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A Rapid Evidence Assessment of Health Information System in Jordan

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Abstract

This study aims to assess the health information system (HIS) in Jordan, and to recommend future steps to support evidence based policies and actions. A rapid evidence assessment and qualitative meta synthesis for the health information system in Jordan. The HIS in Jordan does not secure prompt availability of data and timely publication of information. Also, HIS in Jordan is complex, with multiple data sources, various types of information, and many producers and managers of data. The HIS was shown to be missing key pieces of information. These features are explained by the fact that some of the key pieces of information for the identification of the health inputs, processes, outputs and outcomes of upstream forces do not lend themselves to population survey tools, as well as the absence of some relevant modules in population surveys, and also due to the ineffective capitalization on the potentials of the institutional HIS. Jordan's strategic commitment to improving health services and the existing solid foundation of its HIS are opportunities to be capitalized on. The recent package of indicators for HIS should be used as a foundation to support the realization of an effective health information system in Jordan.

Keywords

Artificial intelligence, Health Systems, Patient record systems, Health Information System, Jordan

I. BACKGROUND

Health systems have been significantly influenced by information technology and health information management. Health system data availability, accuracy, integrity, and security improvements and support efforts to ensure high-quality health service [1]. The digitizing of healthcare data plays important role in the tasks of healthcare data collection, storage and use. The innovations in computer processing, data storage and digitizing of healthcare data, have facilitated the development of enhanced algorithms known as Artificial Intelligence (AI) [2].

Patient care treatments and health systems management need AI technologies to identify new drugs, reduce the cost, improve health services and manage the large data in the sector [2]. The health care service needs labor-saving technology and techniques to better understand the health of the population while managing the health of a greater number of people and saving money. AI reduces the need for the physical presence or recruitment of a qualified health professional to provide health services. It can make the health workforce more efficient. Another demanding factor for AI technology is the large volume of healthcare data which is experiencing an information boom [1]. AI applications can manage the huge amount of data generated in healthcare services and discover new information that would otherwise go on hidden in the accumulation of healthcare big data [2].

A HIS serves a diversity of stakeholders at different levels. At the level of health professionals, it should give insight and provide effective communication that will support improved diagnoses of health problems and effective actions within communities and local areas. If the HIS provide those insights, then health professionals will be more empathetic with the patients' lives and will provide health services within the health system and the community. This is particularly relevant for navigating barriers to accessing health care and other services during the first-hand experience with health services. It is also relevant to adopting comprehensive social and health interventions at community levels. At the level of policies and public sectors, such a system will encourage the implementation of health equities in all policies (HEiP) and inter-sectoral actions for health. It will guide the pursuit of health and wellbeing as a measure of development and social success

This paper recognizes the importance of the HIS of Jordan. It investigates the indicators of HIS functionality and recommends future steps. The paper is based on a rapid evidence assessment of all relevant materials and sources. The paper starts with a description of the methodology, then provides a description of the HIS in Jordan and an assessment of HIS. Finally, the paper discusses the information system and concludes with a discussion of findings and recommendations for the next steps.

AI is a distinct term for computing innovations that represent human intelligence's supporting systems, including cognition, sensory perception, adaptation, deep learning and engagement [1]. AI applications for the health sector are recently gaining attention from health practitioners and researchers [2].

Applications for the health industry in Jordan are uncommon, as far as we know. For instance, there are no such AI applications in Jordan's main health informatics system, Hakeem. The lengthy process of obtaining health information from this system, which requires several permissions and might take more than six months to complete, may be one of the main obstacles. This system has to concentrate on a variety of AI applications, including but not limited to Pandemic prediction and simulations [3], Machine Learning from medical big data [4], Content-based image retrieval [5], disease diagnosis [6], etc.

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METHODS

An extensive rapid evidence assessment was adopted to derive a deeper understanding of the health information system in Jordan. This was carried out during the period from June to August 2021 and involved searching general databases, websites, scientific databases and grey literature too; such as www.google.jo for the following keywords (electronic medical records, health information system, health equity, Jordan). The authors managed to collect over 120 documents. After removing duplicates, and those not satisfying the literature foci, 76 articles were included. Finally, after the initial full reading of the articles, another 53 papers were excluded as deemed inappropriate for addressing the meta synthesis. The remaining 23 papers were uploaded to Atlas.ti 9.0 software for analysis and synthesis. The analysis process followed the thematic analysis technique for distinguishing, categorizing, analyzing, and summarizing themes from the available data.

II. RESULTS

Jordan HIS was coordinated and launched in 2013 based on The Health Metrics Network (HMN) Framework and Standards [7]. This framework divides the components and standards of a health information system into three components including different sub-components (see Figure 1)

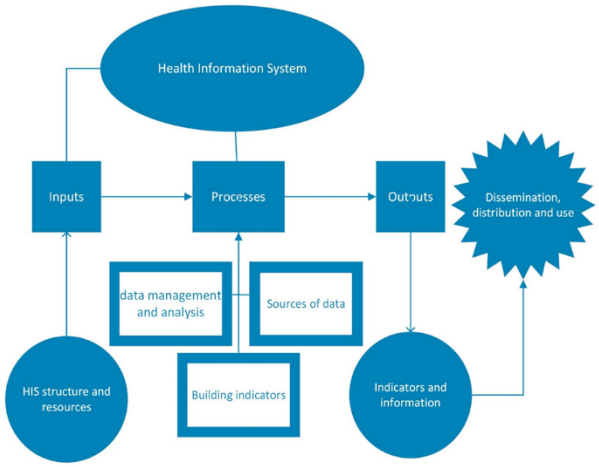

Fig. 1:Health information system components based on Health Metrics Network standards and framework.

Source: study data and adapted from [7] Klaib, A.F., and Nuser, M.S.: 'Evaluating EHR and Health Care in Jordan According to the International Health Metrics Network (HMN) Framework and Standards: A Case Study of Hakeem', IEEE Access, 2019, 7, (1), pp. 51457-51465

Component 1: Input

- HIS structure and resources: include policies, regulations, coordination, infra and supra-structure, financial and human resources and training.

Component 2: Processing

- Data management and analysis: involves data storage, data processing and categorizing data
- Sources of data: population based and institution-based health information data sources.

quality.

- Building indicators: to measure variations in three main domains; the determinants of health, health status and health system.

Component 3: Outputs

- Indicators and information: adopting local indicators comparable to international standards and to convert data into information understandable by decision makers.
- Dissemination, distribution and use: includes institutionalizing information use and demand and use it for decision-making.

The HIS in Jordan [summarized in table (1)] indicates an adequately structured, very rich and complex HIS, with multiple data sources, various types of information, and many producers and managers of data. Some of the adopted data tools rely on paper forms that are further transferred for data validation, coding, data entry and processing. The use of electronic records and fully automated system for some data types and by some managers of data is also indicated.

In terms of the assessment of different types of data in the HIS of Jordan, the registration of vital events is currently assessed to be nearly complete (99%) for birth registration, while death registration stands at 75%. Khader, Alyahya et al. [8] reported that the registration for some neonatal deaths and stillbirths is not complete. This was attributed to the dysfunctional reporting system which leaves the responsibility of births and deaths to the families.

The report of WHO comprehensive assessment of HIS [9] addressed all major data sources (such as censuses, civil registration, population based surveys, individual records, service records and resource records) and its implementation at the national level [9]. It indicated adequate data to understand epidemiological issues and support system response are not available due to improper data collection forms which focus on aggregated disease. It also indicated that the quality assurance mechanisms at the different levels face challenges related to the qualification of staff and heavy workload [9, 10]. The report suggested a "minimum dataset" by reducing the necessary amount of information. At the ministry of health (MoH) level; the directorates of Information Technology and Information and Studies are necessary for setting standards and expectations for enhancing HIS, but both require strengthening and empowerment. The suggestion is made to strengthen HIS by formulating a functional national steering committee in charge of HIS coordination. This committee should involve all relevant stakeholders and respond to strategic issues related to HIS [9]. The report also called for a unified strategic plan.

The assessment of the framework (input, processing and output) indicates that all these components are not well served in Jordan. The processing component of HIS in Jordan includes the three specified sub-components; the indicators, data sources and data management. The indicators do not include all determinants of health, health system and health status. Also, there is no integration between the data sources which include population-based and institution-based data. In addition, data management and data storage, do not ensure data quality and effective data processing.

The processing component does not lead to efficient output in terms of data utilization. The national health plans and policies are partially based on data and evidence. Evidence of policy translation does not exist completely even with the presence of all collected data and information. This is

blamed on the non-integration of data and the weak coordination function between the MoH and its partners [11].

Table 1: Health related data sources, owners & the levels of data collection

Data Type	Data sources	Program	data collected	Forms of data	Owners of the data	Data production
Institutional data	Institutional data [7, 9-27]	Individual Service and Source Records	Institutional data	Paper based	Institutional data (MoH, RMS, Private sector, University and specialized care Hospitals)	Routinely
	National electronic registration system [7, 10, 14-16, 18, 22]	Hakeem	Case based data collected at the health facility level, and collated at the health facility-governorate-national levels	Computerized	Institutional data (MoH, RMS, Private sector, University and specialized care Hospitals)	Routinely
	National electronic registration system [10]	Interactive Electronic Reporting System (IERS)	Case based data collected at the health facility level, and collated at the health facility-governorate-national levels	Computerized (tablet based)	MoH	Routinely
	Institutional data [7, 10, 14-18, 22]	Individual, service and resource records	Institutional data	Paper and computer based	Individual institution	Routinely
	National registration system [7, 10, 12, 19, 20, 22, 24, 28]	National Renal Disease Registry	Registers patients after confirmatory diagnosis through health facilities and specialized care hospitals. Strata of one. Age 2. Sex 3. Residence	Paper based at Hospital level – Collated and digitized centrally	Directorate of Non Communicable Diseases (NCDs) (MoH)	Routinely collected and collated annually
	National registration system [7, 10, 12, 19, 20, 22, 24, 28]	National Thalassemia Registry	Registers patients after confirmatory diagnosis through health facilities and specialized care hospitals. Strata of one. Age 2. Sex 3. Residence	Paper based at Hospital level – Collated and digitized centrally	Directorate of NCDs (MoH)	Routinely collected and collated annually
	National registration system [7, 10, 12, 19, 20, 22, 24, 28]	National Cancer Registry	Registers patients after confirmatory diagnosis through health facilities and specialized care hospitals. Strata of one. Age 2. Sex 3. Residence	Paper based at Hospital level – Collated and digitized centrally	Directorate of NCDs (MoH)	Routinely collected and collated annually
Population based HIS	Census[9-12, 21, 22, 24, 27, 29, 30]	1. Social, economic and demographic conditions locally and nationally. 2. Children and people living with disabilities	Population based data	Paper based, digitized at central level (DoS)	Directorate of Public Statistics	Every 10 years
	Surveys [29]	the Demographic and Health Survey (DHS)	strata of Data: 1. Age groups two. Marital status three. Residence area (urban-rural) 4. Governorate level 5. Nationality 6. Education level 7. Wealth quintiles	Paper based, digitized at central level (Population Higher Council)	Directorate of Public Statistics	Every 5 years
	Civil Registry of Vital Statistics (CRVS) [9-12, 21, 22, 24, 27, 30]	Birth and death registration data from civil registry of vital statistics (CRVS)	1. Data on Births 2. Deaths 3. Marriage 4. Divorce/Separation	Paper based and digitized centrally	Ministry of interior	Routinely
	National Health Accounts [7, 10, 20, 24, 29]	National Health Accounts	Health accounts indicators	Email and paper based collected and collated centrally	Higher Health Council	Annually

Source: study data sources

III. DISCUSSION

The HIS is rich with data about health in Jordan. It has the capacity and ability to serve the needs of a diversity of stakeholders. The value of population-based surveys is no less important than patient record systems such as HAKEEM [11]. All those specially designed assessment tools are producing important knowledge and recommendations on health services besides inequalities and their social determinants. A new structure for HIS in Jordan is required to enable all health related data sources and information systems to talk to each other. There are many efforts to link registrations and records and coordinate between producers of data.

Currently, in Jordan, efforts are working on a new structure for the HIS [9, 12]. This structure will include a data repository for the entire HIS. It will enable data extraction, linkage, and triangulation with other sources such as population-based data (e.g., DHS, census…) and institution-based data (e.g., service records like Hakeem, IERS…). Moreover, it will be assembled into usable statistics and information for comparison of various health indicators and in-depth analysis [27]. supplying data from non-routine sources and routine sources into the repository would create a valuable information base. One of the drawbacks of the existing structure is taking IERS as an acting data repository. The IERS collects data from its standalone terminal ipads but it should be integrated into the institutional systems of the other sources (e.g., UNHCR, refugee camps and Hakeem) [12]. It needs to talk to the whole HIS by developing or transforming its data into the proposed repository for the entire HIS.

Also in Jordan, as in most countries, population-based HIS systems that supply data at periodic intervals are maintained by ministries and departments other than the MoH [9, 10]. Finding the required information in a structure that can be linked with MoH's service delivery information involves close partnerships with these ministries and departments. The information from these systems is necessary, particularly for policy formulation and guiding actions.

IV. CONCLUSION

Jordan's strategic commitment to population health, as well as the existing solid foundation of its HIS, are opportunities to be capitalized on to strengthen its HIS and allow it to serve the wellbeing of all its people and the country's pursuit of development. The recent production of a package of indicators that are required to ensure the functional HIS should be used as a foundation. Such a foundation needs to be adapted to the context of Jordan and integrated into a comprehensive information system to support the realization of high-quality health care in Jordan.

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https://www.aucegypt.edu/research/src/equity-health-information-system

REFERENCES

[1] S. Secinaro, D. Calandra, A. Secinaro, V. Muthurangu, and P. Biancone, "The role of artificial intelligence in healthcare: a structured literature review," BMC Med Inform Decis Mak, vol. 21, no. 1, p. 125, Apr 10 2021, doi: 10.1186/s12911-021-01488-9.

[2] M. H. Stanfill and D. T. Marc, "Health Information Management: Implications of Artificial Intelligence on Healthcare Data and Information Management," (in En), Yearb Med Inform, vol. 28, no. 1, pp. 56-64, Aug 2019, doi: 10.1055/s-0039-1677913.

[3] A. B. Hassanat et al., "A Simulation Model for Forecasting COVID-19 Pandemic Spread: Analytical Results Based on the Current Saudi COVID-19 Data," Sustainability, vol. 13, no. 9, p. 22, 2021, doi: 10.3390/su13094888.

[4] A. Hassanat, H. Ali, and A. Tarawneh, "Magnetic Force Classifier: A Novel Method for Big Data Classification," IEEE Access, vol. 10, no. 1, pp. 12592-12606, 2022.

[5] A. Tarawneh, A. Hassanat, C. Celik, and D. Chetverikov, "Deep Face Image Retrieval: A Comparative Study with Dictionary Learning," in 10th International Conference on Information and Communication Systems, Irbid, June, 2019 2019 IEEE, 2019, pp. 185 -192.

[6] A. Alqatawneh, R. Alhalaseh, A. Hassanat, and M. Abbadi, "Statistical-Hypothesis-Aided Tests for Epilepsy Classification," Computers, vol. 8, no. 4, p. 13, 2019, doi: 10.3390/computers8040084.

[7] A. F. Klaib and M. S. Nuser, "Evaluating EHR and Health Care in Jordan According to the International Health Metrics Network (HMN) Framework and Standards: A Case Study of Hakeem," IEEE Access, vol. 7, no. 1, pp. 51457-51465, 2019, doi: 10.1109/access.2019.2911684.

[8] Y. S. Khader, M. Alyahya, and A. Batieha, "Birth and Neonatal Death Registrations in Jordan," in Handbook of Healthcare in the Arab World, I. Laher Ed. Cham: Springer International Publishing, 2019, ch. Chapter 116-1, pp. 1-12.

[9] World Health Organization and Regional Office for the Eastern Mediterranean, Comprehensive assessment of Jordan's health information system 2016, WHO Regional Office for the Eastern Mediterranean, ed., Cairo: WHO, 2016, p. 40. [Online]. Available: https://applications.emro.who.int/docs/9789290222583-eng.pdf?ua=1.

[10] (2019). Health Information System Strategic Plan 2019-2023. [Online] Available: https://www.moh.gov.jo/EchoBusV3.0/SystemAssets/PDFs/PDFs%20AR/Strategies_AR/HIS-Eng.pdf

[11] World Health Organization, "SCORE for Health Data Technical Package: Assessment Summary for Jordan from 2013-2018," World Health Organization, , Geneva, MARCH 15, 2021 2021. Accessed: 19.9.2021. [Online]. Available: https://cdn.who.int/media/docs/default-source/documents/ddi/score/country-profiles/who_score_jor_en.pdf?sfvrsn=6428bcfb_10

[12] A. M. Ahmad, "Planning of health data repository by assessing the feasibility of creating and operating an integrated web ‐ portal platform for housing at MOH Jordan," WHO, Jordan, Technical support for the planning of health data repository by assessing the feasibility of creating and operating an integrated web ‐ portal platform for MOH Jordan, 2020.

[13] M. T. Ajlouni, "Integrity and Corruption in the Health Sector in Jordan: The Perceptions of Leaders of Non-government Health

Organizations (NGHOs)," International Business Research, vol. 10, no. 2, pp. 95-103, 2017, doi: doi:10.5539/ibr.v10n2p95
[14] L. Akhu-Zaheya, R. Al-Maaitah, and S. Bany Hani, "Quality of nursing documentation: Paper-based health records versus electronic-based health records," J Clin Nurs, vol. 27, no. 3-4, pp. e578-e589, Feb 2018, doi: 10.1111/jocn.14097.
[15] O. Al-Rawajfah and A. Tubaishat, "Barriers and facilitators to using electronic healthcare records in Jordanian hospitals from the nurses' perspective: A national survey," Informatics for Health and Social Care, vol. 44, no. 1, pp. 1-11, 2019. [Online]. Available: https://www.tandfonline.com/doi/full/10.1080/17538157.2017.1353998.
[16] N. Al-Shorbaji et al., "Middle East and North African Health Informatics Association (MENAHIA): Building Sustainable Collaboration," Yearbook of medical informatics, vol. 27, no. 01, pp. 286-291, 2018, doi: 10.1055/s-0038-1641207.
[17] S. M. Alkhaldi et al., "Patterns of antibiotic prescribing and appropriateness for respiratory tract infections in a teaching hospital in Jordan," Int J Clin Pract, vol. 75, no. 6, p. e14113, Jun 2021, doi: 10.1111/ijcp.14113.
[18] A. M. AlSobeh, A. F. Klaib, and A. AlYahya, "A national framework for e-health data collection in Jordan with current practices," International Journal of Computer Applications in Technology, vol. 59, no. 1, pp. 64-73, 2019, doi: 10.1504/IJCAT.2019.097118.
[19] T. Atobishi and Z. G. Szalay, "The Impact of Information System on Administrative Service Quality in Hospitals: The Case of Prince Hamzah Hospital, Jordan 2015," Studia Mundi–Economica, vol. 5, no. 2, pp. 143-152, 2018, doi: 10.18531/Studia.Mundi.2018.05.02.143-152.
[20] Higher Health Council. (2014). 5, Jordan National Health Accounts. [Online] Available: http://hhc.gov.jo/uploadedimages/07e53204-969e-4552-a67e-3581f7790912.pdf
[21] Higher Health Council, Jordan. (2016). The National Strategy for Health Sector in Jordan 2016- 2020. [Online] Available: https://extranet.who.int/countryplanningcycles/sites/default/files/planning_cycle_repository/jordan/national_strategy_for_health_sector_2016-2020_jordan.pdf
[22] Y. Jalghoum, A. Tahtamouni, S. Khasawneh, and A. Al-Madadha, "Challenges to healthcare information systems development: The case of Jordan," International Journal of Healthcare Management, vol. 14, no. 2, pp. 447-455, 2019, doi: 10.1080/20479700.2019.1658159.
[23] Z. Khadr, H. Rashad, and S. Shawky, "Health Inequalities in Jordan and their Social Determinants: Evidence and Policy Implications.," The Social Research Center of the American University in Cairo and the World Health Organization/ Jordan, Cairo, 2019. Accessed: 7.9.2021. [Online]. Available: https://documents.aucegypt.edu/Docs/src/Jordan-health-equity.pdf
[24] (2018). The Ministry of Health Strategic Plan 2018-2022. [Online] Available: https://moh.gov.jo/ebv4.0/root_storage/en/eb_list_page/the_ministry_of_health_strategic_plan_2018-2022.pdf
[25] H. Rashad, S. Shawky, Z. Khadr, M. Afifi, and S. Sahbani, "Reproductive Health Equity in the Arab Region: Fairness and Social Success," in Regional Study, ed. Cairo: the Social Research Center/the American University in Cairo, 2019.
[26] N. Ravishankar and J. Gausman, "Analysing equity in health utilization and expenditure in Jordan with focus on maternal and child health services.," Higher Health Council, Amman, 2018. Accessed: 3.10.2021. [Online]. Available: https://thinkwell.global/wp-content/uploads/2016/10/Thinkwell-Jordan-Report-FINAL_August31.pdf
[27] World Health Organization, "WHO Jordan: Joint Collaboration Programme 2016–2017 - Achievement Report," Regional Office for the Eastern Mediterranean,, Cairo, WHO-EM/JOR/001/E, 2020. [Online]. Available: https://applications.emro.who.int/docs/WHOEMJOR001E-eng.pdf?ua=1
[28] K. G. Al-Moghrabi, A. M. Al-Ghonmein, M. Z. Alksasbeh, and A. A. Al-Dalaien, "Towards A Cloud Computing Success Model For Hospital Information System In Jordan," International Journal of Advanced Trends in Computer Science and Engineering, vol. 10, no. 2, pp. 1121-1127, 2021, doi: 10.30534/ijatcse/2021/891022021.
[29] Department of Statistics (DOS) and ICF, "Jordan Population and Family and Health Survey 2017-18 " DOS and ICF, Amman, Jordan, and Rockville, Maryland, USA, March 2019 2019. [Online]. Available: https://dhsprogram.com/pubs/pdf/FR346/FR346.pdf
[30] Y. S. Khader, K. K. Shattnawi, N. Al-Sheyab, M. Alyahya, and A. Batieha, "The usability of Jordan stillbirths and neonatal deaths surveillance (JSANDS) system: results of focus group discussions," Arch Public Health, vol. 79, no. 1, p. 29, Mar 7 2021, doi: 10.1186/s13690-021-00551-1.