UNIVERSITY FOR DEVELOPMENT STUDIES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF EPIDEMIOLOGY, BIOSTATISTICS AND DISEASE CONTROL

FACTORS ASSOCIATED WITH THE UTILIZATION OF HEALTH INFORMATICS SYSTEMS IN THE SAGNERIGU MUNICIPALITY

ABDUL GANIYU ABUBAKARI

2024

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THESIS SUBMITTED TO THE DEPARTMENT OF EPIDEMIOLOGY, BIOSTATISTICS AND DISEASE CONTROL, SCHOOL OF PUBLIC HEALTH, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PUBLIC HEALTH

OCTOBER, 2024

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Name of student	Signature	Date
Abdul Ganiyu Abubakari		14-10-24

Supervisor's Declaration

I hereby declare that the preparation and presentation of this thesis was supervised following the guidelines on supervision of thesis laid down by the University for Development Studies.

Name of Supervisor	Signature	Date
Dr. Abdulai Tanko		15-10-24

ABSTRACT

Background: Health Informatics Systems (HIS) are crucial globally for enhancing healthcare quality and service coverage. They provide essential data for vital decision-making in healthcare, impacting both operations and strategy. Despite their importance, Ghana faces challenges with HIS quality and usage, especially at district health offices and facilities. This affects effective decision-making in healthcare.

Aim: The study assessed factors associated with the utilization of Health Informatics Systems (HIS) among healthcare providers in Sagnerigu Municipality health facilities. Specifically, the study assessed the demographic, personal, institutional, and technical factors affecting HIS utilization.

Methodology: An institution-based cross-sectional study was conducted in health facilities under Sagnerigu Municipality. A total of 249 healthcare providers were selected from the health facilities using multiple sampling techniques. The data was collected using a standard structured and self-administered questionnaire built in Kobo Collect. The data was cleaned in excel and exported into SPSS version 26 for further statistical analysis. Chi-square test of independence and binary logistics regression were used to establish factors associated with HIS utilization.

Results: Out of the 249 respondents, overall utilization of HIS was low (59.44%, n=148). Qualification ($\chi2=15.687$, $P<0.001$), Sub-municipality ($\chi2=35.706$, $P<0.001$), and Facility work experience ($\chi2=20.207$, $P<0.001$) were the demographic factors found to be statistically significantly associated with utilization of HIS. [Personal factors such as confidence in HIS usage($\chi^2 = 30.165$, $p < 0.001$), regular update of HIS skills($\chi^2 = 7.633$, $p = 0.006$), Computer competence(($\chi^2 = 8.766$, $p = 0.003$), with an overall ($\chi2=15.480$, $P<0.001$, AOR=0.046[0.008 – 0.1731]) were found to be statistically significant. Institutional factors such as HIS training($\chi2=9.567$, $p=0.002$), Communication($\chi2=4.567$, $p=0.033$), adequate resourses($\chi2=62.461$, $p<0.001$), provision of incentives($\chi2=0.133$, $p=0.715$) with an overall ($\chi2=72.756$, $P<0.001$, OR=0.518, 95%CI [0.4048 – 0.6322]) were found to be statistically significant, technical factors such as software reliability(($\chi2=30.461$, $p<0.001$), easy to navigate(($\chi2=33.489$, $p<0.001$) and compartbility on other devices($\chi2=16.813$, $p<0.001$) with an oveall ($\chi2=72.756$, $P<0.001$, OR=0.281,95%CI [0.261 – 0.312]) were all found to statistically significant. Healthcare provide who agreed that these factors exisit reported low HIS utilization.

Conclusion: In conclusion, the critical role of personal, technical, and institutional factors in influencing the utilization of Health Informatics Systems (HIS) was revealed. Higher education, leadership support, system reliability, and adequate training significantly contribute to increased HIS usage. It is recommended that healthcare facilities invest in continuous training, strengthen leadership support, and improve technical infrastructure to enhance HIS adoption and efficiency.

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I am deeply indebted to the management and staff of the Sagnerigu Municipal Health Directorate, as well as the healthcare facilities and the participants who generously agreed to be a part of this study. Their cooperation and assistance have been instrumental.

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I therefore sum up by thanking all those who contributed overtly and covertly to make my education in general successful.

DEDICATION

To my family and friends.

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LIST OF ABBREVIATIONS

ANC	Antenatal Care
CAPI	Computer-Assisted Personal Interview

CHAG	Christian Health Association of Ghana
CWC	Child welfare Clinic
DHIMS2	District Health Information Management System 2
DHIS	District Health Information System
eHIS	Electronic Health Information Systems
EHR	Electronic Health Records
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HAMS	Health Administration Management System
HIMS	Health Information Management Systems
HIS	Health Informatics System
HMIS	Health Management Information System
IT	Information Technology
LHIMS	Lightwave Health Information Management System
MoH	Ministry of Health
PNC	Postnatal Care
RHIS	Routine Health Information System
SMA	Sagnerigu Municipal Assembly
SPSS	Statistical Package for Social Science
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globally, the health sector is continuously evolving to ensure the delivery of effective and efficient healthcare services. Over time, there has been a shift from curative care to preventive care, from hospital-centered care to community and public health services, and from centralized to decentralized healthcare models. Global health is always changing to guarantee that patients receive high-quality, cost-effective care. Curative care has become preventive care, hospital-centered care has become community and public health services, and decentralized healthcare models have replaced centralized healthcare models (Addise et al., 2023a). One of the biggest changes in healthcare management in recent years has been the transition from paper-based to electronic systems (Seid et al., 2021). This is because technology has the potential to improve healthcare delivery, streamline procedures, and improve patient access to complete and accurate health informatics by implementing electronic health Informatics systems (eHIS) (Simoes, 2015). Electronic healthcare management is the shift from traditional paper-based systems to electronic-based management systems. This shift is driven by the recognition of the potential benefits of technology in improving healthcare delivery, streamlining processes, and enhancing access to accurate and comprehensive health Informatics through the implementation of electronic health Informatics systems (eHIS) (Simoes, 2015). However, the formal introduction of technology into Ghana's public health system started in 2014 (Afarikumah, 2014).

The World Health Organization (2018) states that Health Informatics Systems (HIS) are essential to the efficient management and sharing of health-related informatics, and they are a crucial component of contemporary healthcare delivery. According to Dagnew et al. (2018) and Shiferaw et al. (2017), HIS is one of the six essential building blocks of healthcare systems made for gathering, analyzing, and sharing health-related data in order to enhance patient outcomes. Consequently, these systems comprise an extensive array of technologies, procedures, and assets intended to gather, store, retrieve, and apply health informatics for diverse objectives. Enhancing patient outcomes while raising the standard, safety, and effectiveness of healthcare services is the main objective of health informatics system (Wijayati et al., 2019). However, using health informatics for decision-making processes is how its benefit is realized (Tilahun et al., 2018).

Systems for health informatics are essential to the administrative and clinical operations of healthcare institutions. In order to help healthcare providers monitor patient health, make well-informed decisions, and enhance overall healthcare delivery, they offer a framework for the collection, management, and analysis of health data (Sanjuluca et al., 2022) These systems consist of both paper-based and electronic components, albeit in recent years, digital technologies have received more attention. Additionally, the electronic component of health informatics systems would be highlighted in this study (Sanjuluca et al., 2022). These systems consist of both paper-based and electronic components, albeit in recent years, digital technologies have received more attention.

The District Health Management Information System 2 (DHIMS2) is the principal system used by the Ghana Health Service (GHS) in Ghana since 2012 for the gathering, reporting,

and analysis of health service data to support decision-making. To streamline health informatics management procedures and enable service data reporting, DHIMS2 has been installed in all Ghanaian healthcare facilities. But facility-based management systems have recently advanced, with the use of programs like Hospital Administration and Management System (HAMS), Lightwave Health Information Management System (LHIMS) and Helix (Mendako et al., 2022). These solutions have been used in conjunction with DHIMS2 to improve the management of informatics in healthcare settings.

One of the main pillars of the global healthcare system is the Health Informatics System (HIS). Systems for health informatics are becoming more and more crucial for assessing and enhancing the availability and caliber of healthcare services. For operational and strategic decision-making that improves health and saves lives, fast and reliable health informatics is essential for facilities in Ghana, particularly Sagnerigu Municipal, are encountering hurdles in implementing and exploiting health informatics systems, despite their relevance (Abajebel et al., 2011).

Health Informatics system adoption varies across countries worldwide. The use of health informatics systems (HIS) in public health facilities is frequently low in developing nations, including Ghana. Prior research has repeatedly demonstrated that African nations use HIS at a low rate (Aquil et al., 2015) Comparably, underuse of health informatics systems in Ghana affects decision-making processes and yields low-quality health data (Kanfe et al., 2021). Comparably, underuse of health informatics systems in Ghana affects decision-making processes and yields low-quality health data (Essuman et al., 2020).

Demographic factors (Kanfe et al., 2022) and institutional factors (Shiferaw et al., 2017), personal factors among healthcare providers, and technical factors (Wude et al., 2020) are some of the determinants. This study assessed the factors associated with the utilization of health informatics systems among healthcare providers in Sagnerigu municipality by incorporating the factors from the body of existing literature.

1.2 Problem Statement

A key instrument for raising the standard of care given by medical facilities and promoting individual health is health informatics (Kanfe et al., 2021). Facility managers can also monitor their performance level with the aid of health informatics systems (Abajebel et al., 2011). This can be used by policymakers to monitor the achievements and failures of health programs. Health informatics is widely used for decision-making at all levels of healthcare facilities, although it is rarely applied in low- and middle-income countries like Ghana.

According to Shiferaw et al., (2017), between 10% and 56% of Africa's population uses health informatics systems. There are still flaws in Ghana's healthcare system, even with advancements in health informatics. According to research carried out locally in Ghana's Eastern region (Essuman et al., 2020) and Brong Ahafo region (Odei-Lartey et al., 2020) the health informatics system is generally used in public health facilities, with reported rates of 58.9% and 26%, respectively. As a result, these findings suggest that decisions made in the healthcare industry are insufficient and not supported by evidence. Such actions may lead to improper use of health resources, incorrect setting of priorities, and unfulfilled patient needs.

Numerous factors that affect the use of health informatics systems have been noted in existing literature. Key determinants of health informatics system utilization have been identified as demographic factors (Kanfe et al., 2021), institutional factors (Shiferaw et al., 2017), technical and personal factors (Seid et al., 2021).The use of health informatics systems and related aspects by healthcare professionals in delivery of healthcare service are inadequately studied in Sagnaergiu Municipality despite the substantial research in the area of health informatics. The municipality is one of the municipalities that are currently adopting HIS and therefore there is the need to research on the factors that can influence their usage of it as reported in dhims2 data report rate is 32%(SMHD annual report). Thus, the purpose of this study was to assess how health informatics systems are used in public health facilities in the Sagnerigu Municipality of Ghana, as well as the related factors that influence healthcare providers' adoption of these systems.

1.3 Aim of the Study

To assess the factors associated with the utilization of Health informatics systems (HIS) in the Sagnerigu Municipality.

1.4 Objectives of the study

i. To determine the demographic factors factors associated with the utilization of HIS in Sagnerigu Municipality.

ii. To examine the personal factors associated with the utilization of HIS in Sagnerigu Municipality.

iii. To analyze the institutional factors associated with the utilization of HIS in Sagnerigu Municipality.

iv. To establish the technical factors associated with the utilization of HIS in Sagnerigu Municipality.

1.5 Research Questions

i. What are the demographic factors associated with the utilization of HIS in Sagnerigu Municipality?

ii. What are the personal factors associated with the utilization of HIS in Sagnerigu Municipality?

iii. What are the institutional factors associated with the utilization of HIS in Sagnerigu Municipality?

iv. What are the technical factors associated with the utilization of HIS in Sagnerigu Municipality?

1.6 Justification of the Study

Although the use of electronic health informatics systems (HIS) has grown in popularity worldwide, Ghana and the research sector are relatively new to it. Nevertheless, data indicates that many healthcare providers may not be fully adopting HIS despite its adoption (Odei-Lartey et al., 2020). Furthermore, there is limited research in the field that examine how HIS is used and the related variables that affect that usage. Using health informatics systems (HIS) is critical to raising the standard and effectiveness of medical care. To effectively encourage HIS adoption and optimize its potential benefits, it is imperative to

comprehend the aspects that impact its utilization. Although a number of factors influencing HIS utilization have been found in earlier research, these aspects must be examined within the particular context of the study location.

Through examining the variables that affect HIS usage, the research can offer insightful recommendations for enhancing the uptake and application of these systems. Policymakers, healthcare administrators, and system developers in Ghana and other comparable contexts might benefit from the findings by learning about the critical areas that require attention to improve the efficient use of HIS. In the end, this may result in enhanced decision-making, resource allocation, and healthcare delivery. Additionally, the study will offer insightful information to help government organizations, the Ghana Health Service (GHS), the Ministry of Health (MoH), and healthcare facilities make evidence-based decisions and enhance the provision of healthcare.

Lastly, this research will add to the body of knowledge already available on the use of health informatics systems, specifically in the study region.

1.7 Operational definition of terms

i. ***Health Informatics Systems****:* Health informatics systems encompass a range of technologies and methods used to manage and analyze healthcare data. These systems include electronic health records (EHR), health information exchange (HIE), clinical decision support systems (CDSS), and other software and hardware solutions designed to improve the efficiency and effectiveness of healthcare delivery.

ii. ***Utilization:*** it pertains to how extensively health informatics systems are employed within the healthcare facilities to provide healthcare services in the Sagnerigu Municipality.

iii. ***Factors:*** various aspects that influence the utilization of health informatics systems in the Sagnerigu Municipality.

iv. ***Association*****:** refers to the relationship between various factors or variables and the extent to which health informatics systems are utilized within healthcare settings.

v. ***Demographic Factors:*** These are characteristics of the healthcare providers such as age, gender, education level, working experience that may influence how healthcare providers interact with health informatics systems in providing healthcare

vi. **Personal Factors:** these refers to factors such as attitudes, beliefs, perceptions, health and IT literacy, and previous experiences related to health informatics systems that may influence the utilization of health informatics systems in providing healthcare

vii. **Institutional Factors:** these include factors such as organizational culture, leadership support, resources, infrastructure, policies, and workflows related to the adoption and use of health informatics systems at the service provider level in providing healthcare delivery

viii. **Technical Factors:** this refers to factors such as system usability, interoperability, reliability, performance, security, and accessibility of HIS within the healthcare environment.

1.8 Organization of the Thesis

In order to guarantee a logical and consistent presentation of the research, this study was organization into six chapters. Chapter one contains the background, problem statement, objectives, research questions, aims, and study significance. Chapter two unfolds literature on the utilization of health informatics systems focusing on demographic, personal, institutional and technical factors influencing their adoption and use. The research design and technique used in the study is explained in the third chapter. It contains information about the research field participants, sampling strategies, methods for gathering data, and strategies for data processing and analysis. Ethical issues is also discussed in this chapter. The results of the study based on the gathered data is presented in Chapter four. The findings were examined and interpreted in line with study's objective. Chapter five is the discussion of the findings whilst the study's main conclusions and recommendations drawn from the study is contained in the final chapter six

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The study assessed utilization of Health Informatics Systems (HIS) in Sagnerigu Municipality public healthcare institutions. Reviewing and analyzing the body of research in the field is essential to gaining a thorough understanding of this subject. This chapter offers a thorough analysis of pertinent studies, research papers, and academic publications that provide insight into the factors impacting the utilization of HIS.

2.1 Overview of Health Informatics System

The system that combines data collecting, processing, reporting, and informatics use required to increase health service effectiveness and efficiency through improved management at all health service levels is known as the Health Informatics System(WHO-South-East Asia, 2018). Rather than being used for the delivery of healthcare, the Health Management Informatics System (HMIS) is an informatics tool specifically created to support the administration and planning of health programs(Bañez-Coronel et al., 2018). According to Shiferaw et al.,(2017), one of the six essential building blocks of healthcare systems created for the gathering, analyzing, and sharing of health-related data in order to enhance healthcare outcomes is a health informatics system.

Globally, HIS is becoming more electronic rather than paper-based due to the proliferation of technology. Achampong (2022) list a few of the electronic health records systems that have been implemented in Ghana , including GHS IHOST, Hospital Administration Management System (HAMS), District Health Information System (DHIS), District Health

Information Management System (DHIMS2), Health Informatics Management Systems (HIMS), Helix, Lightwave Health Information System (LHIMS), and Hospital Administration Management Systems (Sneha & Misra, 2017).

While the introduction of electronic health records (EHR) has received relatively little attention in poor nations, the discussion surrounding EHRs has gained steam in industrialized nations. The main areas of concern for health informatics technology in affluent nations have been inadequate funding, privacy, and security(Were & Meslin, 2011). However, cultural differences like the patient-provider connection and a lack of enthusiasm in EHR deployment, developing nations have similar difficulties, albeit with slight variances (Were & Meslin, 2011).

Ghana, however, has shown a noteworthy dedication to implementing EHR. In Ghana, the process of creating a paperless health records system got underway in the late 1980s (Were & Meslin, 2011). The Ghanaian government developed national initiatives to encourage the use of EHRs in 2010. By establishing support for health informatics management, eHealth sector creation, and improved ICT access, these policies sought to facilitate the expansion of the healthcare industry (Adegbore & Omowumi, 2021). These programs helped Ghana move closer to having a paperless healthcare system by igniting conversations on health informatics there.

But problems remained since there was a lack of health informatics education, which affected ICT spending and human capital (Seid et al., 2021) These issues made it difficult

for EHR to be implemented and used effectively in Ghana, which made it necessary to have a thorough grasp of the potential and challenges present in the local environment.

2.2 Utilization of HIS Among Healthcare Providers

According to Amoah et al. (2021), Ghanaian public hospitals personnel HIS adoption is on the right direction. On the other hand, HIS utilization among South African healthcare practitioners was found to be quite low by (Kuek & Hakkennes, 2020), with a significant number of providers continuing to maintain paper-based data.

In Kenya, a study revealed weak health Informatics utilization, particularly in the context of routinely collected health Informatics. The study highlighted that only 51% of health professionals utilized health Informatics systems and emphasized the lack of skilled human resources for effective data collection, processing, analysis, interpretation, and dissemination (Mensah, 2022)

A notable research endeavor undertaken by (Kondoro et al., 2022) extensively explored the degree of utilization of Health Management Informatics Systems (HMIS) by employing a precise operational definition as a benchmark. The outcomes of their investigation revealed a utilization rate of 69.3% across the surveyed entities.

Moreover, a Ghanaian study showed that, in order to report to higher healthcare levels, 15.3% of private medical facilities only used the District Health Information System 2 (DHIS2) (Mohammad et al., 2023). Similarly, healthcare practitioners in Ghana's Eastern region did not use health informatics systems at all, according to a cross-sectional survey (Essuman et al., 2020).

2.3 Factors Associated with the Utilization of HIS

Several factors have been found to be associated with the utilization of HIS by healthcare providers in health facilities globally where Sagnerigu Municipality is not exceptional (Essuman et al., 2020; Dagnew et al., 2018; Jawhari et al., 2016). These factors include demographic, personal, technical, and institutional factors.

2.3.1 Demographic Factors Associated with Healthcare Providers Utilization of HIS

Healthcare professionals' use of HIS has been found to be influenced by demographic characteristics, including age, gender, and educational attainment(Jimenez et al., 2023). In a 2019 study conducted in Korea, it was discovered that women used Health Informatics Systems (HIS) at a significantly higher rate of 87.6% than men (83.2%). In addition, the study found that those under 40 had a higher utilization rate of 94.7% than people over 60, who had a utilization rate of 69.1% (Sanjuluca et al., 2022).This was observed among younger age groups.

Similarly, an Australian study by (Khir, Khairina Ahmad; Ismail, Nazlin; Balu, 2017) showed that hospital staff members' attitudes regarding informatics systems and their level of digital literacy varied according to their age. Male health care providers had higher odds of using regular health informatics (2.19) than female counterparts, according to a different cross-sectional study carried out in Ethiopia by Dagnew and colleagues(Dagnew et al., 2018). Additionally, (Kipturgo et al., 2014) found that health professionals' attitudes regarding computerization in Kenya are influenced by their age.

Additionally, a Kenyan study found that health workers' attitudes regarding computerization are influenced by their educational background (Sukums et al., 2014). Conversely, a cross-sectional study conducted in Kenya's Nyando Sub-County found no evidence of a significant correlation between the professional qualification of staff members and the degree of facility and informatics utilization in decision-making, or between the two (Otieno et al., 2020). According to a recent study conducted in the southwest of Ethiopia, healthcare workers' knowledge, attitudes, and associated factors for using the district health informatics system were influenced by their age and job experience (Kanfe et al., 2021).

2.3.2 Personal Factors Associated with Healthcare Providers Utilization of HIS

The adoption of Health Informatics Systems (HIS) is largely shaped by behavioral factors, with attitudes toward technology and perceived ease of use emerging as key determinants (Magsamen-Conrad et al., 2020). These elements come under the category of behavioral/personal factors in the context of this study. Numerous studies have looked into how these elements affect the use of health informatics systems, and the results show that competence, motivation, attitude, and confidence are important behavioral determinants that affect the adoption and use of health informatics in particular contexts.

A study done in Ghana's Eastern Region found that personal factors like a lack of general computer proficiency, ignorance of HIS, a lack of use of HIS technology, a fear of technology, an excessive workload, and poor inter-user communication are significantly linked to health professionals' use of HIS (Essuman et al., 2020) Comparable results were found in Ghana (Achampong, 2022) and other underdeveloped countries (Malik et al.,

2009) demonstrated that the adoption of HIS is influenced by personal characteristics. The majority of these variables are probably dominating individual capacity variables, which are occasionally linked to the use of new technology. A person's decision to switch from one method of doing something to another can occasionally be difficult. This is likely due to a variety of factors, including a lack of general competence, knowledge about the technology, inadequate technology usage, fear of technology, an excessive amount of work, and poor user communication (Adegbore & Omowumi, 2021).

Furthermore, (Sood et al., 2008) and (Jawhari et al., 2016) found that impediments to the adoption of technology in healthcare delivery can be attributed to individual variables in their study. According to a study by (Alexander, 2023) the three most often mentioned individual issues are staff shortages with sufficient knowledge of informatics technology, physician aversion to using HIS, and unclear return on investment. HIS utilization was found to be substantially correlated with attitudes regarding the use of health informatics systems and data analysis skills by (Shiferaw et al., 2017) and (Dagnew et al., 2018).

The majority of study participants (73.79%) had a good understanding of HMIS, and 60% felt confident enough to use data for decision-making, according to a cross-sectional study on the use of Routine Health Information System (RHIS) and related factors among health professionals working at public health facilities in Hadiya Zone, southern Ethiopia (Jimenez et al., 2023). Furthermore, motivated personnel had two times higher probabilities of using HMIS data than unmotivated staff, according to a study by (Agyemang et al., 2023).

2.3.3 Technical Factors Associated with Healthcare Providers Utilization of HIS

A system cannot generate the informatics needed for decision-making without competent staff and well-defined policies and procedures. Enhancing technical proficiency or learning about the technology used to increase data availability and quality is the main way to improve the usage of health informatics. These essential components and abilities are the foundation of an effective and efficient health management informatics system, even while technical rigor is unquestionably necessary in informatics systems (Nsiah et al., 2022). A study conducted by Gabarron et al. (2021) found that certain technical factors, such as a lack of computers, internet access, technical support, low proficiency with data quality, absence of security policies and guidelines, and a shortage of trained personnel, had an impact on the use of HIS.

Additionally, a study carried out in north Ethiopia by Dagnew et al., (2018) revealed that, more than 70.1% of the respondents in north Ethopia lacked professional knowledge about national indicators and professional data analysis skills respectively. In addition to their findings, the likelihood of using HIS was 3.28 times higher for health professionals compared to those who are not using standard indicators in their offices. In a similar vein, (Adegbore & Omowumi, 2021) and (Seid et al., 2021) found that health professionals were more adept at using the health informatics system when they had standard indicators in their working office as opposed to when they did not.

In addition, a cross-sectional study carried out in Ethiopia provided insight into the variables affecting health providers' use of health informatics. The results showed that people were more likely to use health informatics when they thought that Health

Management Informatics Systems (HMIS) formats were simpler than when they thought that they were more complicated. Furthermore, according to the study, the likelihood of health practitioners using health informatics was 2.5 times higher for those who regularly submitted data (Jimenez et al., 2023).

2.3.4 Institutional Factors Associated with Healthcare Providers Utilization of HIS

The use of Health Informatics Systems (HIS) has been found to be significantly influenced by organizational characteristics, which include management support, technical assistance, and training (Amoah et al., 2021). The significance of these organizational characteristics is further highlighted by a recent study carried out in Ghana by Otieno et al., (2020). Their results show that having thorough training in Health Management Informatics Systems (HMIS), having clear process manuals available, and having supportive supervision are all highly correlated with using HIS.

A facility-based cross-sectional study carried out in Ethiopia found that routine health informatics data utilization is nearly twice as common among health practitioners who receive regular feedback as it is among their peers (Seid et al., 2021). In addition to their conclusions, health professionals are positively associated with HIS when they receive consistent supervision and training. Encouraging health providers to recognize gaps in their performance and make improvements is facilitated by supportive supervision.

Institutional factors such as a lack of general IT infrastructure, the cost of electronic medical records resources and facilities, maintenance, a lack of technical personnel, a lack of reliable EMR software, inadequate internet bandwidth, and security concerns regarding

patient privacy were found to be significantly associated with EMR utilization in a study conducted in Ghana by (Essuman et al., 2020). Due to a number of factors, including high maintenance and procurement costs for health technology infrastructure, a lack of financial incentives and priorities, inadequate internet and electricity connectivity, and low computer skills among primary users, healthcare system utilization is typically low in Sub-Saharan African countries (Jawhari et al., 2016) . Nonetheless, the adoption of a phased deployment procedure, training end users, a suitable implementation plan, funding, and a well-chosen health technology system will all help to make HIS use easier.

Furthermore, it was discovered that routine health informatics system utilization was significantly correlated with HMIS training, data analysis proficiency, supervision, frequent feedback, and the kind of healthcare facility (Shiferaw et al., 2017). Informatics use culture, planning, supervision, resource availability, and governance were found to be predictors of efficient routine health informatics utilization in a cross-sectional study conducted in Uganda among medical professionals in private health facilities(Asiimwe, 2015). A related study conducted in Ethiopia discovered a correlation between HIS use and effective governance (Dagnew et al., 2018).

A thorough research from Uganda emphasized how important it is for healthcare providers to receive training in computer software, data management, and Health Management Informatics Systems (HMIS). According to the study, their inability to understand standard indicators and evaluate the quality of the data was impeded by their lack of training in these areas, which led to a restricted use of routine health data(Asiimwe, 2015).

In addition, significant research conducted by Wude et al., (2020) and Shiferaw et al., (2017) has brought attention to the impact of training on the utilization of Health Management Informatics Systems (HMIS), showing that those with training have a greater inclination to use HMIS than those without training. Analogously, studies carried out in Ethiopia have demonstrated that a significant segment of the health workforce, specifically 46.6% (Wude et al., 2020), 63.1% (Finamore et al., 2021) and 57.6% (Dagnew et al., 2018), have been provided with supportive supervision by their direct supervisors. Interestingly, these healthcare practitioners have almost three times higher odds of using HMIS than their peers who did not undergo this kind of monitoring.

2.4 The conceptual model

The technological acceptance model (TAM), which was first presented in the 1980s and has been extensively utilized by researchers to examine technology acceptability, is adopted in this study (Zaman et al., 2021). TAM offers a framework for examining how outside factors influence a person's intention to employ a specific technology. Perceived ease of use (PEOU), perceived usefulness (PU), attitude toward using (ATU), behavioral intention to use (ITU), and actual usage (AU) of a computer system are the five main factors of the original TAM (Zaman et al., 2021) External variables, such as social factors, have an impact on people's initial impressions of new technologies and have an impact on PEOU (the degree to which people believe using the technology will require little effort) and PU (the degree to which people believe the technology will improve their performance). These variables then impact views regarding technology and, in the end, forecast its actual use.

Studies have found that TAM can effectively explain differences in technology use behaviour in different contexts and situations, including the health context, for eHealth records (EHRs) (Al-Otaibi et al., 2022; Holden, 2012), telehealth (Hsieh et al., 2022; Daniel et al., 2021), mobile health technologies (Alsyouf et al., 2022; Alsyouf et al., 2018; Pagalday-Olivares et al., 2017), cloud-based services (Gupta et al., 2022), medical devices and telemonitoring tools (Maskeliūnas et al., 2019; Infarinato et al., 2020), assistive technology (Chimento-Díaz et al., 2022), and software products (Kakar,2017). Additionally, previous studies have used TAM as a theoretical framework to explore the students' acceptance of technology in educational settings, such as web-based learning, online courses, and clinical imaging portal for developing healthcare education(Walle et al., 2023). Walle et al., (2023) found that nursing students with more positive attitudes towards EHRs in education were more likely to believe that the systems were easy to use.

While TAM provides a robust framework for assessing user acceptance, other models like the Unified Theory of Acceptance and Use of Technology (UTAUT) and Diffusion of Innovation (DOI) theory offer alternative perspectives by integrating additional factors such as social influence and facilitating conditions. However, TAM was chosen for its simplicity and specific focus on the core psychological factors that directly influence technology adoption, making it more suitable for the focused scope of this study which aims to isolate the impact of user perceptions on HIS utilization.

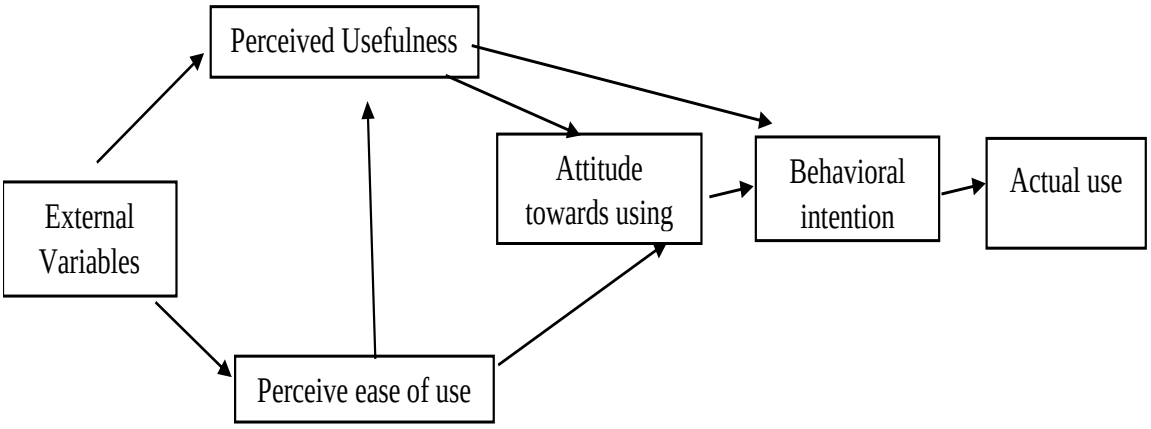

Fig 2.1 shows the Original Technological Acceptance Model Source: (Zaman et al., 2021).

2.5.1 Operationalization of TAM Constructs

2..1 Perceived Usefulness (PU): This TAM component describes an individual's level of belief that utilizing a specific system would improve their ability to accomplish their job (Davis, 1989). Regarding the study, this has to do with how medical personnel view HIS as helpful in enhancing patient care, decision-making, and overall delivery efficiency. For instance, if HIS makes it easier for them to obtain patient records, helps them make clinical judgments quickly, or enhances team member communication, healthcare professionals might find HIS beneficial. Measurement involved Likert-scale items reflecting expectations of HIS's impact on clinical outcomes and operational efficiency.

2.4.2 Perceived Ease of Use (PEOU): PEOU stands for perceived ease of use, or how much someone believes utilizing a specific technology will need no work at all (Davis, 1989). Within the framework of the study, it concerns the perceived ease or difficulty of

HIS use by healthcare practitioners. Perceived ease of use is influenced by a number of factors, including system complexity, user interface design, offered training, and technical support (Al-Otaibi et al., 2022). If healthcare workers regard HIS to be intuitive and user-friendly and if they receive sufficient training and support, they are more likely to adopt it. It was measured by users' responses to statements regarding their direct interactions with HIS.

2.4.3 Attitude Towards Use (ATU): Perceived ease of use and usefulness have an impact on attitudes toward use (Davis, 1989). It represents people's general attitudes whether favorable or unfavorable about utilizing technology (Alsyouf et al., 2022). In this study, healthcare professionals' opinions about the usability and convenience of HIS use influence how they feel about utilizing it. While negative attitudes may result in resistance or reluctance in adoption, positive attitudes are linked to stronger intentions to use HIS. It influences users' motivation to engage with the technology and was assessed through attitudes toward daily use and integration into practice.

2.4.4 Behavioral Intention to Use (BI): Behavioral intention to use refers to individuals' willingness to use a technology (Davis, 1989). It is influenced by attitudes towards use, perceived usefulness, and perceived ease of use (Davis, 1989; Infarinato et al., 2020). In the context of this study, healthcare professionals' behavioral intentions to use HIS are influenced by their attitudes towards HIS and their perceptions of its usefulness and ease of use.

2.5 Proposed Constructs and Research Hypothesis

For this study, TAM was utilized with constructs of demographic, personal, institutional and technical factors which include self-efficacy, general computer skills, and training on any health informatics systems to study how these factors are directly associated with utilization of HIS.

After a thorough assessment of the literature, a number of factors have been shown to have an impact on the use of health informatics systems (HIS). These factors, which include demographic, personal, institutional and technical factors all work together to influence how HIS is adopted and used. Figure 3.1 below shows the direct link between these parameters, highlighting their complex interaction and importance in comprehending health informatics system utilization trends. TAM's constructs of perceived usefulness, perceived ease of use, and behavioral intention to use was examined in this study with respect to HIS The proposed TAM constructs is shown in figure 2.1.

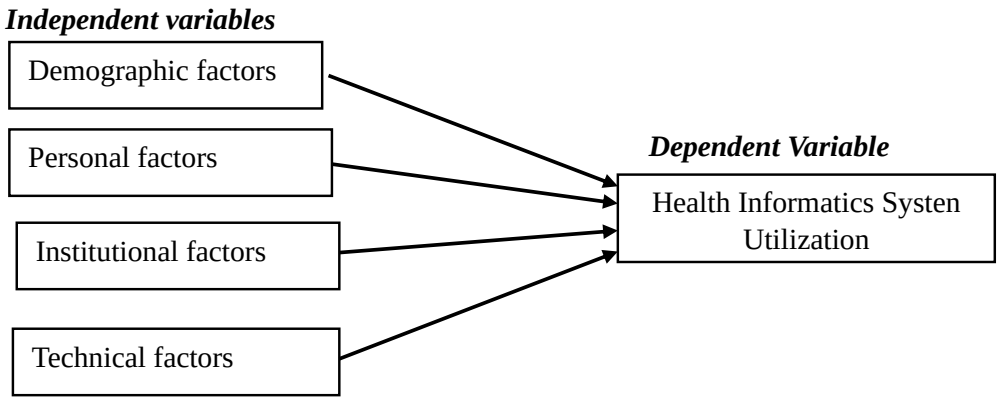

Fig 2.2: Conceptual framework *Source: Author's Construct, 2024*

2.5.1 Demographic Factors: The opinions and attitudes of healthcare professionals regarding HIS may be influenced by demographic factors such as age, gender, educational attainment, and work experience. For instance, compared to elder healthcare personnel, younger ones can be more willing to adopt technology. Compared to older professionals, younger healthcare workers often have more positive opinions regarding the adoption of health information technology (HIT), according to research by (Magsamen-Conrad et al., 2020). Younger people are frequently more accustomed to and at ease with technology, which may have a favorable impact on their adoption of and use of health informatics systems (HIS).

Research conducted by (Mensah, 2022) indicates that attitudes on the adoption of technology may be influenced by gender, with men typically exhibiting higher levels of acceptance than women. Gender's impact on HIS use, however, could change depending on the situation and culture.

Greater acceptability and use of HIT among healthcare workers has been linked to higher educational degrees (Epizitone et al., 2023). Advanced degree holders in the healthcare industry might be more cognitively and problem-solving skilled, which could help HIS adoption.

2.5.2 Personal Factors: HIS utilization can be impacted by individual attributes such as personality traits, prior technological experiences, and perceived self-efficacy. Higher adoption and usage of HIS may be demonstrated by healthcare personnel who are more tech-savvy and self-assured. Prior Technology Experience: Studies show that sentiments

regarding HIS are significantly influenced by prior technology experience. According to (Khubone et al., 2020) people who have previously used electronic health records (EHRs) or other health information systems are more likely to recognize the advantages of HIS and feel more comfortable utilizing them.

It has been found that self-efficacy, or the conviction that one can accomplish a particular activity, is a predictor of technology adoption and use. Research by (Of et al., 2021) has demonstrated that healthcare professionals are more likely to adopt and use HIS effectively if they have better levels of self-efficacy when it comes to using technology.

2.5.3 Institutional Factors: Institutional factors that impact HIS use include organizational culture, leadership support, training and implementation resources, and the perception of HIS's fit with current workflows. Healthcare practitioners' adoption of HIS can be aided by organizational leaders' support, successful change management techniques, and incorporation of HIS into standard clinical practice. Institutional Culture and Support for Leadership: Adoption and implementation of HIS in-healthcare settings are greatly aided by corporate culture and leadership support. Studies conducted by (Yarinbab & Assefa, 2018) highlight the significance of robust leadership backing, proficient communication, and an innovative culture in fostering the prosperous adoption of HIS by healthcare practitioners.

Enough funding must be set aside for assistance and training in order to guarantee that HIS is successfully adopted and used. Research conducted by (Yarinbab & Assefa, 2018) emphasizes the value of thorough training programs, continuous technical support, and

intuitive user interfaces in boosting the confidence and proficiency of healthcare professionals in using HIS.

2.5.4 Technical Factors: HIS utilization is influenced by technological aspects such as system performance speed, security features, interoperability with other systems, and availability of technical assistance. Healthcare workers are more likely to choose a strong and user-friendly HIS that complies with the technical specifications and norms of healthcare environments. User adoption and satisfaction are strongly impacted by the HIS's performance and dependability(Alexander, 2023). Studies by (Jimenez et al., 2023) highlight the significance of system responsiveness, performance speed, and dependability in affecting healthcare workers' attitudes and views of HIS. In order to facilitate smooth information sharing and provider collaboration, HIS must be compatible with current procedures and systems. Research conducted by(Jimenez et al., 2023) and highlights the necessity of interoperable HIS solutions that facilitate communication and data sharing between various healthcare environments.

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CHAPTER THREE

METHODOLOGY

3.0 Introduction

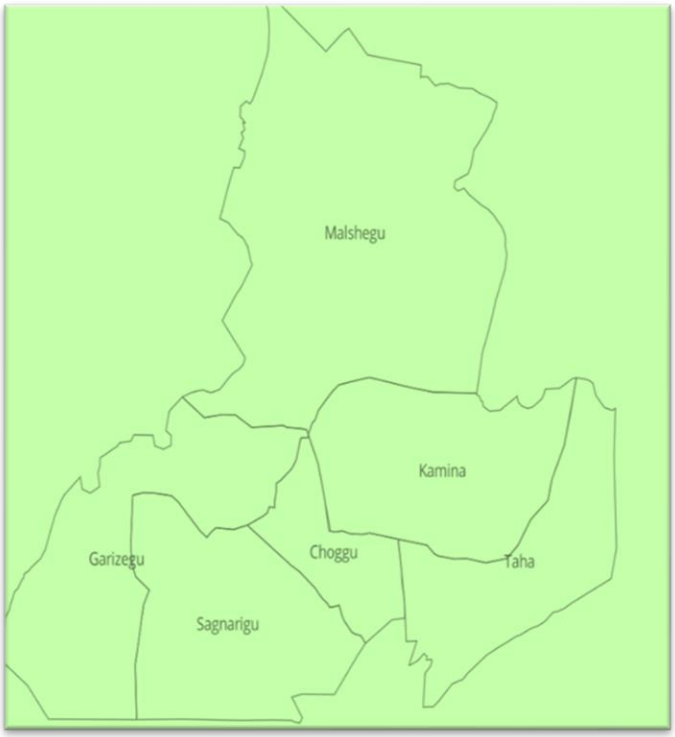
This chapter presents the approach that was utilized in assessing the factors associated with the utilization of Health Informatics System (HIS) in the Sagnerigu Municipality. A detailed description is provided of the selected study design, study area, study population, inclusion and exclusion criteria, sample size calculation, sampling technique, data collection processes, data analysis, and ethical issues.

3.1 Study Design

Research design refers to the overall strategy and framework that guides the process of collecting, measuring, and analyzing data in a research study. It outlines the methods and procedures necessary to answer the research questions and achieve the study objectives. According to Creswell and Creswell (2018), research design involves the blueprint for the collection, measurement, and analysis of data, which helps ensure that the evidence obtained enables the researcher to effectively address the research problem in an unbiased manner. It includes elements such as the type of research (qualitative, quantitative, or mixed methods), the sampling strategy, data collection methods, and data analysis techniques (Saunders et al., 2019). An institutional-based cross-sectional design was used in the study, enabling the collection of data from several individuals in a relatively short period of time. This design makes it easier to conduct quantitative data to successfully examine the relationship between variables and is appropriate for analyzing the relationship between variables.

3.2 Study Area

The study was carried out in the Sagnerigu District, which was created by Legislative Instrument 2066 and is currently known as Sagnerigu Municipal. Divided from Tamale Metropolis, Sagnerigu Municipality, with its capital city of Sagnerigu, is one of the new districts and municipalities established in 2012. There are 63 medical facilities in the municipality; 23 are privately operated and 40 are owned by the state. There are three facilities that are almost entirely private. Tolon to the west, Savelugu-Nanton Municipality to the north, Tamale Metropolitan to the east and south, and Kumbungu to the north-west are its neighbors. There are 210 communities in the municipality, and 361,817 population (GSS, 2021). The six sub-municipalities of the municipality are called Taha, Garizegu, Kamina, Malshegu, Sagnerigu, and Choggu.



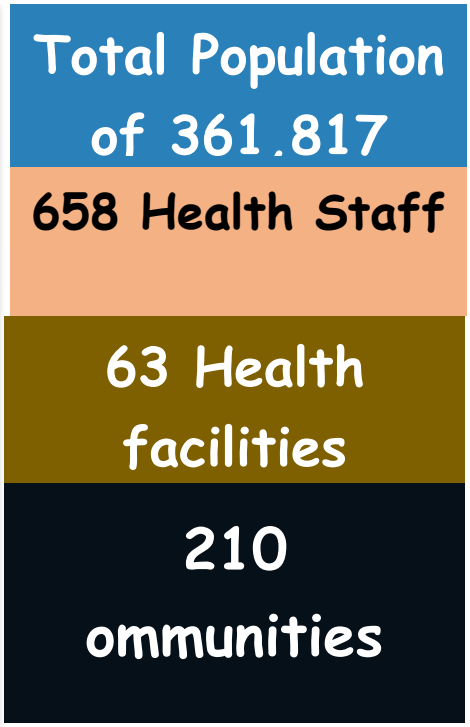


Fig 3.1 Map Showing Sangaenrigu Sub-municipalities

3.3 Study Population

A population refers to the entire group of individuals, objects, events, or elements that share a common characteristic and from which a sample is drawn for a study (Creswell & Creswell, 2018). The study population for this study was healthcare professionals in the Sagnerigu Municipality. The Sagnerigu Municipal Health Directorate Annual Performance Report (SMHD,2023) indicate that, there 658 healthcare professionals working in the municipality's healthcare facilities and this number constitted my study population.

3.4 Target Population

All healthcare professionals employed by Ghana Health Service(GHS) and Christian Health Association of Ghana (CHAG) equipped with health informatics systems were the target population. Physicians, nurses, and other allied health professionals fall under this category.

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

i. Only facility that uses any health informatics systems (LIHMS, HELIX, HAMS) were included from the study

ii. Only health care providers in public health facilities were included in the study

iii. All established healthcare professionals including nurses, physicians, midwives, and allied health professionals who consented were taken into consideration.

3.5.2 Exclusion Criteria

i. Healthcare providers from the facilities without health informatics systems were excluded from the study

ii. Healthcare providers from Private facilities were excluded from the study.

iii. All established staff who were on study, maternal and annual leave were excluded from the study.

iv. Health professionals who refused to consent were also excluded from the study

3.6 Sample Size Determination

The sample for this study was determined using Taro Yamane's (1967) sample size determination formulae since the total population was known. The formula used is as follows;

$$n = \frac{N}{1+Ne^2}$$

Where;

n=sample size,

N=population of the study area (658)

e=Acceptable margin of sampling error (0.05).

$$n = \frac{658}{1+658(0.05^2)} = 248.772$$

Therefore, the sample size for this study is approximately 249.

For easy administration and fair distribution of questionnaires, the research used the municipal health sub district demarcation with its total number of staffs. Proportionate stratified random sampling was used to determine the sample size of each sub district. The strata were also determined by the stratum sample size relation using the formulae below

$$n_h = \frac{n(N_h)}{N} \quad \text{eq 3.1}$$

Where:

n_h = *sample for stratum h*

N_h = *total number of staff for each stratum h*

h = 1, 2, 3, 4 5, and 6. The detail of the stratum calculation is presented in table 3.1

Table 3.1: Number of healthcare providers and sample size of each sub municipality

Sub district	**Total number of Staff**	$nh = \frac{n(Nh)}{N}$	**Sample**
Sagnerigu	132	$n_1 = \frac{249(132)}{658}$	50
Choggu	198	$n_2 = \frac{249(198)}{658}$	75
Garizegu	45	$n_3 = \frac{249(45)}{658}$	17
Kamina	147	$n_4 = \frac{249(147)}{658}$	56
Malshegu	38	$n_5 = \frac{249(38)}{658}$	14
Taha	98	$n_6 = \frac{249(98)}{658}$	37
Total	**658**		**249**

3.7 Sampling Method

Sampling methods are techniques used to select a subset of individuals or units from a population for the purpose of making inferences about the entire population (Saunders et al., 2019). The study employed a multi-stage sampling approach to ensure representative and meaningful data collection from various subdistricts within the municipality. Initially, the municipality was divided into six strata: Malshegu, Taha, Kamina, Choggu, Garizegu, and Sagnerigu, to capture the geographic and demographic diversity. In the second stage, public health facilities within these subdistricts were purposively selected based on their utilization of health informatics systems, ensuring the focus remained on relevant environments for the study. Lastly, simple random sampling was utilized to select individual participants from these facilities, employing a random number generator. This method ensured each potential respondent had an equal chance of selection, thereby reducing selection bias and enhancing the generalizability of the study findings.

3.8 Variables

3.8.1 Dependent Variable

The dependent variable is the outcome or response that is being studied and measured. It is the variable that researchers hypothesize will be affected by changes in the independent variable(s) or factors being manipulated or studied. In this study, the dependent variable is the extent or level of utilization of health informatics systems within a healthcare setting. The questions on the section of utilization of health informatics systems are yes or no questions. The overall utilization will be coded as high and low based on the yes or no responses.

3.8.2 Independent variables

Independent variables are the factors or variables that are manipulated, controlled, or selected by the researcher. They are the variables believed to have an effect on the dependent variable, which is the outcome being measured. In this study, there were four independent variables

i. ***Demographic Factors****:* Such as age, gender, marital status, rank or grad education level, and work experience the study investigated how these demographic variables influence the adoption and use of health informatics systems.

ii. ***Personal Factors****:* This includes attitudes, beliefs, perceptions, health and IT literacy, and previous experiences with technology and healthcare. These personal factors can play a significant role in shaping individuals' behaviors and decisions regarding the utilization of health informatics tools and technologies.

iii. ***Institutional Factors***: Such as organizational culture, leadership support, resource availability, workflow integration, and policies and procedures related to health informatics implementation. These institutional factors can impact the adoption and utilization of health informatics systems within healthcare organizations.

iv. ***Technical factors*****:** Such as system usability, interoperability, reliability, security, and accessibility of health informatics systems. The technical features and functionalities of health informatics systems can affect healthcare providers' acceptance and utilization by healthcare professionals and patients.

3.9 Data Collection and Analysis

3.9.1 Data Collection Instrument

Data collection instruments are tools used by researchers to gather data from respondents or sources (Creswell & Creswell, 2018). The data collection instrument used in this study was questionnaire. A comprehensive examination of pertinent literature, adopeted questionnaire from Shefaw, 2017 was used to collect quantitative data. Kobo Collect was used to build the questionnaire, which was then administered face-to-face to the sampled healthcare providers

A structured questionnaire was used in the study to assess the factors associated with the utilization of health informatics systems in the Sagnerigu Municipality. The questionnaire was grouped into five sections based on the study's objectives. Section 1 contained questions on demographic information of respondents. Sections 2 and 3 contained dichotomous questions relating to personal utilization of HIS and facility utilization of HIS. Sections 4, 5, and 6 were Likert scale questions ranging from strongly disagree (1) to, strongly agree (5). This scale was chosen for its ability to capture the nuances of respondents' attitudes towards personal, institutional, and technical factors affecting HIS usage. The use of a Likert scale is particularly appropriate for this study as it allows for the measurement of degrees of perception and opinion, providing a detailed view of the respondents' attitudes and facilitating a more nuanced analysis of the factors driving HIS adoption.

3.9.2 Procedure of Data Collection

The data collection process for this study was conducted systematically to ensure accuracy and reliability of the data obtained. Initially, an authorization letter was secured from the Sagnerigu Municipal Health Directorate, enabling the commencement of data collection. This was followed by the dissemination of copies of the authorization letter to the in-charges of the participating healthcare facilities, ensuring all parties were duly informed and consenting.

Four trained data collectors, who had undergone a one-day intensive training session on survey administration, were responsible for administering the questionnaires. This training included instructions on ethical considerations, data accuracy, and how to use Kobo Collect, the chosen mobile data collection platform. Kobo Collect was instrumental in this process as it facilitated real-time data entry, reducing errors associated with manual data recording and transcription. The platform also enhanced data accuracy through built-in validation checks that ensured all entered data met predetermined criteria before submission.

Data collection took place over a period of four weeks, during which data collectors visited the selected health facilities in Sagnerigu Municipality. Each participant was approached individually, and the questionnaire was administered face-to-face. The use of Kobo Collect not only streamlined the process but also allowed for immediate storage and encryption of data, significantly improving the overall efficiency of the data collection phase and ensuring that data integrity was maintained throughout the study.

3.10 Instrument Validity and Reliability

The validity and reliability of the questionnaire used in this study were rigorously ensured through meticulous development and testing procedures. Initially, the questionnaire was crafted by adapting items from previously validated instruments relevant to health informatics systems research, thus ensuring content validity. A pilot test was conducted with a small sample of healthcare professionals from Tamale West Hospital as they are not part of the study population to assess the clarity, relevance, and comprehensibility of the questions. Feedback from this pilot was used to refine the questionnaire, eliminating ambiguous or biased items and adjusting the wording for clearer understanding.

Instruments used in quantitative research undergo rigorous evaluation to ensure their validity and reliability. Validity refers to the extent a measure accurately captures the concept it purports to measure, often assessed through expert judgment (Piesie-Anto, 2012). Reliability, on the other hand, concerns the consistency of the measurement across time and different researchers, ensuring stable results (Chiang et al., 2015). For this study, the reliability of the instruments was verified using Cronbach's Alpha (CA) to test internal consistency, with a coefficient above 0.7 considered adequate, aligning with De Veilis's (1991) benchmark for research instrument appropriateness. Additionally, using a validated questionnaire similar to the study setting enhances the instrument's relevance and eases the benchmarking process for researchers (Hyman et al., 2006).

3.11 Data Analysis

The data analysis for this study was structured into univariate, bivariate, and multivariate phases to thoroughly investigate the data collected and address the research questions effectively. All statistical analyses were performed using SPSS for univariate and bivariate analysis. The selection of these software tools was based on their robust analytical capabilities and their ability to handle complex statistical models effectively. The significance of the factors is based on 0.05 level of significance. Each phase utilized specific statistical techniques appropriate for the level of analysis being conducted, as described below:

3.11.1 Univariate Analysis

Univariate analysis was conducted to provide descriptive statistics of the study variables, including means, standard deviations, and distributions for continuous variables, and frequencies and percentages for categorical variables. This initial analysis helped to summarize the data and give an overall picture of the characteristics of the study population. It also served to identify any outliers or anomalies that needed to be addressed before further analysis.

3.11.2 Bivariate Analysis

Bivariate analysis involved examining the relationships between pairs of variables using chi-square tests for categorical variables. This step was crucial for identifying significant associations between demographic factors and utilization of health informatics systems (HIS). The results from the chi-square tests helped to pinpoint which variables should be included in the more complex models of the multivariate analysis phase.

3.11.3 Multivariate Analysis

In the multivariate analysis phase, logistic regression were employed to establish the magnitude of the factors associated with the tilization of health informatics systems.

Logistic Regression: This technique was used to explore the predictors of HIS adoption, adjusting for potential confounders. The outputs included odds ratios, which provided insights into the strength and direction of associations between predictor variables and HIS utilization.

3.11.4 Handling of Missing Data

Throughout all phases of the analysis, missing data were addressed using multiple imputation techniques. This approach was chosen to avoid loss of information and potential bias associated with listwise deletion of cases with missing values. Multiple imputation also helped maintain the robustness of the analyses by using all available data and providing estimates that reflect uncertainty due to missingness. The imputed datasets were analyzed in each phase of the study to ensure consistency and reliability of the findings.

3.12 Ethical Consideration

The study was conducted in strict accordance with ethical guidelines for research involving human subjects. Ethical approval was granted by the Committee for Human Research and Publications at Kwame Nkrumah University of Sceience and Technology (KNUST), with the reference number CHRPE/AP/397/24. Supporting documents included a letter from my supervisor and an introductory letter from the Dean of the School of Public Health.

Approval letters were also obtained from the Regional Health Directorate and Sagnerigu Municipal Health Directorate, facilitating access to the health facilities involved in the study.

Prior to data collection, informed consent was obtained from all participants. This process involved clearly explaining the study's purpose, potential risks, and benefits to ensure participants were fully informed before agreeing to partake. Participants were assured of their voluntary participation and their right to withdraw from the study at any time without any consequences. This consent process also provided participants with the opportunity to ask questions and address any concerns regarding their involvement in the study.

3.13 Limitations of the Methodology

This study's cross-sectional design limits the ability to draw causal inferences between factors and the utilization of health informatics systems (HIS), only allowing for identification of associations. The purposive selection of facilities using HIS may introduce selection bias, potentially limiting the generalizability of the findings to other settings. Additionally, the sample size, while sufficient for broad statistical analyses, may not capture smaller effect sizes or allow for robust sub-group analyses. This limitation could restrict the findings' applicability across different healthcare provider populations or regions. The use of self-reported measures for data collection could also introduce response biases, such as social desirability or recall inaccuracies, possibly skewing results.

CHAPTER FOUR

RESULTS

4. 1 Introduction

The study assessed factors associated with the utilization of Health Informatics Systems in the Sagnerigu Municipality. The results of the study are presented in this chapter with both descriptive and inferential analysis.

4.2 Demographic Characteristics of Healthcare Providers

The demographic characteristics of the healthcare providers (n=249) presented in Table 4.1 reveal a predominantly young workforce, with an average age of 30.9 years (SD=5.30). The majority of participants fall within the 30-39 age range 125(50.2%), followed by those aged 20-29 105(42.2%). Most of the respondents are female 151(60.6%), and a significant portion are married 184(73.9%). Regarding educational qualifications, a substantial number hold a certificate 92(36.9%), while others have a diploma 84(33.7%) or a degree 72(28.9%), with only a small fraction possessing a master's degree 1(0.4%).

The majority of the healthcare providers are clinical staff 220(88.4%) and are classified as senior staff 199(79.9%). In terms of experience, 107(43.1%) have less than three years of experience at their current facility, while 93(37.5%) have overall work experience ranging between 9-13 years.

Table 4.1: Demographic Characteristics of Healthcare Providers (n=249)

Variable	Category	Frequency	Percent
Age*(years) x̄=30.9, SD= 5.30*	20-29	105	42.2
Med.=30, mode=32	30-39	125	50.2
	40-49	19	7.6
Gender	Female	151	60.6
	Male	98	39.4
Marital Status	Married	184	73.9
	Single	65	26.1
qualification	Certificate	92	36.9
	Diploma	84	33.7
	Degree	72	28.9
	Master's degree	1	0.4
Category	Clinical Staff	220	88.4
	Non-clinical staff	29	11.6
Rank	Junior Staff	50	20.1
	Senior Staff	199	79.9
Facility Experience (years)	<3	107	43.1
	3-5	79	31.9
	6-8	55	22.2
	9-11	7	2.8
Overall experience (years)	<4	40	16.1
	4-8	49	19.8
	9-13	93	37.5
	14-18	66	26.6

Source: field survey (2024)

4.3 Type of Health Informatics System currently in use

Fig 4. 1 represents the type of health informatics system used in the Sagnerigu Municipality. The data indicates that, the majority (n=221, 88.8%) uses HELIX in their various facilities, whilst only 11.2%(n=28) uses LHIMS.

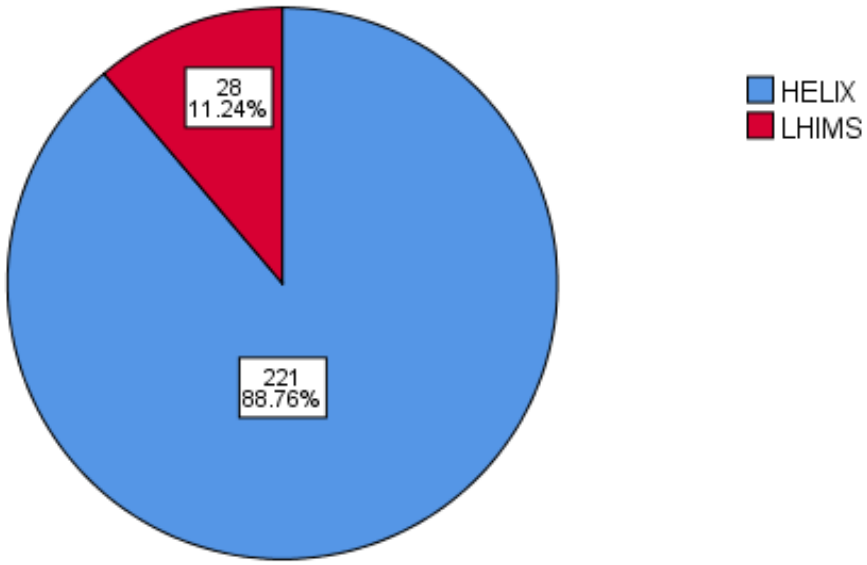


Fig 4.1: Health Informatics System Use

4.4 Utilization of Health Informatics Systems

Table 4.2 presents the utilization of Health Informatics Systems (HIS) among the 249 healthcare providers surveyed. The majority 150(60.2%) regularly log into the HIS, and 59.8% use it for providing services. However, a slightly lower percentage 136(54.6%) utilize HIS for-patient record management, while only 43.8% use it to monitor daily activities. A significant majority 226(90.8%) do not generate health reports from the HIS. Despite these varying levels of usage, 151(60.6%) of healthcare providers express overall satisfaction with the HIS whereas 98(39.4%) showed no usage. This implies that while HIS

is widely used, its application is more prevalent in-service provision and patient record management than in monitoring activities or report generation.

Table 4.2 Utilization of Health Informatics Systems by (n=249)

Variable	No	Yes
	Frequency (%)	**Frequency (%)**
HIS user logins	99(39.8)	150(60.2)
Use of HIS to monitor daily activities	140(56.2)	109(43.8)
Use of HIS for providing service	100(40.2)	149(59.8)
Use of HIS for-patient record management	113(45.4)	136(54.6)
Generating health reports from HIS	226(90.8)	23(9.3)
Overall satisfied with HIS	98(39.4)	151(60.6)
Overall (Yes/No)	**776(51.9)**	**718(48.1)**

Source: field survey (2024)

4.4.1 Overall Utilization of HIS

The overall utilization of Health Informatics Systems (HIS) among the surveyed healthcare providers is presented in Figure 4.2. Out of the 249 healthcare providers, 40.6% (n = 101) reported high utilization of HIS, while 59.4% (n = 148) reported low utilization.

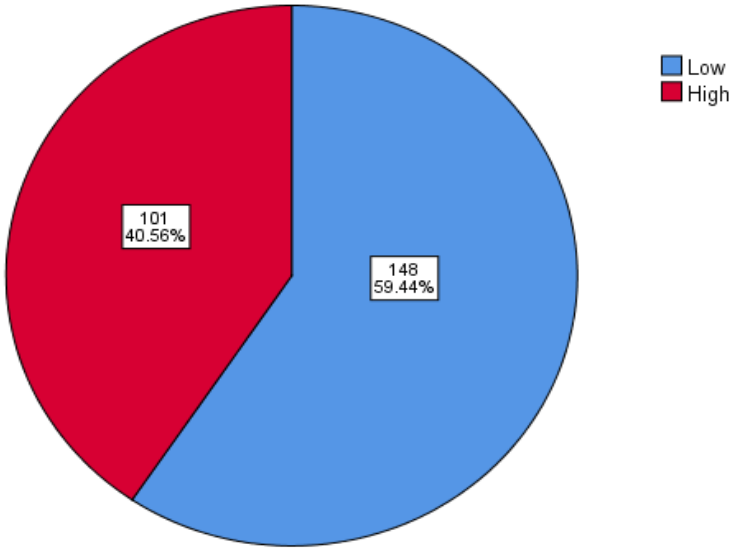


Fig 4.2 Pie chart showing utilization of HIS *Source: field survey (2024)*

High usage: Healthcare providers who scored at least 5 points out of 6 HIS usage questions
Low usage: Healthcare Providers who scored less than 5 points out of 6 HIS usage questions

4.5 Utilization of Health informatics Systems by departments

Table 4.3 revealed the knowledge of healthcare providers on the utilization of Health Informatics Systems (HIS) across different departments. The Records Unit shows the highest knowledge level, with 245(98.4%) of providers knowledgeable about HIS. Similarly, high knowledge levels are observed in the Outpatient Department 202(81.1%), laboratory 188(75.5%), and consulting rooms and pharmacy 166(66.7%). In contrast, departments like Child Welfare Clinic, Postnatal Clinic, and Disease Control show very low knowledge levels 28(11.2%), with 221(99.8%) of providers in these departments indicating a lack of HIS knowledge. Notably, no healthcare provider in Family Planning has knowledge of HIS utilization. These results highlight a significant variability in HIS

knowledge across departments, with some areas being well-versed while others have minimal or no familiarity with the systems.

Table 4.3: Healthcare Providers Knowledge on the Utilization of Health Informatics Systems by Departments (n=249)

Department	No	Yes
	Frequency (%)	Frequency (%)
Records Unit	4(1.6)	245(98.4)
Outpatient department (OPD)	47(18.9)	202(81.1)
Inpatient department (IPD)	96(38.6)	153(61.6)
Child Welfare Clinic (CWC)	221(99.8)	28(11.2)
Postnatal Clinic (PNC)	221(99.8)	28(11.2)
Family planning (FP)	249(100)	0(0.0)
Antenatal care (ANC)	100(40.2)	149(59.8)
laboratory	61(24.5)	188(75.5)
Consulting rooms	83(33.3)	166(66.7)
Pharmacy	83(33.3)	166(66.7)
Disease control	221(99.8)	28(11.2)

Source: field survey (2024)

4.6 Utilization of Health Informatics Systems by sub-municipality

Table 4.4 shows the utilization of Health Informatics Systems (HIS) across various sub-municipalities and facilities. There is significant variability in HIS usage among these areas. Choggu sub-municipality has a higher proportion of low usage 50(66.7%) across its facilities, with TaTU Hospital having the lowest high usage rate at 9(28.1%). In Garizegu, low usage is also predominant 12(70.6%), especially at Kpinjing CHPS, where 6(85.7%) report low usage. Kamina sub-municipality presents the highest overall low usage 42(75%), with Dungu CHPS showing no high usage at all 9(100% low usage). Malshegu follows closely, with 13(92.9%) reporting low usage, and Sorogu CHPS showing no high usage 5(100% low usage).

On the other hand, Sagnerigu and Taha sub-municipalities demonstrate relatively higher levels of HIS utilization. Sagnerigu, in particular, stands out with 14(68%) reporting high usage, especially at Kpene CHPS and Shishagu CHPS, where 100% of users report high utilization. Similarly, in Taha, 22(59.5%) of users report high usage, with FUO Community Hospital, Kulaa CHPS, and Kalpohini Health Center leading in high usage, with rates of 100%, 100%, and 55.6%, respectively.

Table 4.4 Utilization of Health Informatics Systems by sub-municipality (n=249)

Sub Municipality	Facility	Low Usage	High Usage
		Frequency (%)	Frequency (%)
Choggu	Choggu Health Center	10(66.7)	15(33.3)
	St Lucy Hospital	17(60.7)	11(39.3)
	TaTU Hospital	23(71.9)	9(28.1)
Total		**50(66.7)**	**25(33.3)**
Garizegu	Garizegu CHPS	6(60.0)	4(40.0)
	Kpinjing CHPS	6(85.7)	1(14.3)
Total		**12(70.6)**	**5(29.4)**
Kamina	Dungu CHPS	9(100.0)	0(0.00)
	Gbanyamni CHPS	10(90.0)	1(9.0)
	Gumani CHPS	1(50.0)	1(50.0)
	Kanvili Health Center	12(63.2)	7(36.8)
	Kogni CHPS	0(0.00)	3(100.0)
	Zagyuri CHPS	10(83.3)	2(16.7)
Total		**42(75.0)**	**14(25.0)**
Malshegu	Malshegu CHPS	8(88.9)	1(11.1)
	Sorogu CHPS	5(100.0)	0(0.00)
Total		**13(92.9)**	**1(7.1)**
Sagnerigu	Bagabaga Health Center	2(11.8)	15(88.2)
	Kpene CHPS	0(0.00)	3(100.0)
	Sagnerigu H/C	11(50.0)	11(50.0)
	Shishagu CHPS	0(0.00)	5(100.0)
	TACE	3(100.0)	0(0.00)
Total		**16(32.0)**	**14(68.0)**
Taha	FUO comm. Hospital	0(0.00)	9(100.0)
	Gbalahi CHPS	1(100)	0(0.00)
	Gbrima CHPS	1(100)	0(0.00)
	Kalpohin Health Center	4(44.4)	5(55.6)
	Kalpohini CHPS	3(60.0)	2(40.0)
	Kalpohini M/Center	6(54.5)	5(45.5)
	Kulaa CHPS	0(0.00)	1(100.0)
Total		**15(40.5)**	**22(59.5)**

Source: field survey (2024)

4.7 Demographic factors Associated with the utilization of Health informatics Systems

Table 4.5 presents the results of demographic factors associated with the utilization of health informatics systems among healthcare providers. Several demographic variables can be singled out as significantly associated with distinguishing between high and low utilization of HIS,

Gender, in contrast, is not significantly associated with HIS use. Females and males essentially have similar HIS usage patterns, where 60.9 %(n=92) of females and 57.1%(n=56) of males report low HIS usage, 39.1%(n=59) of females and 42.9%(n=42) of males report high use levels. Subjecting data through the chi-square test of independence, gender does not significantly impact whether healthcare personnel are more or less uses HIS driven ($\chi^2 = 0.353$, $p = 0.552$).

Similarly, Marital status appears as an unrelated episode on HIS utilization since 44.6%(n=111) of married Healthcare providers to 56.9% (n=37) of single ones revealed low HIS utilization, 39.7%(n=73) married to 43.1%(n=28) single had high utilization. A chi-square value of 0.231 and a p-value of 0.631 also suggest the lack of a high dependency level on the marital status of HIS usage.

Educational qualification, on the other hand, shows a highly significant relationship with HIS use. The certificate holders mainly reported low use of HIS, 75%(n=69), whereas high HIS use was reported only by 25%(n=23). The diploma holders and degree holders show almost equal balance in both, regarding high HIS use (n= 42, 50%) each, respectively. Chi-

square shows: $\chi^2 = 15.687$; $p = 0.001$; hence, the increased use of HIS is associated with increased educational qualifications and higher education levels.

The impact of staff category on HIS utilization, does not have much effect. For the low HIS usage of the clinical staff, it was noted at 57.7%(n=127), whereas for the non-clinical staff, this was at 72.4%(n=21). The high rate of using HIS for the clinical staff was 42.3%(n=93); for non-clinical staff, it was only 27.3%. (n=8) Comparing the low-involvement levels of these two subgroups revealed a Chi-square value of 2.292, with $p>0.05$(0.130).

Staff rank is not associated with the utilization of HIS ($\chi^2 = 1.117$; $p = 0.290$) as 66.3%(n=33) reported low and 34.0%(n=17) reported high HIS usage among junior staff. Similarly, 115(57.8%) reported low usage whilst (n=84, 42.2%) reported high usage.

The sub-municipality variable reveals a high correlation with the utilization of HIS. Specifically, Malshegu has a very minimal high utilization of HIS at 7.1%(n=1), whereas it has a low utilization at 92.2%(n=13). Choggu also illustrates high utilization at 66.7%(n=50), while it reveals low utilization at 33.3%(n=25). However, Sagnerigu emerges as the district with a relatively low 32.0%(n=16) and high 68.0% (n= 34) utilization of HIS. The chi-square test ($\chi^2 = 35.706$; $p < 0.001$) suggests working in a particular sub-municipality is associated with HIS usage.

Age is not significantly associated with HIS utilization, with an almost equal pattern of usage being noticed across all age brackets; 60% low and 40% high usage of HIS in the age group 20-29, while 60.8% low and 39.2% high in the age group 30-39; the age group

40-49 shows 47.4% low and 52.6% high utilization. The chi-square value of 1.258 with a p-value of 0.533 shows no significant impact from age on the level of using HIS.

Facility work experience is associated with HIS use as with less than three years working for a particular facility reported low usage (n=60, 56.1%) as compared to those with 3 years or more. A result of the chi-square test: $\chi^2 = 20.207$, $p < 0.001$. This indicates that, facility work experience is statistically significantly associated with the utilization of HIS. In contrast, the total work experience shows no significant relationship with the use of HIS.

The majority of those who have work experience of less than four years show 47.5% and 52.5% in low and high usage, respectively. Meanwhile, most 4-8 years category have 53.1% and 46.9% low and high usage, respectively. Of the Healthcare providers with 9-13 years of experience, 61.3% use HIS at a low level, and only 38.7% use it at a high level, while those in the 14-18 years category use HIS at 68.2% on a low level and 31.8% at a high level. Therefore, overall work experience and HIS usage have no significant correlation as the computed chi-square value is 5.407, with a $p>0.05(0.144)$.

The results of the analysis reveal that while HIS utilization is not associated with a user's gender; marital status; staff category; rank; age group; and overall work experience, it is associated with educational qualification, sub-municipality, and facility work experience. It was found that users with a higher educational status and those with fewer years of experience at a facility had higher odds of using HIS. There were also observed differences in HIS use by sub-municipality. The results imply that educational and locational factors should be taken into consideration when urging healthcare workers to utilize HIS.

Table 4.5: Demographic factors Associated with the utilization of HIS (N=249)

Variable	Overall UHIS		Chi-square	P-value
	Low	High		
Gender			0.353	0.552
Female	92(60.9)	59(39.1)		
Male	56(57.1)	42(42.9)		
Marital Status			0.231	0.631
Married	111(60.3)	73(39.7)		
Single	37(56.9)	28(43.1)		
Qualification			15.687	***0.001***
Certificate	69(75.0)	23(25.0)		
Diploma	42(50.0)	42(50.0)		
Degree	36(50.0)	36(50.0)		
Master's degree	1(100.0)	0(0.0)		
Staff Category			2.292	0.130
Clinical Staff	127(57.7)	93(42.3)		
Non-clinical staff	21(72.4)	8(27.3)		
Rank			1.117	0.290
Junior Staff	33(66.3)	17(34.0)		
Senior Staff	115(57.8)	84(42.2)		
Sub municipality			35.706	***<0.001***
Malshegu	13(92.2)	1(7.1)		
Choggu	50(66.7)	25(33.3)		
Garizegu	12(70.6)	5(29.4)		
Kamina	42(75.0)	14(25.0)		
Sagnerigu	16(32,0)	34(68.0)		
Taha	15(40.5)	22(59.5)		
Age group			1.258	0.533
20-29	63(60.0)	42(40,0)		
30-39	76(60.8)	49(39.2)		
40-49	9(47.4)	10(52.6)		
Facility work experience			20.207	***<0.001***
<3	60(56.1)	47(43.9)		
3-5	36(45.6)	43(54.4)		
6-8	45(81.8)	10(18.2)		
9-11	6(85.7)	1(14.3)		
Overall work experience			5.407	0.144
<4	19(47.5)	21(52.5)		
4-8	26(53.1)	23(46.9)		
9-13	57(61.3)	36(38.7)		
14-18	45(68.2)	21(31.8)		

Source: field survey (2024)

4.8 Personal factors associated with the utilization of HIS

Table 4.6 shows the analysis on personal factors associated with the utilization of HIS. Confidence in using HIS significantly associate with HIS utilization: 53.1% of the Healthcare providers who agree to feel confident using HIS report a high level of HIS use, compared with 17.2% of healthcare providers who disagree; $\chi^2 = 30.165$, $p < 0.001$.

Comfort with technology is associated with HIS utilization as most of those who agree that they are comfortable with technology have a high rate of HIS utilization, about 47.3%, compared to about 19.7% of those who disagree that they are comfortable with technology. $\chi^2 = 14.624$, $p < 0.001$.

The belief that HIS improves work efficiency also relates to increased usage. 48.2% of the Healthcare providers who agree that HIS improves work efficiency report high levels of usage compared with only 14.3% among those who disagree ($\chi^2 = 12.369$, $p < 0.001$

Data security issues are another major determinant of HIS use. The users who agree that the security of data is essential to them significantly use HIS more extensively than those who disagree. Some 42.2% of the former and 44.6% of the latter would use HIS extensively $\chi^2 = 20.691$, $p<0.001$).

Another aspect affecting the patterns of utilization is the perception that HIS as necessary for one's job. There is more frequent HIS usage from those who agree with the statement, 44.3%, compared to those who disagree, 18.9% with $\chi^2 = 8.444$, $p = 0.004$. This indicates that if healthcare providers acknowledges that HIS is an integral part of performing his or her job, he or she is likely to use it more.

Another significant factor was adequate HIS support from colleagues. those who receive sufficient support show higher usage at 25.8% compared to those who do not at 49.4% (χ^2 = 13.406, p < 0.001). This indicates that peer support and a collaborative environment contribute to higher HIS utilization. Regular of HIS skill were found to be statistically significant (χ^2 = 7.633, p = 0.006). as those regularly update their HIS skills reported high HIS usage compared to those who do not regular update their HIS skills.

A belief that HIS enhances patient care was significantly associated with higher utilization. Those who strongly agree were higher at 45.1% as opposed to those who disagree at 18.6% (χ^2 = 10.394, p = 0.001). Recommendations HIS to other were no statistically significant (χ^2 = 3.779, p = 0.552). there were no significant differences in the usage level between those who recommends HIS to others and those who do not

HIS contribution to professional growth was found to be statistically significant (χ^2 = 45.235, p < 0.001). There is higher usage of the system for respondent agrees that HIS contributes to their development (n= 65.7%) compared to those who disagree (n=23.1%). General computer competence significantly impacts HIS usage. More Healthcare providers who disagreed with the statement about having low computer competence reported higher HIS usage, 44.0%, compared with those who agreed, 16.1% (χ^2 = 8.766, p = 0.003). This indicates that general computer skills are essential in using HIS.

A lack of HIS knowledge also significantly affects utilization. There is a higher utilization for those who disagreed with lacking HIS knowledge at 43.8% compared to those who agreed at 8.7% (χ^2 = 10.631, p = 0.001). These views forward the need for knowledge of

HIS and familiarity to effectively use the system. Workload perception also does not influence HIS utilization. A comparison of the agreement and disagreement on the issue of whether they have too much workload in terms of levels of HIS usage does not show any difference ($\chi^2 = 1.238$, $p = 0.266$).

Finally, poor communication among users significantly affects HIS use. A higher proportion of those who disagreed with this statement reported a higher use rate, 42.2%, compared to 8.3% of those who agreed ($\chi^2 = 5.432$, $p = 0.020$). This shows that good communication among users records high HIS use. Overall, personal factors analysis gives ($\chi^2 = 15.480$, $p < 0.001$), implying personal attitude, confidence, and skills significantly affect the use of HIS. Confidence in using HIS, comfort with technology, and perception of HIS about efficiency, patient care, and professional growth increase motivation to use the system more.

Table 4.6: Personal factors associated with the utilization of HIS (N=249)

Variable	Overall UHIS		Chi-square	p-value
	Low	High		
I feel confident using HIS.			30.165	**<0.001**
Disagree	72(82.8)	15(17.2)		
Agree	76(46.9)	86(53.1)		
I am comfortable with technology.			14.624	**<0.001**
Disagree	49(80.3)	12(19.7)		
Agree	99(52.7)	89(47.3)		
HIS improves my work efficiency.			12.369	**<0.001**
Disagree	48(85.7)	8(14.3)		
Agree	100(51.8)	93(48.2)		
Data security in HIS is important to me.			20.691	**<0.001**
Disagree	31(55.4)	25(44.6)		
Agree	112(58.0)	81(42.2)		

HIS is essential for my job.			8.444	**0.004**
Disagree	30(81.1)	7(18.9)		
Agree	118(55.7)	94(44.3)		
I receive adequate HIS support from colleagues.			13.406	**<0.001**
Disagree	79(50.6)	77(49.4)		
Agree	69(74.2)	24(25.8)		
I regularly update my HIS skills.			7.633	**0.006**
Disagree	126(56.5)	97(43.5)		
Agree	22(84.6)	4(15.4)		
HIS enhances patient care.			10.394	**0.001**
Disagree	35(81.4)	8(18.6)		
Agree	113(54.9)	93(45.1)		
I recommend HIS to other providers.			3.779	0.552
Disagree	83(54.6)	69(45.4)		
Agree	65(67.0)	32(33.0)		
HIS contributes to my professional growth.			45.235	**<0.001**
Disagree	113(73.9)	34(23.1)		
Agree	35(34.3)	67(65.7)		
I lack general computer competence			8.766	**0.003**
Disagree	122(56.0)	96(44.0)		
Agree	26(83.9)	5(16.1)		
I lack HIS knowledge.				
Disagree	127(56.2)	99(43.8)	10.631	**0.001**
Agree	21(91.3)	2(8.7)		
I have too much workload.			1.238	0.266
Disagree	112(61.5)	70(38.5)		
Agree	36(53.7)	31(46.3)		
There is poor communication between users.			5.432	**0.020**
Disagree	137(57.8)	100(42.2)		
Agree	11(91.7)	1(8.3)		
Overall personal factors			**15.480**	**<0.001**
Disagree	94(51.9)	87(48.1)		
Agree	54(79.4)	14(20.6)		

Source: field survey (2024)

4.9 Institutional factors associated with the utilization of HIS

The results in Table 4.7 present the associations between various institutional factors and the utilization of Health Informatics Systems (HIS) among 249 healthcare providers.

Adequate training on HIS is significantly associated with higher utilization ($\chi 2$ =9.567, p=0.002). Among Healthcare providers who agree that adequate training is provided, 65.6% report high HIS utilization, compared to 36.9% who disagree. This suggests that training is a critical factor in promoting higher HIS usage. The use of user-friendly HIS software also shows a significant relationship with HIS utilization ($\chi 2$=4.355, p=0.037). Healthcare providers who find the HIS software user-friendly report higher proportions of high utilization (50%) compared to those who do not agree (36.1%), indicating that user-friendly software contributes to higher utilization.

Encouragement and incentives for using HIS do not significantly influence utilization (χ^2=0.133, p=0.715) Both Healthcare providers who agree (33.3%) and those who disagree (40.7%) show similar levels of HIS utilization, suggesting that these measures alone may not be sufficient to drive HIS usage. HIS utilization monitoring and evaluation are strongly associated with higher usage (χ^2=72.018, p<0.001). A significant portion of healthcare providers who agree that HIS usage is monitored (69.3%) report high utilization compared to those who disagree (16.3%), highlighting the importance of ongoing oversight in promoting HIS use.

Support from leadership for HIS implementation is significantly related to higher utilization (χ^2=25.343, p<0.001). Healthcare providers who perceive strong leadership

support report higher HIS utilization (15.7%) compared to those who do not agree (69.6%), indicating that leadership endorsement is vital for effective HIS usage. Regular updates and improvements to HIS are significantly associated with higher utilization (χ^2=13.812, p<0.001). Those who agree that HIS is regularly updated report more high utilization (72.4%) compared to those who disagree (36.4%), underscoring the role of system enhancements in facilitating better usage.

The provision of adequate resources for HIS usage shows a strong association with higher utilization (χ^2=62.461, p<0.001). Healthcare providers who agree on the availability of adequate resources report significantly higher HIS utilization (74.4%) compared to those who disagree (22.7%). Policies that ensure data security in HIS are significantly linked to higher utilization (χ2=65.884, p<0.001). Those who agree that such policies are in place report higher HIS utilization (57.6%) compared to those who disagree (17.2%), emphasizing the importance of data security in HIS use.

Effective communication regarding HIS updates is significantly associated with higher utilization (χ^2=4.567, p=0.033). A greater proportion of healthcare providers who agree that communication is effective report high utilization (57.6%) compared to those who disagree (38%), indicating that clear communication on updates is important for effective HIS use. Rewards for effective HIS utilization do not show a significant impact on usage (χ^2=0.058, p=0.809). Both groups report similar levels of high utilization 44.6% for those who agree and 40.4% for those who disagree), suggesting that rewards may not be a strong driver for HIS usage.

Overall, institutional factors collectively have a significant impact on HIS utilization (χ^2=72.756, p<0.001). Healthcare providers who perceive favorable institutional conditions report much higher HIS utilization (70.6%) compared to those who perceive unfavorable conditions (17.1%).

Table 4.7: Institutional factors associated with the utilization of HIS (N=249)

Variable	Overall PUHIS		Chi-square	p-value
	Low	High		
Adequate HIS training is provided.			9.567	**0.002**
Disagree	137(63.1)	80(36.9)		
Agree	11(34.4)	21(65.6)		
User-friendly HIS software is in use.			4.355	**0.037**
Disagree	108(63.9)	61(36.1)		
Agree	40(50.0)	40(50.0)		
HIS usage is encouraged and incentivized.			0.133	0.715
Disagree	144(59.3)	99(40.7)		
Agree	4(66.7)	2(33.3)		
HIS usage is monitored and evaluated.			72.018	**<0.001**
Disagree	113(83.7)	22(16.3)		
Agree	35(30.7)	79(69.3)		
Leadership supports HIS implementation.			25.343	**<0.001**
Disagree	131(67.9)	62(32.1)		
Agree	17(3.4)	39(69.6)		
HIS is regularly updated and improved.			13.812	**<0.001**
Disagree	140(63.6)	80(36.4)		
Agree	8(27.6)	21(72.4)		
Adequate resources for HIS usage are provided.			62.461	**<0.001**
Disagree	126(77.3)	37(22.7)		
Agree	22(25.6)	64(74.4)		

Policies ensure data security in HIS.			65.884	**<0.001**
Disagree	111(82.8)	23(17.2)		
Agree	37(32.2)	78(67.8)		
Effective communication on HIS updates exists.			4.567	**0.033**
Disagree	134(62.0)	82(38.0)		
Agree	14(42.4)	19(57.6)		
Rewards are given for effective HIS utilization			0.058	0.809
Disagree	143(59.6)	97(40.4)		
Agree	5(55.6)	4(44.6)		
Overall Institutional factors			**72.756**	**<0.001**
Disagree	116(82.9)	24(17.1)		
Agree	32(29.4)	77(70.6)		

Source: field survey (2024)

4.10 Technical factors associated with the utilization of HIS

Table 4.8 examined the relationship between various technical factors and the utilization of Health Informatics Systems (HIS) among 249 Healthcare providers, distinguishing between low and high utilization. Significant findings are highlighted by their chi-square values and p-values, indicating how strongly each factor correlates with HIS usage.

HIS ease of navigation is important for utilization. Healthcare providers who find the system easy to navigate are more likely to report high utilization (60%) compared to those who find it difficult (23.9%), with this difference being statistically significant (χ^2=33.489, p<0.001). Similarly, HIS compatibility with various devices is another key factor. A greater proportion of healthcare providers who agree on its compatibility report high utilization (52.7%) versus those who disagree (27.1%), reflected in a significant chi-square value (χ2=16.813, p<0.001).

In contrast, the ability of HIS to provide quick access to patient informatics does not significantly affect its utilization (χ2=0.717, p=0.397). Both those who agree (50%) and those who disagree (39.8%) exhibit similar levels of utilization, suggesting that this feature is not a decisive factor. Reliability of the HIS, however, significantly enhances its utilization. Those who agree that HIS is reliable and rarely encounters issues are more likely to report high utilization (60.2%) compared to those who disagree (25.5%), as shown by a significant chi-square value (χ^2=30.461, p<0.001).

HIS integration with other systems is also important. Healthcare providers who agree that HIS integrates well with other systems are more likely to report high utilization (72.0%) compared to those who disagree (37.1%), with a significant chi-square value (χ^2=11.392, p=0.001). Effective communication facilitated by HIS is strongly linked to higher utilization. Those who agree on this aspect have a higher rate of high utilization (59.6%) than those who disagree (15.7%), supported by a significant chi-square value (χ^2=48.739, p<0.001).

However, the usefulness of HIS clinical decision support features does not show a significant impact on its utilization (χ^2=0.003, p=0.957), with similar proportions of high utilization among both those who agree (40%) and those who disagree (40.6%). The customization ability of HIS significantly influences its usage. High utilization is more prevalent among those who agree that HIS allows customization for provider needs (58.8%) compared to those who disagree (20.3%), as indicated by a significant chi-square value (χ^2=38.048, p<0.001)

Technical support availability is crucial for HIS utilization. Healthcare providers who agree that technical support is readily available report higher utilization (74.1%) than those who disagree (23.2%), with this difference being statistically significant (χ^2=60.272, p<0.001). Ensuring data confidentiality and security by HIS is also a significant factor. Those who agree on its data security are more likely to report high utilization (60%) compared to those who disagree (15.6%), as indicated by a significant chi-square value (χ^2=50.120, p<0.001).

On the other hand, HIS user-friendliness and efficiency show no significant relationship with its utilization (χ^2=3.278, p=0.070). High utilization levels are similar among those who agree (48.8%) and those who disagree (36.7%). Finally, overall technical factors are significantly associated with HIS utilization. Healthcare providers who agree on favorable technical factors report much higher utilization (70.6%) compared to those who disagree (17.1%), with a significant chi-square value (χ^2=72.756, p<0.001).

Table 4.8: Technical factors associated with the utilization of HIS (N=249)

Variable	Overall UHIS		Chi-square	p-value
	Low	High		
HIS is easy to navigate				
Disagree	102(76.1)	32(23.9)	33.489	**<0.001**
Agree	46(40.0)	69(60.0)		
HIS is compatible with various devices.			16.813	**<0.001**
Disagree	86(72.9)	32(27.1)		
Agree	62(47.3)	69(52.7)		
HIS provides quick access to patient informatics			0.717	0.397
Disagree	139(60.2)	92(39.8)		
Agree	9(50.0)	9(50.0)		
HIS is reliable and rarely encounters issues.			30.461	**<0.001**
Disagree	105(74.5)	36(25.5)		
Agree	43(39.8)	65(60.2)		

HIS integrates well with other systems.			11.392	**0.001**
Disagree	141(62,9)	83(37.1)		
Agree	7(28.0)	18(72.0)		
HIS facilitates effective provider communication.			48.739	**<0.001**
Disagree	91(84.3)	17(15.7)		
Agree	57(40.4)	84(59.6)		
HIS offers useful clinical decision support features.			0.003	0.957
Disagree	136(59.4)	93(40.6)		
Agree	12(60.0)	8(40.0)		
HIS allows customization for provider needs.			38.048	**<0.001**
Disagree	94(79.7)	24(20.3)		
Agree	54(41.2)	77(58.8)		
HIS technical support is readily available.			60.272	**<0.001**
Disagree	126(76.8)	38(23.2)		
Agree	22(25.9)	63(74.1)		
HIS ensures data confidentiality and security.			50.120	**<0.001**
Disagree	92(84.4)	17(15.6)		
Agree	56(40.0)	84(60.0)		
User-friendly and efficient.			3.278	0.070
Disagree	107(63.3)	62(36.7)		
Agree	41(51.2)	39(48.8)		
Overall Technical factors			**72.756**	**<0.001**
Disagree	116(82.9)	24(17.1)		
Agree	32(29.4)	77(70.6)		

Source: field survey (2024)

4.11 Binary Logistic Regression of Demographic Factors Associated with the HIS

The binary logistic regression analysis in Table 4.9 examined the relationship between demographic characteristics and the utilization of Health Information Systems (HIS), focusing on the Adjusted Odds Ratios (AORs). Educational qualification was a significant predictor of HIS utilization. Compared to individuals with a certificate, those with a

diploma were 8.71 times more likely to utilize HIS (AOR = 8.712, 95% CI: 4.311-10.761, p < .001). Similarly, individuals with a degree were 3.22 times more likely to use HIS (AOR = 3.217, 95% CI: 1.554-6.658, p < .001), and those with a master's degree were 3.32 times more likely to do so (AOR = 3.321, 95% CI: 3.320-8.832, p < .001). These findings suggest that higher educational qualifications are strongly associated with increased HIS utilization.

Sub-municipality of residence also influenced HIS utilization. Healthcare providers in Choggu sub municipality were significantly more likely to use HIS compared to those in Malshegu (AOR = 1.121, 95% CI: 1.013-1.089, p = .01). Similarly, individuals from Garizegu and Kamina were more likely to utilize HIS, with AORs of 4.461 (95% CI: 1.192-1.109, p < .001) and 1.466 (95% CI: 1.122-1.790, p = .005), respectively. Those from Sagnerigu also showed a significant association with HIS utilization (AOR = 2.326, 95% CI: 1.125-0.847, p = .020). However, residents of Taha showed a higher likelihood of HIS utilization compared to Malshegu, with an AOR of 1.210 (95% CI: 1.832-5.871, p = .001).

Facility work experience was another significant factor. Individuals with 3-5 years of experience were 2.18 times more likely to utilize HIS compared to those with less than 3 years of experience (AOR = 2.181, 95% CI: 3.411-9.144, p = .01). Those with 6-8 years of experience were 3.92 times more likely to use HIS (AOR = 3.916, 95% CI: 4.223-6.090, p = .02), while individuals with 9-11 years of experience were 4.34 times more likely to do so (AOR = 4.337, 95% CI: 5.102-6.693, p = .01). These results indicate that longer work experience within the facility is associated with increased HIS utilization.

Table 4.9 Binary Logistic Regression of Demographic Factors Associated with the HIS

Demographic Characteristics	Odd Ratios	
	COR (95%CI) p-value	AOR (95%CI) p-value
Qualification		
Certificate	1	
Diploma	1.712[1.311-2.761] <0.001	8.712[4.311-10.761] <0.001
Degree	1.217[1.154-3.658] <0.001	3.217[1.554-6.658] <0.001
Master's degree	1.321[1.320-5.832] <0.001	3.321[3.320-8.832] <0.001
Sub-municipality		
Malshegu	1	
Choggu	0.121[0.013-1.089]0.060	1.121[1.013-1.089]0.01
Garizegu	0.461[0.192- 1.109]0.084	4.461[1.192- 1.109] <0.001
Kamina	0.466[0.122-1.790]0.266	1.466[1.122-1.790]0.005
Sagnerigu	0.326[0.125-0.847]0.021	2.326[1.125-0.847]0.020
Taha	2.210[0.832-5.871]0.112	1.210[1.832-5.871]0.001
Facility work Experience(yrs)		
<3	1	
3-5	1.481[0.60869.144]0.122	2.181[3.411-9.144]0.01
6-8	2.916[0.99212.090]0.051	3.916[4.223-6.090]0.02
9-11	3.337[0.205-6.693]0.494	4.337[5.102-6.693]0.01

Source: field survey (2024)

4.12 Binary Logistic Regression of Personal Factors Associated with the Utilization of HIS

The binary logistic regression analysis in Table 4.10 reveals several personal factors associated with the utilization of Health Informatics Systems (HIS). Confidence in using HIS is a significant predictor, with those who agree they feel confident being 5.432 times more likely to use HIS (AOR=5.432, p<0.001). Comfort with technology is also important, with those comfortable with technology being 3.671 times more likely to utilize HIS (AOR=3.671, p<0.001). Additionally, healthcare providers who believe HIS improves work efficiency are 2.861 times more likely to use it (AOR=2.861, p=0.001).

Healthcare providers who view HIS as essential for their job are 3.414 times more likely to use it (AOR=3.414, p=0.005), and those receiving adequate HIS support from colleagues are 1.357 times more likely to utilize it (AOR=1.357, p<0.001). Regularly updating HIS skills significantly increases utilization, with an odds ratio of 10.148 (AOR=10.148, p=0.001). Belief in HIS enhancing patient care (AOR=3.601, p=0.002) and contributing to professional growth (AOR=6.362, p<0.001) also increases the likelihood of HIS usage.

Conversely, a lack of general computer competence (AOR=0.244, p=0.005), lack of HIS knowledge (AOR=0.122, p=0.005), and poor communication between users (AOR=0.125, p=0.048) are negatively associated with HIS utilization.

Table 4.10 Binary Logistic Regression of Personal Factors Associated with the Utilization of HIS

Personal factors	Odd Ratios	
	COR (95%CI) p-value	AOR (95%CI) p-value
I feel confident using HIS		
Disagree	1	1
Agree	0.395[0.138-1.135]0.085	5.432[2.875-10.261]<0.001
I am comfortable with technology		
Disagree	1	1
Agree	0.889[0.310-2.548]0.826	3.671[1.835-7.342]<0.001
HIS improves my work efficiency		
Disagree	1	1
Agree	3.453[1.10410.802]0.023	2.861[1.574-5.201] 0.001
HIS is essential for my job		
Disagree	1	
Agree	0.674[0.145-3.146]0.617	3.414[1.436-8.118]0.005
Adequate HIS support from colleagues		
Disagree	1	1
Agree	1.883[1.819-8.289]<0.001	1.357[1.204-1.706]<0.001
I regularly update my HIS skills		
Disagree	1	1
Agree	0.236[0.079-0.708]0.010	10.148[2.75037.451]0.001
HIS enhances patient care		
Disagree	1	1
Agree	0.589[0.147-2.341]0.451	3.601[1.593-8.140]0.002
HIS contributes to my professional growth		
Disagree	1	1
Agree	0.229[0.098-0.534]0.001	6.362[3.63311.143]<0.001
I lack general computer competence		
Disagree	1	1
Agree	2.695[0.777-9.341]0.118	0.244[0.090-0.660]0.005
I lack HIS knowledge		
Disagree	1	1
Agree	8.545[1.564-46.688]0.13	0.122[0.028-0.533]0.005
There is poor communication between users		
Disagree	1	1
Agree	5.737[0.526-62.561]0.152	0.125[0.016-0.980]0.048

4.13 Binary Logistic Regression of Institutional Factors Associated with the Utilization of HIS

The binary logistic regression analysis in Table 4.11 highlights the institutional factors associated with Health Informatics Systems (HIS) utilization. Adequate HIS training is a significant predictor, with those who agree that training is provided being 1.245 times more likely to use HIS (AOR=1.245, p=0.03). Similarly, the use of user-friendly HIS software increases the likelihood of HIS utilization, with an odds ratio of 1.565 (AOR=1.565, p=0.038).

Monitoring and evaluating HIS usage also positively influences utilization, as those who agree with this practice are 1.36 times more likely to use the system (AOR=1.36, p<0.001). Leadership support for HIS implementation is another critical factor, with an odds ratio of 1.206 (AOR=1.206, p<0.001), indicating that supportive leadership enhances HIS usage. Regular updates and improvements to HIS are associated with a higher likelihood of utilization (AOR=1.218, p=0.001), as is the provision of adequate resources (AOR=1.101, p<0.001).

Furthermore, institutions that have policies ensuring data security in HIS report higher utilization, with an odds ratio of 1.098 (AOR=1.098, p<0.001). Effective communication about HIS updates also contributes to increased utilization, with an odds ratio of 1.151 (AOR=1.151, p=0.036).

Table 4.11 Binary Logistic Regression of Institutional Factors Associated with the Utilization of HIS

Institutional factors	Odd Ratios	
	COR (95%CI) p-value	AOR (95%CI) p-value
Adequate HIS training is provided		
Disagree	1	1
Agree	0.306[0.140-0.667]0.067	1.245[0.459-3.380]0.03
User-friendly HIS software is in use		
Disagree	1	1
Agree	0.798[0.402-1.581]0.517	1.565[1.329-1.968]0.038
HIS usage is monitored and evaluated		
Disagree	1	1
Agree	0.293[0.093-0.925]0.36	1.36[1.047-1.158]<0.001
Leadership supports HIS implementation		
Disagree	1	1
Agree	0.436[0.191-0.994]0.48	1.206[1.108-1.393] <0.001
HIS is regularly updated and improved		
Disagree	1	1
Agree	0.755[0.262-2.177]0.603	1.218[1.092-1.514]0.001
Adequate resources for HIS usage are provided		
Disagree	1	1
Agree	0.412[0.148-1.150]0.090	1.101[1.055-1.185] <0.001
Policies ensure data security in HIS		
Disagree	1	1
Agree	0.549[0.156-1.912]0.346	1.098[1.054-1.178] <0.001
Effective communication on HIS updates exists		
Disagree	1	1
Agree	1.683[0.659-4.296]0.276	1.151[1.214-0.948]0.036

4.14 Binary Logistic Regression of Technical Factors Associated with the Utilization of HIS

Table 4.12 presents the binary logistic regression analysis of technical factors associated with Health Informatics Systems (HIS) utilization. The ease of navigating HIS significantly influences its usage, with those agreeing that HIS is easy to navigate being 1.209 times more likely to use it (AOR=1.209, p<0.001). Compatibility with various devices also plays a key role, as healthcare providers who agree that HIS is compatible are 1.334 times more likely to use it (AOR=1.334, p<0.001).

The reliability of HIS, meaning fewer technical issues, increases the likelihood of its utilization by 1.227 times (AOR=1.227, p<0.001). Similarly, HIS integration with other systems enhances usage, with those agreeing to this aspect being 1.229 times more likely to use HIS (AOR=1.229, p=0.002). Effective communication among providers facilitated by HIS is another important factor, increasing utilization by 1.127 times (AOR=1.127, p<0.001).

Customization of HIS to meet specific provider needs significantly contributes to its usage, with an odds ratio of 1.179 (AOR=1.179, p<0.001). Readily available technical support further boosts utilization, with an odds ratio of 1.105 (AOR=1.105, p<0.001), as does ensuring data confidentiality and security, which increases HIS usage by 1.123 times (AOR=1.123, p<0.001).

Table 4.12 Binary Logistic Regression of Technical Factors Associated with the Utilization of HIS

Technical factors	Odd Ratios	
	COR (95%CI) p-va	AOR (95%CI) p-value
HIS is easy to navigate		
Disagree	1	1
Agree	0.581[0.287-1.179]0.133	1.209[0.121-1.361] <0.001
HIS is compatible with various devices		
Disagree	1	1
Agree	0.854[0.395-1.846]0.688	1.334[1.197-1.569] <0.001
HIS is reliable and rarely encounters issues		
Disagree	1	1
Agree	2.066[0.734-5.778]0.167	1.227[1.132-1.389] <0.001
HIS integrates well with other systems		
Disagree	1	1
Agree	0.584[0.189-1.806]0.351	1.229[1.092-1.571]0.002
HIS facilitates effective provider communication		
Disagree	1	
Agree	0.275[0.092-0.823]0.021	1.127[1.068-1.235] <0.001
HIS allows customization for provider needs		
Disagree	1	1
Agree	1.310[0.369-4.645]0.676	1.179[1.102-1.316] <0.001
HIS technical support is readily available		
Disagree	1	1
Agree	0.202[0.082-0.498]0.001	1.105[1.057-1.193]<0.001
HIS ensures data confidentiality and security		
Disagree	1	1
Agree	0.400[0.11-1.400]0.152	1.123[1.066-1.229] <0.001

4.14 Recommendation to change current HIS

Figure 4.5 is pie chart on the analysis of as to whether they will recommend switching from their current system to another system. Majority (n=195, 78.31) of the Healthcare providers want to change their current system whilst (n=54, 21,69%) are satisfied with their current HIS.

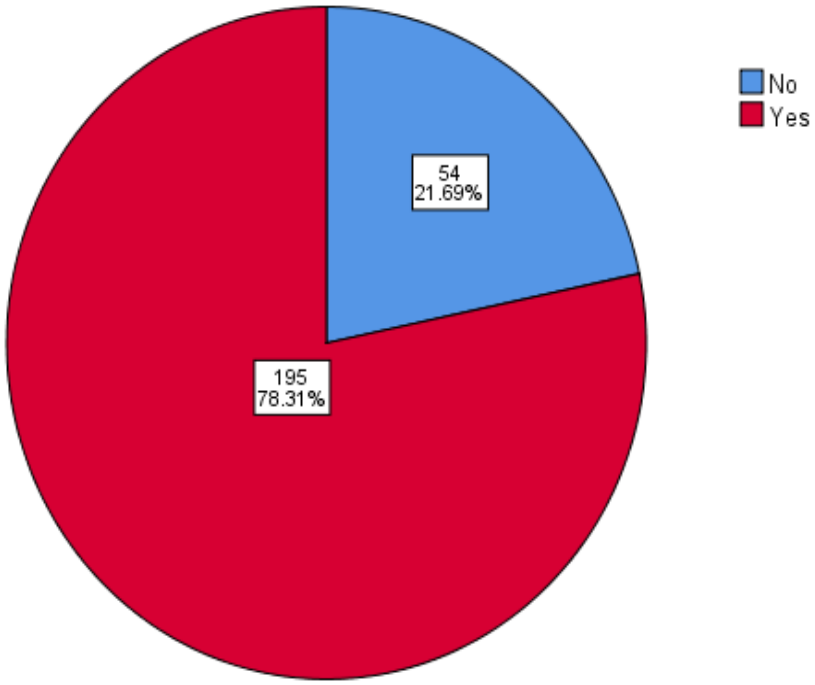


Fig 4.5 Recommendation to change current HIS *Source: field survey (2024)*

4.15 Wish to Switch Health Informatics Systems

Figure 4.6 shows that out of 195(78.31%) who wish to change their current Health Informatics Systems. The majority (n=188, 96.41%) want to switch from their current system (HELIX) to LHIMS whilst only 7(3.59%) wish to switch from HELIX to LHIMS

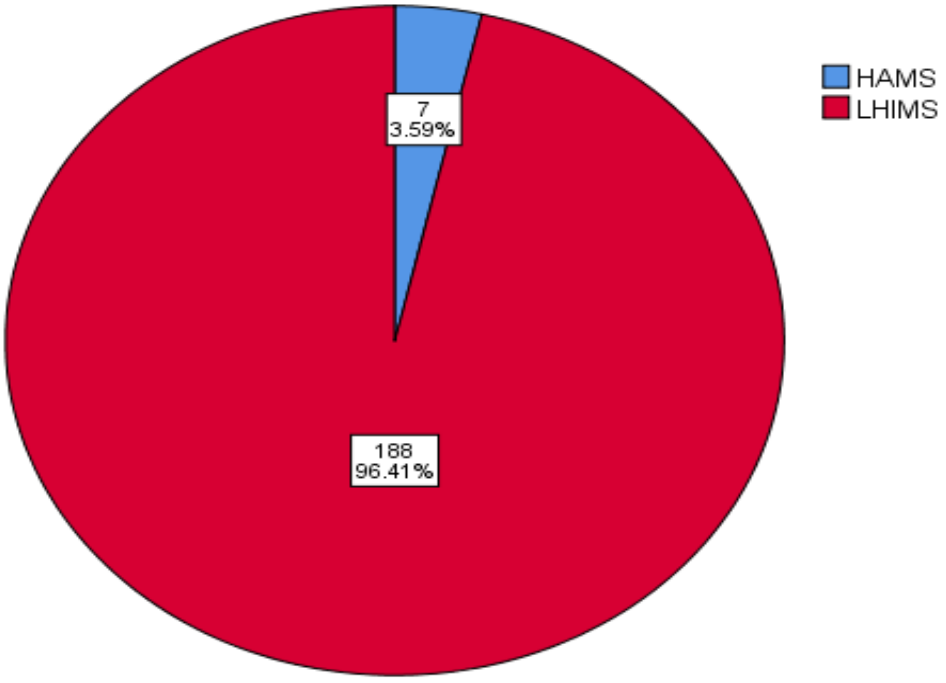


Fig 4.6 Preferred HIS type wish to switch *Source: field survey (2024)*

CHAPTER FIVE

DISCUSSIONS

5.1 Introduction

The Health Informatics System (HIS) stands out as an integral tool in modern healthcare settings, aiming to enhance efficiency, patient care, and organizational decision-making. This chapter discusses the findings of the study and relates other similar studies whose findings are either consistence or not conforming with this current study.

5.1 Utilization of Health Informatics Systems

It was evident that the results varied about the usage of HIS among health providers. While 60.2% of the 249 respondents regularly log into HIS, therefore showing a high level of engagement with the system for primary access, only 43.8% utilize HIS to monitor daily activities. There can thus be noted a system accessibility versus integration problem with daily operations.

The high percentage of 60.2% for the regular HIS login puts forth a positive trend toward adopting health informatics. Regular access indicates familiarity and an essential integration of HIS into the workflow of healthcare providers. Rathert et al., (2019) confirm that consistent access and usage are essential in leveraging technology to enhance healthcare delivery and patient outcomes.

Although the 43.8% usage rate for daily monitoring personnel is lower, indicating that most healthcare providers do not have complete usage of HIS in their day-to-day management

activities. In consolidation of the above opinion, other studies have also shown that even when an EHR or similar system may be present, the full implementation remains unrealized for a variety of reasons, ranging from workflow disruption to lack of training (Yen & Bakken, 2012). This therefore, calls for better issues integration strategies and training to ensure the functional use of HIS in day-to-day activities. Facility service delivery support was highest at 59.8%, which is higher compared to daily monitoring. This indicates a perception that HIS is more important for its role in enhancing direct patient care rather than administrative or operational tasks. This trend is supported by the studies of (Singh & Sittig, 2016), which underlines the role of HIS in improving cl workflows and patient outcomes.

The fact that 54.6% of all providers use HIS to manage patient records indicates that one of the system's core functions is maintaining and accessing patient data. However, a large percentage (45.4%) do not use HIS for this, portraying some barriers to full adoption. Previous studies by(Phichitchaisopa & Naenna, 2013) have reiterated the problem whereby issues such as burdens associated with data entry, usability of the system, and concerns on compatibility affect the adoption of HIS for record management.

In generating health reports, a gross gap exists in using HIS, with more than 90% not using this. This implies gross underutilization of HIS capabilities in generating insight and analytics correct in informed decision-making and management of health. What the low engagement in the generation of the report may mean is intuitive reporting tools or better training on how to use such features accordingly. This findings is consistence with

(Essuman et al., 2020) who studies found low utilization of HIS in the Eastern Region of Ghana.

The general satisfaction level of 60.6% indicates that most health providers are satisfied that HIS is beneficial. Usually, the degree of satisfaction will be directly proportional to the perceived usefulness and ease of use, as well as the effect such a system has on job performance. However, the dissatisfaction level of 39.4 % still proves there are avenues of development in improving system usability and support. Carbone et al., (2022) found that satisfaction of HIS is directly related to HIS utilization.

5.2 Demographic factors associated with utilization of Health Informatics Systems

Evidence from the analysis of the data shows that gender is not statistically significantly associated with using HIS, as females' and males' behavior towards its usage is almost similar. This confirms previous studies conducted by (Snyder et al., 2011) whose findings showed no significant differences between genders. Both groups, in general, report comparable low levels and high HIS use, making gender not a clear determinant for the adoption of HIS.

Similarly, marital status does not significantly influence HIS use. The data indicates that married and single healthcare providers show relatively similar usage. This agrees with several studies that reported minimum effects of marital status on the use of technology settings that are professional in nature. As such, marital status is not considered a critical determinant factor of HIS utilization by healthcare professionals. This finding conforms with the study conducted by(Mohebi et al., 2018)

There is a significant relationship between the use of HIS and educational qualifications. Among the healthcare providers, a more significant proportion of HIS usage was noted among those with higher qualification certificates, either at the diploma or degree levels, compared to those holding certificates. Javaid et al., (2024)study highlighted that, high educational attainment has been associated with an increased adoption and effective use of health information technologies. This could be because higher education instills more developed skills and more confidence in using complex systems, thus increasing the utilization of HIS.

There are also some differences in staff category, although it is not statistically significant. Clinical staff reported more on low and high HIS usage than non-clinical ones. This can be explained by their primary role in patient care, which places them in direct contact with HIS for-patient record management and clinical decision-making processes, (Qazi et al., 2022) reported in their study showed that these differences were not substantial enough to be statistically significant.

Sub-municipality was associated with the use of HIS. The data indicate various healthcare providers in different sub-municipalities with differing extents of HIS usage. Some areas, such as Sagnerigu, show a higher use rate than others, such as Malshegu. This can indicate that local factors, like resource availability, administrative support, or regional policies, play essential roles in the adoption of HIS. A study conducted by Bossen, (2020) also found similar findings.

Facility work experience is strongly related to HIS use; with those having less than three years of facility work experience reporting lower usage as compared to their counterparts who had worked for more than three years in the facilities. What this suggests is that, familiarization with the organizational environment and its systems enhances HIS adoption. Studies have revealed that with increasing tenure, there is usually a better adjustment to and integration of information systems. These findings conform to the studies of Carbone et al., (2022) whose study revealed that, as long as healthcare providers work for long in a particular facility that uses HIS, the likelihood of increase to use of HIS also increases.

5.3 Personal factors associated with utilization of Health Informatics Systems

A number of personal factors were found to be associated with the utilization of health Informatics System., suggesting that significant players in HIS adoption are personal attitudes, perceived benefits, and support structures.

Comfort with technology, therefore, turns out to be a significant determinant: the ones comfortable with technology have a high rate of HIS utilization. That makes sense, as current literature stresses that users' confidence in technology is one of the critical predictors of its adoption and effective use in healthcare settings. Studies by(Mensah, 2022) substantiate this, arguing that healthcare professionals who are comfortable and familiar with technology are likelier to engage with HIS.

Moreover, the perception of improving work efficiency significantly influences the use of HIS. Healthcare providers who feel that, the HIS can help make their work easy and aid

productivity stand at a higher rank in system utilization. This generally agrees with Odei-Lartey et al., (2020), who found that perceived gains in efficiency are significant drivers of the adoption of HIS. If providers feel that there are real benefits in daily tasks, their willingness to use such systems goes up markedly.

Another critical factor influencing HIS usage is data security. In that direction, the degree to which a user is interested in the security of the patients' data corresponds to the degree by which they utilize HIS, showing that awareness and concern for data protection are increasingly realized in healthcare environments. Tariq Khan, (2014) and Aziz, (2017) commented that data security issues could either facilitate or hamper the adoption of HIS depending on how their appropriate deployment can successfully deal with their security problems. In addition, users will require assurance that their patient's data is safe for them to feel confident in using such system.

A strong perception of the necessity of HIS for one's job is therefore correlated with higher usage levels. That is, if healthcare providers perceive HIS as something integral to their job performance, then this would be expected to lead to a high tendency to use it. The result of this study was also supported by (Bossen, 2020), who found that once professionals find technology essential for their role, they are highly motivated to integrate it into their work routine. Knowing the relevance of HIS for their tasks should increase the frequency and effectiveness.

Adequate support from peers was positively related to HIS use. Such adequate peer support makes voluntary interaction with HIS more likely, thus showing that collaboration and

informal sharing of knowledge could enhance the adoption of the system. This agrees with(Lee et al., 2020) who established organizational support and peer help as critical factors that were important to influence attitudes positively toward HIS and its implementation process.

Additionally, utilization of HIS is linked to regular updating of HIS skills. Continuous training and enhancement of these skills keep healthcare providers proficient in using HIS and are critical in keeping pace with the evolution of system functionalities and best practices. This has been summarized in studies by(Veinot et al., 2019) who considered continuous education as necessary for maintaining high levels of HIS engagement and attendant effectiveness.

There is a high association of belief in improving patient care through HIS with higher use. In case healthcare providers find HIS helpful in improving patient care, then they tend to use it more. This converges conforms with what Snyder et al., (2011) established: the perceived improvement in patient outcomes due to HIS can result in increased adoption by healthcare professionals.

In contrast, poor general computer competence negatively influenced HIS usage. Healthcare providers having lower basic computer skills use HIS less. This corroborates well with the findings of Lee et al., (2020) and Javaid et al., (2024), where it was found that general computer literacy is a crucial ingredient to the successful implementation of HIS. Foundational computer competence among healthcare providers can be ensured by improving their capabilities for using more complex health information systems.

Additionally, utilization was hampered by the lack of HIS knowledge. Less involved were those providers who did not understand how to use the HIS and were less familiar with its capabilities. This finding is supported by Sutton et al., (2020) and McGraw & Mandl, (2021) where it is commented that adequate training and familiarization with HIS are essential prerequisites to provide maximum benefit and be compiled with ubiquitous.

Perception of workload does not have a significant influence on HIS use. This means that even if the workload set before healthcare providers ranges from low to high, it is their attitude towards technology and perceived benefit that gives them the drive to use HIS, regardless of how much workload they can handle. (Seid et al., 2021) point out that workload may have the potential for a stressor but would not drive technology adoption unless workload occurs to relate to directly perceived system efficacy who manages it.

Finally, poor communication among the HIS users significantly influences utilization. Effective communication or sharing of information among the users is one of the ingredients of successful implementation; through it, troubleshooting, knowledge exchange, and solution teamwork are facilitated. Lee et al., (2020) observe that good communication practices within teams can enable better adoption of technology by addressing user concerns and thus fostering a supportive environment to learn and adapt.

5.4 Institutional factors associated with utilization of Health Informatics Systems

The findings on institutional factors associated with using Health Information Systems (HIS) portray a great deal of organizational support and systemic attributes in promoting effective HIS use among healthcare providers.

Adequate training in HIS is essential for its higher use as healthcare providers who report adequate training are much more likely to be extensive users of HIS compared with non-users of such training. This therefore, brings out the very critical role played by comprehensive training programs in enhancing HIS competence and confidence among users. This view is supported by Singh & Sittig, (2016) where it has been indicated that continuous education and training greatly enhance the proficiency of users towards the system and its engagement, consequently leading to better adoption rates and effective use of HIS.

Interestingly, encouragement and incentives for HIS use do not significantly influence the utilization rates. This could be interpreted to mean that while such measures might be involved in cultivating initial engagement, they are necessary but not enough to drive long-term usage. Critical drivers of long-term use, as reported by Wude et al., (2020).

Higher reporting on monitoring and evaluation of HIS utilization goes hand in hand with higher usage. Healthcare providers reporting that HIS use was regularly monitored and evaluated indicated significantly higher engagement. This might mean accountability mechanisms or performance feedback may drive more consistent HIS usage. (Lee et al., 2020) sustain this argument, that, continuing system monitoring and feedback improves system performance, but the users also find its guidelines of use more consistent and employ them to improve the general utilization of a system.

One of the key factors encouraging HIS is leadership support. The greater such support and endorsement, the higher the engagement in HIS among healthcare providers. It is very well

explained by Carayon & Hoonakker, (2019) that leaders set the tone regarding technology adoption within a given health organization. Effective leadership may foster system acceptance through championing the system's benefits by users, addressing relevant concerns, and providing resources.

Regular updates and improvements to HIS are essential for higher utilization. Healthcare providers who agreed that the system is updated regularly and improved upon also report more significant usage, which reflects the importance of keeping the technology current and responsive to user needs. (Khatun et al., 2022) and (Liu et al., 2012) emphasized that frequent updates allow one to deal with many emerging issues while accommodating users' feedback and enhancing system functionality in a way that supports higher levels of user engagement.

The supply of adequate HIS use resources is also strongly related to higher utilization. Some of the essential resources that are basic to letting proper HIS use occur are technical support, hardware, and software. In that light, (Marquard, 2021) believes that the availability of resources provides users with the necessary tools and support to effectively use HIS effectively, thus promoting better usage by reducing possible hindrances from the system.

The policies related to data security within HIS are linked with higher utilization, underpinning the fact that robust data protection measures build trust and enable users' full engagement. Tariq Khan, (2014) explained that thorough policies on data security allay

fears among users regarding data leakage, increasing their propensity for using HIS to manage their sensitive health-related information.

Effective communication concerning HIS updates is significantly associated with higher utilization. Healthcare providers reporting a clear and compelling type of communication concerning system updates and changes are more likely to use HIS. Lee et al., (2020) pointed out that effective communication can keep users aware of the system changes, therefore reducing uncertainty, which would then facilitate smoother transitions during update times for the maintenance of high usage levels.

The rewards for the effective utilization of HIS, however, are insignificant about usage, indicating that intrinsic motivators or perceived benefits of HIS play a comparatively more significant role in driving utilization than extrinsic rewards. In this regard, factors such as system usability and perception of value in improving work processes have been identified by (Wang & Shahzad, 2024) as necessary compared to rewards, which present short-term motivation but stand ineffective in long-term engagement.

5.5 Technical factors associated with utilization of Health Informatics Systems

These findings further underline how technical factors remain significant determinants of the use of Health Information Systems by healthcare providers. The navigating aspect in HIS is found to be statistically significant predictors of HIS utilization as healthcare providers who find the system easy to navigate compared with those who do not. In agreement with this, studies by(Bossen, 2020) and (Yen & Bakken, 2012) have found that intuitive navigation systems can reduce the burden on thinking processes which may

results in increased user satisfaction, adoption, and continued use of HIS. The perceived compatibility of HIS with various devices also influences its use. Healthcare providers who feel that he or she is compatible with multiple devices are more likely to use it constantly. This is reflected by, (Rahal et al., 2021) who note that multi-device compatibility makes it very easy to integrate into healthcare workflows since providers can easily access information on different platforms.

This high speed of access to patient informatics through HIS, however, does not significantly affect the uptake rates. This probably means that as much as the quickness of information retrieval is highly considered, it may not be a driver for its increased usage by health providers. Marquard, (2021) observe that while speed might be of the essence, other usability and functional factors may have a higher impact on the adoption and usage of HIS.

Healthcare providers who perceive that HIS is a reliable have extensive usage of it. This agrees with(Wang & Shahzad, 2024) who add that system reliability expresses trust and confidence in the users, reducing resistive behavior to technology adoption and encouraging continuous engagement with HIS. The other critical factor that emerged was the integration capability of the system with other systems. Healthcare providers who found HIS well-integrated with other hospital information systems tended to report higher utilization rates. This conforms with (Lee et al., 2020) who asserted that seamless interoperability builds sharing capabilities on all data and enhances workflow efficiency, thus promoting greater HIS utilization across healthcare settings.

Strong associations with higher utilization levels were made possible by effective communication through HIS among healthcare teams. Providers who agreed that to have effective communication would substantially support and facilitate effective communication were seen to show a relatively high rate in the use level. This replicates findings that enhanced capabilities for communication promote collaboration, smoothen processes associated with patient care, and hence will fuel greater acceptance and use of HIS in (Zeng et al., 2019).

The other chief determinant of higher HIS utilization is user-friendly HIS software. Easy operability and navigation through the system, as expressed by healthcare providers, are associated with increased levels of use. This supports the view of Benti et al., (2019) that ease of use in design is critical to reduce users' frustration and increase continuous use. An easy-to-use, intuitive system would reduce the barriers to entry, and it is much more likely that healthcare professionals will adopt HIS and integrate it into workflows.

In contrast, the perceived usefulness of HIS for clinical decision support features does not significantly influence utilization rates. From here, service providers would perceive equal levels of utilization despite perceiving these features to be useful or otherwise. This observation is in disagreed with Lau et al. (2020) and Wang et al. (2021), that although the decision support tools are valuable, their impact on general HIS adoption and usage may vary depending on other usability and organizational factors. The ability to customize setups significantly influences the use of HIS. Healthcare providers who agreed that he allows the customization of the system by their needs report higher levels of utilization. This concurs with (Zeng et al., 2019) states that such tailored solutions accommodate a

great variety of user preferences and operational requirements, markedly improving user satisfaction regarding HIS and increasing the usability of HIS over the long term.

Of importance is the technical support availability, which emerges as another important determinant. Ready access to technical support services sent utilization rates significantly higher. This is supported by (Cresswell et al., 2020) and (Chen et al., 2020) concerning the fact that timely assistance in solving technical problems enhances the system's reliability and boosts user confidence, thus encouraging continued engagement with HIS.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This final chapter synthesizes the findings on the factors associated with utilization of the Health Informatics System (HIS) among healthcare providers in the Sagnerigu Municipality. The chapter further highlights the strengths and limitations, and suggestions for future research.

6.2 Conclusions

This study provides a current overview of how healthcare providers are using health information systems. It looks into the various facets that affect the adoption and usage patterns of the system. Overall, while accessibility to HIS and its primary usage are relatively high, lacunae are evident regarding its integration into daily clinical workflows and relating to the advanced functionality of its use for generating health reports. Ultimately, technical, personal, institutional, and demographic elements play an essential role in shaping HIS use.

Although there were low influences from variables like gender, marital status, and job rank on HIS usage, educational qualification, and sub-municipality revealed a significant influence on utilization rates. Targeting educational initiatives and local contextual factors

in the kind of implementation strategies for HIS will enhance adoption across different settings of health systems.

Other major personal factors that may impact utilization were the provider's comfort with technology, belief in HIS efficiency gains, perceived data security, and the necessity of HIS forjob performance.

Adequate training, easy-to-use software design, leadership support, regular updating of the system, availability of resources, and effective communication about system changes were some of the key institutional factors related to high HIS utilization. Attention to continual support, thorough training programs, and responsive system updating could foster the kind of sustained engagement with HIS that is desirable.

Ease of navigation, compatibility with multiple devices, reliability, integration capabilities, and effective communication facilitated by HIS, therefore emerged as the critical technical factors significantly associated with higher utilization rates. Such findings highlight the importance of intuitive design, multi-device compatibility, system reliability, interoperability, and communication features in enhancing HIS adoption and usage among health providers.

6.3 Recommendations

1. Health facilities should continuously provide training to enhance the proficiency of health professionals in using health informatics systems so that they have adequate beneficiaries and will be able to put into practice advanced functionalities of relevant systems.

2. Healthcare providers should involve in continuous education process to be updated on new features and best ways of using HIS, fostering a culture of continuous improvement and skill development.

3. The municipal health Director should help ensure uniformity and interoperability in the implementation of standardized HIS within all municipal health facilities so that the exchange of health information and collaboration on health care between them would go on smoothly.

4. The MHMT should set up structures with regular monitoring and evaluation to track the HIS utilization rate, giving feedback to health facilities with appropriate action points for intervention and improvement.

5. The RHMT should Ensure sufficient resources for the infrastructure of HIS, training programs, and continuous support initiatives across all healthcare facilities in the country, with equal access and support provided to these facilities.

6.3.1 Recommendation for Policy level Intervention

1. The Ministry of Health and the Ghana Health Service should develop a national policy framework for the implementation and utilization of Health Informatics Systems (HIS). This policy should focus on:

2. Establishing guidelines for the standardization and interoperability of HIS across all healthcare facilities to ensure seamless exchange of health information.

3. Introducing mandatory training and certification programs for health professionals on HIS to ensure uniformity in skills and competence.

4. Allocating dedicated budgetary support for HIS infrastructure, maintenance, and upgrades to sustain operational efficiency.

5. Establishing a national monitoring and evaluation system to track HIS utilization, identify gaps, and implement evidence-based corrective measures to improve system performance.
6. Encouraging public-private partnerships to enhance technological support, innovation, and continuous improvement of HIS across the healthcare sector.

6.4 Suggestions for further studies

There is the need for a qualitative study to identify specific barriers related to the full adoption and complete use of Health Information Systems by health professionals in the Sagnerigu Municipality. In particular, it should look at issues that pertain to cultural factors, organizational challenges, and resistance to change in HIS adoption. A richer understanding of these barriers will give way to concrete recommendations for their virtue in better integrating HIS into healthcare workflows. It will help strategize effective ways of promoting the use of HIS for-quality healthcare delivery to help improve patient outcomes in Ghana.

6.5 Strengths of the Study

1. The study provides valuable insights into the factors influencing the utilization of Health Informatics Systems (HIS), incorporating a comprehensive range of personal, technical, and institutional factors.
2. A large sample size (n=249) enhances the reliability and generalizability of the findings to similar settings.
3. The use of multivariate analysis offers strong statistical support, strengthening the conclusions drawn from the data.

6.6 Limitations of the Study

1. The study is limited to a specific geographic region(Sagnerigu Municipality), which may affect the generalizability of the results to other regions or countries.
2. The cross-sectional design captures a snapshot in time, which limits the ability to assess long-term trends or changes in HIS utilization and causality could not be establisd
3. Potential self-reporting bias in the responses, as the data were based on participant perceptions, which could affect the accuracy of certain findings.
4. The study is also limited by time as is restricted within a particular time-bound.

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APPENDIX I: SURVEY QUESTIONNAIRE

UNIVERSITY FOR DEVELOPMENT STUDIES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT EPIDEMIOLOGY, BIOSTATISTICS AND DISEASE CONTROL

I am a final year ***MPH (Health Informatics***) student and I sincerely appreciate your willingness to participate in this study. This study is ***to assess the Factors associated with unitization of Health Informatics Systems in Sagnerigu Municipality.*** Your valuable insights will contribute significantly to the quality of healthcare delivery

Section 1: Demographic Information

1. What is your gender? Male( ) Female( )
2. What is your age? ……..
3. Marital Status? Married( ) Single( )
4. What is your qualification? Certificate( )Diploma( ) Degree Master's degree( ) PhD( )
5. What category of staff are you? Junior Staff ( ) Senior Staff( )
6. Which department do you work? Clinical Staff( ) Non-clinical( )
7. What is your current Grade/Rank? Staff Nuese( ) Senior Staff Nurse( ) Nursing Officer( ) Senior Nursing Officer( ) Enrolled Nurse( ) Senior Enrolled Nurse( ) Principal Enrolled Nurse( ) Staff Midwife( ) Senior Staff Midwife( ) Others(Specify) …….
8. Which Sub-municipality do you work? Taha( ) Kamina ( ) Choggu( ) Sagnerigu( ) Malshegu( ) Garizegu( )
9. Which facility do you work for?.....
10. How long have you been working in this facility?.....
11. How long have been working in general(years)? *Please refer to your first appointment*
12. which Health Informatics System do your use in your facility? HELIX( ) LHIMS ( ) HAMS( ) PHIMS( ) CLAIMIT( ) Others(Specify)…….

Section 2: Personal Utilization of Health Informatics Systems

Please respond to the following questions regarding your utilization of Health Informatics Systems

S/N	Statement	Yes	No
13	Do you have user logins for your system?		
14	Do you use HIS to monitor daily activities?		
15	Do you use HIS for providing service?		
16	Do you use HIS for-patient record management?		
17	Do you generate health reports from HIS?		
18	Overall, I am satisfied with HIS utilization.		

Section 3: Facility Utilization of Health Informatics Systems

Please respond to the following questions regarding your knowledge of utilization of Health Informatics Systems in the following department in your facility

No.	Statement	Yes	No
19	Do you use HIS in the records department?		
20	Do you use HIS at opd?		
21	Do you use HIS at IPD?		
22	Do you use HIS at CWC?		
23	Do you use HIS for PNC services?		
24	Do you use HIS for FP services?		
25	Do you use HIS for ANC services?		
26	Do you use HIS in the laboratory department?		
27	Do you use HIS in the consulting rooms?		
28	Do you use HIS in the pharmacy department?		
29	Do you use HIS in the disease control activities?		

Section 4: Personal factors Associated with Utilization of HIS

Please indicate to what extent you agree or disagree with the following statements regarding Personal factors Associated with Utilization of Health Informatics systems by selecting the appropriate response: (1 = Strongly Disagree, 2 = Disagree,3 Neutral 4 = Agree, 5 = Strongly Agree

S/N	Statement	1	2	3	4	5
30	I feel confident using HIS.					
31	I am comfortable with technology.					
32	HIS improves my work efficiency.					
33	Data security in HIS is important to me.					
34	HIS is essential for my job.					
35	I receive adequate HIS support from colleagues.					
36	I regularly update my HIS skills.					
37	HIS enhances patient care.					
38	I recommend HIS to other providers.					
39	HIS contributes to my professional growth.					
40	I lack general computer competence.					
41	I lack HIS knowledge.					
42	I have too much workload.					
43	There is poor communication between users.					

Section 4: Institutional factors Associated with Utilization of HIS

Please indicate to what extent you agree or disagree with the following statements regarding Institutional factors Associated with Utilization of Health Informatics systems by selecting the appropriate response: (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4= Agree, 5= Strongly Agree

No.	Statement	1	2	3	4	5
44	Adequate HIS training is provided.					
45	User-friendly HIS software is in use.					
46	HIS usage is encouraged and incentivized.					
47	HIS usage is monitored and evaluated.					

48	Leadership supports HIS implementation.					
49	HIS is regularly updated and improved.					
50	Adequate resources for HIS usage are provided.					
51	Policies ensure data security in HIS.					
52	Effective communication on HIS updates exists.					
53	Rewards are given for effective HIS utilization.					

Section 6: Technical factors Associated with Utilization of HIS

Please indicate to what extent you agree or disagree with the following statements regarding technical factors Associated with Utilization of Health Informatics systems by selecting the appropriate response: (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral 4=Agree, 5 = Strongly Agree

No.	Statement	1	2	3	4	5
54	HIS is easy to navigate.					
55	HIS is compatible with various devices.					
56	HIS provides quick access to patient info.					
57	HIS is reliable and rarely encounters issues.					
58	HIS integrates well with other systems.					
59	HIS facilitates effective provider communication.					
60	HIS offers useful clinical decision support features.					
61	HIS allows customization for provider needs.					
62	HIS technical support is readily available.					
63	HIS ensures data confidentiality and security.					
64	Overall, HIS is user-friendly and efficient.					

65. Will you recommend switching from your currents system to a different system?

Yes( ) No( )

66. If yes, please specify……..

APPENDIX II: ETHICAL CLEARANCE

Kwame Nkrumah University of Science and Technology, Kumasi

College of Health Sciences
SCHOOL OF MEDICINE AND DENTISTRY

COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/397/24

20th May, 2024

Abdul Ganiyu Abubakari
Department of Epidemiology,
Biostatistics and Disease Control
School of Public Health
UDS-TAMALE.

Dear Sir,

LETTER OF APPROVAL

Protocol Title: ***"Factors Associated with the Utilization of Health Informatics Systems in the Sagnaerigu Municipality."***

Proposed Site: ***Sagnarigu Municipality health facilities.***

Sponsor: ***Self-sponsored.***

Your submission to the Committee on Human Research, Publications, and Ethics on the above-named protocol refer.

The Committee reviewed the following documents:

- A notification letter of 15th April 2024 from the Sagunarigu District Health Directorate (study site) indicating approval for the conduct of the study in the district.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning **20th May 2024** to **19th May 2025** renewable thereafter. The Committee may, however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you for your application.

Yours faithfully,

Rev. Prof. John Appiah-Poku.
Honorary Secretary
FOR: CHAIRMAN

Room 7, Block L, School of Medicine and Dentistry, KNUST, University Post Office, Kumasi, Ghana
Tel: +233 (0) 322 063 248 **Mobile:**+233 (0) 205 453 785 **Email:** chrpe.knust.kath@gmail.com / chrpe@knust.edu.gh

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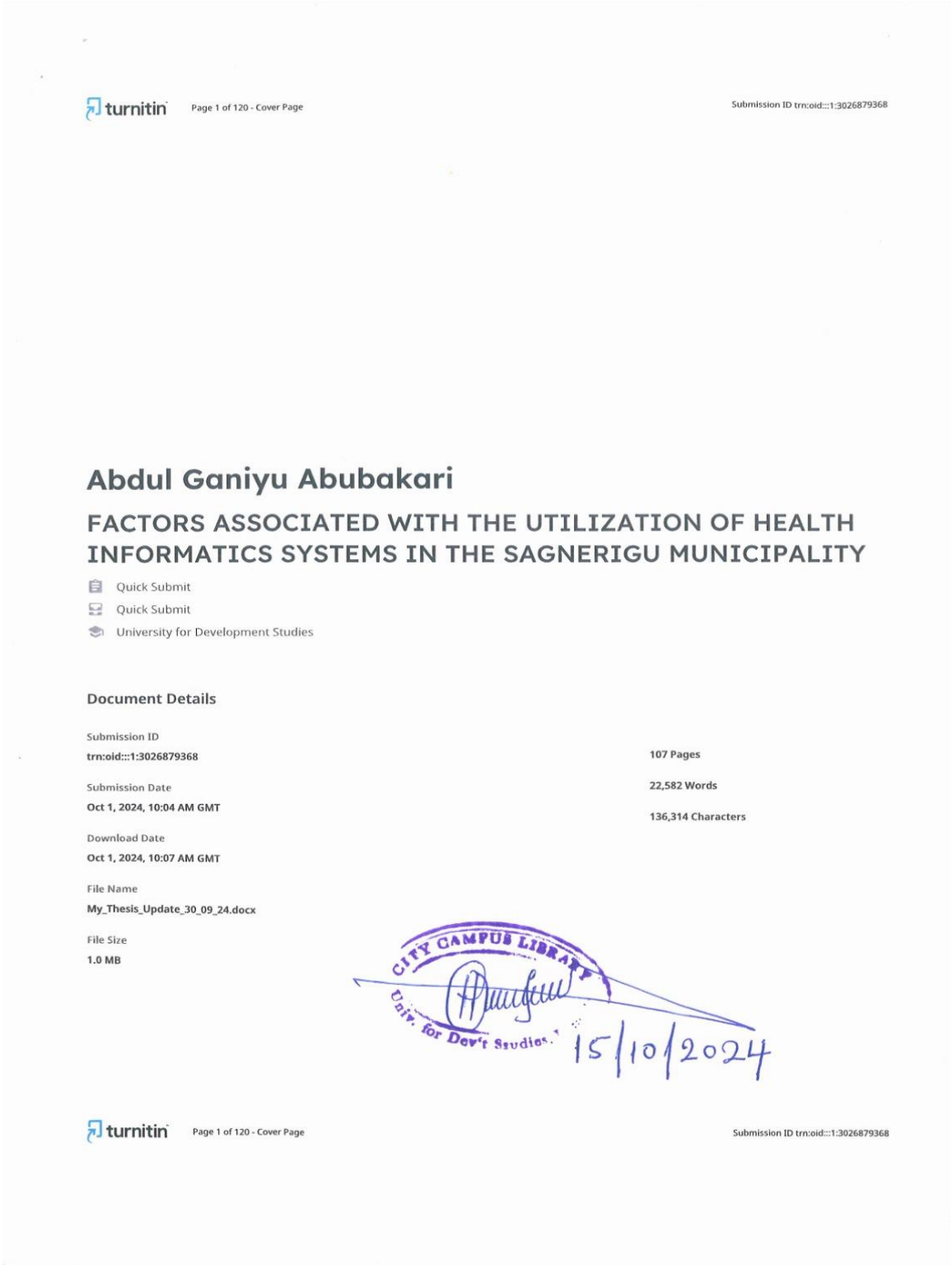

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Abdul Ganiyu Abubakari

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