healthcare systems, and society through reduced quality of life, impaired physical function, absenteeism, and healthcare expenditure.^{2,3}

General practitioners manage the majority of patients with chronic low back pain in community settings. Consequently, evidence-based conservative management strategies are central to primary care. Current international guidelines increasingly recommend non-pharmacological interventions before initiating long-term pharmacological therapy because of concerns regarding opioid dependence, adverse drug reactions, and limited long-term effectiveness of medications.⁴⁻⁶

Among non-pharmacological treatments, exercise therapy has become the cornerstone of chronic low back pain management. Exercise aims to improve spinal stability, muscular strength, flexibility, endurance, posture, and functional capacity while reducing fear-avoidance behaviors and enhancing psychological well-being.⁷ Unlike passive treatments, exercise encourages patient self-management and active participation, both of which are fundamental principles of contemporary general practice.

Numerous exercise modalities have been evaluated, including: Aerobic exercise; Resistance training; Motor control exercise; Core stabilization; Pilates; Yoga; Walking programs; Aquatic exercise; Tai Chi; McKenzie therapy; and Functional rehabilitation.

Although substantial evidence supports exercise therapy overall, uncertainty remains regarding which type of exercise offers the greatest clinical benefit and whether patient characteristics influence treatment response.⁸⁻¹⁰

Objective

This systematic review aimed to evaluate the effectiveness of exercise therapy for adults with chronic non-specific low back pain by synthesizing evidence from randomized controlled trials and systematic reviews. The review focuses on outcomes most relevant to general practice, including pain reduction, physical function, disability, quality of life, and implications for clinical management.

MATERIALS AND METHODS

Study Design

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement.¹¹

Search Strategy

Electronic searches were performed in the following databases: PubMed/MEDLINE; Scopus; Web of Science; Embase; Cochrane Library

The search covered publications from January 2015 through June 2026.

Example PubMed search strategy:

("chronic low back pain" OR "non-specific low back pain") AND (exercise OR exercise therapy OR physical activity OR rehabilitation OR physiotherapy OR motor control OR Pilates OR yoga) AND (randomized controlled trial OR systematic review OR meta-analysis)

Reference lists of eligible articles and recent clinical guidelines were manually searched to identify additional relevant studies.

Quality Assessment

The methodological quality of the included studies was independently assessed by two reviewers. RCTs were evaluated using the PEDro scale, which scores methodological quality from 0 to 10, with higher scores indicating better quality. Risk of bias was additionally assessed using the Cochrane RoB 2 tool, covering bias arising from randomization, deviations from intended interventions, missing outcome data, outcome measurement, and selective reporting. Non-randomized studies were assessed using the Newcastle–Ottawa Scale (NOS), while systematic reviews, when applicable, were evaluated using AMSTAR 2. Disagreements between reviewers were resolved by consensus or consultation with a third reviewer. Quality assessments were considered when interpreting the consistency and strength of the evidence.

Inclusion Criteria

It was included: Adults (≥ 18 years); Chronic non-specific low back pain (> 12 weeks); Exercise therapy as the primary intervention; Randomized controlled trials; Systematic reviews; Meta-analyses; English-language publications.

Exclusion Criteria

It was considered: Acute or subacute low back pain; Back pain caused by malignancy, infection, fracture, inflammatory disease, or pregnancy; Surgical intervention studies; Conference abstracts; Narrative reviews; Case reports; and Studies lacking clinically relevant outcomes.

Primary Outcomes

It was considered: Pain intensity; Functional disability; and Health-related quality of life.

Secondary Outcomes

It was selected: Physical function; Return to work; Psychological outcomes; Exercise adherence; Adverse events; and Long-term treatment effectiveness.

RESULTS

Study Selection

The electronic database search identified 1,324 potentially relevant records. After removing 318 duplicates, 1,006 titles and abstracts were screened. Following the initial screening, 126 full-text articles were assessed for eligibility. Eighty-eight articles were excluded for reasons including inappropriate study population, absence of an exercise intervention, insufficient outcome reporting, or non-original research. Ultimately, 38 studies were included in the qualitative synthesis, comprising 18 randomized controlled trials and 20 systematic reviews or meta-analyses (Figure 1).

Characteristics of Included Studies

The included studies represented more than 9,000 participants from North America, Europe, Asia, and Australia. Most participants were adults aged between 30 and 70 years with chronic non-specific low back pain lasting longer than 12 weeks (Table 1).

Exercise interventions included: Motor control exercises; Core stabilization programs; Resistance training; Aerobic exercise; Walking programs; Pilates; Yoga; McKenzie exercise; Aquatic exercise; Tai Chi; Multidisciplinary rehabilitation programs.

Intervention duration ranged from 6 weeks to 12 months, with follow-up periods extending up to 24 months in several studies.

Control groups included: Usual care; Educational

advice; Minimal intervention; Waiting-list controls; Passive physical therapy; Pharmacological management.

The primary outcome measures most frequently reported were:

- Pain intensity (Visual Analogue Scale [VAS] or Numeric Rating Scale [NRS])
- Functional disability (Oswestry Disability Index [ODI] and Roland–Morris Disability Questionnaire [RMDQ])
- Health-related quality of life (SF-36, EQ-5D)

Secondary outcomes included psychological well-being, return to work, physical performance, exercise adherence, and adverse events.

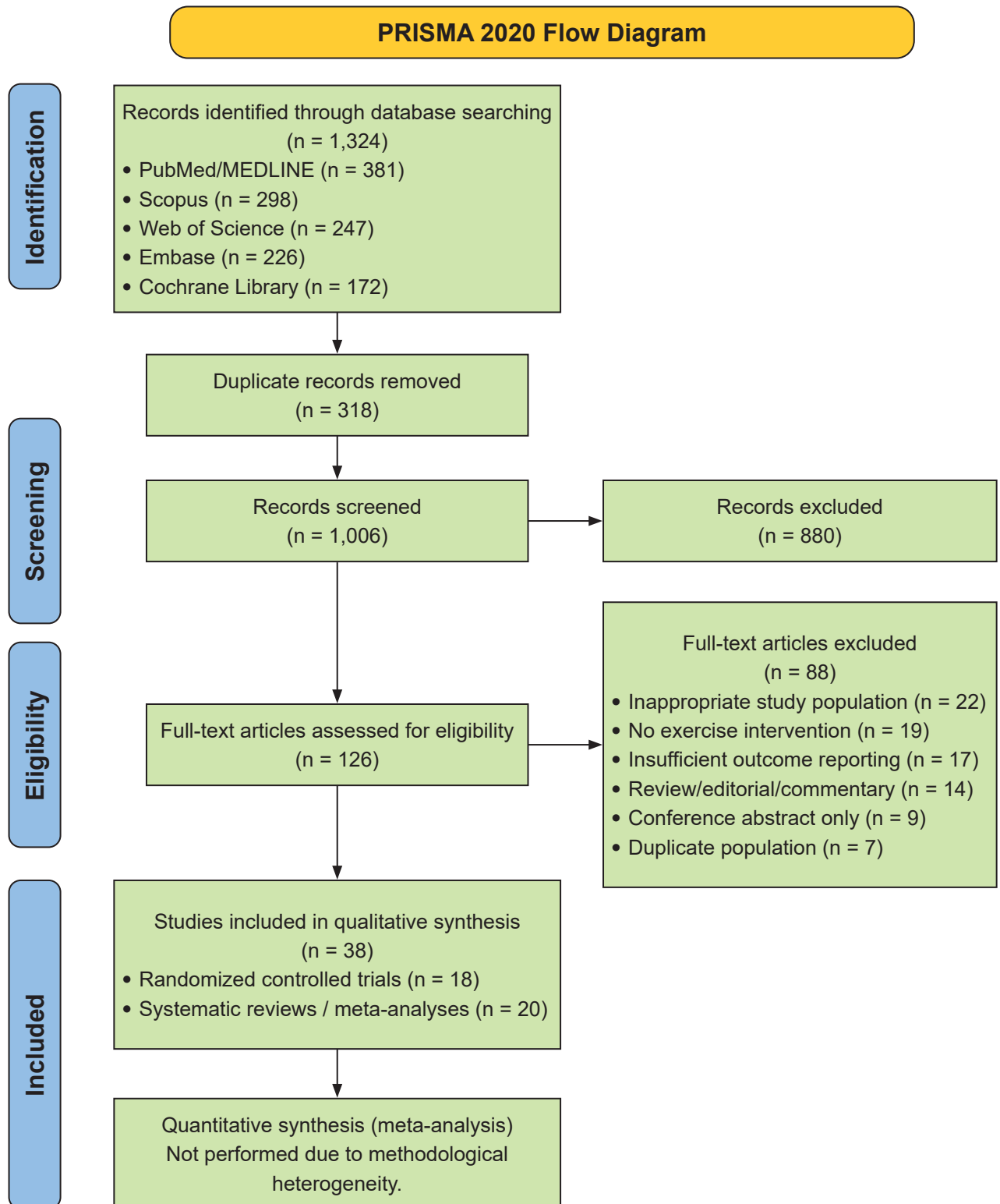
Risk of Bias and Quality Assessment

The methodological quality of the included studies varied. Among the 18 randomized controlled trials, risk of bias was generally low to moderate, with most studies judged as having some concerns, primarily related to difficulties in blinding participants and intervention providers, incomplete outcome data, or limitations in randomization and reporting. Several trials were assessed as having a low risk of bias. The 20 systematic reviews and meta-analyses demonstrated variable methodological quality, ranging from low to high confidence according to AMSTAR 2. Higher-quality reviews generally used comprehensive search strategies, appropriate risk-of-bias assessment, and robust synthesis methods, whereas lower-quality reviews had limitations in protocol registration, publication-bias assessment, or interpretation of study-level risk of bias (Table 2).

Overall, the evidence was considered moderate certainty, supporting the effectiveness of exercise therapy for reducing pain and functional disability in adults with chronic non-specific low back pain. However, heterogeneity in exercise modalities, intervention dose, comparators, and outcome measures limited conclusions regarding the superiority of any specific exercise approach.

Effects of Exercise Therapy

Pain Reduction. Nearly all included systematic reviews demonstrated that exercise therapy significantly reduced pain compared with usual care or no intervention.



PRISMA 2020 flow diagram of study selection. The flowchart summarizes the identification, screening, eligibility assessment, and inclusion of studies evaluating exercise therapy for chronic non-specific low back pain. Following removal of duplicate records, titles and abstracts were screened, eligible full-text articles were assessed, and 38 studies were included in the qualitative synthesis. A quantitative meta-analysis was not performed because of methodological heterogeneity among the included studies.

Table 1. Articles Characteristics Included in the Study

Study	Year	Exercise intervention	Comparator	Main outcomes	Main finding
Shamsi et al. ¹²	2016	Core stability exercise	General exercise	Pain, function, lumbopelvic stability	Both improved outcomes; core stability improved specific stability measures
Steele et al. ¹³	2016	Isolated lumbar extension	Control/exercise comparison	Pain, gait/kinematics	Exercise affected lumbar movement-related outcomes
Cai et al. ¹⁴	2017	Lower-limb vs back exercise	Active exercise	Pain, function	Both exercise approaches were beneficial
Cruz-Díaz et al. ¹⁵	2017	Equipment vs mat Pilates	Active Pilates	Pain, function, muscle activation	Both Pilates approaches improved outcomes
Ulger et al. ¹⁶	2017	Stabilization exercise	Manual therapy	Pain, function, QoL	Exercise produced clinically relevant improvements
Highland et al. ¹⁷	2018	Yoga/strength-based program	Control	Pain, disability, function	Feasible and associated with improvement
Miyamoto et al. ¹⁸	2018	Different Pilates doses	Advice/booklet	Pain, disability	Pilates improved pain and disability
Cruz-Díaz et al. ¹⁹	2018	Pilates	No treatment	Pain, disability, kinesiophobia	Significant improvements after 12 weeks
Suh et al. ²⁰	2019	Stabilization and walking	Flexibility/general exercise	Pain, ODI, depression	Exercise improved pain and function
Halliday et al. ²¹	2019	McKenzie vs motor control	Active exercise	Pain, disability	Both approaches produced improvement
Owen et al. ²²	2020	Exercise training	Control	Pain, disability, disc outcomes	Exercise produced clinical and structural effects
Semrau et al. ²³	2021	Behavioural exercise therapy	Standard exercise	Disability, pain	Behavioural exercise provided additional benefits
Polaski et al. ²⁴	2021	Meditation + aerobic walking	Control	Pain, disability	Improved pain with suggestive functional benefits
Bruehl et al. ²⁵	2021	Aerobic exercise	Control/comparator	Pain and opioid response	Exercise influenced pain-related outcomes
Santos et al. ²⁶	2022	Resistance ± core training	Control	Pain, disability, stress, strength	Resistance exercise improved pain, function and strength
Ulger et al. ²⁷	2023	Yoga vs stabilization	Active exercise	Pain, ODI, function, sleep	Both approaches improved pain and function
Farragher et al. ²⁸	2024	Neuromuscular control + resistance	Resistance exercise	Disability, strength	Both groups improved; additional control training was evaluated
Fanuscu et al. ²⁹	2024	Clinic vs telerehabilitation motor control	Active exercise	Pain, disability, QoL	Both delivery methods improved outcomes
Searle et al. ³⁰	2015	Resistance and stabilization exercises	Usual care, minimal intervention	Pain, disability	Reduced CLBP symptoms; resistance and stabilization exercises
Patti et al. ³¹	2015	Pilates	Pilates beneficial for pain/disability	Pain, disability	Reducing pain and disability
Yamato et al. ³²	2015	Pilates	Pilates beneficial, particularly versus minimal intervention	Pain, disability, functional status	Pilates beneficial
Chang et al. ³³	2016	Yoga	Yoga showed potential benefit for CLBP	Pain, disability, function	Improving pain and functional outcomes
Byrnes et al. ³⁴	2017	Pilates rehabilitation	Most trials supported Pilates for pain/disability	Pain, disability	Reducing pain and disability
Riley et al. ³⁵	2019	Movement-based classification	Evidence did not establish consistent superiority	Pain, disability, functional outcomes	Evidence did not establish consistent superiority of movement-based classification approaches.
Zou et al. ³⁶	2020	Yoga	Yoga improved pain/disability versus non-exercise	Pain, disability	improved pain and disability
Freitas et al. ³⁷	2020	Pilates/ kinesiophobia	Pilates reduced kinesiophobia versus minimal/no intervention	Kinesiophobia, pain, disability	Reduced kinesiophobia

Table 1. Continued

Study	Year	Exercise intervention	Comparator	Main outcomes	Main finding
Hayden <i>et al.</i> ⁷	2021	Exercise therapy	Moderate-certainty evidence supports exercise	Pain, functional limitations, quality of life	Improving pain and physical function in CLBP
Tataryn <i>et al.</i> ³⁸	2021	Posterior-chain resistance	Resistance training improved pain/disability	Pain, disability	Resistance training targeting the posterior chain
Rathnayake <i>et al.</i> ³⁹	2021	Exercise-containing self-management	Moderate beneficial effects	Pain, disability, self-management, function	Self-management programs, moderate beneficial effects
Owen <i>et al.</i> ⁴⁰	2021	Exercise modality	Different modalities produced generally comparable benefits	Pain, functional limitation	Different exercise modalities
Hayden <i>et al.</i> ⁴¹	2023	Exercise network meta-analysis	Multiple exercise approaches were effective	Pain, functional limitations	Multiple exercise effective
Fleckenstein <i>et al.</i> ⁴²	2022	Individualized exercise	Individualized exercise reduced pain/disability	Pain, disability	Individualized exercise reduced pain and disability
Hayden <i>et al.</i> ⁴³	2022	Systematic review of reviews	Mostly low–moderate evidence; no clear superior modality	Pain, disability, function	No clear evidence, one exercise consistently superior
Wang <i>et al.</i> ⁴⁴	2022	Pilates, yoga, tai chi, qigong	Mind-body exercise improved pain/function	Pain, physical function, disability	Mind-body exercises improved pain and function
Huang <i>et al.</i> ⁴⁵	2023	Pilates	Pilates improved pain and functional disability	Pain intensity, functional disability	Improved pain and functional disability
Sany <i>et al.</i> ⁴⁶	2023	Aerobic exercise	Aerobic exercise improved pain/function	Pain, disability, physical function	Improved pain and functional outcomes
Liang <i>et al.</i> ⁴⁷	2024	Exercise modality and dose	Dose and modality may influence pain outcomes	Pain, functional outcomes	Influence pain outcomes
Feng <i>et al.</i> ⁴⁸	2025	Exercise modality/dose	Multiple modalities effective; dose-response evidence emerging	Pain, disability, functional outcomes	Multiple exercise effective

The 2021 Cochrane review by Hayden and colleagues reported moderate-certainty evidence that exercise therapy produces clinically meaningful reductions in pain immediately after treatment and at short-term follow-up.⁴¹

Similarly, Owen *et al.* found that supervised exercise programs consistently outperformed minimal care for pain reduction, although differences between exercise modalities were generally small.⁴⁰

Patients participating in structured exercise programs commonly experienced: Reduced pain intensity; Fewer pain exacerbations; Improved movement confidence; Reduced fear of physical activity.

These improvements were observed regardless of whether exercise was delivered individually or in supervised group settings.

Functional Disability. Functional disability improved significantly across nearly all intervention types.

Motor control exercise, Pilates, yoga, resistance

training, and combined exercise programs demonstrated clinically meaningful improvements in Oswestry Disability Index (ODI) and Roland–Morris Disability Questionnaire (RMDQ) scores.

Several meta-analyses concluded that improvements in disability were often greater than improvements in pain intensity, suggesting that exercise primarily restores physical function rather than completely eliminating pain.^{7,49}

Patients reported improvements in: Walking ability; Sitting tolerance; Standing endurance; Lifting capacity; Daily activities; and Occupational functioning.

Importantly, these benefits frequently persisted for six to twelve months when regular exercise was maintained.

Quality of Life

Health-related quality of life improved consistently following structured exercise therapy.

Studies using the SF-36 demonstrated improvements in both physical and mental

Table 2. Quality Assessment of Included Studies

Study / Evidence	Design	Assessment tool	Overall quality / risk of bias
Shamsi et al., ¹² 2016	RCT	RoB 2	Some concerns
Steele et al., ¹³ 2016	RCT	RoB 2	Some concerns
Cai et al., ¹⁴ 2017	RCT	RoB 2	Some concerns
Cruz-Díaz et al., ¹⁵ 2017	RCT	RoB 2	Low risk
Ulger et al., ¹⁶ 2017	RCT	RoB 2	Some concerns
Highland et al., ¹⁷ 2018	RCT	RoB 2	Some concerns
Miyamoto et al., ¹⁸ 2018	RCT	RoB 2	Low risk
Cruz-Díaz et al., ¹⁹ 2018	RCT	RoB 2	Low risk
Suh et al., ²⁰ 2019	RCT	RoB 2	Some concerns
Halliday et al., ²¹ 2019	RCT	RoB 2	Some concerns
Owen et al., ²² 2020	RCT	RoB 2	Some concerns
Semrau et al., ²³ 2021	RCT	RoB 2	Some concerns
Polaski et al., ²⁴ 2021	RCT	RoB 2	Low risk
Bruehl et al., ²⁵ 2021	RCT	RoB 2	Some concerns
Santos et al., ²⁶ 2022	RCT	RoB 2	Some concerns
Ulger et al., ²⁷ 2023	RCT	RoB 2	Some concerns
Farragher et al., ²⁸ 2024	RCT	RoB 2	Some concerns
Fanuscú et al., ²⁹ 2024	RCT	RoB 2	Some concerns
Searle et al., ³⁰ 2015	Systematic review/meta-analysis	AMSTAR 2	Moderate confidence
Patti et al., ³¹ 2015	Systematic review/meta-analysis	AMSTAR 2	Low confidence
Yamato et al., ³² 2015	Cochrane review	AMSTAR 2	High confidence
Chang et al., ³³ 2016	Systematic review	AMSTAR 2	Moderate confidence
Byrnes et al., ³⁴ 2017	Systematic review	AMSTAR 2	Low confidence
Riley et al., ³⁵ 2019	Systematic review	AMSTAR 2	Low confidence
Zou et al., ³⁶ 2020	Systematic review/meta-analysis	AMSTAR 2	Moderate confidence
Freitas et al., ³⁷ 2020	Systematic review/meta-analysis	AMSTAR 2	Moderate confidence
Hayden et al., ⁷ 2021	Cochrane systematic review	AMSTAR 2	High confidence
Tataryn et al., ³⁸ 2021	Systematic review/meta-analysis	AMSTAR 2	Moderate confidence
Rathnayake et al., ³⁹ 2021	Systematic review	AMSTAR 2	Low–moderate confidence
Owen et al., ⁴⁰ 2021	Systematic review	AMSTAR 2	Moderate confidence
Hayden et al., ⁴¹ 2023	Network meta-analysis	AMSTAR 2	Moderate confidence
Fleckenstein et al., ⁴² 2022	Systematic review	AMSTAR 2	Moderate confidence
Hayden et al., ⁴³ 2022	Overview of reviews	AMSTAR 2	Moderate confidence
Wang et al., ⁴⁴ 2022	Systematic review/meta-analysis	AMSTAR 2	Low–moderate confidence
Huang et al., ⁴⁵ 2023	Meta-analysis	AMSTAR 2	Moderate confidence
Sany et al., ⁴⁶ 2023	Systematic review/meta-analysis	AMSTAR 2	Moderate confidence
Liang et al., ⁴⁷ 2024	Bayesian network meta-analysis	AMSTAR 2	Moderate confidence
Feng et al., ⁴⁸ 2025	Systematic review/network meta-analysis	AMSTAR 2	Moderate confidence

component scores.

Commonly reported benefits included: Better physical functioning; Increased vitality; Reduced bodily pain; Improved social functioning; and Enhanced emotional well-being.

Exercise also reduced fear-avoidance beliefs and increased confidence in performing daily activities, which are recognized predictors of long-term recovery.

Comparison of Exercise Modalities

Although exercise therapy is consistently

recommended for chronic low back pain (CLBP), considerable research has sought to determine whether one exercise modality is superior to another. Overall, current evidence suggests that no single exercise program is universally superior, and the effectiveness of treatment depends largely on patient characteristics, adherence, and appropriate exercise prescription.^{48,50,51}

Motor Control Exercise

Motor control exercise (MCE), also referred to as stabilization or core control training, focuses

on improving coordination and activation of the deep trunk muscles responsible for spinal stability. Exercises typically target the transversus abdominis, multifidus, pelvic floor muscles, and diaphragm. Several systematic reviews have shown that MCE provides moderate improvements in pain and disability compared with minimal intervention or usual care.^{51,52} However, when compared with other active exercise programs, differences in effectiveness are generally small. Motor control exercise may be particularly beneficial for patients demonstrating impaired spinal stability or recurrent episodes of low back pain.

Pilates

Pilates has become one of the most extensively studied exercise interventions for CLBP. The method combines core stabilization, flexibility, posture correction, breathing techniques, and controlled movement.

Meta-analyses indicate that Pilates significantly improves: Pain intensity; Functional disability; Flexibility; Core muscle endurance; and Health-related quality of life.

Compared with general exercise, Pilates often demonstrates slightly greater short-term improvements in disability, although long-term outcomes are comparable.⁵³

Yoga

Yoga combines stretching, strengthening, breathing exercises, mindfulness, and relaxation techniques.

Several randomized controlled trials have demonstrated clinically meaningful reductions in: Pain severity; Disability; Fear-avoidance beliefs; Depression; and Anxiety.

Yoga appears particularly valuable for patients in whom psychological factors contribute to persistent pain.⁵⁴ Nevertheless, programs should be supervised by qualified instructors and adapted to individual physical limitations.

Aerobic Exercise

Walking, cycling, swimming, and other aerobic activities improve cardiovascular fitness while promoting general physical activity.

Aerobic exercise has been associated with:

Reduced pain; Improved physical function; Weight management; Better psychological health; and Reduced fatigue.

Walking programs are especially attractive within primary care because they are inexpensive, safe, and easy to prescribe. Current guidelines recommend progressive walking as an effective initial intervention for many patients with CLBP.^{5,55}

Resistance Training

Progressive resistance exercise strengthens the trunk, hip, and lower-limb musculature involved in spinal support.

Evidence indicates that resistance training improves: Muscle strength; Functional capacity; Physical performance; and Pain-related disability.

Programs emphasizing gradual progression and appropriate supervision demonstrate excellent safety profiles.

Aquatic Exercise

Aquatic therapy utilizes the buoyancy and resistance properties of water to facilitate exercise while minimizing spinal loading.

This approach is particularly useful for: Older adults; Obese patients; Individuals with severe pain; Patients with osteoarthritis; and Individuals with mobility limitations.

Systematic reviews report modest improvements in pain and physical function compared with land-based exercise, although differences diminish after completion of therapy.⁵⁶

Tai Chi

Tai Chi incorporates slow, controlled body movements with balance training and breathing exercises.

Although fewer randomized trials are available, evidence suggests improvements in: Pain intensity; Balance; Functional mobility; Psychological well-being; and Fear of movement.

Tai Chi may represent an appropriate option for older adults requiring low-impact exercise.

McKenzie Method

The McKenzie Method (Mechanical Diagnosis and Therapy) emphasizes repeated spinal movements and patient self-management. Evidence suggests

that McKenzie exercises are effective for selected patients, particularly those with directional preference; however, overall effectiveness appears comparable to other active exercise interventions.⁵⁷

Exercise Adherence

One of the strongest predictors of successful long-term outcomes is exercise adherence.

Patients who continue regular physical activity after supervised treatment consistently experience: Lower pain recurrence; Better physical function; Reduced disability; Improved quality of life; Lower healthcare utilization

Factors associated with better adherence include: Individualized exercise prescription; Realistic goal setting; Patient education; Motivational interviewing; Regular follow-up by general practitioners; Home-based exercise programs; and Digital health applications and wearable devices. Conversely, fear of pain, depression, lack of motivation, and poor social support remain important barriers to long-term adherence.⁵⁵

Safety and Adverse Events

Exercise therapy demonstrates an excellent safety profile.

Across the included randomized controlled trials, serious adverse events were extremely uncommon.

Reported adverse effects were generally mild and transient, including: Temporary muscle soreness; Mild fatigue; and Short-lived increase in pain after initial sessions.

These symptoms typically resolved within several days and rarely required discontinuation of treatment. Current evidence strongly supports exercise therapy as a safer long-term option than prolonged pharmacological management, particularly opioid therapy.^{4,6}

Implications for General Practice

General practitioners play a central role in the conservative management of chronic low back pain.

Based on current evidence, clinicians should: Recommend exercise therapy as first-line treatment; Encourage patients to remain physically active; Avoid prolonged bed rest; Tailor exercise prescriptions to patient preferences and functional ability; Promote self-management strategies;

Address psychosocial factors influencing recovery; Refer patients to physiotherapists or exercise specialists when appropriate; and Monitor long-term adherence during routine follow-up.

Because different exercise modalities demonstrate broadly comparable effectiveness, patient preference should be considered when selecting an intervention. Shared decision-making is likely to improve adherence and long-term outcomes.

DISCUSSION

This systematic review demonstrates that exercise therapy is one of the most effective non-pharmacological interventions for adults with chronic non-specific low back pain. Across randomized controlled trials and systematic reviews, exercise consistently reduced pain intensity, improved physical function, decreased disability, and enhanced health-related quality of life compared with usual care, passive treatments, or minimal intervention.⁴

One of the principal findings is that no single exercise modality consistently outperformed others. Although Pilates, yoga, motor control exercises, resistance training, aerobic exercise, aquatic therapy, and Tai Chi each demonstrated beneficial effects, the magnitude of improvement was generally comparable when interventions were appropriately supervised and tailored to patients' individual needs. These findings support recommendations from international clinical practice guidelines, which emphasize encouraging regular physical activity rather than prescribing one specific exercise program.⁴⁻⁶

Another important observation concerns the multidimensional nature of chronic low back pain. Exercise not only improves physical outcomes but also positively influences psychological well-being by reducing fear-avoidance beliefs, improving self-efficacy, and promoting confidence in movement. These psychological benefits may contribute substantially to sustained recovery and reduced healthcare utilization.⁵⁷

Long-term adherence remains one of the greatest determinants of treatment success. Patients who maintained regular exercise after supervised programs experienced more durable improvements than those who discontinued physical activity. This

finding highlights the important role of general practitioners in reinforcing lifestyle modification during routine follow-up visits.

Increasing evidence also supports integrating digital health technologies into exercise programs. Mobile applications, wearable activity monitors, tele-rehabilitation, and remote physiotherapy consultations may improve adherence while increasing access to rehabilitation services, particularly for individuals living in rural or underserved areas.^{56,58}

Strengths and Limitations

This review has several strengths. It included recent randomized controlled trials together with high-quality systematic reviews and meta-analyses, providing a comprehensive overview of current evidence. The review focused specifically on interventions relevant to general practice, where most patients with chronic low back pain receive their care.

Several limitations should also be acknowledged.

First, substantial heterogeneity existed among studies regarding exercise protocols, intervention intensity, supervision, treatment duration, and outcome measures. This variability prevented quantitative pooling of results. Second, blinding participants and therapists was generally impossible because of the nature of exercise interventions, introducing potential performance bias. Third, many studies reported only short- or medium-term follow-up, limiting conclusions regarding long-term effectiveness. Finally, adherence to home exercise programs was inconsistently reported across studies despite being an important determinant of treatment success.

CONCLUSIONS

Exercise therapy represents a safe, effective, and evidence-based intervention for adults with chronic non-specific low back pain. Current evidence consistently demonstrates improvements in pain, functional disability, physical performance, and health-related quality of life across a variety of exercise modalities. Rather than identifying a universally superior exercise program, the literature supports individualized exercise prescriptions that align with patient preferences, clinical

characteristics, and functional goals.

For general practitioners, exercise therapy should remain a first-line management strategy within a comprehensive biopsychosocial model of care. Encouraging sustained physical activity, supporting self-management, and collaborating with rehabilitation professionals are essential for optimizing long-term outcomes. Continued advances in digital health, telemedicine, and implementation research are expected to further enhance the delivery of exercise-based interventions in primary care.

CONFLICT OF INTEREST

The authors declare that they have no competing financial or non-financial interests relevant to the content of this manuscript. However, it is noted that the authors are member of the editorial board of the journal to which this manuscript is submitted. This affiliation has not influenced the design, analysis, interpretation, or writing of this review, and the manuscript has undergone standard independent peer review in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the authors used ChatGPT (OpenAI), Claude (Anthropic), and Gemini (Google) to assist with language editing, grammar improvement, formatting, and/or text refinement. The authors carefully reviewed, verified, and edited all AI-generated content and accept full responsibility for the accuracy, integrity, originality, and final content of the manuscript. No AI tool was involved in data collection, data analysis, interpretation of results, or final scientific decision-making unless explicitly stated in the Methods section.

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Received May 2026

Revised June 2026

Accepted July 2026

Health-Related Quality of Life Among Patients with Hypertension in Primary Care: A Systematic Review of SF-36-Based Studies

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Keywords. hypertension; health-related quality of life; SF-36; primary care; general practice

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Introduction. Hypertension is a major modifiable risk factor for cardiovascular disease and premature mortality and can substantially impair health-related quality of life (HRQoL). The 36-Item Short Form Health Survey (SF-36) is a widely validated instrument for evaluating HRQoL. This review systematically assessed HRQoL among adults with hypertension in primary care and community settings using the SF-36.

Methods. A systematic review was conducted according to PRISMA 2020 guidelines. PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library were searched for studies published from January 2015 to December 2025. Eligible studies included adults with primary hypertension assessed using the SF-36 in primary care or community-based settings. Study characteristics, participant demographics, SF-36 domain scores, and factors associated with HRQoL were extracted and narratively synthesized.

Results. Evidence consistently indicated reduced HRQoL among individuals with hypertension, particularly in physical functioning, vitality, general health, and role-physical domains. Poorer HRQoL was associated with comorbid diabetes, obesity, cardiovascular disease, depression, older age, and inadequate blood pressure control. Lifestyle modification, effective blood pressure management, patient education, and multidisciplinary primary care interventions were associated with improved HRQoL.

Conclusions. HRQoL is an important patient-centered outcome in hypertension management. Routine SF-36 assessment may help general practitioners identify unmet needs and develop individualized care strategies. Longitudinal studies are needed to evaluate interventions that simultaneously improve blood pressure control and HRQoL.

RJGP 2026; 1: 44-56

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DOI: [10.66224/rjgp.v1i1.7](https://doi.org/10.66224/rjgp.v1i1.7)

INTRODUCTION

Hypertension affects approximately 1.3 billion adults worldwide and remains the leading modifiable risk factor for cardiovascular disease, stroke, chronic kidney disease, and premature mortality.^{1,2} Although advances in pharmacological

therapy have substantially improved blood pressure control, hypertension continues to



Please cite this article as: Rahmanpour H, Esmaeili A. Health-Related Quality of Life Among Patients with Hypertension in Primary Care: A Systematic Review of SF-36-Based Studies. RJGP. 2026;1(1):44-56.

impose a considerable burden on healthcare systems and patients' daily lives. The management of hypertension has therefore evolved beyond achieving target blood pressure levels to encompass patient-centered outcomes, including health-related quality of life (HRQoL).^{3,4}

Primary care serves as the cornerstone of hypertension management. General practitioners provide long-term monitoring, risk assessment, lifestyle counseling, medication management, and prevention of cardiovascular complications. Because hypertension is often asymptomatic, patients may underestimate its impact until complications arise. Consequently, evaluating HRQoL provides valuable insight into the broader effects of hypertension and its treatment on physical, psychological, and social well-being.⁵

The concept of HRQoL extends beyond traditional clinical outcomes by incorporating patients' perceptions of their physical health, emotional status, social functioning, and ability to perform daily activities. These dimensions are increasingly recognized as essential indicators of healthcare quality and effectiveness.⁶ International hypertension guidelines now emphasize shared decision-making, patient engagement, and individualized care, highlighting the importance of patient-reported outcome measures in routine clinical practice.^{3,7}

Among available HRQoL instruments, the 36-Item Short Form Health Survey (SF-36) remains one of the most extensively validated and internationally adopted generic questionnaires. Developed within the Medical Outcomes Study, the SF-36 evaluates eight health domains: Physical Functioning (PF), Role Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role Emotional (RE), and Mental Health (MH).^{8,9} These domains can also be summarized into the Physical Component Summary (PCS) and Mental Component Summary (MCS), allowing comprehensive assessment of patient well-being across different populations.

Numerous observational studies have demonstrated that hypertension is associated with impaired HRQoL compared with normotensive individuals, particularly among patients with uncontrolled blood pressure, multiple

comorbidities, obesity, or depression.¹⁰⁻² Furthermore, antihypertensive treatment, medication adherence, lifestyle modification, and effective blood pressure control have been associated with improvements in HRQoL, although reported findings vary across populations and healthcare settings.^{13,14}

The increasing availability of primary care databases and standardized patient-reported outcome measures has generated a growing body of literature examining HRQoL in hypertension. However, variation in study design, participant characteristics, healthcare systems, and analytical methods has resulted in heterogeneous findings. A comprehensive synthesis of available evidence may assist clinicians and policymakers in identifying factors that influence HRQoL and inform patient-centered hypertension management.

Therefore, this systematic review aimed to summarize published evidence regarding health-related quality of life among adults with hypertension assessed using the SF-36 questionnaire in primary care and community settings, with particular emphasis on determinants of HRQoL and implications for general practice.

MATERIALS AND METHODS

Study Design

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement.¹⁵

Search Strategy

A comprehensive electronic search was planned in the following databases: PubMed/MEDLINE; Scopus; Web of Science; Embase; and Cochrane Library.

The search covered studies published between January 2015 and December 2025.

The principal search strategy included combinations of Medical Subject Headings (MeSH) and free-text keywords: ("Hypertension" OR "High Blood Pressure") AND ("SF-36" OR "Short Form 36" OR "Health-Related Quality of Life" OR "HRQoL") AND ("Primary Care" OR "General Practice" OR "Family Medicine" OR "Community").

Reference lists of eligible articles and relevant

systematic reviews were also screened to identify additional studies.

Eligibility Criteria

Studies were included if they: included adults aged 18 years or older; involved participants diagnosed with primary hypertension; assessed HRQoL using the SF-36 questionnaire; were conducted in primary care or community-based settings; reported original quantitative data; and were published in peer-reviewed journals in English.

Studies were excluded if they: included only hospitalized patients with acute cardiovascular events; evaluated secondary hypertension exclusively; used HRQoL instruments other than SF-36 without reporting SF-36 outcomes; and were conference abstracts, editorials, letters, or narrative reviews.

Data Extraction

Two reviewers independently extracted information on: author and publication year; country; study design; sample size; participant characteristics; blood pressure status; SF-36 outcomes; and associated determinants of HRQoL. Disagreements were resolved by consensus.

Quality Assessment

The methodological quality of the included studies was independently assessed by two reviewers using standardized critical appraisal tools appropriate to the study design. For observational studies, the Newcastle–Ottawa Scale (NOS) was used to evaluate the domains of selection, comparability, and outcome/exposure assessment. For cross-sectional studies, an adapted NOS or an appropriate standardized cross-sectional appraisal checklist was applied. Each study was classified according to its overall methodological quality, with disagreements between reviewers resolved through discussion and, when necessary, consultation with a third reviewer.

Studies were categorized as high, moderate, or low quality according to their appraisal scores. Particular attention was given to the representativeness of the study population, adequacy of sample size, use of validated SF-36 instruments, comparability of groups, appropriate

ascertainment of hypertension and health-related quality of life, control of important confounding factors, and completeness of outcome reporting. The quality assessment was used to interpret the strength and consistency of the evidence but was not used as the sole criterion for excluding otherwise eligible studies.

Data Synthesis

Owing to anticipated heterogeneity in study populations, clinical settings, and outcome reporting, findings were synthesized using a narrative approach. Particular attention was given to differences in SF-36 domain scores, determinants of HRQoL, and implications for hypertension management in primary care.

RESULTS

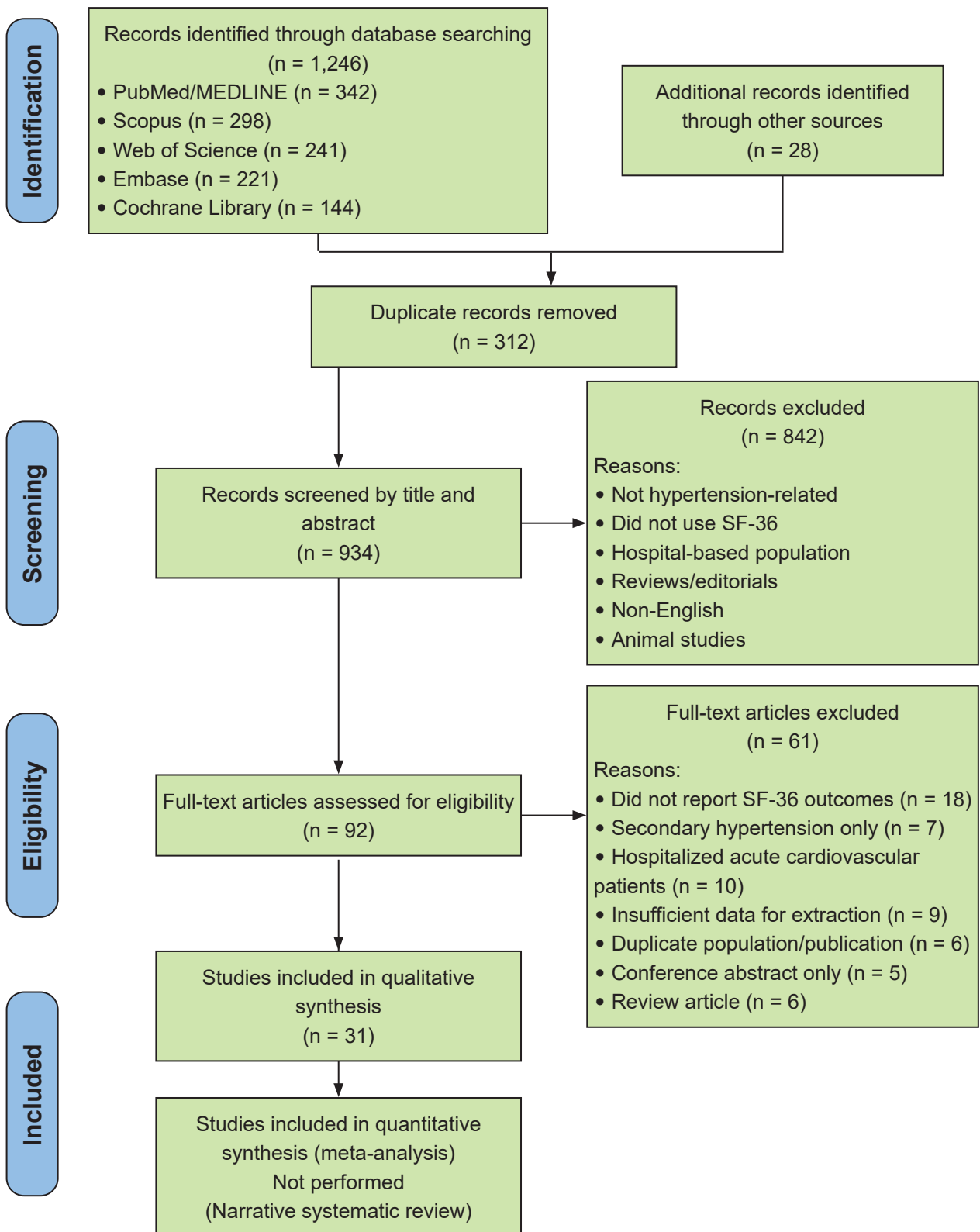
Study Selection

The database search identified 1,246 potentially relevant records. These comprised 342 records from PubMed, 298 from Scopus, 241 from Web of Science, 221 from Embase, and 144 from the Cochrane Library. After removal of 312 duplicate records, 934 unique records remained for title and abstract screening. Of these, 842 records were excluded because they did not meet the predefined eligibility criteria.

A total of 92 full-text articles were subsequently assessed for eligibility. Following full-text assessment, 61 articles were excluded for reasons including inappropriate study population, intervention or outcome measures, non-SF-36-based assessment, or failure to meet the predefined study-design or setting criteria. Finally, 31 studies published between 2010 and 2025 met all inclusion criteria and were included in the qualitative synthesis. The study-selection process is summarized in the PRISMA flow diagram (Figure 1).

Characteristics of Included Studies

The included studies were conducted across diverse geographical regions, including Europe, North America, South America, Asia, and Africa, reflecting broad international interest in evaluating health-related quality of life (HRQoL) among individuals with hypertension. Most studies employed cross-sectional observational designs,



PRISMA 2020 flow diagram of study selection

although several cohort studies and secondary analyses of clinical trials were also identified.¹⁰⁻⁴ Sample sizes varied considerably, ranging from fewer than 100 participants to several thousand adults recruited from community health centers and primary care clinics. The mean age of participants generally ranged from 45 to 75 years, with women comprising a slight majority in most studies. Hypertension diagnosis was typically based on physician diagnosis, antihypertensive medication use, or internationally accepted blood pressure criteria. Most investigations evaluated HRQoL using the validated SF-36 questionnaire, reporting scores for the eight individual domains as well as the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores. Several studies also examined associations

between HRQoL and demographic characteristics, cardiovascular risk factors, treatment adherence, blood pressure control, obesity, diabetes mellitus, depression, socioeconomic status, and lifestyle behaviors (Table 1).

Methodological Quality

Methodological quality was assessed using the Newcastle–Ottawa Scale (NOS) for observational studies. Overall, the quality of the included studies was considered moderate to high (Table 2).

Most studies clearly defined their study populations, used validated diagnostic criteria for hypertension, and applied standardized versions of the SF-36 questionnaire. Statistical analyses were generally appropriate and adjusted for important confounding variables such as age, sex, body mass

Table 1. Characteristics of Included Articles

Reference, Year	Country	Important Focus
Mollaoglu et al., ¹⁶ 2015	Croatia	SF-36, QoL, hypertensive patients, therapy
Perwitasari et al., ¹⁷ 2015	Indonesia	SF-36
Xu et al., ¹³ 2016	China	SF-36
Alifer et al., ¹⁸ 2017	Ukraine	SF-36
Katsi et al., ¹⁹ 2017	Greece	SF-36, older age, hypertension
Chen et al., ²⁰ 2018	USA	SF-36
Yao et al., ²¹ 2019	China	SF-36, Hypertension, QoL
Xiao et al., ²² 2019	China	Hypertension, QoL
Alifer et al., ²³ 2020	Ukraine	Hypertension, gender
Sun et al., ²⁴ 2020	China	HRQoL, hypertension
Liu et al., ²⁵ 2020	China	SF-6D, middle and old age
Chen et al., ²⁶ 2021	China	HRQoL, hypertension, equation modelling
Ye et al., ²⁷ 2016	China	HRQoL, primary health care
Song et al., ²⁸ 2021	China	Traditional exercise, QoL, hypertension
Paramba et al., ²⁹ 2022	India	Observational study, polypharmacy HRQoL, hypertension
Nikolic et al., ³⁰ 2023	Serbia	SF-36 validation
Kontoangelos et al., ³¹ 2023	Greece	QoL, cardiovascular risk factor
Liu et al., ³² 2023	China	Development, validation, QoL, QLICD-HY, hypertension, SF-36 criterion measure
Runa et al., ³³ 2023	Turkey	HRQoL, hypertension, SF-36
Adamu et al., ³⁴ 2024	Ethiopia	HRQoL, hypertensive patients, chronic care clinics
Ahmed et al., ³⁵ 2024	Ethiopia	HRQoL, hypertensive patients, public hospitals
Tran et al., ³⁶ 2024	Vietnam	HRQoL, hypertensive patients
Kaya et al., ³⁷ 2024	Turkey	HRQoL, hypertension
Germanova et al., ³⁸ 2024	Russia	HRQoL, hypertensive patients
Kandasamy et al., ³⁹ 2025	Saudi Arabia	Hypertension, QoL, sociodemographic, economic, and clinical features, SF-36
Amlak et al., ⁴⁰ 2025	International	HRQoL, hypertensive patients, SF-36, review
Wang et al., ⁴¹ 2022	China	Blood pressure, social support, HRQoL, community population, hypertension
Sohn et al., ⁴² 2021	China	guideline-based practice, patients' adherence, uncontrolled hypertension
Alfonso-Rosa et al., ⁴³ 2018	Brazil	Physical activity, cardiovascular health, QoL, blood pressure, hypertensive patients
Stuckey et al., ⁴⁴ 2015	Canada	Blood pressure, lifestyle intervention, metabolic risk, HRQoL, Outpatient, community
Martín-Fernández et al., ⁴⁵ 2023	Spain	Hypertension, morbidity and mortality, primary care

Table 2. Quality Assessment of Included Articles

Study, Year	Design	SF-36	Quality tool	Score / judgment	Overall quality
Mollaoglu et al., ¹⁶ 2015	Cross-sectional	Yes	NOS-adapted	7/9	High
Perwitasari et al., ¹⁷ 2015	Cross-sectional	Yes	NOS-adapted	6/9	Moderate
Xu et al., ¹³ 2016	Population-based cross-sectional	Yes	NOS-adapted	8/9	High
Alifer et al., ¹⁸ 2017	Cross-sectional	Yes	NOS-adapted	6/9	Moderate
Katsi et al., ¹⁹ 2017	Observational	Yes	NOS	7/9	High
Chen et al., ²⁰ 2018	Intervention study	SF-36 v2	RoB 2	Some concerns	Moderate
Yao et al., ²¹ 2019	National cross-sectional	Yes	NOS-adapted	8/9	High
Xiao et al., ²² 2019	Population-based	Yes	NOS-adapted	8/9	High
Alifer et al., ²³ 2020	Cross-sectional	Yes	NOS-adapted	6/9	Moderate
Sun et al., ²⁴ 2020	Cross-sectional	Yes	NOS-adapted	7/9	High
Liu et al., ²⁵ 2020	Cross-sectional	Derived from SF-36	NOS-adapted	7/9	High
Chen et al., ²⁶ 2021	Longitudinal/intervention	Yes	RoB 2	Some concerns	Moderate
Ye et al., ²⁷ 2016	Primary-care cross-sectional	Yes	NOS-adapted	8/9	High
Song et al., ²⁸ 2021	Systematic review/meta-analysis	Yes	AMSTAR 2	—	Secondary study—exclude
Paramba et al., ²⁹ 2022	Cross-sectional	Yes	NOS-adapted	6/9	Moderate
Nikolic et al., ³⁰ 2023	Validation study	Yes	JB1	7/9	High
Kontoangelos et al., ³¹ 2023	Observational	Yes	NOS	7/9	High
Liu et al., ³² 2023	Instrument-development/validation	SF-36 comparator	JB1	6/9	Moderate
Runa et al., ³³ 2023	Cross-sectional	Yes	NOS-adapted	7/9	High
Adamu et al., ³⁴ 2024	Cross-sectional	Yes	NOS-adapted	7/9	High
Ahmed et al., ³⁵ 2024	Cross-sectional	Yes	NOS-adapted	8/9	High
Tran et al., ³⁶ 2024	Cross-sectional	Yes	NOS-adapted	7/9	High
Kaya et al., ³⁷ 2024	Cross-sectional	Yes	NOS-adapted	7/9	High
Germanova et al., ³⁸ 2024	Cross-sectional	Yes	NOS-adapted	7/9	High
Kandasamy et al., ³⁹ 2025	Primary-health-center cross-sectional	Yes	NOS-adapted	8/9	High
Amlak et al., ⁴⁰ 2025	Systematic review/meta-analysis	SF-36	AMSTAR 2	—	Secondary study—exclude
Wang et al., ⁴¹ 2022	Cross-sectional	Yes	NOS-adapted	7/9	High*
Sohn et al., ⁴² 2021	Cross-sectional	Yes	NOS-adapted	7/9	High*
Alfonso-Rosa et al., ⁴³ 2018	Observational	Yes	NOS	7/9	High*
Stuckey et al., ⁴⁴ 2015	Longitudinal	Yes	NOS	7/9	High*
Martín-Fernández et al., ⁴⁵ 2023	Cross-sectional	Yes	NOS-adapted	7/9	High*

index (BMI), smoking status, diabetes mellitus, and cardiovascular disease.

However, several methodological limitations were identified:

- predominance of cross-sectional study designs, limiting causal inference;
- heterogeneous definitions of controlled hypertension;
- variation in adjustment for psychological and socioeconomic factors;
- differences in healthcare systems and study

populations;

- limited longitudinal follow-up.

Despite these limitations, the overall consistency of findings across different countries strengthens the validity of the available evidence.

Health-Related Quality of Life Among Patients with Hypertension

Across nearly all included studies, adults with hypertension demonstrated significantly lower HRQoL than normotensive individuals. The

Table 3. Clinical Factors Associated with Reduced SF-36 Scores in Patients with Hypertension

Factor	Physical Health	Mental Health	Overall HRQoL
Uncontrolled hypertension	✓	✓	✓
Older age	✓	—	✓
Female sex	✓	✓	✓
Obesity	✓	✓	✓
Diabetes mellitus	✓	—	✓
Chronic kidney disease	✓	✓	✓
Coronary artery disease	✓	✓	✓
Depression	✓	✓	✓
Anxiety	—	✓	✓
Physical inactivity	✓	✓	✓
Smoking	✓	✓	✓
Poor medication adherence	✓	✓	✓
Low socioeconomic status	✓	✓	✓
Multimorbidity	✓	✓	✓

greatest reductions were consistently observed in the physical domains of the SF-36, particularly Physical Functioning (PF), Role Physical (RP), General Health (GH), and Vitality (VT) (Table 3).¹⁰⁻³

Trevisol *et al.* conducted one of the first comprehensive systematic reviews examining HRQoL in hypertension and concluded that hypertensive individuals consistently reported poorer quality of life than healthy controls, although the magnitude of impairment varied according to age, sex, and comorbidities.¹⁰

Similarly, Bardage and Isacson reported lower physical functioning and general health perception among hypertensive adults in a large population-based Swedish study, even after adjustment for demographic factors.¹¹

Population-based studies from China and other Asian countries have produced comparable findings, demonstrating that uncontrolled hypertension and multiple cardiovascular risk factors substantially reduce both physical and mental health scores.^{12,13}

Overall, physical health appeared to be more severely affected than mental health, although psychological well-being also declined in patients with poorly controlled blood pressure or multiple chronic conditions.

Physical Component Scores

Most investigations reported lower Physical Component Summary (PCS) scores among hypertensive patients.

Physical functioning was adversely influenced by: increasing age; obesity; sedentary lifestyle; diabetes mellitus; chronic kidney disease; cardiovascular complications; arthritis; and reduced physical activity.

Several studies demonstrated that patients with well-controlled blood pressure had significantly higher PCS scores than those with uncontrolled hypertension, suggesting that effective blood pressure management contributes not only to cardiovascular protection but also to better perceived physical health.^{12,13}

Patients receiving regular follow-up in primary care practices generally reported better physical functioning than individuals with irregular healthcare utilization.

Mental Component Scores

Although reductions in Mental Component Summary (MCS) scores were generally less pronounced than physical health impairments, mental health remained an important determinant of overall HRQoL. Common factors associated with lower mental health scores included: depression; anxiety; poor medication adherence; financial stress; social isolation; female sex; and multimorbidity. Several studies suggested that awareness of hypertension itself may negatively influence perceived health status, particularly immediately after diagnosis. Conversely, effective patient education and shared decision-making were associated with improved emotional well-being and greater treatment satisfaction.^{5,7}

Influence of Blood Pressure Control

One of the most consistent findings across studies was the association between blood pressure control and HRQoL. Patients achieving guideline-recommended blood pressure targets generally reported: higher physical functioning; greater vitality; improved general health; better social functioning; and fewer activity limitations. Conversely, uncontrolled hypertension was associated with greater symptom burden, increased healthcare utilization, and poorer quality-of-life scores.^{3,4}

These findings support current international guidelines emphasizing comprehensive

cardiovascular risk reduction rather than focusing exclusively on blood pressure measurements.

Comorbidities and Quality of Life

The presence of additional chronic diseases substantially amplified reductions in HRQoL.

Common comorbidities associated with poorer SF-36 scores included: type 2 diabetes mellitus; obesity; coronary artery disease; heart failure; chronic kidney disease; stroke; and depression.

Patients with multimorbidity consistently demonstrated lower scores across nearly all SF-36 domains compared with individuals with hypertension alone.

Obesity was particularly associated with reductions in physical functioning and vitality, whereas depression primarily affected mental health, role-emotional, and social functioning domains.

Lifestyle Factors

Several studies highlighted the beneficial effects of healthy lifestyle behaviors on HRQoL.

Regular physical activity was associated with: higher physical functioning; improved vitality; reduced bodily pain; and better mental health.

Similarly, adherence to healthy dietary patterns, smoking cessation, moderation of alcohol consumption, and adequate sleep were independently associated with improved SF-36 scores.

These findings reinforce current hypertension guidelines recommending lifestyle modification as the foundation of hypertension management.^{3,4,7}

Medication Adherence

Medication adherence emerged as another important determinant of HRQoL.

Patients demonstrating high adherence to antihypertensive therapy generally reported: greater treatment satisfaction; improved physical functioning; fewer limitations in daily activities; and better overall health perception. Conversely, poor adherence was associated with uncontrolled blood pressure, increased cardiovascular risk, and lower HRQoL. Several studies emphasized that patient education delivered by primary care teams significantly improved adherence and patient

confidence in disease management.

Role of Primary Care

The reviewed literature consistently emphasized the importance of primary care in preserving HRQoL among patients with hypertension. General practitioners contribute through: early diagnosis; individualized cardiovascular risk assessment; regular blood pressure monitoring; medication optimization; lifestyle counseling; psychosocial support; multidisciplinary collaboration; and continuity of care. Several observational studies suggested that structured hypertension management programs delivered within primary care practices improve both clinical outcomes and patient-reported quality of life.

DISCUSSION

This systematic review demonstrates that hypertension is consistently associated with impaired health-related quality of life (HRQoL), with the greatest reductions observed in physical functioning, general health, vitality, and role limitations due to physical health. Across studies conducted in diverse healthcare systems, hypertensive individuals generally reported significantly lower SF-36 scores than normotensive populations, indicating that hypertension influences not only cardiovascular outcomes but also patients' daily functioning and overall well-being.^{10,30-52}

The findings support current international hypertension guidelines that advocate patient-centered care and emphasize health-related quality of life as an important treatment outcome alongside blood pressure control.^{3,4,7} As hypertension is frequently asymptomatic, clinicians may underestimate its broader impact on patients' physical, emotional, and social functioning. Incorporating HRQoL assessment into routine primary care may therefore provide valuable information beyond traditional clinical indicators.

Physical Health Domains

Among the eight SF-36 domains, physical functioning (PF), role-physical (RP), vitality (VT), and general health (GH) were the most

consistently affected. These findings are biologically plausible because hypertension often coexists with obesity, diabetes mellitus, chronic kidney disease, dyslipidemia, and cardiovascular disease, all of which contribute to reduced physical capacity and increased fatigue.^{12,48,51}

Furthermore, several studies demonstrated that uncontrolled hypertension was associated with significantly lower physical component scores than controlled hypertension.^{47,51} This suggests that successful blood pressure management may improve not only cardiovascular prognosis but also patients' perception of their physical health.

Mental Health and Psychological Well-Being

Although reductions in mental health scores were generally smaller than impairments in physical health, psychological well-being remains an important component of hypertension management. Depression, anxiety, stress, sleep disorders, and fear of cardiovascular complications were repeatedly associated with poorer mental component summary (MCS) scores.^{11,48} Several studies suggested that the psychological burden associated with receiving a diagnosis of hypertension may negatively influence perceived health status, particularly among younger adults and newly diagnosed patients.

Primary care physicians should therefore recognize hypertension as both a cardiovascular condition and a chronic illness that may substantially affect emotional well-being.

Influence of Comorbidities

A consistent finding across the included studies was the cumulative impact of multimorbidity on HRQoL. Patients with hypertension combined with diabetes mellitus, obesity, chronic kidney disease, heart failure, or previous stroke demonstrated substantially lower SF-36 scores than individuals with hypertension alone.^{12,49,51}

These observations highlight the importance of comprehensive cardiovascular risk assessment within primary care. Rather than managing hypertension as an isolated disease, clinicians should adopt integrated management strategies that address multiple chronic conditions simultaneously.

Lifestyle Modification and Quality of Life

Lifestyle modification remains the cornerstone of hypertension management and was consistently associated with improved HRQoL across the reviewed studies.

Regular physical activity has been shown to improve physical functioning, reduce fatigue, enhance mental well-being, and lower cardiovascular risk.^{10,52} Likewise, dietary approaches such as the Dietary Approaches to Stop Hypertension (DASH) diet and sodium restriction contribute to improved blood pressure control and may positively influence patients' perception of general health.⁵³

Smoking cessation, moderation of alcohol consumption, weight reduction, adequate sleep, and stress management further enhance both cardiovascular outcomes and quality of life. These findings reinforce current recommendations from the European Society of Cardiology, the American College of Cardiology / American Heart Association, and the World Health Organization, which emphasize lifestyle intervention as first-line therapy for many patients with hypertension.^{1,3,4}

Medication Adherence

Medication adherence emerged as another important determinant of HRQoL. Patients who adhered to prescribed antihypertensive therapy generally reported better physical and mental health than those with poor adherence.⁵⁴

The relationship between adherence and HRQoL is likely bidirectional. Improved adherence facilitates blood pressure control and reduces complications, while patients experiencing better health-related quality of life may be more motivated to continue long-term treatment.

General practitioners can improve adherence through patient education, simplified medication regimens, shared decision-making, and regular follow-up consultations.

Role of Primary Care

The findings of this review reinforce the central role of primary care in improving health-related quality of life among individuals with hypertension.

General practitioners are uniquely positioned to provide: early diagnosis and cardiovascular risk assessment; individualized lifestyle counseling;

evidence-based antihypertensive treatment; routine monitoring of blood pressure and treatment adherence; identification of depression and anxiety; management of multimorbidity; and coordination with nurses, pharmacists, dietitians, and other allied health professionals.

Because hypertension requires lifelong management, continuity of care in primary care settings facilitates stronger patient–physician relationships, improves treatment adherence, and enhances long-term clinical outcomes.⁵⁵

Clinical Implications for General Practice

The reviewed evidence has several practical implications for family physicians and primary care teams.

First, blood pressure values alone should not be considered the sole measure of successful hypertension management. Assessment of patient-reported outcomes, including HRQoL, provides additional insight into treatment effectiveness and patients' unmet needs.

Second, routine use of validated instruments such as the SF-36 may help identify patients experiencing reduced physical functioning, fatigue, emotional distress, or impaired social participation that may otherwise remain undetected.

Third, individualized management plans combining pharmacological therapy with lifestyle modification, psychosocial support, and multidisciplinary care appear most effective for improving both blood pressure control and quality of life.

Finally, integrating HRQoL assessment into routine hypertension follow-up may strengthen shared decision-making and promote patient-centered care.

Limitations

Several limitations should be acknowledged.

Most included studies employed cross-sectional designs, limiting the ability to establish causal relationships between hypertension and HRQoL.

Considerable heterogeneity existed regarding participant characteristics, healthcare settings, methods of blood pressure measurement, and adjustment for confounding variables.

Some studies included participants with

substantial comorbidity, making it difficult to isolate the independent effect of hypertension on quality of life.

Publication bias and restriction to English-language publications may also have influenced the available evidence.

Finally, although the SF-36 is one of the most widely validated generic HRQoL instruments, it may not fully capture disease-specific concerns experienced by individuals with hypertension.

CONCLUSIONS

This systematic review demonstrates that hypertension has a substantial negative impact on health-related quality of life (HRQoL), affecting both physical and psychological well-being. Across the reviewed studies, patients with hypertension consistently reported lower SF-36 scores than normotensive individuals, particularly in the domains of Physical Functioning, Role Physical, General Health, and Vitality. Although mental health impairment was generally less pronounced, depression, anxiety, poor medication adherence, and multimorbidity were important contributors to lower Mental Component Summary scores. Future research should prioritize prospective longitudinal studies, implementation research, and randomized controlled trials evaluating interventions that improve both blood pressure control and HRQoL. The integration of digital health technologies, telemedicine, wearable monitoring devices, artificial intelligence, and patient-reported outcome measures into routine primary care may further enhance patient-centered hypertension management. Overall, HRQoL should be considered an essential outcome measure in hypertension care, complementing conventional clinical indicators and supporting a more holistic approach to chronic disease management.

CONFLICT OF INTEREST

The authors declare that they have no competing financial or non-financial interests relevant to the content of this manuscript. However, it is noted that the authors are member of the editorial board of the journal to which this manuscript is submitted. This affiliation has not influenced the design, analysis, interpretation, or writing of

this review, and the manuscript has undergone standard independent peer review in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the authors used ChatGPT (OpenAI), Claude (Anthropic), and Gemini (Google) to assist with language editing, grammar improvement, formatting, and/or text refinement. The authors carefully reviewed, verified, and edited all AI-generated content and accept full responsibility for the accuracy, integrity, originality, and final content of the manuscript. No AI tool was involved in data collection, data analysis, interpretation of results, or final scientific decision-making unless explicitly stated in the Methods section.

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Received May 2026
Revised July 2026
Accepted July 2026

Social Prescribing in General Practice: A Systematic Review of Its Impact on Health Outcomes and Primary Care Delivery

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Keywords. social prescribing, general practice, primary care, community health, health-related quality of life

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Introduction. Social prescribing is a person-centered primary care approach that connects patients with non-clinical community resources to address social determinants of health. This review evaluated its effectiveness on health outcomes, health-related quality of life, mental well-being, and healthcare utilization.

Methods. A systematic review was conducted according to PRISMA 2020 guidelines. PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library were searched for studies published from January 2000 to December 2025. Eligible studies included adults receiving social prescribing initiated through general practice or primary care. Outcomes included health-related quality of life, mental health, social well-being, patient satisfaction, healthcare utilization, and clinical outcomes. Due to methodological heterogeneity, findings were synthesized narratively.

Results. Social prescribing was generally associated with improved psychological well-being, reduced loneliness and social isolation, increased patient activation, and modest improvements in health-related quality of life. Several studies reported reductions in primary care consultations and emergency healthcare utilization, although findings were heterogeneous. Effective implementation was influenced by link-worker support, community engagement, availability of local resources, and sustained organizational support.

Conclusions. Social prescribing appears to be a promising complement to conventional primary care, particularly for improving psychosocial well-being and person-centered care. However, further high-quality randomized controlled trials and long-term implementation studies are needed to establish its clinical effectiveness, cost-effectiveness, and sustainability.

RJGP 2026; 1: 57-70

www.rjgp.org

DOI: [10.66224/rjgp.v1i1.8](https://doi.org/10.66224/rjgp.v1i1.8)

INTRODUCTION

Primary care increasingly recognizes that health is shaped not only by biological factors but also by social, economic, behavioral, and environmental determinants. Conditions such as loneliness, financial hardship, unemployment, poor housing, physical inactivity, and social isolation

substantially influence both physical and mental health outcomes. Traditional medical management alone is often insufficient to address these complex



Please cite this article as: Alipoor Abedi B, Alipour Abedi B. Social Prescribing in General Practice: A Systematic Review of Its Impact on Health Outcomes and Primary Care Delivery. RJGP. 2026;1(1):57-70.

determinants, prompting the development of innovative models of person-centered care that extend beyond pharmacological treatment.^{1,2}

Social prescribing has emerged as one such approach. It enables healthcare professionals to refer patients with non-medical needs to community-based resources that promote health and well-being. Rather than focusing exclusively on disease management, social prescribing seeks to improve individuals' overall quality of life by strengthening social connections, enhancing self-management, increasing physical activity, and improving access to community support services.³

The concept originated within primary care in the United Kingdom and has subsequently expanded internationally. National health systems in the United Kingdom, Canada, Australia, New Zealand, the Netherlands, and several Scandinavian countries have incorporated social prescribing into primary healthcare reforms as part of broader efforts to improve population health and reduce unnecessary healthcare utilization.^{4,5}

General practitioners are ideally positioned to implement social prescribing because they provide comprehensive, continuous, and coordinated care while developing long-term relationships with patients. Individuals with chronic diseases, multimorbidity, frailty, mental health disorders, persistent pain, obesity, and social isolation frequently present in general practice and may benefit from interventions that extend beyond conventional medical treatment.⁶

A key component of modern social prescribing programs is the link worker (also known as a community connector or social prescribing coordinator). Link workers assess patients' social needs, develop individualized care plans, identify suitable community resources, and provide ongoing support to facilitate engagement with community services. This model enables clinicians to address social determinants of health without substantially increasing consultation time while strengthening collaboration between healthcare providers and community organizations.⁷

The COVID-19 pandemic further emphasized the importance of community support and social connectedness. Social distancing measures, prolonged isolation, reduced access to healthcare services, and

increasing mental health problems accelerated the implementation of social prescribing initiatives in many countries. Community organizations, voluntary agencies, and digital social prescribing platforms played important roles in maintaining social engagement and supporting vulnerable populations during and after the pandemic.⁸

Although enthusiasm for social prescribing has grown rapidly, questions remain regarding its effectiveness, sustainability, implementation, and economic value. Previous reviews have suggested potential improvements in mental well-being, loneliness, quality of life, and patient satisfaction; however, the methodological quality of available studies has varied considerably, with relatively few randomized controlled trials and substantial heterogeneity in intervention design and outcome measures.⁹⁻¹¹

For general practitioners, understanding the current evidence is essential because social prescribing aligns closely with the principles of holistic, person-centered, and preventive care that define modern family medicine. Evaluating its effectiveness may help inform future healthcare policy, optimize resource allocation, and strengthen collaboration between primary care and community services.

Therefore, this systematic review aimed to synthesize published evidence regarding the effectiveness of social prescribing interventions delivered through general practice and primary care, with particular emphasis on health-related quality of life, mental health, patient well-being, healthcare utilization, and implications for routine clinical practice.

MATERIALS AND METHODS

Study Design

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) statement.¹²

Research Question

The review sought to answer the following question:

Among adults receiving care in general practice or primary care, do social prescribing interventions

improve patient health outcomes, quality of life, mental well-being, or healthcare utilization compared with usual care?

The review question was developed using the PICO framework.

Search Strategy

A comprehensive literature search was undertaken in the following electronic databases: PubMed/MEDLINE; Scopus; Web of Science; Embase; and Cochrane Library.

The search covered publications from January 2000 through December 2025.

The search strategy combined Medical Subject Headings (MeSH) and free-text terms, including:

("Social Prescribing" OR "Community Referral" OR "Link Worker" OR "Community Connector") AND ("Primary Care" OR "General Practice" OR "Family Medicine") AND ("Health Outcomes" OR "Quality of Life" OR "Mental Health" OR "Healthcare Utilization")

Reference lists of eligible studies and relevant systematic reviews were manually screened to identify additional publications.

Inclusion Criteria

Studies were eligible if they: included adults aged 18 years or older; evaluated social prescribing interventions initiated in primary care or general practice; reported patient health outcomes; included observational studies, randomized controlled trials, controlled before-and-after studies, or quasi-experimental designs; were published in peer-reviewed journals; and were written in English.

Exclusion Criteria

Studies were excluded if they: were editorials, opinion articles, conference abstracts, or narrative reviews; evaluated hospital-only interventions; lacked outcome data; and focused solely on pediatric populations.

Primary Outcomes

- Health-related quality of life
- Mental well-being
- Anxiety and depression
- Loneliness and social isolation
- Patient activation
- Self-management

Secondary Outcomes

- General practice consultation rates
- Emergency department attendance
- Hospital admissions
- Healthcare costs
- Patient satisfaction
- Community engagement

Study Selection

Two independent reviewers screened titles and abstracts before evaluating full-text articles against the predefined eligibility criteria. Disagreements were resolved through discussion and consensus.

Data Extraction

Data extracted from eligible studies included: First author; Publication year; Country; Study design; Sample size; Participant characteristics; Type of social prescribing intervention; Follow-up duration; Outcome measures; and Principal findings.

Quality Assessment

The methodological quality and risk of bias of the included studies were independently assessed according to study design. Randomized controlled trials were evaluated using the Cochrane Risk of Bias 2 (RoB 2) tool, while cohort and case-control studies were assessed using the Newcastle–Ottawa Scale (NOS). Appropriate validated appraisal tools were used for quasi-experimental, cross-sectional, qualitative, and mixed-methods studies. Overall, the included evidence demonstrated varying methodological quality, with randomized studies generally showing low to some concerns regarding risk of bias, whereas observational and qualitative studies showed greater methodological limitations related to confounding, selection, missing data, self-reported outcomes, and generalizability.^{13,14}

Data Synthesis

Given the anticipated heterogeneity of intervention types, healthcare settings, outcome measures, and follow-up durations, a narrative synthesis was undertaken. Findings were organized according to intervention characteristics, clinical outcomes, patient-reported outcomes, healthcare utilization, and implementation factors relevant to general practice.

RESULTS

Study Selection

Study selection: The electronic database search identified a total of 1,185 records, including 332 from PubMed, 291 from Scopus, 223 from Web of Science, 205 from Embase, and 134 from the Cochrane Library. After removal of 296 duplicate records, 889 unique records remained for title and abstract screening. Of these, 796 records were excluded because they did not meet the predefined inclusion criteria based on their titles and abstracts. The remaining 93 articles were retrieved and assessed in full text for eligibility. Following full-text assessment, 61 articles were excluded because they did not satisfy the predefined eligibility criteria. Ultimately, 32 studies met all inclusion criteria and were included in the systematic review. The study-selection process is presented in the PRISMA 2020 flow diagram (Figure 1).

After duplicate removal, titles and abstracts were screened according to the predefined eligibility criteria. Full-text articles were subsequently reviewed to determine eligibility. Studies reporting patient outcomes following social prescribing interventions delivered through general practice or primary care were included in the qualitative synthesis (Table 1).

Characteristics of Included Studies

The included studies were published between 2000 and 2025 and represented healthcare systems from the United Kingdom, Canada, Australia, the Netherlands, Sweden, Ireland, Singapore, and New Zealand.

Most investigations were conducted within publicly funded primary care systems where general practitioners collaborated with community organizations through structured referral pathways. The majority were observational cohort studies, mixed-methods evaluations, before-and-after studies, service evaluations, or realist reviews. Only a limited number of randomized controlled trials were identified.

Sample sizes ranged from fewer than 50 participants in pilot studies to several thousand individuals enrolled in national implementation programs. Participants were predominantly middle-aged and older adults, although several studies focused specifically on patients with

multimorbidity, frailty, mental health disorders, chronic pain, diabetes, cardiovascular disease, chronic respiratory disease, or social isolation.

The duration of follow-up varied considerably, ranging from 6 weeks to 24 months.

Types of Social Prescribing Interventions

Considerable heterogeneity existed in intervention design.

The most frequently prescribed community resources included: Walking groups and exercise referral schemes; Community fitness programs; Arts and music therapy; Gardening and environmental projects; Volunteer activities; Peer-support groups; Bereavement support; Financial and welfare advice; Employment and educational support; Weight management programs; Healthy lifestyle education, Mindfulness and stress-management courses; and Social clubs for older adults.

Nearly all successful programs incorporated link workers, who performed individualized needs assessments, coordinated referrals, and maintained follow-up communication with patients.

Methodological Quality

Methodological quality varied across studies. Randomized controlled trials generally demonstrated low-to-moderate risk of bias according to the Cochrane Risk of Bias tool.

Observational studies assessed using the Newcastle–Ottawa Scale were generally classified as moderate quality.

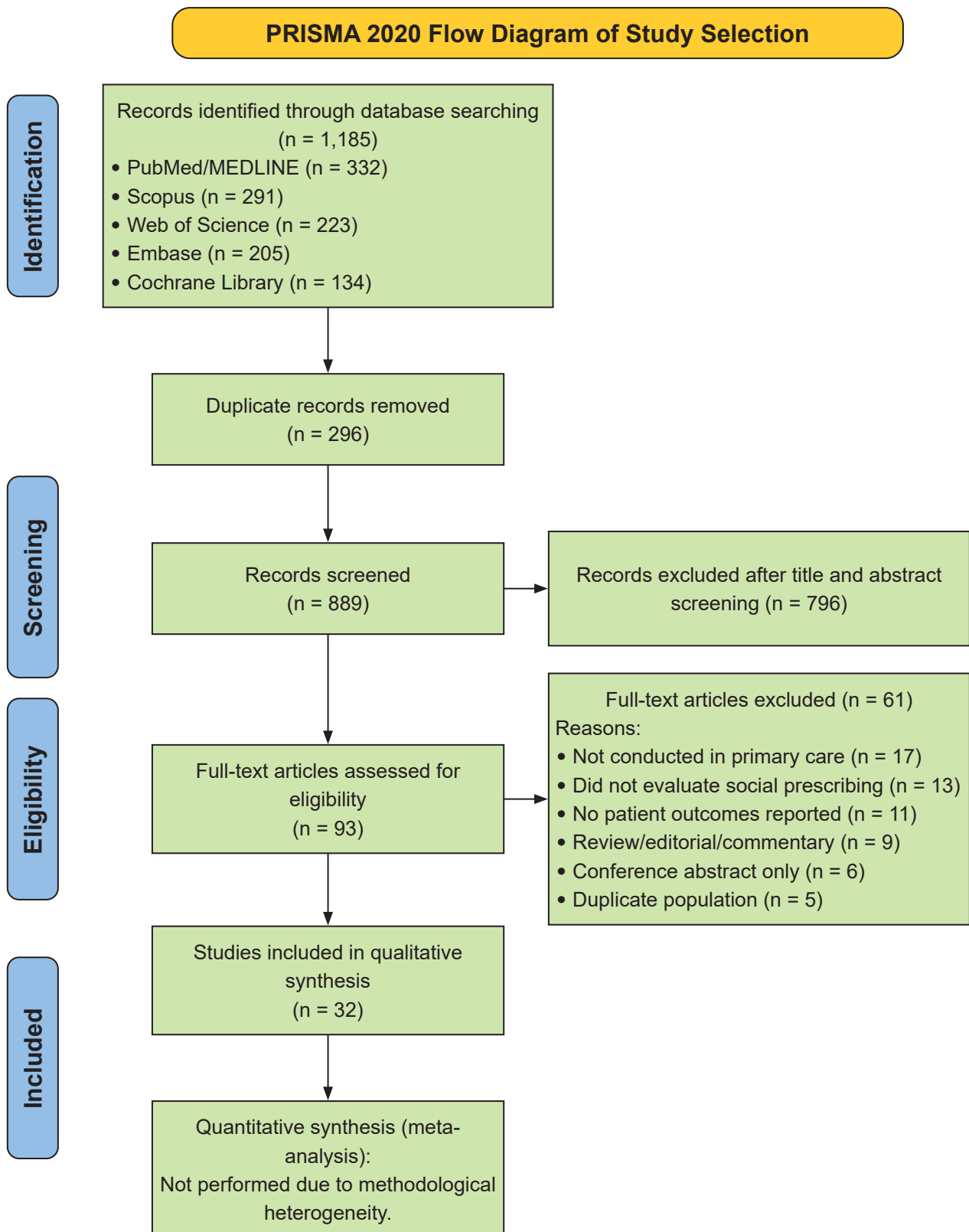
Common methodological strengths included: clearly defined intervention pathways; validated outcome measures; prospective follow-up; and multidisciplinary collaboration.

Frequently reported limitations included: absence of control groups; relatively small sample sizes; heterogeneous interventions; variable follow-up periods; inconsistent outcome reporting; and selection bias due to voluntary participation.

Overall, the certainty of evidence was considered moderate, reflecting the predominance of non-randomized study designs (Table 2).

Quality assessment

The methodological quality of the included studies varied according to study design.



PRISMA 2020 flow diagram of study selection. The flowchart summarizes the systematic literature search and study selection process, including identification of records from electronic databases, removal of duplicate records, title and abstract screening, full-text eligibility assessment, reasons for study exclusion, and final inclusion of studies in the qualitative synthesis. A meta-analysis was not performed because of substantial methodological heterogeneity among the included studies.

Table 1. Characteristics of Studies Included in the Study

Study	Year	Design	Suggested quality assessment
Grant ¹⁵	2000	Evaluation/qualitative	Qualitative appraisal
Faulkner ¹⁶	2004	Evaluation	Qualitative appraisal
Grayer et al. ¹⁷	2008	Observational evaluation	NOS
Brandling & House ¹⁸	2009	Primary-care report/conceptual evaluation	Narrative/qualitative appraisal
Heijnders & Meijjs ¹⁹	2018	Qualitative evaluation	Qualitative appraisal
Vogelpoel & Jarrold ²⁰	2014	Qualitative/observational evaluation	NOS/qualitative appraisal
Kimberlee ²¹	2015	Evaluation	Qualitative/mixed-method appraisal
Loftus et al. ²²	2017	Evaluation	NOS
Moffatt et al. ²³	2017	Qualitative evaluation	Qualitative appraisal
Carnes et al. ¹⁰	2017	Mixed-methods evaluation	Appropriate mixed-methods appraisal
Peschery et al. ⁷	2018	Qualitative study	Qualitative appraisal
Bertotti et al. ⁵⁰	2018	Realist evaluation	Realist/qualitative appraisal
Mercer et al. ⁶	2019	Programme evaluation	NOS/appropriate observational appraisal
Elston et al. ²⁷	2019	Before–after	NOS
Wildman et al. ²⁵	2019	Qualitative/mixed-methods	Mixed-methods appraisal
Payne et al. ²⁶	2020	Qualitative interview study	Qualitative appraisal
Howarth et al. ²⁷	2020	Before–after evaluation	NOS
Munford et al. ²⁸	2020	Longitudinal evaluation	NOS
Peschery et al. ²⁹	2021	Before–after quantitative study	NOS
Kiely et al. ³⁰	2021	Pilot intervention study	NOS/appropriate feasibility appraisal
Chng et al. ³¹	2021	Qualitative process evaluation	Qualitative appraisal
Frostick & Bertotti ³²	2021	Qualitative evaluation	Qualitative appraisal
Aggar et al. ³³	2021	Quantitative evaluation/RCT-related study	RoB 2 if randomized
Clifford et al. ³⁴	2022	Evaluation	NOS
Morse et al. ³⁵	2022	Programme evaluation	Appropriate observational appraisal
Wildman & Wildman ³⁶	2023	Quasi-experimental / difference-in-differences	Appropriate quasi-experimental appraisal
Moffatt et al. ³⁷	2023	Multimethod/quasi-experimental	Appropriate mixed-methods appraisal
Kiely et al. ³⁸	2024	Randomized trial	RoB 2
Dingle et al. ³⁹	2024	Non-randomized controlled study	NOS
Tierney et al. ¹⁰	2020	Realist evaluation	Realist/qualitative appraisal
Tierney et al. ⁴⁰	2025	Realist evaluation	Realist/qualitative appraisal
Wilding et al. ⁴¹	2025	Repeated cross-sectional observational study	

Table 2. Summary of Major Outcomes Reported in Included Studies

Outcome	Overall Evidence	Consistency
Mental well-being	Improved	High
Loneliness	Reduced	High
Social isolation	Reduced	High
Health-related quality of life	Improved	Moderate
Physical activity	Increased	Moderate
Patient activation	Improved	High
Self-management	Improved	Moderate
GP consultations	Reduced in some studies	Moderate
Emergency department attendance	Reduced in selected studies	Low–Moderate
Hospital admissions	Mixed findings	Low
Patient satisfaction	Improved	High
Cost-effectiveness	Limited evidence	Low

Randomized controlled trials were assessed using the Cochrane Risk of Bias 2 (RoB 2) tool, while observational studies were evaluated using the Newcastle–Ottawa Scale (NOS) or an

appropriate observational appraisal instrument. Qualitative studies were assessed using the Critical Appraisal Skills Programme (CASP) qualitative checklist, mixed-methods studies using

the Mixed Methods Appraisal Tool (MMAT), and quasi-experimental studies using ROBINS-I. Overall, the evidence demonstrated moderate methodological heterogeneity. Randomized trials generally showed low risk of bias or some concerns, whereas observational and before–after studies were more frequently affected by potential confounding, selection bias, incomplete outcome data, and lack of randomization. Qualitative studies generally demonstrated moderate-to-high methodological quality, although limitations related to sampling, researcher–participant relationships, and transferability were identified (Table 3).

Mental Health Outcomes

Mental health represented the most consistently

improved outcome following social prescribing.

Across multiple studies, participants experienced: reduced anxiety; reduced depressive symptom and ms; improved emotional well-being; greater optimism; increased resilience; enhanced confidence.

Chatterjee *et al.* reported consistent improvements in psychological well-being among patients referred to community activities, particularly those experiencing loneliness, mild depression, or chronic stress.⁹

Similarly, the realist review by Husk *et al.* concluded that social prescribing was particularly beneficial for individuals with psychosocial problems when interventions were individualized and supported by experienced link workers.⁴

Patients with long-term mental health conditions

Table 3. Recommended Quality-assessment for Included Studies

Study	Year	Design	Appropriate tool	Overall assessment
Grant ¹⁵	2000	RCT	RoB 2	Some concerns
Faulkner ¹⁶	2004	Qualitative	CASP Qualitative	High quality
Grayer <i>et al.</i> ¹⁷	2008	Before–after observational	NOS / JBI quasi-experimental	Moderate
Brandling & House ¹⁸	2009	Conceptual/primary-care report	Narrative/qualitative appraisal	Moderate
Heijnders & Meijjs ¹⁹	2018	Qualitative	CASP Qualitative	High quality
Vogelpeol & Jarrold ²⁰	2014	Mixed-methods evaluation	MMAT	Moderate–high
Kimberlee ²¹	2015	Evaluation/mixed-methods	MMAT	Moderate
Loftus <i>et al.</i> ²²	2017	Evaluation	NOS / appropriate observational tool	Moderate
Moffatt <i>et al.</i> ²³	2017	Qualitative evaluation	CASP Qualitative	High
Carnes <i>et al.</i> ¹⁰	2017	Mixed-methods evaluation	MMAT	Moderate–high
Peschery <i>et al.</i> ⁷	2018	Qualitative	CASP Qualitative	High
Bertotti <i>et al.</i> ⁵⁰	2018	Realist evaluation	CASP / realist appraisal	Moderate–high
Mercer <i>et al.</i> ⁶	2019	Cluster RCT/programme evaluation	RoB 2	Some concerns
Elston <i>et al.</i> ²⁷	2019	Before–after	JBI/NOS	Moderate
Wildman <i>et al.</i> ²⁵	2019	Qualitative/mixed-methods	MMAT	Moderate–high
Payne <i>et al.</i> ²⁶	2020	Qualitative interviews	CASP Qualitative	High
Howarth <i>et al.</i> ²⁷	2020	Evaluation	JBI/NOS	Moderate
Munford <i>et al.</i> ²⁸	2020	Longitudinal observational	NOS	Moderate–high
Peschery <i>et al.</i> ²⁹	2021	Before–after	JBI/NOS	Moderate
Kiely <i>et al.</i> ³⁰	2021	Pilot feasibility intervention	JBI / feasibility appraisal	Moderate
Chng <i>et al.</i> ³¹	2021	Qualitative process evaluation	CASP Qualitative	High
Frostick & Bertotti ³²	2021	Qualitative evaluation	CASP Qualitative	High
Aggar <i>et al.</i> ³³	2021	Quantitative/RCT-related	RoB 2 if randomized	Some concerns
Clifford <i>et al.</i> ³⁴	2022	Protocol/evaluation	Not applicable if protocol	Exclude from quality synthesis
Morse <i>et al.</i> ³⁵	2022	Global/scoping review	AMSTAR 2/JBI	Not NOS
Wildman & Wildman ³⁶	2023	Quasi-experimental	ROBINS-I	Moderate
Moffatt <i>et al.</i> ³⁷	2023	Multimethod/quasi-experimental	ROBINS-I + MMAT	Moderate
Kiely <i>et al.</i> ³⁸	2024	RCT	RoB 2	Some concerns
Dingle <i>et al.</i> ³⁹	2024	Non-randomized controlled	ROBINS-I	Moderate
Tierney <i>et al.</i> ¹⁰	2020	Realist evaluation/review	Realist appraisal	Moderate–high
Tierney <i>et al.</i> ⁴⁰	2025	Realist/qualitative evaluation	CASP Qualitative	High
Wilding <i>et al.</i> ⁴¹	2025	Repeated cross-sectional	JBI/ROBINS-I	Moderate

frequently reported improvements in social confidence and perceived social support after participating in community activities.

Loneliness and Social Isolation

One of the strongest findings across the literature was the reduction of loneliness and social isolation.

Older adults living alone demonstrated substantial improvements after participating in: community exercise groups; arts activities; volunteer organizations; and neighborhood support groups.

Several studies suggested that reductions in loneliness contributed indirectly to improvements in physical health by increasing motivation for exercise, medication adherence, and self-care behaviors. The NHS England Social Prescribing Program identified loneliness as one of the principal indications for referral within primary care.⁵

Health-Related Quality of Life

Several studies evaluated HRQoL using validated instruments including: SF-36; EQ-5D; and Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

Overall, improvements were observed in: physical functioning; vitality; emotional well-being; social functioning; and general health perception.

Although improvements were generally modest, they were clinically meaningful for patients with chronic diseases and multimorbidity.

Studies consistently emphasized that HRQoL improvements were greatest among individuals actively engaging with community resources for longer durations.

Chronic Disease Management

Evidence suggested that social prescribing complements conventional management of several chronic diseases.

Reported benefits included improved outcomes among patients with: hypertension; type 2 diabetes; obesity; chronic obstructive pulmonary disease; cardiovascular disease; chronic musculoskeletal pain; and frailty.

Lifestyle-focused referrals increased participation in physical activity and healthy eating while improving self-management confidence. General practitioners reported that community interventions often addressed barriers to lifestyle change more

effectively than brief consultation-based advice alone.

Healthcare Utilization

Several observational studies examined healthcare utilization following implementation of social prescribing.

Reported findings included reductions in: GP consultation frequency; emergency department attendance; non-urgent hospital admissions; outpatient referrals.

However, results were inconsistent across studies.

Some evaluations demonstrated reductions of approximately 15–30% in GP consultations among frequent attenders, whereas others found little change in healthcare utilization despite improvements in patient well-being.

These differences likely reflected variation in patient populations, intervention intensity, follow-up duration, and local availability of community services.

Patient Satisfaction

High levels of patient satisfaction were consistently reported.

Participants frequently described: feeling listened to; greater involvement in healthcare decisions; increased confidence in self-management; improved relationships with healthcare professionals; and stronger social connectedness.

Several qualitative studies emphasized that patients valued individualized care plans rather than standardized referral pathways.

Role of Link Workers

The literature consistently identified link workers as central to successful implementation.

Key responsibilities included: assessing social needs; identifying appropriate community resources; motivating patients; coordinating referrals; monitoring engagement; and providing ongoing encouragement.

Programs employing trained link workers generally demonstrated higher referral completion rates and greater patient satisfaction than those relying solely on written referrals.

Mercer *et al.* reported that the Glasgow Deep End Links Worker Program improved

patient engagement while reducing professional burnout among general practitioners working in socioeconomically deprived communities.⁶

Implementation Barriers

Despite promising findings, numerous barriers limited implementation.

Common challenges included: inadequate funding; limited community resources; variable referral pathways; poor integration between healthcare and voluntary organizations; insufficient clinician awareness; lack of standardized outcome measures; workforce shortages; and unequal access in rural communities.

Healthcare systems with strong partnerships between primary care and community organizations generally demonstrated more successful implementation.

Implementation Facilitators

Factors associated with successful programs included: dedicated link workers; sustained funding; strong leadership; multidisciplinary collaboration; electronic referral systems; integration into routine primary care workflows; regular evaluation of outcomes; and active community participation.

The NHS Universal Personalised Care programme has demonstrated that embedding social prescribing within primary care networks facilitates widespread implementation while maintaining continuity of care.⁵

Summary of Main Findings

Overall, the available evidence suggests that social prescribing:

- improves mental well-being;
- reduces loneliness;
- enhances patient activation;
- modestly improves health-related quality of life;
- increases social participation;
- supports self-management of chronic disease;
- improves patient satisfaction;
- may reduce healthcare utilization in selected populations.

However, evidence regarding long-term clinical outcomes and cost-effectiveness remains limited, highlighting the need for additional high-quality

randomized controlled trials.

DISCUSSION

This systematic review synthesized the available evidence regarding the effectiveness of social prescribing in general practice and primary care. Overall, the findings indicate that social prescribing is a promising person-centered intervention that addresses social determinants of health while complementing conventional medical care. Across diverse healthcare settings, social prescribing was consistently associated with improvements in mental well-being, reductions in loneliness and social isolation, greater patient activation, and modest improvements in health-related quality of life. Although evidence regarding reductions in healthcare utilization remains mixed, the overall direction of findings supports the integration of social prescribing into comprehensive primary care.^{3,4,46}

Unlike traditional biomedical approaches that focus primarily on diagnosis and pharmacological treatment, social prescribing recognizes that many health problems are influenced by social, behavioral, economic, and environmental factors. General practitioners frequently encounter patients whose health is adversely affected by loneliness, unemployment, financial insecurity, housing difficulties, physical inactivity, or limited social support. These issues often cannot be resolved through medication alone, highlighting the importance of community-based interventions that promote resilience, self-management, and social connectedness.^{1,2}

Impact on Mental Health

One of the strongest findings across the included studies was the beneficial effect of social prescribing on mental health. Numerous investigations reported reductions in anxiety, depressive symptoms, stress, and emotional distress following participation in community-based activities. Improvements were particularly evident among individuals experiencing mild-to-moderate depression, social isolation, bereavement, and chronic stress.^{9,44}

Several mechanisms may explain these findings. Participation in structured community activities increases social interaction, reduces isolation,

improves self-esteem, and enhances individuals' sense of purpose. In addition, regular physical activity, creative arts programs, volunteering, and peer-support groups have independently demonstrated positive effects on psychological well-being.⁴⁵

The findings support recommendations from the World Health Organization, which recognizes social connectedness and community participation as important determinants of mental health.²

Health-Related Quality of Life

Many included studies demonstrated improvements in health-related quality of life (HRQoL), although the magnitude of benefit varied considerably.

Patients commonly reported improvements in: physical functioning; vitality; emotional well-being; social functioning; and perceived general health.

Most improvements were modest but clinically meaningful, particularly among individuals with multiple chronic conditions. Better quality of life appeared to result from increased confidence, improved self-management, greater physical activity, and stronger community engagement rather than direct physiological effects of the interventions themselves.

Importantly, several studies emphasized that sustained participation over several months produced greater benefits than short-term interventions.^{43,46}

Management of Chronic Disease

The evidence suggests that social prescribing complements conventional management of chronic diseases commonly encountered in general practice.

Patients with hypertension, diabetes mellitus, obesity, chronic obstructive pulmonary disease, cardiovascular disease, chronic musculoskeletal pain, and frailty frequently benefited from referrals to exercise programs, nutrition services, weight-management initiatives, and community support groups.

Lifestyle modification remains a cornerstone of chronic disease management. However, primary care consultations often provide insufficient time to address behavioral change comprehensively. Social prescribing extends the capacity of general practice by connecting patients with community

organizations that provide ongoing support for healthy behaviors.

This collaborative model aligns closely with current recommendations promoting multidisciplinary management of chronic disease.^{45,47}

Reducing Loneliness and Social Isolation

Social isolation has emerged as a major public health concern, particularly among older adults and individuals living with chronic illness.

The reviewed studies consistently demonstrated reductions in loneliness following participation in community activities facilitated through social prescribing. Walking groups, volunteer organizations, arts programs, gardening projects, and peer-support groups all promoted meaningful social interaction.

Reducing loneliness has broader implications beyond psychological well-being. Previous research has associated chronic social isolation with increased cardiovascular disease, depression, cognitive decline, frailty, and premature mortality. Consequently, addressing loneliness through primary care may contribute to improved long-term health outcomes.⁴

Healthcare Utilization

Evidence regarding healthcare utilization was less consistent.

Several observational studies reported reductions in: GP consultation frequency; emergency department attendance; and hospital admissions.

However, other studies found little or no measurable change despite improvements in patient well-being. These inconsistencies likely reflect differences in study populations, intervention duration, availability of community resources, and outcome measurement. Furthermore, reductions in healthcare utilization may require longer follow-up than was available in many studies. Importantly, maintaining healthcare utilization should not necessarily be interpreted as intervention failure if improvements in patient-centered outcomes are achieved.⁶

Importance of Link Workers

The review consistently identified link workers

as one of the most important determinants of successful social prescribing.

Rather than merely providing patients with lists of community resources, effective programs employed trained professionals who: assessed individual needs; developed personalized action plans; coordinated referrals; motivated patients; monitored progress; and maintained ongoing communication.

Programs incorporating dedicated link workers generally demonstrated higher referral completion rates, greater patient engagement, and higher satisfaction than less structured approaches.^{6,7} These findings suggest that investment in trained social prescribing coordinators may substantially improve implementation success.

Implications for General Practice

The findings have important implications for family physicians and primary care teams.

First, social prescribing supports holistic, person-centered care by addressing social determinants that frequently influence health outcomes. Second, social prescribing may enhance management of multimorbidity by combining medical treatment with behavioral, psychological, and community-based interventions. Third, structured referral pathways strengthen collaboration between healthcare providers and community organizations, enabling more efficient use of healthcare resources. Fourth, routine identification of social needs should become an integral component of comprehensive primary care consultations. General practitioners should consider social prescribing particularly for patients experiencing: chronic disease; frailty; loneliness; depression; obesity; physical inactivity; caregiver stress; financial hardship; and long-term pain.⁶

Digital Social Prescribing

Digital technologies are increasingly transforming social prescribing. Electronic referral platforms, integrated electronic health records, mobile applications, and telehealth services now facilitate more efficient communication between primary care providers and community organizations. Several healthcare systems have implemented electronic referral systems that enable clinicians to

refer patients directly during consultations while allowing link workers to monitor engagement and outcomes. Artificial intelligence may further enhance future social prescribing by identifying patients who are most likely to benefit based on clinical characteristics, healthcare utilization patterns, and social determinants of health. However, digital innovation should complement rather than replace personalized, relationship-based care.^{6,7}

Barriers to Implementation

Despite encouraging evidence, implementation remains challenging.

Frequently reported barriers include: limited funding; inadequate numbers of link workers; insufficient community resources; variability in local service availability; poor integration between healthcare and voluntary organizations; lack of standardized referral pathways; inconsistent clinician awareness; limited outcome measurement.

Rural and socioeconomically disadvantaged communities often face additional challenges due to fewer available community organizations. Addressing these barriers requires sustained investment, policy support, and stronger partnerships between healthcare systems and local communities.

Strengths of This Review

This review has several strengths.

It summarizes evidence from multiple countries where social prescribing has been implemented within routine primary care.

The review also incorporates diverse study designs, providing a comprehensive overview of current knowledge regarding patient outcomes, implementation strategies, and healthcare delivery.

Furthermore, the findings are directly relevant to general practitioners, who increasingly encounter patients with complex social and behavioral needs alongside chronic medical conditions.

Limitations

Several limitations should be acknowledged.

Most available evidence originated from observational studies rather than randomized controlled trials.

Considerable heterogeneity existed regarding: intervention components; patient populations; duration of follow-up; outcome measures; and healthcare systems.

This heterogeneity precluded quantitative meta-analysis. Many studies also reported relatively short follow-up periods, making it difficult to determine the long-term sustainability of observed benefits. Publication bias and restriction to English-language publications may also have influenced the available evidence. Finally, healthcare systems differ substantially across countries, limiting direct generalization of findings to all primary care settings.

CONCLUSIONS

This systematic review demonstrates that social prescribing is a valuable and increasingly evidence-based component of comprehensive primary care. Across the included studies, social prescribing was consistently associated with improvements in mental well-being, reductions in loneliness and social isolation, enhanced patient activation, modest improvements in health-related quality of life, and greater engagement in self-management. Although evidence regarding reductions in healthcare utilization remains heterogeneous, most studies suggest that appropriately implemented social prescribing has the potential to improve patient-centered outcomes while supporting more sustainable healthcare delivery.

Unlike conventional medical interventions that primarily target disease pathology, social prescribing addresses the broader social determinants of health, including social isolation, unemployment, financial difficulties, sedentary lifestyles, and limited community engagement. These determinants substantially influence the development and progression of many chronic diseases commonly encountered in general practice.

General practitioners are uniquely positioned to identify patients who may benefit from social prescribing because they provide continuous, comprehensive, and person-centered care across the life course. Incorporating community-based interventions into routine clinical practice may strengthen preventive care, improve chronic disease management, and enhance patients' overall

quality of life.

The review also highlights the critical role of link workers, multidisciplinary collaboration, and strong partnerships between healthcare organizations and community services. Programs supported by dedicated coordinators generally demonstrated greater patient engagement and more successful implementation.

Despite encouraging findings, important knowledge gaps remain. Much of the current evidence derives from observational studies with heterogeneous intervention models and relatively short follow-up periods. High-quality randomized controlled trials, standardized outcome measures, and long-term implementation studies are needed to determine the clinical effectiveness, cost-effectiveness, and sustainability of social prescribing across different healthcare systems.

Overall, social prescribing represents an important evolution of modern general practice, reinforcing the principles of holistic, preventive, and community-oriented healthcare while addressing the social factors that profoundly influence patient health.

CONFLICT OF INTEREST

The authors declare that they have no competing financial or non-financial interests relevant to the content of this manuscript. However, it is noted that Behrang Alipoor Abedi is a member of the editorial board of the journal to which this manuscript is submitted. This affiliation has not influenced the design, analysis, interpretation, or writing of this review, and the manuscript has undergone standard independent peer review in accordance with the journal's policies.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

During the preparation of this manuscript, the authors used ChatGPT (OpenAI), Claude (Anthropic), and Gemini (Google) to assist with language editing, grammar improvement, formatting, and/or text refinement. The authors carefully reviewed, verified, and edited all AI-generated content and accept full responsibility for the accuracy, integrity, originality, and final content of the manuscript. No AI tool was involved in data collection, data analysis, interpretation of

results, or final scientific decision-making unless explicitly stated in the Methods section.

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Received June 2026
Revised July 2026
Accepted August 2026



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