A narrative review of ai-based digital health policies to enhance nutrition service quality in primary healthcare in Indonesia

Tinjauan naratif kebijakan kesehatan digital berbasis AI untuk meningkatkan kualitas layanan gizi di pelayanan kesehatan primer di Indonesia

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Abstract

The rising demand for quality nutrition services and increasing burden of NCDs contrast with Indonesia's limited adoption of AI in primary healthcare, underscoring the need to explore AI-driven policies to enhance nutrition service delivery in resource-constrained settings. This study examines how AI-based digital health policies can improve the efficiency and quality of nutrition services and identifies barriers that hinder their implementation. A total of 42 articles were reviewed using a framework encompassing three major dimensions: digital system readiness, digital competency of health workers, and robustness of health data governance. The review identified three central challenges: (1) inadequate digital system reliability, which limits the optimal use of AI in primary healthcare facilities; (2) insufficient digital literacy among nutrition personnel and patients, which reduces the effectiveness of AI-based tools; and (3) the absence of clear regulations to ensure health data protection, system interoperability, and ethical AI use. This study contributes new insights by highlighting AI-based nutrition services as an emerging field that requires greater attention in Indonesia's digital health transformation. The findings underscore the need for stronger policies aimed at enhancing digital infrastructure, improving digital competencies among healthcare workers, and establishing clear regulatory frameworks to ensure the safe and effective use of AI in nutrition services in primary healthcare settings.

Keywords: Artificial Intelligence, Digital Health Policy, Nutrition Services, Primary Healthcare, Indonesia

Abstrak

Peningkatan permintaan akan layanan gizi berkualitas dan beban penyakit tidak menular (NCD) yang semakin berat bertolak belakang dengan adopsi kecerdasan buatan (AI) yang masih terbatas di sektor kesehatan primer di Indonesia, menyoroti perlunya mengeksplorasi kebijakan berbasis AI untuk meningkatkan penyampaian layanan gizi di lingkungan dengan sumber daya terbatas. Studi ini meneliti bagaimana kebijakan kesehatan digital berbasis kecerdasan buatan (AI) dapat meningkatkan efisiensi dan kualitas layanan gizi, serta mengidentifikasi berbagai hambatan dalam penerapannya. Penelitian ini meninjau 42 artikel menggunakan kerangka kerja yang mencakup tiga aspek utama, yaitu kesiapan sistem digital, keterampilan tenaga kesehatan, dan tata kelola data kesehatan. Hasil tinjauan menunjukkan adanya tiga permasalahan besar: pertama, sistem digital yang belum cukup andal sehingga penerapan AI sulit dilakukan secara optimal di fasilitas kesehatan tingkat dasar; kedua, rendahnya literasi digital di kalangan tenaga gizi dan pasien yang menghambat pemanfaatan alat berbasis AI;

dan ketiga, ketiadaan regulasi yang jelas untuk melindungi data kesehatan, menjamin interoperabilitas antar sistem, serta memastikan penggunaan AI yang etis dan bertanggung jawab. Studi ini memberikan kontribusi baru dengan menyoroti bahwa layanan gizi berbasis AI merupakan bidang yang masih baru dan membutuhkan perhatian lebih dalam transformasi kesehatan digital di Indonesia. Temuan ini menegaskan perlunya kebijakan yang lebih kuat untuk meningkatkan keandalan sistem digital, memperkuat kemampuan digital tenaga kesehatan, serta membangun aturan yang jelas agar penggunaan AI dalam layanan gizi di fasilitas kesehatan primer dapat berlangsung secara aman, efektif, dan berkelanjutan.

Kata Kunci: Kecerdasan Buatan, Kebijakan Kesehatan Digital, Layanan Gizi, Pelayanan Kesehatan Primer, Indonesia

Introduction

Recent literature highlights a strong conceptual connection between digital transformation in the healthcare sector, the increasing demand for high-quality nutrition services, and the strategic role of AI-based policies in strengthening primary health care. Salinari et al. (2023) and Saif-Ur-Rahman et al. (2023) emphasized that AI can improve diagnostic accuracy, service efficiency, and the capacity of healthcare workers, making it a relevant solution for countries facing persistent resource constraints. Other studies have emphasized that nutrition services are central to preventing and managing noncommunicable diseases (NCDs), especially given that a substantial portion of the global disease burden is associated with unhealthy dietary patterns (Farhat et al., 2024).

In the Indonesian context, empirical findings, such as the continued reliance on manual record-keeping in primary healthcare facilities (Craig et al., 2021), illustrate a gap between the growing need to adopt advanced technologies such as AI and the actual capacity of local health systems. Collectively, these studies justify the need to examine how AI-based digital health policies can enhance the quality and efficiency of nutrition services in primary healthcare settings, particularly in infrastructure-limited regions such as Aceh, Indonesia. This focus is highly relevant, as nutrition services sit at the intersection of digital health transformation, primary care strengthening, and NCD prevention, three major priorities in global and national health agendas.

Previous studies have explored the potential of AI to improve medical diagnosis, patient data management, and decision-making processes in healthcare (Nguyen & Voznak, 2024). However, despite its recognized potential, the implementation of AI in developing countries remains limited, particularly in nutrition services at the primary health care level. Gap analyses reveal that although some high-income countries have adopted AI for health service delivery, its application in developing nations, such as Indonesia, is still lagging. Barriers include inadequate technological infrastructure, limited human resource capacity, and regulatory challenges (El-Tallawy et al., 2024).

This research is essential for addressing these gaps and supporting the development of AI-based digital health policies relevant to Indonesia. This study aims to explore how AI-driven digital policies can improve nutrition service delivery at the primary healthcare level, while considering existing challenges and potential implementation strategies. In addition, this study seeks to strengthen the evidence base regarding the benefits of AI for enhancing nutrition service quality and operational efficiency in primary healthcare settings (Sheikh et al., 2021).

The novelty of this study lies in its specific focus on integrating artificial intelligence into the management of nutrition services in Indonesia, an area that has received limited attention in both regional and global literature. Existing research in developing countries largely focuses on AI applications for clinical diagnostics, infectious disease surveillance, and decision support systems. Discussions on the use of AI for nutrition service management, particularly within the framework of digital

health policy, remain scarce. Thus, this narrative review provides added value by offering a contextualized and evidence-based analysis of the opportunities and challenges associated with adopting AI to improve nutrition services in Indonesia's primary healthcare system.

Although the initial aim, to explore how AI-based digital policies can improve nutrition services,"is appropriate, it remains broad and lacks a well-defined analytical structure. Therefore, the objective was refined to better capture the dimensions under investigation. In this study, the aim was reformulated as follows: to examine the mechanisms, policy levers, and system-level factors that enable the effective integration of AI into nutrition service management at the primary healthcare level in Indonesia, and to identify the contextual barriers, facilitators, and implementation pathways that can inform evidence-based digital health policy development.

Methods

The PRISMA flow diagram used in this study outlines the systematic process followed to assess the impact of AI-based digital health policies on the efficiency and quality of nutrition services at the primary-care level. This approach adheres to the principles of the Systematic Literature Review (SLR), a well-established methodology designed to minimize bias and enhance transparency through the systematic identification, screening, and evaluation of relevant studies (Dick-Sagoe et al., 2021).

In addition to the structured SLR process, this study incorporates a narrative review component to provide a deeper contextual interpretation of the selected evidence. Through narrative synthesis, the findings are organized, compared, and critically examined to highlight thematic patterns, methodological variations, and knowledge gaps—particularly regarding the role of AI in strengthening nutrition service delivery in low- and middle-income countries. This combined methodology allows for the systematic mapping of the existing evidence base while offering a nuanced understanding of how AI-driven digital health policies can be implemented effectively within Indonesia's primary healthcare system.

Identification Phase

The first stage, record identification, involved searching for relevant studies in the Scopus database using the keyword "healthcare service improvement." Initially, 67 records were identified.

During pre-screening, several records were excluded for specific reasons: 31 records were removed because they did not fall within the predefined publication window of 2020–2025; 5 records were excluded due to ineligibility flagged by automated tier-classification tools (Q1–Q4); and 4 records were removed for lacking abstracts, which are essential for determining preliminary relevance. As a result, 27 records were retained for further review (Alfiero, Brescia, & Bert, 2021).

Screening Phase

In the screening phase, the 27 retained records were examined for relevance to the research question, particularly their focus on AI in healthcare and nutrition policies at the primary-care level (Luo et al., 2024). All 27 records met the inclusion criteria and were considered potentially relevant.

These records were then sought for full retrieval; however, 21 could not be accessed because of subscription restrictions, non-digital availability, or publication format limitations. The remaining six records were successfully retrieved and moved to the eligibility assessment phase (Andersson, 2024).

Eligibility Phase

During the eligibility assessment, the six retrieved studies were evaluated in detail against the predefined inclusion criteria. The objective was to determine whether each study provided substantive evidence related to AI-based digital health policies and their influence on the efficiency and quality of nutrition services in primary healthcare settings (Jessup et al., 2020). After a thorough evaluation, none of the studies were excluded, and all six were deemed suitable for final inclusion.

Prisma Reporting: Literature Analysis Of Ai-based Digital Health Policies On The Efficiency And Quality Of Nutrition Services At The Primary Care Level
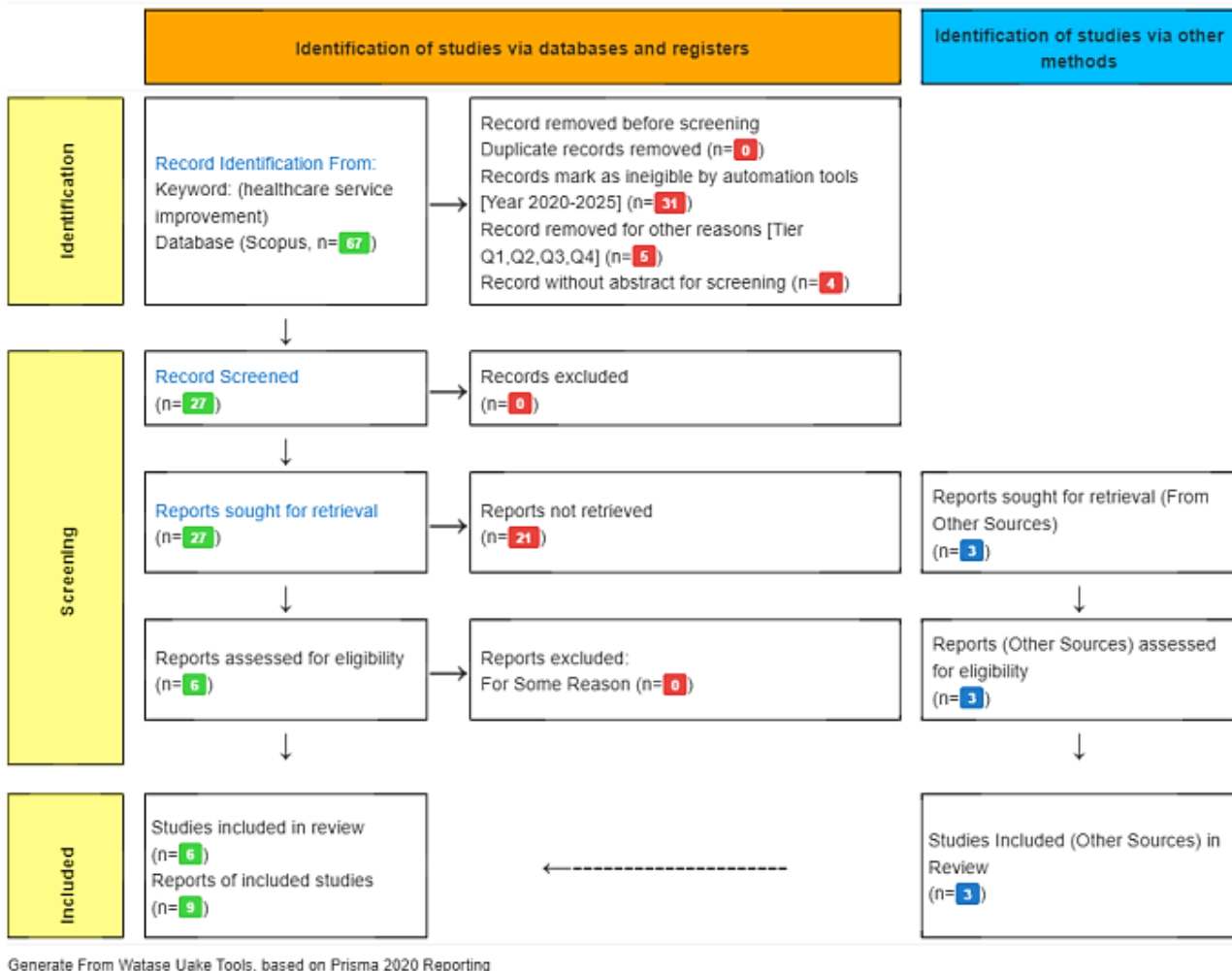

Figure 1. PRISMA model in literature review studies

Inclusion Phase

The six eligible studies from the Scopus database were supplemented by three additional studies identified through manual searches and external sources. These additional studies were assessed using the same criteria and were found to be eligible. Consequently, nine studies formed the final evidence base for this review (Alshammary et al., 2021).

These studies provide a comprehensive overview of how AI integration can influence the efficiency and quality of primary-level nutrition services.

Thematic Synthesis Approach

A limitation of the earlier version of this section was the absence of details regarding how the findings were synthesized across the included studies. To address this, the present study employs a thematic synthesis approach. Key concepts from the nine selected studies were systematically coded, categorized into thematic clusters, and integrated into broader analytical patterns. This process enabled the identification of recurring themes related to AI integration, service efficiency, data governance, and improvements in the quality of healthcare.

Throughout the review, the methodology adhered to the PRISMA 2020 standards to ensure transparency, reproducibility, and methodological rigor. The systematic and thematic processes ensured that only the most relevant and high-quality studies were included, providing a robust evidence base for understanding the role of AI in transforming nutrition services within primary healthcare settings (Kmentt et al., 2021; Nieto et al., 2023).

Result and Discussion

Empirical Data and Analysis on Digital Health in Nutrition Services

Understanding these barriers requires empirical data from Indonesia and other developing countries (Theopilus et al., 2025). Table 1 summarizes the thematic distribution of the findings concerning digital health–related barriers and benefits.

This quantitative summary (Table 2) enhances the transparency of how themes were identified across the evidence base of the review. These findings highlight the critical policy considerations that must be addressed to optimize digital health implementation (Mwogosi et al., 2025).

Table 1. Distribution of findings

Thematic Area	Number of Studies Supporting	Representative Regions
Infrastructure Constraints	9-June	Rural Indonesia, Aceh
Low Digital Literacy	9-May	Indonesia, LMIC settings
Regulatory Gaps	9-April	Indonesia, Sub-Saharan Africa
Benefits of Digital Health in Nutrition Services	9-July	Global & LMICs

Table 2. Digital technology barriers and impacts

Barrier	Impact on Healthcare	Region Affected
Inequity in Digital Infrastructure	Limited access to telemedicine and EMR; delays in diagnosis and treatment	Rural Indonesia, Aceh
Low Digital Literacy	Low adoption of digital tools among providers and patients	Nationwide, especially rural areas
Inadequate Regulatory Framework	Poor integration of digital technologies into public health systems	Developing countries, including Indonesia

Table 3. Summary of key findings from the literature

Findings	Description
The Potential of Digital Health in Primary Healthcare (Xiong et al., 2023)	Technologies such as telemedicine, EMR, and mobile apps improve data accuracy, service efficiency, and patient access.
Digital Infrastructure Challenges (Broo & Schooling, 2023)	Uneven digital infrastructure restricts effective digital health adoption, especially in remote regions.
Digital Literacy Challenges for Medical Personnel (Tegegne et al., 2023)	Limited digital literacy among providers hinders the use of digital platforms and lowers potential benefits.
Digital Literacy Challenges in Patients (Tegegne et al., 2023)	Low patient familiarity with digital apps reduces technology use for health management.
Importance of Supportive Policies (Al Meslamani, 2024)	Policies supporting infrastructure, training, and integration are critical for successful implementation.
Suboptimal Digital Health Implementation (Al Meslamani, 2023)	Lack of supportive policies and uneven technology distribution hinder equitable digital health outcomes.

Digital Health and Its Impact on Nutrition Services in Healthcare

Digital health, which encompasses the integration of digital technologies into healthcare systems, has significantly improved the quality and efficiency of various services, including nutritional care. Numerous studies have indicated that technologies such as telemedicine, electronic medical records (EMR), and mobile health applications facilitate faster, more efficient, and more accurate nutrition assessments and interventions. These technologies also expand access to nutrition services, particularly in remote and underserved areas, enabling patients to consult nutritionists and other healthcare professionals without the need for travel.

In developing countries such as Indonesia, the adoption of digital health technologies

continues to grow; however, progress is constrained by limited infrastructure and technological access (Nieto et al., 2023).

AI has been widely adopted in healthcare to improve diagnostic accuracy, data management and clinical decision-making. Its capacity to rapidly process large volumes of medical data makes AI particularly useful for enhancing nutritional services. For example, AI-driven tools can support personalized nutritional assessments by identifying deficiencies and generating tailored dietary recommendations. AI has also shown utility in disease prediction and management of conditions associated with malnutrition (Verma et al., 2023).

However, challenges persist in their implementation. The effective use of AI requires reliable, up-to-date data and a sufficient understanding of AI systems among healthcare providers. Furthermore, AI must integrate smoothly with existing health information systems, which can be difficult in contexts where digitalization is incomplete or lacking. Despite these challenges, multiple studies have demonstrated that AI can significantly improve diagnostic accuracy, data management, and individualized treatment planning within nutrition services if implemented appropriately (Hasan et al., 2023).

This connection between AI functionalities and nutrition service needs reinforces the importance of examining how AI can improve primary nutrition care. A strong data infrastructure and integrated digital health systems are essential prerequisites for effective AI implementation (Saif-Ur-Rahman et al., 2023).

Barriers to Digital Health Implementation in Nutrition Services
Despite its considerable potential, several challenges impede the full implementation of digital health solutions in nutrition services.

1. Inequitable digital infrastructure
Many rural and remote regions lack reliable Internet connectivity and adequate digital infrastructure, restricting the implementation of digital health technologies (Qoseem et al., 2024). This disparity is particularly evident in Aceh, where connectivity limitations reduce access to online nutrition consultations and educational resources for pregnant women. Limited Internet connectivity and inadequate infrastructure, especially in rural and remote areas, prevent healthcare providers from using AI tools for nutrition assessments and personalized interventions (Liyanage et al., 2019).

2. Low digital literacy
Digital health platforms require digital literacy for effective use. In many developing contexts, insufficient digital literacy among healthcare providers and patients hinders the adoption of digital tools in nutrition services. Providers require appropriate training to conduct digital nutrition assessments, while patients require basic digital skills to engage with nutrition applications and platforms (Negash & Sarmiento, 2023). Healthcare providers and patients often lack the digital competencies required to use AI-assisted nutritional tools effectively (Salinari et al., 2023).

3. Inadequate regulatory frameworks
Weak or incomplete regulatory frameworks also present major obstacles. In low-resource settings, unclear policies related to data protection, system interoperability, and digital health implementation lead to fragmented and inconsistent service delivery (Mfouth et. al., 2024). Without clear regulations, digital health cannot be effectively integrated into existing nutritional service models. In Indonesia and other developing countries, the absence of comprehensive regulatory frameworks complicates AI implementation. Issues related to data privacy, cybersecurity, and interoperability remain major obstacles, resulting in inconsistent and inefficient service deliveries.

Primary healthcare is fundamental to disease prevention, treatment, and health management. Services such as routine checkups, immunizations, chronic disease monitoring, and nutritional assessments are central to its role. Effective primary healthcare reduces the disease burden, enhances the quality of life, and minimizes long-term healthcare costs (Kraef et al., 2020).

Despite its importance, primary healthcare in many developing countries faces challenges, including a shortage of trained staff, limited infrastructure, and inefficient data management. The integration of digital health and AI can help address these challenges by improving the speed and accuracy of nutrition assessments,

enhancing treatment precision, and streamlining nutrition-related data management. However, supportive policies are essential for the successful integration of AI into primary healthcare (Yousefi et al., 2025).

Policy Implications and Recommendations
To fully harness the potential of digital health in improving nutrition services, several targeted policy interventions are required.

1. Strengthening digital infrastructure
Investments in expanding digital infrastructure, particularly in rural and underserved regions, are essential to ensure equitable access to digital health technologies.

2. Enhancing training and capacity building
Improving digital literacy among healthcare providers and patients through structured training programs will support the broader adoption of digital nutrition tools. Providers equipped with digital competencies can integrate technology into patient care more effectively.

3. Establishing comprehensive regulatory frameworks
Clear and supportive regulations are needed to safeguard data privacy, ensure interoperability, and guide the ethical implementation of digital health technologies. Robust policies can facilitate the seamless integration of digital health into national healthcare systems (Mwogosi et al., 2025).

Conclusion

This study examined AI-based digital health policies aimed at improving the efficiency and accuracy of nutrition services in primary healthcare settings in Indonesia. The findings reveal several critical barriers, including inequitable digital infrastructure, low digital literacy among healthcare providers and patients, and insufficient regulatory frameworks in the country. These challenges limit the optimal implementation of digital health technologies in nutrition-service delivery.

To address these barriers, this study recommends policy actions that prioritize the expansion of digital infrastructure in underserved areas, enhancement of digital

literacy through targeted training for healthcare professionals and patients, and development of comprehensive regulatory frameworks to guide the ethical and effective integration of AI into nutrition services. These policy measures are essential to support the successful adoption of AI-driven digital health solutions and ensure equitable improvements in nutrition service quality across primary healthcare, particularly in Indonesia's remote regions.

Overall, this study provides new insights into the practical challenges associated with AI implementation in Indonesia's nutrition services and contributes actionable policy guidance to facilitate the effective and sustainable use of digital health technologies in primary healthcare.

References

Al Meslamani, A. Z. (2023). Technical and regulatory challenges of digital health implementation in developing countries. *Journal of Medical Economics, 26*(1), 1057–1060. https://doi.org/10.1080/13696998.2023.2249757

Al Meslamani, A. Z. (2024). Why are digital health policies crucial? *Journal of Medical Economics, 27*(1), 167–169. https://doi.org/10.1080/13696998.2024.2302254

Alfiero, S., Brescia, V., & Bert, F. (2021). Intellectual capital-based performance improvement: A study in healthcare sector. *BMC Health Services Research, 21*(1), 73. https://doi.org/10.1186/s12913-021-06087-y

Alshammary, S. A., Abuzied, Y., & Ratnapalan, S. (2021). Enhancing palliative care occupancy and efficiency: A quality improvement project that uses a healthcare pathway for service integration and policy development. *BMJ Open Quality, 10*(4), e001391. https://doi.org/10.1136/bmjoq-2021-001391

Andersson, A.-C. (2024). Quality improvement development in Swedish healthcare and welfare services. *International Journal of Lean Six Sigma, 15*(6), 1199–1223. https://doi.org/10.1108/IJLSS-12-2023-

0233

Broo, D. G., & Schooling, J. (2023). Digital twins in infrastructure: Definitions, current practices, challenges and strategies. *International Journal of Construction Management, 23*(7), 1254–1263. https://doi.org/10.1080/15623599.2021.1966980

Craig, K. J. T., Fusco, N., Gunnarsdottir, T., Chamberland, L., Snowdon, J. L., & Kassler, W. J. (2021). Leveraging data and digital health technologies to assess and impact social determinants of health (SDoH): A state-of-the-art literature review. *Online Journal of Public Health Informatics, 13*(3), e14. https://doi.org/10.5210/ojphi.v13i3.11081

Dick-Sagoe, C., Asare-Nuamah, P., & Dick-Sagoe, A. D. (2021). Public choice and decentralised healthcare service delivery in Lesotho: Assessing improvement and efficiency in service delivery. *Cogent Social Sciences, 7*(1), 1969737. https://doi.org/10.1080/23311886.2021.1969737

El-Tallawy, S. N., Pergolizzi, J. V., Vasiliu-Feltes, I., Ahmed, R. S., LeQuang, J. K., Alzahrani, T., Varrassi, G., Awaleh, F. I., Alsubaie, A. T., & Nagiub, M. S. (2024). Innovative applications of telemedicine and other digital health solutions in pain management: A literature review. *Pain and Therapy, 13*(4), 791–812. https://doi.org/10.1007/s40122-024-00620-7

Farhat, R., Malik, A. R. A., Sheikh, A. H., & Fatima, A. N. (2024). The role of AI in enhancing healthcare access and service quality in resource-limited settings. *International Journal of Artificial Intelligence, 11*(2), 70–79. https://doi.org/10.36079/lamintang.ijai-01102.709

Hasan, M. R., Sal Sabil, A., Haque, M. M., Ahamed, K. U., Imran, S., & Mahamud, M. A. (2023). Growth and yield performance of hybrid rice varieties under varying zinc levels. *Archives of Agriculture and Environmental Science, 8*(3), 281–289. https://doi.org/10.26832/24566632.2023.080302

Jessup, R., Putrik, P., Buchbinder, R., Nezon, J., Rischin, K., Cyril, S., Shepperd, S., & O'Connor, D. A. (2020). Identifying alternative models of healthcare service delivery to inform health system improvement: Scoping review of systematic reviews. *BMJ Open, 10*(3), e036112. https://doi.org/10.1136/bmjopen-2019-036112

Kmentt, L., Cronk, R., Tidwell, J. B., & Rogers, E. (2021). Water, sanitation, and hygiene (WASH) in healthcare facilities of 14 low- and middle-income countries: To what extent is WASH implemented and what are the 'drivers' of improvement in their service levels? *H2Open Journal, 4*(1), 129–137. https://doi.org/10.2166/h2oj.2021.095

Kraef, C., Wood, B., von Philipsborn, P., Singh, S., Swartling Peterson, S., & Kallestrup, P. (2020). Primary health care and nutrition. *Bulletin of the World Health Organization, 98*(12), 886. https://doi.org/10.2471/BLT.20.251413

Liyanage, H., Liaw, S.-T., Jonnagaddala, J., Schreiber, R., Kuziemsky, C., Terry, A. L., & de Lusignan, S. (2019). Artificial intelligence in primary health care: Perceptions, issues, and challenges. *Yearbook of Medical Informatics, 28*(1), 41–46. https://doi.org/10.1055/s-0039-1677901

Luo, D., McGlashan, J., Lamprell, K., Arnolda, G., Braithwaite, J., & Zurynski, Y. (2024). Perspectives of cancer consumer representatives on their involvement in healthcare service improvement: A qualitative study. *BMC Health Services Research, 24*(1), 1324. https://doi.org/10.1186/s12913-024-11669-7

Mfouth, K., Pamela, M., Mbanya, A., & Coppieters, Y. (2024). Digital approaches in post-COVID healthcare: A systematic review of technological innovations in disease management. *Biology Methods and Protocols, 9*(1), bpae070. https://doi.org/10.1093/biomethods/bpae070

Mwogosi, A., Simba, R. M., Kayya, A., Abdallah, S., Mkane, P., Lugaba, A., & Hussein, H. (2025). AI-IoT integration in Tanzania's primary healthcare system: A narrative review. *Journal of Health Organization and Management.*

https://doi.org/10.1108/JHOM-01-2025-0013

Negash, Y. T., & Sarmiento, L. S. C. (2023). Smart product-service systems in the healthcare industry: Intelligent connected products and stakeholder communication drive digital health service adoption. *Heliyon, 9*(2). https://doi.org/10.1016/j.heliyon.2023.e13137

Nguyen, H.-S., & Voznak, M. (2024). A bibliometric analysis of technology in digital health: Exploring health metaverse and visualizing emerging healthcare management trends. *IEEE Access, 12*, 23887–23913. https://doi.org/10.1109/ACCESS.2024.3363165

Nieto, L. A., & Parra Sánchez, D. T. (2023). Omnicanalidad: Herramienta clave para la mejora de la atención al cliente y la innovación en el sector salud. https://doi.org/10.29375/25392115.4850

Qoseem, I. O., Okesanya, O. J., Olaleke, N. O., Ukoaka, B. M., Amisu, B. O., Ogaya, J. B., & Lucero-Prisno III, D. E. (2024). Digital health and health equity: How digital health can address healthcare disparities and improve access to quality care in Africa. *Health Promotion Perspectives, 14*(1), 3. https://doi.org/10.34172/hpp.42822

Saif-Ur-Rahman, K. M., Islam, M. S., Alaboson, J., Ola, O., Hasan, I., Islam, N., Mainali, S., Martina, T., Silenga, E., & Muyangana, M. (2023). Artificial intelligence and digital health in improving primary health care service delivery in LMICs: A systematic review. *Journal of Evidence-Based Medicine, 16*(3), 303–320. https://doi.org/10.1111/jebm.12547

Salinari, A., Machì, M., Diaz, Y. A., Cianciosi, D., Qi, Z., Yang, B., Ferreiro Cotorruelo, M. S., Gracia Villar, S., Dzul Lopez, L. A., & Battino, M. (2023). The application of digital technologies and artificial intelligence in healthcare: An overview on nutrition assessment. *Diseases, 11*(3), 97. https://doi.org/10.3390/diseases11030097

Sheikh, A., Anderson, M., Albala, S., Casadei, B., Franklin, B. D., Richards, M., Taylor, D., Tibble, H., & Mossialos, E. (2021). Health information technology and digital innovation for national learning health and care systems. *The Lancet Digital Health, 3*(6), e383–e396. https://doi.org/10.1016/S2589-7500(21)00005-4

Tegegne, M. D., Tilahun, B., Mamuye, A., Kerie, H., Nurhussien, F., Zemen, E., Mebratu, A., Sisay, G., Getachew, R., & Gebeyehu, H. (2023). Digital literacy level and associated factors among health professionals in a referral and teaching hospital: An implication for future digital health systems implementation. *Frontiers in Public Health, 11*, 1130894. https://doi.org/10.3389/fpubh.2023.1130894

Theopilus, Y., Davis, H., & Pedell, S. (2025). Digital technology for supporting aged care services: A scoping review. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems* (pp. 1–12). https://doi.org/10.1145/3706598.3713498

Verma, G. K., Chand, R., Khan, I. A., Kumar, A., & Yadav, R. K. (2023). Association of developmental milestones with vitamin B12 and folate status among hospitalized severe acute malnutrition children at a tertiary care center in North India. *MGM Journal of Medical Sciences, 10*(2), 235–240. https://doi.org/10.4103/mgmj.MGMJ_34_23

Xiong, S., Lu, H., Peoples, N., Duman, E. K., Najarro, A., Ni, Z., Gong, E., Yin, R., Ostbye, T., & Palileo-Villanueva, L. M. (2023). Digital health interventions for non-communicable disease management in primary health care in low- and middle-income countries. *NPJ Digital Medicine, 6*(1), 12. https://doi.org/10.1038/s41746-023-00764-4

Yousefi, F., Dehnavieh, R., Laberge, M., Gagnon, M.-P., Ghaemi, M. M., Nadali, M., & Azizi, N. (2025). Opportunities, challenges, and requirements for artificial intelligence (AI) implementation in primary health care (PHC): A systematic review. *BMC Primary Care, 26*(1), 196. https://doi.org/10.1186/s12875-025-02785-2