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Research Article

Routine Health Information Use for Decision making and Associated Factors by Public Health Care Providers in North West Ethiopia

Alemayehu Tilahun[1*], Zewdie Aderaw Alemu[2], Tewodros Eshete[2]

[1]Department of Planning, Monitoring, and Evaluation, Gimjabet Hospital, Agew Gimjabet, Ethiopia; [2]Department of Public Health, Debre Markos University, Health Sciences College, Agew Gimjabet,Ethiopia

ABSTRACT

Background: Using reliable information from routine health information systems is vital for planning, monitoring, and evaluation thereby improving health outcomes. However, in developing countries including Ethiopia, the level of use of routine health information for decision making is low and the insufficient quality of the data produced limits their usefulness.

Objective: To assess routine health information use for decision-making and associated factors among health care providers of Awi Zone, 2020.

Methods: Institution-based cross-sectional study design was conducted at public health institutions of Awi Zone, Northwest Ethiopia. A total of 562 study participants were included through the stratified sampling technique. Data were analyzed by binary logistic regressions using a statistical package for social science v25.

Result: A total of 555 respondents participated with a response rate of 98.8%. The level of use of data for decision-making was 55.93% at 95% CI (53.71-58.15). The health center healthcare providers (AOR=5.61:2.23-14.08), not having skills in data analysis (AOR=0.37:0.20-0.71), the inability to calculate findings (AOR=0.47: 0.26-0.85), timeliness of data (AOR=4.11:1.70-9.98), the credibility of data (AOR=9.33:4.23-20.55), reviewing performance (AOR=3.49:1.46-8.38), no access to health information (AOR=0.54;0.31-0.93) were found significantly associated with routine health information use for decision making.

Conclusion and Recommendation: Nearly half of health care providers were unable to use routine information for decision-making. Type of health institution, skills in data analysis, ability to calculate findings, timeliness, credibility, frequency of reviwiening indicators, and access to health information were factors related to routine health information use. Addressing these issues is highly recommended for improving routine health information use.

Keywords: Routine health information use; Decision making; Ethiopia

Abbreviations: DDDM: Data-Driven Decision Making; DHIS2: District Health Information System Two; EMR: Electronic Medical Record System; HCF: Health Care Financing; HCP: Health Care Provider; HEW: Health Extension Workers; HMIS: Health Management Information System; HRIS: Human Resources Information System; HSTP2: Health Sector Transformation Two; HT: Health Technology; KII: Key Informant Interview; PHCU: Primary Health Care Unit; PI: Principal Investigator; PRISM: Performance of Routine Information System Management; RHIS: Routine Health Information System; SPSS: Statistical Package for Social Science; UDDM: Use of Data for Decision Making; WHO: World Health Organization; WoHO: Woreda Health Office; ZHD: Zonal Health Department

Correspondence to: Alemayehu Tilahun, Department of Planning, Monitoring, and Evaluation, Gimjabet Hospital, Agew Gimjabet, Ethiopia; E-mail: alexalemayehu48@gmail.com

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INTRODUCTION

Background

Health information is the foundation of the overall building blocks of health systems strengthening. Availability of information that will enable to utilize for better decision making is a crucial step for strengthening the system [1,2]. Information use exists when relevant information is available and decision-makers are aware of the decisions they are about to make or question to be answered [2].

Information use is the use of information in one or more steps and/or processes of policymaking, program planning, managing, monitoring and evaluation, and improving service provision at community, institution, and administrative levels [3]. At the institution level information is used to monitor service coverage and quality, resources availability, clients' satisfaction, and/or informs planning and managing health services, program performance, and resources [2].

One of the most persistent characters of the information age is that health institutions have focused too much on mastering transaction data and not enough on turning it into information and knowledge that can lead to results [4].

Significant human and financial resources have been invested worldwide in the collection of data in health facilities and communities; Health workers collect data on patients and routinely report on all the activities within the health institutions.

Although there is a slight improvement in data monitoring and evaluation, information use for decisions has often been negligible among stakeholders [5]. As a result, many health systems fail to fully link evidence to decisions and suffer from inadequate ability to respond to priority health needs at all levels of the health system [1,5].

Ideally, Public health officials and the communities they serve need to: identify priority health problems; formulate effective health policies; respond to public health emergencies; select, implement, and evaluate cost-effective interventions to prevent and control disease and injury; and allocate human and financial resources [6].

Many public health decisions appear to be made intuitively or politically. The goals of data-driven decision-making are to strengthen the capacity of decision-makers to identify data needs for solving problems, to interpret and use data appropriately for public health decisions. It is also used to enhance the capacity of technical advisors to provide valid, essential, and timely data for decision-makers clearly and effectively. Strengthening Health Information Systems (HISs) to facilitate the collection, analysis, reporting, presentation, and use at local, district, regional, and national levels are the ultimate goals [7].

In few CDC participating countries, the use of routine health information for decision-making strategy improved evidence-based health provisions. Subsequently, information-driven decision-making concepts and practices have been institutionalized [7]. Problem-driven implementation plans with data-based solutions as objectives were developed [5].

Interdisciplinary in-service training programs for mid-level policymakers, program managers, and technical advisors in applied epidemiology, management and leadership, communications, economic evaluation, and HISs were designed and implemented in some countries well practicing routine information use for decision making.

The associated factors behind the poor routine health information use for decision making are poor knowledge of health technology, the inadequacy of information inputs such as computers, behavioral factors of health care providers, and inadequate support and/or feedback [8-15].

MATERIALS AND METHODS

Aim, design, and setting of the study

This study aims to determine routine health information use for decision-making and associated factors among health care providers.

Study design and setting

An institution-based cross-sectional study was conducted from September 2020 to December 2020 In the Awi Zone, North West Ethiopia. Awi Zone has located 445 km from Addis Ababa, the Capital city of Ethiopia, and 112 km from Bahir Dar, the Capital city of Amhara regional state. According to the zonal health department, the study area has a total population of 1322692 [16].

Study population, sample size, and sampling procedure

All health care providers at Awi Zone health institutions were selected through stratified sampling then proportionate allocation.

The sample size was determined using the single population proportion formula, considering the following assumptions;

Proportion=79% (health information utilization at a district level in North Gondar Zone)

Level confidence=95%

Margin of error=5%

Design effect=2

Non-response rate=10%

n=(za/2)2p(1-p)/d2. So n= (1.96)2x0.79 (1-0.79)/ (0.05)2=255. The non-response rate was taken 10%, so the sample is 255+255*0.1=281. Final sample size (considering design effect of 2) was 281*2=562 [17].

Data collection tool and procedure

The data collection tool is the customized PRISM assessment tool, a self-administered structured questionnaire that is carefully reviewed, pretested, and revised before final data collection. The research instrument was an English version and translated to Amharic and back to English for analysis. In the conceptual framework, technical, organizational, and individual factors are determinants of the use of routine health information for decision-making.

To ensure the quality of data, before the actual data collection time, the questionnaire was pre-tested for the relevant modification on the sample size 26(5%). The reliability of the tool for individual,

institutional and technical factors was checked using Cronbach's alpha reliability test with a score of 0.767, 0.898, and 0.77 respectively. Additionally, the data collectors and supervisors were provided with necessary information and instruction. Questionnaires were reviewed and checked regularly for completeness, accuracy, and consistency by the supervisor and the investigator [18-20].

Operational definition and terms

Use of routine health information for decision making: Using routinely collected health information for decisions on planning, monitoring, and evaluation, outbreak investigation, and management, medical supplies management, staffing decisions, service improvement, resource mobilization.

Level of routine health information use: The use of routine health information for informed decision making assessed using information use index based on 6 areas and 22 criteria (planning 4 verifications, monitoring, and evaluation 5 verifications, outbreak investigation and management 4 verifications, medical supplies management 3 verifications, staffing decision 3 verifications and service improvement with 3 verifications). Respondent's self-rated result was calculated out of 22 and the extent to which they use routine health information use for decision making was dichotomized as poor level (0%-50%) and good level (51%-100%) for analysis purposes.

Health care provider: Any staff engaged in an institution providing clinical or public health care. It includes health professionals, health administrators, and officers of health institutions (i.e. zone health department officers, world health officers, hospital staff, health center staff, and health extension workers).

Routine Health Information System (RHIS): Is a system that provides information at regular intervals of a week, month, quarter, bi-annual, or year to meet predictable information needs. These may be paper-based or electronic health records and facility or district-level management information systems [3].

Educational level: Is the respondents' educational background which is expressed as below level IV (health extension workers, others), level IV (diploma), Bachelors' degree (BSc.), masters' degree (MSc.), and specialty.

Data processing and analysis

Questionnaires were coded after cleaning. This was pre-tested by entering questionnaires. After validation, data is entered into epi-data. Then it was exported to SPSS version 25 for statistical analysis.

Data analysis was made by SPSS, for testing association and other statistical computations using the binary logistic regression model. Descriptive statistics such as frequencies, means, and proportions were computed using tables and figures to summarize the variables. Variables with a p-value of less than 0.2 in the bi-variable analysis were entered into the multivariable logistic regression analysis. Both Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR) with 95% confidence intervals were computed to show the strengths of associations with the technique of backward regression method. A p-value of less than 0.05 at the multivariable logistic regression analysis was used to identify variables significantly associated with the use of a routine health information system. Hosmer and Lemeshow's goodness of fit test was used and is greater than 0.05. The multicollinearity assumption was checked through Variance Inflation Factor (VIF) and was below 10.

RESULTS

Socio-demographic characteristics

A total of 555 respondents participated in the study with a response rate of 98.8%. The majority of respondents' age, 376(70.1%) was 20-29 years. Among the study participants more than half, 297(53.9%), were male. One-third, 159(29.2%), of respondents were nurses. More than half, 272(51.5%), of respondents, were diploma. For details of the socio-demographic characteristics, please see the table below (Table 1).

Level of routine information use for decision making

Use of routine health information for decision making was assessed using information use index (mean) established from a set of six (planning, monitoring and evaluation, outbreak investigation and management, medical supplies and drugs management, staffing

Table 1: Socio-demographic characteristic of the study participants, Awi zone, 2020.

Variables	Category	Frequency	Percent
Sex	Male	297	53.9
	Female	254	46.1
Age	20-29	376	70.1
	30-39	134	25
	40-49	19	3.5
	50-60	7	1.4
Profession	Doctors	20	3.7
	Nurses	159	29.2
	Midwives	80	14.7
	HO	49	9
	HEW	96	17.6
	Others*	141	25.9
Education	Certificate (Level 3)	28	5.3
	Diploma (Level 4)	272	51.5
	BSc and above	228	43.2
Experience	Fresh level (0-2 years)	122	22.4
	Junior level (2-5 years)	167	30.7
	Senior-level (>5 years)	255	46.9
Health institution	Health post	95	17.1
	Health Center	221	39.8
	Hospital	199	35.9
	WHO	40	7.2
Department	Health post	95	17.8
	OPD	110	20.6
	IPD	21	3.9
	MCH	71	13.3
	Emergency	18	3.4
	Others**	220	41.1
Salary	Lower paid	38	9.3
	Middle paid	342	83.6
	Higher paid	29	7.1

decisions, and service improvement) areas of information use based on criteria set by PRISM assessment tool. The overall RHI use was calculated by taking the mean of all six dimensions which was found 55.93%. The table below summarizes all dimensions of information use indexes (Table 2).

Technical fact004frs influencing health information use

Training and skills: The training in aspects of information management (HMIS or DHIS2, analysis and presentation, and computer skills) was determined, and reported that only 33%, 29.4%, and 18.4 were trained respectively (Table 3).

The ability to carry out the data manipulation concerning data management shows that most of the respondents have good skills (Table 4).

Organizational factors influencing health information use

Access to functional HMIS materials: Information use is determined by access to functional resources and materials. Among the health workers who participated in study 349(64.3%) have access to routine health data. And 114(20.7%) reported having access to the internet in the office or institution (Table 5).

Level of support: Among the respondents, only 106(19.2%) received adequate support from in-charges. The job descriptions regarding health information use were noted among 219(39.8%) (Figure 1).

Table 2: Overall extent of RHI use for decision making, Awi Zone, 2020.

UDDM areas	Sum of scores	UDDM	Remark
Planning (N=546)	421.7	76.81%	
M and E (N=550)	356.5	64.23%	
Outbreak investigation and management (N=546)	363.9	66.16%	
Medical supplies drugs management (N=545)	343.4	62.89%	
Staffing decisions (N=441)	172.3	39.07%	
Service improvement (N=445)	212.7	47.80%	
Overall RHIS use for decision (N=555)	311.75	55.93%	

Table 3: Extent of training provided for HCP, Awi zone, North West Ethiopia, 2020

Training areas	Frequency	Percent
HMIS (DHIS2)	184	33.3
Data analysis	162	29.4
Basic computer skill	102	18.4

Table 4: Skills of healthcare providers on data quality, Awi zone, 2020.

Skills	Frequency	Percent
I can check data accuracy	453	82.2
I can calculate rates	436	79.3
I can plot information on an appropriate chart/ graph	448	81.2
I can explain findings and their implications	393	71.3
I can use the information to identify gaps and set targets	448	81.2

Table 5: Access to health information, Awi zone Health care providers, 2020.

HMIS materials	Frequency	Percent
Access routine data	349	64.3
Computer	241	43.7
Printer	205	37.1
Data backup units (flash disc, CD or external hard disk)	198	36
Access to internet	114	20.7

Table 6: The table shows the extent of the job description on HMIS, Awi zone, 2020

Variables	Extent		
	Never	Sometimes	Always (adequate)
Clearly defined in your job description in terms of HMIS	92(16.7%)	239(43.5%)	219(39.8%)
Frequency of display key performance indicators	81(14.8%)	264(48.2%)	203(37%)

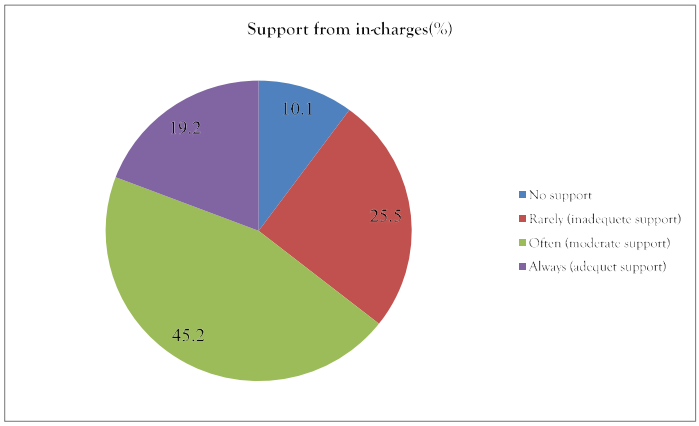

Figure 1: Level of support from in-charge, Awi zone, 2020.

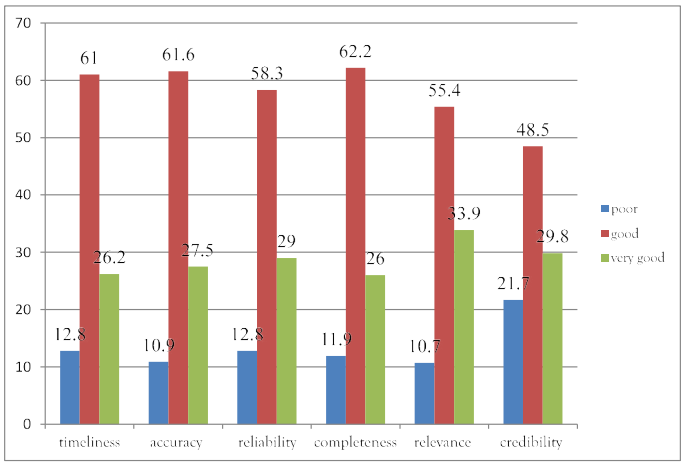

Figure 2: Bar graph depicting data quality level, Awi zone, 2020.

Individual factors influencing health information use

Quality of data collected: Significant respondents, 70(12.8%), reported that the data collected was not timely. Surprisingly 118(21.7%), 59(10.7%), and 65(11.9%) reported that the data collected was incredible, irrelevant, and incomplete respectively (Figure 2)(Table 6).

Table 7: Multivariate logistic regression table showing the significant variables associated with routine health information use, Awi Zone, 2020.

Variable	Level of UDDM		P- value	AOR (95% CI)
	Good	Poor		
Health institution type				
Health post	56(58.95%)	39(41.05%)		1
Health centre	126(57.27%)	94(42.73%)	0	5.606(2.232,14.079) *
Hospital	96(48%)	104(52%)	0.004	4.190(1.586,11.066) *
WoHO	24(60%)	16(40%)	0.005	7.141(1.84, 27.748) *
Training on data analysis				
Yes	118(72.84%)	44(27.16%)		1
No	183(47.04%)	206(52.96%)	0.003	0.374(0.196,0.713) *
I can calculate the rate				
Yes	251(57.57%)	185(42.43%)		1
No	48(42.11%)	66(57.89%)	0.012	0.470(0.261,0.847) *
Access to HMIS				
Yes	220(63.04%)	129(36.96%)		
No	80(41.24%)	114(58.76%)	0.027	0.535(0.307, 0.931) *
Frequency of reviewing indicators				
No	36(44.44%)	45(55.56%)		
Sometimes	104(39.39%)	160(60.61%)	0.519	0.782(0.370,1.652)
Always	160(78.82%)	43(21.08%)	0.005	3.492(1.455, 8.380) *
Timeliness				
Poor	18(25.71%)	52(74.29%)		1
Good	166(49.55%)	169(50.45%)	0.002	4.114(1.698, 9.968) *
Very good	116(80.56%)	28(14.44%)	0.006	4.425(1.528, 12.814) *
Credibility				
Poor	25(21.19%)	93(78.81%)		
Good	155(58.71%)	109(41.29%)	0	9.326(4.232,20.551) *
Very good	116(71.61%)	46(28.39%)	0.017	3.559(1.259,10.064) *

Factors associated with the use of routine health information for decision making: On bivariate logistic regression analysis; professional training, health institution type, level of education, experience, training (on DHIS2 or HMIS, data analysis, and basic computer skill), skills and abilities of data manipulation (checking the accuracy, calculating findings, plotting appropriate chart, using findings and ability to explain findings), access to RHIS, availability of back up materials, availability of printer, access to the internet, support from in-charge, job description regarding HMIS, frequency of reviewing key performance indicators, routine data appropriateness (timeliness, completeness, accuracy, reliability, relevance, and credibility), and level of motivation met the requirement to proceed to multivariable logistic regression analysis.

After multivariable analysis; type of health institution, experience, training on data analysis, ability to calculate findings, access to HMIS materials, frequency of reviewing key performance indicators, timeliness of data, and credibility of data showed statistically significant association with the use of routine health information for decision making.

Those health care provides who are working in health centers were found to increase the odds of use of health information for decision making by 5.6 times as compared to health extensions (AOR=5.61:2.23-14.08), whereas those who are from hospitals 4.2 times and WHO 7.1 times increase the odds of use of health information for decision making (AOR=4.19:1.59-11.07) and AOR=7.14:1.84-27.75) respectively.

Those health care providers who did not take data analysis training were found to decrease by 63% compared to trained health care providers (AOR=0.37: 0.20-0.71). The healthcare providers who cannot calculate findings tend to decrease by 53% (AOR=0.47: 0.26-0.85) compared to those who can compute. Good in timeliness data increases 4.1 times and very good 4.4 times the odds of routine health information use for decision compared to poor in timeliness data (AOR=4.11:1.70-9.97) and 4.43:1.53-12.81) respectively. Where credible data increases odds by 9.3 times (AOR=9.33:4.23-20.55). Those health care providers who are working on health institutions always reviewing performance indicators increase odds of routine health information use by 3.5 times (AOR=3.49: 1.46-8.38) compared to not reviewing.

Having no access to HMIS materials tends to decrease odds of routine health information use for decision by 54%, compared to those who have access to HMIS materials (Table 7).

DISCUSSION

The study found that the use of routine health information for decision-making among health care providers was 55.93% at 95% CI (53.71-58.15). The study finding is in line with a study conducted in Gamo Gofa Zone (58.2%) [12,17].

This finding is higher than that of the study conducted in East

Gojjam Zone 45.8% and Jimma Zone 32.9% [18,19]. The deviation might be due to the attention given by the government to health information included in the health sector transformation agenda 2015 and the information use training manual is published [16].

However, this finding is lower than a study done in North Gondar Zone, Ethiopia (78.5%), and Mombasa, Kenya (69.6%) the variation for the former could be due to different institutions (it is studied from hospitals and health centers only) [21-27]. The difference for the Kenyan study might be a variation of the health care system index for Ethiopia (52.12%) and Kenya (55.83%). In addition, Accuracy and completeness in filling out reports for Ethiopia are low (37.5%) and high in Kenya (63.93) [13].

According to the multivariable logistic regression analysis, the higher odds of routine health information use for decision making was noted among health professionals who are working in health centers 5.6 times, hospitals 4.2 times, and WHO 7.14 compared to the health post. This might be due to the difference in motivation which is better in respective institutions. Hospitals have several departments equipped to treat a wide array of medical issues and admit patients for treatment. They offer a variety of opportunities for clinical work, as well as positions in research, education, and management that motivates and is the preferred workplace.

Those health care providers who did not take training on HMIS were found to decrease by 63%. That health care provider who cannot calculate rates tends to decrease by 53% when compared with those who can calculate. The possible reason might be training increases knowledge and skill there by practice. Effective training lead to quality work and thus to a higher level of achievement.

The health care providers who have access to timely health information use 4.1 times more data for decision-making than those who haven't. Health care providers in health institutions that have credible data can use the information for decision-making 9.5 times more than incredible data. The possible reason for this may be that access to timely and credible health information (including the internet) can enhance fact-driven decision-making significantly [28,29].

Those healthcare providers who are working on health institutions that are always reviewing key performance indicators increase odds of routine health information use by 3.1 times compared to not reviewing. This might be due to the positive race and winning spirit. In addition, it often generates written reports that contribute to transparency and accountability and allows for lessons to be shared more easily [1].

CONCLUSION

Based on the findings of this study, it was concluded that the use of routine health information for decision-making is below expected. This means there are areas to be improved on health institutions and individuals when we compare the result with other studies. Health workers working in health centers, hospitals, and woreda health offices are better at using routine health information than health extension workers. Training and skills in data analysis increase routine health information use. The health workers who can calculate findings and have access to timely and credible data can use routine health information compared to counterparts. Reviewing key indicators always increases routine health information use.

Training, generating timely and credible data, reviewing indicators regularly, and giving attention to health extension workers are highly recommended for improving routine health information use.

ETHICS APPROVAL AND INFORMED CONSENT

Permission was obtained from the Awi Zone Health department and each health institution.

Oral informed consent has been taken from study participants. They have been also given the right to withdrawal from the study at any time during data collection and informed about confidentiality.

By my signature below, I declare and affirm that this study is my work. I have followed all ethical principles of scholarship in the preparation of this study. All scholarly matters that are included in the report have been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this report.

CONSENT FOR PUBLICATION

We declare to accept responsibility for the scientific, ethical, and technical conduct of the research. Contents and details of any images, charts, and figures can be published, and we confirm to provide copies of signed consent forms to the journal editorial office if requested.

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AUTHOR CONTRIBUTIONS

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

REFERENCES

1. Monitoring and evaluation of health systems strengthening. Geneva: WHO. 2009.
2. HMIS information use training manual. FMoH. 2018;1:90.
3. Information revolution roadmap manual. Ethiopia FMoH. 2016;1:62.
4. Bhattacharyya S, Berhanu D, Taddesse N, Srivastava A, Wickremasinghe D, Schellenberg J, et al. District decision-making for health in low-income settings: a case study of the potential of public and private sector data in India and Ethiopia. Health Policy Plan. 2016;31:25-34.

5. Mandinach EB. A perfect time for data use: Using data-driven decision making to inform practice. Educ Psychol. 2012;47(2):71-85.

6. Pappaioanou M, Malison M, Wilkins K, Otto B, Goodman RA, Churchill RE, et al. Strengthening capacity in developing countries for evidence-based public health: The data for decision-making project. Soc Sci Med. 2003; 57(10):1925-1937.

7. Shiferaw AM, Zegeye DT, Assefa S, Yenit MK. Routine health information system utilization and factors associated thereof among health workers at government health institutions in East Gojjam Zone, Northwest Ethiopia. BMC Med Inform Decis Mak. 2017;17(1):1-9.

8. Shagake SS, Mengistu MY, Zeleke AA. Data management knowledge, practice and associated factors of Ethiopian health extension workers in Gamo Gofa Zone, Southern Ethiopia: A cross-sectional study. J Health Med Informat. 2014;5(150):2-4.

9. Aqil A, Lippeveld T, Hozumi D. PRISM framework: A paradigm shift for designing, strengthening and evaluating routine health information systems. Health Policy Plan. 2009;24(3):217-228.

10. Abajebel S, Jira C, Beyene W. Utilization of health information system at district level in Jimma zone Oromia regional state, South West Ethiopia Ethiop J Health Sci. 2011; 21-12.

11. Dovlo D. Wastage in the health workforce: Some perspectives from African countries. Hum Resour Health. 2005 Dec;3(1):1-9.

12. Parker D, Newbrander W. Tackling wastage and inefficiency in the health sector. World health forum. 2014;15(2):107-13; discussion 14-31.

13. Mutale W, Chintu N, Amoroso C, Awoonor-Williams K, Phillips J, Baynes C, et al. Improving health information systems for decision making across five sub-saharan African countries: Implementation strategies from the African Health Initiative. BMC Health Serv Res. 2013;13(2):1-2.

14. Dagnew E, Woreta SA, Shiferaw AM. Routine health information utilization and associated factors among health care professionals working at public health institution in North Gondar, Northwest Ethiopia. BMC Health Serv Res. 2018;18(1):1-8.

15. Kerr K, Norris T, Stockdale R. Data quality information and decision making: A healthcare case study. ACIS 2007 Proceedings. 2007;1-98.

16. James BD, Boyle PA, Yu L, Bennett DA. Internet use and decision making in community-based older adults. Front Psychol. 2013;4:605.

17. Kazanjian A, Green CJ. Beyond effectiveness: The evaluation of information systems using a comprehensive health technology assessment framework. Comput Biol Med. 2002;32(3):165-177.

18. Hivon M, Lehoux P, Denis JL, Tailliez S. Use of health technology assessment in decision making: Coresponsibility of users and producers? Int J Technol Assess Health Care. 2005;21(2):268-275.

19. Sadoughi F, Hemmat M, Valinejadi A, Mohammadi A, Majdabadi HA. Assessment of health information technology knowledge, attitude, and practice among healthcare activists in Tehran hospitals. Int J Netw Secur. 2017;17(1):155.

20. Joshi A, Amadi C, Alam A, Krudysz MA, Hernandez G. Using data to inform decision making in recruitment of prospective public health students. Res High Educ J. 2017;32.

21. Avan BI, Berhanu D, Umar N, Wickremasinghe D, Schellenberg J. District decision-making for health in low-income settings: a feasibility study of a data-informed platform for health in India, Nigeria and Ethiopia. Health Policy Plan. 2016;31:3-11.

22. Coulter A.N.G.E.L.A, Ellins J, Swain D.A.N.I.E.L.L.E, Clarke A.I.L.E.E.N, Heron P, Rasul, F.A.R.H.A.T, et al. 2006. Assessing the quality of information to support people in making decisions about their health and healthcare.2006.

23. Bhattacharyya S, Berhanu D, Taddesse N, Srivastava A, Wickremasinghe D, Schellenberg J, et al. District decision-making for health in low-income settings: A case study of the potential of public and private sector data in India and Ethiopia. Health Policy Plan. 2016;31:25-34.

24. Ledikwe JH, Grignon J, Lebelonyane R, Ludick S, Matshediso E, Sento BW, et al. Improving the quality of health information: A qualitative assessment of data management and reporting systems in Botswana. Health Res Pol Syst. 2014;12(7):10.

25. Mutale W, Chintu N, Amoroso C, Awoonor-Williams K, Phillips J, Baynes C, et al. Improving health information systems for decision making across five sub-saharan African countries: Implementation strategies from the African Health Initiative. BMC Health Serv Res. 2013;1(1):12.

26. Nzomo G. Use of routine health information for decision making among health workers at Coast General Hospital. Mombasa County, Kenya, Kenyatta University, Kenya. 2017.

27. Teklegiorgis K, Tadesse K, Terefe W, Mirutse G. Level of data quality from health management information Systems in a resources limited setting and its associated factors, eastern Ethiopia. S Afr J Inf Manag. 2016;18(1):1-8.

28. Pappaioanou M, Malison M, Wilkins K, Otto B, Goodman RA, Churchill RE, et al. Strengthening capacity in developing countries for evidence-based public health: The data for decision-making project. Soc Sci Med. 2003;57(10):1925-1937.

29. Biruk S, Yilma T, Andualem M, Tilahun B. Health Professionals' readiness to implement electronic medical record system at three hospitals in Ethiopia: A cross sectional study. BMC Med Inform Decis Mak. 2014;14(1):1-8.

30. Wude H, Woldie M, Melese D, Lolaso T, Balcha B. Utilization of routine health information and associated factors among health workers in Hadiya Zone, Southern Ethiopia. PLoS One. 2020;15(5):e0233092.