Journal of Research in Medical and Dental Science
2024, Volume 12, Issue 9, Page No: 01-08

Available Online at: www.jrmds.in
eISSN No. 2347-2367: pISSN No. 2347-2545

Enhancing Healthcare Research in Saudi Arabia According to Vision 2030: An In-Depth Review

Husna Irfan Thalib[1], Aleena Zobairi[1], Zenab Javed[1], Nesa Ansari[1], Asim M Alshanberi[1], Safaa M Alsanosi[2]*, Yosra Z Alhindi[2],Alaa H Falemban[2], Rowaida Bakri[3], Mohammed Shaikhomer[4], Maram H Alshareef[5]

[1]General Medicine Practice Program, Batterjee Medical College, Jeddah, Saudi Arabia

[2]Department of Pharmacology and Toxicology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia

[3]Department of Microbiology and Parasitology, Faculty of Medicine, Umm Al-Qura University, Makkah, Saudi Arabia

[4]Departments of Internal Medicine, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

[5]Department of Community Medicine and Pilgrims Health Care, Umm Alqura University, Makkah, Saudi Arabia

ABSTRACT

Saudi Arabia's Vision 2030, launched in 2016, aims to transform the healthcare sector by improving service access, quality, and disease prevention. The Health Sector Transformation Program focuses on modernizing infrastructure, enhancing the workforce, and adopting new technologies. This review aims to evaluate the current state of healthcare research in Saudi Arabia and identify areas for improvement. Significant emphasis is placed on digital transformation and advancing medical research, with substantial investments in funding and international collaborations. Despite progress, there is still a need for more original research, particularly in maternal and reproductive health. Technological advancements, like Artificial Intelligence (AI) and machine learning, are enhancing research methodologies. Future developments include privatization and public-private partnerships to boost healthcare efficiency and access. Vision 2030 aspires to position Saudi Arabia as a leader in global health research, ultimately improving health outcomes.

Keywords: Healthcare, Vision 2030, Saudi Arabia, Medical Research, Innovation

HOW TO CITE THIS ARTICLE: Safaa M Alsanosi, Husna Irfan Thalib, Aleena Zobairi, et al. Enhancing Healthcare Research in Saudi Arabia According to Vision 2030: An In-Depth Review. J Res Med Dent Sci, 2024; 12(9):01-08.

Corresponding author: Safaa M Alsanosi
E-mail✉**:** smsanosi@uqu.edu.sa
Received: 02-Sep-2024, Manuscript No. jrmds-24-149749;
Editor assigned: 04-Sep-2024, Pre QC No. jrmds-24-149749(PQ);
Reviewed: 19-Sep -2024, QC No. jrmds-24-149749(Q);
Revised: 24-Sep-2024, Manuscript No. jrmds-24-149749(R);
Published: 30-Sep-2024

INTRODUCTION

The Saudi Arabian government unveiled its Vision 2030 in April 2016, which is an ambitious and strategic roadmap to transform and develop various sectors. The Kingdom started transformation initiatives with eight key subjects to accomplish this. This included improving healthcare, modernizing living standards, developing tourism, enabling a sustainable economy, social empowerment, optimizing accessibility to the labor market, and enhancing the private sector and nonprofit sector. Diversifying Saudi Arabia's economy is one of the main objectives in order to lessen its reliance on oil. It involves establishing non-oil industries, generating new revenue streams, and expanding employment prospects. Vision 2030 aims to enhance the quality of life of Saudi citizens by investing in education, healthcare, housing, and social services. The vision strives to establish Saudi Arabia as an internationally competitive economy [1].

Health Care status before Vision 2030

In recent decades, the Kingdom of Saudi Arabia has showed a remarkable progress in improving

its population's health. There has been quite a notable change observed, particularly in the areas of child and maternal mortality and the reduction of infectious diseases. For instance, average life expectancy at birth improved from 64 years in 1970 to 75 years in 2016 [2]. In the year of 1987, the healthcare center-population ratio was 1:7774 and the physician-population ratio was 1:582 [3]. 1925 marked the beginning of an official healthcare infrastructure when King Abdulaziz issued a royal order creating the first municipal public health department in Makkah. The Ministry of Health (MOH) was established a few decades later in 1951. Under the governance of MOH healthcare system transformed from traditional medicine to modernized healthcare. The 1980s were marked as a prosperous period due to massive revenues from oil exports, which allowed the government to invest more in public health facilities. The 1990s were mainly characterized by the expansion of medical education and health research projects. One of the main industries to benefit during the oil boom was the healthcare sector. The total investment increased from 5% in 2003 to 9% in 2018. [4] (Figure 1).

A study was done from 1985 to 2004 on surveying patients about the quality of care in government health sectors. A high percentage of patients (approx. 70-90%) reported to have good access to prenatal care, vaccination programs, and treatment of epidemic diseases. However, there were few common factors that dissatisfied the patients such as waiting time, environment, and lack of access to specialists. 40% of the patients also complained about the language barrier since many physicians are expats and may not speak Arabic [5]. If we look at the statistics of the healthcare status in Saudi Arabia, we can observe that the Kingdom has made great strides towards achieving a developed healthcare system. In 2000, Saudi Arabia's healthcare system was ranked 26th among the 190 world's health systems, according to WHO [6]. Despite the progress made, it still needs to modernize the sector to achieve the goal of Vision 2030.

Vision 2030: Objectives And Goals- Revolutionizing Healthcare

A review identified several critical areas in which the primary health care system has to be improved. This included infrastructure, workforce, demand, quality, safety, management, and leadership issues [7]. Therefore, the ambitious project Vision 2030 launched a Health sector Transformation program as a part of it. The plan has identified 3 major objectives which needs to be achieved by 2030.

1. Increase in access to healthcare services

2. Improved quality of the service

3. Promoting disease prevention

The plan seeks to establish a more innovative, patient-centered, and readily accessible healthcare system for all citizens. Additionally, it highlights the significance of health education and preventive healthcare. This initiative calls for several actions, including hiring more healthcare professionals, improving the infrastructure, and adopting new medical technologies [8]. Digital transformation is one of the key aspects of a successful development plan. The usage of advanced technology like cloud computing and artificial intelligence can dramatically improve performance and productivity, facilitating the integration of modern and eco-friendly technologies in the sector [9]. The healthcare industry in Saudi Arabia can have clear direction due to the implementation of the new Model of Care, which focuses on enhancing data

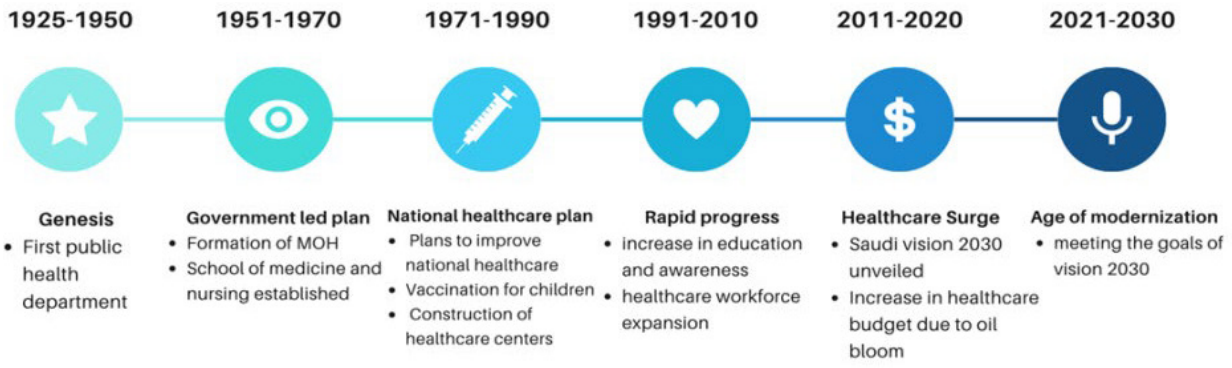

Figure 1: Shows the Timeline of the Health Sector Development in Saudi Arabia.

administration, collecting, and visualization as well as patient and community engagement. It promotes prevention and awareness in the society and guarantees access to health services along with consideration of patient's experience and satisfaction [10].

Advancements in medical research and innovation

A study that employed mixed techniques including a systematic review of high-quality literature of the past 2 years and cross-sectional studies of the key players involved in research set out to examine the current landscape of population health research in Saudi Arabia, analyzing its focus, trends, and areas needing attention. This investigation drew data from a systematic review of influential journal publications from the previous two years, coupled with a survey targeting research leaders to gather insights into ongoing research projects [11]. The study's significance is underscored by Saudi Arabia's strategic shift towards a knowledge-based economy, marked by substantial initiatives over the past decade, including increased research funding and collaborations with international research entities. This concerted effort has led to a remarkable surge in scientific publications emanating from the region, propelling Saudi Arabia to the forefront of scientific research in the Arab world and earning commendable global rankings according to the Scimago Index [12]. However, despite this surge in scholarly output, the study findings reveal a notable gap in original research studies from Saudi Arabia being published in the top-tier Q1 journals in the field of medicine. Instead, a substantial portion of published articles are meta-analyses, systematic reviews, or non-systematic reviews, indicating a scarcity of qualitative research. Qualitative studies, while essential for a comprehensive understanding of population health issues, are often perceived as resource-intensive and less reliable due to their subjective nature. Additionally, the rigor of qualitative research is sometimes questioned due to limitations such as convenience sampling and small sample sizes, which may impact the generalizability of findings and deter journals from publishing such studies [13]. The study highlights the urgent need to address the challenges faced by researchers in conducting original studies and securing publication in high-impact journals. It advocates for a concerted effort to identify and overcome these obstacles to foster a more robust research environment. Furthermore, the study highlights the necessity for longitudinal analysis to track the publication of qualitative research in high-impact medicine journals over time, providing valuable insights into the evolving research landscape in Saudi Arabia [14]. The research findings indicate a notable scarcity of ongoing research projects focusing on maternal health, reproductive health, and developmental disabilities within Saudi Arabia. This aligns with previous literature, which has highlighted the inadequate allocation of funding and research resources for studies in these critical areas. Addressing these gaps and prioritizing these issues for future research endeavors are crucial steps in improving population health outcomes. Furthermore, it reveals a concerning lack of emphasis on studying psychological and behavioral problems, despite a documented increase in years lived with disability in Saudi Arabia attributed to psychiatric and substance abuse disorders. Although several cross-sectional surveys were conducted during the COVID-19 pandemic to explore its psychological and emotional repercussions, the publication of such studies in top-tier Q1 journals necessitates stringent adherence to robust research methodologies and comprehensive reporting, which may be hindered by limited resources [15] Lastly, the survey highlights the inadequate attention directed towards issues related to healthcare management and medical informatics. Given Saudi Arabia's adoption of various health reforms and the automation of healthcare systems, there is a pressing need to allocate additional resources towards studying the impact of automation on healthcare system efficiency, as well as the challenges encountered by healthcare professionals and patients alike. Addressing these research gaps is essential for enhancing high-impact research in the health sciences and ultimately improving healthcare delivery in Saudi Arabia [16].

Technological advances in research

Research is global, fast-paced, and competitive. There is an increased expectation to do more. Due to the rising interdisciplinarity, complexity, and dynamic nature of today's research environment, many researchers must complement one approach with another. All researchers must have a thorough awareness

of the many strategies employed by other academics to enhance collaboration, improve communication, and produce higher-quality research [17] Research has undergone a technological revolution, with improvements in efficiency, accuracy, and scope in a wide range of scientific fields. Utilizing statistical software and automation tools, such as Python libraries, allows researchers to process enormous datasets and carry out sophisticated statistical analyses quickly. It also lowers the possibility of human mistake [18]. By using tools like Tableau and Canva, researchers can produce interactive presentations and visualizations that make complex data easier to interpret. Researchers can share materials, collaborate with colleagues worldwide, and organize their work with the use of online collaboration platforms like PubMed and Google Scholar. There is a resurgence of interest in the still-relatively-underexplored function of artificial intelligence (AI) in research. Advanced AIs that have been trained on carefully selected data have the potential to help with the development of newly discovered substances and the treatment of illnesses like Alzheimer's and cancer [19]. AI can be employed by beginner researchers conducting qualitative research, like conceptual papers or systematic reviews. AI uses vast amounts of text, some of which may be biased toward particular linguistic or racial groupings, to teach them. As a result, the model can generate data that is unjustly biased or discriminatory, which would help to perpetuate negative views and inequities. Therefore, in order to prevent the spread of biased content and criticism, researchers and analysts must delve deeper into the content generated by AI [20].

Resources and Funds for research: Government and University initiatives

Saudi Arabia’s Vision 2030 is the nation’s representation for a transformation, which not only plans to aim at diversifying its economy but also enhance its competition globally. Across various sectors to promote innovation and provide resources, several universities and government initiatives support the nation's vision for 2030 and their development and commitment to research. The Saudi government and the nation’s key universities in achieving these goals, have designed programs and launched several initiatives. King Abdulaziz City for Science and Technology (KACST), King Saud University, and (KAUST) King Abdullah University of Science and Technology are the few key institutions that provide resources and opportunities [21]. In addition to guiding the compass of scientific research and innovation towards solutions more responsive to reality and connecting the research community and universities to an effective partnership with the public and private sectors, the Ministry of Education, represented by the Agency for Research and Innovation, was able to improve the culture of research and innovation in universities and research institutions, support innovators and inventors, develop their scientific skills, and enable them to transform their ideas into ground-breaking projects that support economic growth to achieve sustainable development [22]. A series of workshops has been done by the ministry to link universities with national authorities and organizations through research and innovation, to promote partnerships between universities and the commercial sector in areas of national interest, and to strengthen the role of Saudi universities in promoting economic growth. In addition to initiating creative initiatives in collaboration with industries and converting relevant scientific research into initiatives that may attract investment, growth, and development. Moreover, developing a research strategy and research identity in public universities is also important to meet national needs and advance the strategic goals of the Kingdom's Vision 2030. These goals include improving the caliber of scientific research publications and the caliber of researchers working on issues that have a national impact, both of which will have a positive impact on development and economic indicators. One of the government initiatives which is dedicated to cultural and educational exchange for the students that are studying abroad is called The Saudi Arabian Cultural Mission (SACM). This initiative strongly provides scholarship programs to students to support them in numerous fields which lines up the Saudi Arabia’s Vision 2030. The Saudi Arabian Cultural Mission (SACM) carries out the country's educational and training plans in order to supply our nation with competent people who can accomplish the aims of growth and advancement. A cultural museum that supports the goal of educating about the history of the

Kingdom of Saudi Arabia both historically and currently, as well as the Kingdom's interchange of cultures. At the top educational institutions in the United States, SACM offers students the best educational experiences available. By this active involvement in academic, cultural, and social activities, SACM gathers and disseminates knowledge that represents Saudi culture, tradition, and history [23].

Refining Data Collection Process until Vision 2030

The revolutionizing of data collection in research has undergone significant changes over time, driven by advancements in technology, shifts in methodologies, and changing societal needs. This revolutionizing of data collection with notable changes and anticipated future developments is aligned with Saudi Arabia's Vision 2030 goals. This initiative further aims to transform this process to support economic diversification and technological advancement. This article has discussed the changes that have occurred so far and those anticipated by Vision 2030. Historically, data collection relied heavily on manual methods such as surveys, interviews, and physical measurements, which were time-consuming and often limited in reach. Data were often using paper forms, which were prone to errors and inefficiencies in data entry and management. There was minimal integration of advanced technologies like data analytics, machine learning, or big data techniques in the data collection process. Government agencies and large institutions typically controlled data collection initiatives, which sometimes led to bureaucratic delays and inefficiencies [24]. There has been a shift towards digital data collection methods, leveraging technologies such as mobile devices, IoT sensors, and automated data capture systems. Online surveys, mobile data collection apps, and web scraping techniques are increasingly used to gather data more efficiently and reach a broader audience. Advances in data analytics allow researchers to analyze large volumes of data collected from multiple sources, extracting meaningful insights and patterns. Technologies enable real-time data collection and monitoring, providing timely information for decision-making and research. There has been a push towards transparency and accessibility of data through open data initiatives. Government and private sector data are increasingly being made available for research and analysis purposes. Machine Learning (ML) and Artificial Intelligence (AU) are increasingly used to automate data analysis processes, identify trends, and make predictions based on collected data. There is a growing emphasis on ensuring data quality and accuracy through standardized methodologies, quality control measures, and training for data collectors [25]. As per research, the specific software developments tailored exclusively for data collection in research in Saudi Arabia weren't explicitly documented. However, there are general trends and software solutions that are likely to be utilized or adapted for research data collection in the region, reflecting global advancements. Under Vision 2030, Saudi Arabia has been investing in various software developments aimed at enhancing data collection, management, and analysis across different research domains. These software innovations underline Saudi Arabia's commitment to leveraging technology for research, innovation, and sustainable development under Vision 2030. They play a crucial role in enabling data-driven decision-making, enhancing productivity, and fostering a knowledge-based economy in the kingdom. Tools like Qualtrics, Survey Monkey, and Google Forms are widely used for creating and distributing surveys online. These platforms offer robust features for designing surveys, collecting responses securely, and analyzing data [26]. In the realm of data security and integrity, the Saudi government has explored blockchain technology. Blockchain-based software solutions are being developed to ensure secure and transparent data transactions, particularly in sectors where data authenticity and auditability are critical. As Saudi Arabia advances its smart city initiatives like Neom, new software platforms have emerged to manage urban infrastructure and services efficiently. These platforms integrate data from IoT devices, sensors, and citizen feedback to optimize city operations and improve quality of life. In the healthcare sector, Vision 2030 initiatives have led to the development of integrated healthcare information systems. These systems centralize patient data, facilitate electronic health records (EHRs), and support clinical research by providing secure access to medical data for analysis and decision-making. In the context of Saudi Arabia, these software solutions would likely be adapted to meet specific cultural, regulatory, and language requirements.

Moreover, with the focus on technological advancements under Saudi Arabia's Vision 2030, there may be further developments or adaptations of existing technologies to optimize data collection processes across different research domains [27].

Anticipated developments

The Ministry of Health (MOH) has historically been the primary healthcare provider in Saudi Arabia, responsible for promoting public health, disease prevention, and overseeing regulations for both public and private healthcare sectors. However, this bureaucratic structure has faced challenges in effectively addressing population health measures, access to care, and expenditure, particularly when compared to the actual number of patients treated [28]. The privatization of healthcare in Saudi Arabia is seen as a potential solution to these challenges by introducing decentralization, allowing health clusters and hospitals greater autonomy. This shift aims to foster a cooperative relationship between the public and private sectors in healthcare delivery [29]. Despite the implementation of the Health Insurance Act in 2008, which mandates private healthcare insurance for all Saudi citizens and expatriates, the reality is that all Saudi citizens are already covered by national health insurance. The significant change for Saudis lies in their ability to choose private healthcare institutions for potentially better quality and access to care. This transition towards private healthcare options may lead to a transformation in the healthcare market towards an insurance-based model [30].

Facilitating the transition from public to private healthcare utilization requires concurrent adjustments to provider payment systems, patient deductibles, and hybrid payment methods such as co-insurances. Real-time utilization reviews are essential to monitor the effects of these changes on the private-sector market, patients, and providers. Significant shifts in patient volume towards private institutions may initially alleviate waiting lists in the public healthcare sector. However, there is a risk of excess capacity in public hospitals if demand decreases below their capacity levels. Therefore, it is crucial for Ministry of Health (MOH) hospitals to develop contingency plans to address the evolving competitive landscape. This includes training managers to analyze and anticipate opportunities in this new competitive environment, allowing them to adjust services and budgets accordingly. These measures will help ensure that MOH hospitals can effectively adapt to the changing dynamics of the healthcare market while continuing to meet the needs of the population [31]. The new healthcare model in Saudi Arabia identifies six key enablers to meet health needs: private sector participation, e-Health, workforce development, healthcare financing, corporatization, and governance. These measures aim to streamline the Saudi healthcare system and align with the ambitious Vision of the Kingdom. However, implementing these measures will require a longer timeframe and additional resources. The interconnected Vision Realization Programs (VRPs) are aligned with delivery plans directed by predefined Key Performance Indicators (KPIs). For example, the Human Capability Development program aims to enhance citizens' skills for the future local workforce. Mandatory health insurance coverage in Saudi Arabia is expected to increase access to private healthcare facilities for citizens, expanding primary and secondary healthcare in the private sector and attracting international investment [32]. Currently, the Kingdom heavily relies on international talent to fill healthcare workforce vacancies, with only about 44% of the workforce being Saudi citizens and Saudi physicians constituting only about 30% of the total. Achieving national healthcare transformation necessitates a significant increase in the number of Saudi nationals in the healthcare system. Thus, the Saudization program, a major objective of Vision 2030, aims to address this gap by encouraging Saudi nationals to pursue healthcare professions, establishing new medical and health educational institutions, empowering women's participation, and creating a positive environment for nursing professions among Saudi females [33]. Improving the rate of hiring Saudi healthcare workers could be achieved through endorsing hiring policies that prioritize Saudi nationals and encourage the hiring of highly skilled foreign healthcare providers with specialized experience and certifications. However, the implementation of such policies may face challenges as private hospitals may prioritize cost-effectiveness and prefer hiring less expensive foreign healthcare providers over Saudi counterparts. Balancing these priorities will be crucial for the success

of the Saudization program and the overall healthcare transformation in Saudi Arabia [34]. Limited qualitative data on privatization and Public-Private Partnerships (PPPs) in Saudi Arabia has prompted studies to explore stakeholder perceptions. One such study interviewed administrators and clinical staff from public hospitals in the Eastern province. Findings indicate that privatization is viewed as an opportunity to introduce competition with the private sector, yet there's a recognized need for a deeper understanding of the implementation process and its impact on the Saudi healthcare system [35]. The modernization of Saudi Arabia's healthcare sector is seen as crucial, with initiatives like Vision and NTP providing a platform to enhance efficiency and attract private investment through structured privatization. However, caution is advised in implementing PPP projects. Government agencies must ensure participation from all stakeholders, including health practitioners, consumers, investors, policymakers, market researchers, and the general public, to achieve the objectives of health transformation effectively [36]. As Saudi Arabia progresses towards universal healthcare coverage while containing costs, strategic steps are being taken to develop the private healthcare system, including establishing legislative and governance frameworks for PPPs. However, identifying barriers to PPP implementation early-on is essential for policymakers to adjust and overcome challenges. A study investigating potential barriers identified legal, environmental, and technological obstacles, emphasizing the importance of understanding stakeholder perceptions and addressing concerns in the institutionalization of PPPs in the healthcare sector [37]. In the financial aspect of the transformation program, policymakers must transition towards productivity-based budgeting and implement effective Revenue Cycle Management (RCM) for healthcare reimbursement. This shift is crucial as the Ministry of Health (MOH) transitions from being the primary payer and provider to regulating corporatized payers and providers, such as insurance companies and corporates. However, caution is necessary in implementing RCM to ensure proper coding and documentation of clinical activities, which has historically been lacking in Saudi public hospitals due to budget allocations by the MOH. With the decentralization of health services and autonomy granted to hospitals, policymakers must ensure that vulnerable populations have access to high-quality healthcare and that access to tertiary care for the general population is not compromised [38]. Exploring a hybrid payment model, where both private insurers and the state share the cost, could be beneficial for tertiary care centers in Saudi Arabia. As Saudi Arabia's healthcare system undergoes transformation driven by Vision 2030, the government has laid out a roadmap with legislative frameworks to initiate the process. However, caution is essential as these fundamental changes will directly impact the population's healthcare delivery and well-being. Therefore, ongoing monitoring and adjustments are crucial as this complex and multifaceted process unfolds [39].

CONCLUSION

Saudi Arabia's Vision 2030 aims to transform the country through a diversified economy and improved quality of life, with a significant emphasis on advancing healthcare research. The focus is on enhancing research capabilities, integrating advanced technologies, and fostering innovation to address critical healthcare challenges. This ambitious vision requires support from government and educational institutions and strategic public-private partnerships. Achieving these goals will elevate the country's healthcare research, contribute to a knowledge-based economy, and ensure sustainable development and global competitiveness.

REFERENCES

1. Alshehri1, A., El-Halawany1, F., & Abu-Zinadah1, H. (2021). IOPscience. Journal of Physics: Conference Series.
2. Young Y, Alharthy A, Hosler AS. Transformation of Saudi Arabia’s health system and its impact on population health: what can the USA learn?. Saudi j health syst res. 2021; 1:93-102.
3. Asmri MA, Almalki MJ, Fitzgerald G, et al. The public health care system and primary care services in Saudi Arabia: a system in transition. EMHJ.2020; 26:468-76.
4. Chowdhury S, Mok D, Leenen L. Transformation of health care and the new model of care in Saudi Arabia: Kingdom’s Vision 2030. JML. 2021; 14:347.
5. Hazazi A, Wilson A. Noncommunicable diseases and health system responses in Saudi Arabia: focus on policies and strategies. A qualitative study. HPSR. 2022; 20:63.
6. Al Khashan H, Abogazalah F, Alomary S, et al. Primary health care reform in Saudi Arabia: progress, challenges and prospects. EMHJ. 2021; 27:1016-26.

7. Mani ZA, Goniewicz K. Transforming Healthcare in Saudi Arabia: A Comprehensive Evaluation of Vision 2030's Impact. Sustainability. 2024; 16:3277.
8. Barlow J, Roehrich J, Wright S. Europe sees mixed results from public-private partnerships for building and managing health care facilities and services. Health Affairs. 2013; 32:146-54.
9. Bustamante AV, Méndez CA. Health care privatization in Latin America: comparing divergent privatization approaches in Chile, Colombia, and Mexico. J Health Pol Pol'y & L. 2014; 39:841-86.
10. Al-Shammary AA, Hassan SU, Alshammari FS, et al. A mixed-method analysis to identify the current focus, trends, and gaps in health science research in Saudi Arabia. Fpubh. 2023; 10:1028361.
11. Jahan S, Al-Saigul AM. Primary health care research in Saudi Arabia: A quantitative analysis. Int J Health Sci. 2017; 11:9.
12. Haq IU, Al Fouzan K. Research productivity at King Saud bin Abdul Aziz University for health sciences, Kingdom of Saudi Arabia: A bibliometric appraisal. JRMC. 2017;21.
13. Noorelahi MM, Soubhanneyaz AA, Kasim KA. Perceptions, barriers, and practices of medical research among students at Taibah College of Medicine, Madinah, Saudi Arabia. Adv Med Educ Pract. 2015:479-85.
14. Uddin M, Alharbi NK. The landscape of biomedical research progress, challenges and prospects in Saudi Arabia A systematic review. Digital Health. 2023; 9:20552076231178621.
15. Saquib N, Zaghloul MS, Mazrou A, et al. Cardiovascular disease research in Saudi Arabia: a bibliometric analysis. Scientometrics. 2017; 112:111-40.
16. Rahman R, Qattan A. Vision 2030 and sustainable development: state capacity to revitalize the healthcare system in Saudi Arabia. INQUIRY: The Journal of Health Care Organization, Provision, and Financing. 2021; 58:0046958020984682.
17. Alshuwaikhat HM, Mohammed I. Sustainability matters in national development visions—Evidence from Saudi Arabia's Vision for 2030. Sustainability. 2017;9:408.
18. Alharbi MF. An analysis of the Saudi health-care system's readiness to change in the context of the Saudi National Health-care Plan in Vision 2030. Int J Health Sci. 2018; 12:83.
19. Albejaidi F, Nair KS. Building the health workforce: Saudi Arabia's challenges in achieving Vision 2030. Int J Health Plann. Manage. 2019; 34:e1405-16.
20. Al-Anezi, F. M., Alrajhi, S., et al. (2020). A review of healthcare system in Saudi Arabia. In 2020 19th International Symposium on Distributed Computing and Applications for Business Engineering and Science (DCABES) (pp. 318-322). IEEE.
21. Al-luhaym AN, Alshagrawi S. Factors Associated with Access to the Saudi Primary Healthcare in Light of Vision 2030. Sud J Med Sc. 2023; 18:391-401.
22. Alhakami H, Baz A, Al-shareef M, et al. A Framework for Securing Saudi Arabian Hospital Industry: Vision-2030 Perspective. Intell Autom Soft Comput. 2023; 36:2773-86.
23. Alharbi M. An investigation of the saudi healthcare system's readiness for change in the light of Vision 2030: The role of transformational leadership style. JHS. 2018; 6:45-.
24. Rahman R. The privatization of health care system in Saudi Arabia. Health Serv Insights. 2020; 13:1178632920934497.
25. Alnowibet K, Abduljabbar A, Ahmad S, et al. Healthcare human resources: trends and demand in Saudi Arabia. InHealthcare 2021 (Vol. 9, No. 08, p. 955). MDPI.
26. Basheikh MA, Balubaid H, Mohammed BA, et al. Kingdom of Saudi Arabia. Int J Ageing Dev Ctries. 2021; 6:141-54.
27. Jibreel EA, Zakari NM, Smida JA. Develop assessment framework inspiring-Saudi Arabia s Vision 2030 for health program in higher education: an experience from Al Maarefa University, Riyadh, Saudi Arabia. IJMDC. 2020; 4:1233-.
28. Almubark R, Basyouni M, Alghanem A, et al. Health literacy in Saudi Arabia: Implications for public health and healthcare access. Pharmacol res perspect. 2019; 7:e00514.
29. Alhazmi F. A critical review of healthcare human resource development: a Saudization perspective. Health. 2021; 13:1496-510.
30. Elsheikh AS, Alqurashi AM, Wahba MA, et al. Healthcare Working Force in Saudi Arabia under Saudi Vision.
31. Rahman R, Alsharqi OZ. What drove the health system reforms in the Kingdom of Saudi Arabia? An analysis. Int J Health Plann Manage. 2019; 34:100-10.
32. Gailey S, Bruckner TA, Lin TK, et al. A needs-based methodology to project physicians and nurses to 2030: the case of the Kingdom of Saudi Arabia. HRH. 2021; 19:55.
33. Alotaibi A, Saleh W, Abdulbaqi A, et al. Health research priority agenda for Ministry Of Health, Kingdom of Saudi Arabia from 2020 to 2025. J EPIDEMIOL GLOB HEA. 2022; 12:413-29.
34. Khan MU. Saudi Arabia's vision 2030. Defence Journal. 2016; 19:36.
35. Noor A. The utilization of e-health in the Kingdom of Saudi Arabia. Int Res J Eng Technol. 2019; 6:11.
36. Albalawi, R. S., Alotaibi, M. H. A., Albalawi, F. M., et al. CHALLENGES OF PRIMARY HEALTHCARE IN SAUDI ARABIA: A NARRATIVE REVIEW. *JPTCP*, *31*, 2472-2478.
37. Khan MB, Iqbal S. Vision 2030 and the national transformation program. InResearch, SIPA. 2020 (pp. 146-166). Routledge.
38. Alhawassi TM, Abuelizz HA, Almetwazi M, et al. Advancing pharmaceuticals and patient safety in Saudi Arabia: A 2030 vision initiative. SPJ. 2018; 26:71-4.
39. Alemahu A. Saudi Arabia's Vision 2030 and Its Regional Implication. IJPAMR. 2023; 9:79-85.