How is mhealth and web-based telemedicine implemented in patient with hypertension? : a narrative scoping review

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Abstract: In this digital era, telemedicine has become one of the cutting-edge approaches that is feasible for hypertension management. Despite the proliferation of trial research, reviews of how telemedicine is practiced are limited. The aim of this study is to review how telehealth is applied in patients with hypertension. A scoping review according to the Joanna Briggs Institute Reviewer Manual’s instructions was used with a narrative approach to the type of RCT intervention articles. The search was conducted through electronic databases Scopus, PubMed, and Medline-ovid with the keywords “Telemedicine” and “hypertension”. Of 1945 articles, 13 studies met the criteria and were reviewed. Telemedicine interventions including mhealth-based and web-based provide various ways to manage and provide telemonitoring for BP. The utilization of m-health can be through the development of smartphone applications, text messaging, or the use of current social media. Whereas web-based utilization mostly uses email consultations and not many uses paid websites but are integrated with mobile phones. Telemedicine whether mhealth or web-based makes it easier for healthcare professionals to manage and monitor patients’ BP, offering a sustainable positive impact in the future.

Keywords: Telemedicine, mHealth, Web-based, hypertension

Introduction

Hypertension is called a “silent killer” which makes people unaware that they have hypertension suddenly because they do not have the sign and symptom they feel (WHO, 2021). There are 46% of adults who do not feel aware of their condition (WHO, 2021). Hypertension, often known as high blood pressure, occurs when the blood flow force to the blood vessels is consistently greater than 120/80 mmHg (Singh et al., 2017). Systolic blood pressure greater than 140 mmHg and diastolic blood pressure greater than 90 mmHg at rest indicate hypertension. Hypertension can trigger the occurrence of other diseases such as attacks heart failure, stroke and kidney failure (Singh et al., 2017). Hypertension can harm because it will increase the workload of the heart and blood vessels (AHA, 2020). So, this case is one of the global targets to reduce the prevalence of non-communicable diseases by 33% until 2030 (WHO, 2021).

There are several ways to manage hypertension include lifestyle modification, pharmacological treatment, and adherence to antihypertensive therapy (AHA, 2020). Optimization of medication adherence and monitoring of conditions in hypertensive patients needs to be done to reduce the incidence of hypertension which continues to increase over time (Nurakysh et al., 2022). However, during these past few years, the COVID-19 Pandemic caused a more than 25% decline in a maintenance visits (Taylor et al., 2022). Various reports of this condition have a negative impact on population-level health as well as on individual well-being (Taylor et al., 2022). It is known that many clients with significant chronic illnesses have barriers to accessing care due to COVID-19 (Taylor et al., 2022). Based on this situation, health workers make various programs to
remotely control hypertension, resulting in the rapid expansion of telemedicine as an integral part of outpatient care (Ye et al., 2022).

In this digital era, telemedicine is very beneficial to elevate the effectiveness of medication adherence. Communication between doctors and patients becomes more effective with telemedicine because it only depends on time, not on a good place (Nurakysh et al., 2022). Telemedicine can support the continuity of self-management of chronic illness and potentially implicated for the future delivery of health care. According a previous meta – analysis, telemedicine has proven in controlling blood pressure (Zhang et al., 2021).

Scoping reviews of the evidence for telemedicine interventions in blood pressure management have been undertaken, but this reviews have only focused on low- and middle-income countries (Hoffer-Hawkil et al., 2021). Findings from this study point to the potential of telemedicine as a means to expand access to care and enhance outcomes for hypertension in low- and middle-income countries, particularly in the face of events that impede travel to clinics, like the recent COVID-19 epidemic. Although a scoping review about telemedicine in hypertension management has been conducted, however, information regarding how telemedicine is used in general, not only in certain areas such as low-income countries, is still needed. Accordingly, we believe that exploring the benefits of telemedicine as an intervention to manage hypertension in various way and situation is very important. Therefore, this study aim is to summarize how is telemedicine interventions for hypertension management has implemented and determine which interventions have the most often be used in patient with hypertension in vary condition and situation.

Materials and Methods

Study Design and Eligible Criteria

We conducted a scoping review according to the Joanna Briggs Institute Reviewer Manual’s instructions (Peters et al., 2020; Peters et al., 2015). The PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews) checklist is used to guide the scoping review (Tricco et al., 2018). This review focused on studies of adult 18 and older who received common high blood pressure treatment through telehealth. We also included all publications that looked at any part of telehealth, telemedicine, e-health, and m-health, from direct, real-time video conferencing between patients and healthcare providers to m-health monitoring through apps and wearable smart devices. We compared the treatment for the control group using usual or routine care. The study design included studies focused on randomized control trials. The following conditions were used to eliminate potential article candidates: (1) did not pertain to the stated topic; (2) were not original articles or used an inappropriate study design; (3) secondary analysis.

Search Strategy

Starting on November 24th, 2022, we used keywords and a controlled vocabulary (such as MeSH terms) to conduct a systematic search of three electronic databases (Scopus, PubMed, and Medline-OVID) using the syntax "Telemedicine OR (mobile health) OR (health, mobile) AND hypertension OR (blood pressure, high) OR (blood pressures, high) OR (high blood pressure) OR (high blood pressures)" with five years restrictions and English language limitations. In order to provide a thorough evaluation, we checked the cited works of the included papers for more studies that might be related to ours. Manual searches were not conducted because of the limited time.

Article Selection and Data Extraction

EndNote, version 20.1, was used to search all available databases and screen all relevant articles. Two researchers participated in the screening procedure. For each step of the screening procedure that the first author completed, the other author examined their
work for accuracy. After removing duplicates, we first reviewed articles by title and abstract to determine which would be included in the final article selection. The second step involved screening and reading the complete text of studies to determine whether or not they met the exclusion criteria. When the five authors had differences of opinion during the process, a six author was consulted to make consensus. Finally, we conducted post-hoc searches of a selection of meta-analyses, reviews, and reference lists. At last, the features of the included studies were extracted after they had been identified and reviewed (Table 1 and 2). The features of the study included the following: (1) author and year publication; (2) country; (3) study design; (4) population including age and gender; (5) sample size; (6) type of telemedicine; (7) primary outcomes; (8) secondary outcomes. Four separate reviewers systematically searched for studies that met the PICOS criteria.

**Data Analysis and Synthesis**

A narrative approach of the data plotted for each investigation is provided. We describe and review telemedicine procedures performed using either the mhealth or web-based methods. The narrative approach in this study aims to dissect how telemedicine is applied in each study. The outcomes of the included studies are presented in the form of narrative tables.

**Results**

As shown in the flowchart of PRISMA-ScR (Fig.1), there were three databases used to search relative articles comprise of Scopus (n=1543), PubMed (n=259), and Medline (n=143). Totally, we had 1945 articles and imported them into the Endnote for duplication exclusion. We found that there were 327 duplicate articles. Next step, we screened the titles and abstracts of the remaining 1618 articles. We excluded another 1602 articles
because of irrelevant topic (n=993), irrelevant population (n=279), review/meta-analysis (n=118), non-research article (n=2), study protocol (n=12), and irrelevant design (n=198). Furthermore, 3 articles were excluded for the screening eligibility because of outcome interested not being measure. Finally, we had 13 articles left for qualitative synthesis.

Eight different countries has contributed studies, most of them from high income countries, such as USA (n=2), Canada (n=2) China (n=3), United Kingdom (n=2), Japan (n=1), Taiwan (n=1), and there are two studies from middle income countries, such as Peru (n=1) and Kenya (n=1). In addition, there are three studies used cluster randomized controlled trial and five studies used randomized controlled trial. The biggest population size among these studies is 1460, and the smallest sample size is 26.

Table 1. Characteristic included studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Country</th>
<th>Study Design</th>
<th>Population</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margolis et al, 2013</td>
<td>USA</td>
<td>Cluster - RCT</td>
<td>Age: 61.1 (12.0)<em>&lt;br&gt;Gender: F: 203&lt;br&gt;M: 247&lt;br&gt;Age: NI (30-60)</em>&lt;br&gt;Gender: F: NI&lt;br&gt;M: NI&lt;br&gt;Age: 58.7 (7.5)*</td>
<td>450</td>
</tr>
<tr>
<td>Bernabe et al, 2020</td>
<td>Peru</td>
<td>RCT</td>
<td>Age: NI (30-60)<em>&lt;br&gt;Gender: F: NI&lt;br&gt;M: NI&lt;br&gt;Age: 58.7 (7.5)</em></td>
<td>164</td>
</tr>
<tr>
<td>Gong et al, 2020</td>
<td>China</td>
<td>RCT</td>
<td>Age: 62.7 (9.3)<em>&lt;br&gt;Gender: F: 241&lt;br&gt;M: 202&lt;br&gt;Age: 58.7 (7.5)</em></td>
<td>443</td>
</tr>
<tr>
<td>Kao et al, 2019</td>
<td>Taiwan</td>
<td>RCT</td>
<td>Age: 61.5 (6.4)<em>&lt;br&gt;Gender: F: 108&lt;br&gt;M: 114&lt;br&gt;Age: 58.7 (34-74)</em></td>
<td>222</td>
</tr>
<tr>
<td>Li et al, 2019</td>
<td>China</td>
<td>Cluster - RCT</td>
<td>Age: 57.6 (34-74)<em>&lt;br&gt;Gender: F: 294&lt;br&gt;M: 170&lt;br&gt;Age: 57.6 (34-74)</em></td>
<td>464</td>
</tr>
<tr>
<td>Liu et al, 2019</td>
<td>Canada</td>
<td>RCT</td>
<td>Age: 66.9 (9.4)<em>&lt;br&gt;Gender: F: 154&lt;br&gt;M: 43&lt;br&gt;Age: 66.9 (9.4)</em></td>
<td>197</td>
</tr>
<tr>
<td>McManus et al, 2018</td>
<td>United Kingdom</td>
<td>RCT</td>
<td>Age: 66.9 (9.4)<em>&lt;br&gt;Gender: F: 545&lt;br&gt;M: 628&lt;br&gt;Age: 66.0 (NI)</em></td>
<td>1182</td>
</tr>
<tr>
<td>McManus et al, 2021</td>
<td>United Kingdom</td>
<td>RCT</td>
<td>Age: 66.9 (9.4)<em>&lt;br&gt;Gender: F: 288&lt;br&gt;M: 334&lt;br&gt;Age: 57 (35-75)</em></td>
<td>622</td>
</tr>
<tr>
<td>Pan et al, 2018</td>
<td>China</td>
<td>RCT</td>
<td>Age: 35.2 (NI)<em>&lt;br&gt;Gender: F: 57&lt;br&gt;M: 50&lt;br&gt;Age: 35.2 (NI)</em></td>
<td>107</td>
</tr>
<tr>
<td>Staffileno et al, 2018</td>
<td>USA</td>
<td>RCT</td>
<td>Age: 35.2 (NI)<em>&lt;br&gt;Gender: F: 26&lt;br&gt;M: 50&lt;br&gt;Age: 35.2 (NI)</em></td>
<td>26</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Study Design</td>
<td>Gender*</td>
<td>Age (SD)**</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------</td>
<td>---------------</td>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td>Tobe et al, 2019</td>
<td>Canada</td>
<td>RCT</td>
<td>F: 26, M: 0</td>
<td>48.9 (13.0)*</td>
</tr>
<tr>
<td>Vedanthan et al, 2019</td>
<td>Kenya</td>
<td>Cluster - RCT</td>
<td>F: 70, M: 72</td>
<td>54.2 (16.4)*</td>
</tr>
<tr>
<td>Yatabe et al, 2021</td>
<td>Japan</td>
<td>RCT</td>
<td>F: 58, M: 39</td>
<td>53.0 (9.0)*</td>
</tr>
</tbody>
</table>

Abbreviation: RCT= Randomized controlled trial; *Standard Deviation (SD); **Range age

### 3.1. Implementation of Telemedicine

Based on Table 2, both the use of mHealth and web-based are the same in proportion from 13 included studies. In mHealth intervention (n=6), the authors usually used SMS as one of the most cost-effective ways to conduct the intervention. Meanwhile, the Web/internet-based was becoming the second popular choice for intervention (n=7).

#### 3.1.1. mHealth

Study by Bernabe et al (2021) evaluated the long-term effects of mHealth intervention on blood pressure and body weight in participants recruited in Peru. The intervention lasted one year, adhered to a standardized protocol, was administered by trained nutritionists, and consisted of monthly phone calls in which the nutritionists employed motivational interviewing techniques. Participants were contacted via their personal mobile phones, and the conversations focused on reducing dietary sodium intake, consuming fewer high-fat and high-sugar foods, consuming more fruits and vegetables, and promoting physical activity. Whereas, study by Gong et al (2020) provided mHealth intervention which group participants were suggested to download the “Yan Fu” app and registered using their real names. The investigators instructed each participant on how to use the app and assisted in establishing medication and blood pressure monitoring schedules. Then, the app would then remind participants of the dosage and timing of their medications and blood pressure readings. Participants were given scientific information and recommendations regarding hypertension. The participants were instructed to input their blood pressure to the app at least once per day and to log any medications they took. Eventually, they transmitted their blood pressure data from the automatic sphygmomanometer via Bluetooth to the app. If the participants failed to upload their blood pressure and medication records, the app would send them a reminder message. In case that the participant’s blood pressure was abnormal, the app would alert them to re-measure their blood pressure after resting and reminded them time to directly visit the doctor.

In the other hand, study by Li et al (2019) used WeChat, a social media application in China, to help community middle-aged and elderly adults with hypertension reduce and manage BP. The intervention program had four components: health education, health promotion, group into the high cardiovascular risk group, and others into the low-to-moderate risk group. They conversed and monitored BP. First, they provided three months of health education through WeChat posts and created group chats for each risk group (approximately 30 people per group), which are frequent hypertension issues, medication treatment, prevention of complications, and healthy lifestyle. After read each article, participants had to complete a brief quiz (e.g., “What are the diagnostic criteria for...
hypertension (mmHg)?” with four possible answers (120/80, 135/85, 140/90, and 160/100). In addition, at the conclusion of each quiz, they would inform participants with the correct answers and provide additional explanation to prevent any knowledge retention. They also prepared information on how to take medication, eat well, exercise, quit smoking, limit alcohol consumption, and regulate mood. Eventually, to promote healthy behavior, a punch-in system was required. Furthermore, they could also choose a private WeChat conversation with researchers at any time.

Similarly, Pan et al (2018) and Vedanthan et al (2019) provided home telemonitoring for BP by using smartphone application and Tobe et al (2019) used active message through mobile phone. In the Pat et al (2018) study, the app on the patients' smartphones provided data like blood pressure readings which it connected directly to the hypertension management platform at the community health center. The patients were encouraged to attend the community health center’s training sessions. The research group facilitated training sessions. The learning objectives were when and how to measure blood pressure at home using the automated sphygmomanometer and the app. The learning objectives included information about when and how to measure blood pressure at home using the automated sphygmomanometer and the app. Likewise, study by Vedanthan et al (2019) was carried out by integrating community health workers (CHWs), equipped with behavioral communication strategies and mobile health (mHealth) technology, on linkage to hypertension care and BP reduction among individuals with elevated BP. The CHW is equipped with a smartphone containing real-time decision support and data entry capabilities linked to the electronic health record. Thus, the smartphone provides customized messages and recommendations based on the results of the assessment. Additionally, smartphone technology enables alternative messaging formats, such as images, audio recordings, and videos. Whereas, Tobe et al (2019) provided the active message containing information on hypertension management and a recommendation to follow up with the participant’s healthcare provider if the measured blood pressure is above the target range. Community health workers measure individuals' blood pressure using an automated device with Bluetooth transmission capabilities.

3.1.2. Web/internet-based

The use of web-based BP telemonitoring is diverse. As the study by Margolis et al (2012), they provided telemonitoring equipment to patients' homes and provides them with a toll-free number for customer support. At least once per week, patients connect their telemonitors to their modems (using a cord for a land-line modem or Bluetooth technology for a cellular modem) and press a 'transmit' button, which automatically transmits readings since the last transmission and uploads the data to a secure website. After transmission, an automated computer system calls the patient and asks them to answer two questions. 1) "Have you missed more than one dose of your blood pressure medication in the past week?" and 2) "Are you experiencing any issues that you would like your study pharmacist to call you about before your next scheduled call?" If the patient answers "yes" to either of these questions, the website will send an e-mail alert to the pharmacist case manager. Patients can request that their pharmacist contact them whenever they transmit blood pressure data. Additionally, pharmacists receive automatic e-mail alerts if a patient's blood pressure is dangerously high (180/110 mm Hg) or low (80/50 mm Hg).

Based on study by Kao et al (2019), they determined that patients who can self-titrate medications should be proficient in three areas: the ability to measure blood pressure accurately, the ability to record and interpret blood pressure recordings, and the ability to adjust their dose (increase, maintain, or decrease) or carry out emergency interventions based on instructions. Therefore, a safe website was created to assist patients in performing self-titration in a safe manner. There are five sections on the website: (1) personal data collection, (2) individual physical data recording, (3) blood pressure recording, (4) hypertension patient education, and (5) consultation. Similarly, study by Liu et al (2019)
delivered telemonitoring via email on a set schedule. The emails contained web-links to internet-based session for e-Consultation. They relied heavily on videos featuring their team members to establish a (virtual) therapeutic relationship with participants. They created three types of videos (up to ten minutes in length) featuring team members in their respective areas of expertise (diet, exercise, medication, and smoke-free living). 1) dramatic vignettes reflecting and validating the participant’s experience as a fictional character receiving a diagnosis of hypertension and then planning and implementing lifestyle changes with the support of a healthcare professional or peer; 2) expert-type presentations with self-help guidelines for adhering to self-care behaviors; and 3) open discussions among peers providing positive role models and guidance.

Study by McManus et al (2018) integrated web-based and SMS text-based telemonitoring service. The telemonitoring system included algorithms that reminded participants to contact their surgery in the event of very high or low readings, alerted them if insufficient readings were submitted, encouraged them to contact their practice if their average blood pressure was above target, and displayed readings to attending physicians via a web interface. This protected website automatically calculates the average blood pressure for each monitoring week, highlights very high or low readings, and displays blood pressure measurements graphically. On the other hand, study by McManus et al (2021) provided home-based BP online monitoring with automated email reminders. The BP home intervention for self-management of high blood pressure consists of an integrated patient and healthcare practitioner online digital intervention, blood pressure self-monitoring, healthcare practitioner-directed and supervised antihypertensive medication titration, and user-selected lifestyle modifications.

Two studies by Yatabe et al (2018) and Staffileno et al (2018) provided telemedicine for BP monitoring by using web-based platform provider. As study by Yatabe et al (2018), they used the web-based automatic analysis system (MedicalLINK). In the telemedicine group, the doctor assessed HBP weekly via MedicalLINK and, if necessary, had the patient schedule an online consultation to discuss treatment. In the telemedicine group, prescription refills and dosage adjustments were sent to the patient. Whereas, Staffileno et al (2018), the eHealth intervention was delivered using the Wix web-based platform. Wix is a self-hosted website builder and content management system with over 90 million users (http://www.wix.com). The online education module was developed and contains 12 modules focusing on the Dietary Approaches to Stop Hypertension (DASH) meal plan and 12 modules focusing on the physical activity lifestyle.

3.2. Primary and Secondary Outcome of Telemedicine Intervention

Most of the primary outcome of include studies was blood pressure controlling or lowering (n=12). There was one studies mentioned about healthy lifestyle as primary outcome. For secondary outcome, the authors focused on several outcomes, such as BMI, physical activities, medication adherence, dietary, quality of life, adverse events. Detail information regarding study outcomes were provided in the table 2.

<table>
<thead>
<tr>
<th>No.</th>
<th>Author</th>
<th>Type of Telemedicine</th>
<th>Primary Outcome</th>
<th>Secondary Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Margolis et al, 2013</td>
<td>Web/internet-based</td>
<td>SBP and DBP</td>
<td>Medication adjustment, key components of success</td>
</tr>
<tr>
<td>2</td>
<td>Bernabe et al, 2020</td>
<td>mHealth (SMS, audio call)</td>
<td>SBP and DBP</td>
<td>Body weight, BMI, Physical activity, diet pattern</td>
</tr>
<tr>
<td>3</td>
<td>Gong et al, 2020</td>
<td>mHealth</td>
<td>SBP and DBP</td>
<td>Medication adherence</td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Type/Method</td>
<td>Outcome Measures</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>Kao et al, 2019</td>
<td>Web/internet-based</td>
<td>SBP and DBP, Overall antihypertensive, Health-related Quality of Life</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Li et al, 2019</td>
<td>mHealth</td>
<td>SBP, DBP, BP control, frequency of BP monitoring, hypertension knowledge, self-efficacy, self-management, and social support</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Liu et al, 2019</td>
<td>Web/internet-based</td>
<td>SBP and DBP, Exercise and diet behaviors</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>McManus et al, 2018</td>
<td>Web/internet-based</td>
<td>SBP, Adverse events, medication prescription, self-reported adherence, weight and waist circumference, lifestyle factors, Quality of Life. Drug adherence, health related quality of life, and side effects from the symptoms section of an adjusted illness perceptions questionnaire.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>McManus et al, 2021</td>
<td>Web/internet-based</td>
<td>SBP and DBP, Blood pressure control</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Pan et al, 2018</td>
<td>mHealth</td>
<td>SBP and DBP, Improve the healthy lifestyle</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Staffileno et al, 2018</td>
<td>Web/internet-based</td>
<td>SBP and DBP, Dietary control, BP control and normal of BMI</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Tobe et al, 2019</td>
<td>mHealth</td>
<td>SBP and DBP, BP control</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Vedanthan et al, 2019</td>
<td>mHealth</td>
<td>BP, Linkage overall (usual care, paper-based, and smartphone) Systolic blood-pressure BP control rates, adverse events (e.g., side effects and cardiovascular events), medication prescription, body weight, and laboratory measures.</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Yatabe et al, 2021</td>
<td>Web/internet-based</td>
<td>BP, Linkage overall (usual care, paper-based, and smartphone) Systolic blood-pressure BP control rates, adverse events (e.g., side effects and cardiovascular events), medication prescription, body weight, and laboratory measures.</td>
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</table>

* BP: blood pressure; SBP: systolic blood pressure; DBP: diastolic blood pressure

**Discussion**

The current findings of this study summarized that 13 included studies were explained. Overall, the number of telemedicine interventions including mHealth-based and web-based delivered various way to manage and provided telemonitoring for BP. The use of m-health can be through smartphone application development, short message service (SMS), or the use of the latest social media. Meanwhile, the most common use of web-based is using email consultations and few studies uses paid websites but are integrated with mobile phones. They provided information on primary and secondary outcomes, where blood pressure monitoring shows the most important outcome.

The majority of populations who using telemonitoring as a media for controlling their blood pressure were adults aged 18 to 59 years old. According to a prior study on telehealth use in Bangladesh during COVID-19, the youngest age group, 16–25, used it the most, while the oldest age group, 45 and older, used it the least (Rahman et al., 2022). It could be because people in this age group are very familiar with technology and know where to go for help with online platforms. Meanwhile, based on CDC data explained that telemedicine use increased with age, from 29.4% among persons aged 18–29 to 43.3% among adults 65 and older (Lucas, 2022). The oldest group might be because this generation is least acquainted with technology and least aware of online platforms (Rahman et al., 2022).

Not only age factor, telehealth also is influenced by gender. This study found that number of females is higher than males. This finding related to the CDC that telemedicine use increased, were higher among women (42.0%) compared with men (31.7%) (CDC, 2022). Nevertheless, telehealth usage in Bangladesh during COVID-19 found that male patients had a higher dependency on telehealth than female patients (Rahman, et al.,
This highlights a gap in health awareness and health literacy among females and males in the country. However, it was interesting to note that men also had higher usage with in-person consultation. This can be because our sample had ∼93% males, which lead to a higher number of male telehealth users (Rahman et al., 2022).

Telehealth/telemedicine is implemented similarly in different countries, but the roles of health workers vary depending on the country’s development. In developing nations like Peru and Kenya, nutritionists and community nurses are still necessary to follow up with hypertensive individuals in the community. However, in developed countries, hypertensive patients can use telehealth effectively due to their familiarity with technology. The application of telehealth also differs, as seen in the study by Staffileno et al (2018) where researchers developed a website with web-based telehealth for 90 million users, including educational modules on hypertension that are regularly updated. The coverage of telehealth users is a concern in both developed and developing countries, as people in developed countries generally have better knowledge of hypertension and are more likely to access telehealth services (Hoffer-Hawlik, 2021). Overall, developing telehealth in low middle-income countries is still a concern. Education to the community about telemedicine and how it can improve their access to the healthcare can be the most effective way, such as encouraging patients to participate in telemedicine programs and provide feedback to improve the quality of care.

Mobile health interventions may utilize a variety of mobile technology features, including SMS, voice calls, mobile phone applications, global positioning systems (GPS), and Bluetooth (Cameron et al., 2017). Numerous studies have evaluated the efficacy of mHealth interventions on health practices and outcomes for chronic diseases (Gandhi et al., 2017; Hamine et al., 2015). McClean et al. (2016) found that interactive digital interventions can support patients’ self-management of hypertension in order to lower their blood pressure. Rehman et al. (2017) also found mHealth to be promising and discovered that mHealth interventions in hypertension management have transitioned from text message-based approaches to mobile phone applications with multiple components. Some of these theories (such self-determination) have been applied to mHealth initiatives to improve hypertension medication adherence (Xiong et al., 2018). According a meta-analysis by Finitsis et al (2014), there are three key characteristics of mHealth interventions may have contributed to their effectiveness in improving medication adherence. First, the mHealth approach permits intensive intervention. The majority of included studies utilized automated delivery of daily medication reminders or weekly educational or motivational content. It is difficult to achieve such integration of interventions into patients’ daily lives with non-digital standard care. However, a previous study on mHealth and antiretroviral medication management revealed that a higher SMS frequency could lead to response fatigue and patient distraction.

The use of web-based in our findings does not only focus on blood pressure management but also various outcomes. Web-based monitoring centres can be used to monitor patients’ vital signs at home, such as blood pressure, heart rate, respiratory function, and adherence to antihypertensive therapy, or provide care services. Tools for remote patient monitoring of blood pressure or other vital signs at home, equipped with visiting nurses and phone calls, can be used to remotely collect and transmit data to home health agencies or remote diagnostic testing facilities for interpretation and distribution to referring physicians. Web-based, e-health patient service sites, can offer direct consumer outreach services via the Internet, forward medical and health information to patients, and promote online discussion groups that offer peer-to-peer support (Omboni & Ferrari, 2015). In addition, web-based telehealth care services are advisable in managing BP control and in stimulating community-based self-management of patients with hypertension (Lu et al., 2019).
Conclusions

The application of telemedicine to the treatment of hypertension has a number of significant advantages that are shared with the management of a variety of other chronic conditions using telemedicine technology. The primary benefit of telemedicine is the ability to establish and maintain long-term relationships with patients, a characteristic that is particularly essential in the case of hypertension, a condition that requires lifelong medical monitoring. Telemedicine can empower hypertensive patients, influence their attitudes and behaviours, and enhance their medical conditions in a broader sense. Telemedicine has many benefits like communication between doctors, nurses and patients are becoming easier because it only depends on the time. In this result, despite the fact that telemedicine has the ability to assist the continuation of self-management of chronic illness and has possible implications for the future delivery of health care, telemonitoring was not routinely used as part of telemedicine interventions.

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