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DEVELOPMENT OF THE MOBILE APPLICATION FOR DIGITAL LITERACY IN SOCIOLOGICAL FACTORS RESPONSIBLE FOR CARDIOVASCULAR RISKS.

BY

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Abstract

Objective: Develop a mobile healthcare app targeting sociological risk factors for cardiovascular health to improve awareness and information delivery digitally.

Method: Conduct a six-month prospective qualitative study at a Pune Municipal Corporation (PMC) community site, involving 100 participants aged 18-70 with adequate spatial ability. Exclusions: critically ill and mentally unstable individuals. Approval obtained from Modern College of Pharmacy Nigdi, Pune. The app is available in English, Marathi, and Hindi, with verification forms aligned with the chosen language.

Findings: Positive feedback from diverse users, including housewives, IT professionals, doctors, students, and medical experts. 55% praised the visually appealing interface and icon design, while 53% appreciated user-friendly navigation. 29% found it unnecessarily complex. 47% acknowledged educational value, 44% expressed likelihood to recommend it, and 47% plan to continue usage. The average star rating is 48%. The app effectively enhances sociological awareness, knowledge, and influences social behaviour for 42%, 44%, and 41% of respondents, respectively, across diverse demographics.

KEYWORDS: Cardiovascular disease, Community awareness, Mobile application, Sociological factors, Spatially abled

1. INTRODUCTION

Smartphones, integral personal devices with user-friendly systems like Android and iOS, have spurred market growth, especially in healthcare. Healthcare mobile apps leverage smartphone capabilities for improved patient care. A study, inclusive of spatially abled individuals, analysed MHealth app impact through a questionnaire. [1] Effective care programs for high-needs, high-cost patients emphasize chronic disease self-management, fostering patient engagement. This approach correlates with enhanced quality of life, independence, and reduced hospitalization. Mobile health applications, or smartphone apps, serve as vital tools in empowering high-need, high-cost patients for self-health management [1] (Figure No.1).

Non-communicable diseases (NCDs) constitute a substantial burden, causing two-thirds of global deaths and significant health and financial risks. In India, cardiovascular disease (CVD) is the leading cause of mortality, accounting for 28% of deaths, with high blood pressure affecting one in four and elevated blood sugar one in nine individuals over 18.[4] Behavioural risk factors for CVD, prevalent in India, include lack of exercise, tobacco use, and excessive alcohol consumption, often observed in obese, diabetic, and hypertensive individuals [2]. Cardiovascular health disparities persist globally, with an estimated 23.3 million CVD-related deaths anticipated by 2030. The associated medical costs are expected to double by 2030 [3]. Social determinants of health, encompassing living conditions, work, and distribution of resources, contribute to health disparities, demanding a focus on understanding the "causes of the causes" to address the widening equality gap [5]. In India, managing NCDs faces challenges due to out-of-pocket costs and geographic restrictions, resulting in suboptimal risk factor control, with only 38% of hypertensive urban Indians and 11% in rural areas having their condition under control [2].

Social connections significantly impact health, with both social isolation and loneliness linked to higher mortality rates, comparable to risk factors like physical inactivity and obesity. Three key mechanisms—behavioural, psychological, and

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physiological—illustrate how social ties influence health. Loneliness correlates with lower self-esteem and passive coping mechanisms, while social isolation is associated with reduced self-efficacy. Both contribute to cardiovascular risks. Unhealthy behaviours such as smoking, poor diet, and physical inactivity are indicators of low socioeconomic status, emphasizing the multifaceted nature of non-communicable diseases (NCDs) [2]. Addressing NCDs requires considering political, social, cultural, and economic factors [3]. Socioeconomic variables like education, income, and employment strongly influence cardiovascular health. Psychosocial factors, including negative affect and social exclusion, cluster with behavioural risks, emphasizing the need for interventions addressing both [7][8]. Having more and better social ties is associated with lower health risks, surpassing risks associated with obesity and hypertension [9]. The study also highlights communication challenges for spatially abled populations, emphasizing the role of e-Health in improving care for individuals with disabilities, particularly those who are deaf or mute. Health literacy is crucial, and the study aims to understand factors influencing health literacy in the deaf community, where inadequate literacy contributes to poor health outcomes.

2. METHODOLOGY

2.1 Study design

2.1.1 ***Study Design:*** This research adopts a prospective and qualitative study design, aiming to gain in-depth insights into the subject matter over a six-month period. The study will be conducted in the PMC community area.

2.1.2 ***Sample Size and Sampling Method:*** The study involves a sample size of 108 participants selected through convenient sampling. The target population comprises the general population, encompassing individuals of all genders aged 18 to 70 years, irrespective of literacy levels. The inclusion criteria extend to spatially abled individuals, including those who are deaf and dumb.

2.1.3 ***Study Participation Criteria:*** Inclusion criteria encompass a diverse range, including general population, spatially abled individuals of all genders, and those aged 18 to 70, irrespective of literacy levels. Exclusion criteria involve children below 18, individuals above 70, critically ill patients in the ICU, and psychologically unstable individuals.

2.1.4 ***Activity Developmental Steps:*** The research involves the development of a mobile health (mHealth) app designed as an educational mobile application. The app's database will be managed through Firebase, ensuring efficient data handling.

2.1.5 ***Accessibility and Presentation:*** The mHealth app will be accessible through cell phones and computers, with a web address provided as a link. The app will support multiple languages, including English, Hindi, Marathi, and cater to spatially abled individuals. The content will be presented in various modes, including text, audio, and video formats, enhancing the overall accessibility and engagement for the participants.

2.2 How to Use the App:

2.2.1 For General Community:

Users from the general community can easily navigate the app by following a few simple steps. Start by choosing your preferred language from the language options available. Once selected, navigate to the top right corner and choose between the Audio or Text options based on your preference for information consumption. Subsequently, you can either read or listen to the factors presented, depending on your choice. Towards the end of the list of factors, you'll find abbreviations accompanied by short descriptions of medical terminologies, providing users with additional insights and clarity (Figure No.3).

2.2.2 ***For Spatially Abled Population:*** Specifically designed to cater to the spatially abled population, this section of the app offers an accessible mode of information through videos. Users can select the video option and proceed to choose the factors they are interested in. By doing so, they can watch corresponding videos that present the information in a visual format, ensuring inclusivity and a tailored experience for this demographic. This approach enhances engagement and understanding for individuals who may benefit from a more visual and dynamic presentation of the content (Figure No.4).

2.3 Data Collection and Analysis

A structured survey served as the primary data collection instrument in this study. The questionnaire, printed and self-administered, was distributed to 108 participants. Respondent confidentiality was ensured, with the inclusion of a name field considered optional. The questionnaire consisted of questions adapted from a previous study [10]**,** formulated to gather information for each construct within the modified theoretical model. Utilizing a 5-point scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), the constructs were measured. Descriptive analysis of the collected data was conducted using the Statistical Packages for Social Science (SPSS) tool, aiming to obtain frequencies, means, standard deviation, skewness, and kurtosis.

3. RESULTS AND DISCUSSION

3.1 Result

The outcomes of our health app's feedback survey reveal a positive reception across a diverse respondent group, encompassing housewives, IT employees, doctors, students, and medical professionals. The survey, comprising 18 questions rated on a scale from 1 to 5, provided valuable insights into various facets of user experience.

Commencing with the assessment of the app's interface and icon, a noteworthy 51% of users expressed satisfaction, indicating a visually appealing and engaging design. This positive sentiment extended to the visual appearance, receiving a 32.41% approval rate and contributing to an

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aesthetically pleasing user interface. The efficiency in navigation and accessing different functions resonated positively with 49% of respondents, highlighting the app's user-friendly nature (Graph No.1).

Functional aspects, including app components, received positive feedback, with 44% expressing satisfaction and emphasizing the app's user-friendly design (Graph No.2). Notably, only 27% perceived the app as unnecessarily complex, emphasizing its overall accessibility. The ease of use received a favorable response, with 41% finding the app straightforward, and 30% stating that it did not require additional instructions, indicating an intuitive design (Graph No.3).

Learning speed demonstrated reasonable ease, with 35% quickly grasping the app's functionalities (Graph No.4). The app's ability to capture user interest was affirmed by 40%, while 35% acknowledged the relevance of the information provided, reinforcing the app's educational value. Concerns about the app's complexity were mitigated, with only 32% finding it cumbersome (Graph No.5).

Positive indications continued with 44% expressing their likelihood to recommend the app, and 44% planning to continue using it from the next month, showcasing sustained engagement. The star rating averaged at a notable 45%, indicating a high level of user satisfaction (Graph No.7).
Crucially, the app succeeded in enhancing awareness, knowledge about sociological factors, and influencing social behavior for 39%, 41%, and 38% of respondents, respectively (Graph No.8).

Finally, users felt proficient in using the app, with an impressive 46% expressing confidence in their proficiency (Graph No.6). These positive feedback trends collectively affirm the app's effectiveness in imparting health-related sociological awareness and fostering a user-friendly experience across diverse demographics.

3.1.1Statistical Analysis

Statistical analyses often assume normal data distribution, where observations centre around the mean symmetrically. Skewness measures symmetry, and kurtosis assesses distribution peakedness. Acceptable skewness values range from -2 to +2, denoting a normal univariate distribution. Negative values indicate left-skew, positive values suggest right-skew, and zero implies perfect normality. Similarly, acceptable kurtosis values fall between -2 and +2, with deviations signalling non-normal distribution. Higher kurtosis implies a sharp peak, and lower kurtosis indicates a flatter distribution. Mean values capture respondent consensus, and a standard deviation below 3 is considered acceptable. Based on skewness and kurtosis criteria, the data distribution appears normal [11] (table no.1).

3.2 Discussion

In a 6-month observational and qualitative study involving 108 participants, we investigated cardiovascular risk factors related to social aspects within the general community. The study aimed to introduce sociological risk factors for cardiovascular health and enhance awareness through a digital platform, guided by our primary guide, co-guide, and a software developer. Information input into the app was derived from various literature sources, exploring modifiable factors such as age, diet, exercise, profession, and environmental influences on cardiovascular health.

Through a comprehensive app evaluation, healthcare professionals provided positive feedback, affirming its clarity, structure, and seamless user experience. Users from the general community found the app valuable, addressing their queries effectively. No significant issues were encountered, reinforcing the app's effectiveness and usefulness.

Professionals endorsed the app's efficiency, confirming it meets expectations. With positive feedback and optimal performance, the app appears successful in achieving its objectives. Ongoing monitoring and refinements will ensure the app remains a valuable tool in healthcare, delivering intended benefits to both professionals and patients.

4. CONCLUSION

The cardiovascular health app underwent evaluation by a diverse group, including housewives, doctors, pharmacists, IT employees, students, gym trainers, and health counsellors. The feedback suggests the app could be a valuable resource for patient counselling and education. Offering text, audio, and video features caters to various learning preferences, accommodating users with different information consumption modes. Available in multiple languages like English, Hindi, and Marathi, it has the potential to benefit a broader population.

Various media formats enable effective communication of important messages by the users, potentially enhancing patient comprehension and retention. While the video option holds promise for serving deaf and mute individuals, further evaluation is needed. The app's inclusive features demonstrate a commitment to accessibility, aiming to reach a diverse audience and promote equal access to crucial healthcare information. Overall, the cardiovascular health app shows promise in enhancing patient education and empowering individuals to make informed decisions. Ongoing development and evaluation aim to ensure the app evolves and meets the needs of a broader user base, contributing to a healthier society.

A) FIGURES -

Figure No.1 Sociological Factors Affecting Cardiovascular Health

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Figure No. 2 Illustrative Categories, Factors, Determinants and Contributing Studies [6]

Category	Factor	Determinant
Social	Sociodemographic	Living in urban areas
		Sex, race, and age
		High school education, college-education
	Violence	Early abuse
		Partner violence
	Smoking	Tobacco consumption
		Second hand smoke
	Occupation	Job strain
		Job insecurity
		Occupational social class
		Job stress (work demand and decision latitude)
		Workplace bullying
	Positive childhood experience	Childhood socioeconomic status (parents' occupational status, primary education, secondary education, academic degree, family income, and occupational stability).
		Time spent outdoors
		Media exposure
		Positive home environment
		Under-nutrition (Early life)
	Social inequalities	Educational class inequalities
		Socioeconomic deprivation
	Psychological distress	Depression
		Anxiety
	Eating habits	Breakfast routine
		Mediterranean diet
		Intake of dietary fiber
	Neighborhood	Social disorganization, racial/ethnic minority concentration, urbanization
		Neighborhood-level deprivation
	Others	Tooth loss
		Loneliness
		Living in Slum
Economical	Family income	Annual family income
		Income inequality
Technological	Rapid technology	Modernization
		Industrialization
		Urbanization
		Use of radiotherapy for cancer
Environmental	Environmental pollution	Air pollution
		Vitamin D
		Particulate Matter of <2.5 μm in aerodynamic diameter (PM2.5)
	Living environments	Built environment
		Neighborhood greenness
		Intensity of oil and natural gas activity
		Traffic
	Noise	Aircraft noise
		Noisy roads and railways

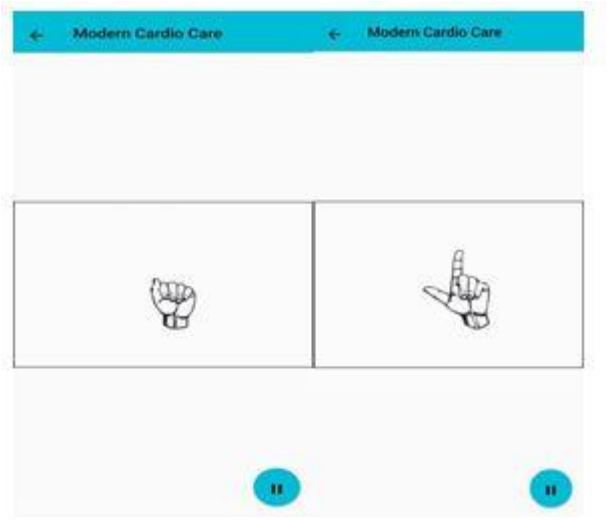
Figure 3. App interface and design

(a) (b) (c)

(d) (e) (f)

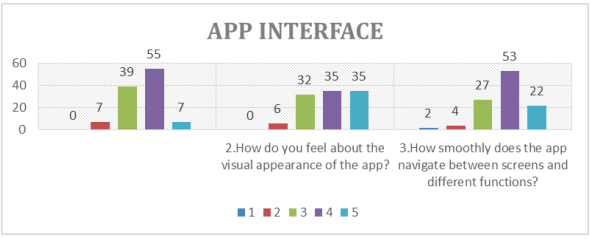
a. Home page; Selection of language
b. App Logo
c. selection of text/audio
d. Factors enlisted in English (e) Factors enlisted in Hindi
e. Factors enlisted in Marathi

Figure 4. Video for Spatially Abled population

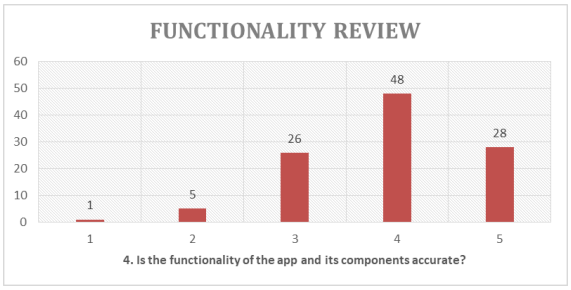


B) GRAPHS -

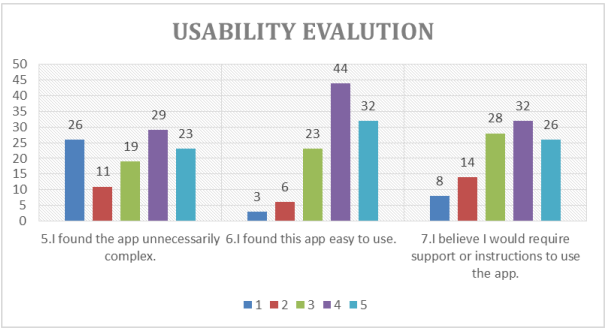
Graph No.1



Graph No.2



Graph No.3



Graph No.4

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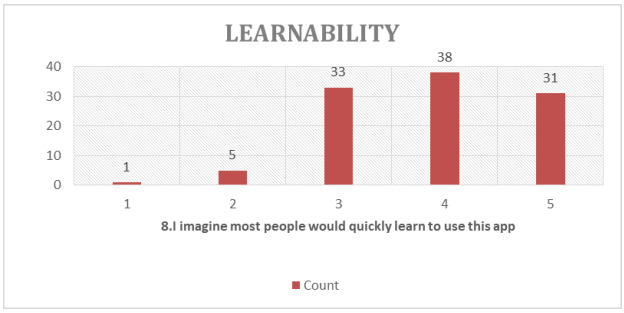
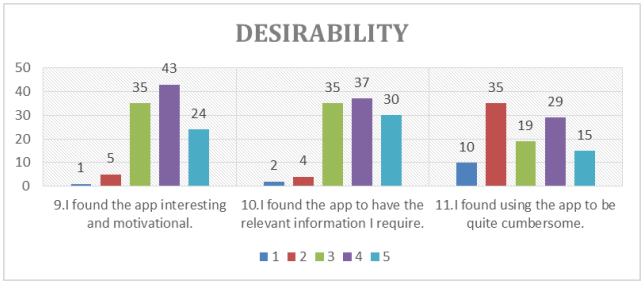
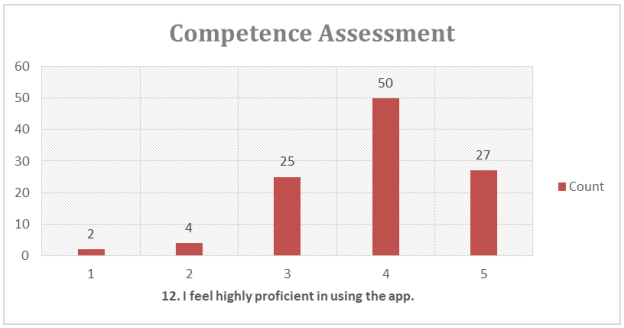


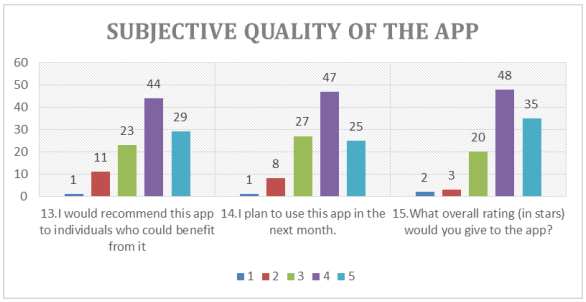
Graph No.5



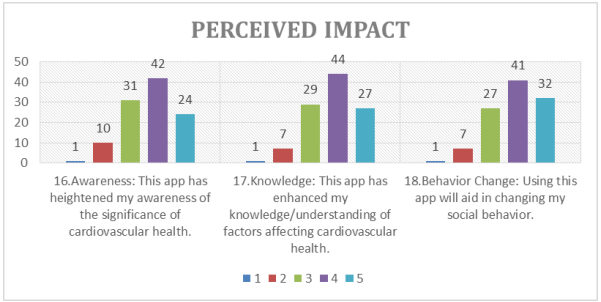
Graph No.6



Graph No.7



Graph No.8



C) TABLE -

Table 1. Measures to determine the reliability and validity of the model

QUESTIONS	MEAN	STANDARD DEVIATION	SKEWNESS STANDARD ERROR	KURTOSIS STANDARD ERROR
App Interface				
1. What are your thoughts on the layout, size of buttons, icons, menus, and content arrangement on the screen?	3.57	0.713	-0.262	-0.105
2.How do you feel about the visual appearance of the app?	3.91	0.918	-0.271	-0.977
3.How smoothly does the app navigate between screens and different functions?	3.82	0.862	-0.707	-0.946
Functionality Review				
4.Is the functionality of the app and its components accurate?	3.89	0.874	-0.559	-0.182
Usability Evaluation				
5.I found the app unnecessarily complex.	3.11	1.481	-0.243	-0.351
6.I found this app easy to use.	3.88	0.989	-0.824	-0.153
7.I believe I would require support or instructions to use the app.	3.5	1.203	-0.452	-0.642
Learnability				

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8.I imagine most people would quickly learn to use this app	3.86	0.921	-0.369	-0.384
Desirability 9.I found the app interesting and motivational.	3.77	0.878	-0.300	-0.172
10.I found the app to have the relevant information I require.	3.82	0.945	-0.443	-0.055
11.I found using the app to be quite cumbersome.	3.03	1.237	-0.078	-0.145
Competence Assessment 12.I feel highly proficient in using the app.	3.88	0.889	-0.742	-0.813
Subjective Quality of the App 13.I would recommend this app to individuals who could benefit from it	3.82	0.974	-0.555	-0.331
14.I plan to use this app in the next month.	3.8	0.911	-0.499	-0.089
15.What overall rating (in stars) would you give to the app?	4.02	0.891	-0.931	-0.189
Perceived Impact 16.Awareness: This app has heightened my awareness of the significance of cardiovascular health.	3.72	0.945	-0.354	-0.420
17.Knowledge: This app has enhanced my knowledge/understanding of factors affecting cardiovascular health.	3.88	0.941	-0.522	-0.252
18.Behaviour Change: Using this app will aid in changing my social behaviour.	3.82	0.915	-0.454	-0.183

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