SHORT ARTICLE

Acceptance and feasibility for handheld Tele-ECG

Shubha Davalagi[1], Balu Palicheralu [2], Sanjana Murthy[3], Manisha Kashyup[4]

[1]Assistant Professor, Department of Community Medicine, Jagadguru Jayadeva Murugarajendra Medical College (JJMMC), Davangere, Karnataka – 577004; [2]Professor & Head, Department of Community Medicine, Jagadguru Jayadeva Murugarajendra Medical College (JJMMC), Davangere, Karnataka – 577004; [3]Post-graduate, Department of Community Medicine, Jagadguru Jayadeva Murugarajendra Medical College (JJMMC), Davangere, Karnataka – 577004; [4]Post-graduate, Department of Community Medicine, Jagadguru Jayadeva Murugarajendra Medical College (JJMMC), Davangere, Karnataka – 577004

Abstract	Introduction	Methodology	Results	Conclusion	References	Citation	Tables / Figures

Corresponding Author

Dr Shubha Davalagi, Assistant Professor, Department of Community Medicine, Jagadguru Jayadeva Murugarajendra Medical College (JJMMC), Davangere, Karnataka – 577004
E Mail ID: shubhadavalgi@gmail.com

Citation

Davalagi S, Palicheralu B, Murthy S, Kashyup M. Acceptance and feasibility for handheld Tele-ECG, India. Indian J Comm Health. 2020;32(3):586-589.

Source of Funding: Nil **Conflict of Interest:** None declared

Article Cycle

Received: 16/06/2020; **Revision:** 04/07/2020; **Accepted:** 12/08/2020; **Published:** 30/09/2020

Abstract

Background: In a developing country like India where mobile phone usage is increasing at an exponential rate, tele monitoring techniques could be used to reduce cardiac related morbidity and mortality. The current study was undertaken to evaluate the acceptance and feasibility of handheld tele-ECG for screening general population for cardiac related abnormalities. **Methods**: The study was conducted among walk-in patients and their attenders of an urban health training centre attached a tertiary care teaching hospital for a period of 6 months in 2019. **Results**: Among the 410 respondents, majority were of age group 30-39yrs (54%) and females (62%). Left ventricular hypertrophy (15.4%) was the commonest abnormality. Majority (97.5%) were very satisfied with the hand held Tele-ECG instrument. **Conclusion**: Telecardiology has a potential to revolutionize the healthcare system particularly in resource poor rural and urban slum settings in bridging the gap between primary and secondary care.

Keywords

Acceptance; Feasibility; Tele-ECG; Urban Slum

Introduction

Cardiovascular diseases (CVDs) are estimated to be the commonest cause of death as well as disability in India by 2030 by the World Health Report 2017. (1) The dietary transformation due to rapid economic growth and urbanization has resulted in epidemiological transition leading to increase prevalence of CVD risk factors in Indian population.(2)

25% of deaths in India are attributable to CVDs and among them >80% are due to ischemic heart disease and stroke. Studies show that in India CVDs affect comparatively younger generation who are in the most productive years of their life compared to developed countries resulting also in catastrophic consequences both economic & social to the community and the country itself. Early diagnosis and treatment are crucial to ensure sustainable medical treatment and improved survival rates.(3)

Electrocardiography (ECG) is a useful tool in the diagnosis and management of several cardiac conditions, and it is commonly used in primary care settings. Telecardiology has been in use in one or another form for over a century, and has multiple applications.(4)

Telemedicine serves as a promising cost-effective alternative in light of the fact that an early, tailored intervention has been shown to prevent deaths and improve functional recovery.(4,) Telemonitoring is a medical practice that involves remotely monitoring patients who are not at the same location as the health care provider. The present study was conducted to assess the acceptance for handheld tele-ECG and to evaluate feasibility of using tele-ECG as a screening device among urban slum population accessing the urban health training centre linked to tertiary care teaching hospital to provide remote care.

Aims & Objectives

1. To evaluate acceptance for handheld tele-ECG among urban slum population
2. To assess the feasibility of using handheld tele-ECG among urban slum population

Material & Methods

A hospital based study was carried out in urban health training centre (UHTC) of a tertiary care teaching hospital catering to 40,000 urban slum population. The UHTC runs a multi-specialty OPD seven days a week and functions as both primary care centre & also as a referral hospital for nearby private health practitioners & govt. urban health care centres. Study was conducted for a period of 06 months from June 1st to November 31st 2019. Sample size calculated was 370 with 95% confidence interval and 50% anticipated acceptance among given population using OpenEpi Software. Study population were adults aged ≥ 30 years accessing the outpatient departments of the UHTC. Ethical approval was taken from institutional ethical committee and informed written consent was taken from study participants before the data was collected.

Procedure o tele-ECG: The tele-ECG system consist of a portable electrocardiograph connected to an Android mobile phone (Android/IOS) via Bluetooth(5). The handheld tele-ECG is a low cost, portable, and compact screening tool. It provides acquisition, processing, storing, and visualization of ECG and also allows transfer of ECG data. The participants will be subjected to tele ECG. The handheld tele-ECG records the ECG and the same will be displayed on the mobile screen. The whole procedure takes approximately 5 minutes. After complete recording, the ECG will be sent to the physician's mobile through WhatsApp for his expert opinion. A copy of the ECG was also given to the respondent for future consultations. Consultant opinion was taken to analyze the ECG.

Also a pretested semi structured questionnaire using Google form was used to collect data regarding the study participants' demographic and socio-economic details, their acceptance & satisfaction towards using handheld tele ECG.

Data was entered in Microsoft Excel 2016 & analyzed using SPSS v16.0 Data was presented using descriptive statistics and presented in appropriate tables and figures wherever necessary.

Results

A total of 410 adults were interviewed for the study including 256 females & 154 males. Majority were in age group 30-39yr (61%) and mean age of study population was 36.2±3.2yrs. Among the study participants' females were in majority (62%) and belonging to Hindu religion (71%). Mean years of schooling was 5.3±0.6 years. For socioeconomic status, modified BG Prasad classification updated for April 2019 was used (Reference). (Table 1). Among the study populace, majority were obese with mean BMI of 31.11 ± 5.13 Kg/m(2). Also 48.6% of them had either Diabetes mellitus or Hypertension or both. Among the study participants' majority (67%) had a family history of diabetes mellitus/hypertension/both.

ECG was reported as normal in 77% of respondents. Some of the abnormalities noted in the remaining individuals (Table 2) were left ventricular hypertrophy (15.4%) followed by sinus tachycardia (3.2%), sinus bradycardia (2.7%) and old myocardial infarction (1.5%). ECG findings matched with the history of the respondents.

The study participants found with abnormal readings were referred to tertiary care teaching hospital for further evaluation & management which included monitoring of the same individuals with a standard 12 lead ECG machine. Outcomes were found to be similar in both handheld tele-ECG and standard ECG thus emphasizing the reliability and accuracy of handheld tele-ECG. Individualized treatment was prescribed for them accordingly.

Majority (97.5%) found it convenient to undergo tele ECG compared to conventional ECG. All the respondents felt comfortable while undergoing tele ECG.

Discussion

Telemonitoring improves the health care delivery in resource poor communities by facilitating access to diagnostic tests.(6,7) The study highlights the convenience, sustainability and reliability of using tele-ECG for monitoring and screening cardiac abnormalities. This could be a boon in primary care settings.(8) The present study demonstrates the applicability of a remote care model that ensures improved availability of health care resources to populations residing in distant areas. The handheld tele-ECG used in the present study is an indigenous design that shows immense potential in replacing conventional ECG, especially for screening purposes. This is in light of the fact that the pilot study showed 95% correlation between tele-ECG and conventional ECG.

In our study, we were able to record majority of good quality ECG (83%) including the rate, rhythm, axis, intervals, P wave, QRS complex, ST segment, and T wave changes and it was similar to another study conducted in rural North India (9) We didn't experience any technical problems in transmission of ECGs which was similar other studies. (9,10)

Tele cardiology could be used for community based screening in rural or urban slum populations for a variety of cardiac abnormalities and thus improving early detection and improving prognosis in turn reducing the out-of-pocket expenditure and enhancing the quality of life.

Overall acceptance for tele-monitoring services worldwide was very good, which was in accordance with our study (97% satisfaction). Moreover, other studies conducted in community based settings(9,10) reported 76% & 70% consistently similar findings compared to standard ECG device, which is similar to 77% in our study.

This tele monitoring model could also be used for self-monitoring among individuals living with cardiac abnormalities thus reducing the overall workload on hospitals.

This process also has some hurdles to be overcome like physician acceptance, privacy of data, subjective differences in interpretation of ECG, false negative results to name a few to combat these limitations, role of artificial intelligence (AI) in interpreting the ECG has also been explored in some parts of the world.

Conclusion

Tele-ECG was fairly accepted among our study participants & majority of them said they would recommend their friends & family to undergo tele ECG. It is safe to conclude that tele-ECG as a portable, cost-effective, and convenient tool for diagnosis and monitoring of cardiac conditions is an excellent option for resource poor settings. It can be used to improve quality and accessibility, especially in rural and/or urban slum areas.

Recommendation

Telemedicine can reduce the pressure on tertiary care centres, which are limited in number, and improve the access of specialists to patients in isolated or remote areas. Telecardiology through early, tailored interventions could be extremely cost-effective in terms of life-saving and functional recovery and has an added advantage for the patient in reducing the cost of frequent travel to secondary/tertiary care centres. In addition, general practitioners gain educationally and burden on tertiary care centres could also be reduced in turn can focus on more serious patients.

Limitation of the study

Opinion of physicians regarding advantages / disadvantages of tele-ECG was not part of the study even though they are the important part of the tele monitoring system.

Relevance of the study

Strength of our study is that we have demonstrated the acceptance of urban slum population for handheld tele-ECG and its feasibility in its usage in primary care setting and in-turn its usage a portable solution for remote clinics.

Authors Contribution

All authors have contributed equally.

Acknowledgement

Authors would like to acknowledge the support of all the participants who were part of the study and staff of urban health training centre for their help in conducting the study. Authors also thank faculty of Dept. of Medicine, Principal & Director (Administration), JJM Medical College for the support during the study.

References

1. Reducing Risks, Promoting Healthy Life, World Health Organization, Geneva, Switzerland, 2017, http://www.who.int/whr/2017/en/whr17 en.pdf.

2. India State-Level Disease Burden Initiative CVD Collaborators. The changing patterns of cardiovascular diseases and their risk factors in the states of India: The Global Burden of Disease Study 1990–2016. Lancet Glob Health. 2018;6: e1339–e1351. DOI: https://doi.org/10.1016/S2214-109X(18)30407-8
3. Backman W, Bendel D, Rakhit R. The telecardiology revolution: improving themanagement of cardiac disease in primary care. J R Soc Med. 2010Nov;103(11):442-6. doi: 10.1258/jrsm.2010.100301. Epub 2010 Oct 19. PMID:20959351; PMCID: PMC2966883.[PubMed].
4. Scalvini S, Glisenti F. Centenary of tele-electrocardiography andtelephonocardiography - where are we today? J Telemed Telecare.2005;11(7):325-30. doi: 10.1258/135763305774472051. PMID: 16238832.[PubMed]
5. SanketLife-ECG Device for all. Agasta Software pvt. Ltd. Available at URL: https://www.agatsa.com/sanketlife/ Accessed on 03/02/2020
6. Mant J, Fitzmaurice DA, Hobbs FD, Jowett S, Murray ET, Holder R, Davies M,Lip GY. Accuracy of diagnosing atrial fibrillation on electrocardiogram byprimary care practitioners and interpretative diagnostic software: analysis ofdata from screening for atrial fibrillation in the elderly (SAFE) trial. BMJ.2007 Aug 25;335(7616):380. doi: 10.1136/bmj.39227.551713.AE. Epub 2007 Jun 29.PMID: 17604299; PMCID: PMC1952490.[PubMed]
7. Shetty R, Samant J, Nayak K, Maiya M, Reddy S. Feasibility of TelecardiologySolution to Connect Rural Health Clinics to a Teaching Hospital. Indian JCommunity Med. 2017 Jul-Sep;42(3):170-173. doi: 10.4103/ijcm.IJCM_368_16. PMID:28852283; PMCID: PMC5561697.[PubMed].
8. Shetty R, Samant J, Nayak K, Maiya M, Reddy S. Feasibility of TelecardiologySolution to Connect Rural Health Clinics to a Teaching Hospital. Indian JCommunity Med. 2017 Jul-Sep;42(3):170-173. doi: 10.4103/ijcm.IJCM_368_16. PMID:28852283; PMCID: PMC5561697.[PubMed].
9. Molinari G, Reboa G, Frascio M, Leoncini M, Rolandi A, Balzan C, Barsotti A.The role of telecardiology in supporting the decision-making process of generalpractitioners during the management of patients with suspected cardiac events. JTelemed Telecare. 2002;8(2):97-101. doi: 10.1258/1357633021937541. PMID:11972944.[PubMed].
10. Oliveira MT Jr, Paula LJ, Marcolino MS, Canesin MF. Executive summary -guideline on telecardiology in the care of patients with acute coronary syndromeand other cardiac diseases. Arq Bras Cardiol. 2015 Aug;105(2):105-11. doi:10.5935/abc.20150104. PMID: 26352177; PMCID: PMC4559118.[PubMed]

Tables

TABLE 1 SOCIODEMOGRAPHIC & PROFILE OF STUDY PARTICIPANTS

Sl. No.	Characteristics	Characteristics	Number (%) (n=410)
1	Age (years)	30-39 40-49 50-59 60-69 ≥ 70	221(54) 86(21) 37(09) 29(07) 37(09)
2	Gender	Female Male	256(62) 154(38)
3	Religion	Hindu Muslim	290(71) 120(29)
4	Education	Literate Illiterate	326(79.5) 84 (20.5)
5	Occupation	Working Retired/Housewives	279 (68) 131 (32)
6	Socio-economic status (As per modified BG Prasad classification)	Class IV Class V	319 (78) 91 (32)
7	Marital status	Married Single	389 (95) 21 (5)

TABLE 2 INTERPRETATION OF FINDINGS USING HANDHELD TELE-ECG

Sl. No.	Diagnosis on ECG	N (%)
1	Normal/No changes observed	317 (77.3)
2	Old myocardial infarction	6 (1.5)
3	Left ventricular hypertrophy	63 (15.4)
4	Sinus bradycardia	11 (2.7)
5	Sinus tachycardia	13 (3.2)