Mapping Iraq's Post-2003 Health Crisis: Two Decades of Retrogression and Kleptocracy

For the CFRI, Professor Robert Istepanian delivers an alarming analysis of the Iraqi healthcare infrastructure, underscoring a critical shortage of resources and rampant corruption afflicting hospitals, health centres, medical personnel, and academic institutions. The far-reaching ramifications of these systemic challenges pose significant threats to the well-being of the country.

31st January 2024

A paramedic sits in front of a field clinic with Arabic that reads, "Martyr al-Sadr hospital," Tahrir Square, Baghdad, Iraq

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Abstract

Over the past two decades following the US-led invasion of Iraq, the country's healthcare system has been in severe decline and continues to be in crisis. The healthcare system in Iraq is multifaceted and remains largely struggling with many serious challenges ahead. The healthcare crisis is largely driven by the economic and political complexities that engulfed Iraq since 2003. These include poor governance, lack of politically independent and expert leadership, widespread corruption and inadequate long-term and sustainable planning.

These issues have drastically reduced the quality, efficiency, and accessibility of basic healthcare services for most Iraqis, especially for those in economically challenging conditions. Rooted in prolonged wars, internal conflicts, and political instability, the healthcare system is overwhelmed by rising patient demands and a lack of access to specialist care. Long-term innovative health policies that can provide efficient, accessible, and affordable healthcare services for all Iraqis are absent and are contributing to the increasing disparities and also lowering the quality and access to basic healthcare services. Furthermore, the healthcare sector is dominated by politically sanctioned corruption that is pervasive in this and other public sectors. Most of the primary and secondary care centres in Iraq remain understaffed, inefficient, and lacking the necessary clinical resources for care standards of the 21st century. Meanwhile, large scale private healthcare systems are rapidly expanding across the country, and serving as alternative routes to the public health system. This politically sanctioned process is establishing a two-lane healthcare system, one tailored for those who are capable of affording these private healthcare services and another for those who are not, thus increasing the health inequality gap within the society. There is also a clear absence of health leadership with a long-term vision for introducing and implementing new and transformative healthcare strategies. These include for example effective and population wide prevention tools and digital health solutions that utilise available and widely used digital and Internet infrastructures. These, if implemented successfully, can be transformative and capable of alleviating many of the above challenges.

This article aims to map Iraq's healthcare crisis since 2003, and discusses its complexities, multifaceted challenges and the barriers contributing to the current status quo and its continuous decline. An overview of the basic structures of the healthcare system in Iraq and the Kurdistan region is also presented. The article also highlights some of the challenges embedded within the primary and secondary care sectors and illustrates these with some examples. It also emphasises the timely and important introduction of new and innovative mobile and digital health solutions and services into the system. To illustrate this argument, two pioneering mobile health (m-Health) pilot studies conducted in Iraq for improved management and educational awareness for diabetes and antenatal patients are used as examples to these solutions.

***Keywords**: Iraq, healthcare, primary healthcare, corruption, secondary healthcare, chronic diseases, mental health, cancer, diabetes, digital health, mobile health, mHealth, ehealth, telemedicine.*

Introduction

Over the past twenty years, Iraq's public healthcare system has steadily declined and remains in an ongoing crisis, driven by complex and multifaceted factors. From the historical perspective, the establishment of the modern healthcare system in Iraq dates back to nearly a century ago, when the first Ministry of Health was established in 1921 **[1]**. However, after several restructuring and modernisation attempts, the state's Ministry of Health (MoH) was established in 1952 **[2]**. Since then, the public healthcare system has remained largely centralised and based on a government-subsidised care model, with the MoH remaining the primary and secondary healthcare provider **[2]**,**[3]**. Throughout the decades that preceded the first Gulf War of the 1980s, Iraq's healthcare system boosted some of the best medical care services and standards in the Middle East **[4]**. The decline of Iraq's public healthcare system began in the early 1990s following the second Gulf War and the subsequent economic sanctions that lasted for another decade. The 2003 invasion of Iraq worsened this situation, damaging an already poorly run sector due to the decade-long sanctions. In the immediate aftermath of the invasion, misjudged political decisions taken then by the US-led Coalition Provisional Authority (CPA) contributed further to this declining process **[5]**,**[6]**. Since then,

the public healthcare system in Iraq is administered and dominated by an incompetent, politically sanctioned and fiercely protected elite, who are largely responsible for the corruption, deterioration, and its continued retrogression.

The impact of this mismanagement can be seen today in many healthcare settings, high disease prevalence levels, persistent low quality of care, poor access, and increased healthcare costs, insecurities, and the massive exodus of Iraqi specialists since 2003. These and other factors are the outcomes of two decades of continued poor healthcare planning, incompetent health policy making, declining levels of medical education, and the corrupt tendencies of the governing elite of the healthcare sector. These are reflected in the steep plummeting of Iraq's healthcare indicators since 2003. Also, the low quality of life indicators among Iraqis listed in many global indices that illustrate the poor healthcare and prevailing disease conditions.

The recent increase in non-communicable diseases (NCDs), mental health and other communicable diseases among Iraqis reflect the above indicators trends. For example, there are high levels of prevalence in diabetes **[7]**, hypertension **[8]**, cancer **[9]**, and cardiovascular diseases **[10]** among Iraqis especially in recent years. These constitute one of the worst prevalence levels of (NCDs) in the Middle East region. The Iraqi MoH indicated that in 2019, more than 20% of the mortality rates amongst young Iraqis were due to non-communicable diseases **[11]**. The World Health Organisation (WHO), also estimates that NCDs account for 62% of the total deaths in Iraq **[18]**. Furthermore, there is an increasing trend and epidemic in mental health in Iraq. This is due to the alarming increase in drug addictions, leading to high suicide incidents amongst Iraqi youth in general and young women in particular **[12]**. The harsh climate and environmental changes in Iraq, compounded with high pollution levels, violence, and other societal factors are also contributing to the overall increase in cancer diagnoses, decline of physical well-being and the increase in mental health conditions, especially among the younger population. The increasing pollution levels of air and waterways also constitute major contributing factors to these high mortality rates **[14]**. There are to date no detailed scientific and large-scale studies, long-term mitigating strategies, viable national prevention policies, nor applicable solutions to alleviate these challenges. The prevailing thinking among the Iraqi health policymakers remains largely focused within the reactive and treatment sphere, and not much is being directed towards implementing effective preventative and personalised healthcare solutions.

Moreover, Iraq has one of the largest displaced populations in the region. The poor quality of health services and the absence of adequate social care services created a major humanitarian crisis, especially since the end of the conflict against the Islamic State (ISIS) in 2018. The calamitous ISIS invasion displaced more than 6 million Iraqis between 2014 and 2017, with nearly 2.5 million Iraqis being left in dire need of basic healthcare, social and mental health services. This has progressed from an acute healthcare crisis in the areas that were under ISIS control to a protracted one.

Furthermore, the devastating impact of the COVID-19 pandemic in 2020, with its high infection and mortality rates among Iraqis constitutes another acute scenario of this healthcare crisis. The World Bank estimated that by 2021, approximately 1.2 million COVID-19 infections and more than 16,000 deaths were due to the COVID complications [16]. Furthermore, the WHO reported that by August 2022, the COVID-19 infection rates increased in Iraq to more than 2 million COVID-19 cases, with more than 25,000 deaths with a cumulative incidence rate of 17,000/100,000 **[33]**. This listed Iraq the second-highest cumulative number of cases, the fourth-highest number of deaths, and ranked 16th in the total vaccine doses per 100 population among the 22 countries in the WHO's Eastern Mediterranean region (EMR) **[33]**.

These alarming statistics remain largely conservative since the exact numbers of the COVID-19 infections and mortality rates remain largely unreported. These are likely to be much higher than the reported cases. These statistics exposed the inadequacies of the current prevention measures and the poor public health preparedness against the COVID-19 or against any future pandemics.

From the relevant clinical perspective, the high COVID-19 infection and mortality rates in Iraq, reflects the high susceptibility levels, elevated vulnerabilities, and low immunities against COVID-19 amongst the Iraqis **[16],[33]**. The current social divide and poor economic and health status among Iraqis are another contributing factors to these alarming statistics. These require further large-scale epidemiological studies to better understand the relevant clinical causes and to identify the best remedial and prevention solutions against this virus and its future variants.

From the health economics and policy perspectives, Iraq is generally categorised as an upper-middle income country, with a gross domestic product per capita (GDP) of US$4,775 as listed in 2021. This GDP growth has accelerated in the first half of 2022 to 10.5 per cent due to the increase in the state oil revenues [13]. However, Iraq's national health allocation and expenditure remains one of the lowest in the region compared to its annual GDP in 2019 **[14]**. Table [1] shows a comparative example of the health expenditure data in Iraq in 2020 **[15]**. These illustrate Iraq's comparative (% of GDP) statistics and health expenditure per capita (PPP) values with other Arab countries in the region **[15]**. This healthcare spending per capita is expected to be approximately $13.80 billion by the end of 2023.

Country	Health Expenditure (% of GDP) - (2020)	Health Expenditure per Capita (PPP) - (2020)
Iraq	5.08	$202.31
Jordan	7.47	$298.64
Lebanon	7.95	$994.49
United Arab Emirates	5.67	$2,191.81
Kuwait	6.31	$1,532.56

Table 1: Comparison of the 2020 Health Expenditure (% of GDP) and Per Capita (PPP) of Iraq and other Arab Countries (Source: World Bank **[15]**)

Similar data from the World Health Organization shows approximate expenditure data to the above [18]. These show that Iraq's central government has consistently spent far less per capita on healthcare than its much poorer neighbours **[46]**. According to the WHO, Iraq's primary healthcare facilities in 2018 were 0.7 per 10,000 population, hospital beds were 13.2 per 10,000 population, and only 57% of Iraqi mothers receive at least one antenatal visit from a certified healthcare worker**[18]**. Furthermore, these also indicated that only 57% of Iraqi mothers receive at least one antenatal visit from a healthcare worker **[18]**. The recent boom in the Iraqi economy and revenue due to the recent hike in oil revenues was not reflected in proportionate investments and expenditures that reflect the increasing healthcare demands and challenges. These reflect the continued inconsistencies, political influences, and inadequacies in long-term healthcare planning since 2003.

In order to map the healthcare crisis in Iraq since 2003, the next sections present a brief introduction of the current healthcare structure in Iraq. It also discusses the key challenges facing the healthcare system and the contributing barriers to this status quo and its continued decline. In addition, the article also highlights some innovative and pioneering pilot studies

in mobile health (mHealth) conducted in Iraq. These studies showcase how successful utilisation of innovative and new technologies in healthcare can provide effective prevention strategies with significant personalised care outcomes. The adoption and scaling up of these and other digital health strategies are both vital and timely for Iraq. These can alleviate many of Iraq's current healthcare, social, and economic challenges. The article concludes by discussing some key takeaways from these findings.

The structure of the healthcare system and services in Iraq: a post-2003 overview

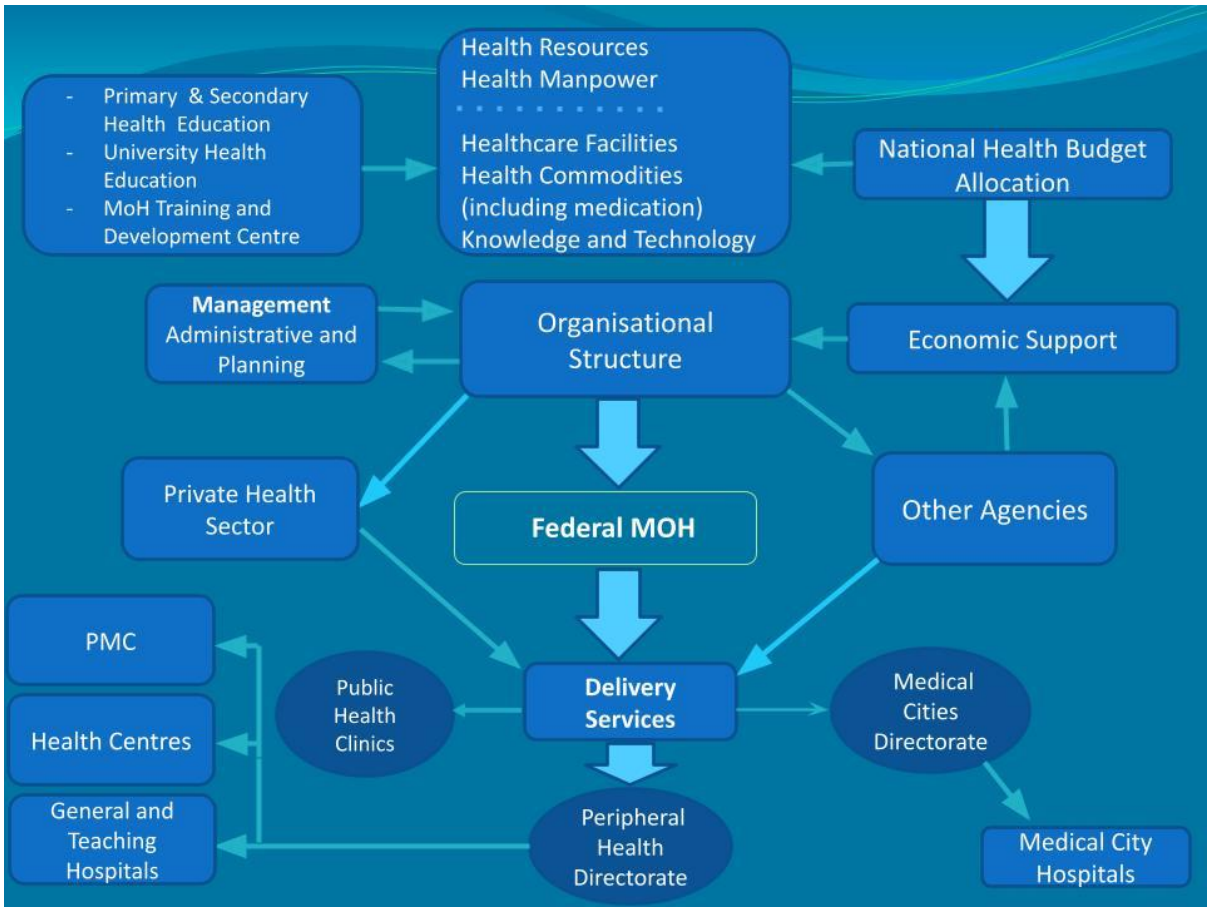

Fig. 1 The general structure of the public healthcare system in Iraq – 2009 (Adapted from: Al Mosawi & Al Hasnawi **[21]**)

As shown in Figure 1, at the core of this centralised structure is the federal Ministry of Health (MoH) in Baghdad. The ministry presents the main primary healthcare provider and is overseen by a health minister **[21]**. The MoH is also the main health procurement authority and is responsible for all its medical and healthcare-related expenditures allocated from its annual budget as approved by the Iraqi parliament and the federal ministry of finance. The office of the federal health minister is typically supported by three appointed deputies, who are responsible for the technical, administrative and infrastructure health areas within the MoH **[21]**. There is also the office of the general inspectorate within the MoH and further specialist directorates and departments within it. However, in recent years, the MoH has undergone a reorientation process that aimed to prioritise its services towards the primary healthcare (PH) services as the main focus of its healthcare delivery focus and operations. There have been some 'cosmetic' operational and administrative changes in this structure, but the overall functional departments and the core centralised structure remain as shown in Figure 1.

The political partisanships, party allegiances and affiliations to associated militia factions have dominated the healthcare leadership in Iraq since 2003. These represented the key prerequisites for most of the senior appointments and key officials within the MoH. This biased and largely corrupt practice began in the post-invasion period when the then CPA authority appointed an inexperienced key advisor for the most senior post within the post-conflict health ministry **[5]**. Simultaneously, this was also supplemented by the appointment of an obscure diaspora Iraqi surgeon from London, associated with a key and influential political party as the interim health minister **[5]**,**[6]**.

Since then, most of the health ministerial, deputy ministerial, and senior directorate positions have followed this politically sanctioned tradition [44]. These posts were predominantly not based on meritorious capabilities of the selected candidates for these posts, such as distinguished academic or clinical careers or successful track record of team leadership within the healthcare sector, but were largely based on cronyism, political affiliations, and allegiances. This process followed the tradition of sectarian cross-party agreements and political consensus that have dominated the political landscape in Iraq since 2003. This led to the establishment of compartmental divisions, and militia or party-backed protective administrative fiefdoms within the MoH. These in turn incubated the corruption and deep state culture within this and other public ministries with disastrous consequences **[44]**.

Primary and Secondary Health Services in Iraq: A Brief Overview

The provision of healthcare services in Iraq has undergone major changes in recent decades. These have largely shifted the public healthcare delivery services from tertiary care to a networked system of national Primary Health Centres (PHCCs) that provide basic healthcare services across the country **[23]**,**[24]**. Most of the existing PHCCs in Iraq were built during the preceding decades with some dating back to the 1970s or earlier. These are generally distributed across Iraq on a typical ratio of one PHCC for each 10,000-45,000 persons **[18]**. A decade ago, Iraq had only 229 hospitals, including 61 teaching hospitals, 92 private hospitals, 2,504 of these PHCCs of which half had no in-house medical doctor **[24]**. These are typically located in major cities, within the populated urban and rural areas, and remain the backbone of the primary healthcare services in Iraq.

However, most of the current healthcare delivery services administered and offered by the MoH are based on a hierarchical package Basic Health Services Package (BHSP) introduced in 2009 **[27]**. This strategy reflects the evolution of its primary health care system, transitioning from the earlier comprehensive services delivery model to the more focused primary care service model. This structure delivers the basic and essential healthcare services stated by the MoH as: "delivering a minimum collection of essential services that all the population need to have a guaranteed access to" **[27]**. These services are delivered via four hierarchical health facilities and centres, and are based on their geographical distribution patterns and the type of the services offered. These are classified as: (i) Community Health houses (HHs), (ii) Primary Health sub-centres, (iii) Primary Health main centres, and (iv) District hospitals. The HHs constitute the backbone of the rural healthcare centres and form the essential health centres for the provision of minimal primary care services, such as dispensing essential medicines at low subsidised costs and referral services if required.

However, most of these services offered by these centres are currently either curtailed or in varying levels of availability. There are currently 497 of these centres across Iraq, and 82% of these are housed in basic or inadequate caravan-like structures **[27]**. Furthermore, most of the HHs are ill-equipped, with basic diagnostics and monitoring equipment, lack of properly organised referral systems, and have severe shortages of dispensing the essential therapeutic

medications **[28]**. In addition, there are other poor or minimally accepted care provisions in these centres **[18]**,**[25]**,**[27]**,**[28]**. A study by the World Bank highlighted these shortcomings and stipulated that "the access to health services in these centres is limited, and geographical disparities are significant" [25]. Additionally, poor organisational skills, shortages of basic medical staff, lack of specialist and affordable medications constitute significant impediments to adequate care provision in these PHCCs **[18]**,**[25]**.

From the secondary care perspective, there are approximately 850 public hospitals in Iraq **[29]**. Figure 2 shows the geographical distribution of public and private hospitals in Iraq in 2019 **[29]**. Many of these hospitals remain largely understaffed, especially of specialist doctors, nurses, and other health and social care personnel. Most of these hospitals remain in varying levels of inadequacy and poor infrastructure levels, particularly in addressing the high level of emergency, mental health, and trauma care. The continuous decline of this sector both in quality and quantity of the services offered since 2003 is alarming. This is due to poor management, lack of continued maintenance and absence of effective governance driven largely by pervasive corruption, and political interferences.

Fig. 2: Iraq's geographical distribution of public and private hospitals in 2019 (Source: Iraq's Socio-Economic Atlas, World Food Program, 2019 **[29]**)

Figure 2 illustrates the geographical disparity of the hospitals and secondary care centre distributions across Iraq. The figure also shows that Baghdad has the highest concentration of these centres, whilst the remainder of the regions, especially in the south, remain largely sparse. The World Health Organisation and other relevant reports have highlighted these healthcare disparities. These include, for example, the low ratios of 8.4 physicians and 19.4 nurses per 10,000 population, low levels of 1.1 hospital beds and 0.8 doctors per 1,000 people (increasing to only 1 per 1,000 people) in 2020.

However, in comparison, the Kurdistan region of Iraq (KRI), have the ratios of 1.5 beds and 1.4 doctors per 1,000 people within their healthcare system. A slight ration improvement

compared to the rest of Iraq **[18],[22],[26]**. Furthermore, the exodus of more than 20,000 qualified clinicians and specialist consultants since the 1990s particularly after 2003, was detrimental to the high-quality specialist care offered in these hospitals **[26]**. Most of these emigration waves were attributed to continuous insecurity, sectarian conflicts, threats, corruption, discrimination, and low pay among others.

From the legal perspective, the 2005 constitution of Iraq assured free healthcare for its citizens as stipulated in its Article 31(1), with emphasis on the state's responsibility for the provision of national health services. However, it also allowed the legal and constitutional framework for the private healthcare provisions under its Article 31(2) **[22]**. The interpretation of these constitutional articles and their applicability within the healthcare sector remain largely selective and chaotic. These are due to the ongoing political instabilities and economic complexities in Iraq since 2003. To overcome these uncertainties, several attempts to devise a national health strategy for the years 2014–2018, and a decade-long national health policy (2014-2023), were ratified in 2015. These aimed to improve the governance and to better guide the national healthcare policies **[18]**. However, the effective implementation and practical realisation of these policies remain largely unknown and ambiguous to date. These were predominately undermined by the continued political instabilities since 2003, and in particular the healthcare crisis created by ISIS and their control of large parts of Iraq from 2014 until 2017. These and other political and economic uncertainties that followed this crisis had a detrimental impact on the performance and efficiency of the healthcare system in the country.

In parallel to the problematic and declining public healthcare system in Iraq, there has been a thriving private healthcare sector in the country since 2003. Whilst this sector has the potential to support and complement some public healthcare sector services and alleviate some of its major challenges, the post-2003 private sector in Iraq is predominantly owned and protected by the same political and religious elite and their conglomerates that run and control the public healthcare sector. The thriving of the private care sector is translated by the sharp increase in the number of private hospitals, specialised care centres, and their affiliated private medical colleges and universities across the country. In 2021, Iraq had 164 private hospitals; roughly two-thirds of these (106) were located in Baghdad and KRI, the remaining third across the other 15 governorates.

The dominant number of these healthcare facilities and educational institutions serve as legal channels for private investments and profiteering sources of the ruling political parties. These for-profit healthcare facilities offer wide-ranging and diverse specialist care, hospitalisation and treatment services, mostly with prohibitive costs and out of reach for most Iraqis. This private sector had created a de facto parallel healthcare system to the public services, and contributed to the decline in the quality, affordability, and accessibility of the services offered by the public sector. In addition, it has excluded a wider segment of the Iraqi society who are unable to afford the private care costs, increasing the secondary care gap.To partially alleviate this gap and accommodate the increasing levels of healthcare disparities amongst Iraqis, the Iraqi parliament ratified "The National Health Insurance Law" No. 22 in 2020. This law aims to introduce universal health insurance coverage with specific care access benefits, and offered at affordable annual insurance payments to the eligible beneficiaries **[35]**. The law stipulated that the insured beneficiaries must contribute towards their specific healthcare insurance plans with affordable fees, which, in turn, provide subsidised coverage for their healthcare expenses, including necessary medications, the costs of certain surgical procedures either in public or private hospitals, and many other healthcare-related benefits. Additionally, the law mandated that a 'Health Commission' be established to engage with the relevant public and

private healthcare providers (PPP) and to set up the necessary regulatory framework with the Ministry of Health. In 2023, this health insurance law was partially enacted as a 'trial run' to evaluate its functionality and applicability. It is currently being deployed for a limited number of beneficiaries within the civil service and governmental beneficiaries at selected ministries. If successful, it is expected that the health insurance coverage will be incremented gradually and scaled up within the next few years to include most of the civil service, governmental employees and other beneficiaries. However, the practical implementation and the potential impact of this health insurance policy remain doubtful and uncertain, especially in the current complex political climate in Iraq. In the absence of multifaceted, robust and independent supervisory and regulatory mechanisms, that can successfully monitor and audit the scaling up process and the accurate implementation of this law, any tangible healthcare benefits to be gained from this process will be minimal, if not superficial. The introduction of secure and modern digital auditing, robust and independent management processes, and the digitization of patient records are some examples of practical solutions that need to be introduced into the system to mitigate some of the above-mentioned challenges. These can also prevent and shield against the pervasive corruption routes embedded within the current healthcare sectors from potentially sneaking into the new health insurance system.

Healthcare services in Iraqi Kurdistan: A Critical Overview

Since 1992, the Kurdistan Autonomous Region of Iraq (KRI) has experienced relative stability and held a semi-autonomous status, which turned into full autonomy in 2003. However, the healthcare system in Iraqi Kurdistan, like the rest of the country, remains marred with many challenges and deficiencies. The region has its own Ministry of Health in Erbil city. It oversees the public administration, finances and draws up the region's healthcare policies and primary care services. Its general structure is shown in Figure 3. However, the healthcare system in KRI largely mirrors Iraq's federal system in several aspects, albeit in less severe formats. The KRI healthcare system remains largely centralised, highly politicised, and lacks transparency, with many of its deficiencies in proper governance, regulation, financing, and independent accountability impacting its finances and performance **[38]**.

The perception of wide political partisanship and the dominant influence of the two main political parties in KRI on the ministry's affairs are well-known. These reflect the similar and politically sanctioned scenarios and the 'modus operandi' of Baghdad's federal MoH as discussed earlier. However, since the KRI region enjoyed relative stability and security compared to the rest of Iraq since 2003, many of the national health challenges and the crisis aspects cited in the rest of Iraq remain less severe within the region's health system **[31]**. Several of the serious challenges and barriers for improving the healthcare facilities and services within KRI share common denominators with the remainder of Iraq's healthcare challenges. These can be stipulated as **[31]**:

1. The number of physician-staffed in the primary health centres (PHC) and the distribution of PHCs and the medical staff in the region are not optimally distributed.
2. Primary care in KRI remains largely of variable quality and availability.
3. Physicians are poorly distributed and overworked, the nurses in the region are underutilised and lack the appropriate training in many important areas.
4. Health information systems are not systematically used to support policymaking, regulation, or system management and integration.
5. Healthcare is generally financed by the federal and regional government budgets, and the financing system provides no incentives to promote efficiency or sustainability. In Iraq, there are limited studies and clinical evidence on public and private insurance on healthcare improvement.

These issues concur with many similar studies on the conditions of the healthcare system and organisational aspects in the region. A study that surveyed 250 medical professionals from the Erbil governorate was conducted to gauge the quality of the basic healthcare services offered in the region **[34]**. The outcomes of this study indicated that a high proportion of the respondents rated either weak or very weak on the different aspects of health services offered and the resources available in their health institutions **[34]**. These included the majority (68.7%) that agreed on the non-availability of the quantity and quality of the medicines offered, 68.7% indicated the non-availability of sufficient medical diagnostic equipment and tools for their patients, and the poor quality of the services offered (65.3%) **[34]**. Another study that focused on the PHCs status in the region concurred with these findings **[32]**. It indicated very low satisfaction levels by patients and visitors on the services offered, including the lack of specialist physicians, among others. The details of these and other relevant studies are beyond the scope of this paper and can be seen elsewhere **[31]**,**[32]**,**[34]**,**[38]**. Similar to the remainder of Iraq, the population in the region have high and increasing prevalence levels in different chronic conditions with increasing outbreaks of infectious diseases in the region, especially in recent years. There is also a significant upswing in the private healthcare sector and services. These are creating a parallel system alongside the public sector, in a similar trend observed across Iraq **[36]**,**[38]**. There is an urgent need to address these and other challenges for improved and more effective healthcare reforms in the region, including the introduction of effective prevention strategies.

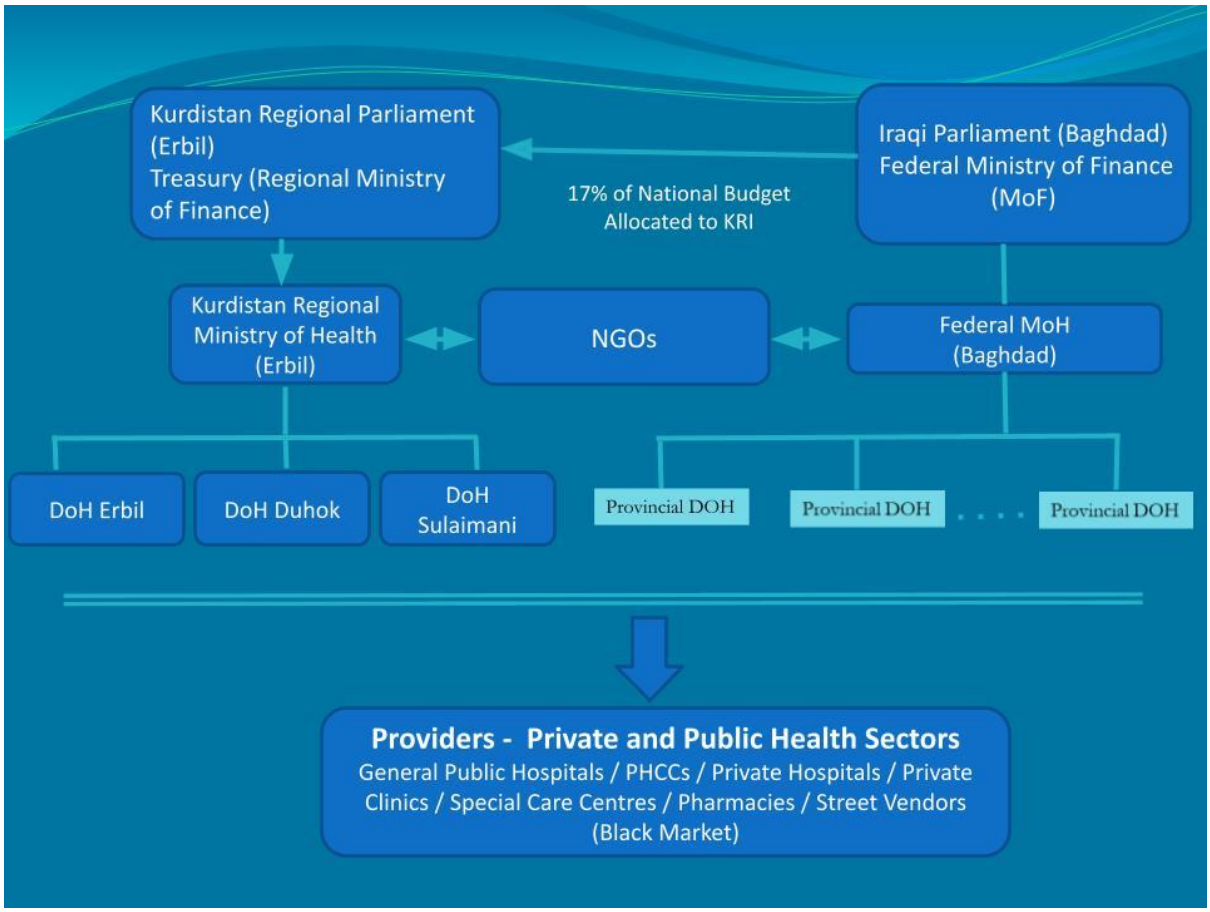

Fig. 3: The healthcare system structure in Kurdistan autonomous region of Iraq (KRI) (Source: Tawfik-Shukor & Khoshnaw, 2010 **[38]**)

Current healthcare challenges and health policy barriers

As discussed earlier, Iraq's healthcare system has been entrenched in crisis since 2003, facing ongoing struggles exacerbated by political instability, sectarian tensions, insecurity, and

widespread corruption. These have significantly hindered the development of a modern, effective, and efficient healthcare system in the country. Amidst this complex landscape, finding the solutions to these multifaceted challenges remains a daunting and difficult task. Some of the key challenges and barriers that catalyse these are summarised as:

(i) Kleptocracy's grip on the healthcare system and increase in health inequality

Since 2003, successive Iraqi governments have struggled to combat the pervasive corruption deeply rooted in the healthcare sector. This led to an increasing health inequality gap in Iraq since 2003. This kleptocracy in the system is structured as a spider's web network that intertwines with the political interests, their mentors and factions that are benefiting from this system, by effectively controlling its different operational structures and facilities. These policies are limiting the basic access to affordable and efficient care for all Iraqis, and increasingly tilting better care towards the private sector. This policy direction well-serves the economic interests of the kleptocracy within the system and consolidates their overall control. These also aim to deplete the care quality, efficiency, and access to public care and subsequently lose trust in the quality of healthcare services offered in these public settings. The implicit policies that are promoting an increasing shift towards private services are exacerbating the disparities in the basic care structures and widening the health inequality gap. Resolving these complex issues is unattainable in Iraq's current political and sectarian climate. Many recent reports have illustrated the scale and the magnitude of the institutionalised corruption within the MoH and its affiliated institutions. These include the kleptocracy in the Iraqi pharmaceutical industries and health procurement sectors among others **[44]**,**[47]**. Furthermore, since 2003 the Iraqi judiciary, executive, and legislative branches have been heavily influenced by the ruling elite and their sectarian political interests. This control, coupled with a lack of proper accountability, has resulted in ineffective legislative oversight by both the federal and KRI parliaments. This extends to the performance and outcomes of government executive branches, including federal and regional MOHs, allowing repeated failures and instances of corruption to go unchecked. Moreover, the recent and alarming increase in the levels of violence and attacks on doctors and healthcare personnel inside Iraqi hospitals is reflection on the above issues **[40]**. These trends reflect the rising levels of insecurity, chaotic conditions, and poor management in many of Iraq's main hospital centres and healthcare settings. These conditions are driving many doctors and specialists either to leave the country permanently or to move internally to safer regions.

(ii) The focus on treatment and not prevention

The predominant healthcare policy focus since 2003 has been on the traditional reactive and treatment approaches. This was driven predominantly by the increase of patients with complications from different chronic conditions such as diabetes, cardiovascular, cancer and other conditions, leading to increased pressure on the secondary care services and the hospitalisations of patients with long term health conditions. These factors also necessitated the need to expand and build newer hospitals and specialised care facilities across Iraq to meet these demands and hospital admissions. These include, for example, building and expanding new specialist cancer care centres, maternity and neonatal care, emergency and trauma units, orthopaedic surgery and specialist mental health services **[17]**. However, many of these were built to low-quality standards and are in poor status, whilst others remain in either planning or construction phases. Questionable building contracts, inadequate regulations, low-quality construction standards, and delays due to political influences are some of the barriers that affected their completion rates. Many attempts to revamp existing hospitals and primary healthcare centres were also impeded by the above barriers. Many of the recent incidents in these hospitals reflect these realities and building flaws. For example, the 2021 fires in the COVID-19 wards at the Baghdad and Nasiriya hospitals, resulting in 174 deaths and 210

injuries **[19]** and the absence of adequate specialised burn treatments and emergency trauma facilities in the 2023 Al-Hamdaniya fire in Mosul **[20]**. These and other examples demonstrate the fundamental inadequacies and deficiencies in the system.

Moreover, the proliferation of building hospitals in both public and private sectors ignores the fundamental focus on health and well-being prevention aspects. There is an urgent need to develop prevention and effective health strategies that aim to alleviate the above challenges. There is a substantial gap in the establishment of effective and innovative national prevention strategies in Iraq that can mitigate many of the healthcare pressures on the primary and secondary care sectors. The clear absence of these strategies and their implementation is reflective of the incompetency and lack of long-term insight within the health policy-making process. The successful introduction and implementation of such prevention strategies and scaling up these will have a major impact on alleviating the healthcare burdens, reduce escalating hospitalisation cost, admissions rate, and reduce many of the existing bureaucratic bottlenecks in the system. Furthermore, the large scale implementation and scaling up of these preventative measures and strategies can serve as utilisation platforms and open new specialised work opportunities for many young Iraqi medical and health related graduates.

(iii) Fragmented intergovernmental coordination and healthcare budgetary constraints

Successful health programs are typically influenced by their financial and budgetary decisions, making the perspectives of budget-makers crucial in shaping the appropriate health financing policies in any country **[37]**. However, since 2003, this fundamental health financing principle has been consistently overlooked in Iraq. The country's healthcare budgets and the proportionate funds allocated for this vital sector remain consistently haphazard, disjointed, and entangled by conflicting political agendas. The consequence of this chaotic process can be seen in the poor healthcare status of Iraq as discussed earlier. As shown in Table 1, the health expenditure (% of GDP) per Capita (PPP) of Iraq has been consistently lower compared to most of its neighbouring countries and the Gulf States. In 2019, the government allocated just 2.5% of the state's $106.5 billion budget to its health ministry. These represent a fraction of the healthcare spending allocated elsewhere in the Middle East. By comparison, the security forces received 18% and the oil ministry 13.5% of the national budget **[46]**. Furthermore, the allocation of healthcare budgets has not kept pace with Iraq's recent population growth and the anticipated rise in its healthcare expenses. Another key issue lies in the lack of coordination and long-term planning amongst the Ministry of Health (MoH) officials and the officials in other relevant departments and ministries (e.g. the finance, planning, higher education, and industries ministries). These are due to the political divisions and sectarian compartmentalisation within these ministries, combined with ineffective regulatory oversights. These constitute some of the root causes of the disorganised and disproportionate health budget allocations since 2003. This chaotic process is also visible in many public health projects commissioned after 2003, such as the delays in hospital completion rates, poor quality and specialist shortages in the PHCs, poor quality of their maintenance and many others. However, to overcome these barriers, some recent attempts to implement Public-Private Partnerships (PPPs) were recently announced by the government. These partnerships aim to provide better and more efficient administration and management for the newly developed hospitals across Iraq. However, the absence of robust and independent regulatory mechanisms, and expert supervision on the performance and evaluation of these PPPs can potentially facilitate governmental corruption routes.

(iv) Challenges in the medical education system and better utilisation of health care human resources

The many challenges in the medical and healthcare educational system in post-2003 Iraq are considered collateral damage of the complex issues discussed earlier. These have inadvertently contributed and consequently impacted on the overall decline in the healthcare system and the quality of the services as discussed earlier. Since 2003, the medical educational system in Iraq remains in flux. The medical schools are facing shortages in qualified staff recruitment, research funding and adequate resource provisions. These and many other issues are affecting the quality of medical education in Iraq since 2003 **[47],[48]**. The absence and low rankings of most Iraqi medical schools and universities in the world universities league ranking tables are reflective of this decline. Furthermore, the medical education sector since 2003 focused on the quantity rather than on the quality. In addition, the recent surge of private medical colleges and universities that offer undergraduate and postgraduate medical and health-related degrees had increased substantially. These privately owned educational institutions are being set-up without proper and strategic educational plans or future outlook for the need for such institutions. The degrees offered by these private colleges are often of questionable quality and are mostly accredited within Iraq. Furthermore, the significant expansion of these private medical institutions will not necessarily address the acute shortages and the expected demands for more specialist care clinicians and health related disciplines. Most of the graduates from these private institutions lack the required robust foreign language proficiency, accredited academic and medical training qualifications and globally accepted standards for attaining further clinical specialities overseas. The acute shortages in specific clinical and health related specialities will continue to be in high demand in the foreseeable future. These include disciplines such as mental health, behavioural change psychologists, social health carers, and many others clinical disciplines. A detailed illustration of these and other challenges are beyond the scope of this article and are described elsewhere **[47],[48]**.

(v) The impact of climate and environmental change on health and wellbeing

Iraq faces serious and dangerous levels of environmental and climate change challenges. These include the shortage of clean drinking water, high pollution levels in the waterways, high levels of air pollution, the deterioration of air quality in many major and oil-producing cities, reduction in biodiversity, and the pollution of its marine waters **[13]**. These have detrimental impacts on the healthcare and well-being of the population. To date, the impact of these detrimental changes on Iraq's population health have not been addressed or studied adequately. However, some recent reviews of studies highlighted these serious environmental and climate changes on population health. A recent study on the use of weaponised uranium suggested possible associations between exposure to depleted uranium and adverse health outcomes among the Iraqi population **[41]**. Another study showed that the high prevalence levels of all cancers in Iraq, particularly lung, gastrointestinal, and brain cancers have been increasing substantially since 2007 **[42]**. Another study highlighted the increasing levels of breast cancer prevalence among women since 2000 **[43]**. More recent studies have indicated a correlation between high pollution levels (from oil and gas flaring) and cancer incidents **[45]**. These and many other studies highlight the urgent need to adapt new and effective health policies and implementation strategies that can mitigate these population and public health challenges. There are currently timid efforts in these directions. The lack of allocated funding and research support for these important health challenges highlights the inadequacy of the public health policy aspects in Iraq.

(vi) Lack of innovations in the healthcare sector

Introducing innovative health policies and pre-emptive advanced technologies into Iraq's healthcare sector is largely absent in Iraq. These advances are largely interpreted in Iraq as the modernisation of diagnostic, surgical and patient monitoring facilities and capabilities in

hospitals and specialist healthcare centres. These limited secondary care improvement horizons need to be broadened, especially among the current healthcare policymakers in Iraq. These also need to include, for example, primary patient-centred services, public health and large-scale innovative prevention approaches, digital patient education tools, and many others. The lessons learnt from the devastating health and economic impact of the COVID-19 pandemic necessitate the introduction and implementation of effective pre-emptive health solutions and long-term shielding strategies. These strategies include the introduction and implementation of "national digital healthcare services" in Iraq **[50]**. Iraq has one of the largest penetration levels and users of Internet and mobile phones globally. Nevertheless, these widely used and pervasive technologies amongst the population have not been utilised effectively for the healthcare sector in Iraq. These digital health services can be provided in many vital services and care settings. These can be scaled up, similar to the newly introduced digital services and transactions introduced in the banking and other financial sectors. If these are properly implemented, funded, and overseen by independent and apolitical experts, many of these transformative solutions and services can be applied successfully to provide more effective and efficient ways to address many of the healthcare issues presented earlier. These will also contribute towards major cost savings and minimise the corruption levels in the healthcare sector. Many examples of these digital and other mobile health solutions and services were implemented worldwide and in many of the Gulf states **[50]**. Examples of these include the mandatory adoption of paperless, electronic transactions and management systems in public and private healthcare sectors. The successful implementation of such systems can substantially reduce the costs and unnecessary administrative delays and burdens on healthcare providers. Moreover, these can also mitigate many corruption routes in the sector. For example, by detecting any questionable financial discrepancies and transactions within the sector and linking these transactions directly to the digital banking accounts of the healthcare providers and suppliers. Other effective examples include digital medication dispensing (e-medication) tools, electronic clinical (e-clinical) fees, electronic patient records and many others that are vital for modernising Iraq's healthcare systems.

From the economic perspective, the introduction of these digital healthcare systems will significantly reduce administrative manpower and financial delays, improving many of the deficiencies of the current systems by fostering better financial control, improving digital auditing, and facilitating independent supervision.

Transformative digital and mobile health (m-Health) strategies for Iraq

To illustrate the importance and transformative capabilities of digital health for Iraq, a brief global outlook will be presented first. The global interest and advancements in digital and mobile health technologies are transforming many of the global healthcare systems and creating new digital economies worldwide. The World Health Organization (WHO) recently acknowledged the significant benefits of digital and mobile health and their transformative impact on global health. These were reflected in WHO's recent digital health guideline recommendations and WHO global digital health strategy **[49]**. These guidelines and global strategy emphasise the pivotal role of mobile and digital health technologies in delivering improved and efficient care, particularly in underprivileged and poorer regions of the world. Digital health technologies offer an array of advantages including availability, accessibility, innovation, cost-effectiveness, real-time information access, and mobility for users and patients. In Iraq, for example, these systems can be effectively leveraged by the widespread popularity of the Internet and smartphone usage among Iraqis by utilising these technologies for different health and well-being needs. They can be similarly applied in Iraq within cost-effective applications and can address diagnosis, management, and monitoring aspects. Numerous mobile and digital health systems are being applied and used globally and across

different countries **[50],[51]**. Examples of these include digital health prevention and disease management tools for diabetes, obesity, cancer, and others. Effective health educational tools for medication reminders via smartphones and behavioural change for better well-being targets are also some of these applications. These also include effective remote care provisions that minimise travel costs and face-to-face consultations such as remote consultation (telemedicine and telehealth) services offered to patients in remote and rural areas. Similar technologies for mobile care facilities can be implemented in refugee and displacement camps across Iraq and can provide diagnostics and consultation services remotely. From the economic perspective, these innovative services can also create new and successful work opportunities for new graduates by allowing the establishment of innovative small and medium enterprises in these areas, thus boosting the digital economy, enhancing the local workforce, and driving the modernization of its healthcare sector, infrastructure and services offered. Many details of these mobile and digital health benefits for the Iraqi healthcare system can be summarised as follows **[50]**:

(i). Bringing healthcare provision to underserved, rural and displaced populations
(ii). Increasing the effectiveness of care quality and reducing the healthcare delivery costs
(iii). Improving the effectiveness of health programmes and enabling suitable prevention methods
(iv). Introduction of digital health tools and solutions for monitoring and managing patients with chronic diseases, and keeping people out of hospital by reducing complications from these diseases (i.e. diabetes, hypertension, cardiovascular disease, kidney failures etc.)
(v). Enhancing patient education and behavioural change and prevention
(vi). Facilitating better and, if necessary, real-time communications between the healthcare providers, clinicians and their patients using available mobile and Internet technologies (e.g. user smartphone applications or m-Health applications)
(vii). Potential cost saving in healthcare expenses such as clinic visits, consultations, compliance with prescribed medications, and mitigating the high financial burdens and organising workflow of patients.

Examples of mobile health (m-Health) pilot studies in Iraq's primary care settings

In this section, we present two pioneering pilots that illustrate the importance of mobile and digital health technologies in improving healthcare services in Iraq. These two pilots focused on using these technologies for improved diabetes and antenatal care and enhancing the education and management aspects for patients visiting the primary health care centres (PHCC) in Baghdad and Basra. These were funded by the UK government's UK-Iraq Higher Education Partnerships: "Working together for Iraq's future: DelPHE" programme **[55]**. The summary of these studies is presented next for completeness. Further clinical and implementation details can be found elsewhere **[53],[54],[55]**.

The Baghdad study focused on the feasibility and acceptability of short messaging for Iraqi pregnant women to support their pregnancy status using personalised educational messages via their mobile phones. A total of 250 women were recruited for this study. The intervention group were presented with special antenatal educational messages through their mobile phones via text-messaging to improve their antenatal care and follow-up processes. Two groups were identified: a control (traditional care) group of 146 pregnant women and an intervention (m-Health) group of 97 pregnant women. The women were asked to complete questionnaires to assess their opinions of the health information provided by the mobile phone SMS messages and the effect of such messages on their attendance at the maternal clinics. A special local mobile telephone number was provided for advice to the women to access their clinicians should they wish to make any enquiries or obtain information about

their health-related issues. The results of the study have shown an increase in the number of visits by the women to their antenatal care centres with a median of four visits for the intervention (m-Health) group compared to a median of two visits for the control group. The outcomes of the study provided the clinical evidence that simple text-messaging approaches can provide low-cost and acceptable methods to better educate Iraqi pregnant women and improve their regular antenatal care visits [54]. This study was the first in Iraq to utilise these technologies for improving antenatal care, considering the progressive decline in the quality of public antenatal services and the increasing shift of these services towards the private sector.

In the Basra study, the feasibility of mobile phone text messaging to support the management of type-2 (T2D) diabetes patients was investigated. The study collected data from the users' smartphones and analysed this data to extrapolate the potential effect of these mobile health interventions on enhancing the knowledge, glycaemic control, and improved diabetes clinic attendance. A total of 50 Iraqi patients diagnosed with T2D in the previous 12 months were recruited from the outpatient Clinic in Al-Sadar Teaching Hospital in Basra. They were asked to complete questionnaires at the beginning and at the end of the pilot study. During the study, education and awareness messages were sent by the clinician to the patients via SMS. The results of the study showed that sending educational text messages significantly increased the knowledge of patients regarding their diabetes conditions, with the level of knowledge, as assessed by the questionnaires, significantly increasing from a score of 8.57 to 9.85. This study also led to a significant reduction of the (HbA1c) levels in the m-Health patients from 9.33 (±1.3) to 8.56 (±1.16), indicating better blood sugar control among the mobile phone patients, compared to the traditional care group **[55]**.

Nevertheless, these remained within the piloting sphere. The attempts for scaling up these innovations to wider services were not possible, and remain unrealisable to date due to continued barriers and challenges as addressed earlier. The absence of follow-up support, politically sanctioned corruption, the perceived lack of funding from either MoH or the municipal health authorities, and the absence of long-term vision amongst the health policy leadership are some of these obstacles. These will continue to hinder the progress and the introduction of transformative solutions in the foreseeable future.

Conclusions

Since 2003, Iraq's healthcare system has been in a continuous crisis and deteriorating flux. Iraq's public healthcare system has steadily declined since then and remains in an ongoing crisis, driven by complex and multifaceted factors.

The mismanagement, organisational corruption, poor level of care services, absence of effective prevention strategies, affordable medication shortages, rising healthcare costs, limited access to specialist care, absence of innovations, and other inefficiencies across its different sectors, are some of the challenging issues of the existing system. This ongoing crisis has been further exacerbated by the lack of forward-thinking to address these challenges, combined with the absence of sustainable and long-term health planning, inadequate health economic policies, and widespread corruption.

In the current political climate, Iraq's healthcare system will unlikely confront these challenges and future issues. These include a growing patient population due to demographic changes, increased prevalence of chronic diseases, rising mental health issues, and the impact of environmental changes and pollution levels on population health. These social and epidemiological factors will further strain the existing infrastructures and services. There are currently no coordinated multi-sector and multidisciplinary solutions to these problems. The

primary focus within the health sector is predominately on reactive healthcare measures and treatment approaches, based on expansions of the existing care centres both in primary and secondary sectors. However, these changes will be neither sufficient nor effective in addressing the impending obstacles and challenges within the sector. Urgent strategic reforms in the health sector and overhaul are essential to overcome these barriers. This includes the gradual shift away from the politicisation of the healthcare system and the healthcare policy-making processes, as well as the eradication of institutionalised corruption within the sector. Implementing innovative and sustainable prevention strategies and moving towards the digitising of the healthcare systems are the crucial steps that must be undertaken to effectively address both current and future healthcare challenges in Iraq.

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[1] Jawad A S, Sir Harry C Sinderson Pasha (1891–1974): Physician, medical educator and royal confidant, J R College of Physicians Edinburgh, 2013; 43:82–7, http://dx.doi.org/10.4997/JRCPE.2013.118.

[2] Cetorelli V, Shabila NP. Expansion of health facilities in Iraq a decade after the US-led invasion, 2003-2012. Confl Health. 2014 Sep 11;8:16. doi: 10.1186/1752-1505-8-16. PMID: 25221620; PMCID: PMC4163049.

[3]] Webster PC. Iraq's health system yet to heal from ravages of war. The Lancet, 2011 Sep 3;378(9794):863-6. doi: 10.1016/s0140-6736(11)61399-8. PMID: 21898919.

[4] Aziz C. Struggling to rebuild Iraq's health-care system. War, sanctions, and mismanagement have left the health system in shambles. Lancet. 2003 Oct 18; 362(9392):1288-9. doi: 10.1016/s0140-6736(03)14618-1. PMID: 14577435.

[5] Editorial- The Lancet, Act now to secure Iraq's health, The Lancet, October 18, 2003, DOI: https://doi.org/10.1016/S0140-6736(03)14611-9.

[6] [6] Fleck F. Swapping Ilford for Baghdad. BMJ. 2004 May 29; 328(7451):1280. doi: 10.1136/bmj.328.7451.1280. PMID: 15166063; PMCID: PMC420163.

[7] Pengpid S, Peltzer K. Prevalence and factors associated with undiagnosed type 2 diabetes among adults in Iraq: analysis of cross-sectional data from the 2015 STEPS survey. BMJ

[8] Al-Isawi Z, Kadhim S, Yahya Y, Hadi NR. Stress as a possible cause of a high incidence of hypertension and diabetes and a low incidence of asthma in the Iraqi population. J Med Life. 2023 Mar;16(3):434-441. doi: 10.25122/jml-2022-0266. PMID: 37168309; PMCID: PMC10165509.

[9] Alwan NAS, Lami F, Al Nsoor M, Kerr D. Trends in the Incidence and Mortality of the Most Common Cancers in Iraq (Iraqi Cancer Registry 1999-2019). Gulf J Oncolog. 2022 Sep;1(40):47-57. PMID: 36448070.

[10] Al Janabi T. Barriers to the Utilization of Primary Health Centers (PHCs) in Iraq. Epidemiologia (Basel). 2023 Apr 13;4(2):121-133. doi: 10.3390/epidemiologia4020013. PMID: 37092458; PMCID: PMC10123605.

[11] Lafta RK, Al-Nuaimi MA. War or health: a four-decade armed conflict in Iraq. Med Confl Surviv. 2019 Sep; 35(3):209-226. doi: 10.1080/13623699.2019.1670431. Epub 2019 Oct 9. PMID: 31597450.

[12] Saied AA, Ahmed SK, Metwally AA, Aiash H. Iraq's mental health crisis: a way forward? Lancet. 2023 Oct 7;402(10409):1235-1236. doi: 10.1016/S0140-6736(23)01283-7. PMID: 37805209.

[13] Price R A, Environmental risks in Iraq, K4D Helpdesk Report, Brighton, UK: Institute of Development Studies, 2018.
[14] United Nations Children's Fund (UNICEF), Iraq- Country Office Annual Report- 2022,
[15] The World Bank, Current Health Expenditure data (extracted from World Health Organization Global Health Expenditure database (apps.who.int/nha/database), retrieved on April 7, 2023).
[16] The World Bank, Addressing the Human capital crisis: A Public expenditure for Human Development Sectors in Iraq, The World Bank Group, pp. 38-80, 31 May 2021,
[17] Cetorelli V, Shabila NP. Expansion of health facilities in Iraq a decade after the US-led invasion, 2003-2012. Confl Health. 2014 Sep 11;8:16. doi: 10.1186/1752-1505-8-16. PMID: 25221620; PMCID: PMC4163049.
[18] World Health Organization (WHO)-Regional Office for the Eastern Mediterranean - Health System Country Profile, 2018.
[19] The Guardian, Dozens die after fire in COVID isolation ward at hospital in southern Iraq, 12 July 2021.
[20] World Health Organization (WHO), Report: WHO rapid support reaches Mosul hospitals to respond to Al Hamdaniya's tragic incident, 27th. September, 2023,
[21] Al Mosawi A and S M Al Hasnawi, Iraq Healthcare System: An Overview, The New Iraqi Journal of Medicine 2009, 5 (3): 5- 132009.
[22] World Health Organization (WHO)-Regional Office for the Eastern Mediterranean - Health System Country Profile, 2018.
[23] Al Janabi T. Barriers to the Utilization of Primary Health Centers (PHCs) in Iraq. Epidemiologia (Basel). 2023 Apr 13;4(2):121-133. doi: 10.3390/epidemiologia4020013. PMID: 37092458; PMCID: PMC10123605.
[24] Al Janabi T. Barriers to the Utilization of Primary Health Centers (PHCs) in Iraq. Epidemiologia (Basel). 2023 Apr 13;4(2):121-133. doi: 10.3390/epidemiologia4020013. PMID: 37092458; PMCID: PMC10123605.
[25] [25] World Bank Group, Iraq- Systematic country diagnostics, Report No. 112333-IQ, pp. 82-85, February 2017.
[26] [26] The Borgen Project, 6 facts about the healthcare in Iraq, July 28th. 2020.
[27] Al-Ashbal MA, Lami FH, Performance evaluation of health houses in Iraq 2021-2022: A descriptive study. J Family Community Med, 2023 Apr-Jun;30(2):116-122. doi: 10.4103/jfcm.jfcm_362_22. Epub 2023 Apr 12. PMID: 37303842; PMCID: PMC10252635
[28] Al Janabi T. Barriers to the Utilization of Primary Health Centers (PHCs) in Iraq. Epidemiologia (Basel). 2023 Apr 13;4(2):121-133. doi: 10.3390/epidemiologia4020013. PMID: 37092458; PMCID: PMC10123605.
[29] World Food Programme (WFP), Iraq Socio-Economic Atlas, pp. 1-158.
[30]
[31] Moore M., Anthony R. C., Lim Y., Jones S. S., Overton A., Yoong J. K., The Future of Health Care in the Kurdistan Region — Iraq: Toward an Effective, High-Quality System with an Emphasis on Primary Care , Report, RAND Corporation, 2014.
[32] Mahmood KA, Saleh AM. Barriers and facilitators influencing access to and utilization of primary healthcare services in Kurdistan-region, Iraq: a cross-sectional study. Ann Med Surg (Lond), 2023 Jun 10; 85(7):3409-3417. doi: 10.1097/MS9.0000000000000957. PMID: 37427184; PMCID: PMC10328711.
[33] lshalah A, Douedari Y, Howard N, What we lacked was the courage to take decisions that differed from the rest of the world': expert perspectives on the role of evidence in COVID-19 policymaking in Iraq, BMJ Global Health, 2023;8:e012926.
[34] Shabila, N.P., Al-Tawil, N.G., Tahir, R. et al. Iraqi health system in Kurdistan region: medical professionals' perspectives on challenges and priorities for improvement. Conflict and Health, 4, 19 (2010).

[35] Dabbagh A., Taher M., An overview of the new Iraqi Health Insurance Law, Al Tamimi & Co.
[36] Qadir, D., Creating a New Healthcare System in the Middle East: the Case of Private Healthcare Providers in Kurdistan. Horizons of Education, 16 (40), 113-126, 2017, DOI: 10.17399/HW.2017.164007.
[37] White J. Budget-makers and health care systems. Health Policy. 2013 Oct; 112(3):163-71. doi: 10.1016/j.healthpol.2013.07.024. Epub 2013 Aug 6. PMID: 23958590.
[38] Tawfik-Shukor, A., Khoshnaw, H. The impact of health system governance and policy processes on health services in Iraqi Kurdistan. BMC Int Health Hum Rights, 10, 14, 2010.
[39]
[40] Lafta R, Qusay N, Mary M, Burnham G. Violence against doctors in Iraq during the time of COVID-19. PLoS One. 2021 Aug 6;16(8):e0254401. doi: 10.1371/journal.pone.0254401. PMID: 34358239; PMCID: PMC8345879.
[41] Surdyk S, Itani M, Al-Lobaidy M, Kahale LA, Farha A, Dewachi O, Akl EA, Habib RR. Weaponised uranium and adverse health outcomes in Iraq: a systematic review. BMJ Glob Health. 2021 Feb;6(2):e004166. doi: 10.1136/bmjgh-2020-004166. PMID: 33619039; PMCID: PMC7903104.
[42] Hussain AM, Lafta RK. Cancer Trends in Iraq 2000-2016. Oman Med J. 2021 Jan 31;36(1):e219. doi: 10.5001/omj.2021.18. PMID: 33552559; PMCID: PMC7847549.
[43] Al-Hashimi MMY. Trends in Breast Cancer Incidence in Iraq During the Period 2000-2019. Asian Pac J Cancer Prev. 2021 Dec 1;22(12):3889-3896. doi: 10.31557/APJCP.2021.22.12.3889. PMID: 34967568; PMCID: PMC9080353.
[44] Jiyad, S. Corruption is the lifeblood of politics in Iraq (PeaceRep report), Middle East Centre, London School of Economics, 2023,
[45] Kelly J, Pinnell O, Stallard E, BP in oil field where 'cancer is rife', BBC News, 30 September 2022
[46] Abulenein A, Levinson R, The medical crisis that's aggravating Iraq's unrest, A Reuters special report, 2 March 2020,
[47] Jiyad, S. Corruption is the lifeblood of politics in Iraq (PeaceRep report), Middle East Centre, London School of Economics, 2023,
[48] [48] Al-Shamsi M. Medical education in Iraq: issues and challenges. Int J Med Educ. 2017 Mar 11;8:88-90. doi: 10.5116/ijme.58b1.c927. PMID: 28285276; PMCID: PMC5357542.
[49] World Health Organization (WHO), WHO Guidelines: Recommendations on digital interventions for health system strengthening, ISBN: 978 92 4 155050 5, 2019.
[50] Istepanian, R S H and Woodard, B., 'M-health Fundamentals and Applications' John Wiley- IEEE Press, 2017.
[51] Istepanian, R S H and Woodard, B., 'M-health Fundamentals and Applications' John Wiley- IEEE Press, 2017.
[52]
[53] Istepanian, R. S. H., Mobile Applications (Apps) for Diabetes Management: Efficacy Issues and Regulatory Challenges, Lancet- Diabetes and Endocrinology, 3,12 pp. 921-923, 2015.
[54] Istepanian, R. S. H., Mobile Applications (Apps) for Diabetes Management: Efficacy Issues and Regulatory Challenges, Lancet- Diabetes and Endocrinology, 3,12 pp. 921-923, 2015.
[55] Haddad, N.S., Istepanian, R. S. H., Philip, N., Khazaal, F., Hamdan, T. A., Pickles, T., Amso,, N. and Gregory , J. W., ' A feasibility study of mobile phone text messaging to support education and management of Type-2 diabetes in Iraq', Diabetes Technology and Therapeutics, 16, 7, pp. 454-459, 2014.