Saudi Journal of Health Systems Research

Research Article

Saudi J Health Syst Res 2024;4:127–136
DOI: 10.1159/000539708

Received: January 31, 2024
Accepted: June 3, 2024
Published online: July 16, 2024

Performance Power: Boosting Saudi Arabia's Health System Disaster Readiness (2017–2023)

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Keywords
Saudi Arabia · Health system · Readiness · Performance · Boost

Abstract

Introduction: The 2016 self-assessment based on joint external evaluation (JEE) identified certain gaps, which prompted the need for additional improvement. This study attempted to address an approach to enhance preparedness using the performance management system's components focusing on related areas in the JEE tool by the International Health Regulations (IHR). ***Methods:*** This was an observational cross-sectional study including all hospitals and regional health directorates within the Ministry of Health, Saudi Arabia. Entities preparedness was calculated using the JEE tool. Moreover, the implementation of the performance management system was also assessed for Saudi Arabia from the year 2017 to 2022. Additionally, the feedback was collected using the survey from the 11 National Preparedness Index (NPI) coordinators. ***Results:*** Total readiness was found to be 52% only, which was far less than the planned value of 75%. While regarding the implementation of the performance management system, it was noted that there was a progressive increase in the implementation from 10% in the year 2017 to 81.25% in the year 2022. Considering the feedback responses of NPI coordinators, it was found that 100% of coordinators agreed that the NPI has supported enhancing Health emergency preparedness and that the follow-up and support from the NPI team played an important role in NPI score improvement. ***Conclusion:*** The analysis indicated that while there are areas of progress, Saudi Arabia is still working on strengthening fundamental public health functions and emergency preparedness. This is evident when comparing a range of indicators with those of many countries under the purview of the World Health Organization (WHO).

Introduction

Performance management systems have become of high importance at the level of various sciences, which include the sciences of emergency and disaster management. In a parallel context, the interest in preparing for emergencies has increased over recent years, starting with the unification of definitions and objectives on national and local levels [1]. For monitoring and improving systems' capacities and capabilities, measuring preparedness complex is an essential concept to consider despite the limitations related to it [2].

For instance, the disaster risk reduction strategy for the Arab States has complemented the continuous efforts by technical national and international institutions that

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helped in reducing the risk of disasters in the Arab States [3]. Additionally, a multi-sectoral approach was implemented by the partners of the League of Arab States to reduce the risk of disasters in Arab regions by 2030, in line with the priorities set by the Sendai Framework for Disaster Risk Reduction 2015–2030, and the SDGs [4, 5].

The literature suggested that a one-size-fits-all assessment system has limited the comparative value and was not proven to answer the unique countries' risks. By looking at the risk posture in each state and the unique capability needs, a model emerges that includes existing quantitative information and combines it with qualitative efforts sustained in emergency management [2, 6, 7].

In that context, using different tools for measuring and enhancing preparedness can be justified as stated by Chiossi's study scoping review on recent tools and methods for assessing public health emergency preparedness [2], despite the limitations in these methodologies such as the lack of system-level performance measures [8].

The 2016 self-assessment based on a joint external evaluation (JEE) for technical area preparedness showed that the Saudi Arabia scores were sufficient. However, certain areas requiring further enhancement were recognized, in addition to the subjective nature of the evaluation, which underscored the necessity for ongoing improvement.

The question that the study attempts to answer is, what is the impact of the implementation of a performance management system on enhancing the kingdom's disaster preparedness? This study attempted to address an approach to enhance preparedness using the performance management system's components focusing on related areas in the JEE tool by the International Health Regulations (IHR) [9]. This study aimed to highlight the role of performance management in enhancing Disaster Preparedness based on JEE standards. To explore the relationship between performance management systems and disaster preparedness based on JEE standards.

Methods

The study was conducted in Saudi Arabia, the Ministry of Health, in the general directorate of emergencies, disasters, and medical transportation. The governance of disaster and crisis management is characterized by the following: the first responder to all risks except health risks is the civil defense, and the first responder for health emergencies is the Ministry of Health and the Saudi Red Crescent. In the governance framework of disaster and crisis management within Saudi Arabia, the General Directorate of Emergencies, disasters and medical transportation under the Ministry of Health outlines the roles of responders: civil defense is tasked with responding to all risks except health-related ones, whereas the Ministry of Health alongside the Saudi Red Crescent are designated as the primary responders for health emergencies (Ministry of Health, General Directorate of Emergencies, Disasters and Medical Transportation, Saudi Arabia) [10].

The population of the study included all regional health directorates for the first component, National Preparedness Index (NPI) regional health directorate coordinators ($n = 40$) and regional directors for the regional directorates of emergencies, disasters, and medical transportation ($n = 20$). All the people working as National Health Emergency Operations Center (NHEOC) NPI's Coordinators were taken as a sample size for both study components. The study encompasses all individuals in pivotal roles associated with the NHEOC and the regional health directorates, specifically targeting 40 NPI regional health directorate coordinators and 20 regional directors for the Regional Directorates of Emergencies, Disasters, and Medical Transportation. By including every person holding these roles, the study captured an exhaustive perspective on the governance, coordination, and operational dynamics across all regions. Given the crucial and limited number of individuals in these roles, including all such individuals was feasible and efficient. This strategy maximized the efficiency of the data collection process, ensuring comprehensive coverage of essential viewpoints without logistical complexities [11].

The materials and methods of this study were thoughtfully designed to include both an experimental section and a survey section, ensuring a comprehensive analysis of the performance management systems used within the NPI. Below is a brief description and justification of these methods.

The experimental section of the study involved using the NPI performance management system to evaluate preparedness across various operational units, namely, the Ministry of Health and Regional Health Directorates. The methodology was centered on assessing 16 performance indicators, which are critical for gauging the readiness of these directorates to handle health emergencies. Each indicator was scored across three categories: "not available," "partially available," and "available." This categorization allowed a nuanced analysis of the preparedness levels, highlighting areas of strength and those needing improvement. The second part is the survey section conducted to gather feedback and insights from stakeholders within the evaluated entities. This component is crucial for understanding the contextual factors that influence the performance scores and for gathering firsthand accounts of the system's efficacy and areas for enhancement.

Combining experimental and survey methods allowed a robust evaluation that incorporated both quantitative performance data and qualitative insights. This holistic approach ensured a more comprehensive understanding of the preparedness levels. The use of defined performance indicators and categorical scoring in the experimental section provided clarity and specificity in the assessment, making it easier to identify specific areas of improvement and success within the health directorates. The survey method engaged stakeholders directly, providing a platform for expressing concerns and suggestions. This engagement was essential for validating the experimental data and for ensuring that the performance management system was responsive to the actual needs and conditions on the ground. The findings from both sections of the study are invaluable for refining the NPI and its associated performance management system. The dual-method approach facilitates ongoing adjustments and enhancements based on detailed, multi-faceted feedback [11]. The latter included a questionnaire targeting relevant staff opinion on the use of the NPI and the follow-up of its team on enhancing disaster preparedness.

The questionnaire was administered to the same respondents at two different points in time under similar conditions. The National Experts in Disaster Management ensured that the questionnaire items comprehensively covered all relevant aspects of disaster preparedness influenced by the NPI. The correlation between the questionnaire results and other established measures of disaster preparedness was examined to confirm that the questionnaire effectively measured the intended construct. The questionnaire results were compared with external criteria that are definitive markers of disaster preparedness, to confirm the accuracy of the questionnaire in measuring preparedness levels. Further, the questionnaire was pilot-tested to identify and correct issues related to question clarity, structure, or response scaling, which helped refine the tool for better reliability and validity.

The regional preparedness key performance indicators (KPI) of different regional health directorates were assessed using the questionnaire from the years 2019 to 2022. Annual preparedness scores were calculated for each region included in the study. Further, the implementation of a performance management system was inquired about by the participants for the years 2020 and 2021. On this basis, the preparedness score of the regional health directorates were assessed.

No weighting scheme present is standardized for the generation of indices in JEE as per the 19 technical areas [12]. Furthermore, there is a scientific debate on the benefit of presenting a single JEE index composite. Thus, color coding for the NPI was based on internally agreed thresholds and targets. Where standards 1–10 were scored as 3, 1, and 0 representing full availability, partial availability, and non-availability of the specific standards, respectively. Whereas standards 11–16 were scored as 12, 1, and 0 representing full availability, partial availability, and non-availability of the standards, respectively, in each of the study settings. Moreover, full availability, partial availability and non-availability of the standards were color coded as green, yellow, and red, respectively. After that total score for each regional health directorate was calculated to determine the readiness and then cumulative readiness was calculated for Saudi Arabia.

The results of the present study were analyzed using an Excel sheet. Data were expressed as mean ± standard deviation for continuous variables while frequency and percentages were presented for categorical variables. The significance of the implementation of the performance management system was assessed through cross-tabulation and the χ^2 test. A p value of less than 0.05 was considered statistically significant. All statistical analyses were conducted using SPSS version 22. Additionally, the feedback-generated responses were analyzed using the χ^2 test and paired sample t test. While this analysis looks basic, it presented a non-biased baseline status of Saudi Arabia regarding the IHR capacities.

Results

In 2020, it was observed that overall preparedness reached a mere 52%, which notably fell short of the targeted benchmark of 75%. This underscores a critical need for strategic initiatives to bridge the preparedness discrepancy and align with the planned targets (Table 1).

Moreover, the implementation of the performance management system was also assessed in different cities of Saudi Arabia for the years 2017–2022. The analysis of the performance management system's implementation in Saudi Arabia from 2017 to 2022 was conducted to evaluate its impact on disaster preparedness levels across different provinces and nationwide. This type of analysis is critical for the provision of progress evidence. The data showing a progressive increase in preparedness scores from 10% in 2017 to 82% in 2022 provides concrete evidence of the effectiveness of the performance management system introduced in 2020. This upward trend is crucial for demonstrating the tangible benefits of structured performance management in enhancing disaster readiness. The use of statistical tests, such as the χ^2 test, to find a significant correlation (p value = 0.015) between the implementation of performance management systems and disaster preparedness confirms the hypothesis that effective performance management is key to improving preparedness. This statistical validation underscores the reliability of the performance management system as a tool for enhancing disaster readiness (Table 2).

Implementation of the performance management system was also assessed collectively for Saudi Arabia. It was noted that there was a progressive increase in the preparedness score from 10% in the year 2017 to 82% in the year 2022 as the performance management system was implemented in the year 2020. Thus, the hypothesis of the current study that there is a correlation between performance measurement systems and disaster preparedness was confirmed as a statistically significant association was found between the implementation of performance management systems and disaster preparedness (p value = 0.015) (shown in Fig. 1).

Additionally, the feedback was collected using the survey from the 11 NPI coordinators through feedback forms and the generated responses were analyzed. For this purpose, feedback responses from NPI coordinators were collected and it was found that 100% of coordinators agreed that the NPI has supported enhancing health emergency preparedness and that the follow-up and support from the NPI team played an important role in NPI score improvement (p value = 0.045). Furthermore, the most effective performance management system's elements in the National Emergency Preparedness Index project were tagged to be NPI targets setting (n = 8/11), followed by regular follow-up meetings with NPI regional health directorates coordinators (n = 4/11) (p value = 0.000). The feedback collected through surveys from NPI coordinators showed that 100% agreed that the NPI has significantly enhanced health emergency preparedness, which is vital. It not only confirms the effectiveness of the NPI but also highlights the critical role of continuous support and follow-up by the NPI team. The analysis of this feedback provides insights into which

Table 1. Evaluation of emergency preparedness for the year 2020 using 16 Standard Preparedness Assessment tool

Regions	S1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S10	S11	S12	S1 3	S 14	S 15	S 16	T
MoH	NA	3	3	3	3	3	1	3	3	NA	NA	NA	12	12	12	NA	58
Asir	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Bisha	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Baha	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Dammam	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Hafr Albatin	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Hail	3	3	1	1	3	3	1	3	3	3	1	0	1	1	12	3	42
Hassa	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Jazan	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Jeddah	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Jouf	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Madinah	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Makkah	3	3	1	1	3	3	1	3	3	3	1	1	12	1	12	3	54
Najran	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Northern borders	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Qassim	3	3	1	1	3	3	1	3	3	3	1	1	12	1	12	3	54
Qonfotha	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Quryat	3	3	1	1	3	3	1	3	3	3	1	1	1	1	12	3	43
Riyadh	3	3	1	1	3	3	1	3	3	3	1	1	12	1	1	3	43
Tabouk	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Taief	3	3	1	1	3	3	1	3	3	3	1	1	1	1	1	3	32
Total Score																	**851**
Total Readiness %																	**52**

NA, not applicable; S, standard; T, total.

elements of the system are most beneficial, such as target setting and regular follow-up meetings. The analysis helped identify the most impactful elements of the performance management system, allowing for targeted improvements in future iterations. This was particularly important for optimizing the system to meet the unique needs of different regions within Saudi Arabia. The findings from this analysis provided a compelling impetus for policy and operational refinement. By demonstrating a clear link between systematic performance management and improved preparedness, the study supported the need for continued investment in these systems to achieve higher levels of readiness.

The analysis would aid decision-makers in understanding the effectiveness of current strategies and in planning future actions to further enhance disaster preparedness. Understanding which aspects of the performance management system are most effective allows for better allocation of resources to areas where they are most needed. The results provided a benchmark for evaluating the effectiveness of disaster preparedness initiatives and for identifying areas where additional efforts are necessary. Ultimately, the analysis contributed to building a more resilient health system capable of responding effectively to disasters, thereby safeguarding public health (Table 3).

Table 2. The implementation of the performance management system in different cities of Saudi Arabia for the years 2017–2022

RHD	2017	2018	2019	2019	2020	2021				2022			
	Annual		RP-KPI	NR-KPI	RP-KPI	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Asir	7		-	16	43	22	24	31	34	35	35	35	34
Baha	7		-	16	43	22	24	24	29	28	28	29	31
Bisha	7		-	16	32	22	24	30	34	32	32	32	37
Dammam	8		-	16	43	22	24	27	31	30	30	31	31
Hail	7		-	14	42	22	24	30	32	35	35	35	35
Hassa	8		-	16	43	22	25	26	29	28	28	29	29
Hafr Albatin	8		-	16	32	22	24	27	31	34	34	36	36
Jazan	9		-	16	32	22	24	25	31	28	28	28	28
Jeddah	9		-	16	32	22	24	26	31	29	29	29	29
Jouf	7		-	14	32	22	25	27	30	29	29	29	29
Madinah	10		-	14	43	22	24	28	34	30	30	30	30
Makkah	10		-	16	54	22	24	28	30	35	36	36	36
Najran	7		-	16	43	22	24	25	29	31	32	32	32
Northern Borders	7		-	14	43	22	25	26	30	31	31	31	31
Qassim	7		-	14	54	22	24	26	31	29	29	29	29
Qonfotha	7		-	16	32	22	24	28	31	29	29	29	29
Qaryat	7		-	14	43	22	25	27	31	33	33	33	33
Riyadh	7		-	16	43	22	24	26	29	29	29	29	29
Tabouk	8		-	14	32	22	24	25	29	34	35	35	35
Taif	7		-	16	32	22	24	32	34	33	35	35	35
Total	154	0	0	306	793	440	484	544	620	622	627	632	638

RHD, Regional Health Directorate; RP-KPI, Regional Preparedness KPI; NR-KPI, National Readiness KPI.

Discussion

The overarching evaluation revealed opportunities for enhancement within the regional health directorates to fully integrate the essential IHR capacities. Furthermore, there was considerable potential for development within the regions, as they were approaching the achievement of capacity level 5 for approximately 7 out of the 16 indicators assessed. These included the availability of surge capacity to respond to public health emergencies of both national and international concerns, availability of stockpile plans and logistics management protocols, availability of hospital emergency operations centers (EOCs) staffed and equipped to manage emergencies at local levels, availability of regional health emergency operations center (RHEOC) based on GDEDA-MoH standards, functioning staffed and equipped, availability of capacity building plan for NHEOCS-RHEOC_HEPPUs, and availability of fund and

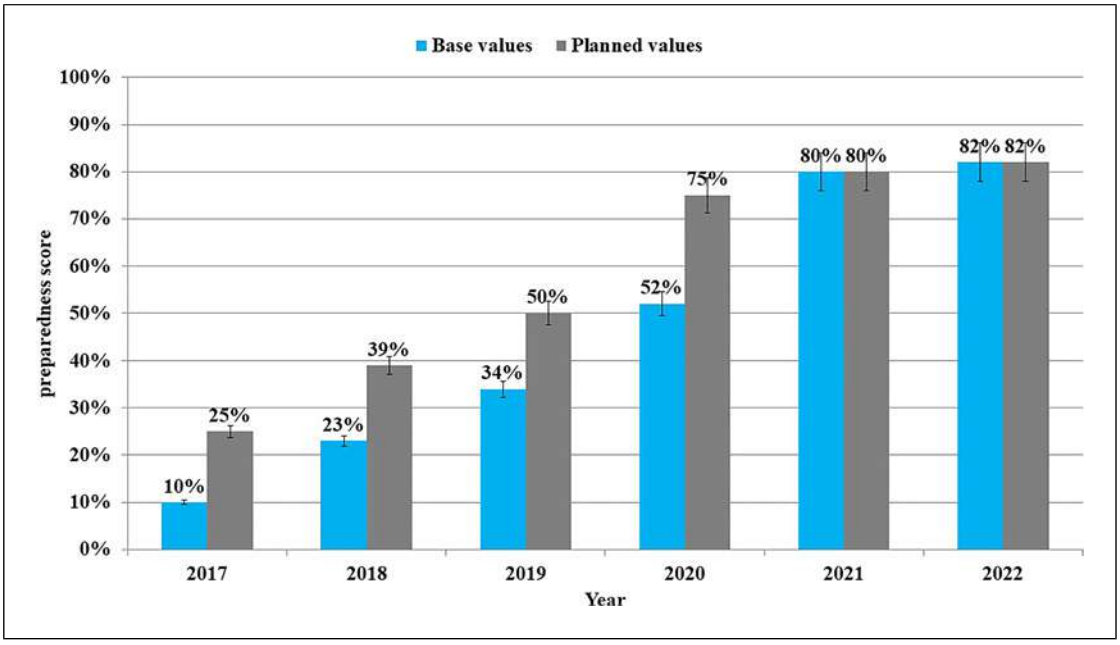

Fig. 1. Comparison of base values to the planned values of the preparedness score from the years 2017–2022.

funding process for emergency response and preparedness activities [13].

Whereas, capacity level 5 was obtained for almost half of the indicators (8 out of 16) including the availability of all hazards emergency preparedness and response plan at the regional level covering MoH Emergency planning framework\SHB Framework\IHR (requirements), Point of Entries (PoEs) [14, 15]. The availability of procedures plans to relocate or mobilize resources in the 5 emergency response levels to support response, priority public health risks, and resources were mapped and utilized to address IHR-relevant hazards and priority risks. Risks were assessed regularly and considered in emergency planning, and regular drills and exercises were carried out regularly for gap assessment. The closure feedback and lessons learned were used for improvement aspects, availability of hospital emergency preparedness tools and auditing procedures and teams to carry out these activities, and implementation of the ambulance centers project [16].

The regional health directorates in Saudi Arabia have garnered positive recognition, with close to 75% having fulfilled the JEE, reflecting a proactive stance in health governance. Given the rising frequency of public health challenges and outbreaks in the region, it is of paramount importance that the nation fortifies its strategy by leveraging robust empirical foundations to update or establish comprehensive health security and national response plans. This strategic foresight will be instrumental in strengthening Saudi Arabia's resilience in public health [17, 18].

The comprehensive analysis conducted in this study highlighted that up to the year 2017, there were significant opportunities for improvement within the emergency preparedness management systems of Saudi Arabia. This underlines the importance of continued development in action plans and response capacities, ensuring that the nation is well equipped to handle future public health challenges. This calls for a collective approach and different stakeholders to combine for the sustainment of the infrastructure, public health capacities, and also the processes for the implementation of the KPIs and health performance management system at the national level [19].

Thus, the regional and national preparedness KPIs were evaluated and a performance management system was implemented. Thereby, the NPI was updated after COVID-19 to have more than the basic 16 standards (28 specific for MoH and 20 standards for the regional health directorates). Hence, the preparedness score was increased to 82% in the year 2022 with an annual change of 2.50%. It is important to monitor the progression of IHR implementation regularly based on the components of the IHR evaluation framework which includes JEE every four to 5 years [20].

This study has highlighted areas for strategic enhancement in the implementation of IHR and emergency preparedness across various levels within the nation. Initially, it was observed that certain public statutes require

Table 3. Feedback responses of NPI coordinators (n = 11)

Details	Frequency	Percent	p value
Gender			
Males	5	45.5	0.016
Females	6	54.5	
Age group			
20–30 years	7	63.6	**0.038**
31–40 years	4	36.4	
Working experience			
1–5 years	8	72.7	0.082
6–10 years	3	27.3	
From your point of view, the National Preparedness Index (NPI) supported enhancing health emergencies preparedness			
Agree	11	100	**0.045**
To some extent	0	0	
Disagree	0	0	
From your point of view, the follow-up and support from NPI team played important role in NPI score improvement			
Agree	11	100	**0.045**
To some extent	0	0	
Disagree	0	0	
	Most effective	Least effective	p value
From your point of view, what are the most effective performance management system's elements in the national emergency preparedness index project			
NPI targets setting	8	3	**0.000**
The development and sharing of regular reports for leaderships	0	11	
Regular follow-up meetings with NPI regional health directorates coordinators	4	7	
Advisory support sessions NPI regional health directorates coordinators	1	10	
Escalation to regional health directorate leaderships if targets not met based on the planned timeline	0	11	
Escalation to regional health directorate leaderships if targets not met based on the planned timeline	0	11	
Training of NPI element's owners and NPI regional health directorate coordinators	3	8	

modernization to fully align with IHR mandates. Additionally, there is a need to augment financial allocations to facilitate the seamless enactment of these health regulations. Furthermore, the research underscored the necessity for a robust health infrastructure capable of efficiently detecting, evaluating, reporting, and managing public health events and emergencies [21].

For instance, a resilient health system requires a collective effort at the multi-sectoral level and from all the stakeholders involved for a long period. Multidisciplinary coordination is desired for the implementation of IHR through an alert, responsive, efficient, and facilitative system. Thus, establishing national focal points for the IHR is essential, and countries should create national public health institutes to coordinate with these national focal points and ensure the integration of IHR. Saudi Arabia is poised to further strengthen its public health system by strategically channeling resources toward health security enhancements. By addressing pivotal health security issues and implementing comprehensive strategies, the nation aspires to advance toward the attainment of universal

health coverage. This approach reflects a commitment to the highest standards of health and well-being for all citizens and residents [22].

Nevertheless, the JEE tool is a globally recognized method for the assessment of countries' capacities and capabilities to encounter public health threats. The evaluation instrument presents some limitations; however, these challenges are surmountable and provide a valuable opportunity for refinement. By adopting the World Health Organization (WHO) expert recommendations, any impediments can be transformed into catalysts for advancing public health practices. Moreover, some form of weighing and standardization is required for the proper use of JEE presentation and analysis, especially when aggregating JEE indices, for the avoidance of biased and subjective indices of JEE [15].

Consequently, the in-depth appraisal of Saudi Arabia's emergency preparedness, governance, and response aptitude, in conjunction with the application of KPIs, constitutes a compelling impetus for policy and operational refinement. This meticulous scrutiny provides foundational technical acumen essential for the country to amplify its public health infrastructure. Moreover, it propels the endeavor toward the attainment of optimal compliance with the IHR, ensuring the highest echelon of readiness is met across all evaluative criteria and norms [23, 24]. Yet, this could be achieved through decisive leadership, clear prioritization, judicious investment in resources, and steadfast commitment – qualities that the Kingdom of Saudi Arabia has demonstrated and continues to exhibit. The nation's response to the COVID-19 pandemic stands as a testament to its capability to effectively mobilize and implement such strategies.

This study is crucial for policymakers for several reasons. The study provides empirical evidence on the effectiveness of performance management systems in enhancing disaster preparedness. This allows policymakers to make informed decisions based on proven strategies that have shown significant improvement in readiness scores. The findings can guide policymakers on optimal resource allocation. Understanding which elements of the performance management system are most effective helps in directing resources toward initiatives that yield the best outcomes. The results from the study offer a solid foundation for developing new policies or refining existing ones related to disaster management and health emergency preparedness. By demonstrating measurable improvements in preparedness, the study supports greater accountability and transparency in how disaster preparedness initiatives are implemented and evaluated. Policymakers can use the insights gained from the study to plan strategically for future public health emergencies, ensuring that the health system is better equipped to respond effectively.

In comparison to other studies, the limited dataset in this analysis presents a unique opportunity to refine the approach to data examination using more sophisticated statistical methodologies. This would enhance our understanding of the determinants influencing the JEE performance within Saudi Arabia. Future research endeavors are thus encouraged to harmonize the computation of JEE metrics and enable a thematic synthesis of these indicators. Moreover, this analysis serves as a preliminary step, not as a conclusive verification of the JEE, and does not seek to establish a causal relationship between the JEE outcomes and their implications.

This study aligns with Saudi Vision 2030 and contributes significantly toward achieving its objectives in the following ways. Saudi Vision 2030 places a strong emphasis on developing a robust healthcare system to ensure the well-being of its population. This study, by enhancing disaster preparedness through the implementation of performance management systems, directly supports the vision's goal to build a resilient healthcare infrastructure capable of responding to emergencies effectively. One of the overarching goals of Vision 2030 is to improve the quality of life for all residents. Efficient management of health emergencies, as improved through this study, helps mitigate the impact of such emergencies, thereby safeguarding public health and enhancing community well-being. Vision 2030 also aims to improve transparency and accountability in governance. The use of performance management systems in disaster preparedness, evaluated in this study, fosters a transparent and accountable approach to emergency management, aligning with the governance improvements targeted by the vision. The vision encourages innovation across all sectors, including public health. This study contributes by identifying and implementing innovative strategies in the management of health emergencies, thereby enhancing public service delivery in line with Vision 2030 objectives. Finally, Vision 2030 includes objectives to extend Saudi Arabia's international collaborations. The methodologies and outcomes of this study could serve as a basis for international cooperation in public health and disaster management, promoting knowledge exchange and capacity building [12].

Conclusion

The comprehensive evaluation of Saudi Arabia's public health readiness and essential capacities has demonstrated varied levels of preparedness across different regions and indicators. However, it unequivocally indicates an overall strengthening in these areas. The JEE scores are pivotal, serving as indicators of this progressive improvement in

emergency preparedness capabilities. The significance of the JEE extends beyond simple evaluation; it offers a sophisticated framework to effectively measure the outcomes resulting from investments in fundamental public health functionalities. This analysis showed that while progress is evident, there are still crucial areas requiring further enhancement to bolster fundamental public health functions and emergency preparedness. This necessity is particularly apparent when the indicators are benchmarked against those of other nations under the WHO oversight. The ongoing efforts and targeted strategies currently in place are crucial for addressing these areas of improvement and ensuring alignment with international standards. Such measures are essential not only for meeting immediate health security needs but also for the strategic long-term strengthening of the public health system in alignment with global practices.

This endeavor is not just about reaching a set benchmark but also about continuous improvement and adaptation to new challenges, ensuring that Saudi Arabia remains equipped to handle future public health crises effectively. This alignment with international standards and commitment to ongoing enhancement directly supports the goals of Saudi Vision 2030 by building a resilient health system that contributes to the nation's overall prosperity and well-being. The JEE tool, developed by the WHO, is widely recognized for its structured and comprehensive approach to assessing a country's capacity to handle public health threats. The JEE serves as a critical mechanism for nations to gauge their readiness and response capabilities systematically, and it is essential for continuous public health improvement.

Statement of Ethics

The study was approved by the Central Institutional Review Board of Ministry of Health, Saudi Arabia, via reference number 22-31 M (dated: 01-06-2022). Written informed consent was obtained from the participants.

Conflict of Interest Statement

The author has no conflicts of interest to declare.

Funding Sources

This study was not supported by any sponsor or funder.

Author Contributions

The author, Hisham Hassan Ali Dinar, contributed to design the study, analysis of the data, preparation of the manuscript, and also in approval of the final manuscript.

Data Availability Statement

The data that support the findings of this study are not publicly available as they contain information that could compromise the privacy but are available from the corresponding author, Hisham Hassan Ali Dinar (hisham.alidinar@gmail.com), upon reasonable request.

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