**Strategies to Strengthen Iraq's Primary Healthcare System: A Systematic Literature Review with Special Focus on Society 5**

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**Ethics statement**

This is systematic review with no study participants.

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**Clinical trial registration**

No clinical trial was conducted in the study.

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Sincerely,

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## Strategies to Strengthen Iraq's Primary Healthcare System: a Systematic Literature Review with Special Focus on Society 5

**Abstract**

**Background and Aims:** The primary healthcare (PHC) system is a comprehensive, equitable, and efficient approach to supporting health and social well-being by offering prevention, treatment, and rehabilitation services close to living environments. The PHC system in Iraq is currently facing issues that limit its effectiveness and efficiency. This research aims to discover strategies to enhance the PHC system in Iraq.

**Methods:** We conducted a systematic search for articles on initiatives aimed at enhancing the PHC system, covering the period from 1980 to June 2024, using eight databases and Google Scholar. We included articles that met the criteria and analyzed them using the framework analysis approach with RevMan 5.3 software.

**Results:** A total of 18,705 articles were extracted. After removing duplicates and items without full text, 15,971 studies remained for title and abstract review, of which 14,175 were removed. Finally, 18 research articles related to PHC strengthening were used. Data collection methods included checking databases (12 studies), interviews (6 studies), focus groups (3 studies), questionnaires, and archival data (15 studies). The majority of research (44.45%) was conducted in Baghdad.

**Conclusion:** In the context of Society 5.0, smart technology's practical applications in healthcare aim to enhance decision-making, patient care, and service delivery. Smart technologies can help nurses make clinical decisions in complex care situations and streamline procedures like paperwork. When rebuilding and strengthening the PHC system, addressing the historical, social, cultural, and economic variables is important.

**Keywords**: Primary Healthcare (PHC), Health System, Society 5.0

**Introduction**

The health system includes individuals, groups, and organizations that are responsible for policymaking, financing, generating resources, and delivering services to promote health [1]. Recognized by the World Health Organization (WHO) in 1975, PHC aims to provide accessible, comprehensive, and efficient health services [2]. In 1978, the World Health Organization and the United Nations Children's Fund organized an international meeting in Alma-Ata, Kazakhstan. During this conference, a plan for PHC was suggested to achieve the goal of "health for all" [3].

PHC is defined as essential health services that are affordable and available to the general population throughout their lifespan. These services encompass health education, illness prevention, treatment, rehabilitation, and palliative care [4]. The key elements of PHC encompass health education, nutrition enhancement, provision of safe drinking water and environmental improvement, promotion of maternal and child health, immunization, availability of essential medications, management of prevalent diseases and injuries, and prevention and control of communicable diseases [5]. The fundamentals of PHC encompass access, community engagement, health promotion, the appropriate skills and technology, and collaboration amongst different sectors. The unique characteristics of PHC are accessibility, comprehensiveness, coordination, and continuity [6].

The Alma-Ata charter declared health as a fundamental right of individuals, emphasizing the need for global cooperation to deliver PHC to all. Nations worldwide began implementing PHC, which has since been linked to improved health outcomes, reduced mortality rates, and increased patient satisfaction. The World Bank asserted in a 2004 report that primary healthcare initiatives can effectively address 90% of individuals' health issues, with only 10% requiring specialized hospital services. Countries that have a robust PHC system have observed several positive outcomes: enhanced accessibility to health services [7], improved quality of health and treatment services [8], decreased disease incidence [9], reduced hospitalizations [10], decreased mortality rates [11], increased patient satisfaction [12], lowered health costs [13], improved fairness [14], and elevated overall health levels of the population [15]. An illustrative study demonstrated that the implementation of efficient PHC initiatives in Europe resulted in improved health outcomes for the European Union population. Furthermore, these programs contributed to the advancement of health equity and a decrease in hospitalization rates [16]. Researchers conducted a recent study in 29 European nations and found that countries with a robust and well-integrated PHC system have better health outcomes for individuals with chronic conditions [17]. In their 2018 statement, officials from the WHO reaffirmed their commitment to expanding access to primary care as a way to achieve sustainable development and universal health coverage [18]. However, a number of issues exist, such as the diversity of primary care professionals' backgrounds and levels of autonomy, the extensive and varied nature of primary care, the limitations of the current infrastructure in promoting community health, and so on. Certain programs can strengthen the PHC system [19].

Artificial intelligence (AI) is leading the way in innovation in a constantly evolving technological environment. AI, a technology that emulates human intelligence in machines, particularly computer systems, is transforming numerous sectors [20]. Healthcare is one of the domains where artificial intelligence has made significant advancements [21].

AI has revolutionized medical diagnostics, administrative efficiency, telemedicine, and personalized medicine by enabling precise medical image interpretation, predictive analytics, and streamlined data processing within EHR systems [22]. However, challenges such as data privacy, the human element in care, system integration, and ethical concerns like algorithmic transparency remain [23, 24]. Future advancements will focus on ethically integrating AI to enhance chronic disease management and mental health treatment [25, 26].

In 2016, Japan introduced the concept of Society 5.0 in the Fifth Fundamental Plan of Science and Technology, aiming to integrate IoT, AI, and robotics to address various challenges [27, 28]. This fifth-generation society will leverage consolidated medical data from multiple sources to enhance treatment effectiveness and enable remote healthcare services, potentially increasing life expectancy [29]. Developed nations, including Japan, are adopting these advancements to tackle issues like ageing populations and rising healthcare costs.

The implementation of the PHC system in Iraq has yielded favorable outcomes, including enhanced availability of health services, decreased maternal and child mortality rates, and increased life expectancy [30, 31]. However, Iraq's PHC system faces various obstacles, including limited adaptability in its structure, inadequate and uneven allocation of resources, limited utilization of modern technologies, insufficient staffing and lack of motivation, a weak information system, centralized decision-making, inconsistency between departments, and inadequate supervision. Administrative bureaucracy and a lack of transparency and accountability are associated with evaluation [32, 33]. This has diminished its efficacy and efficiency in disease management, particularly in epidemics and pandemics like COVID-19 [34, 35]. Therefore, this study *aims* to identify strategies to strengthen Iraq's PHC system. **The study objectives** include:

* Evaluating the current state of Iraq's PHC system.
* Identifying key challenges and barriers to effective PHC delivery.
* Proposing actionable strategies to enhance the efficiency and effectiveness of the PHC system.
* Exploring the role of smart technologies, including AI, in improving PHC outcomes in the context of Society 5.0.

By addressing these objectives, the study seeks to provide policymakers and health administrators with insights to overhaul Iraq's primary healthcare system, ensuring it meets the population's needs effectively

**Methods**

The study was conducted using a systematic literature review methodology. The review offers an analysis and clarification of the data by revealing the cause-and-effect relationships between the health intervention and the outcomes. This review utilized a comprehensive seven-step systematic literature review protocol [36]. The protocol involved the following steps:

1. *Formulating research questions* that guide the review. For this study, the primary research question focuses on identifying strategies to enhance the primary healthcare (PHC) system in Iraq.
2. *Clarifying the underlying theory*. Our theoretical framework involves understanding the current PHC system in Iraq, its challenges, and potential interventions that can improve its effectiveness and efficiency.
3. *Developing search strategies*. We conducted a search using pertinent English keywords, specifically (Primary Health Care [Title/Abstract]) OR (Primary Care [Title/Abstract]) OR (Primary Healthcare [Title/Abstract]) AND (Iraq [Text Word]), utilizing databases like "Web of Science", "Scopus", "PubMed", and "EmBase". The search period covered publications from 1980 to 2024, ensuring a broad temporal scope.

Inclusion and Exclusion criteria: The criteria for entering the study included all the published conducted in the field of strengthening PHC until the end of June 29, 2024. The exclusion criteria also included studies published in different languages except English, studies published after the end date of the search, and scientific sources lacking full text.

1. *Collecting evidence*. We conducted systematic searches across the chosen databases. Additionally, we used Google Scholar to capture grey literature and ensure comprehensive coverage. We input the obtained studies into the EndNote program to organize and manage the citations.
2. *Evaluating and choosing evidence*. To exclude irrelevant studies, two of the authors (FR and KD) independently screened the collected articles by title and abstract which minimized bias. The remaining articles are then reviewed in full text to confirm their relevance. In case of problems, a consensus was reached with the participation of a third person (TK) and discussion.
3. *Synthesizing the evidence*. The data extraction form included the authors' name, journal name, article publication year, study population, study purpose, research type, information collection method, interventions, context, mechanism, and findings. The data analysis process involved utilizing Ritchie and Spencer's five-step framework analysis approach [38]. This method includes establishing a theme framework, indexing, creating tables, mapping, and interpretation. To aid in the data analysis and synthesis, we employed RevMan 5.3 software. We reported the findings using the ScR-PRISMA checklist [39].
4. *Refining the initial theory of the proposal submission program*. We reassessed and refined the theoretical framework based on the synthesized evidence. It involved identifying effective strategies and interventions that can strengthen the PHC system in Iraq. The refined theory provides a comprehensive understanding of the necessary and sufficient resources, innovative technologies, and organizational structures required to enhance PHC delivery.

**Society 5.0**: Society 5.0 emphasizes the necessity of developing society as well as the societal implications of technology [37]. To achieve Society 5.0's goal, it is necessary to reconsider both the relationships between society and technology, as well as the relationships between individuals and society facilitated by technology (**Table 1**).

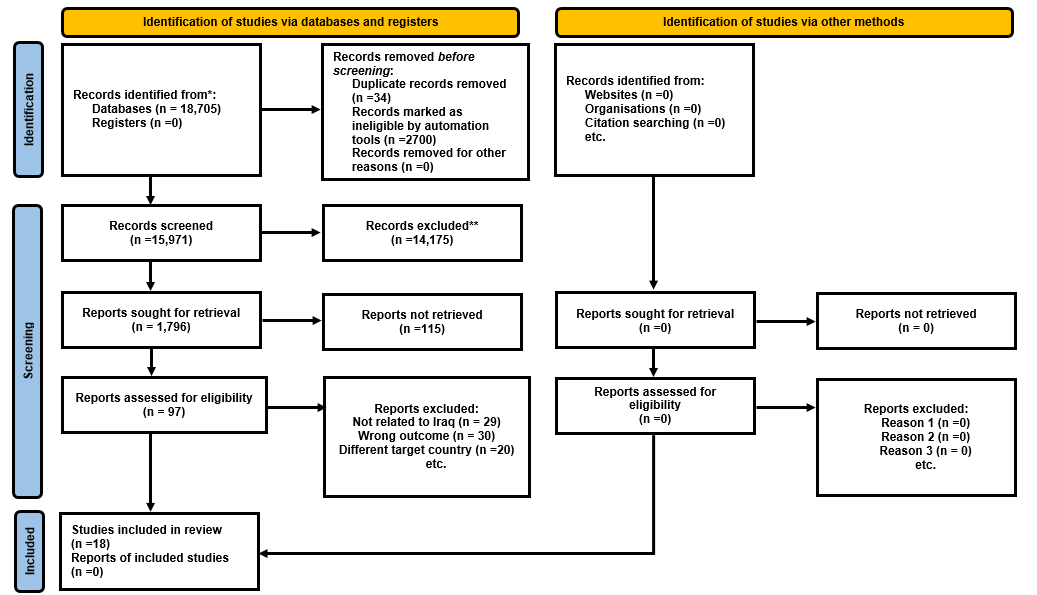
**Table 1**: Design, scope, objective and key elements of Society 5.0

|  |  |  |  |
| --- | --- | --- | --- |
| **Society 5.0** | | | |
| **Design** | **Scope** | **Objective** | **Key elements** |
| * The 5th Science and Technology * Basic Plan and the Comprehensive Strategy on Science, * Technology, and Innovation | Super-smart society | Society as a whole | • The integration of internet and physical space at a sophisticated level.  • Striking a balance between economic progress and addressing social problems.  • A society that prioritizes the needs and well-being of individuals. |

**Results**

In total, 18,705 articles were extracted through databases. After removing duplicates and items without full text, 15,971 studies remained. Screening of titles and abstracts excluded 14,175 articles, leaving 1,796 articles for full-text review. The number of 115 articles in the field of strengthening primary health care was obtained at this stage. After careful study of the remaining articles, 97 articles were removed due to lack of application in the field of strengthening primary health care. No articles were found by checking the sources of the articles. Finally, 18 research articles related to the strengthening of primary health care were used in this study (**Figure 1**).

**Figure 1:** PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources



Out of them, there were:

Observational studies - 12 studies (66.67%),

Quantitative method - 10 studies (55.56%),

Combined method - 4 studies (22.23%), and

Qualitative method - 3 studies (16.67%) (**Table 2**).

By data collection methods, there were:

Database reviews - 12 studies,

Interviews - 6 studies,

Focus groups - 3 studies,

Questionnaires and archival data - 15 studies (**Table 2**).

Geographically, the majority of the studies (44.45%) were conducted in Baghdad, the capital city of Iraq.

This study revised the basic theory of the PHC program by identifying its strategies, field factors, and effective mechanisms. The final theory of the PHC program states: "The PHC system has lofty goals and appropriate strategies, equipped with necessary and sufficient resources (financial, human, physical, and information) and appropriate and innovative technologies, organized in the form of competent teams." Skilled and committed multi-specialty with specific roles and tasks for health workers, who provide comprehensive, quality and affordable health care coordinated with other health services (intervention program), in case of strengthening the elements of governance and leadership, financing, human resources, equipment and medicine, information systems and provision of health services and optimal adaptation to the surrounding political, economic, social and technological environment (field), increase the satisfaction, commitment, accountability and responsibility of managers and health workers, trust participation and satisfaction of patients and people (mechanism) and finally, securing, maintaining and improving the health of the people of the society (result)."

**Table 2:** Characteristics of included studies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Study ID | Method | Study population | Location | Findings |
| Al-Uzri *et al*. 2024 [40] | WHO mhGAP-IG 2.0 training to primary care physicians | 17 participants from different medical specialties | Baghdad, Iraq | WHO mhGAP-IG 2.0 training improved primary care physicians' knowledge in Baghdad. |
| Washi *et al*. 2023 [41] | Evaluation the quality assurance for school health services | 171 respondents (six directors of PHC centers, 32 health and nursing staff, and 133 school principals) | Al-Numaniya District. Iraq | Quality assurance for school health services in Al-Numaniya was moderate in all essential components as structure, process, and outcome |
| Mahmood and Saleh, 2023 [42] | A cross-sectional study using a questionnaire-based survey | A cluster of six households includes 2400 individuals | Erbil, Iraq | Patient satisfaction in Erbil requires integration and improvement of service quality components |
| Abdulrahman *et al*. 2020 [43] | A cross-sectional design | 403 parents and 62 HCPs from 20 PHCCs | Duhok, Iraq | Collaboration among healthcare facility departments and staff needs improvement in Duhok |
| Nguyen *et al*. 2019 [44] | A convergent mixed methods study design, quantitative and qualitative questionnaires | 123 clients, 26 providers, 40 non-MH staff, and 12 directors provided data | Sulaymaniyah, Iraq | Mixed methods study showed supportive integration experiences in Sulaymaniyah. |
| Amily *et al*. 2019 [45] | An interventional study | 42 vaccinators from 10 PHCs | Wasit, Iraq | Training PHC’s vaccinators improved immunization practices in Wasit. |
| Khan *et al*. 2018 [46] | A framework based on five components | 535,253 individuals spread over 55 camps  513,978 individuals from 2,47 camps | Baghdad, Iraq | Framework assessment indicated high-quality care in Baghdad camps. |
| Shabila *et al*. 2014 [47] | Q-methodology for eliciting subjective viewpoints and identifying shared patterns among individuals | 40 persons PHC providers | Erbil, Iraq | Sharing PHC service complaints can enhance the system in Erbil |
| Shabila *et al*. 2013 [48] | Q-methodology for eliciting subjective viewpoints and identifying shared patterns among individuals | Forty primary health care providers representing eight PHC centres | Erbil, Iraq | Knowledge of the opinions held by PHC providers regarding the system may improve its functionality. |
| Burnham *et al*. 2012 [49] | Household national survey | A cluster of 10 households of seven public sector PHC facilities in each of 17 of Iraq's 18 governorates | Baghdad, Iraq | Lower-income individuals predominantly utilize public sector PHC Centers as crucial healthcare providers in Baghdad. |
| Shabila *et al*. 2012 [33] | A qualitative study using a self-administered questionnaire survey | 46 primary care managers, public health professionals and academics | Erbil, Iraq | Found significant barriers to PHC services, including system organization and management concerns, a shortage of and poor medications, and unbalanced staffing and experience distribution. |
| Sadik *et al*. 2011 [50] | Multistage evaluation using a pre- and post-test questionnaire | PHC providers from 143 centers | Baghdad, Babil, Basrah, Dewaniyah, Karbala, and Najaf | There is a notable transformation, not just in understanding, but also in the subsequent display of practical abilities by trained professionals. |
| Burnham *et al*. 2011 [51] | Household national survey | A cluster of 10 households of seven public sector PHC center | Baghdad, Iraq | Lower-income individuals predominantly utilize public sector PHC Centers as crucial healthcare providers. |
| Noël *et al*. 2011 [52] | pilot study conducted a cross-sectional survey | 37 PHC providers | Baghdad, Iraq | PHC providers should be aware of common post-deployment health conditions |
| Boscarino *et al*. 2010 [53] | Need assessment of PHC providers' knowledge and awareness | 1,200 patients and 3,600 of their family members | Baghdad, Iraq | Significant mental health gaps discovered |
| Al-Zwaini *et al*. 2008 [54] | A questionnaire survey | 50 persons PHC providers | Ramadi, Iraq | Needs for improving the knowledge and training |
| Godichet and Ghanem, 2004 [55] | A questionnaire survey | 10 people in all 4 PHC center | Mosul, Iraq | obvious need to explore ways to adapt profiles of medical consumption in the PHC centers |
| Hashim *et al*. 2003 [56] | A structured questionnaire interviews | 500 patients and 500 health care workers selected from 250 PHC centers | Baghdad, Iraq | The national tuberculosis (TB) program has significantly enhanced the understanding |

The data was analyzed using Ritchie and Spencer's framework analysis approach, resulting in the identification of several key themes:

* Governance and leadership: Challenges in organization, communication, and inter-sectoral cooperation.
* Financing: Need for improved allocation and utilization of resources.
* Human resources: Insufficient staffing and motivation among health workers.
* Technology: Limited adoption of modern technologies and information systems.
* Medicine and equipment: Shortage and uneven distribution.
* Health services delivery: Need for better service delivery and patient satisfaction.

Thematic analysis resulted in the following implications for practice:

* AI and smart technologies: Potential to improve decision-making, patient care, and operational efficiency.
* Community engagement: Essential for the sustainability and effectiveness of PHC interventions.
* Training and development: Continuous education and training programs are necessary for health workers.

**Discussion**

This study was conducted with the aim of identifying solutions to strengthen Iraq's PHC system in the context of Society 5. Strengthening the PHC system plays a significant role in increasing universal health coverage, increasing access to health services and benefiting from them, improving the quality of health services, reducing the costs of the health system and paying out of people's pockets, improving justice in health, reducing the rate of illness and death, and promoting community health.

Society 5.0, a concept introduced by Japan, represents a vision for a super-smart society where digital transformation and technological advancements, such as AI, IoT, and robotics, are leveraged to solve social challenges and improve quality of life. In healthcare, Society 5.0 aims to enhance decision-making, patient care, and service delivery through smart technologies.

In this study, 18 published papers describing strengthening the PHC system were identified and categorized into six areas: governance and leadership, financing, human resources, technology, medicine and equipment, information systems, and providing health services.

*Governance and leadership.* Governance entails establishing a mechanism to improve the management of the health system. The health system's governance process includes elements such as organization, communication, inter-sectoral cooperation, policy formulation and planning, supervision and leadership, and monitoring and evaluation [57]. The study showed that governance challenges in Iraq’s healthcare include issues in organization, communication, inter-sectoral cooperation, and policy formulation [33, 41, 43, 47, 50]. The PHC system in low and middle-income countries faces significant governance issues, including the dispersion of public, private, and non-profit health organizations, weak legislation, a lack of transparency, low efficiency, and inadequate accountability and responsibility. These challenges hinder the effectiveness and efficiency of the system [58]. In Iraq, the Ministry of Health is accountable for the management, monitoring, and evaluation of primary health services, as is the case in other countries [59]. This includes establishing an appropriate structure for services such as family physicians and home healthcare, as well as improving the referral system and promoting collaboration between different departments. Actively encouraging their engagement is one way to increase the involvement of private and non-profit organizations in planning and management. Furthermore, promoting individual responsibility and self-care, as well as evaluating the health system and publicly announcing performance indicators, can help to improve overall healthcare.

Implementing AI-driven decision support systems can streamline governance processes, enhance inter-sectoral communication, and improve policy formulation through data-driven insights. AI tools can provide real-time data analysis and predictive analytics, aiding in strategic planning and effective governance [33].

*Resource allocation and financing*. The review identified the need for improved allocation and utilization of resources in Iraq’s PHC system [33, 47, 49]. Active society involvement in the PHC system enhances its long-term viability and efficient utilization of healthcare services. Understanding the social, economic, and cultural determinants that impact a society's health will result in the most suitable healthcare program being implemented. In Africa, the implementation of the health intervention program, which relied on community engagement, resulted in a significant rise in the provision of health services and improved accessibility to healthcare for individuals residing in underserved regions. The program's endorsement by the government, the formation of a large group of enthusiastic volunteers, the education of healthcare professionals and volunteers, the role of the facilitator, the substantial expense of the intervention, the shortage of healthcare personnel and resources, the decreased motivation of certain workers, and the significant distance between some villages and the healthcare centers all contributed to this success [60].

Big data analytics and AI can optimize resource allocation by predicting healthcare needs and efficiently distributing financial resources. This ensures equitable access to healthcare services and better financial management [29].

*Human resource management*. Our study found that insufficient staffing and lack of motivation among health workers are significant issues in Iraq [40, 43-47, 50, 56]. There is a need in continuous provision of adequate and necessary training for both health service providers and recipients. To provide quality and affordable health services, health workers must be educated and trained in evidence-based working methods. Training programs should include all employees of the PHC system, including managers, doctors, nurses, and other staff. In Africa, the training of non-physician health workers led to increased access to health care, especially in rural areas [61].

AI-powered training and development platforms can enhance skillsets and motivation among healthcare workers. Additionally, robotic assistants and AI tools can augment the workforce, reducing the burden on human resources and improving service efficiency [61].

*Technology and Information Systems*. The review showed a limited adoption of modern technologies and weak information systems in Iraq’s PHS system [33, 40, 41, 43, 50, 55, 56]. It hinders the PHC system's effectiveness. It is essential to get precise, reliable, and prompt information from healthcare institutions to furnish the requisite proof for policymakers’ and managers' decision-making [62]. The inadequacy of the basic healthcare information management system results in a lack of prompt access to comprehensive information regarding healthcare requirements, priorities, resources, performance, and quality. The process of information management encompasses the creation of an information management system, which consists of both software and hardware components. It entails information collection, analysis, exchange, and utilization. We are enhancing the integrated primary health care information management system to promote evidence-based decision-making and create connections with public sector data. To instil public confidence, it is crucial to build a comprehensive and easily accessible information and health performance reporting system.  In 2014, the implementation of the electronic health record system in China, in conjunction with the chronic illness self-management program, resulted in an improvement in the quality of life for diabetes patients. Enhancing patient accountability and mitigating stress significantly influenced the achievement of these findings [63]. The primary healthcare information management system must incorporate a mechanism to facilitate ongoing knowledge acquisition. Managers must consistently gather, examine, and stay informed on data pertaining to critical performance metrics. Health organizations' personnel should exploit this knowledge to optimize their performance. Society 5.0 promotes the integration of IoT devices, AI, and advanced information systems in healthcare. These technologies can provide real-time data, improve patient monitoring, and enhance health information management systems [28, 63].

The IoT can collect the data required for the implementation of these technologies, allowing smart connected devices to acquire personalized information about an individual's health, environment, and behavior. To achieve success, it is vital to use digital information in a way that leads to the convergence of the virtual and physical realms through the integration of cyber-physical systems. Implementation of these new developments will necessitate a radical shift in the healthcare landscape. The adoption of this emerging healthcare technology also raises new legal issues, ethical quandaries, and concerns about the reorganization of the healthcare ecosystem. The persistent global energy crisis impedes the implementation of these revolutionary technologies. Efforts are underway to resolve these issues. We use AI, IoT, and digital twins to design and manage modern electrical grids and simplify the integration of alternative energy sources. Furthermore, blockchain technology has the ability to address concerns about data security and management. Using these technologies, implementing healthcare based on the Society 5.0 concept has the potential to improve people's well-being, lengthen their lives, and increase productivity [64].

*Medicine and equipment*. There is a shortage and uneven distribution of medical supplies and equipment in the PHC system in Iraq [40, 41, 55]. AI-driven supply chain management systems can predict demand, optimize inventory, and ensure the timely distribution of medical supplies and equipment, thereby addressing shortages and distribution issues [65].

IoT devices play a vital role in delivering uninterrupted, instantaneous patient monitoring. You can use wearable technology like fitness trackers, biosensors, and smartwatches to monitor a patient's vital signs, including their pulse, blood pressure, glucose levels, and sleep patterns. By broadening the scope of precision medicine, physicians will be able to make very accurate diagnoses.

*Health services delivery*. The reviewed literature showed that improvement in service delivery and patient satisfaction is necessary [33, 41-43, 47, 55, 56]. Telemedicine, AI-assisted diagnostics, and personalized medicine are key components of Society 5.0. These technologies can improve service delivery by providing remote consultations, accurate diagnoses, and tailored treatment plans, enhancing overall patient satisfaction [20, 22].

Society 5.0 will revolutionize healthcare by adopting a proactive approach and providing 24/7 accessibility. In the context of society 5.0, the healthcare sector can use the integration of these developing technologies to achieve this goal. AI, ML, and DL enable the creation of automated systems capable of learning, detecting characteristics in patient data, and making choices about diagnosis, prognosis, and treatment alternatives. AI may also process massive amounts of data to create digital replicas of patients or populations, allowing for more exact modelling in a variety of healthcare settings and facilitating the deployment of precision medicine.

*Practical applications and ethical considerations*. The general public will have access to research-derived medical information. AI algorithms will tailor this information, often without any regulatory oversight from the healthcare system. AI algorithms can support clinical decisions in complex care situations, reducing errors and improving patient outcomes [25]. AI and robotics can streamline procedures like documentation, allowing healthcare professionals to focus more on patient care [23]. This illustrates the concept of "democratization of healthcare." The primary obstacle to the widespread adoption of IoT is the presence of data that has the potential to infringe on human rights and core values, such as privacy, security, and safety. This problem is particularly prevalent in countries that have limited resources [65]. The integration of AI and smart technologies raises ethical issues, including data privacy, algorithmic transparency, and the potential loss of the human element in healthcare. Addressing these concerns is crucial for the ethical adoption of Society 5.0 principles [24].

**Limitations**

The study primarily focuses on Iraq's PHC system, which may have unique challenges and conditions that are not applicable to other countries. The findings and proposed strategies might not be directly transferable to other regions with different healthcare infrastructures, economic conditions, or cultural contexts. This limits the ability to generalize the results to a broader global context.

The study relies on available literature, which may include biases, incomplete data, or varying levels of methodological rigor. The quality and comprehensiveness of the data can influence the reliability of the findings. Incomplete or biased data sources may lead to skewed conclusions, potentially overlooking important factors or misrepresenting the effectiveness of certain strategies.

The integration of Society 5.0 technologies, such as AI and IoT, is discussed in theoretical terms without extensive empirical evidence from within Iraq. Therefore, the practical implementation of these technologies in Iraq's PHC system may face unforeseen challenges, such as infrastructure limitations, resistance to change, or ethical concerns. This uncertainty can impact the feasibility and effectiveness of the proposed strategies.

The study uses a systematic literature review, which, while comprehensive, is limited by the scope of the selected articles and the criteria for inclusion. The exclusion of non-English articles and the specific time frame may result in the omission of relevant studies, potentially affecting the breadth and depth of the review. This could lead to incomplete conclusions or a lack of consideration for recent developments and innovative approaches outside the reviewed literature.

The ethical implications of AI, including data privacy, algorithmic transparency, and the potential loss of the human element in healthcare, are acknowledged but not deeply explored. Overlooking these considerations can lead to ethical dilemmas and practical challenges in implementing AI-driven solutions. Failure to address these issues comprehensively may hinder the acceptance and success of integrating smart technologies into the PHC system.

It is critical to establish clear and specific rules and laws for the advancement and implementation of AI in the healthcare industry. This will guarantee the ethical generation of AI technology that aligns with societal needs. systems use data and algorithms to make recommendations; nevertheless, these recommendations may not fully understand a patient's specific needs and preferences. AI's ability to deliver physical care is limited. AI systems cannot administer medication or perform medical procedures, which are essential components of nursing and midwifery care. AI systems may have a limited capacity to handle complex circumstances, such as those experienced by healthcare staff, which require critical thinking and decision-making abilities. Intelligent systems use precise and detailed data to make recommendations. Data quality issues, such as insufficient or erroneous data, might limit the accuracy of artificial intelligence suggestions. The cost of developing and implementing smart technologies may limit their availability and adoption in particular healthcare areas. Guidelines and regulations are required to ensure safety and transparency when using artificial intelligence in healthcare. Intelligent technologies in healthcare necessitate the collection of personal and sensitive data, which requires protection against cyberattacks and the preservation of patient confidentiality. Accountability is critical to the development and deployment of smart technologies in the healthcare business.

**Implication for policymakers, practitioners and researchers**

Policymakers need to develop robust governance structures that foster inter-sectoral collaboration, transparent decision-making, and accountability. Effective leadership training programs should be established to enhance the capabilities of healthcare managers and leaders.

Efficient allocation and utilization of financial resources are crucial. Policymakers should focus on equitable distribution of resources to ensure all regions have access to quality healthcare.

To predict healthcare needs and optimize resource distribution they should utilize big data analytics. The introduction of performance-based financing will incentivize improvements in healthcare delivery.

Investing in continuous education and training for healthcare workers is essential to maintain a skilled workforce. Policymakers should address motivational issues and ensure adequate staffing levels. Implementing AI in developing training programs will provide personalized learning experiences. The introduction of incentives and career development opportunities will boost motivation and retention among healthcare workers.

The integration of modern technologies such as AI, IoT, and electronic health records (EHR) can significantly enhance healthcare delivery. Policymakers must ensure the necessary infrastructure and regulatory frameworks are in place. Pilot AI and IoT projects in selected PHC centers must be implemented to evaluate their impact and scalability. To ensure data privacy and security while using these technologies regulatory guidelines should be established.

Enhancing the delivery of health services is critical for patient satisfaction and overall system effectiveness. Practitioners should adopt patient-centered approaches and leverage technology for better service delivery. To improve access to care, especially in remote areas, telemedicine services can be used. AI-assisted diagnostics and personalized medicine will enhance the accuracy and efficiency of treatments.

Future research can be focused on empirical validation of the effectiveness and feasibility of integrating AI and smart technologies in Iraq’s PHC system. Carrying out longitudinal studies to assess the long-term impact of proposed strategies on health outcomes and patient satisfaction. The development of comprehensive ethical and regulatory frameworks for the use of AI in healthcare, ensuring data privacy, transparency, and the preservation of the human element is another important research topic.

To find strategies for fostering greater community involvement in the planning and implementation of PHC services, the role of community engagement in enhancing the effectiveness and sustainability of PHC interventions should be explored.

At last, it is important to investigate the impact of smart technologies on health disparities and access to care, particularly in marginalized populations. Future research must answer such questions as how do AI and telemedicine services affect health outcomes in economically disadvantaged communities, or what are the barriers to technology adoption in low-income areas, and how can they be overcome.

**Conclusion**

The health system in Iraq is currently facing significant challenges, including the escalating burden of chronic non-communicable diseases, the emergence of novel diseases like COVID-19, and the rise of antimicrobial resistance. Hence, health system policymakers must shift their focus from disease treatment to prevention. Strengthening the PHC system is crucial for improving population health and reducing illness and death rates. A one-size-fits-all approach cannot be applied to enhance the PHC system in various countries. When rebuilding and strengthening the PHC system, it is essential to address the historical, social, cultural, and economic variables that impact it. A systematic strategy, grounded in systems thinking, is essential.

Effective PHC requires robust governance, sustainable financing, efficient information management, and high-quality service delivery. Synchronizing PHC reforms with broader health system reforms is critical to addressing ageing populations and chronic disease burden, enhancing collaboration and coordination within the health system.

Integrating smart technologies from Society 5.0 into healthcare can improve decision-making, patient care, and system efficiency. AI can support clinical decisions, streamline administrative tasks, and enhance diagnostic accuracy, though it cannot replace the human elements of care. Ethical considerations, such as data privacy and compassionate care, must guide the use of AI. Smart technologies offer innovative ways to provide healthcare, helping practitioners learn more effectively and deliver better services. By leveraging these advancements, Iraq can build a resilient and responsive PHC system that aligns with Society 5.0 and meets the healthcare needs of its population.

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**Conflict of Interest**

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