P-ISSN: 2170-1040 | **Journal of Economic Papers**
Volume : 14 – Issue : 01 (2023), P: 01 - 16 | **E-ISSN:** 2602-5426

The Role of Health Information Technology in eliminating the Effects of COVID-19 Pandemic in Private Hospital Establishments: a study of a sample of doctors and officials' perspectives at private hospital establishments in M'Sila

BEN TOUMI Sarra
M'Sila University, (Algeria), sarra.bentoumi@univ-msila.dz

Received: 08/03/2023 **Accepted:** 27/04/2023 **Published:** 20/05/2023

Abstract:

Recent years have witnessed a rapid development in the use of health information technology in the health systems of some countries because of the vital role played by this technology in facing COVID-19. Therefore, this study comes to highlight the impact of using health information technology in eliminating the effects of COVID-19 in the Algerian hospital establishments.

To achieve this objective, questionnaires have been used as a main tool for data collection. So, 90 questionnaires have been distributed to a sample of doctors and officials, at a number of private hospital establishments in M'Sila city, in order to learn about the extent of using health information technology and the nature of the relationship between its application and the elimination of the effects of COVID-19 pandemic.

The study has concluded that the hospital establishments used a high level of health information technology, which contributes to the limitation of the effects of COVID-19 pandemic in the hospital establishments, where the study took place, by 44.89%.

Keywords: Health Information Technology (HIT); Private Hospital Establishment (PHE); COVID-19 Pandemic.

JEL Classification: M150; I120; O32.

1. Introduction:

Throughout the last three years, the world has witnessed unprecedented changes in the global economy. The World Health Organization (WHO) declared the outspread of COVID-19 pandemic on March 11th, 2020. It asked governments to prepare for the first wave of the global health emergency through implementing several measures (World Health Organization, 2020) to mitigate the economic, social and health effects of COVID-19 crisis in countries. The countries' responses varied, according to their capabilities and circumstances.

In the same context, health information technology has emerged as a fundamental change throughout the pandemic. Its main features include: privacy of records, level of care, interactive consultation, appropriate communication, ... etc.), as well as providing services that extended to doctors, health care staff, patients, ... etc (Chandra, Kumar, Thakur, Chahopadhyaya, & Kumar, 2020), which has allowed for comprehensive health control and patients' monitoring through a systematic channel of information-based smart applications.

1.1 Study problem:

COVID-19 pandemic has revealed the role played by health information technology in providing telehealth services, since medical consultations have become very difficult for everyone, especially for patients. In the light of the above-mentioned circumstances, It has become necessary for private health establishments in Algeria to invest in health information technology infrastructure, as well as to expand training programs for their employees on current health information technology Because of the vital role played by these tools including: Telemedicine, Health Information System, Telemedicine Conferences, Telehealth, Personal Health Record, Electronic Medical Record) in confronting COVID-19 in different countries. Therefore, the research problem is to study the role of health information technology in limiting the effects of COVID-19 pandemic in private hospital establishments including: El-Kalaa clinic, Hodna clinic and Hammadien clinic in the city of M'Sila by asking the following main question:

Which role did health information technology play in private hospital establishments in eliminating the effects of COVID-19 pandemic in M'Sila?

To answer the main question of the study, the following sub-questions have been asked:

- Has medical equipment played a role in limiting the effects of COVID-19 pandemic in M'Sila?
- Has the website created by the hospital establishments played a role in limiting the effects of COVID-19 pandemic in M'Sila?
- Have electronic health information systems at hospital establishments played a role in limiting the effects of COVID-19 pandemic in M'Sila?
- Have electronic medical records in the hospital establishments played a role in limiting the effects of COVID-19 pandemic in M'Sila?
- Has telemedicine in the hospital establishments played a role in limiting the effects of COVID-19 pandemic in M'Sila?

1.2 Study hypotheses:

On the basis of the above questions, the following main hypothesis has been formulated:

Health information technology at private hospital establishments has played a major role in limiting the effects of COVID-19 pandemic in the city of M'Sila.

From the main hypothesis, the following sub-hypotheses have emerged:

- There is a statistically significant effect of medical equipment at private hospital establishments in limiting the effects of COVID-19 pandemic in the city of M'Sila.
- There is a statistically significant effect of the websites of private hospital establishments in limiting the effects of COVID-19 pandemic in the city of M'Sila.
- There is a statistically significant effect of health information systems in private hospital establishments in limiting the effects of COVID-19 pandemic in the city of M'Sila.
- There is a statistically significant effect of the electronic medical record in private hospital establishments in limiting the effects of COVID-19 pandemic in the city of M'Sila.
- There is a statistically significant effect of telemedicine in private hospital establishments in limiting the effects of COVID-19 pandemic in the city of M'Sila.

1.3. Study objectives:

Through this research, we look for achieving the following objectives:

- Learning about the most important mechanisms that the Algerian government has adopted to limit the effects of COVID-19 pandemic.
- Identifying the level of use of health information technology in the private hospital establishments under study, according to the doctors and officials' perspective.
- Identifying the nature of the relationship between health information technology, at the private hospital establishments under study, and the mechanisms of reducing the effects of COVID-19 pandemic, according to the doctors and officials' perspective.
- Identifying the role of health information technology applications (medical equipment, websites, electronic health information system, electronic medical records, telemedicine) at the private hospital establishments under study in reducing the effects of COVID-19 pandemic in the city of M'Sila.
- Based on the obtained results, a set of recommendations have been developed to guide the private hospital establishments under study.

1.4. Study Methodology:

The study aims to know the extent of the impact of using health information technology on eliminating the effects of COVID-19 pandemic at private hospital establishments. On the basis of the study nature and the given questions, we have adopted the descriptive approach that is appropriate to the nature of the studied topic.

2. The Conceptual framework of health information technolog:

Deployment of ICT in healthcare settings has helped healthcare professionals to improve the efficiency and effectiveness of healthcare delivery (Almunawar & Anshari, 2011). In a study by **Mekhjian et al** (S.Mekhjian, et al., 2002), Information Technology has the potential of reducing hospital stay by 5% or more via speeding up certain hospital functions; like ordering and completing tests, ordering and administering medications, and collecting information and preparing

for patients' discharge, and also by preventing costly errors; such as adverse drug reactions that in turn result in lengthening of hospital stay and some delay in discharge. This part of the study focuses on the concept of health information technology and its applications.

2.1. The concept of health information technology (HIT):

The use of health information technology will be a part of the future of healthcare and will likely become even more important. Furthermore, it promises to empower patients to become active participants in their healthcare. Below, we review some of the definitions provided for health information technology.

Goldschmidt (2005) defines Health information technology as: "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data, and knowledge for communication and decision making." (G.Goldschmidt, October 2005). This definition indicates that health information technology contains the capture, storage, use and/or transmission of health information through electronic processes for use by consumers, payers, providers, insurers, and other groups dealing with health and health care.

Marjan Laal (2012) defines it as follows: "is the application of information technology to plan, spread, make, use and maintain of information systems for the healthcare industry." (Laal, 14-16 Novembre 2012). Health information technology can be implemented in the form of Health Records (EHR), Electronic Medical Records (EMR), Computerized Physician Order Entry (CPOE), Clinical Decision Support System (CDSS),……. etc. (Ahlan & Ahmed, 2014)

In short, the concept of Health Information Technology (HIT) is about the use of information-based technologies, strategies, applications, etc. in healthcare-related services. (Singh, Javiad, Haleem, Vaishya, & Bahl, 2020), However, HIT systems are not widely available, and even if, they are not properly utilized. Unfortunately, in most countries, particularly in developing economies, people do not have access to healthcare facilities due to factors like the shortage of healthcare professionals, inadequate hospitals or clinics, high cost of medical consultation, ……etc. (Odekunle, Odekunle, & Shankar, 2017)

2.2. The aspects of using health information technology in health establishments:

This part of the study aims to highlight the aspects of using health information technology in the provision of health services.

2.2.1. The electronic Health Records (EHRs):

The Electronic health records are the focus of efforts across the health industry to best inform the care delivery process using the most comprehensive available information. The definition recognizes that health-related information about a patient is available in many locations and systems so that, if presented through a common and user-friendly interface, this information can improve the ability of clinical personnel to support the best possible diagnosis, treatment, and health management decisions for and with an individual. (The National Alliance for Health Information Technology, 28 April 2008)

2.2.2. The personal Health Records (PHRs):

An electronic record of an individual's health-related information is identical to the nationally recognized interoperability standards, that can be extracted from multiple sources while being managed, shared and controlled by the individual. (The National Alliance for Health Information Technology, 28 April 2008, p.19).

Paralleling the movement to patient-focused EHRs is the growing momentum to encourage people to be active participants in their health and care by giving them the means to set up and manage their own electronic store of health-care and wellness information. The purpose of this personal health record is to encourage people to pursue healthy lifestyles, manage health risks and chronic conditions, access health and wellness services and make more informed decisions. (The National Alliance for Health Information Technology, 28 April 2008, p.14).

2.2.3 Telemedicine:

Telemedicine is defined as "the use of electronic information and communication technologies to provide and support health care when distance separates the participants." (Kunwar, Dhungana, Aryal, Gaire, Abhikari, & Ojha, 2022). It is also defined as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment, prevention of disease and injuries, research, evaluation and for the continuation of education of health care providers for the sake of advancing the health of individuals and their communities." (Ittipong, Watsawee, & Manachai, 2019)

The two previous definitions emphasize that the field of telemedicine is very broad and diverse. Seven areas of use of telemedicine can be defined, depending on whether the application concerned mainly aims to: Teleconsultation and tele-expertise, Remote Assistance, Remote monitoring, Telediagnosis or telesurgery, E-learning, Cyber management, E-health. (Hocini, Idir, Ahmane, Abbassene, Boumaraf, & Sekkai, 2008) .

2.2.4 Health Information System (HIS)

A health information system is any form of structured data, information, or knowledge that can be used to support healthcare delivery or promote health. This definition is of relatively little value because the term has been widely used to include applications not directly related to health development, such as computerized hospital billing systems. (R.B.Panerai, 2010)

Some researchers believe that adopting health information technology can provide significant savings by lowering the cost of providing health care, eliminating unnecessary health care services (such as duplicate diagnostic tests), and improving the quality of care in ways that may reduce costs (by reducing costs) for example, the likelihood of an adverse drug event) (Agha, 2014). On the other hand, there is another school of thought that believes that health information technology can enhance the quality of care, but also increases spending on healthcare services because improvements in quality will stimulate the demand for additional services. (K.Alotaibi & Federico, 2017) Conversely, some argue that health information technology can improve the quality of care, but it can also increase spending on health care services, because the improved quality stimulates demand for additional services. (MD, 2019)

3.The Role played by Health Information Technology throughout COVID-19 Pandemic in Algeria

With the spread of COVID-19 virus at the beginning of 2020 and the accompanying wave of panic, most governments have adopted a quarantine policy that disrupted all aspects of life and allowed health institutions to handle a large number of patients, from one side. From the other side, institutions, individuals and governments have increasingly turned to digital technologies to mitigate the crisis impact and overcome its difficulties. Since Algeria had been affected by this global pandemic, it had to move quickly, and for this reason, a state of health emergency was declared on March 19, 2021, and all the materials and the logistical capabilities have been provided to limit its spread while encouraging work to develop the use of health information technology in health institutions; One of the most important manifestations in this regard is the establishment and the activation of a number of electronic platforms devoted to the remote delivery of health information, including:

3.1 The Digital Platform of The Ministry of Health:

The electronic platform of the Ministry of Health to monitor the development of the Coronavirus in Algeria is a result of the state's move towards developing digital content and telehealth services, as well as the gradual digital transformation in various fields and at the level of institutions. The features offered by this platform are not limited to tracking the latest developments related to the spread of the Coronavirus in Algeria, but extend to the fact that this platform provides information and developments to the citizen, as well as educative advice, whether about the disease or preventative measures, as a part of the measures taken to confront this epidemic. (http://covid19.sante.gov.dz)

3.2 The Digital Platform of the Algerian Telecommunication Company:

The Algerian Telecommunication Company has created an electronic platform that serves as an information board for various health interests. It also allows obtaining a clear picture of the status of the spread of the Coronavirus in the country in real-time, as the public health directorates of each state will be able - through this electronic platform - to provide and follow up on information available in a database. (Benhammou & Merah, 2022)

3.3. Bioval Application:

The " Val Group Clinic" launched an electronic application "BIOVAL APP", on July 21st 2022,which is a part of the process of developing a high-quality medical service at home combining reliability and speed. The app allows patients to make online appointments for medical analysis at home for the same price as in a medical laboratory, which means that no transportation costs. The electronic application provides a wide range of specialized medical analyses that are processed on the latest generation of devices, which primarily serve social groups with limited mobility or those who live in isolated areas. (SANTENEWS-DZ, 2022)

3.4 e-Tabib Platform

"E-Tabib" is a local electronic platform that provides free medical services remotely during the quarantine period. It is the first of its kind in the field of a remote medical consultation with video technology in Algeria. It was launched in conjunction with the

outbreak of the epidemic in the country, using the phone or computers. (Nabil, Logiciel médicaux et Services pour les Pros , 2020).

The initiative aims to reduce pressure on hospitals and allow patients to resume medical appointments remotely, in line with measures put in place to limit the spread of the coronavirus. The platform website includes a team of young volunteers and qualified cooperating doctors. Their selection is based on expertise and experience, as well as their possession of an official license that allows them to practice, as the platform offers 20 medical specialties. (APS, 2021)

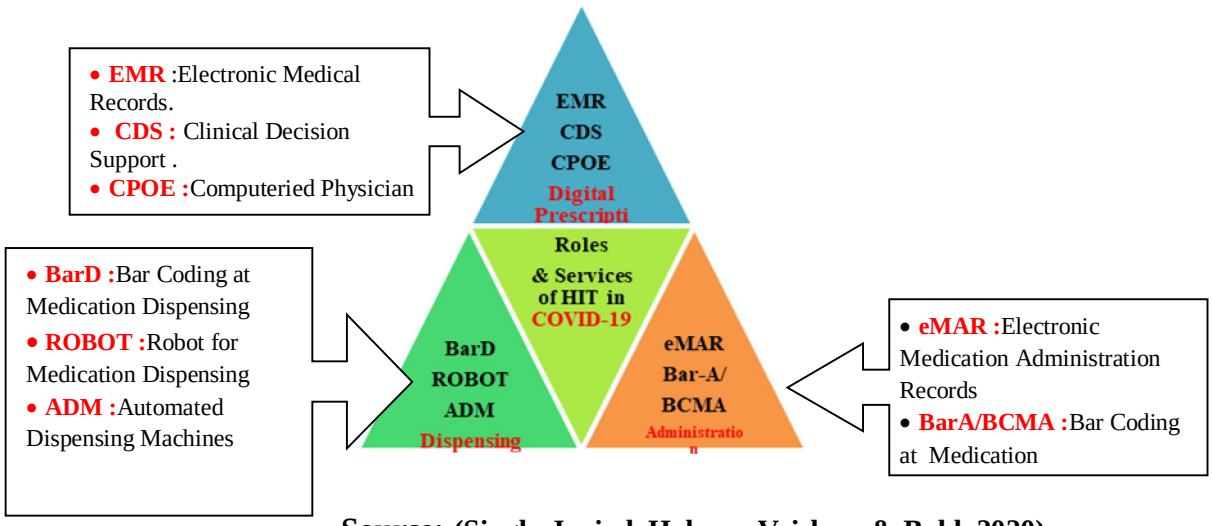
3.5. Docta platform

A group of Algerian competent doctors launched an electronic health platform, under the name "Docta", aims at ensuring a more accessible healthcare experience. This new idea in Algeria has come within the framework of the need for digital solutions that keep pace with reality and improve the health care experience in the country, especially in light of this epidemiologic situation. “Docta” platform aims to organize medical appointments , manage patients' medical information and files on one platform, in addition to the improvement of the doctors’ relationship with the patients through facilitating the process of communication between them. (Algérie Docta, 2021)

Undoubtedly, these electronic platforms have greatly contributed to put an end to the patients’ suffering, especially the elderly, as it has become easy to communicate with the doctor to examine the patient remotely without moving under the restrictions of the pandemic.

In addition to that, the outbreak of COVID-19 pandemic has led to an urgent and unprecedented need for digital solutions in the health sector. Innovation and expansion of applications related to information and communication technology have been key factors in ensuring business continuity in the healthcare industry (Singh, Javiad, Haleem, Vaishya, & Bahl, 2020). The figure below shows the role played by health information technology could provide in healthcare throughout Covid-19 pandemic:

Fig 01. Roles & Services of Health Information Technology in Healthcare



Source: (Singh, Javiad, Haleem, Vaishya, & Bahl, 2020)

The above figure shows the roles and services provided by health information technology in healthcare during Covid-19; the applications serve the idea of telemedicine

technology using modern technology, as well as widely available programs, which made this work revive the idea of medicine and withdraw the idea of clinical medicine, since it is one of the traditional mechanisms that pose a threat to doctors and patients, it is a potential factor in the transmission and spread of infection. Medical consultation is enough for everyone, but especially for patients, health information technology is a game changer through providing extended services for doctors, medical staff, patients...etc.

The most important thing to note from the figure above is that much of the aforementioned outbreak of COVID-19 pandemic has resulted in an urgent and unprecedented need for digital solutions in the health sector. Innovation and expansion of applications related to information and communication technology has been a key factor in ensuring business continuity in the healthcare industry.

4. Research Method and Procedures:

This part of the study is dedicated to present the methodological aspects of the field study, which uses a questionnaire as the main tool.

4.1 The Tool Used in The Study:

The questionnaire was relied upon as a main tool for collecting information, as it was prepared based on previous studies related to the study variables, and it was divided into three axes:

-The first axis: relates to the independent variable represented in health information technology and the extent of its application in the health establishments under study, and includes 25 phrases related to the independent variable represented in the characteristics of the Corona virus, and includes 14 phrases .

-The second axis: Dedicated to the study of the variable dependent on the study, which is the mechanisms to reduce Covid-19 effects in the health establishments under study.

-The third axis: is related to the general data related to the research sample, and it consists of 4 paragraphs.

Match the statements of each of the axes of the questionnaire with a group of scores that correspond to the five-point Likert scale.

4.2 Study Community

The study community has been chosen based on the independent variable (health information technology). The study has been conducted on all health hospital establishments in the city of M'Sila, which are represented in El-Kalaa clinic, Hodna clinic, and Hammadien clinic, as they depend on health information technology in providing the services. While the study sample has randomly been chosen from the study population, which includes the director and heads of departments and doctors, in order to find out the uses of health information technology in the aforementioned establishments, and the extent of its impact in limiting the aggravation of COVID-19 pandemic.

4.3 The Study Sample

We've tried to distribute the questionnaire to the largest number of the study community individuals, but we've been unable to do so, due to some of them business, and

the absence of others. So, we've distributed (90 Questionnaires), which has included managers, heads of services and doctors. (83 Questionnaires) have been retrieved, and after the test, (10 Questionnaires) have been canceled, because they haven't met the conditions for the correct answer. Thus, the number of valid questionnaires for statistical analysis becomes (73 Questionnaires).

The following table shows the demographic characteristics of the study sample in terms of gender, age, job nature and professional experience variables.

Table 1. Demographic data of the sample

VARIABLES	CATEGORIES	N=64	%	HODNA CLINIC		EL-KALAA CLINIC		HAMMADIEN CLINIC	
SEX	Male	46	63.01	09	45%	16	64%	20	71.43%
	Female	27	36.99	11	55%	09	36%	08	28.57%
TOTAL		**73**	**100**	**20**	**100%**	**25**	**100%**	**28**	**100%**
AGE	Less than 30 years old	05	6.85	01	05%	01	04%	03	10.71%
	30-39 years old	30	41.09	06	30%	09	36%	15	53.57%
	40-49 years old	23	31.51	08	40%	11	44%	04	14.29%
	50-59 years old	11	15.07	03	15%	04	16%	04	14.29%
	Older than 60 years old	04	5.48	02	10%	00	00%	02	7.14%
TOTAL		**73**	**100**	**20**	**100%**	**25**	**100%**	**28**	**100%**
TYPE OF JOB	Doctor	39	53.42	11	55%	13		15	
	Administrative Position	34	46.58	09	45%	12		13	
TOTAL		**73**	**100**	**20**	**100%**	**25**	**100%**	**28**	**100%**
YEARS OF EXPERIENCE	Less than 5 years	23	31.51	01	5%	02	00	20	82.14%
	5-10 years	35	47.94	14	70%	13		08	17.86%
	11-15 years	07	09.59	02	10%	05		00	00%
	Older than 15 years	08	10.96	03	15%	05		00	00%
TOTAL		**73**	**100**	**20**	**100%**	**25**	**100%**	**28**	**100%**

Source: made by author

Through the above table, we note that Hammadien clinic ranked first in terms of the collected questionnaires' number (28 questionnaires), followed by el-kalaa clinic with 25 questionnaires and finally Hodna clinic with 20 questionnaires, which reflects the actual reality of the number of employees in private hospital establishments in the city of M'Sila.

The results in Table (01) show that most of the respondents were men, accounting for 63.01% and 36.99% respectively, reflecting the fact that most of the doctors working in private hospital establishments are men.

We also note that 47.94% of respondents are under 40 years old, followed by 31.51% between 41-50 years old and 31.51% over 50 years old. This percentage was estimated at 20.55%, which reflects the hospital establishments' policy on hiring and contracting young physicians.

The sample has also included 46.58% of the directors and department heads of the private hospital institutions studied, while the remaining 53.42% has come from the category of physicians interviewed. Also, the majority of respondents 79.45% have an average experience of less than 10 years, and this result is reflected in the age group of the respondents, as 47.94% is those who have less than (40 years), while the remaining percentage is those who changed their jobs in some period of their lives.

4.4 Statistical Analysis of Methods Used:

To answer research questions and test their hypotheses, the Statistical Package for the Social Sciences (SPSS 25) program used the following statistical methods:

- Descriptive statistical measures represented in the arithmetic mean and standard deviations to analyze the trends of the respondents' opinions about the study variables.

- Correlation coefficient «Pearson » to measure the validity of internal consistency.
- Cronbach's alpha coefficient to measure the stability of the study instrument.
- A regression analysis of variance to study the validity of the study model for regression; Simple linear regression to test the main and subsidiary hypotheses.
-

4.5. The Questionnaire validity and Reliability:

The validity test of the tool aims to determine the coverage and consistency of the questionnaire items, consistent with the actual design of the measurement object.

4.5.1. The study tool Validity:

The construct validity of the questionnaire has been verified by calculating the Pearson correlation coefficient between the scores of each statement and the total score of the same dimension, and it has come between 0.362 and 0.763, which means the condition of validity and structural validity of the questionnaire is accepted and verified.

4.5.2. Research Stability Test (Test Reliability):

The stability of the search tool has been measured using the "Alpha Cronbach coefficient," which determines the level of acceptance of the measurement tool at a level (0.6) or more, where we found that the internal consistency stability coefficient « Cronbach's Alpha». The axes of the study are, respectively (0.685; 0.762; 0.666; 0.802; 0.734; 0.875) which are high values and suitable for research purposes, on the one hand, and on the other hand, it shows that the questionnaire is characterized with stability, which means that it will give the same results, if it will be used again under the same conditions.

5. Results presentation and Hypotheses Test:

In this part, we will attempt to analyze the study sample's perceptions of the study variables.

5.1. The analysis of The Respondents' Opinions about The Use of Health Information Technology in Private Hospital Establishments in The City of M'Sila:

In order to identify the respondents' attitudes to the use of health information technology in private hospital establishments in the city of M'Sila, The phrases that measure this axis shown in Table (02) will be analyzed.

Table (02) shows the arithmetic mean and standard deviation of the respondents' answers regarding the use of health information technology in the private hospital establishments of the city of M'Sila.

Table 2. The arithmetic means and standard deviation of the respondents' answers about the use of health information technology in private hospital establishments

N	PHRASES	MEAN	STANDARD DEVIATION	T	SIG
01	Your hospital establishment is equipped with technologically advanced medical tools and equipment that are in line ,with global developments in the field of modern medicine.	4.18	0.855	11.767	0.000
02	Your hospital establishment has a sufficient amount of medical equipment and equipment to deal with sudden health crises.	3.90	1.016	7.603	0.000
03	Your hospital establishment works to keep pace with international standards in the field of providing health care to the patient.	4.32	0.743	15.121	0.000
04	After the "Covid-19" pandemic, there is an increasing tendency for your hospital establishment to use health information technology in making decisions related to patient diagnosis or treatment.	4.15	0.794	12.389	0.000
TOTAL (MEDICAL DEVICES AND EQUIPMENT)		4.14	0.536		
05	The website of your hospital establishment provides a group of free (telecare) health services for the patient.	3.93	0.805	9.887	0.000
06	The website of your hospital establishment has the ability to book an appointment in advance for the patient.	3.86	0.822	8.972	0.000
07	The website of the hospital establishment facilitates the process of communication between the doctor and his patient.	4.19	0.616	13.442	0.000
08	The information on the hospital establishment's website is updated periodically.	4.11	0.718	16.196	0.000
09	The website of the hospital establishment is distinguished by an easy user interface.	4.19	0.758	16.532	0.000
10	Your hospital establishment publishes its new services through its accounts on social media.	4.27	0.672	13.203	0.000
TOTAL(THE WEBSITE)		4.09	0.423		
11	The software used in your hospital establishment is compatible with the requirements of working in the medical field and providing health care.	4.22	0.731	14.246	0.000
12	Modern technologies are used to deliver the required information in a timely manner to the medical staff in youraaqq hospital establishment.	3.99	0.790	10.661	0.000
13	Private data is updated The patient at every visit (constantly) to your hospital establishment.	3.92	0.812	9.654	0.000
14	Your hospital establishment uses the internal network between its various departments.	3.82	0.962	7.297	0.000
15	Your hospital establishment exchanges information with its external environment electronically.	3.59	1.128	4.460	0.000
TOTAL (ELECTRONIC HEALTH INFORMATION SYSTEM)		3.91	0.523		
16	Your hospital establishment creates an electronic medical record for each patient who visits it.	4.00	0.816	10.464	0.000
17	Your hospital establishment creates an electronic medical record for each newborn born there.	4.00	0.601	14.218	0.000
18	The form used for the electronic medical record by your hospital establishment covers all information (medical, nursing, administrative...) related to the patient's condition.	3.95	0.780	8.929	0.000
19	The patient who visited your hospital establishment can easily access his electronic medical record	3.84	0.800	10.356	0.000
20	Electronic medical records contributed to the diagnosis of many rare diseases for patients.	3.86	0.694	10.632	0.000
TOTAL (ELECTRONIC MEDICAL RECORD)		3.92	0.436		
21	Your hospital establishment, in cooperation with doctors from outside the country, performs some surgeries remotely using network technology.	3.82	0.674	10.423	0.000
22	Tele-lecture technology is used to train the medical staff in your hospital establishment.	3.88	0.832	8.999	0.000
23	Doctors in the hospital establishment provide medical consultations to patients over the phone.	3.99	0.754	11.169	0.000
24	Many doctors in your hospital establishment have joined the digital platforms (e-Tabib, Docta, ……..) during COVID-19 pandemic.	3.89	0.698	10.892	0.000
25	Sending an e-mail and/or over the phone reminding the patient of his next medical appointment.	3.95	0.724	11.149	0.000
TOTAL (TELEMEDICINE)		3.92	0.459		

Source: Prepared by the researcher based on the outputs of the program SPSS V-25

Table (02) shows that the respondent's attitude toward the use of health information technology in their medical establishments is high. The arithmetic mean of the answers for this axis is (3.99) and the standard deviation is (0.6627). In the light of the study sample's answers to the questionnaire data, the dimensions of devices and equipment in the private

hospital establishments ranked first in terms of the relative importance given to them by the research sample. The arithmetic average of the responses to this dimension was (4.137) with a standard deviation of (0.536), While the mean values for the phases of this dimension ranged between (4.32-3.95), the values of the standard deviation ranged from (1.106-0.743). Thus, this result indicates that this dimension is available to a high degree, from the point of view of the respondents.

5.2. The analysis of the respondents' opinions about the mechanisms to limit the effects of COVID-19 pandemic in the city of M'Sila:

The following table shows the arithmetic mean and standard deviation of the respondents' answers about the mechanisms to limit the effects of COVID-19 pandemic.

Table 3. The arithmetic mean and standard deviation of the respondents' answers about the mechanisms to reduce the effects of COVID-19 pandemic

N	PHRASES	MEAN	STANDARD DEVIATION	T
01	The provision of equipment and laboratory analysis in the hospital establishment contributed to the early detection of the virus in patients.	4.34	0.628	18.251
02	Personal protective equipment (masks, medical glasses, shoes, gowns...) Vaccines available at your hospital office can help limit the spread of the virus among medical staff..	4.22	0.651	16.006
03	The hospital establishment has set up a dedicated office to receive suspected cases of coronavirus infection, away from patients, which helps limit the spread of COVID-19.	4.00	0.601	14.218
04	The installation of an oxygen concentrator in your institution contributed to relieving pressure as a result of the acute crisis of hypoxia.	4.00	0.624	13.701
05	Providing the service of sending the results of analysis and/or x-rays to doctors via phone and/or e-mail to reduce the spread of infection from one person to another.	3.88	0.763	9.820
06	Adopting a chloroquine regimen can help reduce the number of deaths from COVID-19.	4.16	0.646	15.405
07	Vaccines contributed to a decrease in the number of laboratory-confirmed infections with COVID-19 among people who had been vaccinated.	4.16	0.624	15.945
08	Messages were sent via the phone stating the need to obtain a Covid-19 vaccine for each person whose data was recorded in the electronic medical record of the hospital establishment.	4.08	0.662	13.977
09	During COVID-19 pandemic, the management of your hospital facility has provided additional bonuses and incentives for its medical staff.	3.85	0.776	9.353
10	Partnering with physicians contracted by your hospital establishment can help reduce the stress on its medical staff in the face of COVID-19.	3.89	0.809	9.404
11	Cooperation between the hospital establishments in the city of M'Sila contributed to ameliorating the pressure on the medical staff because of the increase in critical cases.	4.15	0.660	14.901
12	Applying the concept of social distancing and preventing gatherings contributed to reducing COVID-19 pandemic.	4.11	0.657	14.419
13	Many doctors in your hospital establishment have joined the digital telemedicine Platform (e-Tabib, Docta,……) during COVID-19 pandemic period.	4.00	0.645	13.236
14	Activating telemedicine practices during COVID-19 pandemic contributed to reducing infections among medical staff.	4.01	0.736	11.770
TOTAL		4.06	0.419	

Source: Prepared by the researcher based on the outputs of the program SPSS V-25

We note that the table above shows that the arithmetic means of the sum of the phrases of this dimension was (4.06), with a standard deviation equal to (0.419). It shows a great agreement in the responses of the respondents on this dimension. While the values of the averages of the phrases of this dimension ranged between (4.34-3.85), the standard

deviation values ranged between (0.809-0.624). It recorded the phrase No. (1): “The provision of equipment and laboratory analysis in the hospital establishment contributed to the early detection of the virus in patients" The highest averages (4.34) and a standard deviation (0.628), given that the first stage in the treatment journey is the detection of COVID-19 through medical analysis, followed by a set of steps to reduce the effects of the spread among individuals in case of infection is proven. While she came phrase (09): "The management of your hospital establishment provided additional bonuses and incentives to its medical staff during COVID-19 pandemic." In the last place in terms of importance due to the symbolism of the reward obtained compared to the effort expended and the potential risk of injury.

5.3 Test the study hypotheses

The validity of research hypotheses will be checked by calculating «The Pearson» correlation coefficient, variance test «ANOVA», as well as simple and multiple regression tests.

5.3.1. Test of normal distribution:

To verify that the data follows a normal distribution, the Kolmogorov-Smirnov test was used, as it was found that the level of significance for all values of (Z) is more significant than (0.05), which prompts us to say that the variables of the study are subject to a normal distribution, Hence, the hypotheses can be tested using parametric tests.

5.3.2. Testing the explanatory power

Before confirming the validity or falsity of the hypothesis that states that there is a statistically significant impact between health information technology and its various dimensions on the management of COVID-19 pandemic, it must first be confirmed that there is a correlation between health information technology and the management of COVID-19 pandemic in hospital establishments in the city of M’Sila, through the Pearson correlation coefficient.

The results of the statistical analysis showed that there is a statistically significant relationship between the use of health information technology and limiting the effects of COVID-19 pandemic in the hospital establishments under study.

The value of the correlation coefficient (is 0.670), which indicates the existence of a strong correlation with statistical significance at a significant level (0.000), As, for the coefficient of determination, it reached 0.449, meaning that 44.9% of the mechanisms for limiting the effects of COVID-19 pandemic in the hospital establishments under the study were using health information technology, while the remaining percentage is due to other variables that were not included in the study model. In addition to the above, the statistical significance value was estimated at 0.000, which is ultimately lower than the significance level of 0.05.

After making sure that the data follows a normal distribution using the Kolmogorov-Smirnov test, the method of variance (ANOVA) was used to verify the linearity of the relationship between the independent variable and the dependent variable, meaning that there is a linear relationship between the dependent and independent variables, the following table shows the results obtained.

Table 4. Variance Analysis Results (ANOVA) and Correlation test results

Variables	Source	Sun Squares	DF	Mean Square	F	Sig	correlation coefficient "r"	Statistical decision
Medical devices and equipment	Between Groups	0.972	1	0.972	5.889	0.018	0.277*	weak direct relationship
	Within groups	11.715	71	0.165				
	Total	12.687	72					
The website	Between Groups	2.734	1	2.734	19.502	0.000	0.464**	medium direct relationship
	Within groups	9.953	71	0.140				
	Total	12.687	72					
Electronic Health Information System	Between Groups	3.805	1	3.805	30.422	0.000	0.548**	medium direct relationship
	Within groups	8.881	71	0.125				
	Total	12.687	72					
Electronic medical record	Between Groups	2.967	1	2.967	21.672	0.000	0.484**	medium direct relationship
	Within groups	9.720	71	0.137				
	Total	12.687	72					
Telemedicine	Between Groups	2.012	1	2.012	13.381	0.000	0.398**	medium direct relationship
	Within groups	10.675	71	0.150				
	Total	12.687	72					
Health information technology	Between Groups	5.692	5	1.138	10.905	0.000	0.670**	Strong direct correlation
	Within groups	6.995	67	0.104				
	Total	12.687	72					

Source: Prepared by the researcher based on the outputs of the program SPSS V-25

The above table shows the significance of the results obtained, as well as the higher value of (F) calculated from the tabular value, This means that the conditions for studying the association between the dimensions of health information technology and the mechanisms for limiting the consequences of COVID-19.

5.3.3 Sub-hypothesis testing

Table (05) shows the results of testing the sub-hypotheses, which are: There is a statistically significant effect of health information technology dimensions as independent variables and among reducing the effects of COVID-19 pandemic as a dependent variable.

Table 5. Results of regression analysis to test the impact of independent variables of health information technology in private hospital establishments in limiting the effects of COVID-19 pandemic in M'Sila

Sub-hypotheses	r^2	Constant	Regression coefficient B	Calculated t-value	SIG	$\hat{Y}=a+BX_x$	
Sub-hypothesis 1	0.277	3.167	0.216	2.427	0.018	$\hat{Y}=3.167+0.216X_1$	Accept Hypothesis H_1
Sub-hypothesis 2	0.464	2.176	0.461	4.416	0.000	$\hat{Y}=2.176+0.461X_2$	Accept Hypothesis H_0
Sub-hypothesis 3	0.548	2.490	0.402	5.516	0.000	$\hat{Y}=2.490+0.402X_3$	Accept Hypothesis H_0
Sub-hypothesis 4	0.484	2.234	0.465	4.655	0.000	$\hat{Y}=2.234+0.465X_4$	Accept Hypothesis H_0
Sub-hypothesis 5	0.398	2.642	0.364	3.658	0.000	$\hat{Y}=2.642+0.364X_5$	Accept Hypothesis H_0

Source: Prepared by the researcher based on the outputs of the program SPSS V-25

It can be seen from Table (05) that:

- Acceptance of the main hypothesis states that:"Health information technology in private hospital establishments has played a major role in limiting the effects of COVID-19 pandemic in the city of M'Sila". The significance level is 0.05;
- There is a very weak effect of medical equipment and equipment in reducing the effects of COVID-19 pandemic at the significance level of 0.05, and from it, we reject the first sub-hypothesis, which states that: "There is a statistically significant effect of medical devices and equipment in private hospital establishments in limiting the effects of COVID-19

pandemic in the city of M'Sila";

- There is a statistically significant effect at the level of significance 0.05 for health information technology dimensions (website, electronic health information system, electronic medical record, telemedicine) in private hospital establishments in limiting the effects of COVID-19 pandemic in M'Sila city.

6. Conclusion:

Through this study, in its theoretical and applied aspects, we've attempted to highlight the role played by health information technology in limiting the effects of Covid-19 in Algeria, specifically, the city of M'Sila, through studying the opinions of a sample of doctors and officials of private hospital establishments in M'Sila. The most important findings of the study, with an attempt to present some suggestions to strengthen the conclusions raised in the field under study (the health sector), are listed as follows:

6.1. The study results:

This study has concluded with many results, and the most important of them are listed as follows:

- Abandoning traditional medicine practices has clearly contributed to limiting the spread of COVID-19. On the other hand, there is an activation of telemedicine practices as one of the proposed tools to reduce the pandemic.
- An increase in the number of electronic platforms for telemedicine in Algeria during the period of COVID-19 pandemic, due to the high demand for services provided by this type of platform during the quarantine period imposed by the Algerian government.
- The perceptions of the opinions of a sample (doctors and officials) about the level of health information technology in the hospital establishments under study tended towards the high level, but what we noticed during our field visits to them (Al-kalaa clinic, Al-Hodan clinic, Al-Hammadien clinic) is the excellence of the Al-Hammadien clinic. In terms of the novelty of the website, the electronic medical record, and the health information system, this may be due to its recent establishment.
- There is an impact of the use of health information technology in the hospital institutions under study in reducing the effects of COVID-19 pandemic in the city of M'Sila, through the effect of dimensions (website, electronic health information system, electronic medical record, telemedicine.

6.2 suggestions:

In light of the results reached, a number of suggestions were presented:

- Work on adapting the legal system of the health sector in Algeria to global trends towards e-health, especially after COVID-19 pandemic, which will allow private hospital establishments to make wider use of health information technology.
- Working to generalize the use of health information technology in all Algerian public hospital establishments can improve the quality of services provided.
- Work on developing a national strategy to create a personal electronic health record for every citizen, which can contribute to the discovery and treatment of many diseases before they turn into chronic diseases.

7. References:

Ahlan, A. R., & Ahmed, B. I. (2014). ***User Acceptance of Health Information Technology (HIT): In Developing Countries: Aconceptual Model***. Proce technology , 16, 1287-1296.

Algeria Press Service. (2020). ***Covid 19/eTaib platform: More than 2,600 telemedicine consultations since the end of March***, Retrieved 1 10, 2022, from APS: https://www.aps.dz/algerie/tag/Coronavirus?start=2600

Algérie Docto .(2022). Retrieved 5 10, 2022, from Algérie-Docto: https://algerie-docto.com/

Almunawar, M. N., & Anshari, M. (2011). ***Heath Information System (HIS): Concept and Technology***. International Conference Informatics Development. Yogyakarta, Indonesia.

Chandra, M., Kumar, K., Thakur, P., Chahopadhyaya, S., & Kumar, F. A. (2020). ***Digital technologies, healthcare and Covid-19: insights from developing and emergingnations***. Health and Technology , 12, 547-568.

B.Kunwar, A.Dhungana, B.Aryal, A.Gaire, A.Bikram, R.Ojha. (2022). ***Cross-Sectional Study on Knowledge and Attitude of Telemedicine in Medical Students of Nepal***. *Health Science Reports, 05(*02), 1-10

F.Benhammau, N.L.Marah. (2022). ***The role of information and communication technology in Algeria's transformation into a digital country during the emerging crisis of the Corona virus(Covid 19)***. Economic Studies and Research Journal, 6 (01), 668-687.

G.Goldschmidt, P. (October 2005). ***HIT and MIS: Implications of Health Information Technology and Medical Information Systems***. Communications of the ACM , 48 (10), 69-74

Hocini, H., Idir, O., Ahmane, H., Abbassene, A., Boumaraf, M., & Sekkai, L. (2008). ***La Telémédecine pour le Désendavement des Zones Saharienne en Algérie***. Congres méditerranéen des télécommunications et exposition CMT08. Tanger-Marocco.

I.Khemapech, W.Sansrimahachai, M.Toachoodee. (2019). ***Telemedicine-Meaning, Challengs and Opportunities***. Siriraj Medical Journal, 71(03), 246-252.

K.Alataibi, F.Federico.(2017). ***The Impact of Health Information Technology on Patient Safety***. Saudi Medical Journal, 38 (12), 1173-1180.

L.Agha. (2014). ***The Effects of Health Information Technology On the Costs and Quality of Medical Care***. Journal Health Econ, 34, 19-30.

Laal, M. (2012). ***Health IT: What does the Term Mean***. 3rd World Conference on Information Technology (WCIT), 1806-1811. Barcelona-Spain.

M.Nabil.(2020).***Logiciel médicaux et Services pour les Pros***. Retrieved 5 10, 2022, from etabib: https://etabib.dz/fr/cliniques-et-medecins-au-bout-du-doigt/pro/

Odekunle, F. F., Odekunle, R. O., & Shankar, S. (2017). ***Why Sub-Saharan Africa Lags Inelectronic Health Record Adoption and Possible Stratégies to Increase Its Adoption In This Region***. International Journal of Health Sciences , 11, 59-64.

R.B.Panerai. (2010). ***Health Information Systems. Global Perspectives in Health***, Encyclopedia of Life Support Systems (EOLSS). 01, pp. 1-6.

S.Mekhjian, H., R.Kumar, R., Kuehn, L., D.Bently, T., Teater, P., Thomas, A., et al. (2002). ***Immediate Benefits Realized Following Implementation of Physician Order Entry at an Academic Medical Centre***. Journal of the Amerecian Medical Informatics Assocciaton , 09 (05), 529-539.

SANTENEWS-DZ. (2022). ***Médical Digital "Bioval APP"***. Retrieved 10 12, 2022, from SANTENEWS-DZ: http://www.santenews-dz.com/communiques/medical-digital-bioval-app/

Singh, R. P., Javiad, M., Haleem, A., Vaishya, R., & Bahl, S. (2020). ***Significance of Health Information Technology (HIT) in Context to COVID-19 Pandemic: Potential Roles and Challenges***. Journal of Industrial Integration and Management , 05 (04), 427-440.

The National Alliance for Health Information Technology. (2008). ***Defining Key Heath Information Technology Terms.*** .The Office of the National Coordination for Health Information Technology. https://www.healthit.gov/.

World Health Organization. (2020). Retrieved 10 13, 2022, from WHO: https://www.who.int/emergencies/diseases/novel-coronavirus-2019.