WhatsApp-assisted health education intervention: a systematic review

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Abstract

The acknowledgment of social media as a strategy in health education is essential, providing benefits to health promotion and the prevention and treatment of comorbidities. This study assessed the contribution of WhatsApp use on the prognosis of medical conditions and its impact on enhancing the quality of life. The review protocol used PubMed and Web of Science as databases, followed PRISMA-E 2012 guidelines, was registered in PROSPERO (Nº2021232688), and its risk of bias was analyzed Cochrane Collaboration's tool for assessing the risk of bias. Thirteen impact studies (n = 1653 participants) were selected and showed

evidence on metabolic parameters such as reducing blood pressure (7.6%); body mass index-BMI (7.6%); glycated haemoglobin-HbA1c (15.4%); resting heart rate (7.6%); increase in static balance increase on balance (7.6%) and reduced body weight (7.6%). Furthermore, specific findings on each intervention were demonstrated, such a s diminished rates of relapse in substance users (7.6%); increased populational knowledge on chronic diseases (23%) associated with a decrease in the potential complications (7.6%), and a rise on treatment adhesion (7.6%); impact on the follow-up of pregnant patients (7.6%) and progress on oral hygiene (15.4%). Therefore, it was concluded that this intervention strategy demonstrated significant magnitude in reducing the progression and complication of the assessed disorders.

Keywords: social media; health education; prognosis; quality of life.

1. Introduction

The term health education has been used since the first decades of the 20th century (Falkenberg et al. 2014). It can be defined as the principle through which individuals and groups of people learn how to behave to promote, maintain and restore health. Among the benefits is creating a sense of health promotion, preventive and curative methods allowing the population to develop appropriate knowledge and attitudes necessary for maintaining good health (Idoko, Idoko, and Chidolue 2019). The World Health Organization (WHO) defines health education as: *An educational process based on the construction of knowledge that aims at the theme's appropriation by the population [...]. A group of actions contributes to enhancing populational autonomy on health care and its ability to debate with health professionals and managers to demand health care according to its necessities.* The WHO affirms that the definition of health education consists in the production and organization of knowledge related to practicing healthcare through teaching, didactic guidelines and, curricular orientation (World Health Organization 2009).

Moreover, it is known that the perception of the health care user as a social, historical, and political individual associated with its family, environment, and society are important for creating health education measures that allow the user to take care of itself, its family and surroundings (Machado et al. 2007). Thus, there are many strategies for promoting health education, one of them being social media. Social media is defined as an application or platform that allows exchanging messages, documents, and multimedia files through chatrooms (Giansanti 2020). The use of smartphones, in general, is rapidly growing, and associated with them are applications related to health care. Therefore, the mobile revolution offers a new opportunity to provide medical support whenever and wherever people need it (Giordano et al. 2017; Nardo et al. 2016). To this moment, a few studies assessed the efficacy of WhatsApp use on health education. Hence, knowing the popularity and viability of this software for communication, this systematic review goal was to determine, synthesize and present evidence on the use of WhatsApp in health education.

2. Materials and methods

This article is a systematic review, written based on the PRISMA-E 2012 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) report guide (Welch et al. 2012). It was registered on PROSPERO (Nº CRD CRD42021233688).

2.1 Literature research and study selection

The research for the articles on this review used the United States National Library of Medicine PubMed and Web of Science as databases. It occurred during the following period – September 4th, 2020 – January 26th, 2021. The Medical Subject Headings (MeSH) database index term was applied to this research, and the description was "social media". The selection and analysis of the papers were made by two independent researchers whose disagreements were solved with the help of a third researcher.

2.2 Eligibility Criteria

The studies considered eligible were the ones that contemplated WhatsApp's use to provide health education to patients published during the last 05 years. The applied exclusion criteria were: studies older than 5 years, animal studies, studies that did not include WhatsApp, case reports, letters to editors, opinion articles, and editorials. Articles that were not wholly available doubled articles, and articles focused on health care students/professionals were also excluded.
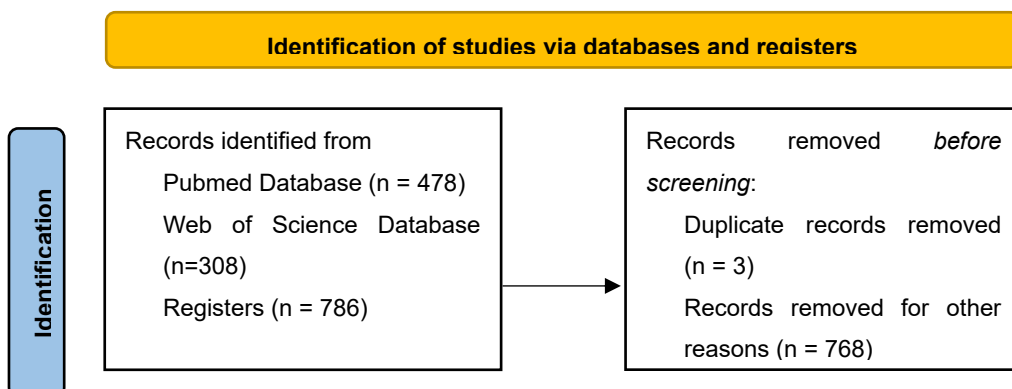
2.3 Risk of Bias Assessment

Cochrane Collaboration's tool for assessing the risk of bias was used according to the following categories: Random sequence generation; placing sigil; blinding of the participants, assessors, and professionals; uncompleted turnouts; selective reports and other potential bias sources.   The level of bias risk was determined for each domain: (1) High Risk, (2) Uncertain Risk (3) Low Risk.

3. Results

3.1 Study selection

As demonstrated in Figure 1, the initial electronic research identified 786 studies, 478 at PubMed and 308 at Web of Science. Out of the 786 studies, 3 were eliminated after duplication analysis. Due to access unavailability, 17 articles were excluded from this study. Thirty-nine articles were removed for being a letter to editors, 6 for being opinion articles, and 7 for editorials. Twelve articles were removed due to their classification as case reports/experience, 3 for being news, and 1 for being a manuscript. 680 were excluded for not including WhatsApp as an interventional measure on patient's health education. Thus, 13 articles were systematically and thoroughly analyzed.
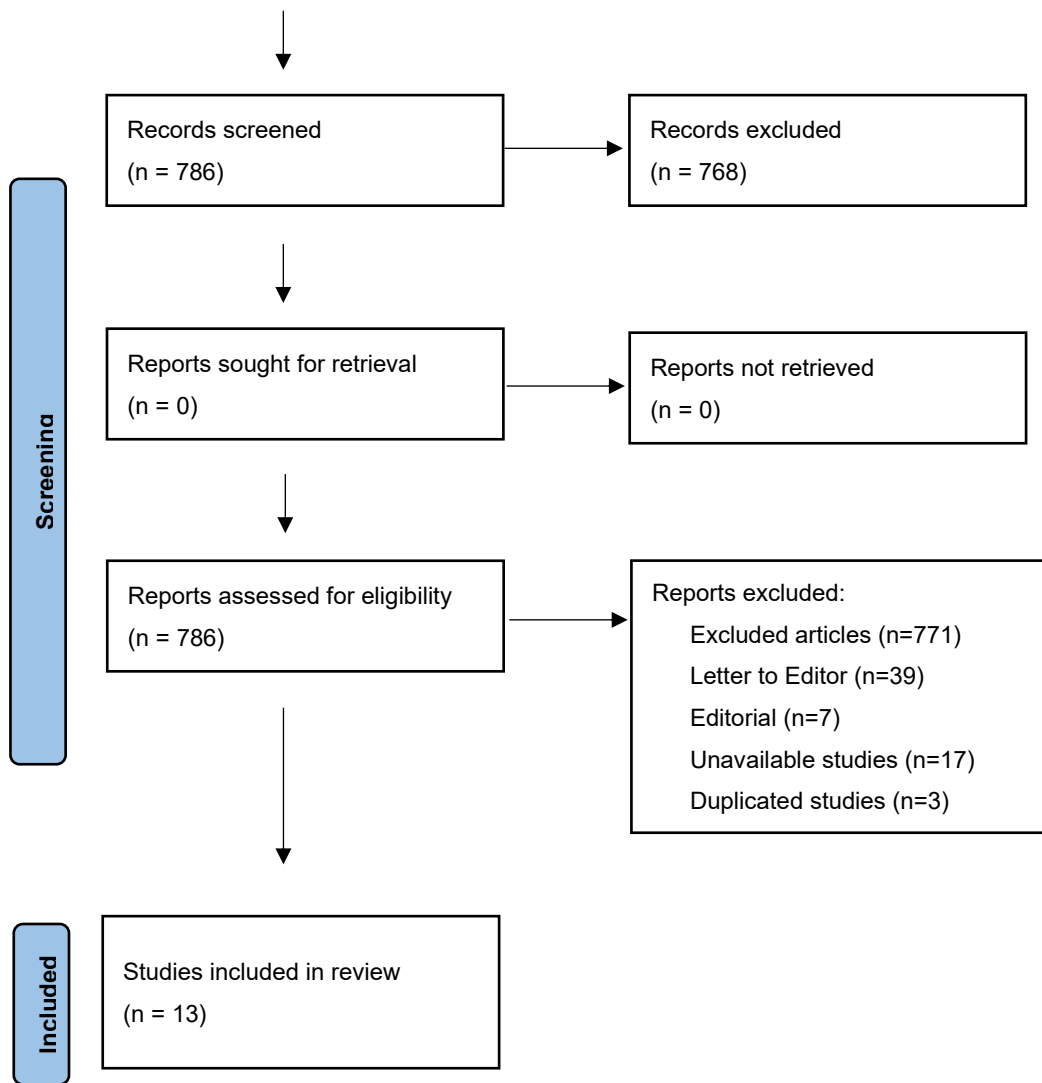

Identification of studies via databases and registers

| Identification | Records identified from
Pubmed Database (n = 478)
Web of Science Database (n=308)
Registers (n = 786) | Records removed *before screening*:
Duplicate records removed (n = 3)
Records removed for other reasons (n = 768) |

Figure 1

3.2 Study features

Thirteen studies were selected and involved 1653 patients, 7 of them being randomized clinical trials, 2 non-randomized trials, 1 pre-post intervention, 1 prospective-observational study, 1 study that applied mixed methods and 1 article that presented an experimental design. There were various interventions because the approached themes included heterogeneous age ranges (from teenagers to elderly patients) and comorbidities. The approached studies included smoking ($n = 2$), breast cancer ($n = 1$), injectable drug use ($n = 1$), pregnant patients ($n = 1$), type 2 diabetes mellitus (TD2M) and systemic arterial hypertension ($n = 3$), physical exercise ($n = 2$), and lifestyle changes ($n = 1$). The general features of the studies are presented in Table 1.

Table 1. General features of the studies

Study	Sampling	Design	Objective
Alghafri et al., 2018	232 patients with DM2 were divided into an intervention group	Randomized Clinical Trial	The participants received monthly standardized messages from the POs,

	and a control group, with 137 women and 95 being men. The median age was 47, 10 years.		and the whole group dynamic was monitored.
Calvo et al., 2020	105 injectable drug users, with 38 of them being men and 67 being women. The median age was 41, 3 years.	Longitudinal prospective-observational study	The participants were distributed among 07 WhatsApp groups, and each group received a weekly theme relevant to the risk reduction caused by injectable drugs.
Cheung et al., 2015	136 participants were divided into three groups, with 104 of them being men and 32 being women. The median age was 40, 2 years.	Randomized Clinical Trial	Themes such as abstinence, trigger prevention, humor, stress, and mass body control were approached through texts, photographs, and videos.
Durmaz et al., 2019	132 participants were randomly placed on the intervention arm and the control group. 52 of them were women, and 80 of them men older than 18 years.	Randomized Clinical Trial	Messages containing techniques focused on smoking cessation were sent. These included an action and relapse prevention plan and support from a public health specialist, pulmonary medicine, medical education on dependencies, a primary care physician, a psychologist, a nutritionist, and people with experience on relapses.
Muntaner-Mas et al., 2017	32 participants were separated into three groups, with 24 of them being women and 08 being men. The age range was 53-73 years.	Interventional Non-Randomized Study	An exercise program was executed through a messaging app. Subtitles that indicated the description, intensity, and rest period for each exercise were inserted.
Al Omar et al., 2020	164 diabetic patients were divided into control and intervention groups, with 95 of them being women and 69 being men. The median age was 41, 98 years, 71.% were women.	Randomized Clinical Trial	The participants received daily messages containing healthy diets, food portion control, physical activity, blood sugar levels self-monitoring, reminders on taking the medication, insulin use, and adaptation to diabetes.
Patel et al., 2018)	50 pregnant patients with pregnancies up to three weeks. The age range was 21-29 years.	Mixed methods study	The approached themes were: cost of services post-partum and child care; services and work hours, Family planning, back pain, ultrasonography, abdominal pain, labor preparation, swelling, and insomnia.
(Pereira et	18 women with the age range	Pre-post	Daily sessions based on text messages

al. 2020)	between 45-69 years.	intervention study	and an audiovisual approach on breast cancer were sent to the participants of the study.
(Sap et al. 2019)	54 patients were divided into intervention and control groups, with 29 men and 25 being women. The age range was 17-20 years	Non-Randomized Clinical Trial	Basic information regarding DM1 as well as adequate insulin use and diet were discussed.
Sartori et al., 2020	496 patients , who had diabetes or high blood pressure were divided into a control group and an intervention group with 322 women being women and 174 of them being men. The age range was 56,9 years.	Randomized Clinical Trial	Health care promotion-based text messages, audios, and images focused on pharmacological treatment adhesion were sent through WhatsApp.
Tang et al., 2018	94 patients with coronary artery disease were divided into a control group and an intervention group, with 47 of them being men and 47 of them being women. The median age was of 59,93 years.	Semi-experimental studies including pre-post tests for intervention and control groups.	The intervention group received daily information from WhatsApp for one month, and after that, both groups were tested.
Zotti et al., 2016	80 teenage patients were divided into a control group and an intervention group, with 34 of them being boys and 46 being girls. The median age was 13,8 years.	Randomized Clinical Trial	The patients were instructed on oral hygiene, orthodontic treatment and were stimulated to send self-portraits depicting their teeth throughout the intervention and after it.
Zotti et al., 2019	60 post-orthodontic patients, with 24 of them being men and 36 being women. The age range was 16-19 years.	Randomized Clinical Trial	The participants were invited to choose a nickname and join a competition named "Relapse Game", in which they were to share a weekly selfie of their teeth demonstrating orthodontic stability.

3.3 Main findings

According to Table 2, there was a significant effect of the interventions on the approached groups. All the studies showed substantial impact on the presented comorbidities, demonstrating efficacy in minimizing the symptoms, progression and/or worsening of the presented disorders. Among the most specific findings

were described cardiometabolic benefits such as lowering systolic and diastolic arterial blood pressure (7.6%), BMI (7.6%), Hb1Ac (15.4%), median blood pressure (7.6%), resting heart rate (7.6%), increase in static balance (7.6%) and decrease body weight (7.6%). This study also indicated a decrease in relapses on substance users with a potential dependency (7.6%).

Furthermore, it was possible to increase the population knowledge towards various chronic disorders (23%), particularly diabetes, high blood pressure, coronary disease, and decrease the potential complications (7.6%) and increase the adhesion to the pharmacological treatment of the mentioned diseases. Health education benefits were also demonstrated, especially with the follow-up of pregnant patients, which showed a significant increase in antenatal appointments and antenatal and long-term birth control (7.6%). Finally, oral hygiene progress (15.4%) was observed regarding the decrease of dental plaques and the intercanine width benefits.

Table 2. Duration and interventions main findings

Study	Duration	Main Findings
Alghafri et al., 2018	12 months	In total, 75% of the patients were able to complete the study, and despite no differences among the groups on weight alteration, body mass index (BMI), or HbA1c, significant differences among the group for the medium weight(p = ≤0.001), BMI (p = ≤0.001) and Hb1Ac (p = 0.03) were found on the intervention group between the baseline and 12 months.
Calvo et al., 2020	8 weeks	The study obtained success on the intervention that helped injectable drug users through a risk score-adjusted according to the clinical and social variables.
Cheung et al., 2015	6 months of follow-up	At the end of the study, the permanence rate after 6 months was of 73.5% of ex-smokers with less frequent relapses associated to the WhatsApp group (17%) compared to the control group (42.6%).
Durmaz et al., 2019	3 months of intervention followed by 3 months of follow-up	With the intervention, the abstinence rates were raised by 3,5x at the beginning, 2,5x on the third month, and 2,3 at the sixth month compared to the control group receiving common care. Among all the members of the study; 49,2, 37,1 and 29,5% successfully quit smoking by the end of the first, third, and sixth month accordingly
Muntaner-Mas et al., 2017	10 weeks	The training group decreased systolic blood pressure (p = 0.038), diastolic blood pressure (p = 0,005), mean arterial pressure (p = 0,006), and heart rate after exercising (p = 0.002). The mobile group decreased systolic blood pressure (p = 0.142) and heart rate after exercising (p =0.134). The balance changes were greater on the training group than on the control group (p = 0.024). No significant difference in strength variable was observed between the training group and the control group
Al Omar et al., 2020	6 months	Out of all patients, 75% completed the study, and those in the intervention group presented a significant decrease in HbA1c levels after 6 months.

		(p = 0.001).
Patel et al., 2018	38 weeks	Regarding antenatal care, 62% of the participants who received the intervention measures presented 4 or more visits to the appointments, a higher number when compared to the mean number of consultations seen on the general population, 3. (p <0.001). 20% of the study participants adopted a post-partum birth control strategy when compared to 15% on the general population (p = 0.38). The participants' choice towards a long-acting reversible contraceptive (LARC) method was of 14% and two times higher than the general population (p = 0.04).
Pereira et al., 2020	3 weeks	An increase in breast cancer knowledge was demonstrated after the educative intervention, with a significance level of 5% (p <0.001).
Sap et al., 2019	2 months	There was a significant increase in the knowledge regarding diabetes in the intervention group after two months (p <0.01), when compared to a slight decrease in the control group (p = 0.33). The mean proportion of acute complications decreased in the intervention group (p = 0.46) and increased in the control group. (p = 0.01).
Sartori et al., 2020	4 months	After the follow-up period, 67.5% of the patients on the intervention group adhered to the antihypertensive and/or antidiabetic medications compared to 58.5% on the control group (p = 0.077).
Tang et al., 2018	3 months	A positive and significant effect of the intervention was observed on the knowledge of the patients towards CAD and its risk factors (p <0.001), as well as on lifestyle modifications (p<0.001).
Zotti et al., 2016	12 months	An intragroup analysis revealed a decrease in the formation of dental plaques on the intervention group during the study compared to the control group.
Zotti et al., 2019	12 months	There was a significant difference in the width of the intercanines when comparing both groups (p ≤ 0.05); the greater benefit was observed in the intervention group (p ≤ 0.05).

4. Discussion

The objective of this systematic review includes assessing, resuming, and presenting the available evidence about the use of WhatsApp. Hence, it is intended to contribute by presenting literature with different perspectives, including the role of primary interventions that patients in health education can efficiently and safely use through this application. In short, the main findings demonstrated the possibility of using WhatsApp to prevent worsening of a patient's health conditions when the latter refuses to seek treatment and optimize the disorder's prognosis through information.

4.1 Intervention studies in smoking patients
Despite the availability of medication and counseling services, smoking cessation is related to frequent

relapses until the practical act of stop smoking takes place (Caponnetto et al. 2013; Reid et al. 2016). Cellphone-based interventions are potentially efficacious in supporting recent quitters to stop smoking (Haug et al. 2013; Whittaker et al. 2009) and prevent relapses (Devries, Kenward, and Free 2013; Snuggs et al. 2012). A few exploratory studies have shown that a social media service reached many smokers in the community and increased peer interaction (Brandt et al. 2013; Struik and Baskerville 2014). The impact of websites, mobile apps, telephone lines, email-based services, telephone appointments, and Short Message Service (SMS) reminders on the adhesion of smoking patients to the addiction interruption process was recently observed (Trujillo Gómez et al. 2015). Thus, considering the potential impact of social media, it seems that the use of this tool became essential in the present day. Similarly to these findings, Cheung et al. (2015) demonstrated in their study with smoking patients that the discussions and reminders through WhatsApp significantly decreased relapses and could present a more significant effect on short-time abstinence when compared to face-to-face groups. Moreover, the reminders sent by the moderators were specially created to prevent relapses of recent quitters. Furthermore, in (Durmaz et al. 2019) study, there was a success in the abstinence rate on the smoking group that received WhatsApp messages as additional support compared to the usual treatment. Regarding the time and intensity of the messages, it was seen that adaptations to the patients' needs allowed a greater adhesion. The app's privacy, sigil, and practicality that helped the continuity of care allow greater adhesion to medication use.

4.2 Intervention studies on orthodontic patients

The success of an orthodontic treatment involving removable retainers is greatly dependent on the patient's adhesion and presents a significant risk of relapse in the long-term with a variety of studies showing approach strategies to optimize the adhesion of these patients (Eppright et al. 2014; Wong and Freer 2005). In the last decades, there were great adhesions to focus groups, motivational interviews, and patient education, although, on the present day, most of these measures take place on social medial and smartphone applications (Ackerman and Thornton 2011; Scheerman et al. 2018). Studies have shown that integrating new social technology in a standard motivational protocol focused on oral hygiene is efficacious in enhancing teenage patients' adhesion and increasing oral hygiene during the multibracket orthodontic treatment (Zotti et al. 2016, 2019). It was observed that WhatsApp use established a long-term follow-up that presented an increase in the stability and adhesion of the orthodontic treatment.

4.3 Intervention studies on physical activity

A few studies assessed the efficacy of mobile phones on the promotion of physical activities and showed that these devices could help to enhance health determinants (Cavallo et al., 2012; Valle et al., 2013; Alghafri et al., 2018) demonstrated that the "MOVEdiabetes" intervention was effective on raising the levels of physical activities among sedentary adults that suffered from TD2M. There was a reduction in systolic and diastolic blood pressures and positive alterations on these patients' lipid profiles, especially triglycerides, over 12 months, demonstrating positive cardiovascular results in the long term. One can conclude that personalized physical activity appointments can take place in diabetes primary care, including monthly WhatsApp messages. Similar results were seen in the (Muntaner-Mas et al. 2017) study, in which the intervention group showed increased maximal isometric handgrip strength, aerobic capacity, decreased

systolic blood pressure, and heart rate after exercising, although no difference from the control group was observed. The comparison between the training and control groups demonstrated that the WhatsApp-based physical activity intervention shows positive results, indicating that social networking was responsible for minor alterations on some health-related physical fitness components and reduced cardiovascular risk factors.

4.4 Intervention studies on pregnant patients

Training and educating women during pregnancy and post-partum can impact the behaviors of seeking medical care and health results (Gakidou et al. 2010; Karlsen et al. 2011). The antenatal services have demonstrated an increase in adhesion and a decrease in premature birth rates, and enhance satisfaction with care in some contexts (Catling et al. 2015). From this perspective, Patel et al. (2018) obtained great results on their studies with pregnant patients who showed higher follow-up rates, post-partum birth control, increments in the adhesion, decrease in premature births, and an enhancement in the satisfaction with care. In short, the author suggests that mothers need informative support outside the antenatal appointments and confirms the acceptance of this type of service by the patients, considering the high demand. Evidence suggests that social support raises stress resilience which causes a plausible impact on health results.

4.5 Intervention studies on patients with T2DM and/or HTN

Diet and physical activity are aspects of lifestyle changes that lead to better blood sugar level control and diminished morbidity in diabetic patients (Alanzi 2018). Globally, studies report that education on self-management of diabetes had positive results on controlling HbA1c levels and on reducing the risk of fatal complications (Kitsiou et al. 2017; Quinn et al. 2018). However, diabetic patients face many obstacles to adherence to traditional self-care protocols, such as lack of knowledge of the disorder, personalized interventions, cost, and time limitations (Adisa, B. Alutundu, and O. Fakeye 2009; Pal et al. 2018; Whitley et al. 2006).

A recent metanalysis shows that interventions focused on increasing adhesion to pharmacological treatment need to focus on behavioral strategies (Conn & Ruppar, 2017). Smartphones are potential mobile health (mHealth) tools to facilitate change of habits and adhesion to treating chronic diseases.   Recently, a study conducted by (Sartori et al. 2020) demonstrated that educational interventions through WhatsApp could positively support adhesion to medication. The study showed a significant effect on patients' knowledge regarding risk factors for coronary artery disease and promoted lifestyle changes.

In another study stated that a significant decrease in HbA1c levels was observed, and 80% of the participants considered the social network intervention to be positive, besides suggesting that it should be used for a longer period (6 months) which demonstrated promising results on the use of WhatsApp, despite the patient's level of education. This study is important for the pharmaceutical practice because it shows the importance of these professionals exploring social media as a potential tool to teach, monitor, and assess clinical results. The research approach involved direct communication with diabetic patients overcoming the boundaries of direct personal contact, providing quality information that is easily accessible and has no cost (Al Omar et al. 2020).

Similarly, (Sap et al. 2019), showed in their study that the intervention group presented a significant

increase in its knowledge on diabetes.   Through social medical, patient education helped enhance the knowledge on type I Diabetes and reduce acute complications with no changes in blood glucose control after two months.

4.6 Intervention studies for a healthy lifestyle

Various studies proved that mobile apps on health intervention methods significantly increased patients' knowledge and reduced readmission in hospitals due to the comprehension of cardiac diseases (Beatty, Fukuoka, and Whooley 2013; Widmer et al. 2014).   Besides that, Forman et al., 2014 also mentioned that mobile technology helped make health education interventions more viable. Tang also studied the "healthy lifestyle" thematic, and the author reports that there is a clear indication that the interventions through mobile apps have a positive effect on the patient's knowledge regarding risk factors for coronary artery disease. This finding established the new reference for current methods of health education distribution in Malaysia. This can be due to the fact that information distributed through cellphones was more attractive and could be recovered anywhere.   Besides that, patients that were previously defenseless can now directly express their concerns to health professionals through WhatsApp. The positive and encouraging atmosphere created inside the group made the patients eager for new information every day.

4.7 Intervention studies on women with breast cancer

The morbidity rates associated with breast cancer are higher in low/medium income countries due to failures on early diagnosis and insufficient access to treatment (Knaul et al. 2018; Torre et al. 2017). Educational interventions through mobile technologies help promote health due to its simplicity, accessibility, and minimization of the distance, cost, and time barriers (Bradway et al. 2017; Oreskovic, Huang, and Moon 2015). A study conducted by (Pereira et al. 2020)) showed the benefits of the educative intervention on breast cancer. According to the authors, it is the first study to use WhatsApp as a health education tool destined for Brazilian women on Brazil's public health system that focused on risk reduction and early detection of this disorders. The application enabled the solving of doubts that were not commonly discussed during a regular appointment. The application made it possible to clarify doubts not commonly discussed during the face-to-face service. In essence, it was noticeable that the use of social media positively interfered on the prognosis of this comorbidity.

4.8 Intervention studies on injectable drug users

At last, when dealing with injectable drug use, a few studies that support the use of social networking on eHealth appear to be effective in reducing the direct harm caused by the abuse of alcohol and other drugs (Rice, Milburn, and Monro 2011) and on the acceptance of prevention programs (Rice et al. 2012). Educational and psychological interventions destined to socially excluded people show psychological benefits on their own (Calvo and Carbonell 2018). Thus, Calvo et al. (2020) also demonstrated WhatsApp's efficacy on health intervention in his study, describing two main lessons extracted from his work. All patients that finished the process reported that they would be willing to participate periodically in virtual groups or continuously as part of their therapeutic process. In that way, it was possible to reduce the risks related to injectable drug use, especially regarding the diseases transmitted through it.

5. Conclusion

This study contemplated different interventions to describe WhatsApp-based strategies applied to pregnant, smokers, diabetic, breast cancer, received dental care, and injectable drug users and interventions on the adherence to a healthier lifestyle and the practice of physical activities. All studies were unanimous in presenting positive changes related to health care, demonstrating the potential of this intervention model on treating chronic conditions and health education and prevention. Therefore, stimulating the use of this intervention model can help treat the patient and promote a series of actions that encourage a healthier lifestyle.

The use of instant message apps is almost universal among the general population, and with that, new ways of managing health through these applications are arising. These interventions proved to be dynamic to health professionals as well as to patients. Moreover, great versatility in the age range and themes approached by this study was observed, demonstrating a significant number of possibilities for preventing and promoting health.

6. Acknowledgement

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