



Awareness and Utilization of Online Medical Resources among Medical Practitioners at Port Sudan Teaching Hospital, Sudan, 2025

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Abstract

Background: Online medical resources (OMRs) constitute a critical component of global clinical decision-making. However, their utilization and awareness in low-resource settings have not been adequately studied.

Methods: This descriptive cross-sectional study was conducted in July 2025 among 174 healthcare professionals at Port Sudan Teaching Hospital. A structured questionnaire was used for data collection. Descriptive statistics summarized awareness and utilization patterns. Associations were tested using Chi-square, and logistic regression calculated predictors of awareness with odds ratios (OR) and 95% confidence intervals (CI)

Results: Overall awareness was high (90%), with Medscape (70%) and UpToDate (40%) being the most recognized tools. Free sources like PubMed (30%) and Google Scholar (20%) were most frequently used. The frequency of use was distributed as follows: 19% daily, 35% weekly, 17% monthly, 19% seldom, and 10% never. Poor internet connection (55%), no training (78%), and subscription fees (22%) were the obstacles. Logistic regression showed that awareness was significantly associated with professional role (OR = 2.1, 95% CI: 1.3-3.5) and department (OR= 1.8, 95% CI: 1.1-3.0).

Conclusion: Awareness of online resources among practitioners was high, with junior doctors demonstrating greater usage. However, the actual utilization was moderate. Systemic barriers including limited connectivity and inadequate training, were major impediments. Strengthening Institutional support and capacity-building initiatives could enhance the integration of OMRs into routine clinical practice.

Keywords: online resources, awareness, utilization, medical practitioners, Sudan

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Introduction:

Online medical resources (OMRs) such as Medscape and UpToDate play a vital role in supporting evidence-based medical practice by giving clinicians rapid and accurate access to current scientific evidence. They are significant in enhancing diagnostic accuracy, informing clinical decision-making, and keeping healthcare workers up-to-date with the latest advances in medicine and healthcare delivery.(1)

In high-income countries, OMRs are deeply integrated into medical education, hospital systems, and routine patient care. Their presence has enhanced the quality of clinical services by filling the information gaps, enabling continuous professional development, and refining standard evidence-based interventions.(2)

In low- and middle-income countries (LMICs), however, adoption and effective utilization of OMRs remain low. Barriers such as poor internet connections, high subscription costs, limited institutional access, and poor digital literacy among health professionals are considerable deterrents.(3-6) Organizational and cultural problems, such as insufficient institutional backing and low levels of

awareness about accessible databases, also contribute to underutilization. Research conducted in Ethiopia and Iran has shown the differential level of awareness and usage among physicians, nurses, and medical students, where usage patterns significantly depend on the availability of infrastructure, technical proficiency, and organizational policy. (6,7)

In the Sudanese context, no studies have been conducted on this topic, though an increasing number of hospitals and medical schools are becoming more aware of digital health tools.

However, no empirical data exist describing how Sudanese physicians view, access, and implement OMRs in everyday clinical work. To our knowledge, no study published to date has comprehensively assessed OMR awareness, utilization patterns, and barriers among healthcare workers in Sudan.

This study aims to assess the level of awareness, utilization patterns and perceived barriers concerning OMRs among medical practitioners at Port Sudan Teaching Hospital. It explores the predictors influencing OMR use and hence provides insights that could enhance digital resource adoption into practice in Sudan.

Materials and Methods:

Study Design and Area:

A descriptive cross-sectional survey design was conducted in July 2025 at the Port Sudan Teaching Hospital. The Hospital is one of the main tertiary hospitals in the eastern region of Sudan, located in the Red Sea State. It is an important location for studying such trends, considering its heterogeneous workforce and status as a centre of medical education.

Sample Design:

The study population included medical doctors (interns, medical officers, residents, and consultants) working in the hospital during the study period. All doctors actively engaged in clinical duties were eligible to participate. The sample size was calculated using the single population proportion formula (8)

$$n = N / (1 + N * d^2)$$

Where n is the sample size, N is the finite study population ($N=315$); d = margin of error ($d=0.05$). This yielded a required sample size of 176

The participants were selected using a convenience sampling technique, as the questionnaire was distributed electronically to all eligible medical doctors via hospital communication platforms (Google form), and participation was voluntary.

Data collection tools and procedures:

Data were initially collected using a structured questionnaire adapted by the study team from previously published tools. (6,7) To ensure content validity, the draft questionnaire was reviewed by two experts in medical education and clinical research. Their feedback was used to refine the wording, clarity, and relevance of the items before finalization.

The questionnaire was then pilot-tested among 20 healthcare professionals not included in the main study to assess clarity, comprehension, and estimated completion time. Necessary modifications were made before the final distribution. Data from the pretest were not included in the final analysis.

The questionnaire included four domains: (1) demographic information, (2) awareness of online medical resources, (3) utilization patterns, and (4) perceived barriers.

Duplicate-prevention measures included one-response-per-device restriction, IP-based response monitoring, and manual review for identical timestamps or demographic duplication, with measures in place to prevent duplicate responses.

The questionnaire remained open from 2 July to 27 July 2025. Participation was voluntary, and submission of a completed questionnaire

was considered as implied consent to participate.

Data analysis:

Data were analyzed using SPSS version 25. Descriptive statistics (frequencies and percentages) were used to summarize awareness and utilization patterns, perceptions, and perceived barriers. Associations between categorical variables were examined with the chi-square test.

Binary Logistic regression was applied to identify predictors of awareness and utilization of OMRs, Independent variables included gender, professional role, department, and

years of professional experience. Odds ratios (OR) with 95% confidence intervals (CI). Statistical significance was set at $p < 0.05$

Ethical approval:

Ethical approval was obtained from the Institutional Review Board (IRB) of Port Sudan Teaching Hospital, Reference Number: PSTH-IRB-2025-07-OMR-12. No personal identifiers were collected, and confidentiality was maintained throughout the study, based on voluntary participation and electronic informed consent.

Results:

A total of 174 medical doctors participated in the study with 99% response rate. The majority were female (64.6%), and most of the respondents were from the 20–30 years age group (70.3%). In terms of professional level, medical officers comprised more than half of the sample (51.7%). Representation by speciality was extensive, with the largest being from internal medicine (28.0%). As displayed in Table 1.

Table 1: Participants' Demographic Characteristics

Variable	Category	n (%)
Gender	Male	62 (35.6)
	Female	112 (64.4)
Age group	years 20 - 30	122 (70.3)
	years 31 - 40	39 (22.4)
	> 40 years	13 (7.3)
Professional role	Intern (House officer)	25 (14.4)
	Medical officer	90 (51.7)
	Resident (Registrar)	41 (23.6)
Speciality	Specialist/Consultant	18 (10.3)
	Internal medicine	49 (28.0)
	Surgery	33 (18.9)
	Pediatrics	27 (15.4)
	Obstetrics/Gyne.	27 (15.4)
	Emergency medicine	31 (17.7)
	Others	7 (4.0)

Awareness of online medical resources

Overall, 90% of respondents reported awareness of at least one OMR. Medscape was the most commonly recognized platform (70%), while DynaMed was the least known (6%). (figure 1)

The most frequently cited barrier was lack of training (78%), and the least was the reliability concerns (17%), as shown in Table 2.

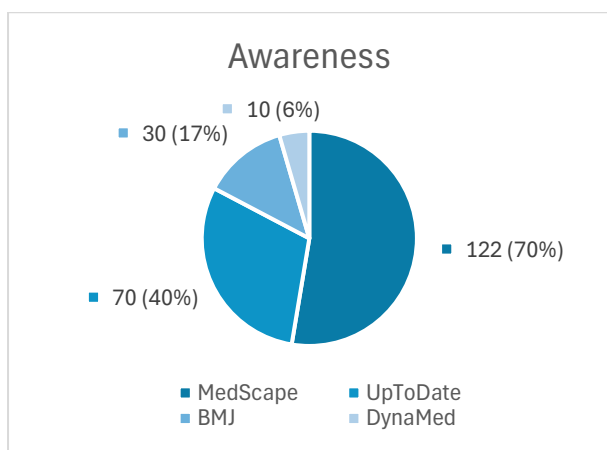


Figure 1: Awareness to Online Medical Resources

Table 2: Barriers to Utilization of Online Medical Resources

Variable	Category	n (%)
Barriers	Lack of training	136 (78.0)
	Poor internet access	96 (55.0)
	Subscription cost	38 (22.0)
	Reliability concerns	30 (17.0)
	Concern about clinical judgement*	40 (23.0)

*Clinical judgment: is defined in Methods/Results as the concern that reliance on OMRs might reduce physicians' independent reasoning.

Patterns of utilization

The frequency of OMRs use ranged between daily used accounting for (19%) and never used (9%).

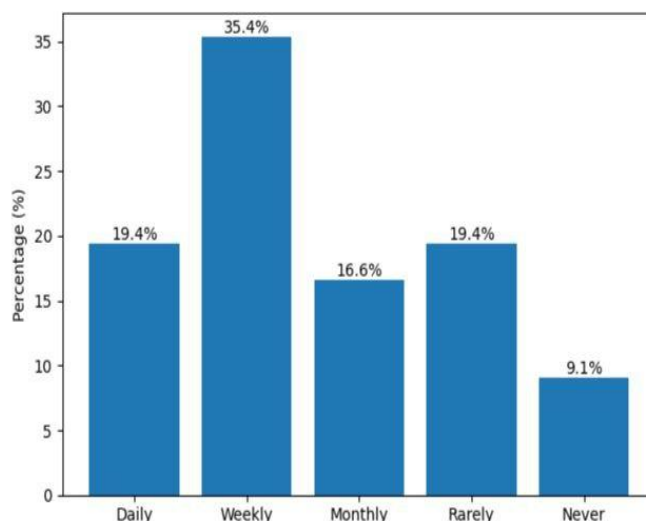


Figure 2: Frequency of Online Medical Resources Use (n=174)

Frequency of Use of Free-access websites

PubMed (30%), local clinical guidelines (23%), Google Scholar (20%), and WHO databases (19%). These were more commonly used than the subscription-based or paid databases.

Perceptions and Clinical Impact

There was a positive perception toward online medical resources in general among respondents, where 85% of them believed that OMRs provided quicker and easier access to information compared to textbooks.

Table 3 shows the clinical impact on OMRs as perceived by the respondents. improved diagnostic accuracy (65%), reduced clinical errors (54%), saved clinical time (51%), and improved patient outcomes (38%). Only a small minority (7%) was of the view that OMRs did not influence practice.

Table 3: Perceptions Toward Online Medical Resources

Perception	n (%)
Faster/easier than textbooks	148 (85.0)
Improve diagnostic accuracy	113 (65.0)
Reduce clinical errors	94 (54.0)
Save clinical time	89 (51.0)
Improve patient outcomes	66 (38.0)
No significant impact on practice	12 (7.0)

Predictors of use and awareness

Multivariable logistic regression analysis showed that professional role and clinical department were significantly associated with awareness of online medical resources.

Professional role was a significant predictor of awareness (OR = 2.1; 95% CI: 1.3–3.5), with higher awareness observed among non-consultant physicians compared with consultants P-value = 0,018. Departmental affiliation was also significantly associated with awareness (OR = 1.8; 95% CI: 1.1–3.0; p = 0.026) In contrast, gender (p = 0.585) and years of professional experience (p = 0.394) were not significantly associated with awareness of online medical resources.

Table 4: Multivariate Logistic Regression of Predictors of Awareness

Variable	OR	CI %95	p-value
Professional role	2.1	3.5 – 1.3	0.018
Department	1.8	3.0- 1.1	0.026
Gender	1.1	1.6 – 0.7	0.585
Years of experience	0.9	1.4 – 0.6	0.394

Discussion:

This study assessed the awareness and utilization of online medical resources (OMRs) among medical practitioners at Port Sudan Teaching Hospital. The findings indicate that overall awareness of OMRs was high (90%), with most respondents familiar with at least one platform. This aligns with previous research showing widespread awareness among healthcare providers around the world. (3-5)

Medscape and UpToDate were the most recognized tools, accounting for 70% and 40% respectively, while subscription-based platforms like DynaMed were less known. For example, Ethiopian physicians often use medical applications like UpToDate and Medscape for clinical decisions. Ref Awareness was greater among younger and junior doctors. This mirrors findings from studies in Canada, which reported higher online medical resource use among residents compared to senior consultants. (11) This may reflect differences in Digital literacy and the need for rapid access to evidence.

This study reflects a higher weekly frequency of use (35%) than daily (19%) and monthly (17%), showing moderate integration into clinical practice. Similar trends have been noted in resource-limited areas, where free-access databases like PubMed and Google Scholar are frequently used.(12) In contrast, Iranian studies showed moderate awareness but limited use due

to a lack of institutional support (6,7). These findings highlight that infrastructure and access significantly shape usage patterns.

Barriers identified in this study included poor internet connectivity (55%), lack of training (78%) and subscription costs (22%). These issues align with challenges found in other LMICs. Jahanshir et al. in Iran noted that the lack of formal training limited proper online medical resource use. (7) In Ecuador, Cherrez-Ojeda et al. identified additional barriers, such as legal risks and questions about content reliability.(10) These results indicate that barriers exist at various levels: structural, institutional, and individual, where systemic solutions are needed.

Overall, perceptions towards online medical resources were mostly positive. Eighty-five per cent of participants viewed them as faster and easier to access than textbooks. Many respondents attributed benefits like improved diagnostic accuracy, reduced errors, and time savings to their use. This aligns with studies in Canada and Ethiopia, which found that online resources boost clinician confidence and efficiency in decision-making. (6-13) However some respondents (23%) expressed concerns that frequent reliance on OMRs could compromise clinical judgment. This reflects a perceived conflict between relying on online tools and

maintaining professional reasoning. Previous studies have also warned against overreliance on unverified digital sources. (4)

In this study, professional role and department were significant predictors of awareness of online medical resources ($p = 0.018$ and $p < 0.05$, respectively), whereas gender and years of experience were not ($P = 0.585$ and $p > 0.05$).

These findings align with previous research published in *BMJ Open* (2022), which demonstrated that clinical settings and professional responsibilities strongly influence the adoption of digital tools (12). Notably, younger clinicians appeared more comfortable integrating online medical resources into their daily practice, suggesting that digital proficiency and role-specific expectations shape usage patterns.

Conclusion:

This study demonstrated that while awareness of online medical resources among doctors at Port Sudan Teaching Hospital was high, particularly among junior practitioners, the actual utilization of these tools remains suboptimal. Most respondents depended on freely available platforms such as PubMed and Google Scholar, with limited use of subscription-based resources due to barriers including poor internet connectivity, insufficient formal training, and the high cost of subscriptions.

Despite these limitations, participants expressed positive perceptions toward online resources, recognizing their value in improving diagnostic accuracy, reducing clinical errors and enhancing efficiency. Addressing systemic challenges through strengthened internet infrastructure, targeted capacity-building programs, and subsidized or institutional access to high-quality subscription resources may substantially enhance effective utilization.

Future research should assess the impact of improved access and training on clinical decision-making and patient outcomes. Furthermore, research is needed to explore strategies to promote greater adoption of digital evidence-based tools among senior clinicians.

Study Limitations:

This study has several limitations, namely, the use of a convenience sampling technique may limit the generalizability of the findings beyond the study population. The reliance on self-reported data introduces the possibility of recall and social desirability bias. In addition, the single-centre design restricts the applicability of results to other healthcare settings in Sudan. Finally, the cross-sectional nature of the study limits causal interpretation of the observed associations

Conflict of Interest:

The authors declare no conflict of interest.

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