Effects of Patient Education via Smartphone Messaging Application on Knowledge, Attitude, Self-Care Practice, Quality of Life (KAPQ) And Medication Adherence Among Heart Failure Patients During COVID-19 Pandemic

Lee Siew Huang¹, Shairyzah Ahmad Hisham²*, Syahirah Hamdan¹, Chan Pooi Mun¹, AnnurAmanina Abdul Manaf¹, SafiahtulLaini Shabry¹, Sarmini Gunalan¹, Ting Leong Yuen¹, Agnes Lim Yan Chyi¹, Leong Siew Lian², Zainol Akbar Zainal²

¹Pharmacy Department, Kuala Kangsar Hospital, Jalan Sultan Idris Shah 1, Taman Mawar, 33000 Kuala Kangsar, Perak, Malaysia.
²Faculty of Pharmacy, University of Cyberjaya, Persiaran Bestari, 63000 Cyberjaya, Selangor, Malaysia.

*Corresponding author:
Shairyzah Ahmad Hisham, PhD, Faculty of Pharmacy, University of Cyberjaya, Persiaran Bestari, 63000 Cyberjaya, Selangor, Malaysia.
E-mail: shairyzah@cyberjaya.edu.my
Phone number: +6013 287 2126
+603 8313 7051

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Background
Heart failure (HF) is a burdening disease which may lead to deterioration of healthcare-related quality of life (HRQoL), increased risk of hospitalisation and mortality. Previous studies have established association between poor disease knowledge among HF patients and poor prognosis. An alternative to traditional patient education which could effectively deliver patient education while maintaining social distancing is needed in a time of crisis such as during current coronavirus disease 2019 (COVID-19) pandemic.

Objective
This study was designed to assess the effectiveness of visual-aided HF patient education program conducted via smartphone messaging application on HF-related disease knowledge, attitude, self-care practice, HRQoL (KAPQ) and medication adherence among HF patients.

Methods
A total of 50 adult HF patients who visited outpatient pharmacy for medication supply at a Malaysia district hospital were recruited. Baseline HF-related disease knowledge, attitude, self-care practice, HRQoL (KAPQ) and medication adherence were assessed using previously developed and validated self-administered questionnaires. The patients then received ten picture messages containing important HF-
related educational information via smartphone messaging application WhatsApp®. KAPQ and medication adherence were reassessed at two weeks post education and compared against baseline scores.

**Results**
Participants were found to have poor HF knowledge, moderate attitude towards the disease, self-care practice, and HRQoL and baseline. However, very high medication adherence was observed. Post-education program assessment found significant improvement in all parameters except for HRQoL.

**Conclusion**
This study has demonstrated that a simple HF patient education program utilising smartphone messaging application WhatsApp® is effective. It is a cheap and practical alternative when face-to-face patient education is not feasible.

**Keywords:** heart failure, patient education, knowledge, attitude, self-care practice, health-related quality of life, medication adherence

1.0 Introduction

Prevalence of heart failure (HF) is increasing globally, and it imposes a heavy burden on healthcare services with its high patient-loads. In Malaysia, the exact disease prevalence is still unknown but an estimated of USD 194 million are reported to be spent annually as direct and indirect costs of managing the disease[1]. Majority of the direct cost can be attributed to frequent hospital re-admissions while indirect cost which resulted from reduction in health-related quality of life (HRQoL) and loss of productivity from morbidity and premature mortality far exceeded the direct medical cost of HF.

Previous studies have established that patient education and systematic self-care management play an important role in improving outcomes among HF patients. Patient education programme incorporating self-care management with recognition of sign and symptoms of HF, daily weighing, dietary restriction and medication adherence have been shown to significantly decrease all-cause and HF-related hospital
admission[2]. Similarly, improvement in disease knowledge have also been shown to be associated with improved self-care behaviour, HRQoL and physical functioning[3,4]. A study also reported that improvement in knowledge and self-care behaviour following HF specific education by multidisciplinary team during accumulated visits at outpatient clinic persisted after nine months[5]. This highlights the need for strategic approaches to improve outcomes among local HF population, particularly through multidisciplinary initiatives. In Malaysia, these approaches include the establishment of HF medication therapy adherence clinics (HF-MTAC) by the Pharmaceutical Services Division, Ministry of Health, Malaysia as part of its ambulatory pharmacy services[6]. HF-MTAC aims at improving patients’ adherence towards medications and general disease management through education that involves close collaboration between pharmacists and medical practitioners.

However, the novel coronavirus disease (COVID-19) which was announced as a global pandemic by World Health Organisation (WHO) in March 2020 has brought a new barrier to the effective delivery of patient education programmes. Reduction in physical contact remains a critical preventive measure against the spread of COVID-19. Hence, innovative methods which incorporated modern communication tools are needed for the continuity of delivering HF patient education while maintaining social distancing. A randomised controlled study conducted in Saudi Arabia has demonstrated that the use of WhatsApp®, a smartphone messaging application for patient education among patients with type II diabetes mellitus could lead to significant improvement in knowledge and self-efficacy [7]. Therefore, this study was conducted to explore the effectiveness of patient education provided by pharmacists via smartphone messaging application on HF-related knowledge, attitude, self-care practice, quality of life (KAPQ) and medication adherence during the COVID-19 pandemic.

2.0 Methods
2.1 Design and setting
This was a prospective cohort study conducted at a district hospital in Perak, Malaysia involving adult (≥18 years) HF patients with documented diagnosis of HF and attended outpatient pharmacy department for medication supply during the study period of 1st June 2020 to 31st July 2020. Participants were recruited through convenient sampling. Participants without access to smartphone messaging application (WhatsApp®), those who had previously attended patient education programmes such as HF-MTAC and those who were pregnant, illiterate, or unable to read and speak in Malay language were excluded from this study.

2.2 Study tools and data collection

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This study utilised Knowledge, Attitude, Practice and Quality of Life of Heart Failure patients (KAPQ-HF) questionnaire and General Medication Adherence Scale (GMAS) to assess participants knowledge, attitude, self-care practice, HRQoL and medication adherence before and after a disease education program conducted via smartphone messaging application[8, 9, 10]. KAPQ-HF is a self-administered questionnaire validated in English and Malay language containing a total of 38 items with a possible minimum score of 0 point and a possible maximum score of 167 points. There were four subsections for assessing the four components of KAPQ using multiple choice and Likert scale questions. Scores for knowledge, attitude and self-care practice are positively related to the corresponding parameters while HRQoL score is inversely correlated to HRQoL status. Meanwhile, GMAS is a validated self-reporting adherence tool toward medication use in chronic illness patients including HF. It was first introduced in Urdu language and later translated and validated in English, Malay and Mandarin. The Malay version was used in this study. Both authors provided consent for the use of the questionnaires in this study.

Sociodemographic data including age, gender, ethnicity, highest education attainment, and gross monthly income were gathered through telephone interviews at the beginning of the study. Although utilised study tools were self-administered questionnaires, data collection in this study was conducted via telephone interviews to suit the study population. Interviewers were provided with adequate training prior to the start of the study to ensure standardisation and minimized bias. Participants’ clinical characteristics such as left ventricular ejection fraction (LVEF) and co-morbidities were obtained by reviewing their medical records. Patient education materials with standardized instructions were sent to participants via smartphone messaging application, WhatsApp®, after baseline assessment of KAPQ and medication adherence were completed. Reassessment of KAPQ and medication adherence were conducted 2 weeks later.

2.3 Patient education
Patient education materials consisted of ten pictures with text and images defining HF, pathophysiology, signs and symptoms, commonly used medications as well as lifestyle and diet modifications recommended for HF patients. The information was retrieved from literature review and particularly from the 2019 Malaysian Clinical Practice Guideline for the Management of HF [11]. Gathered information was then translated to simple pictorial format in Malay language by a team of practising pharmacists who had at least one-year experience in patient counselling.

2.4 Data analysis
Collected data was analyzed using Statistical Package for Social Sciences (SPSS) version 25.0 software. All collected data was coded into variables and normality of numerical variables were checked. Since all numerical data was normality distributed, mean and standard deviation (SD) were used to describe the variables while categorical data was described in frequency and percentages. Pre- and post-education program KAPQ and GMAS scores were compared using paired T-test.

2.5 Ethical consideration
This study was registered to Malaysia National Medical Research Register (NMRR) (NMRR-18-957-40452) and has been approved by Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia. Participants provided informed consent after reviewing patient information sheets.

3.0 Results
3.1 Sociodemographic data & clinical characteristics
A total of 50 participants were recruited into the study and none were lost to follow-up. The mean (SD) age was 66.9 (12.01) years and ranged between 42 to 94 years (Table 1.0). Female participants were almost twice of male participants and majority were Malay. Almost half of the participants did not receive any formal education (48%, n = 24) although a big proportion of the participants (46%, n = 23) had gross monthly income of Malaysian Ringgit (RM) of 2500 or more. The mean (SD) left ventricle ejection fraction (LVEF) was 47.11 (12.48)% and almost half (42%, n = 21) were classified as having HF with preserved ejection fraction (HFpEF) (LVEF >50%). The two most common co-morbidities recorded were hypertension (88%, n = 44) and dyslipidaemia (78%, n = 39).

3.2 Baseline knowledge, attitude, self-care practice, HRQoL and medication adherence
Table 2.0 summarizes the baseline knowledge, attitude, self-care practice, HRQoL and medication adherence of study participants measured as KAPQ and GMAS scores. The mean (SD) knowledge score was 3.80 (2.05) with majority of the participants were found to have poor knowledge on HF and its management (78%, n = 39). Majority had moderate attitude towards HF (70% n = 35) and the mean (SD) attitude score was 25.52 (3.36). This study also found that only 4 participants (8%) had good self-care practice and almost half (46%, n = 23) had poor self-care practice prior to the patient education program. However, majority of the participants had moderate HRQoL (58%, n = 29) and very high adherence to medications (76% , n = 38). The mean (SD) scores for HRQoL and medication adherence were 35.07 (15.00) and 30.46 (2.83) respectively.
3.3 Comparison of knowledge, attitude, self-care practice, HRQoL and medication adherence pre- and post-education programme via smartphone messaging application.

As tabulated in Table 3.0, statistically significant improvement was found between pre- and post-education, with regards to mean knowledge score (mean difference = 2.460, 95% CI 1.982, 2.938; P < 0.001), mean attitude score (mean difference = 1.860, 95% CI 1.157, 2.563; P < 0.001), mean self-care practice score (mean difference = 2.320, 95% CI 1.609, 3.031; P < 0.001), and mean GMAS score (mean difference = 0.800, 95% CI 0.390, 1.210; P < 0.001). However, there was no statistically significant difference found between mean pre- and post-education HRQoL scores (P = 0.699).

4.0 Discussion

Provision of quality patient education programs for HF patients plays a vital role in improving patients’ knowledge towards the disease, thus reducing hospitalisation as well as improving survivability. It becomes more important during pandemic period when medical resources are exhausted. Reducing the presence of HF patients at secondary and tertiary healthcare facilities for acute exacerbations may ease the healthcare burden where allocation of medical beds and oxygen supplied can be reserved for moderate to severe COVID-19 patients.

Majority of the participants in this study was found to have poor knowledge on HF and the mean (SD) score of 3.80 (2.05) was lower compared to mean (SD) of 5.67 (2.03) reported by Ahmad Hisham et al. [12]. The difference in HF-related knowledge may be attributed to differences in study setting where the previous study was conducted in a large referral hospital in the city of Kuala Lumpur with established cardiology services including HF-MTAC. In contrast, this present study was conducted in a 136-bed district hospital serving mostly rural population [13]. The result also corresponded with highest education attained by study participants where a large number did not receive any formal education. Although the baseline attitude towards HF, self-care practice and HRQoL among the study participants were moderate and medication adherence were very high, a big proportion was found to have poor self-care practice. Strategies to tackle this issue must be put in place speedily since the ability to voluntarily execute and maintain daily self-care practices is essential in achieving positive clinical outcomes and HRQoL [14]. Self-care in HF may be complicated and good practices may be difficult to maintain, hence requires a multidimensional, multidisciplinary interventional approaches. Interventions such as patient education should be practical and flexible enough to be individualised according to patients’ needs [15]. Previous
study has also established a weak but statistically significant correlation between knowledge on HF and self-care practice, suggesting that any efforts to improve knowledge can help to improve self-care practice as well [12].

Statistically significant improvements were demonstrated for knowledge, attitude towards HF and its management, self-care practice and medication adherence among the participants study, hence, highly supporting the effectiveness of the education program delivered by pharmacists via smartphone messaging application. A study conducted in Singapore reported that knowledge deficit identified was mainly on therapeutic regimens and HF symptoms/recognition of HF symptoms which was similar in this study at baseline [16]. Therefore, great efforts were made to ensure that the prepared education materials covered these areas as well as on proper self-care practices such as salt and fluid restriction, daily weight monitoring and regular exercise. However, education material in this study did not include any information on a few newer medicationssuch as ivabradine, sacubitril/valsartan and SGLT-2 inhibitors as these agents were not used at the study site.

There was no significant improvement of HRQoL found post-education. Changes in HRQoL post intervention may require more than two weeks to observe. A randomized clinical trial conducted to assess the effect of educational program on HRQoL of HF patient found that ongoing program including one-to-one teaching, counselling sessions and phone calls over 3 months were able to significantly improve the physical, emotional dimensions and total HRQoL [17]. A meta-analysis has also found significant relationship between positive outcomes with follow-up duration of more than 6 months [18]. Therefore, an education program involving longer follow-up period is suggested to observe the benefit in HRQoL.

There were a few limitations identified within this study. This study was not designed as a randomised controlled trial due to small population size. Long-term effects from the intervention were not able to be assessed due to short follow-up period. However, the results gathered can serve as an early indication of the effectiveness of such innovations particularly in settings with limited resources and restricted patient movements due to the on-going pandemic.

5.0 Conclusion
This study demonstrated that visual-aided patient education program conducted via smartphone messaging application can significantly increase HF-related knowledge, attitude, self-care practice and medication adherence especially in patients with moderate to poor baseline KAPQ-HF scores. This simple method offers a viable option as alternative to traditional patient education, particularly when physical contacts are not feasible or desirable.

Acknowledgement

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Funding

None to declare.

Conflict of interest

None to declare.

References


Table 1.0: Sociodemographic and clinical background of participants

<table>
<thead>
<tr>
<th>Sociodemographic Characteristics</th>
<th>Frequency (%)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>N = 50</td>
<td>66.92 (12.01) (Range: 42 - 94)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17 (34)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>33 (66)</td>
<td></td>
</tr>
</tbody>
</table>
Table 2.0: Baseline KAPQ-HF and GMAS scores

<table>
<thead>
<tr>
<th>Clinical Characteristics</th>
<th>Frequency (%) N = 50</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td></td>
<td>3.80 (2.05)</td>
</tr>
<tr>
<td>Good (score 9-11)</td>
<td>1 (2)</td>
<td></td>
</tr>
<tr>
<td>Moderate (score 6-8)</td>
<td>10 (20)</td>
<td></td>
</tr>
<tr>
<td>Poor (score 0-5)</td>
<td>39 (78)</td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>25.52 (3.36)</td>
<td></td>
</tr>
<tr>
<td>Good (score 28-35)</td>
<td>15 (30)</td>
<td></td>
</tr>
<tr>
<td>Moderate (score 18-27)</td>
<td>35 (70)</td>
<td></td>
</tr>
<tr>
<td>Poor (score 7-17)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Self-care practice</td>
<td>11.30 (3.10)</td>
<td></td>
</tr>
<tr>
<td>Good (score 17-21)</td>
<td>4 (8)</td>
<td></td>
</tr>
<tr>
<td>Moderate (score 11-16)</td>
<td>23 (46)</td>
<td></td>
</tr>
<tr>
<td>Poor (score 0-10)</td>
<td>23 (46)</td>
<td></td>
</tr>
<tr>
<td>HRQoL</td>
<td>35.07 (15.00)</td>
<td></td>
</tr>
<tr>
<td>Good (score 0-22)</td>
<td>10 (20)</td>
<td></td>
</tr>
<tr>
<td>Moderate (score 23-43)</td>
<td>29 (58)</td>
<td></td>
</tr>
<tr>
<td>Poor (score 44-100)</td>
<td>11 (22)</td>
<td></td>
</tr>
<tr>
<td>GMAS</td>
<td>30.46 (2.83)</td>
<td></td>
</tr>
<tr>
<td>High (score 30-33)</td>
<td>38 (76)</td>
<td></td>
</tr>
<tr>
<td>Good (score 27-29)</td>
<td>6 (12)</td>
<td></td>
</tr>
<tr>
<td>Partial (score 17-26)</td>
<td>6 (12)</td>
<td></td>
</tr>
</tbody>
</table>

Ethnicity
- Malay: 37 (74)
- Chinese: 6 (12)
- Indian: 7 (14)

Highest Education Attainment
- No formal education: 24 (48)
- Primary school: 8 (16)
- Secondary school: 9 (18)
- Tertiary education: 9 (18)

Gross Monthly Income
- No regular income: 22 (44)
- < RM 2,500: 5 (10)
- ≥ RM 2,500: 23 (46)

Left ventricular ejection fraction (LVEF)
- < 40%: 13 (26)
- 40 – 50%: 10 (20)
- > 50%: 21 (42)
- LVEF not available: 6 (12)

Co-morbidities
- Hypertension: 44 (88)
- Dyslipidaemia: 39 (78)
- Diabetes Mellitus: 24 (48)
- Coronary Artery Disease: 30 (60)
- Chronic Kidney Disease: 6 (12)
Table 3.0: Effect of education program on KAPQ-HF and GMAS scores (N= 50)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-education score Mean (SD)</th>
<th>Post-education score Mean (SD)</th>
<th>Mean difference (95% CI)</th>
<th>P-valuea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>3.80 (2.05)</td>
<td>6.26 (2.60)</td>
<td>-2.460</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-2.938, -1.982)</td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td>25.52 (3.36)</td>
<td>27.38 (3.00)</td>
<td>-1.860</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-2.563, -1.157)</td>
<td></td>
</tr>
<tr>
<td>Self-care practice</td>
<td>11.34 (3.07)</td>
<td>13.66 (3.19)</td>
<td>-2.320</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-3.031, -1.609)</td>
<td></td>
</tr>
<tr>
<td>HRQoL</td>
<td>35.07 (15.00)</td>
<td>35.27 (15.50)</td>
<td>-0.206</td>
<td>0.699</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-1.267, -0.856)</td>
<td></td>
</tr>
<tr>
<td>GMAS</td>
<td>30.46 (2.83)</td>
<td>31.26 (1.88)</td>
<td>-0.800</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-1.210, -0.390)</td>
<td></td>
</tr>
</tbody>
</table>

a Paired T-test
* P-value < 0.05 indicate statistical significance