

RESIDENTS PERSPECTIVES ON TECHNOLOGY USE, BARRIERS AND SATISFACTION IN CHRONIC DISEASE MANAGEMENT FOR ELDER PATIENTS: A CROSS-SECTIONAL SURVEY IN JAZAN, SAUDI ARABIA

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Abstract:

The study aimed to evaluate how Jazan residents in Saudi Arabia understand technology-based solutions for elder people chronic disease management. A cross-sectional survey employed Google Forms to collect participant feedback about these technological solutions through an online questionnaire.

The study results show that 78% of participants knew about these technologies yet understanding dropped substantially among participants elder than 70 years. The majority of participants used these technologies to manage diabetes and hypertension which demonstrates their importance in chronic disease care. The satisfaction rate reached 73.8% but multiple barriers prevented these technologies from becoming widely adopted. The main barriers that users faced involved high costs at 39.84% followed by insufficient awareness at 44.27% and language-related problems at 40.89%.

The analysis of demographic factors revealed their effect on awareness but occupation and gender did not produce significant results. User satisfaction correlated positively with the encountered challenges and the effectiveness of these technologies correlated positively with quality of life improvements. The study demonstrates how technology supports elder patients

yet demonstrates the requirement to overcome current barriers to improve accessibility and adoption rates.

Keywords: Elder People, Chronic Disease Management, Health technologies, Use, Barriers

1.Introduction:

Technology has sped up success in chronic disease and elderly care, the biggest processes today. The healthcare sector in Saudi Arabia has increasingly embraced digital health technologies such as telemedicine, mobile health applications (mHealth), wearable devices, and artificial intelligence (AI)-based interventions. These technologies have the ability to address challenges in healthcare accessibility, patient engagement, and disease surveillance, especially in areas that are heterogeneous in demographic and geographical profile like Jazan. The effectiveness of such technologies depends largely upon acceptance, usability, and accessibility of these solutions among elderly patients and patients suffering from chronic diseases.

Studies estimate that chronic diseases such as diabetes, hypertension, cardiovascular diseases, and respiratory conditions are prevalent among the elderly in the Saudi population, affecting their health, and the need for continuous monitoring and management of these diseases (Al-Hanawi *et al.*, 2019). World Health Organization (WHO) has suggested digital health approaches to tackle chronic conditions, especially in the aging demographic, where the notion of self-care, tracking and remote monitoring, and telehealth services can address barriers to health access (WHO, 2021). Particularly, in the health sector the Vision 2030 project focuses on the use of smart health technology encourages the digital transformation for the improvement of medical services and patient outcomes (Saudi Vision 2030, 2020). However, despite beneficial aspects, many barriers hinder elder users and caregivers, such as a lack of information, financial challenges, low digital literacy and language limitations (Alqahtani *et al.*, 2021).

Strategic interventions are required in order to overcome these barriers. With the goals of increasing telehealth services, enhancing digital literacy, and incorporating AI-based solutions for managing chronic diseases, the Saudi Vision 2030 plan places a strong emphasis on digital transformation in healthcare (Saudi Ministry of Health, 2023). Promoting the effective implementation of health technology in Jazan requires stepping up awareness campaigns, improving internet infrastructure, and putting in place training programs for patients and healthcare professionals. Because these technologies enable early intervention, on-going monitoring, and remote consultations, their integration is especially important in the areas grappling with aging populations and an increasing incidence of chronic diseases (Topol, 2019).

This study aims to assess the impact of technology on the management of chronic diseases of older patients in Jazan, Saudi Arabia. It measures participants awareness levels, their satisfaction with the technology options available to them, and the primary barriers to adoption. To bridge the technological gap and provide more inclusive and efficient healthcare solutions for the elderly, policymakers, healthcare professionals, and technology developers

must have a comprehensive understanding of these concerns. Saudi Arabia can improve chronic illness management outcomes and the quality of life for its aging population by addressing current issues and utilizing cutting-edge digital health approaches.

The purpose of this study is to assess the impact of technologies affect elderly patient's chronic disease management in the Saudi Arabian Jazan region. The study aims to provide important insights into how elders perceive and interact with technology solutions including wearable health monitors, telemedicine, mobile health apps, and AI-assisted diagnostics by emphasizing on three main dimensions: awareness, satisfaction, and barriers.

The lack of knowledge on how elderly patients and their caregivers use technology-based healthcare tools is one of the main gaps in the way healthcare is now delivered. Limited digital literacy, accessibility problems, language limitations, and a general lack of exposure to technological solutions are some of the particular difficulties that elderly people frequently experience. These barriers may lessen the efficacy of medical technology intended to facilitate remote consultations, monitoring, and self-care. This study offers empirical evidence to support more specialized and inclusive strategies by methodically determining the levels of awareness and satisfaction as well as by documenting the particular barriers that people perceive.

Additionally, the study provides a contribution by directly engaging community people from a variety of demographics in Jazan, a place renowned for its population and geographic diversity. To make sure that health technology projects are both realistic and culturally relevant, it is essential to comprehend the local environment. Policymakers and healthcare planners will use the data to determine the most critical areas for infrastructure expenditures, digital literacy training, and instructional campaigns. For instance, technology developers can respond by making platforms that are easier to use and more accessible if the results indicate that low levels of satisfaction are caused by subpar user interface design or a lack of multilingual support. Targeted outreach initiatives can be put in place if ignorance is the barrier.

The study can also determine which subgroups are more underserved by comparing participant attributes like age, gender, and geography with their perceptions and use of technology. This focused strategy makes it possible to design policies and allocate resources more precisely, which is in line with Saudi Arabia's Vision 2030's overarching objectives of better healthcare results and digital transformation.

Essentially, by offering evidence-based suggestions to enhance the accessibility, usability, and inclusivity of digital health services for the elderly, this study contributes to closing the current technology gap. The study's conclusions will ultimately help in the development of more patient-centered, efficient, and fair digital health interventions, which will improve the management of chronic illnesses and the standard of living for Saudi Arabia's aging population.

2.Methodology:

2.1 Study population:

Resident's perspectives on the use of digital health technology in the management of chronic diseases among elder patients in Jazan, Saudi Arabia, were examined in this study using a quantitative, cross-sectional survey approach. Evaluating awareness, satisfaction, and barriers regarding the adoption and use of these technologies was the main goal. The 1,404,997 people who lived in Jazan as of 2022 were the study's target population. Participants had to be permanent inhabitants of the Jazan region, be at least 16 years old, and be able to understand Arabic or English. The study excluded non-residents, people under the age of 16, and anyone who couldn't understand either of the two languages.

2.2 Sample Size:

To ensure statistical representation, the required sample size was determined using Cochran's formula for an infinite population. The formula is expressed as:

$$n_0 = \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{(0.05)^2} = \frac{3.8416 \times 0.25}{0.0025} = \frac{0.9604}{0.0025} = 384.16$$

Thus, the minimum required sample size was approximately 384 participants.

2.3 Data Collection:

A structured online survey created with Google Forms was used to gather data. Demographic information (age, gender, and location), knowledge of technology, satisfaction with existing technology services, and perceived barriers to their use comprised in the survey. The goal of the study was explained to participants and their informed consent was collected on the first page of the questionnaire. Anonymity and confidentiality were emphasized and strictly maintained throughout the study process. The questionnaire link was disseminated through various online channels including social media platforms, email distribution lists, and community networks. Data were collected electronically and responses were automatically recorded in an Excel spread sheet linked to Google Forms.

Python modules like Pandas, NumPy, and SciPy were used to do statistical assessment after the raw data was imported into PyCharm Community Edition 2024.2.0.1 for analysis. Responses pertaining to awareness, satisfaction, and barriers were compiled using descriptive statistics, such as frequencies and percentages. Inferential statistics included Pearson or Spearman correlation analysis to look at relationships between important variables like awareness, satisfaction, and barriers with demographic attributes like age, gender, and location, and chi-square tests to evaluate associations between categorical variables (e.g., age and awareness). For all inferential tests, a significance level of $p < 0.05$ was used. The methodology of the study was outlined in the flowchart presented in Figure 1.

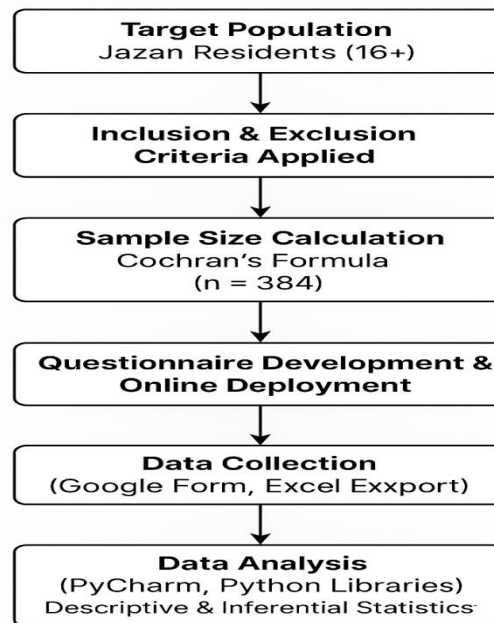


Figure 1: Methodological flowchart of this study

The study's variables were categorized as follows: age, gender, and location were the dependent variables; awareness level, satisfaction, and perceived barriers were the independent variables; and, in order to ensure internal consistency, Arabic and English language proficiency and Jazan residency status were the control variables. The study received ethical approval from the appropriate review board. Informed consent was obtained digitally before participants could proceed with the questionnaire. All collected data were securely stored and used solely for research purposes.

3. Results:

3.1 Demography of the study participants:

The survey included 51.72% female and 46.98% male participants from Jazan, Saudi Arabia. A significant portion of participants (53.85%) were under the age of 30, and the majority (58.85%) lived in rural areas. Among the participants, healthcare professionals made up 23.44%, while 20.31% were family members of elder patients, as shown in Table 1.

Table 1: Demography of the study participants

Category	%
Age Group	
Under 30	53.85%
30-39	25.21%
40-49	12.08%
50-59	4.95%
60-69	1.56%

70 and above	2.34%
Gender	
Female	51.72%
Male	46.98%
Occupation	
Healthcare Professional	23.44%
Family Member of Elder Patient	20.31%
Elder Patient	2.86%
Other (Not Specified)	48.44%

3.2 Awareness of technology used for chronic disease management in Elder patients:

In this study, a considerable percentage of the participants are familiar with the technology available in Jazan, Saudi Arabia, for the care of elders and management of chronic diseases. 78% of the participants indicated that they were familiar with this technology, and a smaller percentage, approximately 22%, represented that they were not aware, as shown in Figure 2.

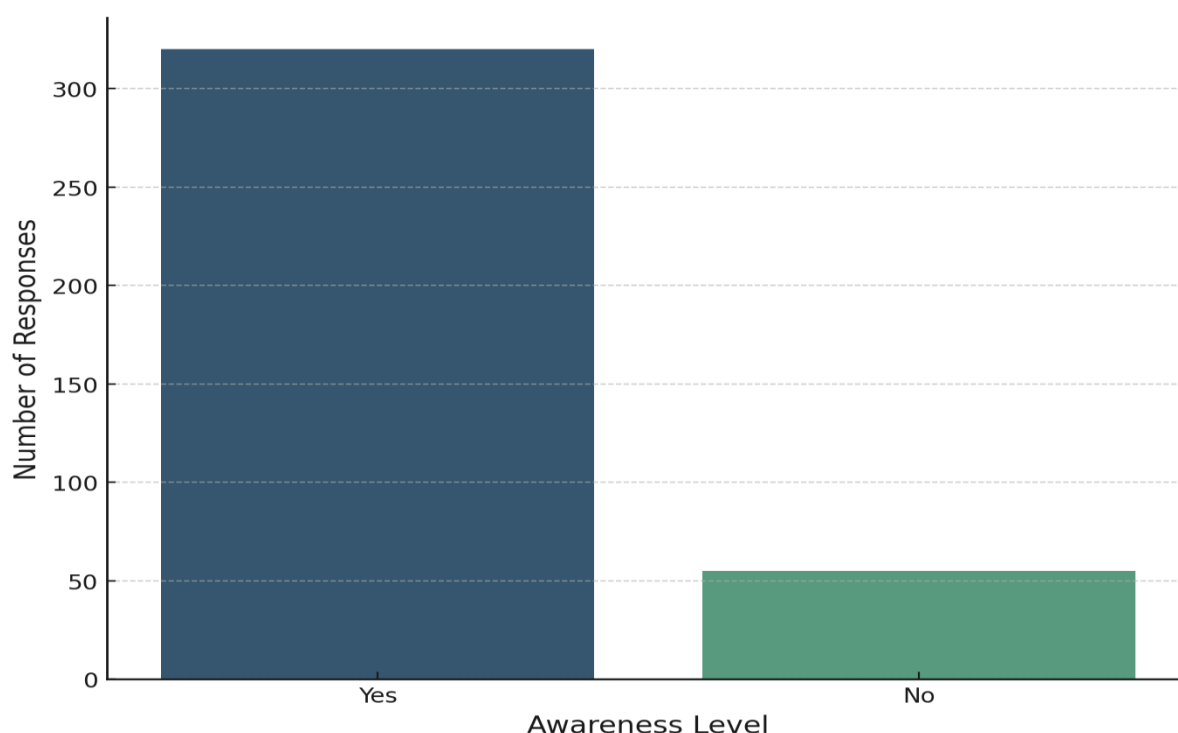


Figure 2: Awareness of technology used for chronic disease management in elder patients

3.3 Common chronic disease managed by technology in elder patients:

Figure 3 illustrates the most common chronic diseases managed with technology for elder patients. The patients monitored and treated diabetes most frequently, with 274 patients using computerized devices to manage their condition. Hypertension comes in second with 238 patients using technological assistance to treat it. Beyond the aforementioned categories, health technology is extensively applied to treating respiratory diseases, such as asthma (120 patients) and cardiovascular diseases (88 patients). The application of technology in geriatric conditions and cognitive function is also on the increase, as seen in the 51 patients with Alzheimer's disease and dementia. Additionally, the rehabilitation for stroke (25 patients) and arthritis (42 patients) demonstrates the importance of assistive technology in providing mobility support and rehabilitation interventions.

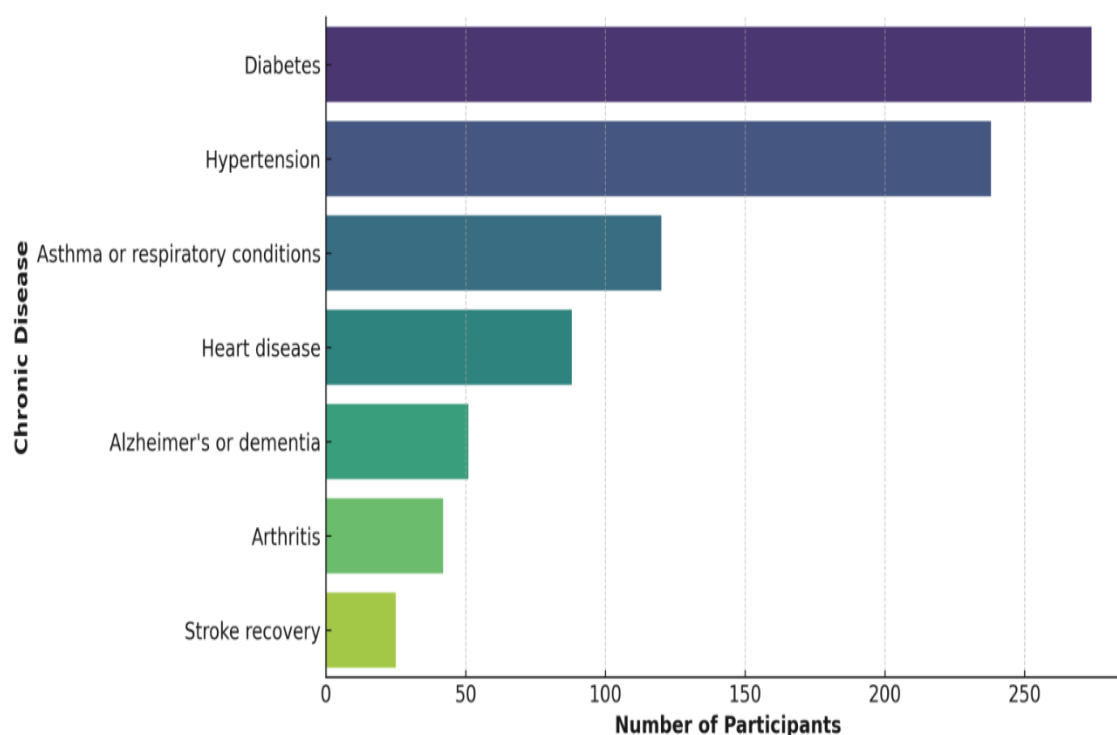


Figure 3: Common chronic disease managed by technology in elder patients

3.4 Type of technology used for elder patient's chronic disease management:

With 24.8% of the responses, wearable health tracking devices, such as fitness trackers and smart watches, were the most used. 23.6% of participants were aware of distant monitoring equipment, such as blood pressure and glucose monitors. Telemedicine services, which involve online consultations with doctors, were familiar to 19.7% of the participants. With 11% of the total, drug reminder devices (such as pill dispensers and apps) showed modest prevalence and use. With a total of 6.2%, cognitive well-being tools (such as brain training programs and virtual reality for mental health) were used less frequently than other interventions. 9% of respondents mentioned smart home tech, such as voice assistants and home automation. Personal Emergency Response Systems (PERS) were mentioned in 5.4% of responses, and it is presented in Figure 4.

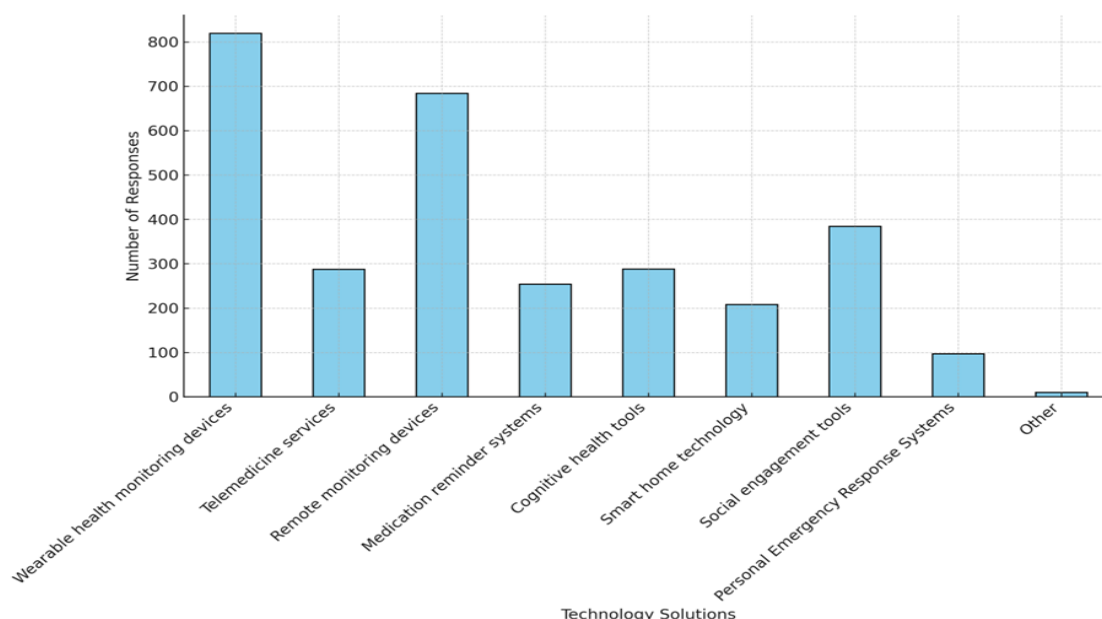


Figure 3: Type of technology used for elder patient's chronic disease management

3.5 Frequency of technology used for elder patient's chronic disease management:

The frequency of technology use in elder patients chronic disease management, highlighting different usage patterns, is illustrated in Figure 4. About 31% of people reported using it weekly, which was the most frequently given response. Monthly usage is also noteworthy, with about 22% of people reporting this frequency. While 19% of people reported using the technology daily, this was somewhat a lower percentage compared to weekly usage. However, the rarely and never categories each received roughly 14% of responses, indicating infrequent or no use by some people.

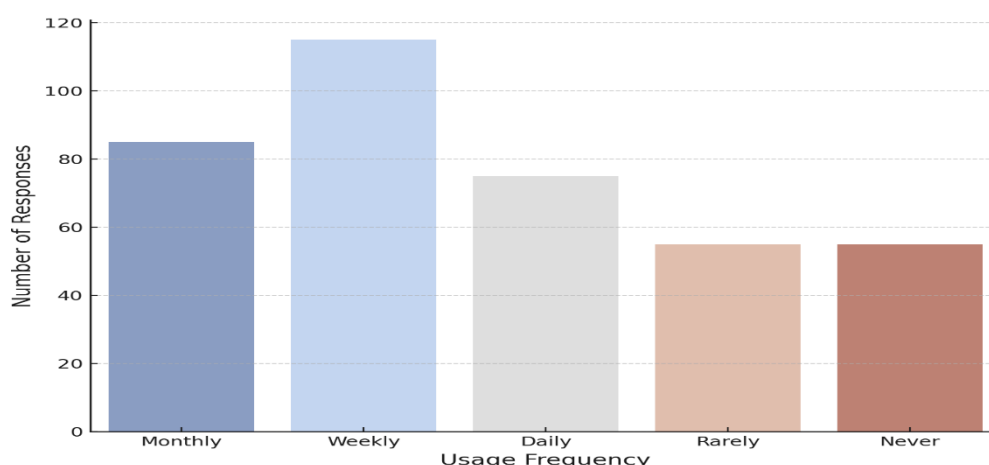


Figure 4: Frequency of technology used for elder patients chronic disease management

3.6 Satisfaction of technology used for elder patient's chronic disease management:

Participant's satisfaction levels with available technological solutions for elder patient's chronic disease management are depicted in Figure 5. The combined score of very satisfied and satisfied indicates reveals that a substantial 73.8% of the participants have a

positive view of technology solutions for elderly people suggesting a strong acceptance of current technological interventions in elderly care settings. A relatively small proportion of participants 7.5% express dissatisfaction, while 16.3% remain neutral.

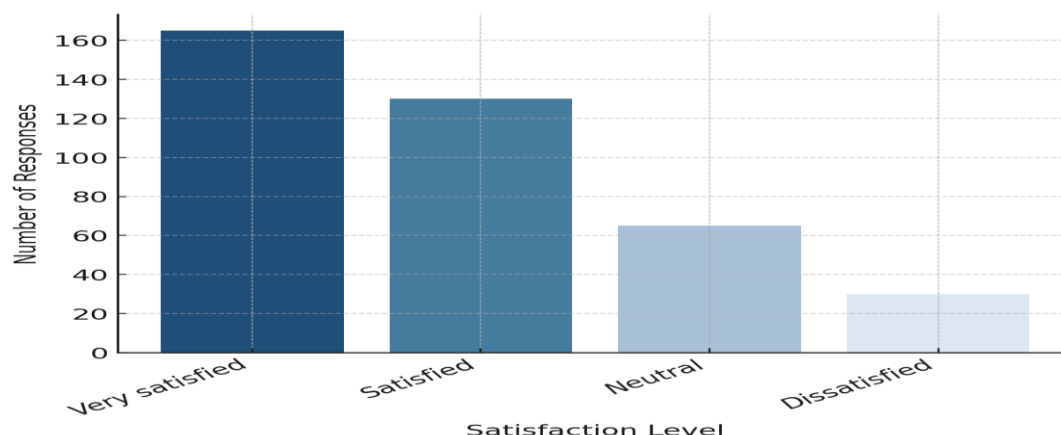


Figure 5 : Satisfaction of technology used for elder patient's chronic disease management

3.7 Barriers to use technology for elder patient's chronic disease management:

A significant barrier to implementing technology for elder patient's chronic disease management is lack of knowledge or information (44.27%), suggesting a critical need for educational programs. Another significant challenge is language limitations, with 40.89 % of participants indicating that apps are only available in English make the development of more locally relevant solutions imperative. Adoption is further hampered by high device and service costs as reported by 39.84% of participants, indicating that affordability is still a major issue. Further limiting access, particularly in remote areas, are low internet connectivity (29.95%), limited technology availability (37.76%), and a lack of technical expertise or support (17.97%) as reported by participants and it is presented in Figure 6.

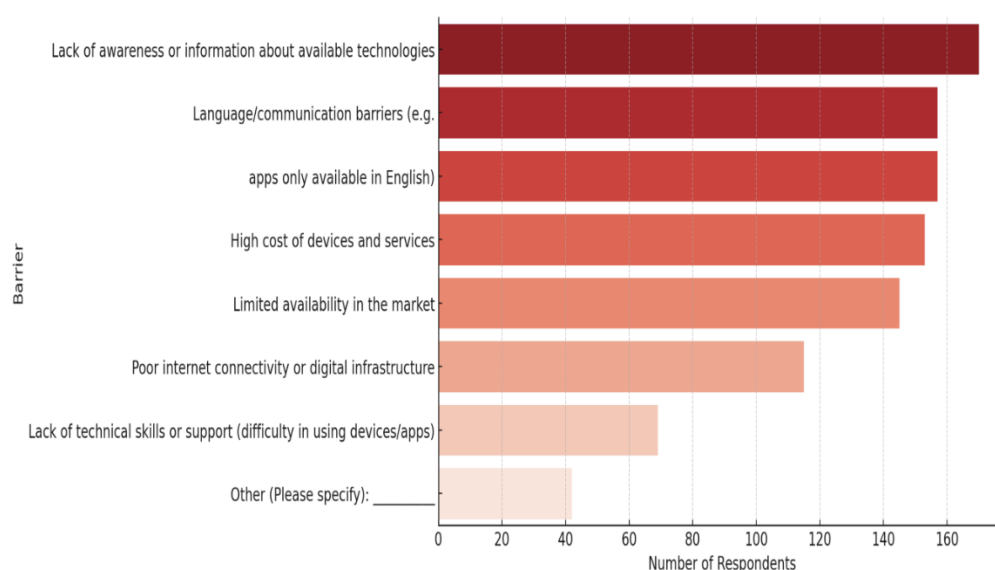


Figure 6: Barriers to use technology for elder patient's chronic disease management

3.8 Relationship of demographics with awareness of technology for elder patient's chronic disease management:

Table 2 illustrates the percentage of individuals aware of technological solutions for elder patient's chronic disease management, divided by age group highlighting the varying levels of awareness across different age demographics. Among those under 30, 3.11% are unaware, whereas 96.89% are aware. The majority in the 30-39 and 40-49 age groups are well aware of the technology. Individuals above 70 have the lowest awareness, with 55.56% aware and 44.44% unaware. Younger groups are typically well-informed about accessible technology solutions, but elder groups have significantly lower awareness as indicated by the data.

Table 2: Awareness by age group

Demographic Information	No %	Yes %
Under 30	3.11	96.89
30-39	0	100
40-49	0	100
Above 70	44.44	55.56

The chi-square test interpretation results presented in Table 3 shows the relationship between demographics and awareness of technology for elder patient's chronic disease management: and indicates that age is the only major demographic factor influencing significantly associated with awareness is age levels, people over 70 had much demonstrated awareness levels that were lower levels of awareness than other age groups. No statistically significant associations were found between awareness levels and gender, location, or occupation.

Table 3: Chi-Square Test Interpretation

Factor	Chi-Square (χ^2)	p-value	Interpretation
Age Group	44.92	0.000000015 (Significant)	Awareness depends on age (older people are less aware).
Gender	0.37	0.829	No significant relationship.
Occupation	3.36	0.645	No strong impact

Figure 7 visually represents the awareness distribution across age groups, observing full awareness (100%) in the 30-49 age groups. A gradual decline in awareness for elder age groups, with the most significant drop in the above-70 category.

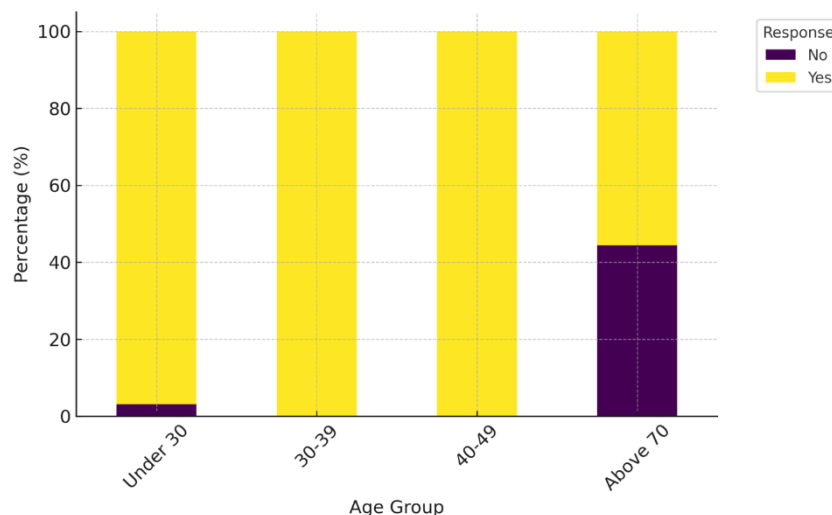


Figure 7: The relationship between age groups and awareness of technology for elder patient's chronic disease management

3.9 Relationship of satisfaction and barriers encountered while using technology for elder patient's chronic disease management:

Figure 8 illustrates the relationship between Saudi Arabian's satisfaction with accessible health technology solutions and the barriers they face when using them. The colour gradient shows the direction and strength of the interactions between satisfaction levels and barriers faced. Stronger negative associations are represented by darker red hues, indicating that satisfaction is lower when these barriers are encountered. According to the illustration, the most negative associations with satisfaction are the high cost of gadgets and services, limited market availability, and apps only available in English. Although much less severe, poor internet connectivity and lack of understanding of relevant technologies can negatively impact satisfaction.

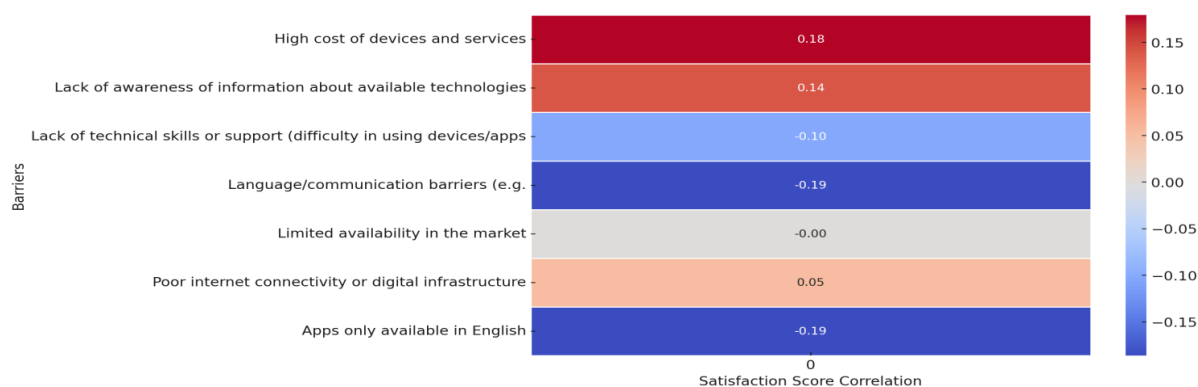


Figure 8: Relationship of Satisfaction and barriers encountered while using technology for elder patient's chronic disease management.

3.10 Relationship of effectiveness and improvement of quality of life while using technology for elder patient's chronic disease management:

The relationship between the perceived improvement in elderly people's quality of life and the efficiency of technology in controlling chronic illnesses is graphically shown by the heatmap in Figure 9. Warmer hues (red) imply stronger positive correlations, whereas cooler hues (blue) suggest weaker ties. The colour intensity represents the strength of the link. From Figure 9, the heatmap illustrates that the two variables have a positive association (0.35). This implies that participants are more likely to claim an improvement in the quality of life for elderly individuals if they believe technology is more successful at controlling chronic illnesses.

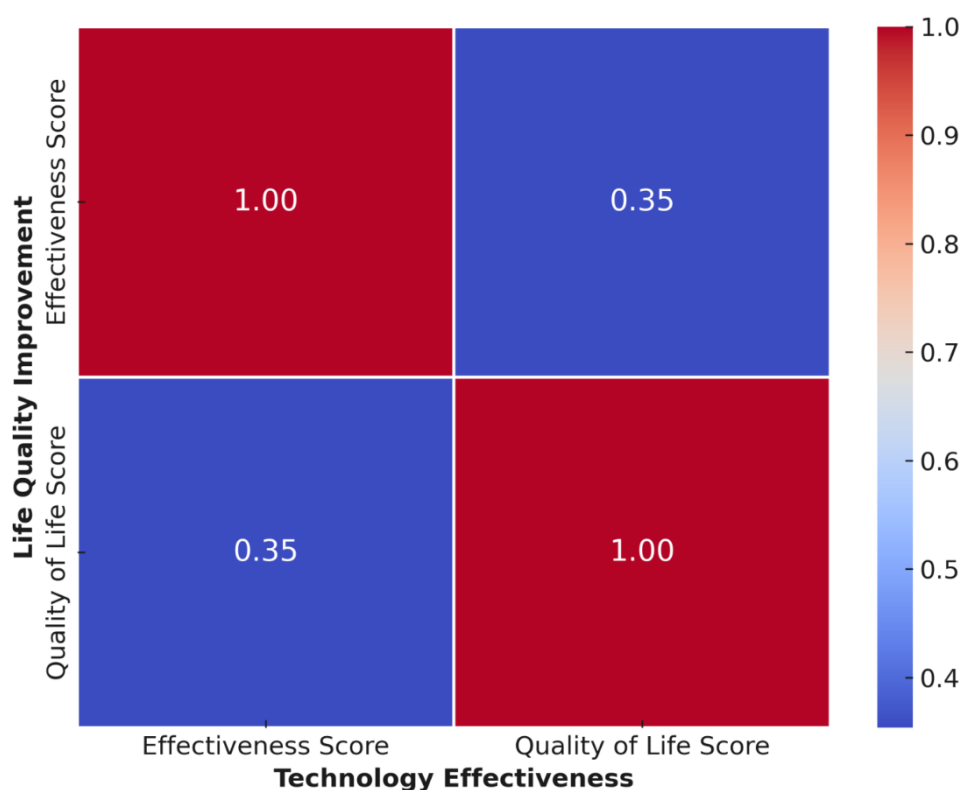


Figure 9 : Relationship of effectiveness and improvement of quality of life while using technology for elder patient's chronic disease management

4. Discussion:

In Yanbu, Saudi Arabia, 400 adult patients with noncommunicable chronic diseases participated in a cross-sectional survey. 52.4% of patients had monthly follow-ups, 57.5% had hypertension, and 69.2% had diabetes mellitus, according to the results. Even though digital health apps like Sehhaty and Tawakkalna are available, only 29.75% of patients use them to track their health, and only 38.7% say they are satisfied with them. The study concluded that low computer literacy, a lack of knowledge, and the elderly population's difficulty utilizing technology were the main reasons why digital health services were not entirely effective (Hussein *et al.*, 2022).

The usefulness of lifestyle interventions delivered via social media for diabetes management and prevention is investigated. The analysis of twelve studies showed that the majority of interventions lasted roughly six months and were organized by multidisciplinary healthcare professionals. These interventions used a mix of videos, texts, images, and audio to educate participants. Results showed improvements in glycosylated hemoglobin (HbA1c), diabetes self-care, and fasting plasma glucose levels. Additionally, dietary intake assessments in individuals with prediabetes showed promising results. The analysis underlines the potential of social media as a cost-effective tool for healthcare professionals and policymakers to develop population-based diabetic therapies (Lim *et al.*, 2023).

The usefulness of mobile health (mHealth) interventions in controlling cardio metabolic outcomes in older persons with type 2 diabetes mellitus (T2DM) was assessed. Glycosylated hemoglobin (HbA1c), postprandial blood glucose, and lipid levels all significantly improved, according to a systematic review of 16 randomized controlled studies. Blood pressure, high-density lipoprotein cholesterol, and low-density lipoprotein cholesterol, however, did not show any discernible changes. According to the results, mHealth interventions can improve the management of diabetes in older persons, although they still have room for improvement. The adoption and impact of mHealth solutions for older persons with type 2 diabetes may be increased by removing technological obstacles and enhancing user engagement (Lee *et al.*, 2023).

A study assessed smartphone usage patterns and perceptions among healthcare workers (HCWs) at King Abdul-Aziz Medical City in Riyadh, Saudi Arabia. A cross-sectional survey of 351 HCWs found that only 42.3% used smartphones in healthcare settings, and just 6.1% regularly used medical applications. Common uses included accessing drug information (69.8%), disease diagnosis (56.4%), and medical websites (42.5%). However, overall perception towards smartphone use was low, with only 11.6% expressing a positive view. Perceived usefulness and practicality significantly predicted smartphone use and medical application installation. Physicians were more likely to install medical apps. The findings highlight the need for initiatives from health authorities to promote smartphone use in clinical practice and further research on its impact on healthcare quality in Saudi Arabia (Abolfotouh *et al.*, 2019).

According to Sheerah *et al.*, (2024), the rise of virtual healthcare and its transformative impact on the healthcare landscape in the Kingdom of Saudi Arabia. The rapid adoption of telemedicine and digital health solutions driven by advancements in technology, government initiatives, and the increasing demand for accessible healthcare services. It highlights key benefits such as improved patient access, reduced healthcare costs, and enhanced efficiency in medical service delivery. Despite these advancements, challenges, including regulatory hurdles, data security concerns, and the need for infrastructure development and digital literacy among healthcare providers and patients. The role of the Saudi Ministry of Health in integrating virtual healthcare into the national healthcare system, aligning with Vision 2030 goals.

The elderly patients adopting health technologies will show improvement in medication adherence, disease management and quality of life (Alqahtani *et al.*, 2022). Smartphone applications and wearables examples of digital health solutions provide real-time tracking of vital signs, reminders to take medications, virtual consultations with providers. Moreover, analytics from AI can be used for personalized health insights, helping patients and clinicians to make informed medical decisions (AlDossary *et al.*, 2020).

Concerns about cyber security threats, data privacy, and the privacy of their medical records are frequently expressed by elderly patients (Alshehri *et al.*, 2022). Family is very important in Saudi society when it comes to caring for the elderly. While some patients prefer conventional in-person healthcare contacts, others rely on younger family members to help them use technology (AlDhaif *et al.*, 2023). According to AlMalki *et al.* (2023), certain doctors and healthcare professionals are not motivated or trained to integrate digital health technology into standard care, which limits their ability to advocate for such interventions.

The current study highlights a gap in awareness of health technology for elderly care, underscoring the need for better education and outreach. While many are familiar with these advancements, elderly individuals and caregiver who stand to benefit the most often lack access to crucial information.

Technologies are mostly used in the chronic disease space (such as diabetes and hypertension) and increasingly in cardiovascular and neurological care. But daily use is still low, indicating barriers like cost, accessibility and misunderstanding. Others described how they only used health technology occasionally or not at all, indicating the importance of practical solutions that are more affordable and easier to use. While cost, availability and language barriers are top concerns, technical know-how and support could have a smaller role in user dissatisfaction, the study found. Better affordability, broader availability and better language support particularly for Arabic speakers could substantially increase both adoption and the level of satisfaction.

Moreover, participants who found the health technology to be effective in managing chronic diseases reported improved quality of life for elderly individuals. Even though this isn't absolute, more approaches of technology being accessible, affordable, and usable can positively play a better role in the independence, well-being, and better health outcomes for the elderly in Jazan, Saudi Arabia.

5. Conclusion:

In conclusion, an opportunity exists to promote the use and effectiveness of technology based solutions in care for the elderly and chronic diseases management through awareness, language, affordability and accessibility. Addressing these challenges will require collaboration between policymakers, healthcare providers, and technology developers so that we can provide better quality of life for elder people both in Jazan and similar areas.

The study shows that technology has a significant role in chronic disease management and patient support in the elderly care of Jazan Province, Saudi Arabia. Although most participants indicated that they were aware of available digital health solutions, those aged

fewer than 25 had the most knowledge of benefits of this solutions and those above 70 years had significantly less knowledge. This gap underscores the importance of targeted education and outreach to ensure that elder people and their caregivers can make use of these advances.

Diabetes and hypertension were the most frequently managed chronic conditions leveraging technology, demonstrating that technology can be useful for sustained health monitoring. But there are a number of barriers to widespread adoption. Key challenges included lack of awareness, high costs, language limitations and poor internet access. While many participants were satisfied with these solutions, affordability, limited availability in the market, and language issues were major sources of dissatisfaction. Solution a few of these challenges by making technology more affordable, accessible, and culturally relevant can help significantly improve the user experience with these tools, leading to higher rates of adoption.

To summarize, we can further leverage the power of technology in the elderly care space by increasing awareness, investing in better language support, lowering costs of products and services and enabling wider access. By considering the potential benefits and challenges associated with implementing technology for elderly people in Jazan, policymakers, healthcare providers, and tech developers can collaborate to overcome these challenges and create solutions that not only made a real difference for elderly people in Jazan, but also can be implemented in other parts of the world.

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