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Mobile Application for Registration and Diagnosis of Respiratory Diseases: a Review of the Scientific Literature between 2010 and 2020

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***Abstract*— In early 2020, an unknown aetiological pneumonia named by the World Health Organization (WHO) as COVID-19, is causing the death of millions of people around the world. At present, there is no treatment or vaccine against the disease, so the need to find various strategies to combat it is urgent. This document used a systematic review of the literature (SLR) as a method, where the objective is to identify the benefits of mobile applications that allow the registration and diagnosis of respiratory diseases. For the research, a literature review was conducted in databases such as Scielo, IEEE Xplore, Proquest, Ebsco, Scopus, Google academic and WoS from which 60 scientific articles were obtained between the periods 2010-2020. Of the 60 articles found, they were synthesized in 12 groups in relation to the topic, of which 11 articles were related to medical chatbot, which showed positive effects regarding the influence of a mobile application for the diagnosis of diseases.**

Keywords*— mobile application, etiology, Covid-19, systematic review

I. INTRODUCTION

At the end of 2019, the World Health Organization (WHO) office in China was informed of the cases of unknown etiological pneumonia detected in the city of Wuhan, Hubei Province, China. The WHO considers the risk of this event to be very high in China, high at the regional level and high at the global level and in February 2020 the WHO calls the disease COVID-19, short for "Coronavirus Disease 2019" [1].

In Peru, in particular, a national health emergency was declared by supreme decree for a period of 90 calendar days due to the existence of COVID-19. A State of National Emergency was also declared due to the outbreak of COVID-19 in the interior of the country [2]. Currently, there is no vaccine or antiviral treatment for human and animal coronavirus, so identifying drug treatment options as soon as possible is critical to the response to the 2019-nCoV outbreak [3]; the only thing left to do is to be alert to the symptoms we present. But how do we know if the symptoms we have are those of COVID-19? A rapid and reliable detection method is urgently needed to prevent the spread of the infection [4]. Morbidity and mortality due to respiratory tract infection (RTI) is still among the top 10 reasons for consultation, especially in developing countries and for some vulnerable groups such as the extreme poor [5]. In view of the above, the present study was carried out to answer the question: How does a mobile application for obtaining diagnosis and recommendations for Covid-19 disease influence?

As a result of the current contingency. Therefore, the objective of the study was to analyze the importance of the development of a mobile application for the diagnosis and recommendations for respiratory diseases. For this purpose, we used databases, scientific journals and public scientific articles in Spanish and English languages, following an in-depth analysis, research design, medical and computer sector, instruments and variables needed for the study.

II. METHODOLOGY

In this document, we use a review process according to the SLR framework defined by Kitchenham [6]. Thus, our review was conducted in three phases: planning, conducting and reporting; in the planning phase we used a research protocol consisting of the following elements: research questions, search strategy and study selection criteria.

A. Research question

The research question used was the following:
RQ1. How does a mobile application influence the diagnosis of respiratory diseases?

B. Search strategies

After determining the research question, a bibliographic search was conducted for scientific studies published between 2010-2020 in virtual scientific libraries: Scielo, IEEE Explore, ProQuest, Ebsco, Scopus, WoS.

The search for information focused on defining the information resources used in the research and the use of key words in this study with the aim of discerning those that do not have the same field of application. The keywords used were "respiratory diseases", "respiratory pandemics", "H1N1", "application", "diagnostic application", "covid-19 outbreak" "Covid stress", "diagnostic applications", "disease diagnosis", "diagnosis with big data" and "coronavirus", "pathogenic coronavirus", "avian influenza", "SARS", "MERS-COV". "Outbreaks of avian influenza" "chatbox". "Influenza Pandemic", "Pandemia", "Impacts of the 2009-H1N1", "Big data and Diagnostics", "Mobile Applications". "coronavirus", "sars", "pandemics" "Diagnostic applications and Diseases". "Diagnostics", "sars".

C. Inclusion and exclusion criteria

Scientific, technological and empirical studies developing mobile applications for disease diagnosis were selected as well as scientific articles on respiratory diseases.

From the studies and articles reviewed, publications other than English and Spanish were discarded. Likewise, articles whose information was related to the research topic, but was not relevant or did not enrich the objective of the research.

No studies older than 10 years were considered; in fact, the period covered is from 2010 to 2020. On the other hand, all documents and research that do not address the implementation or development of a mobile application that allows the entry of symptoms and the diagnosis of diseases were discarded.

III. RESULTS

The total number of articles displayed for this systematic review was 80, of which 20 articles were eliminated because they were not related to the objective of the review, articles and whose publication years were not within 2010-2020, leaving 60 articles.

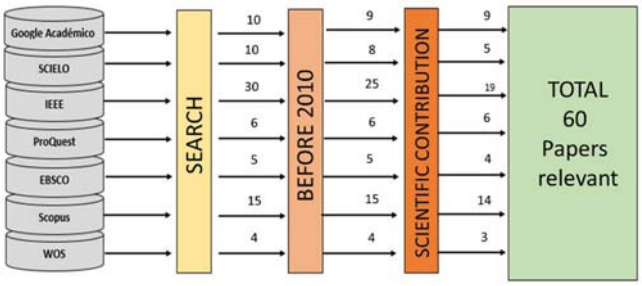

Fig. 1. Search procedure for including articles in the review.

The database with the largest number of articles related to the topic and objective was the virtual library IEEE Explore with 19 articles, Scopus with 14 reviewed articles, Google academic with 9, ProQuest with 6, Scielo with 5, EBSCO 4 and WOS with 3.

Studies were selected for no more than 10 years, in the period from 2010-2020, as shown in Fig. 2, which shows that in the years 2019-2020 the publication of scientific articles was considerable compared to previous years. We analyzed the different respiratory diseases, the new technologies with respect to the development of mobile applications and diagnosis of diseases, among them 53 articles in English and 7 articles in Spanish.

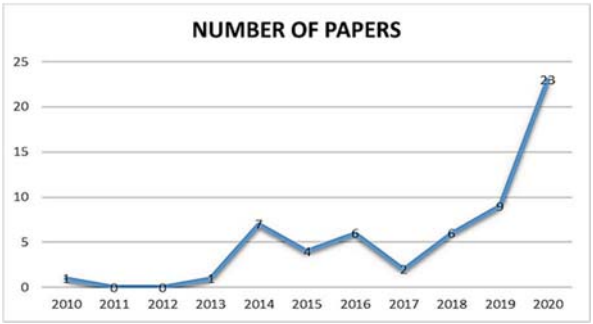

Fig. 2. Number of articles published in the years 2010-2020.

The scientific articles reviewed on the basis of the theme and the research question posed were grouped according to their subject matter. The amount of the subject matter was 12. These subjects were distributed in relation to the research topic.

TABLE I. DISTRIBUTION ACCORDING TO THE THEMES OF THE ARTICLES ANALYSED.

	Theme	Number of studies
Mobile applications and technologies for the diagnosis of diseases	Diagnostic Disease Detection System	5
	Implementation of a Medical ChatBot	12
	Predicting diseases through computational intelligence	5
	Mobile Application Development	2
	Predictive models for diagnosis and data extraction	5
Respiratory diseases	Recent advances and challenges of respiratory diseases COVID.19	7
	Characteristics and advances of the new coronavirus pandemic (COVID-19)	5
	Characteristics of the Middle East Respiratory Syndrome	5
	Characteristics of Avian Influenza	1
	Characteristics of the a-influenced virus (H1N1)	4
	Impact of the new COVID-19 pandemic on the population	3
	Progress and new findings regarding the new coronavirus pandemic	6

The following is a detail of the 60 articles analyzed.

A. *Mobile Applications and Technologies for Disease Diagnosis.*

Within the themes related to Mobile Applications and technologies for the diagnosis of diseases, the benefits of the construction of data monitoring to speed up diagnosis are shown. In addition, the development of medical ChatBot for disease prediction and treatment recommendation is a good alternative to support the health system. Also, the use of advanced medical diagnosis and prediction using deep learning, prediction from the databases of symptoms provided. Regarding the development of mobile applications, we obtained the emerging practices in the development process of mobile devices and IDE tools in terms of features, components and structure for the development of mobile applications in Android, through the evaluation of ISO/IEC 9126-1.

TABLE II STUDIES RELATED TO MOBILE APPLICATIONS AND TECHNOLOGIES FOR THE DIAGNOSIS OF DISEASES.

THEMATICS	STUDIES
Diagnostic Disease Detection System	[4] [7] [8] [9]
Implementation of a Medical ChatBot	[10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20]
Predicting diseases through computational intelligence	[21] [22] [23] [24] [25]
Mobile Application Development	[26] [27]
Predictive models for diagnosis and data extraction	[25] [28] [29] [11] [30]

B. *Respiratory Diseases*

Research on recent advances and challenges in the development of drugs against COVID-19, measures taken in different countries such as social distancing, describe the generalities of the pandemic, such information, together with previous studies of respiratory diseases, are of great

importance to reduce the risks of deaths. The following are studies related to respiratory diseases.

TABLE III STUDIES RELATED TO RESPIRATORY DISEASES.

THEMATICS	STUDIES
Recent advances and challenges of respiratory diseases COVID.19	[31] [32] [33] [34] [35] [36] [37]
Characteristics and advances of the new coronavirus pandemic (COVID-19)	[38] [39] [40] [41] [42]
Characteristics of the Middle East Respiratory Syndrome	[43] [44] [31] [45] [46]
Characteristics of Avian Influenza	[47]
Characteristics of the a-influenced virus (H1N1)	[48] [49] [50]
Impact of the new COVID-19 pandemic on the population	[51] [52]
Progress and new findings regarding the new coronavirus pandemic	[53] [33] [34] [35] [36]

IV. DISCUSSION

This study systematically reviewed the importance of mobile applications for the diagnosis of respiratory diseases. As expected, evidence showed the importance of these applications. Also, there are more positive studies corresponding to the implementation of Chatbot to perform the registration and diagnosis of respiratory diseases, which helps to maximize the comfort for users, increase the service capacity and decrease the operation cost of the medical consulting service can also respond the appropriate responses to the user with proper guidance to manage the symptoms. [13].

There are other systematic reviews exploring the diagnosis of respiratory diseases, such as the study by N. Siangchin and T. Samanchuen, [18] which focused on the implementation of a messaging recommendation system with natural language processing (NLP) libraries; Kadariya, et al. 19] focused only on the continuous monitoring of patient medication, tracking of relevant health signals and environmental data; Kao, et al. [16] only studied the combination of the multi-turn dialogue model and the sentiment recognition model to develop a chatbot; Koumaras, et al. [14] only provided an experimental study of the performance/QoS of chatbot applications under different network and reception conditions.

V. CONCLUSIONS

The study presents a review of the scientific literature on the importance of a mobile application for the registration and diagnosis of respiratory diseases. The total number of selected articles was 60, between the years 2010-2020. These articles were distributed in groups according to their subject.

The topics "system of detection of diseases diagnosis" and "implementation of a chatbot" already presented the implementation of mobile applications for the diagnosis of diseases, this allowed to confirm the importance of a mobile application for registration and diagnosis of respiratory diseases. In addition, the review allowed us to answer the question posed by the research. RQ1. How does a mobile application influence the diagnosis of respiratory diseases? Strategies to control respiratory diseases highlight the importance of this study, since detecting a disease in the early stages can be very important and can prevent us from having more deaths. The importance of the role of artificial intelligence through automated learning was discovered for the development of these applications. Projects related to the diagnosis of diseases through chatbot were discovered. According to the results and the importance of these projects for society, it was possible to demonstrate that a mobile application has a positive influence on the detection of respiratory diseases.

As future work on the diagnosis of respiratory diseases, we recommend the development of mobile applications with artificial intelligence implemented in the chatbot since the beginning or suspicion of pandemics, with the data and characteristics related to the disease, which in our study has been a limitation with respect to the COVID-19 disease due to its constant changes in antiviral treatments. However, the collection of previous diagnoses and diseases has allowed us to reach these conclusions.

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