Implementation of Health Information Systems at Health Centres and Health Offices in Ciamis District

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Abstract: The Indonesian Ministry of Health recently introduced the health information system (HIS) to record and report health programs, including at community health centres (CHCs) and the district health office. Therefore, this study aimed to examine the implementation of HIS in CHCs and the Ciamis District Health Office. This was a descriptive quantitative study with a secondary data analysis approach. The data used were obtained from Risfaskes results, HIS implementation documents, and HIS staff information. Subsequently, analysis was carried out using Wallace Foundation guidelines in Workbook B; Secondary Data Analysis. The analysis showed that HIS had been implemented in 37 CHCs and the Ciamis District Health Office. However, some CHCs had not consistently implemented all HIS applications as intended. The flow of data and information between CHCs and the district health office and from the district health office to higher levels lacked a one-data and one-door system due to variations in the implementation across different programs and fields. The implementer of HIS was the personnel assigned to each health program that used the system. Some CHCs had not implemented the use of HIS in the Ciamis District. Furthermore, the existence of this HIS had not been able to facilitate the work and burden of CHCs.

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1 INTRODUCTION

The health sector has rapidly implemented and developed information and communication technology (ICT), as evidenced by the widespread adoption of e-health in various countries. WHO defines e-health as the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research. Furthermore, e-health is characterized by the utilization of ICT to enhance the flow of information through electronic channels, thereby strengthening health services and the management of healthcare systems. This concept is not only related to the technical aspects but also encompasses attitudes and mindsets that extend beyond the purview of local and national healthcare services, such as regional and world interests (Union 2012).

In Indonesia, the adoption of e-health is marked by the establishment of a health information system (HIS). This concept is defined as an intricate arrangement that encompasses data, information, indicators, procedures, devices, technology, and human resources (HR). The components are intricately linked and managed using an integrated approach to guide actions or decisions geared towards supporting health development (Menkes RI 2014)

HIS is a pivotal component of the healthcare infrastructure of a country and it affects the prevailing government system. Furthermore, HIS serves as the backbone of e-Health, as it involves systematic and integrated management of health data and information at all levels of government to improve healthcare services provided to the community (Soemitro 2016). Information systems can be defined as organizational frameworks that incorporate a blend of people, facilities, technology, media, procedures, and controls. These elements work together to establish communication channels, process routine transactions, ensure signal management, manage internal and external events, and provide a foundation of information for intelligent decision-making (Vondewi, R 2010). The development process involves the creation of a new system to completely replace the old variants or improve the existing

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variants (Kinasih 2011). Several reports have shown that the implementation of HIS still faces various problems, including unintegrated and uncoordinated data and information management activities. These conditions often lead to overlapping data collection and processing activities, both at the centre and in the regions (Rondo, Pelealu, and Maramis 2013).

The development of the Ministry of Health's HIS began in 1982 with the establishment of the Data Collection and Processing Division within the Planning Bureau (now the Data and Information Center) (Soemitro 2016). At this time, there were 3 (three) managerial models, namely (1) manual management by recording and reporting using register books, cards, and forms, (2) offline computerized management, which was mainly carried out with computer devices, either by using management information system (SIM) applications or ordinary electronic office applications. However, it lacked support from online internet networks connecting the district/city and the provincial health office, as well as national health data banks, (3) online computerized HIS management, which was mostly or entirely carried out with computer devices, using SIM applications. It was connected online through the internet network to the district and the provincial health office, and national health data banks, to facilitate communication and data synchronization (Menkes RI 2012).

One of the healthcare facilities that has embraced e-Health is CHCs (Puskesmas), leading to the implementation of the Puskesmas Management Information System (SIMPUS) at this level. SIMPUS is designed to provide information that aids the decision-making process in carrying out Puskesmas management and achieving its target activities. Furthermore, it takes the form of web-based software that is connected to the system in the health department (Perwira 2012). The use of SIMPUS by employing ICT holds the potential to significantly enhance the operational capabilities of community health centres (CHCs). The system empowers puskesmas to efficiently coordinate both public health efforts (UKM) and individual health efforts (UKP) by prioritizing promotive and preventive initiatives, to elevate the level of public health (Menkes RI 2014).

The use of manual systems within certain CHCs has led to the occurrence of various problems. In the handling of patient data, there has been a notable prevalence of errors during processing (registration data, examination data, referral data, and laboratory data). Moreover, the patient service process has been hindered by slow data retrieval within the registers. These challenges can be addressed through the use of SIMPUS, which leverages computer technology in processing data. The advantages of this system include expediting services, enhancing information accuracy, swift data searches, quicker report generation, and uniformity of information system, leading to improved healthcare service (Wibisono and Munawaroh 2012). SIMPUS incorporates a standardized data structure for reporting across health centres at the district/city level. This standardized approach offers the dual benefits of swiftness and precision in data and information processing (Wijaya, Ifada, and Jauhari 2009).

Apart from SIMPUS, other HISs have also been implemented at CHCs, including (1) health centre records consisting of 4 items, (2) primary care (Pcare), (3) health facilities information system (HFIS), (4) BPJS non-capitation claims, and (5) Puskesmas report, consisting of 7 items (Balitbangkes, 2019). Several studies have shown that the comprehensive adoption of SIMPUS remains uneven across different CHCs due to challenges encountered in various regions. Consequently, various puskesmas still opt for the traditional approach of data reporting, using manual procedures. A review of the implementation of the computer-based SIMPUS showed that its application yielded considerable benefits. These include enhanced performance, and accuracy, as well as time and energy efficiency but some individuals considered its implementation an additional workload for officers (Putri 2013). This challenge can be addressed by assigning special personnel with appropriate expertise, namely information technology to manage the application (Abdul 2003). The existing personnel at Puskesmas conform to the stipulation of Law No. 36 of 2014 concerning Health Workers, which consist of health workers and assistants, as well as non-health workers who perform administrative duties.

The achievement of health program objectives, which encompass indicators of life expectancy, mortality, morbidity, and nutritional status of the community, hinges on the establishment and development of District ICIS, tailored to align with the principle of centralization or regional autonomy in the healthcare domain. The implementation of district HIS holds immense significance, as it serves as a mechanism for furnishing indicators that measure the realization of a healthy district, while also serving as a fundamental framework for health-oriented regional development. Anticipated outcomes from the data and information produced by the HIS include bolstering the formulation of regional development plans, providing analytical insight to support budget

allocation, aiding resource development, and guiding policymakers during decision-making.

The management of HIS at the Ciamis District Health Office is carried out by the Planning Subdivision of the Information Program and Public Relations Subdivision. One of their key responsibilities is to collect, process, and present data, information, programs, and activities within the Health sector. HIS activities are also carried out by program implementers in certain regions. Meanwhile, HIS management at CHCs is entrusted to the discretion of the head of each Puskesmas (Dinas Kesehatan Kabupaten Ciamis 2019).

The mandatory adoption of HIS in Indonesia commenced with the Regulation of the Minister of Health Republic of Indonesia Number 18 of 2022 concerning the implementation of one health sector data through HIS (Kemenkes RI 2022). The World Health Organization (WHO) defines e-health as the cost-effective and secure use of ICT to support health-related fields, including health services, surveillance, literature, education, knowledge, and study. Clear evidence exists on the growing impact of e-Health on the delivery of healthcare services across the work in terms of improved delivery, effectiveness, and responsiveness to the needs and expectations of the community (WHO Eastern Mediterranean 2023). Therefore, this study aims to develop policy recommendations for the implementation of HIS to support electronic recording and policy reporting at CHCs and the Ciamis District Health Office..

2 METHOD

This was a descriptive quantitative study, with a secondary data analysis approach. The data used were obtained from Health Facility Research (Risfaskes), HIS implementation documents, and a dataset on HIS staff. Furthermore, the secondary data consisted of the results of the 2019 Risfaskes in Ciamis District, documents on the implementation of HIS and the types of HIS that had been implemented, personnel implementing HIS, and personnel with educational background or information technology training. Confirmation was carried out on the implementation of HIS at several CHCs and the Ciamis District Health Office. This process was expected to provide information on the operation of HIS, including the data flow system from the Puskesmas to the health office.

Analysis was carried out using the Wallace Foundation guidelines in Workbook B; Secondary Data Analysis, and the results were presented in a tabular form.

3 RESULTS

3.1 General Data of Ciamis District

Ciamis was one of the districts in West Java Province, consisting of 27 sub-districts, 258 villages, and 7 villages. Furthermore, its geographical position was at the coordinates of 1080 20' to 1080 40' East Longitude and 70 40' 20" to 70 41' 20" South Latitude (BPS Ciamis, 2019).

Table 1. General Description of Ciamis District.

Indicators	Numbers/Values
Total Area	1.434 Km^2
Number of Subdistrict	27 Sub-district
Number of Villages	265 Villages
Total Population	1.418.301 Peoples
Number of Households	496.893 Households
Average Souls/Households	2,9 Souls/ Households
Population Density per km^2	989,1 Soul/Km^2
Dependent Load Ratio	45,6 Per 100 productive population
Sex Ratio	100,7
Population 15 Years Old	1.156.401 Peoples
Population 15 years old with no primary school certificate	263.875 Peoples

Ciamis district had a land area of 1,433.10 km^2 with a total population of 1,418,301 people from 406,893 households in 2019 (DHO Kab Ciamis, 2020). This indicated that the population density was 989.1 people per km2, with a household density of 2.9 people per household. Among 1,156,401 individuals aged >15 years, a total of 263,875 (22.82%) did not have a primary school certificate, while 991,107 people (77.18%) had a certificate. The highest level of education possessed by individuals aged >15 years was elementary/middle school education, namely 597,117 people (60.25%), with the least being a master's or doctoral degree among 1,747 people (0.18%). The results showed that there was no data on vocational high school graduates, as shown in Table 1.

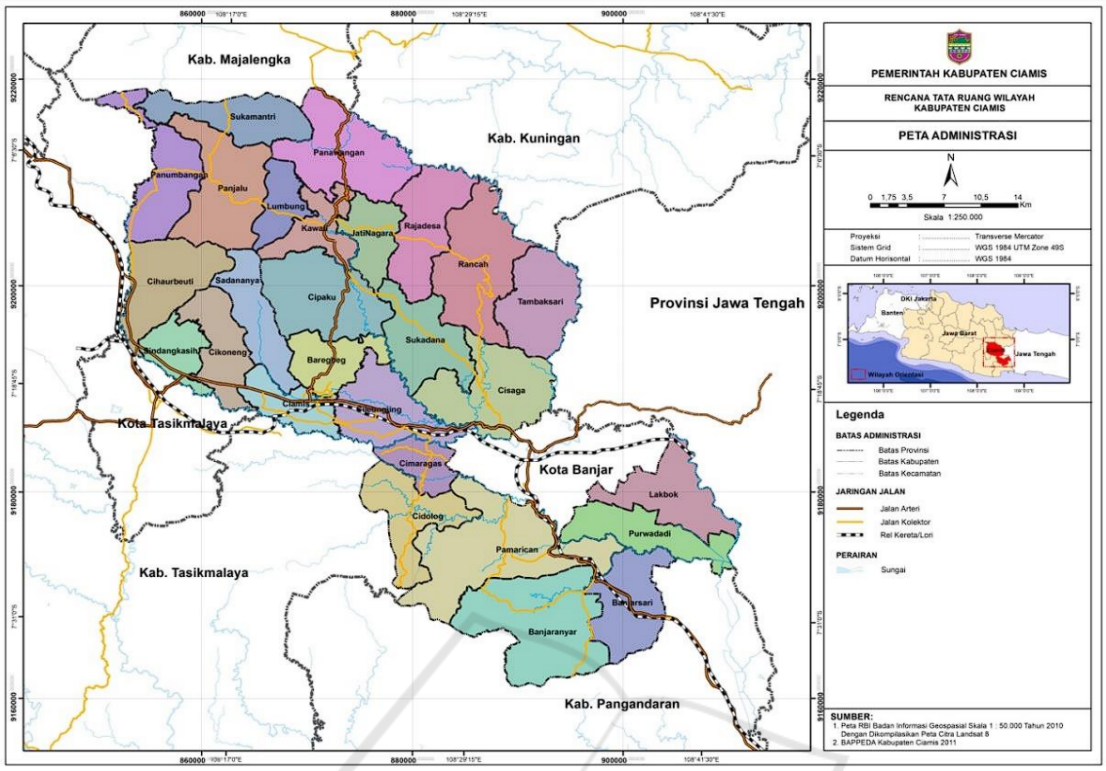

Figure 1. Administrative Map of Ciamis District.

3.2 Health Care Facilities

Health service facilities in Ciamis District in 2019 consisted of 7 types, namely General Hospitals, Inpatient Puskesmas, Non-Inpatient Puskesmas, Mobile Puskesmas, Puskesmas Pembantu, Pharmacies, and Village Health Posts (Poskesdes), while there were no Special Hospitals, as shown in Table 2.

Table 2. Health Service Facilities in Ciamis District.

Indicators	Numbers/ Values	Unit
General Hospital	4	Hospital
Specialized Hospital	0	Hospital
Inpatient Community Health Centre	29	CHCs
Non-Inpatient Health Centre	17	CHCs
Mobile Health Centre	75	Mobile-CHCs
Sub-Community Health Centre	85	Sub-CHCs
Pharmacy	135	Pharmacy
Village Health Post (VHP)	139	VHP

Based on Government Regulation No. 47/2016 on health service facilities, a health service facility was a tool and/or place used to organize healthcare efforts, including promotive, preventive, curative, and rehabilitative. These efforts were often carried out by the central and regional governments, and/or community.

3.3 Human Resources (HR)

The number of health HR in CHCs, hospitals, UPTD Pharmacy, Labkesda, and health offices in Ciamis District in 2019 was 1,837 people, which were classified into 12 groups. Furthermore, there were 25 specialist doctors, 78 general practitioners, 13 dentists, 1 specialist dentist, 827 nurses, 461 midwives, 90 public health workers, 38 environmental health workers, 45 nutritionists, 32 medical laboratory experts, 70 other biomedical techniques, 11 physical therapists, 88 medical technicians, and 58 pharmaceutical workers, as shown in Table 3.

The ratio of HR at the 37 CHCs in the region was highest for the midwife at 26.09 people per 100,000, followed by nurses at 20.59 people per 100,000. The smallest ratios were observed in physical therapists at 0.35 people per 100,000 and dentists at 0.71 people per 100,000, as shown in Table 4.

Table 3. Number of Health HR in Ciamis District.

No	Type of Health Worker	Type				
		Hospital	Technical Implementation Unit (UPTD) Pharmacy & Regional Health Laboratory	Head Office	CHCs	Total
1	Specialist Doctor	25	0	0	0	25
2	General Practitioner	29	1	4	44	78
3	Dentist	3	0	0	10	13
4	Specialist Dentist	1	0	0	0	1
5	Nurse	535	0	0	292	827
6	Midwife	91	0	0	370	461
7	Public Health	6	0	8	76	90
8	Environmental Health	3	0	2	33	38
9	Nutrition	10	0	2	33	45
10	Medical Laboratory Expert	20	0	0	12	32
11	Biomedical Engineering	35	0	0	35	70
12	Physical Therapist	6	0	0	5	11
13	Medical Technician	27	0	0	61	88
14	Pharmacy	40	0	0	18	58
Total		831	1	16	989	1.837

Table 4. Number and Ratio of Medical Staff, Midwives, and Nurses to Population at Puskesmas in Ciamis District.

No	Type of Health Worker	Inpatient Community Health Centre		Non-Inpatient Health Centre		Total	Ratio
		Total	Average	Total	Average		
1	General Practitioner	24	1,2	20	1,18	44	3,1
2	Dentist	6	0,3	4	0,24	10	0,71
3	Nurse	174	8,7	118	6,94	292	20,59
4	Midwife	181	9,05	189	11,12	370	26,09
5	Public Health	39	1,95	37	2,18	76	5,36
6	Environmental Health	18	0,9	15	0,88	33	2,33
7	Nutrition	19	0,95	14	0,82	33	2,33
8	Medical Laboratory Expert	7	0,35	5	0,29	12	0,85
9	Biomedical Engineering	22	1,1	13	0,76	35	2,47
10	Physical Therapist	5	0,25	0	0,00	5	0,35
11	Medical Technician	34	1,7	27	1,59	61	4,3
12	Pharmacy	7	0,35	11	0,65	18	1,27
		536	-	453	-	989	

The number of HR assigned to 37 CHCs (20 treatment and 17 non-care Puskesmas) was 869 people, consisting of 13 sub-groups. The prevalent types of HR were midwives, namely 370 individuals or an average of 10 people per health centre, followed by nurses, with 292 individuals or an average of 7.89 people per health centre. The last type of HR was physical therapists, namely 5 people or an average of 0.14 people per health centre. Furthermore, the types of HR whose average per Puskesmas was less than 1 were dentists (0.27), followed by environmental health workers (0.89), nutritionists (0.89), medical laboratory experts (0.32), biomedical engineering experts (0.95), physical therapists (0.14), and pharmacist (0.49).

The ratio of HR in 37 health centres in Ciamis District was highest for midwives at 26.09 people per 100,000 population and nurses at 20.59 people per 100,000 population. Meanwhile, the smallest ratios were physical therapists at 0.35 people per 100,000 population and dentists at 0.71 people per 100,000 population, as shown in Table 4.

Based on the results of confirmation at the Ciamis District Health Office, the number of non-health HR on duty in 2019 was 381 people, including 48 and 333 individuals at the health Office and CHCs, respectively.

In terms of the type of knowledge at the undergraduate level, a total of 15.62% of the samples were graduates in other fields, with an average of 1.41 people per Puskesmas. Furthermore, 6.97% were in economics with an average of 0.62, 5.11% in management with an average of 0.46, 3.00% were in informatics with an average of 0.27, 2.40% were in administration with an average of 0.22, 0.60% were in law with an average of 0.05 people per Puskesmas, and 0.30% were in education with an average of 0.03.

Based on the results, there were also non-health HR who had attended informatics courses, namely 0.30% with an average of 0.03 people per Puskesmas. The most common type of HR was elementary/junior high/senior high school graduates, namely 65.77% with an average of 5.92 people per health centre. This condition was similar in the health office, where the majority of the samples were other (47.92%), economics (2.08%), management (6.25%), non-informatics, administration (4.17%), law (2.08%), and non-education graduates, as well as those who attended informatics courses. The most common type of HR in health offices was elementary/junior high/senior high school graduates, namely 47.92%, as shown in Table 5.

Table 5. Non-Health HR in Health Center and Health Office Ciamis District.

No	Types of Non-Health HR	CHCs			Health Office		Total	
		Total	%	Average/ Health Center	Total	%	Total	%
1	Bachelor of Administration	8	2,40	0,22	2	4,17	10	2,62
2	Bachelor of Economics	23	6,91	0,62	1	2,08	24	6,30
3	Bachelor of Management	17	5,11	0,46	3	6,25	20	5,25
4	Bachelor of Informatics	10	3,00	0,27	0	0,00	10	2,62
5	Bachelor of Law	2	0,60	0,05	1	2,08	3	0,79
6	Bachelor of Education	1	0,30	0,03	0	0,00	1	0,26
7	Other Bachelor	52	15,62	1,41	18	37,50	70	18,37
8	Informatics Course	1	0,30	0,03	0	0,00	1	0,26
10	Elementary/Secondary/High School	219	65,77	5,92	23	47,92	242	63,52
	Total	333	-	-	48	-	381	-

3.4 HIS Implementation

Based on data from the Balitbangkes Data Management Laboratory from the 2019 Rifaskes results, activities at the Puskesmas supported by HIS application could be divided into 6 groups, namely:

a. Puskesmas Management, consisting of 3 applications, namely the SIMPUS, SP2TP/SP3, and e-Puskesmas.
b. HISDA application.
c. ASPAK.
d. Disease case/health status data, consisting of 10 applications, namely SITT, SIHA, SIHEPI, SI PTM, SI PD3I, SISMAL, SI STBM, E-PPGBM, KS, and SKDR.
e. Primary Care Application (Pcare).
f. HFIS application.
g. BPJS non-capitation claims, consisting of (1) Pap smear/IVA claims, (2) Primary/promotive screening, (3). First-level hospitalization (RITP), (4) Obstetrics and neonates, (5) Ambulance Claims, and (6) Other claims.
h. Puskesmas Report, consisting of:
   (1) Monthly Report on Morbidity Data (LB1)
   (2) Monthly Report on Drug Usage and Request Sheet (LPLPO or LB2)
   (3) Monthly Report on Nutrition, MCH, Immunization, P2M (LB3)
   (4) Monthly Report of Puskesmas Activity Data (LB4)
   (5) Annual Report of Basic Health Center Data (LT1)
   (6) Annual Report of Puskesmas Personnel Data (LT2)
   (7) Annual Report of Puskesmas Equipment Data (LT3).
i. Medical record application.

Table 6. Number of Health Centers Based on the Availability of HIS Ciamis District.

No	HIS Implementation System	Recording System				
		Electronics	Electronics & Manuals	Manuals	Not in Use	Total
1.	Health center management					
	a) SIMPUS	7	10	5	15	37
	b) SP2TP/SP3	10	10	5	12	37
	c) e-Puskesmas	16	11	1	9	37
2.	HISDA	5	7	1	24	37
3.	ASPAK	18	18	1	0	37
4.	Disease Case Data/Health Status					
	a) SITT	14	16	5	2	37
	b) SIHA	15	21	1	0	37
	c) SIHEPI	11	18	1	7	37
	d) SI PTM	13	23	1	0	37
	e) SI PD3I	10	17	5	5	37
	f) E-ISMAL	8	13	2	14	37
	g) SI STBM	13	15	5	4	37
	h) E-PPGBM	18	18	1	0	37
	i) KS	15	22	0	0	37
	h) SKDR	11	13	4	9	37

Table 7. Number of HIS Implementation Activities at Puskesmas Ciamis District.

No	HIS Implementation System	Activity Period	Number of Activities/ CHCs	Total CHCs	Number of Activities	%
	Health center management					
	a) SIMPUS	Monthly	12 times	22	264	0.36
	b) SP2TP/SP3	Monthly	12 times	25	300	0.41
	c) e-Puskesmas	Monthly	12 times	28	336	0.23
	HISDA	Monthly & Incidental	13 times	13	169	0.60
	ASPAK	Incidental	-	37	444	0.60
	Disease Case Data/Health Status					
	a) SITT	Monthly	12 times	35	420	0.57
	b) SIHA	Monthly	12 times	37	444	0.60
	c) SIHEPI	Monthly	12 times	30	360	0.49
	d) SI PTM	Monthly	12 times	37	444	0.60
	e) SI PD3I	Monthly	12 times	32	384	0.54
	f) E-ISMAL	Monthly	12 times	23	276	0.37
	g) SI STBM	Monthly	12 times	33	396	0.54
	h) E-PPGBM	Monthly	12 times	37	444	0.60
	i) KS	Incidental	-	37	444	0.60
	j) SKDR	Incidental	-	28	336	0.46
	Pcare	Monthly	12 times	37	444	0.60
	HFIS	Monthly	12 times	37	444	0.60
	BPJS Non-Capitation Claims					
	a) Pap smear/IVA	Incidental	-	3	117	0.16
	b) RITP	Incidental	-	20	13,620	18.46
	c) Obstetrics and neonates	Incidental	-	35	33,574	45.46
	d) Ambulance Claims	Incidental	-	15	961	1.30
	e) Other Claims	Incidental	-	20	64,690	8.77
	CHCs report					
	a) LB1	Monthly	12 times	37	444	0.60
	b) LPLPO or LB2	Monthly	12 times	37	444	0.60
	c) LB3	Monthly	12 times	37	444	0.60
	d) LB4	Monthly	12 times	37	444	0.60
	e) LT1	Yearly	1 time	37	37	0.05
	f) LT2	Yearly	1 time	37	37	0.05
	g) LT3	Yearly	1 time	37	37	0.05

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No	HIS Implementation System	Activity Period	Number of Activities/ CHCs	Total CHCs	Number of Activities	%
	Medical records (electronic and combined)	Daily	292 times	37	10,804	14.64
Total					132.002	

The implementation of each HIS application did not have the same operational period, where some were daily. In the case of medical records, some of them were monthly, annual, monthly and annual, and incidental.

Due to various reasons, a proportion of health centres in the Ciamis district have not implemented all HIS applications. The results also showed that some HISs were manual, electronic, and a mixture of electronic and manual.

The least used application was HISDA, which was used by 13 CHCs, accounting for 35.14% of the total population. Among these Puskesmas, the availability of data was carried out electronically by 5 of them (13.51%), a mixture of electronic and manual by 7 (18.91%), and manually by 1 (2.70%).

The most widely used HIS applications were ASPAK, SIHA, SI PTM, E-PPGBM, and KS, which were used by all CHCs (100%). Among HIS applications, none of them were carried out electronically.

The most highly used electronic applications were ASPAK and E-PPGBM by 18 Puskesmas (48.65%). Meanwhile, the least used was HISDA, namely 5 Puskesmas (13.51%).

In the implementation of HIS (Table 7), some CHCs did not record all HIS applications. Among those using the recording system, some of them were online, offline, or a mixture of online and offline.

The application with the least online recording system was ASPAK, which was used by 36 Puskesmas. The results showed that none of the Puskesmas had an online recording system is online, with 17 (47.22%) being offline and 19 (52.78%) not using any system, as shown in Table 8.

In 2018, the types of HIS applications carried out by 37 health centres in Ciamis District were recorded at 30 items, with the total number or frequency of activities being 132,002, as shown in Table 7.

Based on the number of activities, the 5 items of HIS activity types with the highest number of activities were (1) obstetric and neonate claims, namely 33,574 times (45.50%) by 35 Puskesmas, (2) RITP claims, namely 13,620 times (18.46%) by 20 Puskesmas, (3) Electronic and combined medical records were 108,04 times (14.64%) by 37 Puskesmas, (4) BPJS non-capitation claims for other claims were 6,469 times (8.77%), and (5) BPJS non-capitation for ambulance claims were 961 times (1.30%) by 15 Puskesmas.

In terms of groups, the 5 HIS items with the highest number of activities were (1) BPJS non-capitation claims, namely 112,962 times (85.58%) by 37 Puskesmas, (2) medical records, namely 10,804 times (8.18%) by 37 Puskesmas, (3). Disease Case data was performed 3,948 times (2.99%) by 33 health centres, (4) Health centre reports were carried out 1,887 times (8.18%) by 37 health centres, and (5) health centre management was performed 900 times (0.68%) by an average of 25 health centre, as shown in Table 2.

The calculation of the number of medical record activities using HIS was based on the assumption that each working day was carried out 1 time per Puskesmas. The working days in Ciamis District were 6 days per week, and in a year, it was 52 weeks x 6 days - 20 national holidays and public holidays, to give 292 working days. The number of medical record activities carried out in Ciamis District in 2019 was 10,804.

In providing services in the building, some CHCs did not have an inter-room computer network. The 2019 Rifaskes results showed that 17 of them (45.95%) had the networks, 15 (40.54%) experienced a total absence, and 5(13.51%) did not use computers.

Patient medical records in 23 CHCs (62.16%) were in the form of family folders, and the remaining 14 (37.84%) were in other forms. In inpatient registration, a total of 10 (27.02%) were online, and the remaining 27 (72.98%) did not apply for registration, as shown in Table 8.

Table 8. Computer Network System in Providing Indoor Services and Online Patient Registration at Puskesmas Ciamis District.

No	Activities	Yes		No	
		Total	%	Total	%
1.	Using computers in in-building services	32 CHCs	86.49	5 CHCs	13.51
2.	Computer networks exist between rooms in the building	17 CHCs	45.95	15 CHCs	40.54
3.	The online patient registration system	10 CHCs	27.02	27 CHCs	72.98

The results showed that 16 activity items must be implemented at the district health office and supported by the HIS application, namely HISda, data communication (komdat), health office management information system (SIM DHO), SIMPUS, SP2TP/SP3, e-Puskesmas, ASPAK, SITT, SIHA, SIHEPI, SI PTM, SIPD3I, SISMAL, SI-STBM, EPPGBM, and SKDR. A total of HIS data on 10 items that had been implemented were available, namely Komdat, e-Puskesmas, ASPAK, SITT, SIHA, SIPTM, SISMAL, SI-STBM, and EPPGBM. Furthermore, the results showed that 2 of them were still manual (SIHEPI and SIPD3I), while HISDA, SIM DHO, SIMPUS, and SP2TP/SP3 had no dataset. Among the data available, only 1 HIS activity (10%) was available electronically, namely, ASPAK and the remaining 9 were a combination of electronic and manual, as shown in Table 9.

In the 10 HIS items, 3 activities (30%) used online recording systems, namely ASPAK, SISMAL, and SI-STBM, and the remaining 7 used a combination of online and offline recording.

System developers were 70% MOH, 20% health office, and 10% private developers, while the data storage was 99% MOH servers and 10% non-government servers, as shown in Table 9.

Based on the confirmation results at the 4 CHCs and the Ciamis District Health Office, until 2020, there were no issued regional policies from the local government or health office regarding the implementation of HIS in healthcare programs. Therefore, the use of the program was considered the main tasks and functions (tusi) of the implementation unit and the duties of each officer. For example, if the HIS application was related to nutrition, then the person in charge of the EPPGBM also had the responsibility of monitoring the nutrition program. The person in charge of the SI-STBM application also had the role of supervising the environmental health program. These decisions depended on the policy of the head of the Puskesmas, issued by the decision letter.

Based on Rifaskes 2019 data, among 37 CHCs in Ciamis District, a total of 24 (64.86%) had special personnel, who were assigned to be responsible for recording, while the remaining 13 (35.14%) did not assign any personnel. The person in charge was only saddled with an additional task but still had the main responsibility of supervising the program implemented by Puskesmas. Based on educational background among 24 staff, 3 (12.5%) had an education in medical records and health information (RMIK) or health information (Infokes), while the remaining 21 (87.5%) had a variety of backgrounds, such as midwives, nurses, public health, environmental health, and nutrition (Table 10).

Table 9. HIS Implemented by Health Office Ciamis District.

No	Health Information Sistem Types	Availability	Recording System	Developer	Data Storage (Server)
1.	HISDA	-	-	-	-
2.	Data Communication (Komdat) Application	Electronics & Manuals	Online & Offline	Health Ministry	Health Ministry
3.	SIM Health Office	-	-	-	-
4.	SIMPUS	-	-	-	-
5.	SP2TP/SP3	-	-	-	-
6.	e-Puskesmas	Electronics & Manuals	Online & Offline	Private	Non-Government
7.	ASPAK	Electronics	Online	Health Ministry	Health Ministry
8.	SITT	Electronics & Manuals	Online & Offline	Health Office	Health Ministry
9.	SIHA	Electronics & Manuals	Online & Offline	Health Ministry	Health Ministry
10.	SIHEPI	Manuals	-	-	-
11.	SI PTM	Electronics & Manuals	Online & Offline	Health Office	Health Ministry
12.	SIPD3I	Manuals	-	-	-
13.	SISMAL	Electronics & Manuals	Online	Health Ministry	Health Ministry
14.	SI-STBM	Electronics & Manuals	Online	Health Ministry	Health Ministry
15.	EPPGBM	Electronics & Manuals	Online & Offline	Health Ministry	Health Ministry
16.	SKDR	Electronics & Manuals	Online & Offline	Health Ministry	Health Ministry

Table 10. Person in Charge of Recording and Reporting at Puskesmas Ciamis District.

No	Person in Charge of Recording and Reporting at the Health Center	There is a Person in Charge of Recording and Reporting		
		Yes	No	Total
1.	Special personnel assigned to be responsible for recording and reporting at CHCs	24 CHCs	13 CHCs	37 CHCs
2.	Educated in RMIK or Infokes	3 CHCs	21 CHCs	24 CHCs

The flow of data and information in the implementation of HIS in the Ciamis District was still carried out partially, without the use of a single data system tailored to the tasks of implementing each program. Furthermore, data flow links were also performed separately for each program. The flow of a program at the Puskesmas was connected to the same program at a higher level, and other programs had different links.

4 DISCUSSIONS

In 2019, the overall HR at the Puskesmas in Ciamis District, specifically medical personnel (general practitioners and dentists), nurses, and midwives did not meet the targets set 10 years ago (2010). The targets were 30 general practitioners per 100,000 population, 11 dentists per 100,000 population, 75 midwives per 100,000 population, and 158 nurses per 100,000 population (BPPSDM, 2019). Based on the results, the ratio of general practitioners, dentists, nurses, and midwives was less than 26.9 per 100,000 population (less than 89.67%), 10.29 per 100,000 population (less than 93.55%), and 137.41 per 100,000 population (less than 86.97%), and 48.91 per 100,000 population (less than 65.21%).

Compared to the minimum standards of staffing by the Annex of Permenkes No. 75 of 2014 (averaged including the category of rural areas) in both treatment and non-treatment Puskesmas, some health HR had not met the requirement. The standards in the treatment health centre were (1) 2 doctors or primary doctors, (2) 1 dentist, (3) 8 nurses, (4) 7 midwives, (5) 1 community health worker, (6) 1 environmental health worker, (7) 1 medical laboratory technologist, (8) 2 nutrition workers, (9) 1 pharmaceutical worker, (10) 2 administrative personnel, and 1 staff. Meanwhile, the standards in the non-care health centre were (1) 1 doctor or primary doctor, (2) 1 dentist, (3) 5 nurses, (4) 4 midwives, (5) 1 community health worker, (6) 1 environmental health worker, (7) 1 medical laboratory technologist, (8) 1 nutritionist, (9) 1 pharmaceutical worker, (10) 2 administrative personnel, and 1 staff 1 person (Ministry of Health, 2014). These results indicated that in the treatment health centre, general practitioners, dentists, environmental health workers, medical laboratories technologists, nutritionists, and pharmaceutical workers were still lacking by 0.8, 0.7, 0.1, 0.65, 0.05, and 0.65 persons per health centre, respectively. The results also showed that nurses, midwives, and community health workers had reached the minimum standard of 0.7, 2.05, and 0.95 persons per health centre, respectively. In non-care health centres, general practitioners met the minimum standard of 0.18 per health centre, followed by nurses (1.97), midwives (7.12), and community health workers (1.18). Dentists, environmental health workers, medical laboratory technologists, nutritionists, and pharmaceutical workers were still lacking by 0.76, 0.12, 0.71, 0.18, and 0.35 people per health centre, respectively.

Health workers at Puskesmas, specifically doctors, midwives, and nurses were also given other responsibilities as implementers of programs, which were often related to their profession. This was because Puskesmas was a health service facility used to organize healthcare efforts, including promotive, preventive, curative, and rehabilitative, with the function of organizing public (UKM) and individual (UKP) health efforts (Menteri Kesehatan 2014).

The implementation of all healthcare efforts required coordination with all stakeholders in the working area to prevent and reduce risks faced by individuals, families, groups, and communities based on the principles of the healthy paradigm. The confirmation at the sample Puskesmas revealed that most of these activities were carried out by medical personnel, midwives, nurses, and management personnel. Apart from health workers, the facility also consisted of non-health staff who must support administrative activities, financial administration, information systems, and other operational activities (Menteri Kesehatan 2014).

The HIS was developed to support the seven national healthcare subsystems, namely (1) health efforts, (2) health study and development; (3) health financing; (4) health HR; (5) pharmaceutical preparations, medical devices, and food; (6) health management and regulation; and (7) community

empowerment (Daryo Soemitro, 2016). The implementation of this program was expected to make the recording and reporting activities at the Puskesmas become an interrelated unit. In its application, the use of ICT was a necessity because HIS increased along with efforts to improve the quality, efficiency, and effectiveness of management and implementation of health development.

At present, the frequency of ICT activities is very high, including in Ciamis District. According to Rifaskes 2019 data, the frequency of HIS implementation at Puskesmas during 2018 in 9 activity items, namely Puskesmas management (25), HISDA (13), ASPAK (37), disease case data (33), Pcare (37), HFIS (37), BPJS non-capitation claims (19), Puskesmas reports (37) and medical records (33) was 132,002 times (Table 7.9) or 452 times per working day. The confirmation from 4 Puskesmas showed that the application of ICT could enhance performance, increase accuracy, and reduce the time required (time and energy efficiency). However, the large amount of applications and the high frequency of ICT activities increased the burden on employees, including health workers. This was because there was no officer specifically handling HIS and the implementation process was complex.

One of the consequences of this situation was that some CHCs in the Ciamis District could not implement all SIMPUS items. Rifaskes 2019 data showed that among 37 Puskesmas, 22 (54.46%) implemented SIMPUS, and only 7 had electronic information. The report also revealed that only 5 of them used online recording systems. Several HIS applications have been implemented by all facilities, such as ASPAK, SIHA, SI PTM, E-PPGBM, and KS. Meanwhile, HISDA had the lowest implementation, namely 13 Puskesmas, accounting for 35.13% of the total population. In the availability of information, some of the facilities used electronic approaches, with ASPAK and E-PPGBM being the most used applications by 18 CHCs (48.65%). Based on the results, HISDA had the lowest usage by only 5 facilities (13.51%). The most common use of the online recording system was observed in KS by 17 samples (45.95%), and the least was HISDA with only 3 samples (8.11%). ASPAK was not carried out using online recording by any of the facilities.

HIS must be managed at the central and regional levels (provincial and district/city), as well as in health care facilities by their respective authorities. This arrangement aimed to (1) ensure the availability, quality, and access to health information, (2) empower the participation of the community, including professional organizations in the implementation of HIS, and (3) achieve the implementation of the HIS within the scope of the national health system, specifically through strengthening cooperation, coordination, integration, and synchronization (Kemsekneg 2014).

The management of HIS in districts/cities was carried out by structural or functional work units that organized government affairs in the health sector. The activities carried out included managing health data and information at the district/city scale, in the form of (1) requesting health data and information from parties related to HIS management, (2) collecting and/or combining routine and non-routine datasets from sources, (3) processing health data, (4). storing, maintaining, and providing health data and information reserves, (5) providing feedback to sources, (6) conducting data analysis as needed, (7) disseminating health information using electronic and/or non-electronic media, (8). sending health data and information needed in the management of provincial and national HIS, and (9) implementing guidance and facilitating the development of HIS in first-level facilities. Meanwhile, the management of the program in health facilities was carried out by the HIS manager in each health facility (Kemsekneg 2014). This regulation implied that the management of HIS at the district level and health facilities must be carried out by a special unit or team or officer who performed these activities. The aim was to facilitate the management of data and information, as well as their flow to various levels. The approach was also used to ensure that all components of the HIS were implemented properly. Therefore, data and information managed in the HIS application at the health facility level were only issued and received by the manager (one door), while the source of data was from program implementers at the health facility. Feedback from higher-level ICT managers (district/city, provincial and central) was received by other managers and then channelled to the relevant people. The management of the HIS at the district/city level must also be carried out by a special unit to ensure that all data and information flow only entered and were issued by the unit. Data from health facilities were forwarded to the relevant field or section, while data inputted for reporting and feedback were obtained from the relevant field or section. This type of ICT management helped to ensure that there was only one data (one data) at the health facility or district level because it was only managed by one unit. Furthermore, this situation facilitated data management, which could be used as a basis for making decisions or policies as a follow-up to information received.

One-stop HIS management by using ICT was the national e-health strategy, which was a comprehensive approach to planning, developing, implementing, and evaluating the use of ICT in the health sector. The aim was to provide a reference for the government, professional/community organizations, academics, practitioners, and other stakeholders in carrying out e-health planning, development, implementation, and evaluation (Permenkes RI 2017). Furthermore, the optimal use of ICT in the implementation of HIS was an aspect of the application of the Electronic-Based Government System (SPBE). The SPBE approach was defined as the administration of government that used ICT to provide services to users (Peraturan Presiden RI 2018).

In the strategic plan of the Ministry of Health (Renstra) for the 2020-2024 period, HIS management was one of the priority programs, intending to stabilize (1) health information services that were faster, valid, resource sharing, (2) integrated electronic-based standard HIS, and (3) the implementation of HIS in health service facilities. Furthermore, data flow optimization was carried out, which involved data reporting from districts/cities through the Komdat application, reporting from all source entities, and data bank development. The fragmentation of the current HIS showed the need to develop the ONE DATA initiative with a strategy through the development of one standard, one standardized metadata, and one portal. The aim was to improve the integration, interoperability, and use of government data whose use was not limited to agencies, but also as a form of fulfilling public information needs (Kemenkes 2020). In connection with one data, a regulation had been issued, namely Presidential Regulation Number 39 of 2019 concerning One Data Indonesia. In this regulation, *Satu Data Indonesia* was defined as a government policy to produce a dataset that was accurate, up-to-date, integrated, and accountable, as well as easily accessible and shared between central agencies and regional agencies. This could be achieved through the fulfilment of data standards, metadata, data interoperability, and using reference codes and master data (Pemerintah Republik Indonesia 2019).

The 2019 Ciamis District Health Profile showed that the number of Health HR was still insufficient when compared to the ratio of the population to be served. This indicates that to prevent an increase in the burden on HR, the management of HIS at the Puskesmas was carried out by non-health HR or others who did not provide direct services to patients and the number had exceeded the minimum standard. However, non-health HR with a background in informatics and informatics courses were few sat health office and Puskesmas, namely 11 individuals, which was insufficient to manage HIS. The short-term countermeasure was to provide courses or training on informatics, including software, hardware, network management, and ICT to existing HR. These individuals were then given the responsibility of managing the entire ICT by using the principle of one data in their respective work units. For the long term, recruitment of non-health HR with a background in informatics was carried out, both ASN recruitment and Government Employees with Work Agreements (PPPK). The type of people managing the program must be permanent employees, namely ASN or PPPK. This was to ensure that they had high responsibility due to employment status, considering the importance of data and information management in policy-making. The approach was expected to help non-health HR support administrative activities, financial administration, information systems, and other operational activities (Menkes RI 2014).

The implementation of data communication in the HIS must be carried out in an integrated manner. The aim was to 1) ensure the availability, quality, and access to priority health data and other data content, 2) optimize the flow of health data from districts/cities and/or provinces to the ministry or vice versa, and 3) realize the implementation of an integrated HIS (Menteri Kesehatan 2014). The MOH regulation implied that the flow of data and information from the health centre to the district health office must be connected to the provincial health office and the MOH in a network. To support this policy, a national information system network (HISNAS) was established, which was an integrated data communication network infrastructure using a wide area network (WAN). The WAN was a telecommunications network that covered a large area and was used to send information over long distances between different local area networks (LANs), and other local computer architectures (Menteri Kesehatan 2014). The results of the 2017 HIS evaluation showed that it was "present but inadequate" for resources (47%), indicators (61%), data sources (51%), data quality (55%), data use and dissemination (57%) and "not adequate" for data management (35%). Based on these results, the overall HIS still needed to be improved (Menkes RI 2012). A similar situation also occurred at the Puskesmas and the Ciamis District Health Office, where the application was not yet interconnected with the HISNAS Network. To improve the

implementation of HIS, the Indonesian Ministry of Health developed a Roadmap for the Action Plan to Strengthen the Indonesian HIS, which in one part mentioned the national model, namely integrated HIS. This national model was defined as an information system that provided an interconnection mechanism between information sub-systems in various appropriate ways. Therefore, data from one system could routinely flow to, go to, or be retrieved by one or more other system. Integration included both technical systems (systems that can communicate with each other) and content (common data sets). The physical form of integrated ICT was an information system application that was linked to other applications.

To implement all ICT applications in Puskesmas in Ciamis District, it was necessary to improve the management of ICT at the local level. Improvements were made to the management of HIS implementing HR, work units, supporting hardware, data and information flow system, internet networks, financing, and regulations or policies on its implementation issued by the Regent or Head of SKPD and as well as the head of Fasyankes. Furthermore, to strengthen the optimization of HIS with one Puskesmas data and one Ciamis District Health Office data connected in the HISNAS Network, it was necessary to establish a one-door system at the Ministry of Health. This had been stated in the Roadmap of the Action Plan for Strengthening the Indonesian HIS, that strengthening the HIS could be carried out by developing a national model, namely an integrated HIS. This model was an information system that provided a mechanism for interconnection between information sub-systems in various appropriate ways. The physical form of an integrated HIS is an information system application that is linked to other applications. Therefore, data from one system could routinely flow, go to, or be retrieved by one or more other systems.

5 CONCLUSIONS

In conclusion, HIS has been implemented in 37 CHCs and the Ciamis District Health Office, but some of the CHCs have not routinely used all HIS applications. The data and information flow from the Puskesmas to the health office and from the district health office to a higher level lacked a one-data and one-door system. This was because each program or field employed its unique approach, leading to fragmentation and a lack of integration with the HISNAS Network.

HIS implementers at Puskesmas and the health office were also in charge of executing health programs involving HIS applications. Consequently, for some certain individuals, the implementation of HIS was considered an additional burden after carrying out the primary duties and functions.

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