

A Study to Develop and Evaluate the Effectiveness of a Mobile App: *Samrudheart* on Self-Care Management of a Patient with Heart Failure in Terms of Knowledge, Practice, and Adherence to Treatment among Heart Failure Patients in Safdarjung Hospital, New Delhi

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ABSTRACT

Topic: A study to develop and evaluate the effectiveness of mobile app: *Samrudheart* on self-care management of patient with heart failure in terms of knowledge, practice, and adherence to treatment among heart failure patients in Safdarjung Hospital, New Delhi.

Objectives: The objectives of the study were to develop and evaluate the effectiveness of mobile app: *Samrudheart* on self-care management of patient with heart failure, to assess and evaluate the knowledge, practice, and adherence to the treatment of heart failure patients, to find the relationship between knowledge, practice, and adherence to treatment after the administration of mobile app, on heart failure patients, to find the association between knowledge, practice, and adherence to treatment of heart failure patients after the administration of mobile app on selfcare management of heart failure with selected variables like age, sex, education status, family income, BMI, duration of illness, smoking, tobacco use, alcohol intake, lifestyle, diet, regular follow-up.

Methodology: The research approach was the quasi-experimental approach. The Research design was one group pre-test and post-test control group design. The research setting selected for the study was cardiology OPD of VMMC and Safdarjung Hospital, New Delhi. The sample was comprised of (60) Heart Failure patients attending cardiology OPD. The independent variable in the study was a mobile app: *Samrudheart* and reminder call for adherence to treatment on self-care management of a patient with heart failure and the dependent variable was knowledge, practice, and adherence to treatment on self-care management of heart failure. The tool used for data collection were demographic data of sample characteristics, health determinant data of sample characteristics, structured knowledge questionnaire, structured practice checklist, structured adherence to the treatment rating scale, and structured opinionnaire. The KR-20, inter-observer and Cronbach's alpha formula was used to assess the reliability of tools.

Results: Major findings of the study revealed that initially, the heart failure patients had poor knowledge, practice, and adherence to treatment on self-care management of heart failure. The mobile app was found to be effective in improving the knowledge, practice, and adherence to treatment of heart failure patients. There was no significant association between the knowledge, treatment adherence and not influenced by the selected variables except the practice scores are influenced by the regular follow up.

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Conclusion: Findings revealed that the mobile app: Samrudheart was found to be an effective strategy in improving the knowledge, practice, and adherence to treatment on self-care management of a patient with heart failure.

Keywords: Mobile App, Self-care management, Knowledge, Practice, Adherence, Heart Failure Patients.

INTRODUCTION

Chronic heart failure (HF), a progressive and debilitating disease, is increasing in epidemic proportions and affecting both the developed and the developing world.^[1] Heart failure is associated with shorter life expectancy, increased frequency of hospitalization, and poor quality of life and is a major public health challenge even in India.^[2] Heart failure (HF) is one of the most prevalent cardiovascular diseases in the world which is associated with significant mortality, morbidity, and huge financial burden, particularly among an aging population. Rehospitalization remains a concern in the care of the heart failure patient which is largely associated with delay in symptoms recognition, treatment, diet non-compliance, and also lack of knowledge and skills in heart failure self-care. Guideline on HF emphasizes the importance of self-care in preventing symptoms and hospital readmission.^[3]

HF self-care is defined as assisting the patients to manage their own care at home is a key component of HF management. Mobile health (mHealth) technology is defined as the “use of smartphones, tablets and other mobile devices to deliver health care and preventive health services”^[4]

India was seen to be the capital of diabetes and coronary heart disease in the world. According to current estimates, India will soon have the highest number of heart disease cases in the world.^[5] According to the “Indian Heart Association”, “50% of all heart attacks in Indians occur under 50 years of age and 25% of all heart attacks in Indians occur under 40 years of age.”^[6] Heart disease is increasing in the younger generation with a significant risk in both males and females. More and more

young Indians are suffering from coronary artery disease, owing to their poor lifestyle, and if this continues the future looks even more dangerous.^[7]

The World Health Organization (WHO) defined compliance and adherence as the degree to which a patient’s behavior (such as taking medication, diet, and lifestyle changes) is consistent with the generally agreed therapeutic recommendations. The aims of the treatment for patients with HF include improving their clinical status, exercise capacity, and quality of life, preventing hospitalizations, and a reduction in total mortality. Adequate and current information that will allow them to make decisions about lifestyle changes and proper care of themselves should be provided to patients.^[8]

Mobile technology offers ways to help with these challenges. through mobile health applications, sensors, medical devices, and remote patient monitoring products, there are avenues through which health care delivery can be improved. They enable easy-to-use access to tools like calorie counters, prescription reminders, appointment notices, medical references, and physician or hospital locators. These applications empower patients and health providers proactively to address medical conditions, through near real-time monitoring and treatment, no matter the location of the patient or health provider.^[9]

OBJECTIVES OF THE STUDY

1. To develop and apply a mobile app: Samrudheart on self-care management of a patient with heart failure
2. To assess and evaluate the knowledge of heart failure patients related to self-care management of heart failure before and after the administration of a mobile app: Samrudheart.

3. To assess and evaluate the practice of heart failure patients related to self-care management of heart failure before and after the administration of a mobile app: Samrudheart.
4. To assess and evaluate the adherence to treatment of heart failure patients related to self-care management of heart failure before and after the administration of a mobile app: Samrudheart.
5. To find the relationship between mean post-test knowledge score and mean post-test practice score of heart failure patients about self-care management of heart failure after the administration of a mobile app: Samrudheart.
6. To find the relationship between mean post-test practice score and post-test adherence to treatment a score of heart failure patients regarding self-care management of heart failure after the administration of a mobile app: Samrudheart.
7. To find the relationship between mean post-test knowledge score and mean post-test adherence to treatment score of heart failure patients regarding self-care management of heart failure after the administration of a mobile app: Samrudheart.
8. To find the association between mean post-test knowledge scores of heart failure patients with selected variables.
9. To find out the association between mean post-test practices scores of heart failure patients with selected variables.
10. To find out the association between mean post-test adherences to treatment scores of heart failure patients with selected variables.
11. To determine the acceptability and utility of a mobile app: Samrudheart on self-care management of a patient with heart failure in terms of the opinion of Heart Failure patients.

OPERATIONAL DEFINITION

1. Develop: -In this study, it refers to prepare a mobile app: Samrudheart on self-care management of a patient with heart

failure to improve the knowledge, practice, and adherence to the treatment.

2. Evaluate: - In this study, it refers to the measurement of knowledge, practice, and adherence to the treatment of heart failure patients before and after administration of mobile app: Samrudheart on self-care management of heart failure.

3. Effectiveness: - In this study, effectiveness refers to the significant gain in knowledge, practice and adherence to treatment regarding self-care management of a patient with heart failure after the administration of mobile app: Samrudheart.

4. Knowledge: -In this study, knowledge refers to correct response to the items of structured knowledge questionnaire obtained regarding Self-Care management of Patients with Heart Failure.

Poor knowledge	-	0-7
Fair knowledge	-	8-14
Good knowledge	-	15-22
Very good knowledge	-	23-30

5. Practice: - In this study, practice refers to the expressed practice of a patient regarding the self-care management of a patient with heart failure at home as expressed by their responses to the items of the structured practice checklist.

Poor practices	-	0-10
Fair practices	-	11-20
Good practices	-	21-30

6. Adherence to the treatment: - In this study, adherence to treatment refers to the act to conform the recommendations made by the patients to timing and frequency of medication taking and regular follow-up.

Poor adherence	=	0-10
Fair adherence	=	11-20
Good adherence	=	21-30

7. Mobile app: Samrudheart on self-care management of heart failure: - In this study, A mobile app is based on self-instructional reading material for achieving

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pre-specified objectives; includes the instructional materials necessary for learning the self-care management of heart failure, app contains,

- Mobile app - Providing instruction material on self-care management of heart failure.
- Reminder- In this study, a reminder is mean a call to a patient once a day for 6 days for medication adherence and to follow the instruction of the app.

In this study name of the app is “**Samrudheart Poonam**” **Link on the Google play store- for the android phone user.**<https://play.google.com/store/apps/details?id=codenticer.samrudheart>

8. Self-care management: - In this study self-care management involves an active participation by a patient in his or her own health care decisions and interventions like adherence to medication, following a low-salt diet, limiting alcohol consumption, avoiding tobacco, smoking, alcohol intake and daily monitoring of weight, other signs and symptoms that indicate worsening heart failure.

9. Heart failure: - In this study heart failure mean the patient who is having Ejection fraction of heart less than 40%.

10. Selected variables: - In the present study, it denotes the certain factors that play a vital role in influencing knowledge, practice, and adherence after heart failure. these factors include:

- Age
- Sex
- Education status
- Family income
- BMI
- Duration of Illness
- Smoking
- Tobacco
- Alcohol Intake
- Diet
- Lifestyle

- Regular Follow-up

METHODOLOGY

Research approach- quasi-experimental approach

Research design- pre-test post-test control group design.

Dependent Variable: - knowledge, practice, and adherence to the treatment regarding self-care management of heart failure.

Independent variable: - Mobile app on self-care management of a patient with heart failure.

The extraneous variables: - In this study, the extraneous variables include Age, Sex, Education status, Family income, BMI, Duration of Illness, Smoking, Tobacco, Alcohol, Diet, Life Style, Regular Follow-up

The setting of the study: -Final study was conducted in cardiology OPD of Safdarjung Hospital, New Delhi.

Population: - In this study, the population comprised of the “Heart failure patients” attending cardiology OPD of Safdarjung Hospital, New Delhi”.

Sample: - 60 heart failure patients (30 in experimental group and 30 in the control group)

Sample technique: - Sample was selected by purposive sampling technique and samples were randomly assigned to the 30-heart failure patient to the experimental and 30 heart failure patient control group.

ETHICAL CONSIDERATION

- Ethical permission was taken from the Ethical Committee of Rajkumari Amrit Kaur College of Nursing, New Delhi to conduct the research study.
- The pilot study was conducted to check the feasibility of the study and establish the reliability of the tool in Super Specialty Hospital Janakpuri New Delhi after obtaining permission from medical superintendent of the hospital.
- The final research study was conducted in VMMC and Safdarjung hospital New Delhi after obtaining the initial

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administrative approval from the ethical committee and Medical Superintendent.

Procedure:

- **Tool of the study** - The tools used for the study were a structured knowledge questionnaire, structured practice checklist, Structured adherence to treatment rating scale and a structured opinionnaire, paper and pencil, and observation method were used to administer tool.
- The possible range of scores to be obtained by heart failure patient was from 0-30 for knowledge. The following categories were created for the interpretation of the knowledge scores obtained by heart failure patients. Hence, their scores were interpreted as:
Categorization of knowledge scores:
 - Score between 23-30 = Very good knowledge
 - Score between 15-22 = Good knowledge.
 - Score between 8-14 = Fair knowledge.
 - The score between 0-7 = Poor knowledge.
- The possible range of scores to be obtained by heart failure patient was from 0-30 for practice. The following categories were created for the interpretation of the practice scores obtained by heart failure patient. Hence, their scores were interpreted as:
Categorization of practice scores:
 - The score between 21-30 = Good practices.
 - The score between 11-20 = Fair practices.
 - The score between 0-10 = Poor practices.

SCORING

For positive questions, scoring is done as follows

- Always- (2)
- Sometimes- (1)
- Never- (0)

For negative questions, scoring is done as follows

- Always- (0)
- Sometimes- (1)
- Never- (2)

- The possible range of scores to be obtained by heart failure patient was from 0-30 for treatment adherence. The following categories were created for the interpretation of the adherence to treatment scores obtained by heart failure patients. Hence, their scores were interpreted as:

Categorization of adherence:

- The score between 21-30 = Good adherence
- The score between 11-20 = Fair adherence
- The score between 0-10 = Poor adherence

SCORING

For positive questions, scoring is done as follows

- Strongly agree- (2)
- Agree- (1)
- Disagree - (0)

For negative questions, scoring is done as follows

- Strongly agree- (0)
- Agree- (1)
- Disagree- (2)

• DESCRIPTION OF STRUCTURED OPINIONAIRE

The structured opinionnaire consisted of 10 items. Each item comprised of three responses that are “to a great extent”, “to some extent” and “to very less extent”,

- 21-30 marks = “to a great extent”,
- 11-20 marks = “to some extent”
- 0-10 mark = “to a very little extent”.

- To ensure the content validity of the tools, i.e. structured knowledge questionnaire, observational checklist for practice, adherence to treatment rating scale and opinionnaire was submitted to the 11 experts from the field of nursing and medical. The

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- experts were chosen based on their expertise, experience, qualification, and interest in the problem area.
- The internal consistency method by using Kuder Richardson-20 was used to compute the reliability of the structured knowledge questionnaire (0.78), for the reliability of the structured practice checklist by Cronbach's alpha formula (0.77) for adherence to treatment rating scale by Cronbach's alpha formula (0.79).
- The final data obtained was collected according to research design, the data were organized and interpreted by using both descriptive and inferential statistics according to objectives and hypothesis of the study.

STATISTICAL ANALYSIS

The data obtained would be analyzed using the following plan of analysis: -

- Demographic and health determinant data analysis by using frequencies and percentage
- Mean, Median & Standard deviation of pre-test & post-test knowledge scores.
- Mean, Median & Standard deviation of pre-test & post-test practice scores.
- Mean Median & Standard deviation of pre-test & post-test adherence to treatment scores.
- 't' value to determine the significance of difference between the mean of pre-test & post-test knowledge scores of patients on self-care management of a patient with heart failure.
- 't' value to determine the significance of the difference between the mean of pre-test & post-test practice scores of patients on self-care management of a patient with heart failure.

- 't' value to determine the significance of the difference between the mean of pre-test & post-test adherence to treatment scores of patients on self-care management of a patient with heart failure.
- Coefficient of correlation (r value) to find out the relationship between post-test knowledge and practice scores.
- Coefficient of correlation (r value) to find out the relationship between post-test practice & adherence to treatment scores.
- Coefficient of correlation (r value) to find out the relationship between post-test adherence to treatment & knowledge scores.
- 'chi square' value would be computed to determine any significant association between post-test knowledge & selected variables as age, sex, family income, education status, BMI, duration of heart failure, diet, smoking, tobacco, alcohol, lifestyle, and regular follow-up.
- 'chi square' value would be computed to determine any significant association between post-test practice & selected variables as age, sex, family income, education status, BMI, duration of heart failure, diet, smoking, tobacco, alcohol, lifestyle, and regular follow-up.
- 'chi square' value would be computed to determine any significant association between post-test adherence to treatment & selected variables as age, sex, family income, education status, BMI, duration of heart failure, diet, smoking, tobacco, alcohol, lifestyle, and regular follow-up.

RESULTS

TABLE -1: FREQUENCY AND PERCENTAGE DISTRIBUTION OF DEMOGRAPHIC DATA OF SAMPLE CHARACTERISTIC, N=60

S. NO	PATIENTS CHARACTERISTICS	EXPERIMENTAL GROUP		CONTROL GROUP		TOTAL	
		F	%	F	%	f	%
1.	Gender						
1.1	Male	17	57%	21	70%	38	63%
1.2	Female	13	43%	9	30%	22	37%

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Table 1 Continued...

2.	Age(years)						
2.1	20-30	2	7%	2	6.67%	4	5%
2.2	31-40	4	13%	5	16.67%	9	15%
2.3	41-50	10	33%	8	26.67%	18	30%
2.4	51-60	14	46.6%	15	50.00%	29	50%
3.	Education						
3.1	5 th – 8 th class	9	30%	14	46.67%	23	38%
3.2	9 th -12 th class	14	47%	11	36.67%	25	42%
3.3	Graduation	4	1%	2	6.67%	6	10%
3.4	Post-Graduation and Above	3	10%	3	10.00%	6	10%
4	Family Income in Rs.						
4.1	Below 5000	7	23%	10	33%	17	28%
4.2	5001-10000	4	13%	5	17%	9	15%
4.3	10001-20000	11	37%	8	27%	19	32%
4.4	Above 20000	8	27%	7	23%	15	25%

TABLE- 2: FREQUENCY AND PERCENTAGE DISTRIBUTION OF HEALTH DETERMINANT DATA OF SAMPLE CHARACTERISTIC. N=60

S.NO	PATIENTS CHARACTERISTICS	EXPERIMENTAL GROUP		CONTROL GROUP		Total	
		F	%	F	%S	F	%
1.	BMI						
1.1	Underweight (below 18.5)	2	7%	4	13%	6	10%
1.2	Average weight (18.5to 24.9)	20	67%	20	67%	40	67%
1.3	Overweight (above 24.9)	8	27%	6	20%	14	23%
2.	DURATION OF ILLNESS						
2.1	< 3months	5	17%	3	10%	8	13%
2.2	3-1 year	9	30%	3	10%	12	20%
2.3	1-3 years	7	23%	11	37%	18	30%
2.4	>3 years	9	30%	13	43%	22	37%
3.	Lifestyle						
3.1	Sedentary	18	60%	13	43%	31	52%
3.2	Active	12	40%	17	57%	29	48%
4.	Smoking						
4.1	Yes	16	53%	17	57%	33	55%
4.2	No	14	47%	13	43%	27	45%
5.	Tobacco						
5.1	Yes	11	37%	8	27%	19	32%
5.2	No	19	63%	22	73%	41	68%
6.	Alcohol						
6.1	Yes	13	43%	15	50%	28	47%
6.2	No	17	57%	15	50%	32	53%
7.	Diet						
7.1	Vegetarian	12	40%	6	20%	18	30%
7.2	Non-Vegetarian	15	50%	20	67%	35	58%
7.3	Eggetarian	3	10%	4	13%	7	12%
8.	Follow Up						
8.1	Rarely	4	13%	5	17%	9	15%
8.2	Unscheduled	12	40%	8	27%	20	33%
8.3	In emergency	8	27%	8	27%	16	27%
8.4	Scheduled	6	20%	9	30%	15	25%

TABLE -3: Mean, median, standard deviation of pre-test and post-test knowledge scores on self-care management of a patient with heart failure in experimental and control group.N=60

GROUP	KNOWLEDGE SCORE (30)	SCORE RANGE	MEAN	MEDIAN	STANDARD DEVIATION
Experimental group n=30	Pre-test	11-20	14.1	14	2.26
	Post-test	17-25	21.6	22	1.85
Control group n=30	Pre-test	11-21	14.07	14	2.12
	Post-test	11-21	14.7	14	2.94

TABLE: 4: Mean, mean difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}), and "t" value of the pre-test and post-test knowledge scores of heart failure in a patient of experimental group. n=30

GROUP	KNOWLEDGE SCORE (30)	MEAN	MEAN DIFFERENCE (MD)	SD _d	SE _{MD}	"t" VALUE
Experimental group	Pre-test	14.1	7.5	1.76	0.32	23.38*
	Post-test	21.6				

*t value for df (29) level=1.70, p<0.05=significant at 0.05 level

*t value for df (29) level=2.46, p<0.01=significant at 0.01 level

The data presented in table (4) shows that the mean post-test knowledge scores of the experimental group (21.6) are higher than the mean pre-test knowledge

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scores of the experimental group (14.1) with a mean difference of (7.5). The calculated “t” value (23.38) for df 29 was found to be statistically significant at 0.05 and 0.01 levels of significance. Thus, it is established

that the difference obtained in the mean pre-test and post-test knowledge scores of the experimental group is a true difference and not by chance.

TABLE- 5: Mean, mean difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}), and “t” value of the post-test knowledge scores of heart failure a patient of experimental and control group. N=60

GROUP	KNOWLEDGE SCORES (30)	SCORE RANGE	MEAN	MEAN DIFFERENCE (MD)	SD _d	SE _{MD}	“t” value
Experimental group n=30	Post-test	17-25	21.6	6.9	1.55	0.4	17.01*
Control group n=30	Post-test	11-21	14.7				

*t value for df (58) level=1.67, p<0.05= significance at 0.05 level.

*t value for df (58) level=2.39, p<0.01= significance at 0.01 level.

The data are given in table (5) shows that the mean post-test knowledge scores (21.6) of heart failure patient in the experimental group is higher than the mean post-test knowledge scores of control group (14.7) scores with a mean difference of (6.9). The calculated “t” value (17.01) for df

58 was found to be statistically significant at 0.05 and 0.01 levels of significance. Thus, it is established that the difference obtained in the mean post-test knowledge scores of an experimental and control group is a true difference and not by chance.

TABLE- 6: Mean, a median, standard deviation of pre-test and post-test practice scores on self-care management of heart failure in experimental and control group. N=60

GROUP	PRACTICE SCORE (30)	SCORE RANGE	MEAN	MEDIAN	STANDARD DEVIATION
Experimental group n=30	Pre-test	10-20	15.5	16	2.25
	Post-test	18-26	21.4	21.5	1.99
Control group n=30	Pre-test	11-19	15.1	15	2.50
	Post-test	11-20	15.13	15	2.33

TABLE- 7: Mean, mean difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}), and “t” value of the pre-test and post-test practice scores of heart failure a patient of the experimental group. n=30

GROUP	PRACTICE SCORE (30)	Score range	MEAN	MEAN DIFFERENCE (MD)	S D _d	SE _{MD}	“t” VALUE
Experimental group	PRE-TEST	10-21	15.5	5.93	1.89	0.35	16.8*
	POST-TEST	11-19	21.43				

*t value for df (29) level=1.70, p<0.05=significant at 0.05 level

*t value for df (29) level=2.46, p<0.01=significant at 0.01 level

The data presented in table (7) shows that the mean post-test practice scores of the experimental group (21.43) are higher than the mean pre-test practice scores of the experimental group (15.5) with a mean difference of (5.93). The calculated “t” value (16.8) is more than the table value

for df 29 was found to be statistically significant at 0.05 and 0.01 level of significance. Thus, it is established that the difference obtained in the mean pre-test and post-test practice scores of the experimental group are a true difference and not by chance.

Table – 8: Mean, mean difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}), and “t” value of the post-test practice scores of heart failure a patient of experimental and control group. N=60

GROUP	PRACTICE SCORE (30)	Score range	MEAN	MEAN DIFFERENCE (MD)	SD _d	SE _{MD}	“t” value
Experimental Group n=30	Post-test	18-26	21.43	6.27	0.86	0.22	28.33*
Control group n=30	Post-test	11-20	15.13				

*t value for df (58) level=1.67, p<0.05= significance at 0.05 level.

*t value for df (58) level=2.39, p<0.01= significance at 0.01 level.

The data are given in table (8) shows that the mean post-test practice scores

(21.43) of heart failure patient in the experimental group is higher than the mean

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post-test practice scores of the control group (15.13) scores with a mean difference of (6.27). The calculated “t” value (28.33) for df 58 was found to be statistically significant at 0.05 and 0.01 levels of

significance. Thus, it is established that the difference obtained in the mean post-test practice scores of experimental group and control group is a true difference and not by chance.

TABLE – 9: MEAN, MEDIAN, STANDARD DEVIATION OF PRE-TEST AND POST-TEST ADHERENCE TO TREATMENT SCORES ON SELF-CARE MANAGEMENT OF A PATIENT WITH HEART FAILURE IN EXPERIMENTAL AND CONTROL GROUP. N=60

GROUP	ADHERENCE SCORE (30)	SCORING RANGE	MEAN	MEDIAN	STANDARD DEVIATION
Experimental group n=30	Pre-test	12-19	15	15	2.13
	Post-test	20-26	22.9	23	1.8
Control group n=30	Pre-test	12-19	14.87	14	2.15
	Post-test	12-22	16.4	16	2.3

TABLE: - 10: Mean, mean difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}) and “t” value of the pre-test and post-test adherence scores of heart failure in a patient of experimental group. n=30

GROUP	ADHERENCE SCORE	Score range	MEAN	Mean difference (MD)	SD _d	SE _{MD}	“t” VALUE
Experimental group (n=30)	PRE-TEST	12-19	15	7.9	2.02	0.37	28.4*
	POST-TEST	20-26	22.9				

*t value for df (29) level=1.70, p<0.05=significant at 0.05 level
*t value for df (29) level=2.46, p<0.01=significant at 0.01 level

The data presented in table (10) shows that the mean post-test adherence to treatment scores of the experimental group (22.9) is higher than the mean pre-test adherence to treatment scores of the experimental group (15) with a mean difference of (7.9). The calculated “t” value (28.9) is more than the table value for df 29

was found to be statistically significant at 0.05 and 0.01 level of significance as well. Thus, it is established that the difference obtained in the mean pre-test and post-test adherence to treatment scores of the experimental group is a true difference and not by chance.

TABLE – 11: Mean, a median difference (MD), standard deviation difference (SD_d), standard error of mean difference (SE_{MD}), and “t” value of the post-test adherence to treatment scores of heart failure a patient of the experimental and control group. N=60

GROUP	ADHERENCE SCORE	Score range	MEAN	Mean difference (MD)	SD _d	SE _{MD}	“t” value
Experimental Group, n= 30	Post-test	20-26	22.9	6.5	1	0.26	25.08*
Control group n= 30	Post-test	12-22	16.4				

*t value for df (58) level=1.67, p<0.05= significant at 0.05 level.
*t value for df (58) level=2.39, p<0.01= significant at 0.01 level.

The data are given in table (11) shows that the mean post-test adherence to treatment scores (22.9) of heart failure a patient in the experimental group is higher than the mean post-test adherence to treatment scores of the control group (15.13) scores with a mean difference of (6.27). The calculated “t” value (25.08) is

more than the table value for df 58 was found to be statistically significant at 0.05 and 0.01 level of significance as well. Thus, it is established that the difference obtained in the mean post-test adherence to treatment scores of the experimental group and a control group is a true difference and not by chance.

TABLE- 12: Karl Pearson coefficient of correlation between post-test knowledge scores and post-test practice scores of adolescent scores of a patient with heart failure of the experimental group. n=30

Group	Variables	Mean	SD	“r” value
Experimental group	Knowledge scores	21.63	1.89	0.99*
	Practice scores	21.43	1.75	

*r value for df (28) “r” = 0.296, significant at 0.05 level.
*r value for df (28) “r” = 0.409, significant at 0.01 level.

TABLE- 13: Karl Pearson coefficient of correlation between post-test practice scores and post-test adherence to treatment scores of adolescent scores of a patient with heart failure of the experimental group. n=30

Group	Variables	Mean	SD	“r” value
Experimental group	Practice scores	21.43	1.81	0.98*
	Adherence to treatment scores	22.9	1.75	

*r value for df (28) “r” = 0.296, significant at 0.05 level.
*r value for df (28) “r” = 0.409, significant at 0.01 level.

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TABLE- 14: Karl Pearson coefficient of correlation between post-test knowledge scores and post-test adherence scores of a patient with heart failure of experimental group. n=30

Group	Variables	Mean	SD	"r" value
Experimental group	Knowledge scores	21.6	1.89	0.98*
	Adherence to treatment scores	22.9	1.81	

*r value for df (28) "r" = 0.296, significant at 0.05 level.

*r value for df (28) "r" = 0.409, significant at 0.01 level.

TABLE- 15: CHI-SQUARE VALUE SHOWING ASSOCIATION BETWEEN POST-TEST KNOWLEDGE SCORES WITH SELECTED VARIABLES OF HEART FAILURE A PATIENT OF EXPERIMENTAL GROUP. n=30

S.no	Sample characteristics	Knowledge scores		chi-square		df	Significant/Not significant
		Below median(f)	Above median(f)	Computed value	Table value		
1	Age			4.630	7.81	3	Not significant
	20-30	1	1				
	31-40	2	2				
	41-50	2	8				
	51-60	9	5				
2	Sex			0.4751	3.84	1	Not significant
	Male	7	10				
	Female	7	6				
3	BMI			1	5.99	2	Not significant
	Underweight	2	1				
	Average weight	7	12				
	Overweight	5	3				
4	Family income			4.630	7.81	3	Not significant
	< 5000	4	3				
	Between 5001-10000	3	1				
	Between 10001-20000	5	6				
	> 20001	2	6				
5	Educational status			1.604	7.81	3	Not significant
	5th-8th pass	5	4				
	9th-12th pass	6	8				
	Graduates	1	3				
	Postgraduates	2	1				
6	Lifestyle factors			0.0893	3.84	1	Not significant
	Sedentary	8	10				
	Active	6	6				
7	Smoking			0.1531	3.84	1	Not significant
	Yes	8	8				
	No	6	8				
8	Tobacco			0.0893	3.84	1	Not significant
	Yes	6	6				
	No	8	10				
9	Alcohol			1.4286	3.84	1	Not significant
	Yes	4	8				
	No	10	8				
10	Diet			3.2204	5.99	2	Not significant
	Vegetarian	3	8				
	Non-vegetarian	8	7				
	Eggetarian	3	1				
11	Duration of illness			2.4745	7.81	3	Not significant
	< 3 month	2	3				
	3 month-1 year	4	5				
	1-3 year	2	5				
	> 3 years	6	3				
12	Regular follow up			3.7013	7.81	3	Not significant
	a Rarely	1	4				
	unscheduled		7				
	c In emergency	6	3				
	Regular	3	2				

This shows that there is no significant association between the post-test knowledge scores of heart failure patient in the experimental group and selected variables

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TABLE- 16: Chi-square value showing the association between post-test practice scores with selected variables of heart failure a patient of the experimental group. n=30

S.no	Sample characteristics	Practice scores		chi-square		df	Significant/ Not Significant
		Below median (f)	Above median (f)	Computed value	Table value		
1	Age			0.69	7.81	3	Not significant
	20-30	1	1				
	31-40	2	2				
	41-50	4	6				
	51-60	8	6				
2	Sex			1.22	3.84	1	Not significant
	Male	10	7				
	Female	5	8				
3	BMI			0.89	5.99	2	Not significant
	Underweight	2	1				
	Average weight	10	9				
	Overweight	3	5				
4	Family income			1.46	7.81	2	Not significant
	< 5000	3	4				
	Between 5001-10000	2	2				
	Between 10001-20000	7	4				
	> 20001	3	5				
5	Educational status			1.73	7.81	3	Not significant
	5th-8th pass	5	4				
	9th-12th pass	6	8				
	Graduates	3	1				
	Postgraduates	1	2				
6	Lifestyle factors			0	3.84	1	Not significant
	Sedentary	9	9				
	Active	6	6				
7	Smoking			0.54	3.84	1	Not significant
	Yes	9	7				
	No	6	8				
8	Tobacco			0.55	3.84	1	Not significant
	Yes	5	7				
	No	10	8				
9	Alcohol			0	3.84	1	Not significant
	Yes	6	6				
	No	9	9				
10	Diet			1.42	5.99	2	Not significant
	Vegetarian	7	4				
	Non-veg	6	9				
	Eggetarian	2	2				
11	Duration of illness			1.45	7.81	3	Not significant
	< 3 months	3	2				
	3 month-1 year	5	4				
	1-3 year	4	3				
	> 3 years	3	6				
12	Regular follow up			8.26	7.81	3	Significant
	Rarely	4	1				
	unscheduled	7	4				
	In-emergency	1	8				
	Regular	3	2				

This shows that there is no significant association between the post-test practice scores of heart failure patients in the experimental group and selected variables except regular follow-up.

TABLE- 17: Chi-square value showing the association between post-test adherence to treatment scores with selected variables of heart failure a patient of experimental group. n=30

S.no	Sample characteristics	Adherence score		chi-square	TABLE VALUE	df	Significant/ Not Significant
		Below median(f)	Above median(f)				
1	Age			1.56	7.81	3	Not Significant
	20-30	1	1				
	31-40	1	3				
	41-50	6	4				
	51-60	6	8				
2	Sex			0.002	3.84	1	Not Significant
	Male	8	9				
	Female	6	7				

Table: 17: Continued ...

3	BMI			0.25	5.99	2	Not Significant
	Underweight	1	2				
	Average weight	9	10				
	Overweight	4	4				
4	Family income			0.10	5.99	2	Not Significant
	Below 5000	3	0				
	Between 5001-10000	1	3				
	Between 10001-20000	1	2				
	Above 20001						
5	Educational status			0.31	7.81	3	Not Significant
	5th-8th pass	4	5				
	9th-12th pass	7	7				
	Graduates	2	2				
	Postgraduates	1	2				
6	Lifestyle factors			1.09	3.84	1	Not Significant
	Sedentary	7	11				
	Active	7	5				
7	Smoking			0.15	3.84	1	Not Significant
	Yes	8	8				
	No	6	8				
8	Tobacco			0.20	3.84	1	Not Significant
	Yes	5	7				
	No	9	9				
9	Alcohol			0.20	3.84	1	Not Significant
	Yes	5	7				
	No	9	9				
10	Diet			1.03	5.99	2	Not Significant
	Vegetarian	6	5				
	Non-vegetarian	7	8				
	Eggetarian	1	3				
11	Duration of illness			1.72	7.81	3	Not Significant
	Less than 3 months	2	3				
	3 month-1 year	4	5				
	1-3 year	2	5				
	More than 3 years	6	3				
12	Regular follow up			2.08	7.81	3	Not Significant
	Rarely	3	2				
	Unscheduled	6	5				
	In emergency	4	5				
	Scheduled	1	4				

This shows that there is no significant association between the post-test adherence to treatment scores of heart failure patients in the experimental group and selected variables

Mean percentage distribution of acceptability of mobile app.

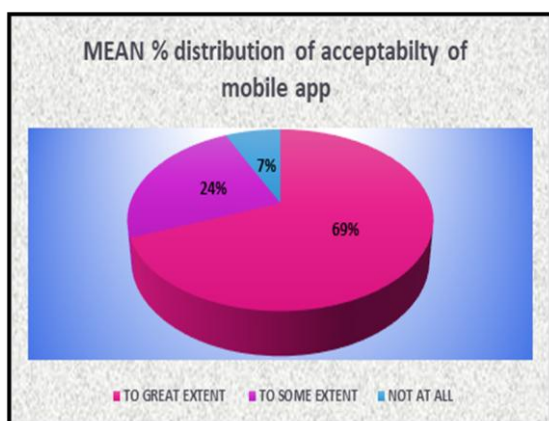


Figure: 1 - Pie diagram showing mean% of acceptability and utility response on the structured opinionnaire.

DISCUSSION

- Major findings of the study were, the maximum number of patients were male (63%), (50%) in the age group [50-60 yrs.] of having the sedentary life style (52%), the education status (47%) was 10-12th pass, (67%) were having average BMI and most of the heart failure patients were (58%) non-vegetarian.
- The present study showed that the mobile app: Samrudheart was found to be an effective strategy in improving the knowledge, practice, and adherence to treatment of heart failure patients.
- The present study showed that the mean post-test knowledge score (21.6) of the patient get increase after the administration of mobile app. Similar findings were revealed by the study⁽¹¹⁾ which showed that the patients have deficit knowledge regarding self-

- care management of heart failure but after the discharge teaching it increases.
- The present study showed that the mean post-test practice score (21.43) of the patient get increase after the administration of mobile app. The similar findings were revealed by the study⁽¹²⁾ which showed that the patients have deficit practice regarding self-care management of heart failure but after the discharge teaching, it increases.
 - The present study showed that the mean post-test adherence to treatment scores (22.9) of the patient get increase after the administration of the mobile app. The study⁽¹³⁾ done in India shows that the people have inadequate adherence to treatment regarding self-care management of heart failure and there should gave regular follow-up and adherence to treatment to improve the self-care management of heart failure and decrease the comorbidity.
 - The findings of this study confirm with the study⁽¹⁴⁾ which showed that the use of the mobile app was found to be an effective strategy in increasing the knowledge, practice, and adherence to treatment of the heart failure patients regarding self-care management.
 - The findings of this study confirm with the study⁽¹⁵⁾ which showed that the use of reminder call or telemonitoring was found to be an effective strategy in increasing the knowledge, practice, and adherence to treatment of heart failure patients regarding self-care management.
 - There was a significant positive correlation between knowledge and practice scores (0.99), practice and adherence to treatment scores (0.98) and adherence to treatment and knowledge scores (0.98) of heart failure patients in the experimental group.
 - There was no significant association between the post-test knowledge scores of heart failure patient in the experimental group and selected variables.
 - There was no significant association between the post-test practice scores of heart failure patients in the experimental group and selected variables except for the regular follow-up.
 - There was no significant association between the post-test adherence to treatment scores of heart failure a patient in the experimental group and selected variables. This shows that the knowledge, adherence to treatment is independent on its own, and not influenced by the selected variables except the practice scores are influenced by the regular follow-up.
 - The acceptability and utility score of the mobile app: Samrudheart was close to the maximum scores. This indicates good acceptability and usability of the guideline by the heart failure patients.

Limitations of the Study

- 1) The study is confined to a small number of patients, i.e. 30 in the experimental and 30 in the control group which limits the generalization of findings only to the study sample.
- 2) The study was confined to a selected hospital i.e. cardiology OPD of Safdarjung hospital of Delhi because of the limited time framework for data collection, limiting the generalization of the findings only to the study sample.
- 3) The tool is valid and applicable only to literate and android phone user population.
- 4) Information given in the mobile app was only in Hindi language.

CONCLUSION

- The presented study identified that there was deficient knowledge, practice and adherence to treatment in heart failure patients.
- Education was necessary for improving the knowledge, practice, and adherence to treatment of the heart failure patients on self-care management of heart failure.

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- The mobile app was effective to increase the knowledge of the patient on self-care management of heart failure.
- A mobile app was effective to increase the practice of the patient on self-care management of heart failure.
- A mobile app was effective to increase the adherence to treatment of the patient on self-care management of heart failure.

IMPLICATIONS

NURSING PRACTICE- This study shows the strong need to prepare self-instructional mobile app for the heart failure patient on self-care management of the patient with heart failure in promoting and reinforcing positive health behaviours.

NURSING EDUCATION- this study shows great attention towards the skill attainment in telemedicine, telehealth, compliance to treatment by regular monitoring by reminders and phone calls, providing the health education with the help of the mobile app and phone calls at the basic level of education in nursing.

NURSING ADMINISTRATION- The nursing administration department should provide an opportunity to the clinical nurse to adopt a program like a mobile app on self-instructional module for early detection and management of complication of heart failure to improve the quality of care of patients and to decrease the unnecessary burden to the hospital on unscheduled hospitalization. The nurse the administration should give suggestions to the hospital administrators on more and more adoption of these types of mobile apps for close monitoring of patient's condition like early detection of complication, self-care management of heart failure, regular follow-up, adherence to treatment closely, preventions of defaulters, and decreasing the unscheduled hospital admission.

NURSING RESEARCH- There is a need to promote a research-based practice and the use of evaluation methods to the major outcome and document the quality and cost-effective care as for nursing moves towards

an independent professional practice mode. Emphasis should also be laid on the publication of findings of research in the journals to disseminate the research-based evidence for nurse practitioners. It also can be presented at various nursing forums so that a greater number of nurses become aware of the importance of the use of mobile apps in various disease conditions.

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