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Abstract

Background: Despite Ethiopia's keen interest in adopting Electronic Medical Record (EMR) systems, the acceptance rate remains low, primarily due to health professionals' attitudes towards new technology. Understanding the factors influencing these attitudes is crucial for successful EMR implementation. This study aimed to evaluate health professionals' attitudes and associated factors towards EMR implementation in Ethiopian hospitals in 2023.

Objective: To assess the attitudes of health professionals towards the implementation of Electronic Medical Record (EMR) systems in Ethiopian hospitals and identify the factors associated with their attitudes.

Methods: Multicenter cross-sectional study was conducted in piloted hospitals in Ethiopia from April 30 to May 15, 2023. A systematic random sampling technique was used to select 397 participants from the three selected hospitals. Data were collected through a self-administered questionnaire, cleaned, coded, inputted into EpiData software (version 4.6), and analyzed using SPSS version 25. Binary logistic regression analysis was performed, with a significance level of $p < 0.05$ and adjusted odds ratios with 95% confidence intervals used to identify associated factors.

Results: A total of 382 health professionals participated, yielding a response rate of 96.2%. Among the respondents, 184(48.2%) had a favorable attitude towards the implementation of the EMR system. In multivariate analysis, factors significantly associated with attitude included age ? 29 years (Adjusted Odds Ratios (AOR): 3.05; 95% CI: 1.58, 5.9), computer literacy (AOR: 2.66; 95% CI: 1.16-6.09), training on the EMR system (AOR: 2.87; 95% CI: 1.80-4.56)) and health professionals' knowledge of EMR (AOR: 1.8; 95% CI: 1.10-2.96).

Conclusions: Nearly half of the respondents displayed low attitudes towards EMR implementation. Age, knowledge, computer literacy, and training access were significantly associated with attitudes towards the EMR systems. Enhancing health professionals' attitudes and integrating tailored training within the healthcare system are crucial for advancing EMR utilization.

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*Conclusions and recommendations***:** Nearly half of the respondents displayed low attitudes towards EMR implementation. Age, knowledge, computer literacy, and training access were significantly associated with attitudes towards the EMR systems. Enhancing health professionals' attitudes and integrating tailored training within the healthcare system are crucial for advancing EMR utilization.

Keywords: Health Professionals**,** Electronic Medical Record, EMR Implementation, Attitude, Developing Countries, Ethiopia.

INTRODUCTION

Electronic medical records (EMR) represent a significant advancement beyond traditional paper-based records, offering enhanced coordination and communication among healthcare departments and professionals, ultimately improving the quality of patient care (1). In contemporary healthcare

settings, EMR systems function as central platforms for inter-professional communication and care facilitation, aligning with governmental mandates for secure collection, storage, and accessibility of patient health information (2,3).

Despite the global optimism surrounding Electronic Medical Record (EMR) systems, their adoption remains limited, especially in resource-constrained regions with high disease burdens (4). Studies consistently highlight health professionals' negative attitudes as a primary barrier to EMR adoption in developing countries (5,6,7,8). Challenges such as high acquisition and maintenance costs, lack of financial incentives, limited Internet and electrical infrastructure, and insufficient computer skills hinder Electronic Health Record (EHR) uptake in sub-Saharan Africa (9,10).

Many hospitals struggle to implement EHR systems for real-time clinical data entry despite efforts to introduce computerized patient healthcare information systems (11). The Ethiopian Ministry of Health (MOH) has been working on the development and cascading of health information systems and digital health-related national documents including the Information Revolution Roadmap II (2020-2029), the Information Revolution Strategic Plan (2018 -2025) and the ICT Policy and Digital Health Strategy (2020-24) (12). Although digitalizing the health care system is a key priority of the World Health Organization (WHO) and the Ethiopian Ministry of Health (MOH), still there are many challenges towards the implementation of EMR (1, 4, 13). Lack of funding, capacity, infrastructure issues, legal considerations, resistance to computer technology, computer system literacy, privacy, and confidentiality were the most common barriers to the implementation of EMR in Ethiopia. However, a significant challenge lies in the resistance to change exhibited by many healthcare professionals. This resistance, often rooted in inadequate knowledge and negative attitudes towards EMR systems, hinders widespread adoption and requires further investigation. (12).

Therefore, this study investigated the attitudes of health professionals in Ethiopia towards Electronic Medical Record (EMR) implementation in 2023, along with factors influencing those attitudes. The findings will be of significant value to healthcare professionals, health institutions, policymakers, EMR software developers, researchers, and the broader community.

METHODS AND MATERIALS

Study Design, Setting, and Duration: A multicenter cross-sectional study was undertaken to evaluate attitudes and associated factors related to Electronic Medical Record (EMR) implementation among health professionals in EMR-equipped hospitals in Ethiopia. The study was conducted in three

selected government hospitals actively utilizing fully integrated EMR systems: Hakim Gizawu Hospital located in Debire Berhan town, North Shoa, Amhara region; Yekatit 12 Hospital Medical College, and Tirunesh Bejing General Hospital both situated in Addis Ababa. The data collection period spanned from April 1 to April 30, 2023. These hospitals were chosen due to their status as the sole government healthcare facilities with comprehensive EMR implementation.

Study Population, Sample Size and Sampling Methodology: The study population included health professionals from the three hospitals (Table 1). A systematic random sampling approach was utilized to select participants meeting the inclusion criterion of work experience exceeding 6 months, while individuals on maternal leave, annual leave, sick leave, and those providing voluntary services were excluded. The sample size was determined using the single population proportion formula with a 95% confidence level (Zα/2=1.96), margin of error of 5% (d = 0.05), a prevalence rate (P) of 56.1% derived from a prior study (13), and accounting for a 5% non-response rate. Consequently, the final sample size consisted of 397 health professionals.

Table 1. Participating Hospitals, Study Population, and Sample Size

S.N.*	Name of Hospital	Total # of Staff	Percentage	Sample Size
1	Yekatit 12 hospital Medical College	1265	56%	221
2	Tirunesh Bejing Hospital	611	27%	108
3	DebreBirhan University, Hakim Gizaw Hospital	380	17%	68
	Total	**2,256**	**100%**	**397**

***S.N.** = Serial Number

The total sample size of 397 was proportionally allocated to the three hospitals based on their total number of health professionals (Table 1). Study participants were then selected using systematic random sampling from each profession based on the calculated proportion to ensure that each hospital was represented in the study according to its size.

Data Collection Instrument and Quality Assurance: A pretested, structured, and self-administered questionnaire was utilized following the acquisition of consent from study participants. The questionnaire was developed based on standard templates derived from a review of published articles (14, 15, 16, 17, 18, 19) to ensure it captured key constructs. Most of the questions were multiple choice questions and Likert scale questions were also used to measure attitude. Seven data collectors participated in the study. Thes included five General Practitioners (GPS) and two Master of Public

Health (MPH) graduates with experience in research methods and patient surveys. Two trained GP supervisors monitored the data collection process. The supervisors employed the following measures to ensure data quality: Daily cross-checking of a random sample of completed questionnaires by data collectors for completeness and accuracy; Addressing any issues or inconsistencies identified during cross-checking with the data collectors. All data collectors received a two-hour training session covering: The study objectives and rationale; the content and format of the questionnaire; techniques for providing clear and consistent explanations to participants; and maintaining participant privacy and confidentiality. The tool was prepared and distributed in English.

Data Processing and Analysis: The collected data underwent meticulous cleaning, coding, and entry into EpiData software (version 4.6) to enhance data quality and minimize errors during entry. Subsequently, the entered data were exported to SPSS (version 25) for further cleaning and analysis. To identify the determinant factors, we initially conducted a chi-square test for each independent variable. Variables that demonstrated statistical significance (P-value < 0.05) in the chi-square test were subjected to bivariable analysis. Variables with a significance level of P < 0.25 during bivariable analysis were considered candidates for multivariable analysis, while those with a significance level of P < 0.05 were deemed final determinants of the dependent variables (P < 0.05). The degree of association between dependent and independent variables was assessed using Adjusted Odds Ratios (AOR) with a 95% Confidence Interval (CI). Model fitness was evaluated using the Hosmer-Lemeshow goodness -of- fit test, with a p-value above 0.05 (0.80) indicating a well-fitting model. The assumption of independence was also verified at the facility level using the intraclass correlation coefficient (ICC), which was found to be below 10% (0.5%), fulfilling the independence criterion. Finally, the results were presented in the tables and figures for clarity and ease of interpretation.

Dependent and Independent Variables

Dependent Variable: Attitude towards EMR

Independent Variables: Age, Computer literacy, Knowledge of EMR systems, Refreshment training on EMR, EMR functionality interruptions, adequate computer access, Management support for EMR use and Presence of ICT center.

Operational Definition of Terms:

*Level of knowledge***:** This refers to the understanding level of health professionals regarding Electronic Medical Records (EMR) and its benefits. Knowledge level on EMR was categorized into two groups:

Good knowledge: Participants who answered at or above the mean score from 12 Yes/No type questions related to EMR were classified as knowledgeable.

Poor knowledge: Participants whose responses fell below the mean score from the knowledge-related questions were categorized as having poor knowledge.

*Attitude***:** This denotes the intention of participants towards EMR implementation. Attitude towards EMR implementation was assessed using 18 questions and was divided into two levels:

Favorable attitude: Participants who scored above the median were labeled as having a favorable attitude.

Unfavorable attitude: Participants who scored below the median were labeled as having an unfavorable attitude.

Computer literacy: Respondents who were capable of basic Microsoft office applications (MS Word, PowerPoint, Excel, and Internet services) were considered to have computer literacy.

EMR training: This refers to refreshment training provided to health professionals for one day at least twice per year.

Management support: Management support is indicated by the presence of an EMR committee that conducts regular monitoring and evaluation and takes immediate action whenever problems arise.

*Electric power interruption***:** This occurs if there is at least one electric power interruption per day.

RESULTS

Socio-Demographic Characteristics of Study Participants

A total of 382 professionals participated in the study, with a response rate of 96.2%. The majority (61.8%) of respondents were male. The mean age was 30.04 (±4.43 SD) years. Nearly two-thirds of the participants (64.4%) had less than 6 years of work experience, and 69.6% were Bachelor of Science (BSC) holders. A high proportion of study participants (88.7%) demonstrated computer literacy, while nearly a third (29.6%) reported experience working in private hospitals (Table 2).

Table 2. Socio-Demographic Characteristics of the Study Participants in EMR-Implementing Hospitals, Ethiopia, 2023 (n = 382).			
Name of variable	**Category**	**Frequency**	**Percent**
Sex	Male	236	61.8
	Female	146	38.2
Marital status	Single	207	54.2
	Married	175	45.8
Type of professional	Nurse/Midwife	144	37.7
	Pharmacy	36	9.4
	Laboratory	30	7.9
	General practitioner	67	17.5
	Advanced practitioners	44	11.5
	Radiology	15	3.9
	Anesthesia	32	8.4
	Others	14	3.7
Work experience	<6 year	246	64.4
	>=6 year	136	35.6
Educational status	Diploma	9	2.4
	BSc	266	69.6
	MPH/MSc	63	16.5
	Advanced Practitioners	44	11.5
Computer literacy	Yes	339	88.7
	No	43	11.3
Employment part time in private sector	Yes	113	29.6
	No	269	70.4

Knowledge towards EMR

Among study participants, approximately two-thirds (65.7%) demonstrated good knowledge of EMR (Figure 1). Notably, most respondents were aware of the diverse functions of EMR including handling patient data, reviewing patient problems, obtaining test results, enabling private ward access, facilitating local network operations, and updating patient information. Furthermore, about three-quarters of the participants were knowledgeable about EMR functionalities such as laboratory order requests and, prescription capabilities, and the presence of disease codes and data backup systems (Table 3).

Table 3: Health Professionals' Knowledge of Electronic Medical Records (EMR), in EMR- Implementing Hospitals, Ethiopia, 2023					
S.N*	**Knowledge Parameters (n = 382) Capabilities of the EMR**	**Yes**		**No**	
		N	**%**	**N**	**%**

	system include				
1.	**Review patient medical history**	364	95.3	18	4.7
2.	**Track patient lab results**	359	94.0	23	6.0
3.	**Document patient care**	343	89.8	39	10.2
4.	**Order lab tests**	292	76.4	90	23.6
5.	**Generate patient reports**	339	88.7	43	11.3
6.	**Prescribe medications**	268	70.2	114	29.8
7.	**Utilize diagnosis codes**	280	73.3	102	26.7
8.	**Access patient test results**	327	85.6	55	14.4
9.	**Maintain data backups**	280	73.3	102	26.7
10.	**Secure patient data**	322	84.3	60	15.7
11.	**Integrate with local network**	330	86.4	52	13.6
12.	**Support clinical decision-making**	289	75.7	93	24.3

***S.N.** = Serial Number

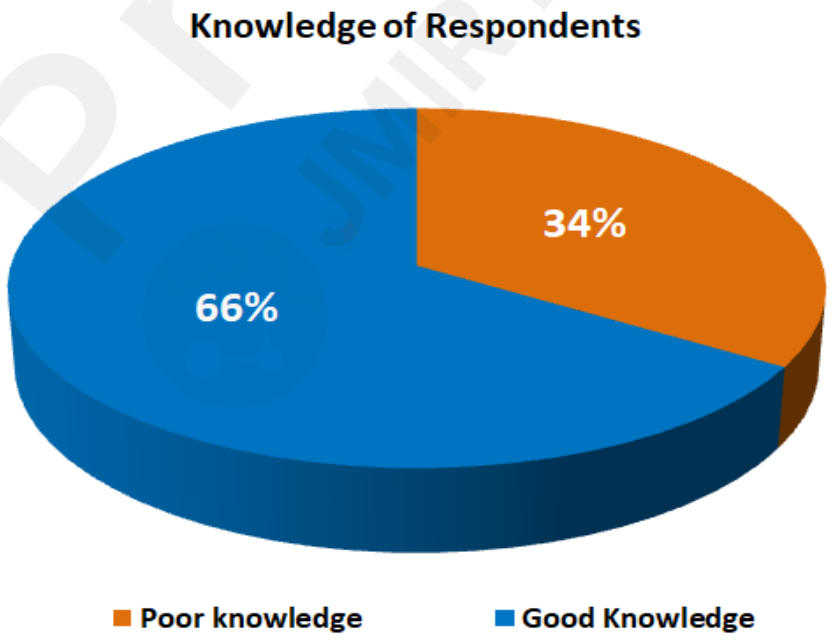


***Figure** 1. Self-Reported knowledge of Health Professionals about Electronic Medical Records (EMR) in EMR-implementing Hospitals, Ethiopia, 2023*

Attitude towards EMR

Among the 382 study participants, 184(48.2%) demonstrated a favorable attitude towards the implementation of EMR (Figure 2). The study participants expressed strong agreement several benefits of EMR, including cost-saving potential (30.6%), ease of data entry (26%), facilitation of timely decisions (24.3%), acknowledgement of the need for training (43.5%), reduction of medical errors (26.2%), enhancement of productivity (27.7%), and suitability for audit trials (28.8%). Additionally, approximately 40.8% strongly agreed and 39.5% agreed to encourage other hospitals to implement EMR (Table 4).

Table 4: Attitudes of Health Professionals towards Use of EMR, in EMR-Implementing Hospitals, Ethiopia, 2023

S.N	Perceived EMR Benefit	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
		N	%	N	%	N	%	N	%	N	%
1.	**Easy to enter data**	23	6.0	28	7.3	47	12.3	185	48.4	99	25.9
2.	**Saves cost**	16	4.2	19	5.0	46	12.0	184	48.2	117	30.6
3.	**Saves time**	21	5.5	46	12.0	42	11.0	161	42.1	112	29.3
4.	**Improves patient satisfaction**	20	5.2	41	10.7	89	23.3	152	39.8	80	20.9
5.	**Improves timeliness of clinical decisions**	16	4.2	35	9.2	70	18.3	168	44.0	93	24.3
6.	**Provides easy access to patient information**	15	3.9	20	5.2	39	10.2	191	50.0	117	30.6
7.	**Requires training**	21	5.5	19	5.0	33	8.6	143	37.4	166	43.5
8.	**Reduces the risk of medical errors**	18	4.7	32	8.4	89	23.3	143	37.4	100	26.2
9.	**Benefits the healthcare facility**	14	3.7	18	4.7	38	9.9	186	48.7	126	33.0
10.	**Eliminates need for physical storage**	19	5.0	25	6.5	69	18.1	155	40.6	114	29.8
11.	**Increases productivity**	17	4.5	23	6.0	66	17.3	170	44.5	106	27.7
12.	**Reduces workload**	23	6.0	60	15.7	62	16.2	151	39.5	86	22.5
13.	**Ensures data security**	20	5.2	22	5.8	47	12.3	190	49.7	103	27.0
14.	**Maintains data backup**	25	6.5	47	12.3	72	18.8	154	40.3	84	22.0
15.	**Offers a consistent user interface**	17	4.5	31	8.1	86	22.5	160	41.9	88	23.0
16.	**Enhances audit trial functionality**	11	2.9	26	6.8	55	14.4	180	47.1	110	28.8
17.	**Encourage other hospital to use EMR**	14	3.7	20	5.2	41	10.7	151	39.5	156	40.8

***S.N.** = Serial Number

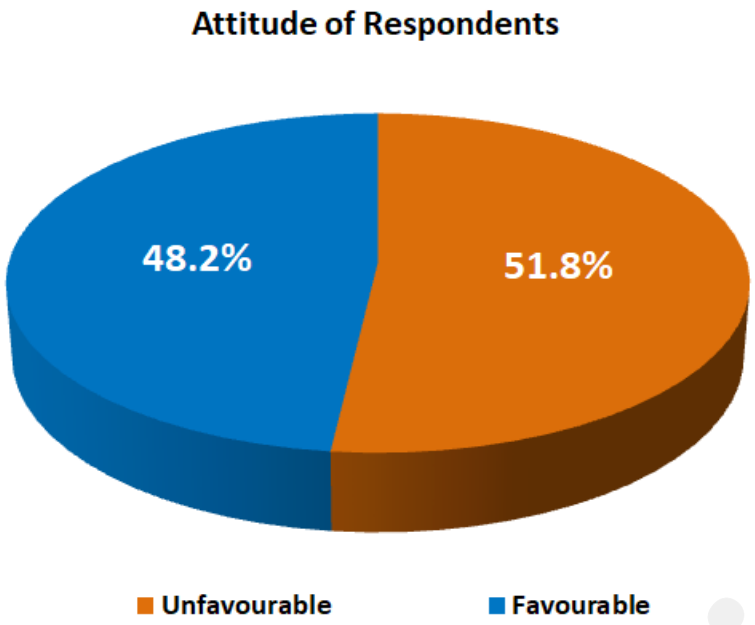


***Figure 2**: Self-reported Attitudes of Health Professionals towards EMR in EMR-Implementing Ethiopian Hospitals, 2023.*

Technology and Organizational Readiness

Most of the respondents reported the fulfillment of certain organizational factors: 73.0% mentioned the assignment of an EMR focal person and duty person; 77.7% believed that management supports EMR implementation; and 86.4% witnessed the presence of an ICT (Information and Communication Technology) center. However, less than half of respondents received refreshment training on EMR (48.2%); only 38% perceived adequate computer access for EMR, and 39.8% responded that they had regular meetings (Table 5).

Table 5. Technology and Organizational Readiness of Health Professionals in EMR- Implementing Ethiopian Hospitals, 2023

S.N*	Variable	Yes		No	
		N	%	N	%
1.	**EMR Refresher Training**	184	48.2	198	51.8
2.	**Experienced Interruption in**	287	75.1	95	24.9
3.	**Adequate computer access**	145	38.0	237	62.0
4.	**Assigned EMR focal person**	279	73.0	103	27.0
5.	**Management support for**	297	77.7	85	22.3
6.	**Presence of EMR manual**	187	49.0	195	51.0
7.	**Hospital has Standby**	269	70.4	113	29.6
8.	**Regular meeting on EMR**	152	39.8	230	60.2
9.	**Assigned EMR Duty Person**	279	73.0	103	27.0

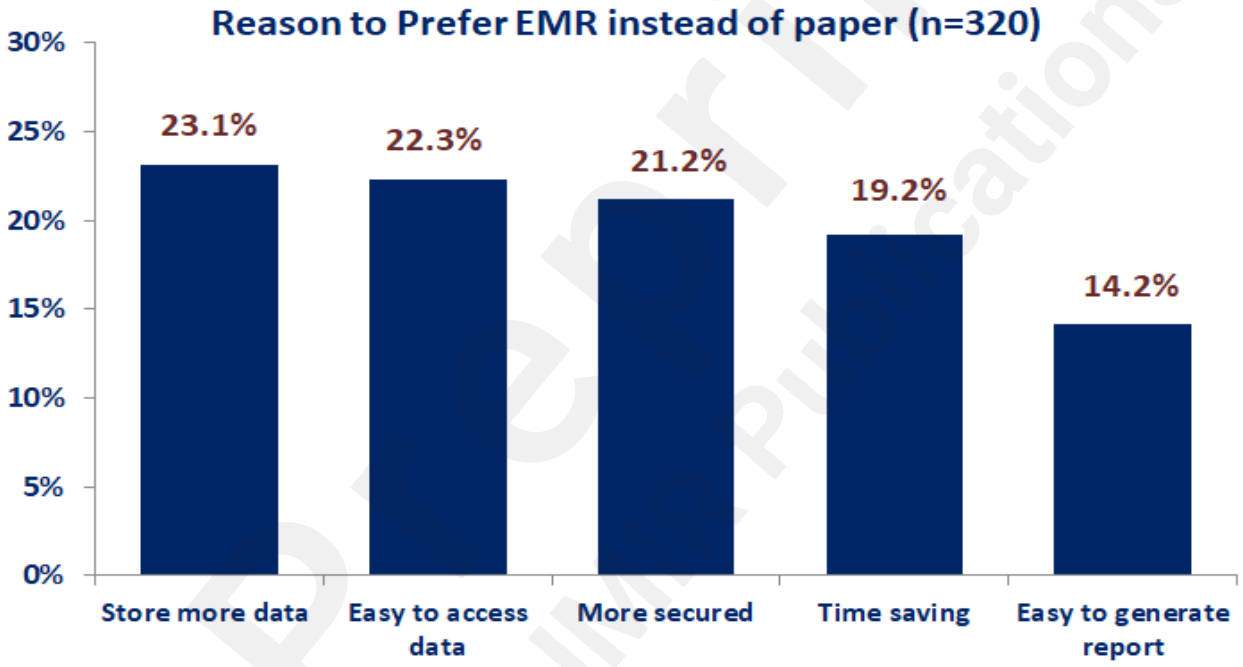
10.	**Hospital has ICT Center**	330	86.4	52	13.6

***S.N.** = Serial Number

Advantages of EMR Systems

The study revealed a strong preference for Electronic Medical Records (EMR) over paper-based systems among participants. A significant majority (83.8%, n=320) reported finding EMR systems advantageous for several reasons (Figure 3). These advantages included:

- Time savings (19.2%)
- Increased data storage capacity (23.1%)
- Easier access to patient information (22.3%)
- Simplified report writing (14.2%)
- Enhanced data security (21.2%)

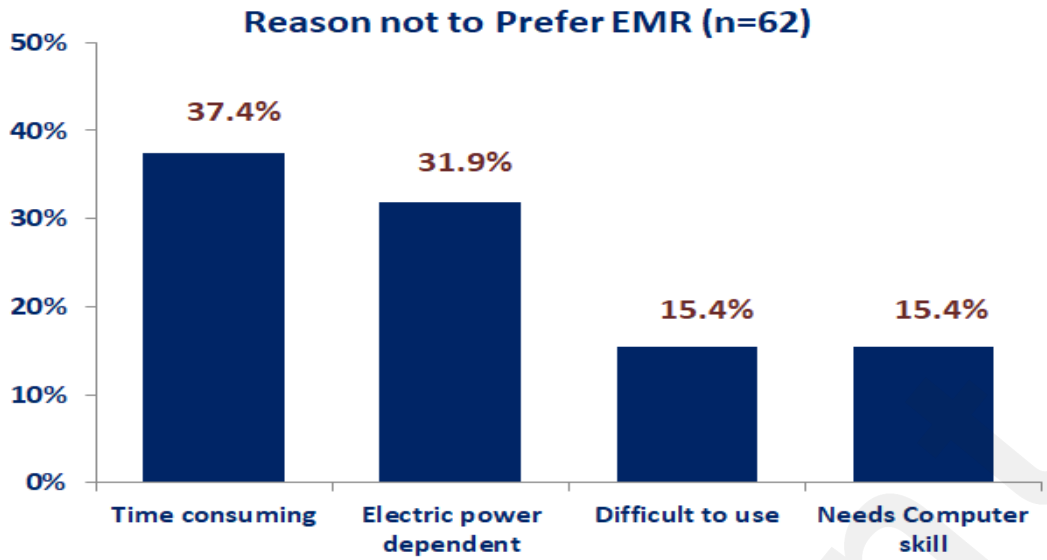


N.B: Participants could select more than one option.

***Figure 3**: Self-reported Reasons for Limited Preference for EMR Systems over Paper Documentation Among Health Professionals in EMR-Implementing Ethiopian Hospitals, 2023.*

Barriers to EMR Adoption

While most participants favored EMR, some reported challenges. Figure 4 highlights the reasons why a minority of participants expressed reservations about EMR use. The main concerns was the time required for data entry (mentioned as a reason by some who did not prefer EMR).



N.B: Participants could select more than one option**.**

Figure 4*: Self-reported Reasons for Health Professional's Preference for Paper-Based Documentation over EMR Systems in EMR- Implementing Ethiopian Hospitals, 2023*

Factors Associated with Health Professionals' Attitudes towards EMR Systems

In this study, all independent variables underwent initial computation using the chi-square test, and variables with a P-value ≤ 0.05 were selected for bivariate analysis. Among these, variables with a P-value of ≤ 0.25 were considered for multivariate analysis Following adjustment for other variables, the multi variable logistic regression analysis revealed that respondents aged ≤ 29 years were three times more likely to exhibit positive attitudes towards EMR implementation compared to those aged ≥ 35 years (AOR: -3.05; 95% CI: -1.58, 5.9). Furthermore, individuals who received EMR training were 2.8 times more inclined to have a favorable attitude towards EMR implementation than those without training (AOR: -2.87; 95% CI: -1.80-4.56). Health professionals with computer literacy displayed a 2.7 times higher likelihood of holding positive attitudes towards EMR implementation compared to those without computer skills (AOR: 2.66; 95% CI: 1.16-6.09), while those with good knowledge of EMR were 1.8 times more likely to have a favorable attitude towards EMR than those with poor knowledge (AOR: 1.8; 95% CI: 1.10-2.96) (Table 6).

Table 6: Factors Associated with Health Professionals' Attitudes towards EMR at Three EMR-Implementing Ethiopian Hospitals, 2023 (n = 382).

Variable	Response Type	Attitude of EMR		COR 95%CI	AOR 95%CI	P-Value
		Positive	Negative			
Age of the	<=29	73	107	2.37(*1.34-4.20*)	3.05(*1.58-5.9*)*	.001
	30-34	69	65	1.52(*0.84-2.76*)	1.79(*0.92-3.48*)	.09

respondent	>=35	42	26	1	1	
Computer literacy	Yes	174	165	3.48(*1.66-7.29*)	2.66(*1.16-6.09*)*	.02
	No	10	33	1	1	
Working in private sector	Yes	66	47	1.80(*1.15-2.80*)	1.00(*0.60-1.69*)	.99
	No	118	151	1	1	
Knowledge of EMR systems	Poor	47	84	1	1	
	Good	137	114	2.15(*1.39-3.32*)	1.80(*1.10-2.96*)	.02
Refreshment training on EMR	Yes	116	68	3.26(*2.15-4.96*)	2.87(*1.80-4.56*)**	.00
	No	68	130	1	1	
EMR functionality interruptions	Yes	148	139	1.75(*1.09-2.80*)	1.43(*0.84-2.46*)	.19
	No	36	59	1	1	
Adequate computer access	Yes	82	63	1.72(*1.14-2.61*)	..91(*0.55-1.49*)	.70
	No	102	135	1	1	
Management support for EMR use	Yes	157	140	2.41(*1.45-4.01*)	1.47(*0.81-2.64*)	.20
	No	27	58	1	1	
Presence of ICT center	Yes	166	164	1.91(*1.04-3.52*)	1.26(*0.64-2.49*)	.50
	No	18	34	1	1	

∗∗P < 0.001, ∗P ≥ 0.001.

DISCUSSION

This study investigated health professionals' attitudes towards Electronic Medical Record (EMR) systems in Ethiopian hospitals, alongside factors influencing their use. While nearly half of respondents (48.2%) (CI: .431-.532) expressed favorable attitudes, this is lower than findings from studies conducted in developed countries like the USA (97%) (20), and other developing countries like Saudi (70%) (21), and South Africa (67.2%) (22). This disparity might be attributed to differences in resource availability. Health professionals in high-income countries likely have greater access to computers and experience using technology in their daily routines. This familiarity could lead to a better understanding of EMR systems' potential benefits for healthcare delivery. This study's findings on attitude also differed from previous research within Ethiopia. Studies in Northern Ethiopia (50.6%) [16], St. Paulos Hospital (52.1%) [18], Amhara region hospitals (58.3%) [14], and Eastern Ethiopia (72.8%) [15] reported higher favorability towards EMRs. A possible explanation might be that the current study participants were from hospitals with full EMR implementation, whereas prior studies included facilities with partial or no EMR use. Our study identified factors associated with positive attitudes towards EMR systems among health professionals in Ethiopia. Thes included being younger than 30 years old, having computer literacy, receiving EMR training, and possessing good knowledge of EMR systems. This aligns with findings is supported by studies

from other studies in in Sub-Sahara Africa (9), Eastern Ethiopia (15), and Northern Ethiopia (23). However, a broader perspective emerges when considering research from developed countries like Canada where physician attitudes were influenced by a wider range of factors (24). These factors included user satisfaction, access to training resources, the ability to provide collaborative care, financial incentives, and government policies that promoted the value of EMR systems for healthcare professionals. This suggests that in contexts with high baseline computer literacy, other considerations become more prominent. The potential benefits and drawbacks of EMR systems are also well-documented. While some studies highlight improved efficiency and effectiveness (25, 23, 26), others raise concerns about increased workload, time demands, and the need for strong computer skills (20, 27). Our findings support this ongoing debate by identifying both positive motivators and potential challenges associated with EMR implementation.

Our study identified several factors not significantly associated with health professionals' attitudes towards EMR systems in Ethiopia. These included work experience, educational level, profession type, management support, computer access, presence of EMR manuals, ICT centers, and dedicated EMR personnel.

However, other studies have reported associations between these variables and attitudes. For example, research in Sub-Saharan Africa highlighted the impact of poor network infrastructure, high costs, and maintenance challenges (28). Similarly, studies in Dire Dawa (25), the Amhara region (14), and St. Paulos/Ayder hospitals (25) identified factors like limited work experience, infrequent EMR meetings, lack of management commitment, and poor network connectivity as influencing attitudes. These discrepancies might be attributed to variations in management focus, commitment levels, and budgetary resources among healthcare institutions.

Finally, we would like to acknowledge the limitations of our study. We have a small sample size of respondents from major hospitals in urban settings restricting the generalizability of our findings in the larger population of health professionals in Ethiopia. Furthermore, the cross-sectional design of our study is a snapshot in time and cannot establish cause-and-effect relationships. The specific

survey instruments used may not adequately capture all the nuances of health professionals' attitudes towards EMR systems. It is therefore possible that other factors not measured in the study influenced attitudes. Lastly, there may be time-bound limitations to this study as technology and healthcare practices evolve rapidly, and therefore the study's findings may not be relevant in the long term.

CONCLUSIONS

In this study, nearly half of the respondents had low attitudes towards the implementation of EMR. Variables related to socio-demographic (health professionals' age), personal (health professionals' knowledge of EMR), technology-related (health professionals' computer literacy), and organization-related (health professionals' EMR training) factors were significantly associated with health professionals' attitudes towards the EMR system.

RECOMMENDATIONS

Based on the findings of this study, it is important to focus on the gaps identified to implement EMR systems efficiently and effectively in all Ethiopian hospitals. Enhancing health professionals' attitudes and contextualizing EMR training in the health care system are highly recommended for scaling up EMR use. For **future researchers** interested in EMR-related research in Ethiopia**,** employing mixed methods (quantitative and qualitative) could be highly beneficial.

Abbreviations

AOR	Adjusted odds ratio
CI	Confidence interval
COR	Crude odds ratio
EHR	Electronic Health Record
EMR	Electronic Medical Record
HIS	Health Information System
HMIS	Health Management Information System
ICC	Intra class Correlation Coefficient
ICT	Information Communication Technology
MOH	Ministry of Health
SPSS	Statistical Package for Social Science
SRS	Systematic Random Sampling
USA	United States of America
WHO	World Health Organization

Ethical Approval and Consent to Participate

Ethical approval was obtained from the Ethical Clearance Review Board of the Asrat Woldeyes Health Science Campus, Debre Berhan University (Protocol number IRB 01/125/2015), in accordance with the Helsinki Declaration guidelines and regulations, and permission was obtained from the hospital. Informed consent was obtained from all health professionals who participated in this study. All necessary data were collected and registered based on the unique codes of the study participants who were de-identified throughout the study. Hence, all the information was kept confidential. Participants were also informed that they would have the right to withdraw from the study at any time.

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Competing Interest: The authors declare that they have no competing interest.

Author’s contribution

Molawork Ayele: contributed to conception, design, data collection, analysis, report writing, and manuscript writing. Zaki A. Sherif substantially edited and rewrote the final manuscript.

All other authors (Akine Eshete, Tadesse Mamo, Besufekad Mulugeta, Mohammed Awol, Girma Deshimo, Asimamaw Abera, Alemu Basazin Mingude, Deneke Ayele, Zenebe Abebe, Hajira Mohammed and Alemu Kibret) have substantial contribution in the conception and design as well as revising of the manuscript. All authors read and approved the final manuscript and its submission for publication.

REFERENCES

1. WHO. Electronic health records: manual for developing countries: WHO Regional Office for the Western Pacific; 2006.

2. Boshnak H, Gaber SA, Abdo A, Yehia EJIJoCA. Guidelines to Overcome the Electronic Health Records Barriers in Developing Countries.975:8887.

3. MOH. Standard For Electronic Health Record System EHR in Ethiopia. 2021.

4. WHO. National eHealth strategy toolkit: International Telecommunication Union; 2012.

5. WHO. Management of patient information: trends and challenges in Member States: based on the findings of the second global survey on eHealth. 2012.

6. Berihun B, Atnafu DD, Sitotaw GJBri. Willingness to use electronic medical record (EMR) system in healthcare facilities of Bahir Dar City, Northwest Ethiopia. 2020;2020.

7. Oumer A. Utilization of Electronic Medical Record and Associated Factors Among Health Professionals in Public Health Facilities With Service Delivery, Eastern Ethiopia. 2020.

8. Yilma TM, Tilahun B, Mamuye A, Kerie H, Nurhussien F, Zemen E, et al. Organizational and health professional readiness for the implementation of electronic medical record system: an implication for the current EMR implementation in northwest Ethiopia. 2023;30(1).

9. Odekunle FF, Odekunle RO, Shankar SJIjohs. Why sub-Saharan Africa lags in electronic health record adoption and possible strategies to increase its adoption in this region. 2017;11(4):59.

10. Odekunle FF, Srinivasan S, Odekunle ROJJoHIiA. Why Sub-Saharan Africa lags in electronic health record (EHR) adoption and possible strategies to increase EHR adoption in this region. 2018;5(1):8-15.

11. Ohuabunwa EC, Sun J, Jubanyik KJ, Wallis LAJAJoEM. Electronic Medical Records in low to middle income countries: The case of Khayelitsha Hospital, South Africa. 2016;6(1):38-43.

12. MOH. Electronic Medical Recording Software Requirements Analysis. 2021.

13. MOH. Digital health blueprint. 2021.

14. Kalayou MH, Endehabtu BF, Guadie HA, Abebaw Z, Dessie K, Awol SM, et al. Physicians' Attitude towards Electronic Medical Record Systems: An Input for Future Implementers. 2021;2021.

15. Meinert DBJISIJoaET. Resistance to Electronic Medical Records(EMRs): A Barrier to Improved Quality of Care. 2005;2:493-504.

16. Alzobaidi H, Zolaly E, Sadeq B, Alghamdi A, Ahmed EJIJMSPH. Attitudes toward implementing electronic medical record among Saudi physicians. 2016;5(6):1244.

17. Yehualashet G, Asemahagn M, Tilahun BJJoHIiA. The attitude towards and use of electronic medical record system by health professionals at a referral hospital in northern Ethiopia: Cross-sectional study. 2015;3(1).

18. Akwaowo CD, Sabi HM, Ekpenyong N, Isiguzo CM, Andem NF, Maduka O, et al. Adoption of electronic medical records in developing countries—A multi-state study of the Nigerian healthcare system. 2022;4:239.

19. Hana Alharthi P, Adel Youssef, PhD *, Salma Radwan, BS,, Sukainah Al-Muallim BaA-TZ, BS. Physician satisfaction with electronic medical records in a major Saudi Government hospital. 2014.

20. Awol SM, Birhanu AY, Mekonnen ZA, Gashu KD, Shiferaw AM, Endehabtu BF, et al. Health professionals' readiness and its associated factors to implement electronic medical record system in four selected primary hospitals in Ethiopia. 2020:147-54.

21. Biruk S, Yilma T, Andualem M, Tilahun BJBmi, making d. Health Professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: a cross sectional study. 2014;14(1):1-8.

22. Tolera A, Oljira L, Dingeta T, Abera A, Roba HSJFiDH. Electronic medical record use and associated factors among healthcare professionals at public health facilities in Dire Dawa, eastern Ethiopia: A mixed-method study. 2022;4.

23. Bisrat A, Minda D, Assamnew B, Abebe B, Abegaz TJBmi, making d. Implementation challenges and perception of care providers on Electronic Medical Records at St. Paul's and Ayder Hospitals, Ethiopia. 2021;21(1):1-12.

24. Mulugeta B, Kasahun. Physicians' Attitude towards Electronic Medical Record Systems: An Input for Future Implementers. 2021.

25. Oumer A, Muhye A, Dagne I, Ishak N, Ale A, Bekele AJBri. Utilization, determinants, and prospects of electronic medical records in Ethiopia. 2021;2021:1-11.

26. Rana Melisa Jm. Factors afecting the mature use of electronic medical records by primary care physicians: a systematic revie. 2021.

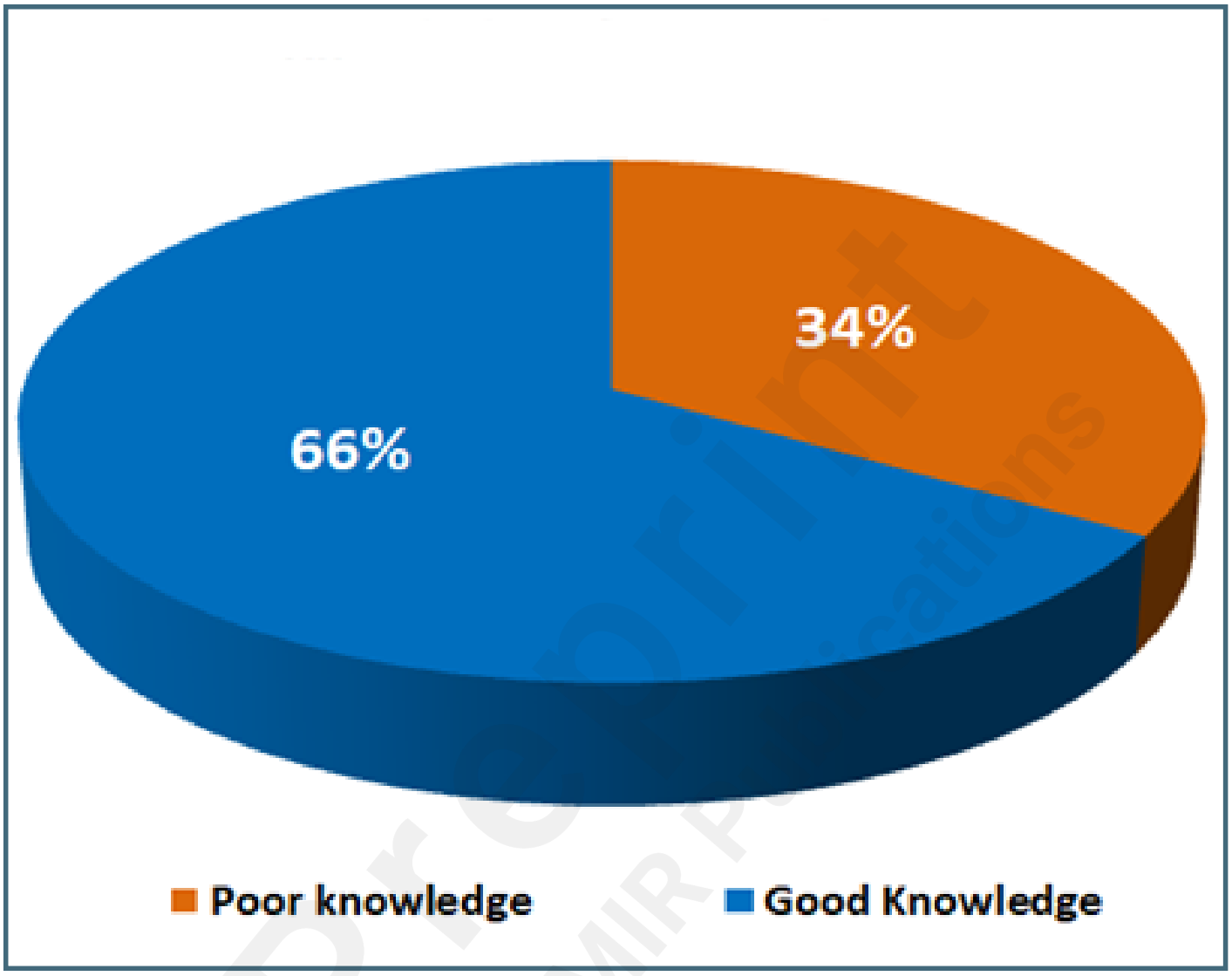
27. Lium JT. Use of Electronic Medical Recordsand the road towards paperlesshospitals in Norway: A socio-technical perspective. 2007.

28. Akanbi MO, Ocheke AN, Agaba PA, Daniyam CA, Agaba EI, Okeke EN, et al. Use of electronic health records in sub-Saharan Africa: progress and challenges. 2012;14(1):1.

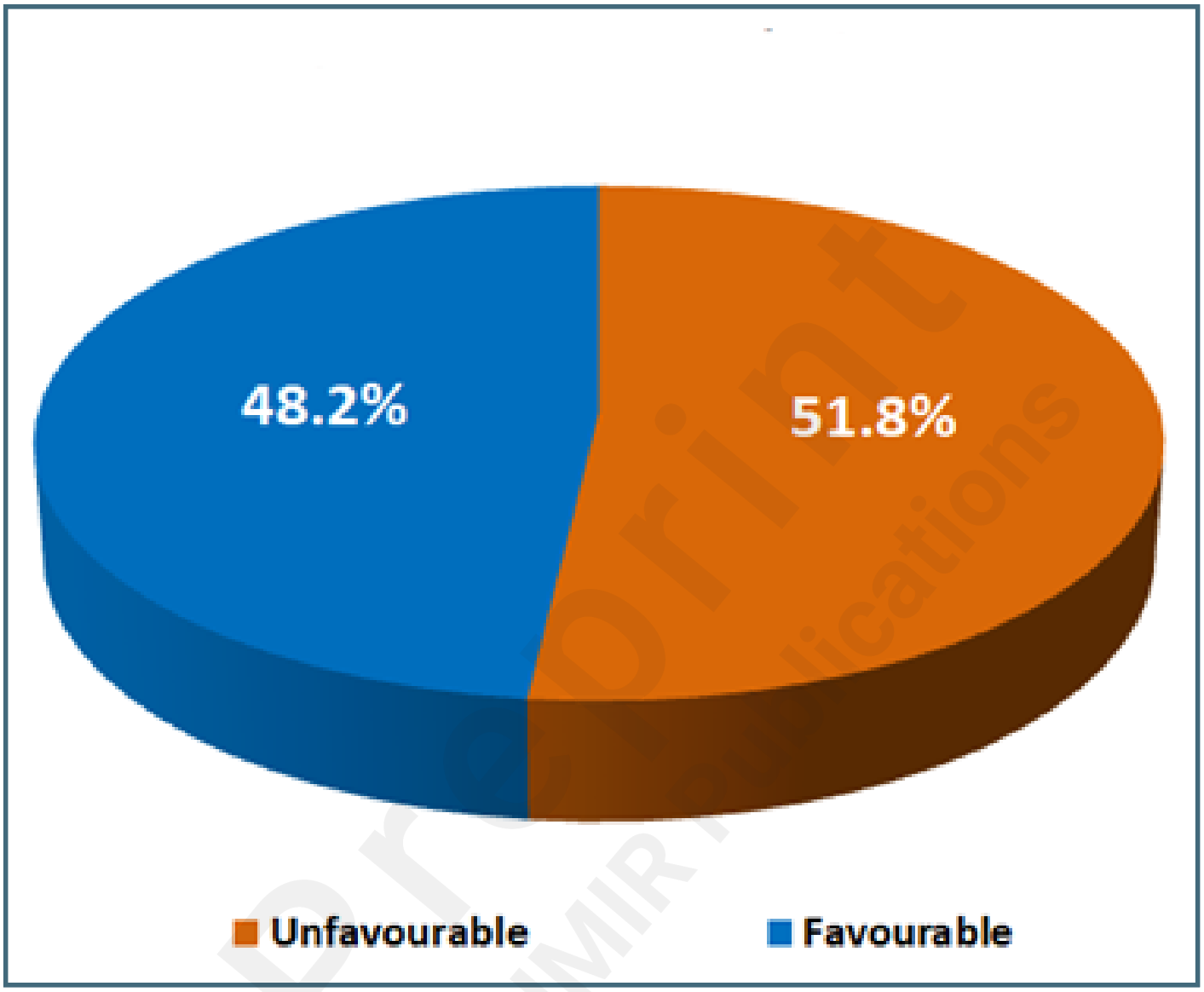
Supplementary Files

Figures

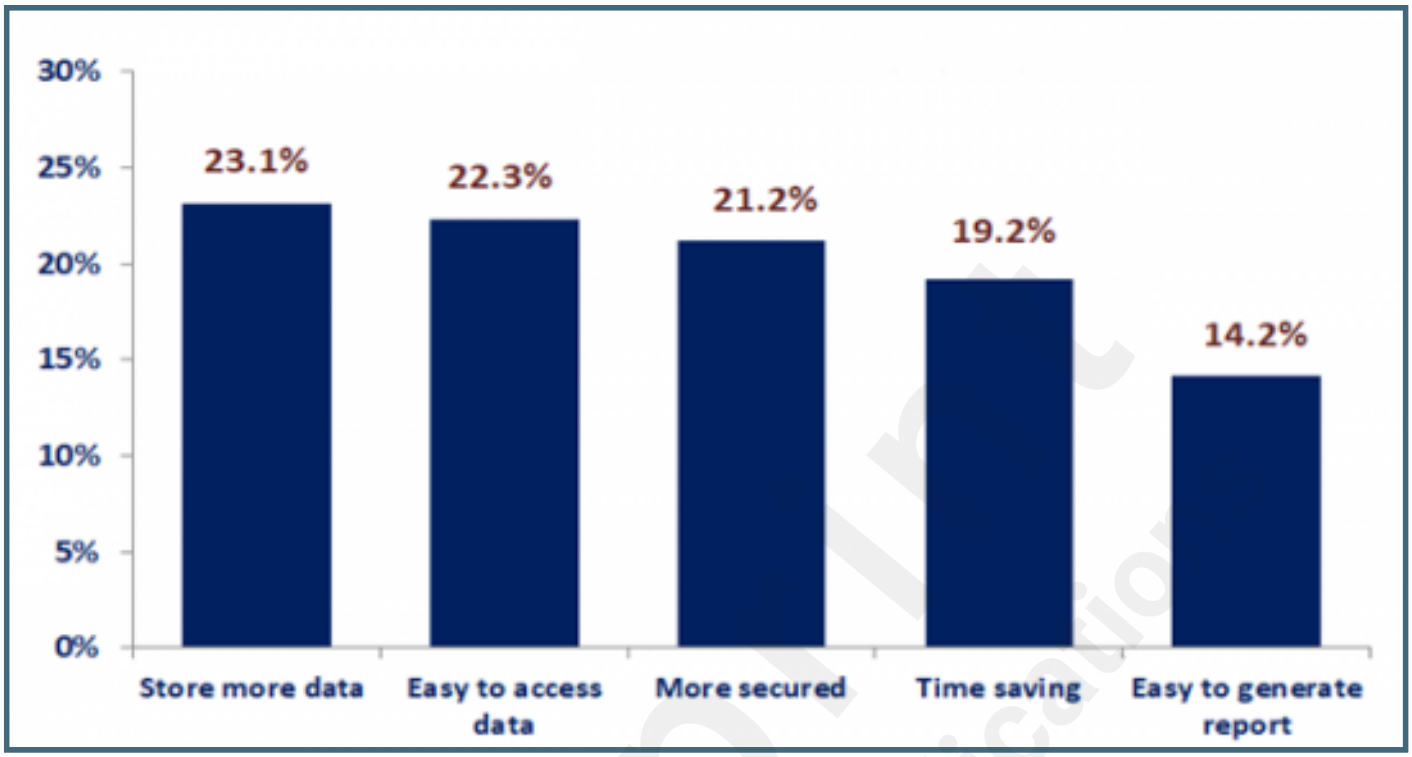
Self-Reported knowledge of Health Professionals about Electronic Medical Records (EMR) in EM-implementing Hospitals, Ethiopia, 2023.



Self-reported Attitudes of Health Professionals towards EMR in EMR-Implementing Ethiopian Hospitals, 2023.



Self-reported Reasons for Limited Preference for EMR Systems over Paper Documentation Among Health Professionals in EMR-Implementing Ethiopian Hospitals, 2023.



Self-reported Reasons for Health Professional's Preference for Paper-Based Documentation over EMR Systems in EMR-Implementing Ethiopian Hospitals, 2023.