Journal of Current Science and Technology, January-April 2023 Vol. 13 No. 1, pp. 118-135

ISSN 2630-0656 (Online)

Cite this article: Ray, S., & Pareek, A. (2023, January). A systematic review on using virtual assistance-based education and lifestyle interventions to prevent non-communicable diseases. *Journal of Current Science and Technology, 13*(1), 118-135. DOI:

Journal of Current Science and Technology

Journal homepage: https://jcst.rsu.ac.th

A systematic review on using virtual assistance-based education and lifestyle interventions to prevent non-communicable diseases

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Received 16 May 2022; Revised 22 December 2022; Accepted 26 December 2022;
Published online 29 January 2023

Abstract

Non-communicable diseases (NCDs) are chronic lifestyle disorders endangering a significant amount of the population and causing augmented morbidity and mortality. Virtual assistants (VA) empower these patients with the web, smart tracking equipment, and mobile-based interactivities. The availability of cheaper smartphones, internet, and fitness devices in the market of developed and developing nations is a boon. Technology aided in the effective utility of knowledge-sharing, awareness, and service proviso for NCD patients, thus optimizing the outcome. This manuscript reviewed published health intervention studies to prevent NCDs with VA-based education and lifestyle modulation programs. It encompasses a systematic literature review, retrieving published VA articles from Pubmed, Embase, Google Scholar, Scopus databases, and government websites from January 2015 to January 2022. There were 21 articles meeting the inclusion criteria. Descriptive analysis was used. The international perception was provided in 62% of papers, while 38% provided the national review in India. Almost 38% of the studies found that VA using the various modes was highly effective for NCD patients. Another 38% implied that the method could be effective but with the refinement of tools, guidelines, and incorporation of suitable models. It was also highlighted (14%) the need for a pragmatic approach with in-depth studies to come to a definite conclusion. The findings accentuate that VA-based education and lifestyle interventions to prevent NCDs in this healthcare turmoil; were cost-effective in the long run and held high promise in terms of efficacy, accessibility, and acceptability with the proper implementation and regulations.

Keywords*: a systematic review; digital therapeutics; information and communication technologies; health; non-communicable diseases; self-management; virtual health.*

1. Introduction

The non-communicable disease (NCDs) implies the diverse assemblage of chronic ailments which are not contagious. The array of disorders does not get transferred from one person to another. The disease generally starts with a slow progression and persists for a prolonged period (Lee, Wong, & Puah, 2021). World Health Organization (WHO) has categorized NCDs as "Group II Diseases," comprising malignant and benign neoplasms, endocrine disorders, diabetes mellitus, neuropsychiatric conditions, sense organ diseases,

cardiovascular diseases, respiratory diseases, digestive diseases, genitourinary diseases, skin diseases, musculoskeletal diseases, congenital anomalies, and oral conditions (World Health Organization (WHO), 2021). In the present healthcare turmoil, NCDs and associated metabolic, behavioral, and environmental risks have enhanced susceptibility to coronavirus disease (COVID-19) infection (Pal, & Bhadada, 2020). The co-morbidities augment the severity of the disease and have lethal implications.

NCDs are the foremost cause of adult morbidity and mortality globally, with almost 70% of all deaths. It was estimated that 82% of the 16 million populace had premature mortality before reaching 70 years (WHO, 2021). The disease does not only affect the patient and family physically but gets drenched financially as well. The data reveals that the average annual expenditure for all low and middle-income nations (LMICs) is around US$ 11.4 billion from 2011 to 2025 (WHO, 2012). Understanding the dual burden of communicable and non-communicable diseases, the healthcare industry and its dynamics need to raise the bar toward patient engagement and quality care with "Virtual Assistance." A suitable mode of patient engagement is the only strategy to improve the population's health at an affordable cost (Cavalin, & Lescoat, 2017).

The virtual assistants have the potential to empower patients suffering from NCDs, with the web (online portals maintaining the privacy and confidentiality of data), smart tracking equipment (fitness devices), and mobile-based (mHealth apps) interactivity and tools (Genay-Diliautas, & Malgouires, 2018). The availability of cheaper smartphones, internet, and fitness devices in the market of developed and developing nations is a boon. These technologies will aid in effectively utilizing knowledge-sharing, awareness-raising, and service proviso (consultation and lifestyle modifications) for NCD patients, thus optimizing the outcome (Pundora, 2021). It can be easily accessible to the remotest corner of the globe at a convenient time, is cost-effective, minimizes convenience, and supercharge productivity (24*7 availability, improved service quality from trained and competent professionals). It enhances patient-healthcare providers' relations (improved patient-physician communication, personal medical advice) with specialized task assistance (telephone, tracking equipment, social media management).

The manuscript explored and comprehended the role of the VA and the usefulness of lifestyle interventions amongst the population suffering from NCDs. It emphasizes the prevention and better management of the disease. The feasibility of imbibing VA amongst developing and developed nations' present populations was analyzed. There are few studies, and in-depth surveys in this segment are still scarce. The surveys so far are yet to explore the long-term aspects with a large sample size. Implementing the program for a considerable population would require a pragmatic approach. Identifying the suitable mode of intervention in the population would augment likelihood, improve diagnosis, curative management, mechanisms to optimize the use of resources, and patient-centric initiatives, and have a positive impact on the quality of service and care.

2. Objective

This study sought to review and summarize virtual assistance-based education and lifestyle interventions to prevent non-communicable diseases from published articles in academic journals.

3. Methodology

The systematic review of the literature was steered; by retrieving published mHealth articles from Pubmed, Embase, Google Scholar, and Scopus databases from January 2015 to January 2022. Data from government websites and vital reports were also encompassed. The study duration is for seven months, from July 2021 to February 2022. The keywords used for searching published articles in academic journals were digital behavioral coaching, chronic disease, NCDs, digital health, mHealth, virtual health assistance, artificial intelligence, wearables, prevention, management, and telemedicine. The search syntax is "virtual assistance to educate and bring lifestyle interventions in preventing non-communicable diseases." The flow chart (Figure 1) elaborates on the inclusion and exclusion criteria. From the retrieved documents, 21 had inclusion criteria. The inclusion criteria emphasized the articles with digital interventions, awareness programs, lifestyle modifications, and virtual assistance sought

by NCD patients and healthcare providers. The various government, independent institutes, and initiatives were also included who are propagating the venture.

The digital interpolations included devices, appliances, and systems, such as smartphones, laptops, digital assistance, personal computers, telemedicine, text messages, digital apps, videoconferencing, and so on. The efficacy of the health-seeking behavior and the management of the lethal disease were evaluated. Both primary and secondary research has been collated. The information extracted from the articles on the following attributes: subject, first author, year of publication, region, period, type of study, sample size, study methodology, conclusion, and effectiveness of the intervention. A contingency table (I) had been created; the cells represented the articles and their corresponding attributes. The data were evaluated using descriptive analysis. The information was collated and screened for any inconsistencies in MS Excel. The data analysis was done using the same platform.

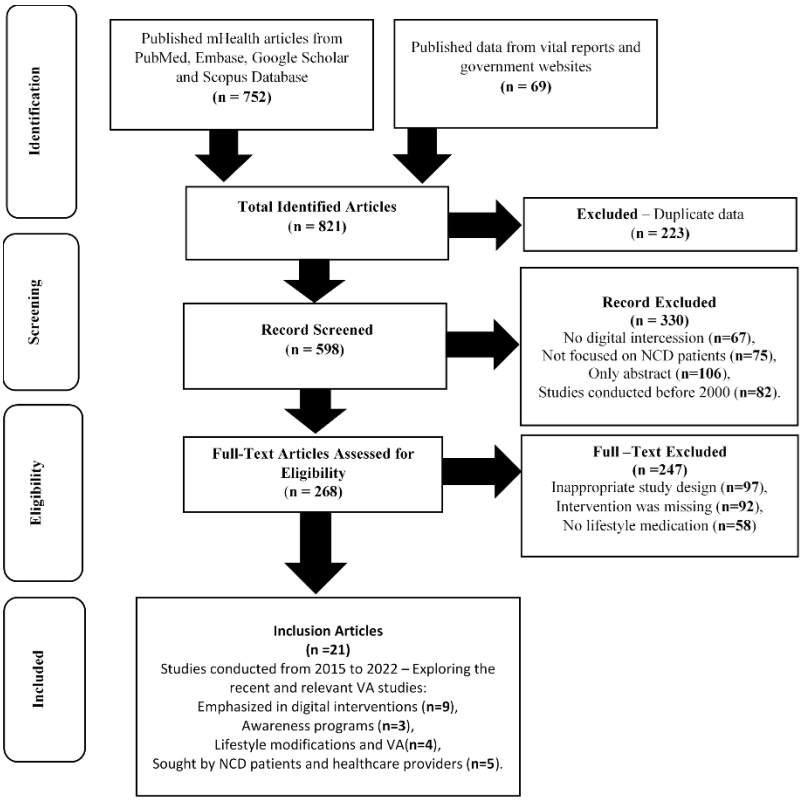

Figure 1 Flow Chart for Systemic Review

4. Results

Of numerous studies from various databases and additional sources, 21 articles were evaluated for the VA interventions. Table 1 incorporated the main attributes and findings of the concerned studies. The virtual assistance-based studies were analyzed for the treatment and management of NCDs.

Table 1: Main attributes and findings from 21 studies evaluating the VA interventions.

Slno	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
1	Factors Determining the Success and Failure of eHealth Interventions: Systematic Review of the Literature	Granja, Janssen and Johansen (2018)	Global	October 2016	221 articles	Secondary	Systematically review, quantitative analysis	Systematical review of the causes which impel the result of eHealth interpolations in terms of accomplishment and failure.	Augmented likelihood of success with eHealth interventions. Critical need for in-depth research and incorporated means for the quality of service and care related to diagnosis, curative management, and patient-centric initiatives.	It can be effective.
2	Electronic Health Lifestyle Coaching Among Diabetes Patients in a Real-Life Municipality Setting: Observational Study	Komkova, Brandt, Hansen Pedersen, Emneus and Sortsø (2019)	Denmark	2016-2018	103 participants	Primary	Observational study with regression methodology	To evaluate the effects of eHealth intercession amongst diabetes patients in a real-life municipal setting.	The real-life eHealth and lifestyle intercession had a positive impact. The long-term aspect needs to be explored in further research.	Effective
3	Evaluation of the Clinical and Economic Effects of a Primary Care Anchored, Collaborative, Electronic Health Lifestyle Coaching Program in Denmark: Protocol for a Two-	Brandt et al. (2020)	Denmark	Two years	340 participants	Primary	Randomized controlled trial	To assess the medical and financial effects of lifestyle education programs for obese accomplices with and without type 2 diabetes.	It was a first-time initiative for an app and web-based eHealth lifestyle coaching program. It holds great potential to decrease the incidence of NCDs if proven effective	It can be effective

Sln o	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
	Year Randomized Controlled Trial.									
4	Effectiveness and Feasibility of a Remote Lifestyle Intervention by Dietitians for Overweight and Obese Adults: Pilot Study	Haas, Hayoz and Maurer-Wiesner (2019)	Switzerland	April 2016 to May 2018	36 participants	Primary	Pre- and a post-test pilot study with 1-year behavioral intervention	To assess the efficiency and viability of weight loss counseling by a nutritionist with the aid of a mobile phone app for overweight and obese patients.	Nutritionists' professional aid and customer-specific apps can provide sustainable and practical support to alter behavior and reduce obesity.	Effective
5	Digital Health Tools for Managing Non-Communicable Diseases During and After the COVID-19 Pandemic: Perspectives of Patients and Caregivers.	Monaco et al. (2021)	Europe	Two years Sep 2018 – July 2020	Not applicable	Qualitative	The advisory board of patients and health care providers- be held on 28th July 2020:an as an initiative to bring together the main stakeholders from the private and public sectors.	To ascertain forthcoming guidelines based on patients' perspectives, discuss the role of digital health tools in managing NCD patients during and after the COVID-19 pandemic amongst the advisory board of patients and healthcare providers.	Public-private partnership models can be effective models.	It can be effective with the incorporation of a suitable model.
6	mHealth Tools for the Self-Management of Patients with Multimorbidity in Primary Care Settings: Pilot Study	Khan, Gill, Cott, Hans and Gray (2018)	Toronto, Canada	4-week	18 participants	Primary	A pilot study of the ePRO tool	To explore the user's experience with multimorbidity and their healthcare providers related to	The ePRO tool needs to be refined to avail self-management efforts.	It can be effective with the advanced tool.

Sln o	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
	to Explore User Experience.							the ePRO tool for self-management.		
7	A Systematic Review of Application and Effectiveness of mHealth Interventions for Obesity and Diabetes Treatment and Self-Management.	Wang, Xue, Huang, Huang, & Zhang (2017)	Global	2000-2016	24 articles	Secondary	Descriptive study	To examine mHealth intercession studies for obesity and diabetes treatment and management to measure the efficacy and recommend pathways for the future.	It implied positive effects based on the interventions and self-management programs.	Effective
8	Virtual reality applications for chronic conditions management: A review.	Gohari, Gozali and Kalhori (2019)	Global	Jan 2001-Dec 2015	52 articles	Secondary	Descriptive study	To review VR solicitation in chronic conditions for cure and rehabilitation.	VR technology is highly used among patients with chronic diseases for motivation, treatment, and rehabilitation.	Effective
9	Digital health: a new dimension in rheumatology patient care.	Kataria and Ravindran (2018)	Global	Not Specified	15 digital health systems	Secondary	Descriptive Study of Digital health systems	To refurbish the advanced digital health features which would aid the routine care for rheumatology patients.	The sample size needs to be increased to assert efficacy.	More research required
10	Mobile technology and the digitization of healthcare. *European Heart Journal*	Bhavnani, Narula and Sengupta (2016)	Global	Not Specified	17 articles	Secondary	A descriptive Study of current literature on mHealth	To bestow a framework for understanding the advances in mHealth about device designs and patient engagement at the individual and	The advent of new technology in the digital and medical scenario holds exceptional promises.	It can be effective.

Slno	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
								population-based levels.		
11	The role of social media in preventing and managing non-communicable diseases in low-and-middle-income countries: Hope or hype?	Islam et al. (2019)	LMICs	Not Specified	Not Specified	Secondary	Descriptive Study-NCD patient using social media.	To delve into social media in LMICs in deterrence and controlling NCDs.	The prospective studies need to envisage diverse groups to interpret the efficacy for long and short-term effectivity in LMICs.	More research required
12	The Challenges in Developing Diabetes Prevention and Care Models in Low-Income Settings.	Karachaliou, Simatos and Simatou (2020)	LMICs	Not Specified	Seven articles	Secondary	Descriptive Study – PubMed database	To highlight attributes of the effective models for preventing diabetes in low-income settings.	Significant improvements for NCD patients aided with the mobile phone.	Effective
13	Combating non-communicable diseases: potentials and challenges for community health workers in a digital age, a narrative review of the literature.	Mishra et al. (2019)	LMICs	Not Specified	26 articles	Secondary	PubMed and Embase	Review the affirmations and deliberate the digitalization affecting the CHWs programs for managing NCDs in LMICs.	Community health workers' programs and digital technology were afflicted with numerous challenges but would add value if used at the right time and place.	It can be effective.
14	mHealth in the Prevention and Control of Non-Communicable	Majumdar, Kar, Palanivel,	India	Not Specified	Not Specified	Secondary	Descriptive Study.	To probe the existing prospects and forthcoming scope of mhealth for NCD	mHealth can be considered the apt technology, and other features - are yet to be	It can be effective.

Sln o	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
	Diseases in India: Current Possibilities and the Way Forward.	and Misra (2015)						prevention and control in India.	explored in developing countries.	
15	Efficacy of a virtual assistance-based lifestyle intervention in reducing risk factors for Type 2 diabetes in young employees in the information technology industry in India: LIMIT, a randomized controlled trial	Limaye et al. (2016)	India	One year	265 participants	Primary	Randomized controlled trial	To inspect the VA-based lifestyle interpolation to decrease risk factors for Type 2 diabetes in young workforces in the information technology business in India.	The Virtual assistance-based lifestyle intervention seemed effective in expenditure and decreasing the risk of diabetics.	Effective
16	Digital interventions for people living with non-communicable diseases in India: A systematic review of intervention studies and recommendations for future research and development	Hossain et al. (2019)	India	Not Specified	13 articles	Secondary	Descriptive Study with PRISMA guidelines	To evaluate the evidence on digital interferences for NCD patients in India and ways to improve those interventions.	A low number of studies were undertaken but with a positive response.	Effective

Sln o	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
17	Current Status and Future Directions of mHealth Interventions for Health System Strengthening in India: Systematic Review.	Bassi et al. (2018)	India	January 1997 – June 2017	318 articles	Secondary	Descriptive Study	To classify the mHealth or telemedicine ingenuities in India and to demonstrate the current role o strengthening the health systems.	A pragmatic approach is required to gather quality evidence for digital health initiatives.	More research required
18	Telemedicine in Camp Mode While Screening for Non-communicable Diseases: A Preliminary Report from India.	Ganapathy et al. (2020)	6 locations in India - Bengaluru, Coimbatore, Delhi National Capital Region, Kolkata, Pune, and Vijayawada	August 27, 2015 – October 31, 2018	13,615 participants	Primary	Descriptive Study	The report aims to document the progression and interpretations during teleconsultations provided in NCD screening camps across several locations in India.	99.8% of the participants responded positively.	Effective
19	Potential for the use of mHealth in the management of cardiovascular disease in Kerala: a qualitative study.	Smith et al. (2015)	Five primary health centers in Ernakula	Six weeks	15 participants	Primary	Combination of Maximum variation sampling and convenience sampling.	To evaluate the potential of using mHealth in cardiovascular disease management in Kerala.	A successful mHealth program accounted for the barriers, complemented practice, and used mechanisms to optimize the use of resources.	It can be effective.

Sln o	Topic	Ref/ Year	Region	Period	Sample Size	Type	Methodology	Objectives	Brief Summary	Effectiveness
			m district, Kerala, India.							
20	Continuum of care for non-communicable diseases during COVID-19 pandemic in rural India: A mixed-methods study	John et al., 2020	Srikakulam District of Andhra Pradesh	8 Weeks	2419 participants	Primary	Mixed method study	To assess the acuities of COVID-19, the effect of the lockdown on access to health services, and the continuum of care for NCD patients amongst a cohort of adults in rural India.	Future guidelines are required before adapting telehealth modes for the continuum of care through digital health tools.	It can be effective with future guidelines
21	E-Health & Telemedicine. Department Of Health & Family Welfare.	Ministry of Health & Family Welfare (MoHFW). (2022)	India	Ongoing	NA	NA	NA	To create a national digital health ecosystem that supports universal health coverage.	The Ministry of Health & Family Welfare has initiated using Information & Communication Technologies (ICT) to enhance the proficiency & efficiency of the healthcare system in the country.	It can be effective

Amongst them, 13 studies (62%) provided the perception at the international level. Out of these, three studies (14%) portrayed low and middle-income nations. The eight studies (38%) were conducted in India, the majority in the southern belt of the country (Figure 2).

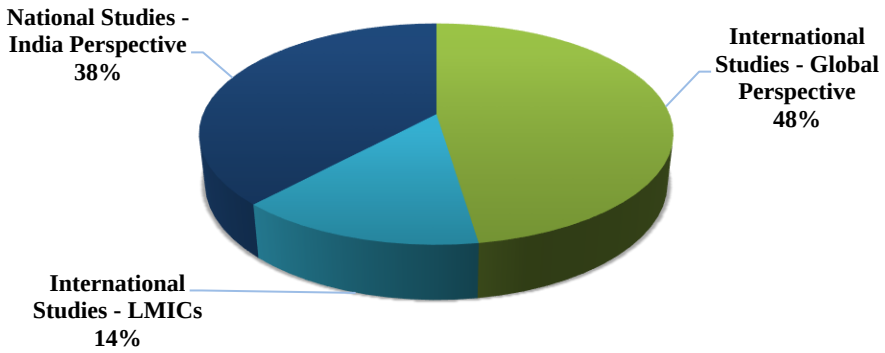

Figure 2 Geographic Locus (Region) of the Study.

Regarding the study type, 11 (52%) were secondary studies collated and analyzed from the existing databases. The 8 (38%) studies were primary, with randomized controlled trials, mixed-method studies, and so on (Figure 3).

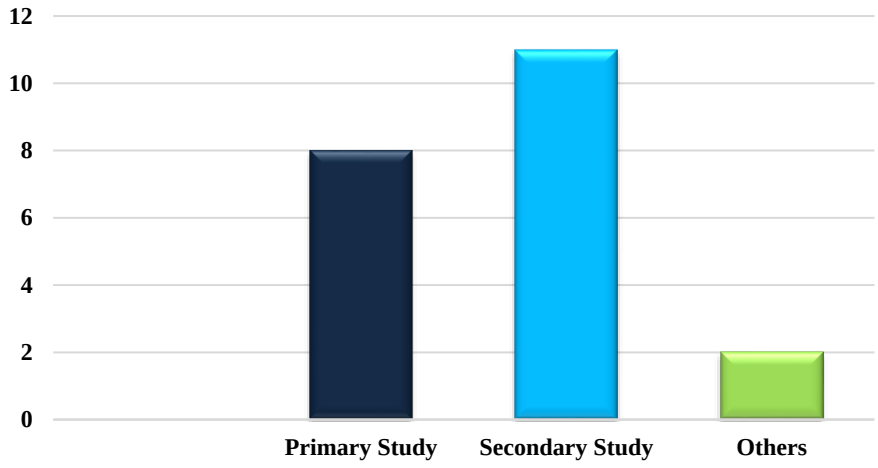

Figure 3 Study Types

In the majority of the studies, the sample size is significantly small. The application of the intervention implied the effectiveness reflected (Figure 4); eight studies (38%) found that virtual assistance using the various modes has been highly effective for NCD patients. The ten studies (47%) implied that the method can be effective but requires refinements of tools, guidelines, incorporation of a suitable model (public-private partnership), and so on. The three studies (14%) revealed that a more pragmatic approach with in-depth studies is essential to come to any definite conclusion.

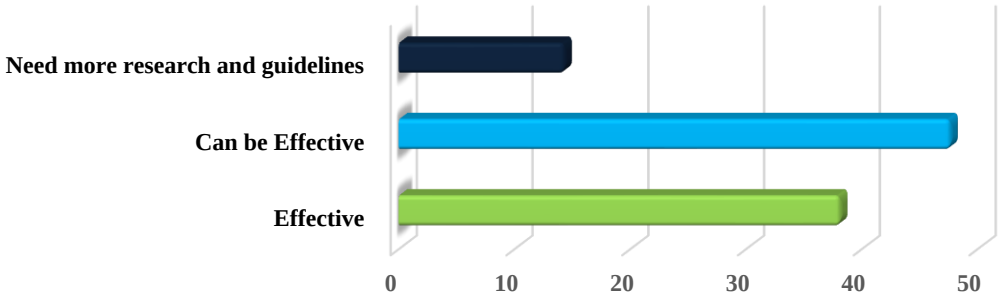

Figure 4 Effectiveness of the VA Interventions for the Prevention of NCDs

5. Discussion

The eHealth application has a promising impact on healthcare. However, some gaps need to be mended before installation in practice. The study conducted by Granja et al. (2018), evaluated the outcome of eHealth interventions. It can enhance the program's success with a focus on ameliorating diagnosis and better clinical management with high-quality patient-centered care, emphasizing the necessity to execute in-depth studies of the workflows involving the clinical processes (Lee et al., 2021). Komkova et al. (2019) highlighted the adoption of cyberspace and mobile interventions in promoting a healthy lifestyle. The lifestyle coaching with real-life electronic health (eHealth) intervention comprised the initial briefing, endowing empathic relationship, and digital lifestyle training, guided by a Web-based community amongst the NCD patients (Breda et al., 2018). The usefulness of the intervention of the self-reported change in weight of patients with obesity and diabetes is undeniable (Gautam, 2018). It implied that eHealth is significantly impactful because it is scalable, accessible, cost-effective, maintains privacy, having user control with real-life settings.

The app and web-based propagations significantly impact lifestyle behaviors reducing weight at a reasonable cost. Although, it raised concerns about the sustainability of the project. Brandt et al. (2020) evaluated medical weight loss, hemoglobin level, sustainability, and monitoring quality of life. It assimilated the economic implications of the program, that is, long-term Lifestyle Change InterVention and eHealth Application (LIVA). It was conducted for obese people with and without diabetes (type 2). It was the first e-health app implemented in Danish municipalities and is expected to respond positively. The efficiency and achievability of weight loss programs through dietary consultations are important components (Li, 2019). It had been emphasized Haas et al. (2019), examined the aspects with the aid of competent nutritionists using the virtual platform of a mobile app for the concerned patients to reduce obesity, focusing on behavioral intervention. Customized guidance and counseling through the app, providing feedback regularly through a photo-based food log, various motivational and educative materials, and options for group chats had a significant impact (Li, 2019). The outcome was evaluated by weight loss, hemoglobin level, fasting glucose and insulin, triglyceride, high-density lipoprotein cholesterol, blood pressure, body mass index, waist circumference, and body fat. With the aid of a professional nutritionist and app, it holds enormous potential for behavioral change amongst the end-users and thus provides sustainable weight reduction (Delobelle, 2019).

NCD patients adopted the digital platform at the onset of the first wave of COVID-19. It has drastically decreased physical consultations. Monaco et al. (2021) elucidated various cybernetic tools and their impact on assisting patients with the disease in this COVID era. The methodology comprised the NCD Partnership model of Upjohn. It was a cyber-

advisory panel of patients and caregivers promoting the cause on July 28, 2020. It aimed to collaborate with prominent patrons from both public and private domains, evaluating the needs of patients. The stakeholders could provide a vivid depiction of the practical usage and strategies to enhance adoption. It should be designed for patients with complicated conditions, such as co-morbidities, impairments, etc. However, the patients should have access to alternative tools. The future roadmap can consider the former model to ensure better care and services to the concerned patients (Genay-Diliautas, & Malgouires, 2018). Electronic patient-reported outcomes (ePRO) device was developed for adult patients with co-morbidities in Toronto, Canada. The aid of patients and healthcare providers as an interdisciplinary primary care team to support self-management with ascertained unequivocal recognition of the theoretical features is mandated during preparation (Gudi, Yadav, John, & Webster, 2021). Khan et al. (2018) confirmed that the tool could be improved before adopting and accommodating complex medical conditions.

The mHealth has utilized mobile devices, high wireless techs, and wearable devices. The three aspects were text messaging, various smartphone applications, and portable monitoring gadgets (Wang et al., 2017). The outcome revealed that weight loss and reduction/maintenance in glucose level in blood was achieved along with behavior changes among the concerned population. The programs had positively enhanced the self-cogency and acceptance of the program. Chronic diseases can be addressed by computer technology called Virtual Realit. It aids in stimulating real environments and conditions by providing prompt services, curative measures, and rehabilitation. The technology has imbibed and helped in augmented treatment and rehabilitation facilities (Gohari et al., 2019). It allowed the patients to be motivated with efficacious management.

Chronic diseases like rheumatoid have experienced better healthcare with the ministration of digital health. It bridges the gap between the various stakeholders, clinicians, patients, caregivers, and so on. The enhancement of quality of services and care needs to be the base of the new technology; smartphone applications, social media, video, messengers, wearable devices, or the amalgamation of these products. It aids in better care delivery and overcoming the coercion of distance, place, or time (Kataria, & Ravindran, 2018). Digital therapeutics succor with customized apps provides patient education, consultations, health coaching, and detailed guidance on lifestyle modifications. They assisted care with robotic interventions guided by voice and visuals. On the other hand, wearables fortified with sensors capture the symptoms, providing a vivid insight into the disease's progression, response, and various complications (Herrick, 2019). The real-time data analytics with artificial intelligence optimized the understanding of the disease for a better response from the clinician and the patients, drastically enhancing the study's outcome.

The merging of technology and science in the modern era has helped in creating new avenues; diseases can be treated with miniaturized diagnostic instruments incorporated into smartphones. Mobile health appliances with facilities like iECG (electrocardiogram), lab-on-a-chip, or handheld ultrasound have aggrandized the patients' enthusiasm as they can reduce the cost and enhance the outcome (Bhavnani et al., 2016). It has provided a roadmap considering the appliances, the target population, clinical needs to maximize patient engagement, workflow, and finally, the regulation of the hi-tech devices. Social Media has reached mass even in LMICs. The powerful tools for managing NCDs are awareness, education of the patients along with psychological support (Islam et al., 2019). It implied various challenges in gathering the correct information, and the patient's data confidentiality was compromised. Standardization of the processes with monitoring authorities needs to be defined. Commercial interests and equity inaccessibility must also be considered (Cowling, & Magraw, 2019). The lack of standards had evaded any detrimental consequences. The prospective studies need to envisage diverse groups to interpret the efficacy for long and short-term effectivity in LMICs.

In LMICs, the population faces various challenges in fighting the prevalence of diabetics due to a common understanding of the disease etiology, awareness, accessibility for consultations, and medications (Kundu, Hazra, Pal, & Bhattacharya, 2018). The treatment and management of the disease

get compromised, resulting in a steep rise. Karachaliou et al. (2020); reviewed the newest research and investigated the successful models for the prevention in low-income setups. A vivid picture has been provided of the efficacy of the programs, considering the cost and sustainability. The community health workers had been thought to promote home-based healthcare education and counseling sessions availing the digital platform for the various NCDs in LMICs (Mishra et al., 2019). The acceptance of digital technology amongst the population and the low expenditure can be the perfect platform to incorporate health at the right stage and location.

In developing countries like India, NCDs have risen at an alarming level. The availability of cheap mobiles in the market has been a boon. The healthcare industry is using technology to assist patients in the pandemic era. The existing system in India has been explored to understand the benefits, possibilities, and challenges of mobile health (Majumdar et al., 2015). The data about the research was scarce. It has promising advantages, but it is essential to eradicate challenges like awareness, network issues, and so on to scale up the implementation at the national platform. Lifestyle Modification in Information Technology (LIMIT) comprised initial lifestyle counseling and reinforcement through messages. With the proper intervention, various risk factors for diabetes can be eliminated among young employees (Limaye et al., 2016). Innovations in digital intervention, such as mHealth, eHealth, and telemedicine for patients with NCDs, have facilitated patient-centered care for NCDs (Hossain et al., 2019). There is a positive impact of digital mediation as it provides excellent self-management, augmented patient-provider communion, and medication cohesion, which results in decreased symptoms of the ailments. There were still loads of areas for improvement. And future research needs to explore technologies to ensure equitable and supportable development in the field.

Public health inventiveness found an accession amongst the population of India with the exponential rise in the use of mobiles. Financial initiatives and human resources played a magnum role in strengthening health systems (Bassi et al., 2018). But there is a poor endowment of quality evidence in the context of efficiency, acceptability, and cost-efficacy. The risk factors can be identified long before the symptoms of NCDs emerges. Screening for NCDs is considered the most effective tool in controlling diseases. Real-time teleconsultation helps in screening which adds value to the services (Ganapathy et al., 2020). The internet-enabled camps to propagate awareness, supported by the software to capture the details of the patients; teleconsultations for people who were "at-risk" of NCDs can be identified and receive beneficiaries to overcome the incidence of the lethal disease (Cowling, & Magraw, 2019). The potential use of mHealth for treating and managing cardiovascular disease was scrutinized in Kerala. The experiences and hurdles of the present management of cardiovascular diseases and mobile phones were posited in detail. Three key potential usages of mHealth for the Indian population are; to propagate awareness – educational tools, it can work beyond the boundaries with minimum expenditure, and finally will aid in the prevention and management of the disease (Smith et al., 2015). The mHealth design needs to overcome the present barriers to optimize the resources.

In the COVID-19 era, it is vital to reckon with acuities and its implication in accessing and maintaining quality care for NCD patients (John et al., 2020). A comprehensive guideline must be considered for the country's marginalized population with lower socio-economic bands (Cavalin, & Lescoat, 2017). The Ministry of Health & Family Welfare has initiated various programs using Information & Communication Technologies to enhance the competence & efficiency of the civic healthcare system (MoHFW, 2022). Ministry is developing and upgrading the ICT initiatives, which are propagated through National Health Portal, e-Hospital, Online Registration System (ORS), Swasth Bharat, mDiabetes Program, National Telemedicine Network, and so on.

The study's limitations were that there was diversity in the study designs of the 21 articles. Few researchers did not furnish adequate outlines and summaries, demographics of the responders, the test used, or the anticipated role of the test. There are loads of challenges concerning the poor quality and scarce evidence in virtual assistance to aid NCD patients.

6. Conclusion

The increased burden of non-communicable diseases has made it essential to imbibe innovative and digital assistance. The COVID-19 pandemic has also shrunk physical consultations making healthcare leaders adopt new strategies. Thus, the role of virtual aid for awareness, education, and lifestyle modifications for preventing and managing NCDs is undeniable. With the advent of new technical supports, and exponential growth in the use of smartphones and gadgets, virtual health care and services seem feasible. The program can incorporate and impart comprehensive knowledge about self-management with mass information sharing, counseling sessions, health-seeking behavior, and capacity building of the providers and users (Cavalin, & Lescoat, 2017). The government and private bodies are exploring the viable option to reduce the high morbidity and mortality of the lethal ailment.

There are several hurdles concerning insufficient evidence, the confidentiality of the data, the privacy of the patients, equity of services, supervision, monitoring, evaluation, and quality that urgently need to be addressed. The standard operating procedures in the regulatory guides need to embody all the former issues to strengthen the healthcare system (Cowling, & Magraw, 2019). Thus, it can be concluded that; virtual assistance-based education and lifestyle interventions to prevent non-communicable diseases; are cost-effective in the long run and hold high promise in terms of efficacy, accessibility, and acceptability with the suitable mode of implementation and regulations.

7. Acknowledgments

I would like to express my gratitude to Dr. Sukanti Bhattacharyya, MD, Associate Professor, Medical Physiology, IIMSAR & Dr. B. C. Roy Hospital, Haldia, West Bengal, India, for his valuable and constructive suggestions, which significantly improved the manuscript. His willingness to give his time so generously is worth appreciation.

8. Data and Materials Availability Statement

All data reviewed and analyzed during this study are included in this article (Table 1).

9. Disclosure of Interest

There is no competing interest.

10. Authors Contribution

Author 1's contributions to the manuscript were conceptualizing, conceiving, designing the analysis, collecting the data, performing research, and paper formatting and drafting. Author 2 aided in the process of conceptualization. There is no conflict of interest.

11. Funding

This research received no specific grant from public, commercial, or not-for-profit funding agencies.

12. References

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