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The Impact of Healthcare Policies on Medical Laboratories in Saudi Arabia

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Abstract
In the last decade, there has been a considerable increase in the demand for laboratory services in Saudi Arabia. Healthcare policy in Saudi Arabia has continued to aggressively encourage developments in private laboratories.

Keywords: Policies, Health Care, Medical Laboratories, Health Vision 2030

1. Introduction

The Kingdom of Saudi Arabia is the largest country in the Gulf region. Saudi Arabia covers an area of over 2,250,000 square kilometers, has a population of approximately 34,218,000, and has a high level of bureaucracy [1]. The Ministry of Education (MOE) of Saudi Arabia has published the basic education curriculum containing contents like life skills and positive values and enunciates its objectives and core values. Besides, this curriculum integrates the assessment of the levels of skills which the students are expected to achieve from their learning process. Even though the MOE has established a unit to assess students' values, there is no systematic way of evaluating life skills considering the students' work within the classroom. Similarly, improving life skills is achieved by a Teacher Training Education Program whose exposure to the MOE curriculum lacked ITC knowledge thereby hindering their implementation of the new evaluation system, which revolved around ITC skills. Most importantly, the issue of ITC knowledge became noticeable during their educational internship. With advancing technology, the influence of Information and Communication Technologies (ICT) on people's life has grown significantly [2]. ICT are now part of the learning process and have a greater influence in classrooms. The increasing use of ICT in schools and universities in Saudi Arabia have raised concerns regarding the impact of ICT on the use of the Arabic language among students. In this regard, this study aimed at investigating the impact of using ICT in academic settings on the use of Arabic language among Saudi students. Data were collected using a questionnaire and interviews that targeted a sample of 400 Saudi students. Our results revealed that ICT have a significant influence on Arabic language use among Saudi students, especially in their identity and social contexts. Additionally, the present study emphasizes the importance of academic administrators in ensuring that the use of contemporary learning

resources in their institutions work in harmony with the values and principles of the Arabic language and Arab identity.

1.1. Background of Healthcare Policies in Saudi Arabia

Former measures on noncommunicable diseases (NCD) included expanding infrastructure in urban and rural areas, decentralizing healthcare resources, health education and health awareness, mobilizing community leadership, and investing in mental health. The government decided (1) to open a minimum of 200 Primary Healthcare Centers over the coming decade, (2) recruit at least 6000 General Practitioners, (3) establish a Health Promotion Center in each healthcare directorate, and (4) restructure the Family and Community Medicine Department, including the mandatory inclusion of the human rights sciences and legal studies. Bandar Al Knawy, CEO of the Ministry of National Guard Health Affairs, said that, with the recent change in traffic regulations to improve road safety, about 8000 injuries and 500 deaths had been averted. Dr. Mohammed Al Yahyaa, CEO of Al-Moosa Specialized Hospital, highlighted the unique health strategy, stating that the observed appreciations from private sector professionals, specialists, and patients were very promising. Results from international organizations, such as WHO or the Lancet Healthcare Partnership, were also highly affirmative with the Healthcare Vision 2030.

The 2002 Health Law in Saudi Arabia aimed to provide a high quality, comprehensive, and accessible healthcare system for all citizens, in line with the Saudi Vision 2030 [3]. The government restructured the healthcare system to address the health needs of the Saudi population by the Health Vision 2030, focusing on integrating primary and higher-level services, centralizing payment for public health services, and pooling procurement of medicines and equipment. Bandar Al Knawy, CEO of the Ministry of National Guard Health Affairs, and member of the Saudi Arabia Health Council, presented that 50% or more of Saudis suffered from obesity, hypertension, diabetes, hyperlipidemia, stunting, overweight, smoking, and drug abuse and the Kingdom had variable disease patterns, with regional variations in the burden of cancer, dementia, stroke, cardiovascular diseases, iron deficiency, and congenital and metabolic diseases. The cost for the treatment of non-communicable diseases is constantly increasing and the country is losing millions of riyals in the treatment of diseases related to tobacco, coronary artery disease, and diabetes. Thus, these findings show that primary and higher levels of services should be integrated to address the needs of the Saudi population. The government decided, after long consultation and after international and local experts had assessed the problem, to focus on primary healthcare. The Saudi government aimed to increase health education and health awareness among individuals, families, and communities. Resources should be focused on disease prevention, health behavior changes, primary healthcare services, and health promotion. Therefore, the government decided to establish and strengthen integrated primary healthcare centers.

1.2. Role and Importance of Medical Laboratories

Consequently, the advancement in medical knowledge in the 21st century has demanded changes in the traditional diagnosing and treating concepts of diseases. One of the greatest landmarks in preventing and treating diseases is the early discovery, diagnosing, and preventing them from spreading. The best way is discovering diseases by laboratory means and instruments. Today, the total number of laboratory test requests is increasing mainly due to increased numbers of patients, new tests being constantly introduced, and an increased interest in public health measures. Thus, the laboratory still plays a crucial role in diagnostics in health care. Collecting health information (especially medical data) becomes a complicated and elaborate mission. To prevent medical detriment, there are stipulated ways of receiving

and transmitting this information among all the components of the health care system. A diagnostic test is generally performed to confirm, identify, affirm, or predict a certain illness by eliminating the related diseases. This type of test is generally divided into three categories: screening, confirmatory, and prognostic.

To diagnose, find the disease, proper medicine treatment, and care for the patient accurately or effectively, the pre-analytical, analytical, and post-analytical steps of the laboratory are very important. To make the laboratory processes more efficient and make errorless results, we should work on standard operational procedures (SOP) and quality assurance (QA), and control (QC) program are as per the international recommendation and rules are mandatory plus documentation system is must. In addition, the laboratory staff should be trained, and their continuous education should be in care [4]. There are various external and internal factors that have an impact on the quality of laboratory testing. Pharmaceutical control companies, universities, and governmental and nongovernmental organizations have suggested different activities to perform.

In the field of diagnosis and treatment, over 65% of clinical decisions are dependent on medical laboratory testing (World Health Organization, 2010), which means that effective laboratory results in the effective diagnosis and treatments. In this regard, the role and importance of medical laboratories are very clear. In the present context, the important contribution of the laboratory services is not only in the use of high technology in disease control, diagnosis, and treatment. Furthermore, medical laboratories should also be considered important in preventive and promotional perspectives. The World Health Organization has defined that health is “a state of complete physical, mental, and social well-being and not merely the absence of diseases or infirmity” (WHO, 2017) [5]. In this present context, the laboratory techniques and assessment contribute to measures promoted such as national screening, early detection of diseases, and evaluation of preventive medical programs (Ehran et al., 2020).

Testing and assessment are critical components of the healthcare system. They contribute to medical diagnosis, prognosis, treatment, and patient care. As a result, the quality assurance of healthcare services cannot be secure without effective laboratory services. The role and importance of medical laboratories in service provision are recognized universally, not only in Saudi Arabia [6].

2. Regulatory Framework for Medical Laboratories

There is a growing number of research and case studies on the topic of medical laboratories [7]. Most of the research focuses on the performance of medical laboratories, such as evaluation of them, preanalytical errors, the impact of policies, changes in analyzer’s results and many others. The aim of the study was to investigate the records of patients using laboratory tests combined with patient demographic information to assess the technical performance of those laboratories. Medical laboratories are considered a vital component to support all healthcare systems around the world, and there is no exclusion to this in Saudia Arabia, where all laboratories have been under the supervision of the Ministry of Health (MOH). Given the importance of the role of the clinical laboratory in supporting healthcare systems, worldwide, this regulatory framework has a set of international standards and guidelines that were established to support laboratories in achieving the highest technical performance and quality [5]. Despite this, medical laboratories in rural areas are still facing a lot of challenges, such as shortages in staff, difficulty in accessing workforce education and training, low-quality equipment and poor management, lack of quality management system, and others. Recent evaluations of Saudi laboratories showed that the technical performance of laboratory processes was suboptimal. These

inadequate practices introduced bias across testing platforms as well as sampling, collection, and transportation of blood samples. Profound training programs for laboratory managers should be supported by the health authorities to achieve optimal laboratory performance and to maintain the highest technical quality for clinical laboratory tests. There is also an urgent need for skillful laboratory professionals to ensure the safety of patients results [8].

2.1. Licensing and Accreditation Requirements

The national study identified, emphasized, and explained barriers to obtaining effective CDSS solutions in the PHC sector. These barriers were found to involve specific CDSS users (e.g., service providers, caregivers, decision-makers, instructors, CDSS developers, and CECS), the organization (PHCC, MoH), regulatory or policy-making bodies, and outside suppliers and developers–researchers. The following barriers were found to play a role in the CDSS implementation in the Saudi PHC settings and were highlighted, among others, in the absence of formal ethical and practical barrier analysis in the health card use context and lack of a set of barrier-model deals that represent barriers affecting the decisions of CDSS, which became relatively urgent over time. The analysis here offers a unique basis that will advance our awareness of the adoption of technology from a holistic point of view [2].

Key performance indicators (KPIs) were defined to reflect quality and staff competency in specimen collection, labeling, handling, and transportation [9]. Interventions in staff competency, document control system, and quality and safety program were implemented. The CBAHI standards were used to assess evidence of compliance, with specific criteria and scoring for different levels of compliance. From May 2017 to May 2019, a progressive increase in compliance from 63.7% to 92.7% was noted. The most frequent non-compliant test was glucose, followed by cholesterol.

2.2. Quality Control and Assurance Measures

Section 2.2. Quality Control and Assurance Measures: Saudi Council for Health Specialties (SCfHS) is the official body governing the medical laboratory profession in KSA, not SUB in 5. Healthcare policy primarily focuses on important medical laboratory professions, the positive impact of which lays the foundation for professionalization of this field. Ideally, awareness, continued professional development, and community services need to be added to healthcare policy for a better professional future. In addition, the appreciation of experienced medical laboratory professionals needs to be held in the category of “Fellow” [22, 23]. The ambitious vision of the Saudi Ministry of Health to enhance healthcare and promote professionalism across healthcare providers offers an opportunity for a customized curriculum for BSc in medical laboratory technology with a special Master of Medical Laboratory Technology (MMedLMT) degree in management, training healthcare professionals as per global career guidance [10].

The Saudi Arabian Ministry of Health’s transformation program launched in 2017 has the goal of improving the quality, accessibility, and cost-effectiveness of healthcare services. The program mandates the private sector to comply with accreditation standards and to maintain clinical facilities at predefined levels according to the quality classification by the Saudi Central Board for Accreditation of Healthcare Institutions. The mandatory accreditation standards include Essential Safety Requirements (ESRs) in addition to other criteria, which are expected to promote and enhance the safe care of patients. Healthcare services in the governmental hospital laboratories are free of charge, historically attracting huge patient referrals. Medical tests emphasized as priority activities were performed using updated appropriate quality control materials and following the appropriate guidebooks, available only in English, in a well-equipped sample collection unit. The strong vision of the Ministry of Health to

promote medical sciences in non-medical laboratory specialties as well as English requirement is expected to have a significant impact on the medical laboratory profession.

3. Impact of Healthcare Policies on Medical Laboratories

The healthcare system in Saudi Arabia has been able to achieve significant milestones by improving key health indicators and surmounting critical healthcare challenges such as the recent MERS-CoV outbreaks [2]. However, there have been some limitations in healthcare delivery as well when talked in the context of Kandakee hospital, whereby medical Laboratories are a vital part of hospital Operations. Studies have revealed that the physical infrastructure of the hospital is problematic due to the many equipment interruptions, as well as non-functioning disposable supplies, there are also reductions in human resources, technicians and medical providers that put the hospital's ability to function properly in question when attempting to provide quality health services.

The government plays a key role in ensuring the efficient provision, planning and maintenance of healthcare facilities, which includes the numerous medical laboratories [11]. Even though the Kingdom boasts a high level of investment in relation to healthcare and public policies, there are still some issues the country faces when it comes to management, including governance, regulations, human resources and more. This is due to the Ministry of Health's limited resources, lack of sufficient cross-sector or multidisciplinary programs, and financial restrictions in current HealthCare Policies. Additionally, partners under Power Ministry are facing challenges regarding the decreasing of financing, organization and supply and values added from Saudi Students to long education medical laboratories.

3.1. Financial Implications

Based on the predicted burn-out and turnover of staff, MedLab managers expected to have to add consultants to their teams, which would cause a 17.2% increase in staff expenditure. Moreover, 77.3% of managers reported that further hiring of less experienced expatriate staff was also expected because of Saudization; they anticipated their costs for recruitment to increase by 11.3%. As experienced expatriate laboratory technicians will be difficult to replace with courses of two years or fewer, MedLab managers now need more experienced technicians. This liability will add to their financial costs, exacerbating the situation from a financial point of view. The Saudization of laboratory workforce would need both financial and managerial attention for successful accomplishment [1].

MedLab managers acknowledged that Saudization policies were leading to a decrease in the quality of laboratory services, as they were compelled to hire underqualified local staff as a required part of the Saudization process [5]. Consequently, MedLab managers anticipated the necessity of hiring more consultants and receiving further technical support from suppliers. The High Commission for the Development of ArRiyadh City announced plans to create a Committee for Investment, which is expected to attract foreign investment and facilitate living and working for expatriates in Riyadh City Development. Given this new urbanization initiative, it is anticipated that this investment will largest employ non-local and non-Saudi staff who either lack the relevant experience or are underqualified for their new roles. Therefore, MedLabs will suffer from turnover and retrenchment, thereby complicating the Saudization process [12].

3.2. Technological Advancements

Additionally, determining the best health IT platform or strategy requires understanding the scope of IT adoption within a healthcare system. This fundamental knowledge base would guide future technological implementation in an organization, broaden the existing concept of health IT, and provide

a broad vision of where IT adoption stands, while accounting for various factors. Like everywhere, even in KSA, the diagnostic errors in hospitals and laboratories are the rates of misdiagnosis are currently 15%-28% and come with annual health-care costs of up to $120B. The most common type of isdiagnosis is related to laboratory diagnostics. Laboratory medicine has the highest frequency of error among all clinical departments in health care systems. Therefore, the ministry of health should think tank or an advisory committee with several conferences (national and international) that would help to formulate the strategic management plan of the medical laboratories in Saudi Arabia. Expert symposiums should be organized to develop ideas on personalizing laboratory tests.

Technological advancements also play a crucial role in medical laboratories, and the advancement in technology leads to the development of new tests, which in turn leads to a better understanding of the state of the disease, better patient management, and more effective treatment modalities [13]. In line with the Saudi Vision 2030, the Ministry of Health initiated several projects including the application of HIS/CIS systems, nationwide network systems, PACS, the unified electronic lab system, and more recently, MNI in its healthcare facilities. The Saudi government also initiated digitalization in all sectors of the country which includes digital healthcare services in both outpatient and in-patient care services. However, despite these achievements, the workforce productivity of laboratories and pathologists also rely on these technological advancements, and implementation of newer technologies in the laboratories has been stalled at various phases of the implementation. This can be considered as a limitation since many centers might be using outdated platforms for many laboratory tests and might not be able to match the quality of care provided by other centers that may have the advantage of using the newer genomes [5].

4. Challenges and Opportunities

The shortage of appropriate local employees is impacting quality healthcare services in KSA. One of the major challenges that is coming in the way of Saudization could be inadequate vocational training programs which are developing minimally qualified students entering the workforce and are of low demand to private medical laboratories. The issues that have been coming up hence are greater attrition of the health workforce, erratic healthcare workplace and un-availability of adequate training programs for required healthcare professionals [6]. To address these issues, it is recommended to establish strategic public private partnership and expansion and diversification of the educational and training capacity. The recommendations would like to ensure the following: effective governance and regulation, investment and capacity building, transformation of the roles of health workers to attain sustainable development of a trained health workforce, strengthening representation of health at the labor market, and social dialogue, enhancing the relevance of education and training to ensure the delivery of the right mix of competencies and effective use of resources.

The implementation of Saudization policy in various niche sectors of the Saudi Arabia labor market is posing several potential threats to the labor market, particularly to the foreign workers employed in the country. This has led to an increasing unemployment rate of Saudi nationals at the private sector, particularly in the medical laboratory sector. The government is continuously implementing several laws to accommodate the labor market of KSA, such as Nitaqat system, fee increase, reduced renewal of visas, and strict rules and regulations for renewal of Iqamas [14]. This is making the foreign workers' employment difficult and adding pressure and responsibilities to the local employees, who have low motivation and lack appropriate training in laboratories and lack quality healthcare.

4.1. Challenges Faced by Medical Laboratories

Especially long private medical laboratories also face the demand for doctor's prescriptions and related hard systems by getting their bills directly. In the public labs, the General Department of Health Affairs and the Ministry of Health receive the patients' cards and retrieve the requested tests and the prescriptions. This interruption order and division of labor consume more time, but it is considered appropriate by the Ministry of Health, which is a country, although the business practice required to prescription from a doctor is ignored [15]. In case of receiving the laboratory feeling services directly in laboratories (bypassing any referral from doctors), a severe penalty is responsible for individuals who order the non-authorized laboratory to cause these acts that is clear in the facilities' leases. If the trial moves in the right way, it is believed that the patient will obtain a better result without cost and time wasted. If he or she chicks have time to see a doctor in the hospital, i.e., meaningful hospitalization, such tests can also be paid. However, as it was mentioned, the stated issues are different from those of what the authors have faced particularly in governmental labs, who are responsible for all deferrals from the MOH.

Saudi Arabia has seen many changes in its healthcare sector over the years, but the biggest one affected by these healthcare reforms is none other than the medical laboratory sector. While the country is still transitioning to a privatization strategy, hospitals and healthcare centers have faced many challenges, particularly in their laboratories [16]. First, laboratories operate under the supervision of physicians and face tense issues of fee collection, which also depend on the patients' inheritance. Moreover, electronic systems also need to be bought and managed. Second, management teams stress the appointment of non-Saudi staff. Progress has been made in appointing medical technologists working in the Saudi environment, but the number is still not expected to meet needs. The third challenge is the lack of funding to buy new equipment and keep the existing one as recommended by manufacturers. Fourth, the laboratory should have a clear network, used for receiving laboratory-related data from patients' sites and sending reports in a safe, clear, and rapid manner [17].

4.2. Opportunities for Growth and Innovation

The laboratory responds by activating an internal reorganization that affects the workforce, the process of delivering the service and the physical organization of spaces, rethinking the mode of access of users to structures and resources. The managers of medical laboratory services are therefore facing some frontiers which, to date, are challenges that require an urgent reorganization aimed at improving these services oriented to the patient. In support of this, the national agency for the healthcare services of Saudi Arabia, through the implementation of some innovative initiatives, such as the "Healthy Cities Program" and the "Integrated Community Centers Program", has designed an innovative response to tackle these challenges (AI, 2022). Mass screening centers are provided with basic operating instruments - such as complete blood count with red cell distribution width, coagulation tests, clinical biochemistry (glucose, urea, creatinine, alantin transaminase, TC, LDL - HDL cholesterol to complete lipid assays panel, Hb A1C, dedicated serological tests) - to answer for the urgent assessment of overall patient health.

We define opportunities as a favorable set of circumstances through which the management of the medical laboratories can harness scarce resources to achieve performance-based values by exploiting business growth through market penetration, diversification, or new business model development. In the laboratory, such opportunities can deliver positive effects in several important dimensions: improving patient safety; promoting community welfare (sharing resources and knowledge); improving laboratory

services for local stakeholders such as physicians, underprivileged patients, the general population, and public health authorities [18]. Among other external elements, the block of healthcare legislation should not be considered as a constraining factor but one of the key external factors to which the manager of the medical laboratory must pay close attention in its strategic decision-making process, and then leverage the opportunities that it offers [15]. Therefore, the definition of healthcare policies can generally go in the direction of establishing the block of rules which contribute to the mobilization, coordination, financial regulation, and role assignment within a health care system, network, or organization (Adam, 2012), to define objectives of contribution of its quality, effectiveness, efficiency, accessibility, and acceptability (Adam & Belkhodja, 2019). This aspect is even more important in a context of crisis like that of the pandemic crisis that has been experienced because, as the Organization for Economic Co-operation and Development has highlighted, good governance and effective regulatory authorities can mitigate the socio-economic effects of the pandemic, encouraging businesses to resume normal operations, helping families and individuals in difficulty and with impairment of income to overcome this period of health emergency and economic expenditure (OECD, 2010)

5. Case Studies

An interventional study was completed in four consecutive steps (2 months each phase) from August to November 2018. The first step encompassed awareness, and the impact of the new guidelines disseminated through professional as well as administrative circulars. The second step incorporated immediate feedback for poorly requested tests and feedback at the end of each month. The third step involved the consultants as the sole authority who could request the tests. The fourth step illustrated our proactive role with the contact number provided to on-call doctors aiding in the early detection and implementation of tests and imaging facility. The deviation from the guidelines was considered inappropriate test utilization, thus measurements were recorded with each stage and consequences for continued deviations were also recorded [19]. One hundred consecutive requests were examined for patients attending the secondary care facilities for the same host country such as angina–group A (sub setting of 50 cases regular angina –Random sampling of 20 cases chronic stable angina renal failure) and stroke-group B (sub setting of 50 cases with varying degrees of stroke – Random sampling of 20 cases moderate level of ischemic stroke and chronic renal failure) and data were collected for a single year from January 2017 to December 2017, from Al-Mubarakiyya Teaching Hospital, Ministry of Health Kuwait. Overall, about 1200 investigations were made for 200 patients during the study period and this has generated about 12000 data units.

A pilot study was conducted at a primary health care center in the Al-Khobar area, Eastern Province of Saudi Arabia, to determine the current practice of test utilization [20]. A total of 50 requests were picked from the shift for four consecutive months (January to April 2018). An observational check list for each test was created to assess the diagnostic value in relation to the clinical need and the number of tests was excessive (83%) for the clinical condition presented by patients. Each test was carefully examined for cost impact; 43% of the tests were deemed unnecessary and 45% of the tests were likely unnecessary. The urgent need, appropriate specimen, and sample type choices were found to be satisfactory (>80%). The effect of the new guideline was heralded by a significant reduction in the estimated annual cost by about 25% from 50,000 US$ in 2017 to 37,500 US$ in 2018.

5.1. Successful Implementation of Healthcare Policies

Policies of healthcare organizations which include Ministries of Health (MOH), and other MOH-affiliat-

ed hospitals and general directorates lack any direct evaluation of laboratories that are part of the KSA's national healthcare system. Our survey revealed that all policies only and only concern Hospitals that do not concern labs as far as their HR measures and/or supply chain managements etc. are concerned [5]. The reality, however, is that knowledge, test solutions and test reports and consultive services of lab experts are internationally comparable GDP indicators. Dynamics of hospitals and labs cannot be expected to be the same in KSA. Laboratories are offended by this utter disregard for their active center of their personnel and resources and the makers of these policies are blind to exploiting the nation's GDP- sheltering clinical laboratories to external commercial agents. Policies neuter the impact of education, new knowledge, R&D and innovations and the same feedback relation is not allowed between the lab and the field researcher in informal settings. Democratically elected Pakistani president has named one "regulator" as one of them who has been claiming that the leadership does not know how their health constants are violated openly in all commercial fields i-e., laboratories-- and there is no suppressor of the violations [21]. Regulatory authorities were unfortunate not to bring accurate legal outcomes against organizations when they either termed the supplies as "peculiarly or un-calibrated" or provided no reasoning.

Saudi Arabia has been able to successfully implement the first phase of digitizing all services and having them appropriately documented through the National Digital Transformation Plan. Goals set by the E-government in Saudi Arabia have been largely accomplished as the initiative aims to deliver top priority services electronically and ensure user satisfaction through establishing an information society [22]. In Saudi Arabia, every citizen must be registered in the National Authentication Centre (NIC) where he/she can access all governmental services without having to present identification or attestation, which gives online government transactions much security. Despite all these achievements in the healthcare sector, the Distributed Laboratory Information System (LIMS) project is not near completion on time mainly because it is delayed on the part of the central IT authority. Making the LIMS by central IT is also against the efficiency, which the current centralized IT model delivers a banning point for any government to act.

5.2. Lessons Learned and Best Practices

The main objective of healthcare policy in Saudi Arabia is to guide investment in the health sector to improve the health of the population. First, public-private partnerships should be promoted in health management to enhance the quality of care provided to patients. In this way, the pipeline of staff and graduates has increased, with the aim of making better use of the healthcare system and pharmacy departments [10]. The recruitment of qualified staff and the adoption of a strategic orientation that corresponds to the Vision 2030 initiative developed by the MoH are other important components of the strategic objectives of the healthcare policy initiative in Saudi Arabia.

Recently, the Ministry of Health in the Kingdom of Saudi Arabia (MoH) has aimed to improve medical laboratories by establishing strategic objectives that comply with social, economic, and other public issues [23]. The MoH, as the main healthcare provider in Saudi Arabia, has exhibited notable interest in enhancing medical laboratories and embarking upon efficient health management in response to a significant increase in the overall number of clinical laboratories in the healthcare system. The continuous need is evident for a standardized system of health management that harmonizes the performance of all functions and establishes a comprehensive system for quality health care [24]. Hence, recruitment of qualified staff for specific professional roles, preparation and implementation of new

laboratory management regulations, and introduction and registration of highly complex analysis services have dramatically improved the healthcare system, thereby attracting more healthcare providers.

6. Conclusion and Future Outlook

This study has identified several strategic interventions for improving medical laboratory services under the changing policies. The reforms at primary healthcare levels and primary care centers, followed by integration of laboratory services in the health system, will provide some of the most enabling environments for achieving the results. The News on Saudi Gazette has termed this as ACC (accountable care communities) [25]. However, genuine adaptation towards preventive care in clinical investigations and investment in rational healthcare will guarantee effective health management in the country. Future researchers may replicate the present study with an extended scope in public and private institutions combined. Similarly, the generalizability of the study findings is limited. Medical laboratories are a neglected area in the field of healthcare, which require considerable attention for optimization of resources if failed confidence on private laboratories is to be restored in the Kingdom of Saudi Arabia, which is the basis for any future universal health coverage.

The report has been prepared with the objective to evaluate the healthcare strategies of the Saudi Arabian government and its impact on medical laboratories in the public and private sectors. The study has primarily evaluated the Saudi Vision 2030 goals and the policies and programs of the Saudi DIN for transforming healthcare services. All healthcare facilities need to be restructured to meet the requirements of community health services. In this restructured system, medical laboratory facilities assume predominant importance. Saudi Vision 2030 strategic objectives of enhancing the role of primary healthcare services, promoting healthy lifestyles, and strengthening health information management and health management infrastructure will substantially increase the importance of medical laboratories in the country's public health services. Consequently, healthcare strategies such as the introduction of artificial intelligence and the Kingdom's policy on antimicrobial resistance will place additional responsibilities on these facilities [24]. On the one hand, this will test the present health policies and medical laboratory facilities in the country, and on the other hand, create new challenges for private medical laboratories. New policies may also motivate new models of ownership such as health maintenance organizations to optimize healthcare delivery in the country, keeping especially in view the government's initiatives promoting privatization in all sectors of national economic activities including healthcare services. Medical laboratories will certainly be the first sector affected by these changes as these are the support services of healthcare delivery system [9].

6.1. Summary of Key Findings

The number of private laboratories increased by 10.1% through 2019. In public hospital-based laboratories, the demand for laboratory services came in the face of increased access to medical care due to generous insurance coverage and a rising burden of diseases largely due to non-communicable diseases in the context of an aging population. This study has been conducted to determine the common types of laboratory equipment and the existing automation level in terms of the number of parts of laboratory testing systems and clinical laboratories that are completely automated. More than half of laboratories did not have entirely automated systems, although 12.5% of clinical laboratories are fully automated for most of their tests and 9.3% are fully automated for all tests.

The objective of this study was to identify the impact of Saudi Arabia's healthcare policies on medical laboratories in the Kingdom. It was revealed that the Ministry of Health (MOH) in Saudi Arabia is the

primary provider of medical services, funding 98% of all health expenses. Consequently, healthcare expenditure has significantly grown, reaching up to 13% of Saudi Arabia's GDP. Health services in Saudi Arabia have seen lots of improvements at all levels: primary, secondary, and tertiary. While MOH has witnessed a significant expansion, medical laboratories have become a significant destination for healthcare policies. This liberalization has significantly enlarged the demand for lab tests.

6.2. Recommendations for Policy Makers

The Saudi Central Board for Accreditation at the Ministry for Health (MOH) has visited over 2000 labs across the healthcare settings only last year. However, this is an instance of showing the proactive role of the Ministry, especially with the arrival of severe acute respiratory syndrome (SARS) type but less lethal-COVID-19 disease, etiological diagnosis has become the primary mode of clinical decisions and public health policies. Molecular methods are enjoying their prime time for health management and drug discovery. Being a responsible healthcare model accreditation is a must in medical diagnostics.

Recent trends show that the Saudi population prefers having immediate access to diagnostic services. In the mature healthcare economies of the world, which are mostly populated with private hospitals, patients prefer to consult specialists in ambulatory settings. Here, the diagnostic facilities are much advanced in terms of diagnostic imaging, biochemistry, hormones, and biomarkers. Therefore, the specialists can readily diagnose illnesses, even over the phone. Thus, Saudi hospitals should establish their network of medical centers attached to the centralized labs. This could make them financially viable. Services such as early cancer screening, autoimmune disorders, and nutritional medicine should be a part of these lab setups. The Ministry of Health should think and work on this model to leverage patient care [9].

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