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Review article

Measuring Health System Performance Globally by highlighting the Indicators, Frameworks, and Challenges

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ABSTRACT

Evaluating the performance of the health system is important for anyone who wants to improve population health. In response to this challenge, the World Health Organization (WHO) introduced its first formal health system performance assessment framework in 1999–2000. From that time, a variety of additional conceptual frameworks, monitoring tools, and indicators have been developed to help describe, measure, and compare health systems internationally. This article focuses on four interconnected streams of literature related to the WHO Health System Performance Framework and the controversies that have arisen from it. The subsequent WHO Health Systems Building Blocks framework, along with the degree to which it has been adopted globally to strengthen health systems. The key tools for evaluating health systems and the indicators currently used to monitor and assess health system inputs, processes, outputs, and outcomes, including those for universal health coverage. This manuscript deals with the continuing methodological hurdles that researchers continue to face as they attempt to assess health system performance, e.g. the poor data infrastructures that exist in low and middle-income countries; the technical complexity of effectively linking health systems performance outputs to specific health service system inputs; the possibility that if separate performance measures for the different health systems functions are not developed. The integration of these functions may lead to poor evaluation processes and the fragmentation of interdependent functions into separate data, as well as ongoing debates about how to weight and sum multiple performance indicators into a composite performance measure for any specific health system. No single framework or tool is sufficient, but the complementary use of conceptual frameworks, facility-based assessment tools, and routine information systems offers the most realistic path toward solidifying an accountable, evidence-based health system.

Keywords: Health system; Frameworks; WHO; Global challenges; Low-income countries.

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1. INTRODUCTION

While health systems have been established to protect and promote the health of the population, how well they achieve that goal can vary widely between countries with similar wealth, educational levels, and levels of health expenditures [1,2]. This variability has fuelled decades of work attempting to define what a health system is, what it is supposed to accomplish, and how performa-

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nce of the health system can be measured in a scientifically defensible and useful manner for policy purposes [2,3,4]. Performance measurement is important from many perspectives, including: allowing governments and donors to track progress towards national and global health goals, creating accountability for the use of public funds, identifying bottlenecks that impede the delivery of services, and providing an evidence base to compare options for reforming the health system [5,6].

The official assessment of how an overall health system performs began with the WHO World Health Report 2000. The report suggested that all countries (191 WHO member states) be evaluated using a single "composite index," which created controversy in the public health community, especially because this was viewed as a "ranking" of health systems [1,2]. Following the WHO report, the criticism of using a "composite" type ranking promoted the area of health systems assessment to move from measuring health systems through single composite rankings to the development of using multidimensional frameworks that include system "functions" and system "goals" and can be modified for application in any country [7,6]. As a result of this shift in the understanding of how health systems could best be described, the WHO began the development of the Health Systems Building Blocks framework where the interaction of 6 components was used to describe the health system and produced a series of "practical assessment tools" and "indicator handbooks" to support the implementation of the framework at the country level [7,8,9].

This review of the literature has organized the knowledge generated around the following 4 themes: (i) the original WHO performance framework and the scientific debate that it initiated; (ii) the WHO Building Blocks framework for strengthening health systems; (iii) the health system assessment tools that apply these frameworks in practice; and (iv) the indicators that are related to the monitoring and evaluation (M&E) of the performance of health systems over time. Finally, we discuss a number of cross-cutting methodological issues that limit current health system performance assessment in terms of their validity, comparability, and usefulness for policy development across health systems.

2. WHO HEALTH SYSTEM PERFORMANCE FRAMEWORK

2.1. Origins and Structure of the Framework

In 1999, Murray and Frenk developed a framework for the assessment of health system performance which was later refined for inclusion in the World Health Report 2000 [2,3]. The framework established its initial boundaries as being defined around the concept of 'health action', defined as 'all activities undertaken within the system, whose primary purpose is to promote or preserve the health of citizens within that system' [2]. Within those boundaries, a framework identified three inherent goals against which to assess performance:

- To improve the health of individuals as well as the health of populations in absolute terms, and to reduce inequality across populations;
- To increase their response to the legitimate and non-health expectations of the people they serve, including dignity, autonomy, and timely responses; and
- To promote fairness in the contribution of funding, such that individuals and households are protected from catastrophic or impoverishing health costs (i.e. the proportion of national health care expenditures that would qualify as 'catastrophic' must remain below a predetermined threshold) [2,3].

In subsequent revisions, the framework included a fourth analytic layer, identifying four core ‘functions' of the system (stewardship, financing, generating resources, and delivering services), all of which are required to collectively achieve the preceding three goals [1,6]. Total system performance was therefore defined by the level of achievement of each of the three goals relative to the achievable maximum based on all health care expenditures and any other available resources in the country, using methods similar to those used to estimate production frontiers [1].The World Health Report 2000 used this approach to construct a single composite performance index and to rank all WHO member states from 1 to 191 [1].

2.2. Scientific and Political Controversy

The country rankings found in the World Health Report 2000 immediately drew the global research community associated with health; however, the general structure for the conceptual framework of separating functions from their goals was received well and is still used widely today [10]. There were several recurring criticisms of the methodologies used throughout the literature. For example, Navarro claimed that the composite index lacks face validity, as many of the low-performing but highly-rated countries did poorly on independent population satisfaction surveys, and he pointed out that many of the choices made regarding what indicators to use and how to weight them were based on ideological assumptions rather than technical judgements [11-13]. Almeida, et al., raised questions about the data quality and comparability that were used to construct the index; most of the data used to construct the index was based on estimates rather than actual measurements, especially in low-income countries, which raised questions about the validity of those estimates [14]. Williams questioned the assumption that any two countries' health systems were based on one universally accepted set of goals or weights for any one measure, as there are differences among all countries with respect to their social values and political priorities [15].

In their defence of the framework as an important initial step towards achieving evidence-based health policy, Murray and Frenk argued that an imperfect quantitative comparison would still provide more benefit than no systematic assessment of performance across countries, and that this would also provide a basis from which to improve the subsequent data and methods used to make revisions to the framework [16]. In contrast, Navarro's rebuttal argued that collating all performance into a single numeric performance measure would inevitably oversimplify complex, multidimensional systems and could be used for political reasons, as well [12]. This discussion occurred primarily in The Lancet and the American Journal of Public Health and has since been characterised as a landmark debate on health policy and systems research. Furthermore, the debate has continued to influence the development of subsequent frameworks [10].

2.3. Legacy of the Framework

Although there have been differing opinions on the ranking of countries for health system performance, the conceptual value of the Murray–Frenk framework is still strong. The initial distinction between system functions (what the system does) and goals (what the system should do) is an underpinning to most of the existing performance frameworks, such as the WHO Building Blocks framework and the OECD Health Care Quality Indicators Project

[7,17,18]. Also, the Murray–Frenk framework has popularised the notion that responsiveness and fair financing are distinct health system goals in their own right—that is, they are not simply a means to an end (improved health outcomes)—and this idea continues to be a key principle driving universal health coverage (UHC) monitoring frameworks [1,19,20]. Frenk has also argued that the strengthening of national health systems by applying frameworks such as the Murray–Frenk framework should be viewed as a global public good, because of the increasing interdependence of health systems due to pandemics and the migration of health workers across national boundaries [21]. Most other reviews that have been conducted since 2000 have found that the three goals in the Murray–Frenk framework remain conceptually valid. However, the methodology that was used to aggregate the three goals into a single ranking at the time of the 2000 classification system is generally regarded as outdated [5,22].

3. WHO HEALTH SYSTEMS BUILDING BLOCKS FRAMEWORK

3.1. Building Blocks

The WHO published Everybody's Business in the year 2007, which is a document that first presented what is now the most commonly accepted conceptual framework in the work of global health systems. This framework defines how these systems can be described as having six interrelated, or building block, components:

1. Service Delivery, the organization and provision of effective, safe, and good quality (person and non-person) health interventions to those who need them.
2. Health Workforce, a sufficient health workforce that is fairly distributed, competent, and responds to the needs of the population.
3. Health Information Systems - the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status.
4. Medical Products, Vaccines and Technology - equitable access to essential medical products, vaccines and technology of guaranteed quality, safety, effectiveness, and cost-effectiveness.
5. Health Financing, a financing system that raises enough funds for health and protects households from catastrophic financial costs of care.
6. Leadership and Governance, existence of a strategic policy framework, along with effective stewardship, coalition building, regulation and accountability [7,13].

HSS refers to improving the six elements of health system architecture and working to make sure that these elements interact with each other to provide equitable and sustained improvements in health services and health outcomes. The framework was intentionally designed for simplicity of usage and to create a common vocabulary for countries, aid organizations and technical agencies when discussing investment priorities rather than for the purpose of being a precise analytical/reporting instrument.

3.2. Application and Adoption

Widespread use has been associated with the global health practice of the building blocks framework. Examples of this use include the development of national health sector strategic plans, creating portfolios of donor investments, such as those of the Global Fund and Gavi, and developing assessment tools for facilities and countries, including the WHO indicator handbook referred to in Section 4 [8,9]. The empirical application of the building blocks framework includes work that evaluates how well public hospitals and health systems are performing following restructuring; for instance, a study that looked at all six building blocks to evaluate healthcare providers in Ethiopian public hospitals following significant health sector reform [24].

3.3. Critiques of the Building Blocks Approach

While its simplicity is a strength, the Building Blocks Framework has also been heavily critiqued from a methodological perspective. In three empirical studies designed to assess the system-level impacts of vaccine introduction programmes, Mounier-Jack et al. concluded that the Building Blocks Framework was not originally intended to be a research tool and, ultimately, is poorly suited to answer research questions regarding dynamic, complex, and inter-related systems effects [24]. They further noted that the mechanical segmentation of effects into six distinct blocks leads to lost opportunities to examine significant relationships between the blocks; that the Building Blocks Framework fails to give sufficient weight to certain blocks based on their relative significance; and that the Building Blocks Framework is poorly equipped to measure the effects of policy interventions that are expected to unfold over longer time dimensions [24].

Health systems have been described by other writers as being complex adaptive systems where the individual components act in a dynamic fashion and develop emergent (and frequently unplanned) outcomes that cannot be represented effectively in a static, block-based model [25,26]. Van Olmen et al., argue that a number of different frameworks for health systems (including the building blocks framework) are based on implicit political and disciplinary assumptions about what a health system is meant to be. They warn that one cannot treat one framework, such as the building blocks framework, as a neutral or technical representation of reality [27]. The critiques of a number of authors do not call for the abandonment of the building blocks framework, which has an important role to play in terms of communication, planning and general diagnostic purposes, but rather they advocate a critical approach to employing the framework as a rigorous analytic or evaluative tool [24,25].

4. HEALTH SYSTEM ASSESSMENT TOOLS

4.1. Comprehensive National Health System Assessments

The Health System Assessment Approach (HSAA), which was first established in 2004 to 2007 through USAID projects Partners for Health Reform Plus and Health Systems 20/20, has continued to be updated as a "living document" with the goal of providing a rapid and structured methodology for assessing health systems of the nations using multiple modules that are approximately aligned with the health system building blocks [9]. The HSAA will produce an assessment report that documents the information gathered from review of documents, interviews with key informants, and analysis of secondary data [9] and should be used as part of a larger and more comprehensive approach to assessing the health system of a country, which includes the use of multiple methods in determining the state of the system as they will not be used as a substitute for the use of the HSAA in conjunction with methodology specific to that country's health system [6,9].

4.2. Facility-Based Service Availability and Readiness Assessment (SARA)

The Service Availability and Readiness Assessment (SARA), created collaboratively by the World Health Organization (WHO) and the United States Agency for International Development (USAID), is currently one of the most broadly used tools at the level of health facilities for assessing service availability and readiness. SARA was developed to provide a systematic approach for collecting data on service availability and service readiness to support measurement of and tracking progress on health system strengthening by using a standardized set of "tracer" indicators, which quantify both the availability of services physically and how they are used (i.e., service availability) and the capacity of facilities to provide a certain type of service based on the presence of trained personnel, guidelines, equipment, diagnostic capacity, and essential medicines (i.e., service readiness).

SARA builds on previous tools that have been developed to support the evaluation of services. These earlier tools include the Service Availability Mapping (SAM) process developed by the World Health Organisation (WHO) and the Service Provision Assessment (SPA) which was developed for the USAID-supported Demographic and Health Surveys program across 21 and 24 low and middle income countries. SARA starts with a master list of health facilities that will provide the basis for the service availability indicators and sampling frame for the service readiness component of the SARA survey [28].

A variety of SARA surveys have been conducted in a number of low and middle income countries to provide composite or service specific readiness indices for family planning, child health, emergency obstetric care, HIV, tuberculosis, malaria, and non-communicable diseases [29, 28]. The use of standardised and comparable tracer indicators allows for comparison with previous multi-country evaluation strategies, such as the evaluation of the Integrated Management of Childhood Illness (IMCI) strategy which also involved the use of such indicators to evaluate programmatic pathways from inputs to child survival outcomes across 25 countries. As SARA is designed to measure the availability and readiness of health service facilities without regard to the technical quality of care delivered, the preceding distinction is frequently missed by those using the SARA data.

4.3. Quality of Care Assessment: The Donabedian Structure Process Outcome Model

Over the past 50 years, the way quality of care is assessed in individual facilities and services has been primarily guided by the SPO (structure-process-outcome) model developed by Avedis Donabedian beginning in 1966 and elaborated on throughout the 1980s. The SPO model categorizes quality measures as follows: structure measures refer to facility characteristics/attributes (staff, equipment, infrastructure), process measures refer to interactions between the provider and patient (diagnosis, treatment, counselling), and outcome measures refer to resultant changes in health status of the patient (blood pressure control is an example of an intermediate outcome; mortality is an example of a final outcome) [30,31].

One of the underlying principles of Donabedian's model is that good structure increases the likelihood that good processes will be used; likewise, good process will increase the likelihood that a good outcome will occur [29,30]. The causative logic derived from these principles forms the foundation of all facility-based assessment tools (e.g., SARA, which is fundamentally an assessment tool designed to measure structural "readiness"). Furthermore, the impact of SARA is representative of the numerous "SPO" influenced other quality and performance frameworks developed after SARA (including the OECD Health Care Quality Indicators project) [17,18].

4.4. Comparative Summary of Assessment Tools

Table 1 summarizes the principal characteristics of the major frameworks and tools discussed in this review. This table showed the comparative overview of major health system performance frameworks and assessment tools.

Framework / Tool	Primary Purpose	Unit of Analysis	Key Reference
WHO Performance Framework (2000)	Define and compare overall health system performance using three intrinsic goals	National health system	Murray & Frenk, 2000 [2]
Building Blocks Framework (2007)	Guide health systems strengthening investment across six core components	National/subnational health system	WHO, 2007 [7]
Health System Assessment Approach (HSAA)	Rapid, structured diagnostic assessment for strategic planning	National health system	Wendt et al., 2013 [32]
Service Availability and Readiness Assessment (SARA)	Measure facility-level service availability and readiness using tracer indicators	Health facility	WHO/USAID, 2013 [29]
Donabedian SPO Model	Assess clinical quality of care via structure, process, and outcome measures	Service / provider / patient encounter	[26]
OECD Health Care Quality Indicators (HCQI)	Compare quality of care across high-income health systems using standard indicators	National health system (OECD members)	Ameh et al. 2017 [33]
UHC Monitoring Framework	Track coverage of essential services and financial protection toward UHC	National / global population	Boerma et al., 2014 [19]

5. MONITORING AND EVALUATION INDICATORS

5.1. The Results-Chain Logic of Health System Indicators

Most approaches to monitoring and evaluating health system performance organize the set of performance indicators used to assess health system performance into a sequential progression of inputs through to process, outputs and outcomes and impact at the population level [8,34]. Inputs describe the level of resources available to the health system (e.g. number of trained health workers or availability of essential medicines); processes describe how these resources are used (e.g. whether there is adherence to clinical practice guidelines); outputs describe the immediate physical outputs produced from the system (e.g. number of children fully vaccinated); outcomes describe the change in health-seeking behaviour or health status of individuals (e.g. rates of care-seeking or prevalence of disease); and impact describes how the health of the population overall has changed over time (e.g. life expectancy and maternal mortality) [8,34]. While the concept is easy to understand, using the logic in practical applications is more challenging because quality data needed to assess processes and outcomes are often not available, especially in low-resource countries [28,35].

5.2. The WHO Building Blocks Indicator Handbook

In order to implement the building blocks framework for monitoring, WHO published 'Monitoring the Building Blocks of Health Systems: A Handbook of Indicators and Their Measurement Strategies' in 2010 [8]. Each of the six building blocks includes a limited number of core indicators to help assess the health system and some additional indicators which could be chosen based on the country context; each of these indicators has some measurement strategies or data sources available [8]. The handbook has intentionally limited the number of kinds of indicators included, focusing on inputs, processes, and outputs (rather than including broad types of health results and population-level impact) because the impactful changes related to a population will be impacted by many things outside the health system [8]. The handbook continues to be one of the most cited resources for selecting indicators used in health system strengthening evaluations, including assessing the relative comparisons of building block statuses in different sub-Saharan African countries [8,24].

5.3. Health Information Systems as the Backbone of Monitoring

The health information system (HIS) underlies all indicator-based monitoring, the basic structure of the HIS provides reliable and timely data by generating, analysing, and disseminating that data [7,36]. The WHO Health Metrics Network framework published in 2008 established the international standards for strengthening country health information systems, and acknowledged that low- and middle-income countries face many constraints to the performance of their health systems, including the lack of capacity for HIS [36]. AbouZahr and Boerma also state that functioning HIS are a required foundational element of public health practice, rather than simply being a technical accessory; without routine and reliable data, system managers and external evaluators cannot monitor the effectiveness of public health interventions [35]. Empirical research documented HIS strengthening efforts in a number of African Health Initiative countries across sub-Saharan Africa, as well as common implementation approaches such as use of data quality audits, use of feedback loops to facility staff, and integration of multiple vertical reporting systems into one unified platform, as well as documenting the magnitude of the operational challenges associated with HIS strengthening policies [37].

5.4. Indicators for Universal Health Coverage

As global health policy has become increasingly centred on the goal of achieving universal health coverage (UHC), the WHO and the World Bank jointly developed a complementary monitoring framework that first appeared in 2014 [19,20]. This framework tracks two primary dimensions of UHC: coverage of essential health services (using tracer indicators across all five areas of health: reproductive; maternal; infant; communicable disease; and non-communicable disease) and financial protection against catastrophic and impoverishing health expenditures [19,20]. The first global monitoring report for UHC was published in 2015 by the WHO and the World Bank [38]. The UHC framework also states that coverage indicators should be disaggregated by socioeconomic and demographic variables (when data are available) and that this represents a shift in the indicator literature toward equity-sensitive performance measures rather than just average-performance measures [19].

5.5. Indicator Frameworks in High-Income Settings

The OECD's Health Care Quality Indicators (HCQI) Project is a broad international indicator project that started in the early 2000s and has created the most global indicator project among high-income countries [28,29]. The conceptual framework that Kelley & Hurst established and Arah and associates later refined consists of a four-level model for classifying health care quality indicators; namely, the broader health of the population, health determinants other than health care, the performance of the health care system, and the design and context of the health system [17,18]. The layered model acknowledges that the final health outcomes experienced by the population are also influenced by factors outside of the direct control of the health care system, such as income, education, and the physical environment. Furthermore, it provides a caution to researchers and policy makers from attributing all health outcome measures to the performance of the health care system without controlling for these factors: that is, the external health determinants [18,39]. Previous research by Arah & colleagues in this area has indicated that performance measurement frameworks must balance the need to be scientifically sound, relevant to policymakers, and practically feasible to collect routinely [39].

5.6. Selecting and Using Indicators in Practice

Indicator selection among the aforementioned frameworks are guided by a number of reoccurring principles. Indicators should be valid (accurately reflecting what it is trying to measure), reliable (yielding the same result if repeatedly measured), feasible to collect based upon existing infrastructure for data collection, and actionable for the end-user [8,34]. Handler et al. suggested in their writing about performance measurement for public health system performance that an appropriate conceptual framework should also differentiate between structural capacity of a system, its processes, and the outcomes of these processes (which is a model of logic in close alignment with the Donabedian model),

which has served to guide indicator selection beyond that of clinical service settings [30,40]. Composite or summary indices that combine many indicators into one score can be used to communicate complicated data more efficiently; however, composite or summary indices require explicit and defensible decisions regarding how to weight each indicator, which was a point of criticism raised about the original 2000 WHO performance rankings [1,11,13]. Therefore, it is common for more current guidance to advocate that there be a structured "dashboard" organized by domain (where this is not specifically required for composite index presentations, such as will be true UHC service-coverage tracking) rather than simply collapsing performance to a single score [19,22].

6. CROSS-CUTTING CHALLENGES IN HEALTH SYSTEM PERFORMANCE MEASUREMENT

6.1. Data Availability and Quality

The most common barrier identified in all four areas of this review is income and quality of available data from low and middle-income countries. Not only can you not have indicator frameworks and develop an indicator framework without functioning health databases that provide accurate, timely and complete statistical data but there are also significant limitations when it comes to the accuracy, completeness and timeliness of regular (routine) reporting of health service delivery data, as well as vital statistics, and health facility census enumeration data in many settings. While S[A]RA provides accurate primary survey data independent of routine reporting systems focused by facilities via S[A]RA, because S[A]RA surveys are expensive to conduct it is unlikely that they will be conducted on an ongoing basis [41].

6.2. Attribution and Causality

As noted, measuring the impact of health system inputs and reforms has been a long-standing challenge for many reasons, including that health is also determined to some degree by social, economic and environmental factors which lie outside of health systems [18,19]. One way that the OECD's tiered HCQI framework and Donabedian's SPO model attempt to help measure health system outcomes is through distinguishing between proximate process and proximate structure measures that can be more Sassily attributed to health systems actions, from distal outcomes that are also influenced by many other confounding factors [18, 30]. As such, researchers who evaluate health system strengthening interventions (including those using the building blocks framework) continue to report difficulties establishing causal links between specific input and long-term outcomes [24,28].

6.3. Fragmentation Versus System Interactions

Health system frameworks that break down health systems into separate pieces (either the original WHO four functions model or the six building blocks model) provide clarity and create a common vocabulary; however, they also run the risk of eliminating the important relationship between each building block that ultimately determines how well that building block performs in the real world [24,25,27]. This tension between simplicity and complexity is clearly illustrated by Mounier-Jack and colleagues' critique on the building blocks framework, the same simplicity that makes communication and planning easier also limits its ability to analyze genuinely systemic, interconnected solutions to problems occurring in real systems [24]. Complex adaptive systems thinking has been offered as a complementary approach to capturing complex behaviour in social systems but has yet to be developed into a standardised, widely accepted indicator set for measuring behaviours across social systems [25,26].

6.4. Weighting, Aggregation, and the Politics of Comparison

The controversy surrounding the World Health Report 2000 rankings remains unresolved. The methodology of merging many measures into an overall composite score necessitates making value judgements concerning the relative priority of each objective, which may vary greatly, depending on the health care history, available resources, and social priorities of the various countries being evaluated [11,12,13,15]. These same issues continue to be incorporated into attempts at designing new monitoring frameworks; for instance, the UHC monitoring framework is intended to monitor both coverage and financial protection as two separate indicators and will explicitly keep these indicators independent of one another and not combine them into a single index [19,20].

7. CONCLUSION

Since the initial framework for measuring health system performance from the World Health Organization and the debated country rankings based on the World Health Report 2000 [1,2], significant strides have been made in health system performance assessment. A fundamental contribution to the foundations of performance assessment has been the introduction of a conceptual distinction between system functions and goals; this enhancement has since helped improve design of subsequent assessment frameworks such as the Building Blocks and the Universal Health Coverage Monitoring frameworks. With the use of various tools to conduct practical assessments, such as the Health System Assessment Approach and the Service Availability and Readiness Assessment; the frameworks can now be operationalized at both the country and facility levels. In addition, the use of guides to selecting measures across the performance chain is critical for the execution of the frameworks (e.g. WHO's Monitoring the Building Blocks of Health Systems) [8,9,29]. However, there remain fundamental issues that must be addressed such as poor data infrastructure, the inability to determine if unique outcomes can be attributed to specific health system inputs, the potential for creating silos when dealing with performance measures that are all parts of a larger interconnected system, and whether composite scoring should and can be used to aggregate multidimensional measurements of performance [14,18, 24]. No single framework, tool or indicator can totally assess how well a health system performs.

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Ethical Approval

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Razaq H. E. Al-Garawi: Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing.

Availability of data and materials

All information used is available in the cited **literature**.

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