EXPLORATIVE STUDY ON THE ROLE OF ARTIFICIAL INTELLIGENCE IN INDIAN ELDERCARE: INSIGHTS FROM ELDERLY INDIVIDUALS AND HEALTHCARE PROVIDERS

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ABSTRACT

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This research proposal provides an explorative study reviewing the impact of artificial intelligence (AI) in Senior Care in India, acquiring the view point elderly individuals , healthcare providers. & AI Solution providers. With a fast greying population which is estimated to reach 350 million by 2050, India is up for a major difficulties to provide decent healthcare to the seniors live in rural areas in a suboptimal Financial conditions and their families being away in cities which necessitates finding an unique solution which is effective.

Some of the contributing factors which impact the research are captured in the study . The malaise of lifestyle diseases like Diabetes and High Blood Pressure , the migration of the population towards cities in search of livelihood and leaving the seniors behind in the rural areas making them vulnerable on health care and finally the usage of AI based health care

initiatives like Remote monitoring , medication schedule adherence and a few like that are recorded

The expected outcome of this study is to provide awareness on the ground realities which would finally enhance the quality of living standard for Indian elders.

There had been some work done previously in AI based solutions on senior care in India, but no substantial research has happened on the interplay among the elders, care givers and AI solution providers. Taking a composite approach this study finally wants to bring out insights which will assist the Industry and decision makers to formulate approach and policies to boost senior care in India.

The expected outcome of this study is to provide awareness on the ground realities which would finally enhance the quality of living standard for Indian elders

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INTRODUCTION

1.1 Introduction

India having a population of 1.5 billion presently has around 10 percent of its population over 60 years and this figure is projected to reach around 350 million i.e. around 20 percent by the year 2050. Majority of this population will be staying in villages and will be lacking the personal care of the families because of the migrating nature of the populace towards cities. This necessitates the introduction of affordable and quality health care through AI which will address the problem and provide necessary healthcare of the elderly population.

1.2 Key Trends in Eldercare

Rapid Population Aging: India's life expectancy has increased by more than 20 years over the last 50 years, and it has resulted in a fast-growing grey population. Because of this huge increase in numbers of elder population we need to revisit and enhance the present healthcare system. This phenomenon was demonstrated by Kiss et al. (2024) and before that Jeyaraj and AVSM (2023).

Health Care Demand : Experiencing physical challenges are inevitable as one grows old . A lot of lifestyle-based aliments like Diabetes and hypertension , deterioration in cognitive abilities and decrease in functional aspects of life are common features in advanced age . Evolution in Medical Science made the life expectancy considerably stretched but couldn't

escape those issues which are perpetrated by urbanisation byproducts like loneliness and work stress . These issues were clearly brought out by Researchers like Matheny et al. in 2019 and Ho in 2020. However , in India , unfortunately , these issues aren't limited to the elders only . Even twenty percent people below the age of forty are impacted by different chronic diseases which aggravates the health care situation which is already challenged

Upgraded Technology : Another prominent phenomenon is the Technology advancement in elder care in the last decade . It started with relatively basic intervention like remote monitoring and medication discipline as stated by Bradwell et al. in 2019 . Gradually it was deployed to address cognitive challenges and counter mental issues as shown by Xuereb in 2020 and Adus et al. in 2023. Predictive Analytics was also getting used for managing issues like fall prediction as explored by López et al. in 2022.

1.3 Motivation of Research :

Various Factors contributed to the motivation to undertake this study:

Indian Aging Population: Though India is still having primarily a young population, in next 20 years of time the elderly population is likely to double from present 10 percent to more than 20 percent . This is likely to put an enormous burden on the already fragile healthcare system and its imperative to find a way to bolster the framework to address the situation effectively.

India's Unique Context: It's a challenge not only because of large elderly population , India isn't a homogeneous country as far as its senior demography is concerned . The seniors are spread across different geographic regions with diverse language , diversified culture and heterogeneous socio-economic status . On top of that the situation in Rural and urban households are diametrically different.

Potential of AI: AI can augment the present situation of health care of the seniors if and only if AI is accepted and adopted by the elders.

Gap in Research: There are four agents in the entire ecosystem: AI in healthcare, Technology Solution Providers present in that space, Health Care providers and finally the elders. Though a lot of papers have been published focusing on individual actors or maximum two of them, a holistic discussion taking all of them into perspective is extremely rare

1.4 Importance for Industry Practice/Knowledge Advancement

This research is expected to provide important input to AI Industry ecosystem as well to enable them to support the Indian elders in a much enhanced way:

Informing Development: Though some AI driven solutions exists as on date , the findings from this paper is expected to provide a more nuanced input to the Technology Solution Providers so that they can develop a system which is more customised and apt for Indian seniors .

Guiding Policy: This paper can be used as an advisory to Govt & Pvt policy makers in Health Sector so that they can formulate AI usage guidelines which improves the life of the Indian seniors and at the same time taking care of different sensibilities to increase the acceptance rate .

Improving Healthcare Practice: This research will definitely give a better understanding to both Govt & Pvt healthcare providers on how AI driven solutions can be harnessed to provide a better life to the seniors in the country .

Expanding Knowledge: This study can provide a baseline to the future Researchers who build up on the impact of AI on Indian Healthcare .

Driving Innovation: This paper can very well stimulate the innovation by getting the insights on what challenges the elders and the health care providers face as on date and by deciphering their experience.

1.5 Senior Care Initiatives by Government of India

A lot of strategic initiatives have been taken up at federal and regional state level in India to impart elder care through the infusion of AI based tools and these certainly paves ways for better quality of life for the seniors . Following are some of them

Ayushman Bharat Digital Mission (ABDM): Government of India introduced the composite ABDM in the year 2021 which includes ABHA (Ayushmann Bharat Health Account) ID for the consumers , Health Professional Registry & Health Facility Registry . All these stake holders are supposed to work on an inter operable data sets with the privacy safeguards plugged in where the patients hold the right over their health record. This is supposed to have a large impact on the health of the seniors of the country through Digital Initiatives. However the enrolment in ABDM hasn't picked up that way yet as the penetration level is still at three fifth level.

National Programme for Health Care of the Elderly (NPHCE): This initiative was launched in the year 2010-2011 which especially targets to the seniors of the country . It has 3 primary pillars namely prevention, Cure and Rehabilitation. It has dedicated health care hub at every level starting from district to regional level . Three fourth of the funding of the initiative comes from Central Government and State Government contributes the rest . The ASHA (Accredited Social Health Activist) workers enables the seniors here to avail the AI based Health care services which is primarily delivered through Remote monitoring

SAGE (Senior care Ageing Growth Engine): This is another unique initiative which promotes start-ups and overall quality of life for the seniors . The federal government supports the Start up with an equity infusion of INR 1 Cr which is developing AI based

products and Services focusing on elders. A lot of innovative tools are being introduced to the seniors in this way

Bharat Net : This program of Government of India is facilitator of a lot of initiatives towards the advancement of Digital technology in India in the rural segment including Senior Care . More than half a million villages will be connected through this program and will impact for than hundred millions of people over the age of sixty and it would be a huge enabler of AI based tool adoption for the elders in the rural areas

1.6 State-Level initiatives in AI-based Eldercare

The elder care initiatives are not only driven by the federal Government , but Health primarily being a State subject , a number of states have also started programs on their own like the following

National Centre of Ageing (NCA) from State of Tamil Nadu : This is where the elder care facility is provided in the dedicated centres in Chennai with exhaustive usage of AI based Technology . Also, the use of e-paarvai', a mobile app having AI based tools to enable field health care providers to detect early cataract

Programs of Kerala Government : Kerala AI (K-AI) is a collaborative program which promotes the use of AI based tools to the different facets of citizen facing application including Elder care. Here the Government authorities , Start-ups and Researchers are brought in the same platform. Kerala Palliative Care Grid is another initiative which provides different AI based initiatives are carried to the elder homes directly .Nayanamritham 2.0 is another initiative like Tamil Nadu to screen Eye issues through AI based tools

Programs of Karnataka Government : Karnataka state mostly goes with a private partnership. It partnered with Apollo hospital to launch " Senior First" technology driven initiative towards the elders . Similar initiative has been taken care of with Manipal hospital to provide 360 -degree care of the seniors mostly through AI based tools . Also compared to other states the Tele medicine framework is extremely robust to take care of rural senior patients

Arogya Mitra initiative from the state of Maharashtra : Through this program AI based diagnostic tools are integrated to support Rural Health Care centres using primarily predictive analytics . Also International Centre for Transformational Artificial Intelligence (ICTAI) has been launched with NITI Aayog and Wadhwani AI to provide specialised AI based health care to the Rural segment significantly impacting the health of the seniors

1.7 AI startup ecosystem in Senior care in India

In recent times a number of AI startups have come up who are working in various areas of adult care like remote monitoring , DSS and tools to improve the efficiency of the caregivers . Since one in every five Indian would be elder by another twenty years or so , these indigenous organisations are expected to do a good job in the prevailing socio-economic situation of the country . Some of the mention-worthy organisations are the following

Dozee : It's an organisation based in Bangalore . They have been working on a number of initiatives which would go to the welfare of the seniors . Their main product is an IOT sensor based sheet which can capture a number of vital parameter of the humans . Whenever it picks up an outlining data , it alerts the family or Medical Professionals so that the necessary steps can be taken . They have been one of the empanelled members of the ABDM Program

Portea Medical : This is another organisation which is involved in a number of Adult care solutions . They have a product which has embedded AI in triage and Remote monitoring solution and this way they lay a protective cover around seniors and their Doctors can act as a when required . Though it's a little costly , it does provide an additional layer to the fragile healthcare system

Tricog Health : This organisation is really doing an important work on the health of Rural elders when they have heart related issues. They have introduced an ECG reading device which can be placed with rudimentary healthcare facilities like village health care centre and it can communicate the ECG reading to Doctors operating in metros who can access the data almost in real time cutting down the timeline of diagnostic schedule .

Caregiver Smart Solutions : This organisation has a unique solution which came as a blessing to the ones who are away from the family . Their solution is merged in smart homes which captures various parameters like movement or the lack of it , falls etc and this is analysed mostly at an edge level and then the alert goes out to the concerned guardians or Physicians

Docbrella : This organisation offers an AI powered Digital health locker and serves as an health care Services aggregator as well . It transparently and securely stores the Digital health records and provides AI based insights to help the elders make informed decisions

There are a lot more like those who are coming up and have extremely innovative solution targeting the Elder segment in the country

CHAPTER II:

PROBLEM STATEMENT

2.1 The Aging Population in India: A Growing Challenge

AI based solutions have a large role addressing the challenge of the Indian elders which as a demography is increasing at a fast rate. India like other Asian nations like Japan and South Korea is fast moving to a higher percentage of grey population. However, there are fundamental differences between them and India in terms of economic condition and diversity. Those countries are in a position to incrementally expanding the framework of healthcare to take care of the senior population. However Indian healthcare is already in a lean condition and the extra burden on the system may completely overwhelm that. Added to that is the diversity because of urban and rural standing, different lingo-socio-economic condition makes its more daunting. AI based solutions has the power to be an effective tool in addressing this challenge and this study would try to provide a comprehensive view on the issues and impact of AI based solutions in Indian health care.

2.2 Demographic Trends

In the last 30 years or so India's life expectancy has increased by more than 20 pc and though there had been a dip because of Covid, it's expected to go up in the next 20 years or so which will result into more than 20 percent of Indian population being seniors. The country needs to be prepared for this phenomenon and resultant additional healthcare needs.

2.3 Socio-Economic Factors

Other than a significant portion of the population turning into seniors, there are several socio-economic attributes which further complicates the entire situation:

Urbanization and Migration: he population which was mostly into Agri sector over the time moving into cities which is providing a growing number of opportunities because of advancement in IT and Digital Economy. A lot of times they can't bring their parents over and they are mostly left without a support system.

Poverty and Economic Disparity: Though the recent economic activities have done way with the poverty, still a substantial part of the population is impacted by that and the elder population which falls under that bucket are deprived of standard healthcare.

Limited Healthcare Infrastructure: There is another potential problem which occurs because of Urban-Rural division. The Medical Care providers including the Doctors aren't very keen to operate from Rural India and as a result the elders, even when they have financial stability can't get adequate healthcare.

2.4 Healthcare Needs of the Elderly

Health care differs for different age segments and elder care is no exception. Apart from the unplanned medical emergencies they have the following ailments which needs to be taken care of regularly.

Chronic Diseases: As has been explored by Sharma and Bhatti in their paper in 2023**,** majority of Indian elder spectrum suffers from two lifestyle diseases namely Diabetes and Hypertension and subsequently they develop chronic Heart and Kidney conditions which needs to be managed round the clock.

Cognitive Decline and Dementia: The seniors worldwide go through cognitive degradation and Indian seniors are no exception, more so because almost ways they are not captured early. Since these conditions can't be cured it can only be controlled through management.

Other than chronic diseases and dementia, a lot of elders have functional limitations like knee, back, eyesight etc. which also needs constant support

2.5 AI Technologies for Eldercare

AI based solutions can have multiple applications which can be used to mitigate the challenges of eldercare.

Machine Learning: If large enough dataset is fed to specific Machine learning algorithms, then it can predict the ailments which are likely to happen almost accurately

Natural Language Processing: A big enemy of the elders is the isolation and subsequent loneliness. NLP helps to develop chatbots which can interact with the elders in their vernacular language.

Computer Vision: This ML algo can be used effectively to capture the facial expression and posture to detect pains, falls and other physical discomfitures and address those. This has been explained lucidly by Kale et al. in their paper published in 2024 .

Robotics: Though till date its economically not viable still, going forward it may help the elders to execute their daily tasks to a great extent. Xuereb in 2020 mentioned this**.**

Ambient Intelligence: This is more of a theory now because of its high cost of ownership, however it has a potential to be used if further research can bring down the cost .

Smart Home system: Though most of the time it is not economically feasible in a country like India and that too in rural construct, it undeniably provides a safe haven for elders especially when they aren't looked after physically by family. It has different solutions like wearable device to collect vital statistics in real time , smart mirror to capture posture anomalies , NLP based solutions for interactive sessions etc . A lot of Researchers like Xuereb in 2020 and López et al. in 2022 spoke about that

Personalized Care: If sufficient health data points of an elder is fed to an AI based solution, then it can very well make health advisory for that individual which is majorly customised and personalized interventions when required. Adus et al. in 2023 and Milella et al. in 2023 demonstrated sufficient evidence in their paper on this hypothesis.

Cognitive Assistance: The cognitive abilities of elders decline over time and AI can play a powerful role in alleviating some of the challenges like dementia to some extent. A vernacular interactive chatbot is an initiative towards that direction . A lot of researchers

in recent times like Yu, S. and Chen, T. In 2024 & Padhan, S. et al. in 2023 argued in its favour.

Social Engagement: Elders invariably become lonelier with the age. AI driven solutions can mitigate that challenge to some extent by providing a virtual companionship. Malik in his paper of 2023 and earlier Xuereb in his 2020 clearly established that.

Medication Management: Adhering to the medication schedule is extremely important for the elder's wellbeing and it gets impacted because of memory weakness at senior age .AI driven solutions can manage this situation by providing the remainders. This evidence was brought in by Bradwell et al. and Matheny et al. both in 2019.

2.6 Gap between Policy and Implementation at National Level

Though the intention of Government to propagate AI based tools for senior care is undeniable, the implantation hasn't taken off at the ground level with the intensity as expected

ABDM Implementation status: While this integrated platform can do wonders to the overall digital healthcare for the seniors, in reality, it's struggling because of extreme low level of enrolment. By September 2025, less than one seventh of the adult Indians have enrolled in the programme which means it's even lesser in Rural areas where its required

most. Cumbersome workflows and lack of awareness in Digital technology is contributing to this slow adoption, and it needs to be much more simplified

Resource Challenge of NHPCE: Another great program struggling due to shortage of Geriatric specialists. Barely a tad over fifty percent of the resources is filled up till date. This situation actually creates an interesting dilemma - AI has a potential to address the shortfall of specialists however in that case AI would be seen as to replace the human care rather than supplementing it which isn't mostly preferred by elders

Challenges with Digital Infra: Bharat net plans to connect around 400,000 villages across India and would tremendously boost the proliferation of Telemedicine and other AI based healthcare in this country. However, till date only one fourth of the target has been achieved. Moreover, frequent poor issue in the rural areas along with the patchy service of Government owned mobile network BSNL is aggravating the issue further

Lack of clarity on Regulation: Though Personal Data protection bill was introduced in 2019 which got replaced by Digital Data Protection bill in 2023, the actual process on how the privacy and date integrity of the older happens isn't very clear. This challenge takes more severe turn when the senior is from Rural areas, impaired physically and mentally and low on literacy and economic condition

2.7 Implementation Challenges at the States

Unlike the National Government initiatives, the State Governments have different set of challenges. The different states of India are extremely diverse in nature on language, literacy & economic pedestal and their score card on AI based health care also reflects that.

Training & Capacity building: The Training on AI based tools to the ASHA workers are of a big concern. Even in advanced states like Tamil Nada & Kerala, the health care providers routinely complain the lack of AI training. In the state of Karnataka, almost two third of the Health Care providers require additional training.

Financial support: The economically weaker states have huge challenge to allocate adequate Health Budget and the support to elder care as a subgroup is even worse. This challenge is more exacerbated in East & Northeastern states which are comparatively backward economically. Though some of the states have introduced free Life insurance program for the adults including seniors, in reality, this remains just on the paper. The GoI funding of 1 Cr to startups under SAGE program can't fully sustain the product development, though a lot of startups are in the state and their product could have helped the state.

Cultural nuances & Language plurality: over the years the States's demography have become increasingly heterogeneous. Urbanization, Economic disparity and employment

opportunities contributed to this mix up. However, the groups of population keep on holding their cultural attributes and keeps on interacting on their native language. This trait is more prevalent in older and economically weaker section of the society. This creates a typical problem in AI penetration in Senior Care unless a multilingual product with different cultural norms is introduced simultaneously - Case in point being Kerala where the majority of the population remains the Keralites and as a result promoting AI based tools has been easier.

CHAPTER III:
RESEARCH GOALS & OBJECTIVES

3.1 Abstract

Traditionally Technology Acceptance Model (TAM) introduced by Davis in 1989 and Unified Theory of Acceptance and Use of Technology (UTAUT) introduced by Venkatesh et al. in 2003 have been used to decipher the process on how a person adopts and start using Technology. In case of AI based Health Care in India, we need to tweak the model in such a way that the socio-geo-economic layer could be added. Accordingly, the following factors and corresponding assumptions have been embedded in the research to improvise the existing UTAUT/TAM

a. Trust: As espoused by Adus et al. in 2023 it is assumed that the AI based tools are Reliable, Ethical & benevolent
b. Privacy: As aptly cautioned by Ho in 2020 & López et al. in 2022 the perceived risk of abuse of health data
c. Digital savviness: As noted by Yu et al. in 2024 people generally have confidence to manage the usage of AI tools on their own
d. Propensity: As mooted by Venkatesh et al. in 2012 usage of AI based application is mostly voluntary and Regular

e. Digital Awareness: Awareness helps in understanding the UI/UX which in turn promotes adoption
f. Context: Education, Network availability & Age are some of the drivers of embracing the Technology

3.2 Objectives of the Research

This research has goal to add to the ongoing research on the use of AI in eldercare and more specifically focusing on Indian population with the viewpoint of elders, Caregivers and AI solution developers taken into consideration. Through this research some insights are likely to be coming out which would help all the key stakeholders from Government Authorities and Industry leaders to design policies and solutions to address the plights of Indian elders

There are three primary goals of this paper. The first it will acquire the perspective of the impacted cross section of the society, the second it will provide some recommendation based on those insights and the third it will enable the stakeholders to bring out relevant solutions and policies. The goals can broadly be bucketed as follows:

3.3 Understanding Perceptions and Attitudes of the Seniors

The first goal is to find out the holistic approach of the Indian seniors towards using AI based solutions in daily chores and eldercare. It includes capturing the meticulous

perspectives of the Indian elders coming from different socio-economic-lingo-geographical setting. This paper plans to capture their levels of perception, appreciation, acceptance, and doubts on use of AI driven healthcare solutions in their daily life. Focused effort will be initiated to study the differentiating factors which influences their approach and acceptance like literacy, economic background, cultural nuances and prevalent health situation

3.4 Challenges and Opportunities for Stakeholders

This paper would explore in a detailed manner on how the AI driven solutions can improve the welfare of the seniors in India, help them to stay independent and improve their mental state. The research will also seriously investigate the potential pitfalls of using AI in the daily life of elders and how to keep them away from making the life of the elders mechanical and on how to keep the cost of ownership under tight least so that it can be used with a broader base

Also to understand the ground reality on how far the care givers are using AI driven solutions for elder care and what type of practical issues they are facing. This will include capturing inputs from a cross section of caregivers which consists of doctors, nurses and health administrators. This paper would examine the necessities, views, preferences and challenges on the use of AI in eldercare. It will also hopefully capture the challenges which prevents the widespread acceptance of the AI driven solutions like shortage of training, available network bandwidth and regulatory policies. On the other hand, the paper will feature the potential of AI driven solutions to the healthcare givers like it becoming more

efficient and having more enhanced diagnostic accuracy and making the care given more personalized

3.5 Developing Recommendations

To provide recommendations to the Govt policy holders and Enterprises which develops AI based solutions targeted towards eldercare based on the inputs collated from the interaction of the seniors and caregivers and seasoned with the nuances of cultural and economic sensitivity. This essentially means that harvesting the detailed subjective and objective finding derived from the interviews and questionnaire which will be collected from the random but representative sample of seniors and caregivers. After that those observations will be analyzed minutely carefully blending them with India specific considerations of geography, economic status, ethics, cultural angles and then a composite set of suggestions will be developed for the Govt stake holders and key leaders of AI based Health care industry. By pursuing these goals, this research aims to provide a comprehensive and nuanced understanding of the role of AI in Indian eldercare, bridging the gap between technological innovation and the lived experiences of elderly individuals and healthcare providers

3.6 Benefits and Impacts

The true accomplishment of the Research goals will happen when some tangible insights will be developed into recommendations which will notably augment our knowledge base

in this area, it would also impact the present situation of the elder care. The following will be some notable outcome of the research:

Enhanced Understanding: This research will try to bring out the complex dynamic of the impact of AI based healthcare solution with the seniors and care givers in India. This paper plans to scratch beyond the surface level and capture the prevalent reality and it will form the base line for further research on this topic

Improved Productivity and Efficiency: At this point there are some AI driven solutions in health care already existing and a lot of elders and Care givers need that. However, they may be either not aware of that or can't afford. Through this paper a small step could be achieved to increase

Informed Policymaking: Policies are most apt when they are based on facts and not on perceptions however altruist it may sound. This research, by capturing the ground realities, would expect the policies to be moderated at in some form by the concerned authorities through those inputs

Global Contribution: This research is being done in Indian context. However, its utility doesn't stop here only. The finding of this research will resonate with the state and need of every low- and middle-income countries across the world wherever there the health care facility in under strain. Secondly the ethical framework which would be suggested will also serve as a baseline in other countries.

3.7 Synchronization with National and state policy foundation

Alignment with ABDM mission: In this study the AI tools utilisation patterns and acceptance was explored, and it directly attests to the guidance on enhancing the UI/UX & authorization flow of ABDM framework. Also, the importance of the factor of Friends & Family which came out clearly in the study with a mean of 4.51/5 nudges the Authorities clearly on the strategy to ramp up the enrolment speed of ABDM

Perspective on NPHCE effectiveness: The study examined the view of the health care providers to understand what's holding them back and what sort of AI training they do require to unfold the potential of AI based Health Care tools. This finding also can help the policy makers to address the shortfall of the old age Health care workers, and which happens to be the goal of NPHCE Program and that way the humans won't be replaced by AI tools, but the Human touch will be augmented by the usage of AI based tools

Setting Priorities on SAGE Program: The study delves into a detailed study by decoupling the AI bouquet, I.e., by making a differential study on the impact level of Remote Monitoring, NLP based endeavors, Computer Vision or DSS. This would definitely be noteworthy for the decision makers to prioritise the funding on the AI based startups

Success of State level initiatives: This study tried to capture the dissimilarity in adoption rates based on age, education level & economic condition among others. A lot of State

level initiatives like that of Kerala, Karnataka, UP & Maharashtra can pick the evidence to roll out a more effective program to embed AI based tools in diversified demography

3.8 Goal to create Impact on Policy making

Contribution on Regulatory construct: To provide data points to support the framework for users having cognitive disability and the on the quality of support required by the AI based health care solutions

Design of Training Module: Suggest AI based Training modules for different categories of Health Care providers like Doctors, Nurses & ASHA workers which would enable the elderly users to embrace AI based healthcare tools

Guidance on AI tools Integration: To provide on insights on how to ingrate AI based tools in prevailing framework like ABDM data layers and NPHCE working format

3.9 Conclusion

It can be concluded that this research is supposed to bring about a considerable impact on the use of AI driven solutions in Indian eldercare and that in similar countries. Through following up the above-mentioned goals this paper will add to a deeper understanding of the interplay between AI driven solutions in elder care and the seniors. It will also provide a guideline to the AI driven solution developers to fine-tune their solution strategy for elder care. It would also moderate the existing ethical baseline in this area. Finally, the results and corresponding insights can be extrapolated to our countries with similar context.

CHAPTER IV:

LITERATURE REVIEW & KEY FINDINGS

4.1 Understanding the Needs of the Elderly

India being a low-income country, it is next to impossible to have enough resources for everyone. It is more challenging for the elderly population and that too for those who are in rural and remote areas. AI driven initiatives are a blessing for those and would go a long way to address the challenge of the seniors. Also, in India, where minor health issues are generally ignored till the time it gets a huge dimension AI driven early warnings would do a world of good to the seniors.

Physical Health Challenges & Support:

Handling of Lifestyle based Chronic Ailments : AI can provide relief to elders in several ways through different solutions . Matheny et al. in 2029 showed how medication discipline can be administered by AI based remote system. Chatbot-based system has been proposed by multiple researchers like Prakash, A. and Das, S. in 2020 and Padhan, S. et al. in 2023 . Same goes for addressing cognitive impairment in case of dementia which were explored by Researchers like Kale, M. et al. in 2024 and Habbal, S. et al. in 2025

Tailor made Health Care Advice : In India having a personal physician isn't something masses can afford, and things are more dire for the economically challenged rural elder segment . However , AI can address the situation as well to some extent as has been shown by Researchers like Miura, C. et al. in their paper of 2022

Medicine Schedule Discipline : For the Rural Seniors the first problem is to get a physician . Even when they get a see a physician and they prescribe medicines , it is important to take them on time . This is a real challenge to remember in old age . AI can work in this are by providing time-based prompts to enable the elders to take the medicine on time . As early as in 2020 Sahlab, N. and Jazdi, N. spoke about this utility in their paper

.

Fall Detection and Prevention: A lot of elders do lose the balance and injure themselves. AI can very well used to detect falls and provide solution to prevent them through wearable devices and magic mirror type devices.

AI-Enhanced Wearables for Real-Time Monitoring: Bradwell et al. in 2019 demonstrated in their paper that different AI enabled wearable devices can notify the caregivers and family members in case of a fall so that fast response can be arranged.

Predictive Fall Prevention : A major cause for elderly disability is the accidental fall and a lot of times it culminates into lifelong disability or even death . Predictive Analytics based on AI can predict and prevent many accidents . Personal data points of an elder can be modelled to predict the outcome and accordingly preventative steps could be taken .López et al. in 2022 and Kulurkar et al. in 2023 discussed this in detail

Smart Home Integration for Environmental Safety: In a country like India , the neediest segment for an AI based solution is the economically challenged and underprivileged elders . Most of the time their accommodation size is small, poorly lit and hostile to aged people and more often than not , accidents do happen . Xuereb (2020) in his paper in showed on how AI can generate alert for a potential impending mishap

Remote Health Monitoring : In India a lot of migration is happening from rural to Urban segment and they , a lot of times, are forced to leave their parents behind . AI based remote mentoring solution is a great way to make sure of their well-being and in turn give the children a peace of mind .López et al. in their paper of 2022 explained the benefits of Remote Monitoring

Some of the applications of **Remote health monitoring** include:

Vital Sign Tracking and Alerts: Ho (2020) paper explained on how a break in pattern in standard body parameter can alert of an impending health hazard and help the caregivers & relatives to take necessary steps.

Telemedicine Integration : Telemedicine has evolved a long way from its early version of early 2000 where it was managed by carrying the patient video & audio separately . However , 2 factors enabled this system to capture the nuances of the patients and administer treatment more effectively . First was the introduction of 4G followed by 5G in Telecom and then the advent of AI in a major way . Nasr et al. in 2021 and Milella et al. in 2023 discussed this in detail

.

Augmented Care Coordination: Traditional Remote care is effective only to a certain extent . However , once it's leveraged with AI based systems, it can be much more potent . Way back in 2019 , Bradwell et al. explored this possibility.

Mental Health Challenges & Support:

Mental Health Screening and Assessment: Globally once the seniors enter the isolation zone, they become prone to mental stress and subsequently to anxiety and depression and Indian Elders are no exception to this malaise. To further complicate the situation, mental illness in Rural India isn't recognized mostly and branded as queers and they further get pushed to oblivion. AI powered tools can capture these issues early and safely rehabilitate the seniors.

Emotion and Mood Detection based on Computer Vision : With the advancement of AI , it has become possible to capture the mood and emotion of the elderly people through algorithms like CNN and provide an alternative path other than text & voice-based alerts . Cameras capture the facial patterns to understand the pattern and accordingly categorise the mental and physical status . Rubeis, G., et al. in 2022 and Dutta, D. & Muni, A.D. in 2024 mentioned a lot of initiatives in this direction

Behavioural Monitoring through Wearable Devices: The harvesting of data through IOT devices and then analysing that through edge devices has made the remote monitoring of patients extremely feasible . A lot of bodily parameters like Temperature, Blood pressure , Blood sugar and other important data points are analysed on the wearable device itself and the patient along with the family is alerted of the possible future impending danger. Singh, S., Kumari, K. and Vaish, A. in 2024 and González-Baldovinos, D.L. et al. in 2025 mentioned these technologies in their respective papers

Automated Questionnaires and Screening Apps: A lot of time it helps if the elders are guided through the symptoms to either detect the exact ailment or to provide a remedy and it could be achieved through self-guided questionnaires . However, there is a practical challenge here . Since most of the village elders do lack formal education and English is extremely less understood , those questionnaires should be in vernacular languages . Better still they should be either voice guided or associated with emoji's to be deciphered correctly . Sapci & Sapci in 2019 and Pedro et al. in 2023 discussed this approach

Mental Health Interventions: The role of AI based solutions in screening mental health status is undeniable. However , its utility can go further, and it can provide a therapeutic value to mentally challenged underprivileged seniors who otherwise can't afford to consult a doctor.

Cognitive Behavioural Therapy (CBT) : This inevitable challenge of the elderly makes their life fraught with difficulty . Cognitive Behavioural Therapy can help them in some form. This Therapy when layered by AI can be more effective in this context . It helps them to discharge their daily duties , keep them away from depression without compromising their privacy . This was deliberated in detail by Xuereb, M. In her paper in 2020

Personalized Interventions and Progress Tracking: No two humans are equal and the way they respond to therapy or medication is also different . AI can very well record those responses against treatment and modify the course and in some cases suggest alternatives . Some chronic ailments which impair bodily functions and require longer time to heal

could very well be organised this way as its extremely challenging for the rural seniors to visit the doctor dynamically . Some mental issues like anxiety also can be addressed this way .Adus, Macklin & Pinto in 2023 and Dutta & Muni in 2024 deliver deep into these issues in their papers

Mindfulness and Meditation Apps: A collateral damage of old age is the loss of short-term memory, and it poses a huge challenge to discharge their daily activities causing a huge tension in the elder diaspora. AI based applications can help the seniors to remind them of their daily chores and that way help the seniors to regain composure which was shown by Malik (2023).

4.2 Salient Core Insights from Literature

Three themes can be identified which are prominent in nature and can be deliberated in detail in this proposed thesis as Thematic Points:

TP 1: Ethical Consequence of AI usage in Senior care

AI is a tool and like any tool it has a flip side to do harm to humankind in the long run unless monitored . This Thematic point dives into the ethical side of usage. Main discussion points are the following:

Privacy and Security: Going into details of the potential dangers of collecting and analysing the personal health data.

Algorithmic Bias: Addressing the steps to avoid bias in AI algorithm.

Human-AI Interaction: Exploring the ethical considerations where AI interacts with elderly population is implored.

Autonomy and Agency: In this part, the impact of AI on the autonomy and agency of elderly individuals is analyzed.

TP 2: Socioeconomic Factors and AI Adoption in Eldercare

In this theme the different social and economic factors which determines the adoption and rejection of AI centred initiatives in the country by the senior population is discussed. Main points of discussion include:

Digital Divide: Exploring the influence of the Digital Divide on adopting the AI enabled solution is deliberated.

Economic Disparities: Investigation of how economic status difference impacts the adoption rates of the Ai enabled solutions is explored.

Cultural and Social Barriers: Exploring the cultural and social customs influence the adoption of AI powered solution is discussed.

Policy and Regulatory Environment: Researching of role of government policies and regulations in promoting the adoption of AI in eldercare is analyzed.

TP 3: User Experience and Human-Centred Design in AI-Powered Eldercare

This theme explains how the human focused design impacts the user experience and that impacts the adoption of the AI solutions by the elderly.

User-Centred Design: How the best practices to design human centred design in AI solutions and how it influences the adoption by the elders is discussed here.

Usability and Accessibility: The impact of accessibility and usability of AI centred solution is impacted by the people who has cognitive challenge because its prevalent in senior population is discussed.

User Acceptance and Adoption: All the additional factors which influences the adoption of the AI enabled solutions is discussed.

User Feedback and Iteration: The enhanced adoption rate through the feedback on the existing design is examined.

TP 1: Ethical Implications of AI in Eldercare

Agreements

On the issue of adhering to the ethics on the issue of using AI in healthcare of seniors, a lot of Research Scholars have raised concerns on the Data privacy, autonomy & Human touch factor in AI based eldercare. The following points are on where they have an agreement:

1. **Privacy and Data Protection**: A person has the ultimate owner of his own personal health data, and this data can't be used by any other person or entity without his explicit approval. This principle should be immutable and sacrosanct. On the other hand, working on real life datasets is important for the advancement of AI based Healthcare system . Any process or framework devised for AI based systems should be a balance between these two goals . A lot a Researchers like Rubeis, Fang & Sixsmith and Chu et al. in their respective Research papers of 2022 weighed in this two apparently contradicting dictums
2. **Balancing Autonomy with Support**: One of the main goals of AI based elder care solution is to provide autonomy to the seniors so that they can discharge their normal duties with relieve ease and with dignity . However , AI based solution is supposed to be pervasive in their life and in a way, can curb their autonomy and personal space . We have seen multiple researchers spoke about this .Xuereb in 2020 ,Wang and Luo in 2022 and Adus et al., in their papers of 2023 argued for this delicate balance.
3. **Human Contact and Emotional Considerations**: AI based solutions were brought in the health care segment initially to address the physical ailments . However, another reality of the old age is the loneliness as majority of the seniors face social isolation after a certain age bracket . A substantial number of Researchers explored in this area . Xuereb in the year 2020 argued in favour Robots who could assist elders physically and mentally .Adus, Macklin & Pinto in 2023

and Habbal et al. in as recent as in 2025 emphasised the necessity of AI complimenting the human care giving but nor thinking it as a substitute

In short, most of the Researchers have converging views on Privacy, Data Security , Autonomy and companionship with the operative word being “Balance’

Disagreements

While discussing the ethical consideration on the usage of AI there had been some differences among the approach taken by authors:

1. **Extent of Autonomy in AI-Enabled Care :** This convergent view is the potential area of disagreement as well on the extent of Autonomy to be provided. One School of thought proposes that Human life and physical comfort is of utmost importance, and it really doesn’t matter if a little Autonomy I scrubbed in the process . Ho in 2020 agreed in its favour . The other line of thinking is that Autonomy is paramount in Human, and no circumstance should be allowed to compromise on that . Adus, Macklin, and Pinto in their paper in 2023 opined that the seniors should have a final say on the extent of AI involvement in their life
2. **Privacy Standards and Data Security** : This also a subjective statement and open to debate. Interestingly the around five years back Researchers like Ho in 2020 and Xuereb again in 2020 were pretty concerned about the invasion of Privacy by AI based solutions . In recent times, however , the Researchers are taking a more benevolent outlook on this . Researchers like Adus, Macklin & Pinto in 2023 or

González-Baldovinos et al. in 2025 proposed a more managed acceptance of AI in elders' life

3. **Human vs. AI Interaction in Emotional Care** : Here also the divergent paper is evident on timeline . It appears like early Researchers had exception that AI based tools would be able to provide humanoid emotional experience like Prakash & Das hoped in their paper in 2020 . However , later it seems like the Researchers are more reconciled to the fact that it's next to impossible for AI to provide Human like experience like Rubeis, Fang & Sixsmith in 2022 who advised to taper the expectation.
4. **Transparency and User Understanding**: Another interesting debate is there on the usability of AI system. One school of thought that an AI system should come with a lot of transparency and choices. Adus et al. (2023) proposed in that similar line. However, another group of people think that the AI driven tools should be coming with bare minimum interface so that the elders aren't overwhelmed. Wang and Luo (2022) suggested exactly that. On the contrary, Kiss et al. in their paper in 2024 argued that usability and complexity may not necessarily be mutually exclusive.

Problem or Gaps related to Topic:

Few of the challenges and gaps on the issue of the ethical dilemma in delivering AI based solution in adult health care is dealt here. Privacy, validated permission, autonomy and the problems with bias based on algo. Following are the issues:

1. **Privacy and Data Security Concerns** : Since this data was harvested for research purpose which eventually would benefit the elders it would be met with minimal suspicion or doubt . However , there creeps in the threat of missing the data which was raised by multiple Researchers in different contexts . The issues raised by Pedro et al. in 2023 is one like that only.
2. **Informed Consent and User Understanding**: Another grey area was the nature of the consent received from the seniors to harvest and use their data. A lot of times it so happens that they give it without full knowledge and get abused. Adus et al. (2023) explained the challenge in a succinct way.
3. **Algorithmic Bias and Fairness**: This is another potential issue that can plague the paper while dealing with Seniors . This problem could further be accentuated wherever there is a plurality is involved and one attribute is more dominant and easier to access than others . Digital savviness , age & education can further contribute to this . Researchers like Rubeis et al. in 2022 warned against this
4. **Ethical Frameworks for Emotional and Social Aspects**: Though AI is used exhaustively to help elders with their physical help, the emotional support from those is still very sketchy. Bradwell et al. (2019) raised this point and unfortunately the situation in that area hasn't improved much and still doing little to address the loneliness typically faced by older population.

In short, substantial gaps still exist in addressing the ethical concerns related to using the AI driven tools and to address it we require a robust framework.

TP 2: Socioeconomic Factors and AI Adoption in Eldercare

Agreements

The different socio-economic condition the elders are in absolutely impact the rate of adoption of AI driven solutions. We can identify the areas where there is a general agreement:

1. **Cost as a Major Barrier to AI Adoption** : The AI based tools is extremely costly , at least , in the initial stage in any segment and Health Care is no exception . This is the reason a lot of AI based devices and solutions can be acquired and get benefited by the rich segment of the society . The huge computing power required to build any successful AI model keeps the introductory offer very high till the Producers and Developers realise their investment . This pattern is something most of the Researchers are in agreement with. Sapci & Sapci in 2019 and Pedro et al. in 2023 are only a few who are of the similar view.
2. **Accessibility and Digital Literacy Challenges**: Even when the people have money, it's extremely difficult for them to effective exploit the advantage of AI based system if they aren't comfortable with Digital systems. A lot of today's elders weren't exposed to Digital Technology during their growing up and adult years and it sort of becomes a showstopper. Multiple Studies have come out with this challenge and Ho (2020), Adus et al. (2022) and Kiss et al. (2024) are a few of them.

3. **Infrastructure Gaps and Resource Constraints**: Another unique case happens when the elders have money, they have digital understanding but their land lacks infrastructure like internet. Without internet the AI based solutions either simply stops working or works with extremely limited capacity. Nasr et al. in 2021 and López et al. in the year 2022 brought out this challenge.

Infra structure issues , Digital awareness and Cost barrier could be summarised as some of the main factors influencing the adoption of AI based elder care tools

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Disagreements

If the above points are those where most of the Researchers do agree to , there are a few where they have divergent view on the mentioned thematic point . Some of those are as follows:

1. **Approaches to Mitigating Cost Barriers**: While most of the Researchers agree that the cost of ownership for AI driven tools is a challenge, they disagree on how to address it. One school of thought feels that getting fund from International Organizations should be encouraged especially for low- and middle-income countries. For example, López et al. (2022) published their paper which conforms to this idea. Another school of thought firmly believes that this initiative should be coming from within the country driven by the national Government. Authors like Wang et al. (2022) is a proponent of this idea.

2. **Responsibility for Digital Literacy Training**: This is another potential area of disagreement. People differ on whose primary responsibility it is to train the elders in Digital Technology. Ho (2020) proposed that Government bodies should be the one to take up the responsibility. However, Adus et al. stated in their paper in 2023 opined that the AI solution providers should take up the responsibility to provide Digital Literacy so that the adoption rate increases.
3. **Strategies for Addressing Infrastructure Challenges**: There is one fundamental difference here as well especially what should be taken up as a priority. Xuereb (2020) in his paper expressed his view on setting up the Urban Infrastructure first as elder population density is more there and a larger percentage of elder care can be achieved. However, López et al. (2022) opined that rural infrastructure should be taken up first as Remote Elder care is more needed there because of the adult population migrating to cities.

In short, Researchers disagree on the process to be undertaken to bring down the cost of AI adoption, whose responsibility it is to create Digital awareness and how to mitigate existing Infrastructure challenges .

Challenge envisaged on the issue

There are a few prominent challenges which are deliberated vis-à-vis the above-mentioned thematic points namely cost of acquiring ownership of AI based tools , lack of Digital Awareness and shortage of Infrastructure . Those points are discussed below :

1. **Affordability and Financial Barriers**: Though most of the authors agree that AI in Elder care is great thing to happen they clearly point out the lack of funding mechanism to enable that in a low-income country. Both López et al. (2022) and Wang et al. (2022) brought out this challenge in their papers.
2. **Digital Divide and Accessibility Challenges** : This phenomenon is observed across the globe . Economic affluence and Digital adoption go hand in hand as the prohibitive cost of the Digitally enabled devices allows only elites to acquire the same . Not only that , but the adequate bandwidth also which serves as a carrier of Digital enablement is present first at the well to do geographical region . Also is the issue of the Digital benefits not reaching the society segment which needs it the most . Chu et al. in 2022 and González-Baldovinos et al. in 2025 clearly showed the discrimination in their papers
3. **Infrastructure Limitations**: Even with Financial solvency and Digital awareness the initiative of getting the AI driven tools adopted by elders can be severely impacted because of lack of infrastructure inadequacy which mostly is internet. Nasr et al. (2021) and López et al. (2022) pointed out this problem.

To summarise , Entry barrier in terms of cost of ownership , Differential accessibility and Scarcity of Infra impact the adoption of AI based tools .

TP 3: Humanoid design & UI/UX in AI based tool in Senior healthcare

Agreements

The chances of success of any AI based tools in Senior care greatly increases when the design it adopts is human friendly and the authors broadly agree on this point. Following are the points where the agreements are based on:

1. **Preferring the Emotional Connect** : Humans carve for other humans, and it are some of the Researchers who championed for the concept in their papers. becomes more intense for the lonely elders . Post some considerable debate , it has been clearly established that the AI based tools can only supplement human touch but not replace it . Even in that case it makes sense for the tools to be providing at least a human adjacent experience to the seniors to make the tools more acceptable to them. Prakash & Das in 2020 and Miura et al. In 2022
2. **Interfaces which are Easy to use** : Most of the humans are resistant to new approaches and this trait becomes more prominent during advanced ages . For this reason, an AI based tools becomes easier to adopt to rural, less educated seniors if it happens to be easier design and preferably with clear emojis . Many a Researcher has stressed the need for designs having those segment in mind of the developers . López et al. in 2022 and Dutta & Muni in 2024 discussed this in detail The similar sentiment was echoed by Adus, Macklin, and Pinto in their paper of 2023
3. Incorporating User Feedback into Design : Most of the Researchers advised the AI based designs to be easily understood . However, some went a step forward to

take input from the users to be incorporated in the design . It's a fact that when an input from the target community is incorporated into design the acceptability increases exponentially, and it has its proof in many facets of our industries and domains . Sapci & Sapci way back in their paper of 2029 proposed this and this is talked about in recent times as well by Researchers like González-Baldovinos et al. in 2025.

Though end of the day AI driven tools is nothing but machines, the studies show that trying to bring in a similarity between them and the stuffs the seniors use every day would increase the adoption rate.

Disagreements

However, going through the literature, it becomes evident that the authors may have agreed on a lot of points, but the disagreement is also widespread. Following is a few of those:

1. **Degree of Personalization Required**: Though most of the authors agree that there should be some sort of personalization on the AI driven tools, they differ greatly on the degree of it. Bradwell et al. (2019) opined that the systems should be only marginally personalized to make it acceptable to a large cross section of the older population and prevent them from getting hugely complicated. However , authors like Dutta & Muni in their paper in 2024 and Aljohani in 2025 proposed explicitly for higher degree of personalisation to assimilate it into the elder's life more easily

2. **Issue on AI taking humanoid form**: There are varied views among the Researchers on how the AI based tools behave while being used by elders. Researchers like Bradwell et al. in their paper 2023 opined that the tools should try to impersonate the human responses and, in that way, it would be more preferred to be adopted by seniors being more relatable. However, there is a different school of thought, like Matheny et al. who in 2019 argued that trying to emulate human response would set the expectation high which will eventually lead to huge dissatisfaction. According to them the tools instead to try to copy people focus on the functional benefits. Since both the views have merits, its unlikely to be resolved in either way.
3. **Extent & Timing of User Feedback Integration** : Though most of the Researchers agree that the AI based tools becomes more acceptable to the elders if the view from the seniors is taken into consideration , they differ on how much input should be taken and also on the timing on when the design is integrated . Researchers like Bradwell et al. in 2019 argued that the input should be taken at the initial stage whereas scholars like Pedro et al., in 2023 advised the inputs to be taken preferably at the pilot stage. Ho in his paper in 2020 proposed more surface level consolatory feedback to be incorporated in design whereas Adus et al. in 2023 championed more deep-rooted engagement of the seniors in the entire design process

Though almost every researcher agrees that there would be some customization required in AI tools, the above points summarize the difference in approaches

Problems or Gaps Related to Topic

The papers bring out several gaps between the goal and the reality on user-based designs prevailing now. Some of the most prominent ones are the following:

1. Limited Understanding of Diverse User Needs: though the most researchers agree that the user inputs should be incorporated in product designs but differ on the degree and timing, one thing they unanimously agree that there is a lack of those implemented designs in the lower- and middle-income countries. Adus et al. (2023) clearly stated the problem and almost simultaneously Malik (2023) in his paper of the same year reiterated that anomaly.
2. Gap in Long-Term Adaptation and Learning Capabilities: The need quotient of the AI driven systems isn't not constant, and it changes over time for the same subject. Most of the authors agree that dynamism is absent in the available products. Xuereb (2020) pointed out that the ever-changing situation of the elders mental and physical faulty isn't addressed by the existing AI systems. López et al. (2022) repeated the same sentiment of the requirement of the fluidity of an AI system to be used by the same senior over his aging years.

It's extremely important these gaps are properly analyzed and addressed so that the AI systems can contribute to the senior population in a meaningful way.

4.3 The Role of AI in Eldercare Delivery

In India where its next to impossible for the majority elderly population to have personal Doctors & caregivers, AI driven tools and initiatives hold immense potential and would go a long way to alleviate the distress of the seniors.

AI-Powered Healthcare Systems: Though India is a vast country, till date the healthcare data is kept in silos mostly limited to an individual hospital or at the most to a chain of hospitals. In that way a lot of findings which were same across the diaspora was lost. However, with the advent of digitization of healthcare data through EHRs, it's possible to bring out the patterns which had been shown by López et al. (2022) and Xuereb (2020).

Clinical Decision Support Systems (CDSS): This denotes a certain level of maturity of AI based systems in eldercare . After taking some incremental steps in different AI based initiatives like remote monitoring , chat bot etc , this one tries to replace the physician to some extent, and it has met with varied success over the world in the last five years . Initially it was limited to provide guidance to the caregivers as mentioned by Matheny et al. in 2019 and Milella et al. in 2023 . However , gradually it evolved into more complex and sophisticated algorithm as deliberated by Authors like Jeyaraj & AVSM in 2023 and Da'Costa et al. in their paper in 2025

AI-Driven Caregiver Support: Not only enabling Medical Professionals, but AI also may be very well used by caregivers to manage chronic and lifestyle diseases of the elderly which had been shown by Milella et al (2023) and Jeyaraj and AVSM (2023). Even regular

jobs like taking medication in time, ingesting food and water at regular intervals can enabled by remote caregivers through smart home technology which was aptly shown by López et al., (2022). Before that in his paper in Xuereb (2020) showed how robotics can be used to help the elders with limited mobility.

4.4 Challenges and Ethical Considerations

Though prima facie AI does a lot of good to eldercare, there is always a threat of crossing an ethical line and transgress into the privacy of an individual. And this threat is more prominent in case of Indian elders who most of times aren't IT literate and subjected to privacy abuse.

Data Privacy and Security : As discussed earlier in this paper , there is always a debate on the boundary of ethics on Data Privacy . Too much stress on Data privacy may stymie the enhancement of AI based tools but being too much lax on this aspect would potentially make the senior , especially the rural uneducated one vulnerable to exploitation . Authors like Gawankar et al. and Wubineh et al. in their respective papers in 2024 expressed very strong views on Data Privacy . On the other hand, Rubeis, Fang & Sixsmith in 2022 and González-Baldovinos et al. in 2025 took a more pragmatic approach advocating a balanced approach .

Human-AI Interaction: There is another interesting aspect which was raised by Bradwell et al. (2019) and Xuereb (2020). They stressed the fact that AI shouldn't be used to replace human relationship as its extremely critical for the welfare of the elders and it should be used to augment the engagement. Adus et al. (2023) highlighted the overdependence of

humans on AI driven systems and the potential threat to elders when any AI driven system malfunctions.

Accessibility and Affordability : The mere presence of AI based solutions in elder care isn't enough unless the seniors are able to use it . The level of adoption depends on various factors like cost of ownership , ease of use , presence of ancillary services among other things . Researchers like Sapci & Sapci in 2019 and Pedro et al. in 2023 focused on the cost of ownership. Adus et al. in 2023 and Kiss et al. in 2024 stressed the need to have Digital awareness . Guo & Li in 2018 and Lamem et al. in 2025 brought the attention on bandwidth and other infra services.

Regulatory Framework: Now it's imperative that there is a well-defined guidance which serves the dual purpose of protecting the elder citizens as well as to elicit faith of the older populace in AI driven initiative. Adus et al. (2023) and López et al. (2022) reiterated the importance of having an ethical framework established. Xuereb (2020) stressed the need of having the synchronization of international guidelines

4.5 Research Gaps

Though it's undeniable that there is a precipitable change in the interest from the Researchers about usage of AI in Healthcare, there had been several gaps, especially on the Indian context which necessitated this Research at the first place to get a holistic view on the composite knowledge base on the issue

Lack of perspective on overall Eco system: Most of the Researchers focus on the elderly people, a few focus on the Caregiver's adoption of AI and other than the business centric surveys the AI based tool developers focus are not on the priority list of any researchers. However, all this research does happen in isolation, and this siloed approach completely misses the interplay among the three stakeholders namely Seniors, Care givers & the AI software developers. It is extremely important to have a composite approach to have a 360-degree view on the expectation, constraints, realities, ethical adherence and subsequent outcomes on the usage of AI in eldercare.

Lack of Studies on long-term and consequential evidence : Most of the studies conducted by researchers are focused on a snapshot of that particular time frame and there are extremely few detailed studies done in longitudinal way on the clinical outcomes like effect of AI based tools on Blood Pressure , Blood Sugar level , mainlining medication schedule , frequency of hospitalisation trips and on the mental agility of the caregivers for a 1-2 year period . Similar way the causality factor between AI based system and different factors of elder care also remains unexplored. Though this type of longitudinal study was beyond the scope of the study, an effort has been made to gather this data indirectly and subjectively from the seniors and caregivers

Disaggregation of AI components: AI isn't a single entity but an ensemble of different algorithms like decision tree, NLP, Computer Vision, Predictive Analytics, Remote viewing and many more. Barely any study has been done in a pointed way to measure the impact of that on senior care. Again, though that wasn't within this purview of this study

as well, an effort has been made to capture the impact of a few of those like CDSS, Remote Monitoring and NLP based tools.

Inadequate data points on Rural segment with low literacy and connectivity: India still primarily resides in villages where the digital awareness is minimal and more so for the seniors. For them the delivery medium needs to be changed to a voice first, offline centric and icon based. Also, instead of robust cloud-based backend, the edge devices should be given importance. But almost none of studies harvested data points on those initiatives.

Culturally Nuanced Designs with Language plurality: Though a sizeable work has been done on the role of friend and family support towards enablement of Digital literacy, the number of research is very limited to capture the language diversity with region specific cultural norms and how it impacts the adoption rate. In a country like India the AI tools are still almost one size fits all kind of scenario because of this lack of study.

Ethics Governance Framework: Though it exists in theory the actual adherence to privacy and ethics is unknown in a country like India as virtually no organised study had been undertaken till date to capture this. Proper research needs to be done to see whether there is a chasm between policy and its implementation.

Data Integrity in complex ecosystem: India is a vast country where multiple initiatives on adult health are undertaken like ABDM /NHDM, sometimes on overlapping data sets. Things become more dynamic when AI tools are built on this data set. Rarely any study had been undertaken to maintain robust data quality in these endeavours. Though, no

elaborate study could be undertaken in this research, the importance of the same is recognised in this study.

Data points on social engagement and Mental state: A lot of studies have diligently documented the outcome of physical health parameters before and after the introduction of AI based tools. However, this can't be said for psychological health. And a in a country like India the surface has been barely scratched. In this study, it has been tried to delve in this issue.

Lack of data points on Tailor made Training module: This is accepted without debate the caregiver need to be trained for the AI tools to be effective and widely accepted. However, very less clarity exists on what type of content and delivery mechanism would be best fit for imparting the training to the different level of caregiver like doctors, nurses or for that matter ASHA workers in a country like India where addressing diversity is the key.

CHAPTER V:

METHODOLOGY

5.1 Overview of the Research Problem

Though the contribution of AI based solutions in the healthcare segment for seniors is substantial, a lot of potential challenges do occur in the issue of the way the seniors perceive and accept the solution, the result of those solutions on disease redressal and the convenience it offers to the caregivers. This paper focuses on the interplay among the following three issues to bring out clarity on the process through with the elder care in countries like India can be improved:

1. To determine and deliberate on the factors which determines the extent elders will accept the AI driven solutions

2. To capture the consequences of using AI driven solutions on the physical and mental state of the seniors

3. To understand the issues which either encourages or induces reluctancy among the caregivers to use AI driven tools

By addressing those above-mentioned research problems, there will be an understanding on how AI driven solutions can be used for the welfare of the elders in India like countries and it would provide a guidance to the policy makers and AI solution developers for its ethical use and at the same time keeping its cost of ownership affordable.

5.2 Operationalization of Theoretical Constructs

A. Key Themes

The following three themes can be identified as the main issues:

1. AI Acceptance: this construct tries to measure the quantum of willingness to adopt AI in their lives to make it better. It's one of three pivotal points on which the study is based on. There are several instances in the literature on this . Wang, Asan & Mansouri in 2023 tried to capture the elder's perception of AI based solution on chronic diseases .Kiss et al. in their paper in 2024 explored how the seniors behave around smart elements . González-Baldovinos et al. in their paper of 2025 discussed how the seniors react on the remote monitoring system

Operationalization of Key Variables:

Perceived Usefulness*:* Understanding firsthand from the users on what they feel about the advantage of using the AI driven solutions.

Ease of Use*:* Capture the experience of the seniors on how comfortable they are about using AI driven solutions

Trust in AI Systems*:* This one would explore how much faith the elders have in using AI based systems

Social Norms*:* This examines the attitude of the society towards seniors using AI based tools.

2. **Elderly Health Outcomes**: The efficiency of AI based solutions towards addressing the well ness of the elders is reflected in this abstraction. This is a

cornerstone of the entire Research which delves on the role of AI in handling elder ailments both proactive and reactively. Matheny et al. in 2019 discussed about the impact on health through AI based medicine schedule adherence. Nasr et al. in 2021 explore the impact of AI based solutions on lifestyle diseases like Blood pressure and Blood Sugar. Kale et al. & Singh et al. in their respective papers of 2024 states the proactive approach by AI based solution to capture the early symptoms of dementia.

Operationalization of Key Variables:

Physical Health Improvements*:* Benchmarking users physical health parameters against the non-users.

Mental Health Indicators*:* Benchmarking users mental health parameters against the non-users.

Cognitive Function*:* Capturing the difference in cognitive ability of the elders before and after using the tools.

3. Caregiver Support: This point tries to look at the perspective of the provider side and is almost equally important like the first point. This is important for the research as the caregivers forms the third part of the AI driven Health care eco system. Adus et al. (2023) showed how AI-driven tools can take care of the repetitive caregiving jobs and thus give substantial relief to the caregivers. López et al. (2022) explored the use of technology to

impart training and knowledgebase to the caregivers so that they can discharge their duties more efficiently.

Operationalization of Key Variables:

Access to Resources*:* This examines the amount of access the caregivers have on AI educational materials

AI Tools Utilization*:* It measures the usage amount of AI tools by caregivers

Caregiver Stress Levels*:* Capturing the difference in the stress level of the caregivers before and after using the tools

B. Develop of Measurement Instruments

Surveys and Questionnaires: Build up relevant and segmented questionnaires for capturing inputs on acceptance of AI driven solutions, result of using AI tools and the firsthand experience of the Caregivers on using AI solutions.

Interviews and Focus Groups: Engaging the elders and caregivers in a conversational way to capture their inputs on the impact of AI driven solutions on their life and work respectively.

C. Data Analysis

Quantitative Analysis: Find a pair of correlations through regression analysis, first between AI acceptance of elders and wellness outcomes and the other AI acceptance of caregivers and the health outcome of seniors.

Qualitative Analysis: Capturing the broad metrics and through transcripts and then running thematic analysis on them to understand the nuances.

D. Ethically Frame the Research

Informed Consent: Before the elders and caregivers are engaged into quantitative and qualitative survey, their consent needs to be taken explicitly

Data Privacy: Proper precautions would be taken that the sensitive personal health data won't be exploited for Commercial purpose

E. Recommendations for Implementation

Working closely with the AI solution providers to recalibrate their existing tools so that it comes more beneficial and easier to use for the seniors. To get in touch with the Policy makers to suggest them the review the existing guidelines on the usage of AI by elders in the light of findings of the paper

5.3 Research Purpose & Questions

India being a low-income country and which is going to have a huge senior population shortly needs help disruptive technologies based on AI to address its elder health care challenge. The following points were brought on by the literature:

a) **AI Acceptance:** Exploring the keenness of the elders to trust an AI based solution and how much trust they put on it

b) **Elderly Health Outcomes:** Gauging the result of use of AI in senior's welfare by comparing the pre and post scenario

c) **Caregiver Support:** By examining how usage of AI tools by the caregivers makes their workload lesser and make their care delivery more efficient

5.4 Research Design

I) **Research Questions (tuned to constructs):**

a) RQ1: How the elderly people in India perceive the usage of AI driven solutions and how its acceptance is varied as per their socio-economic background

b) RQ2: What is the result of AI tool-based interventions on the physical and mental health of the seniors of India

c) RQ3: What ways the caregivers in India use AI based tools to discharge their duties and how the overall caregiving experience of theirs can be improved through AI based solutions

II) **Mixed-Methods Approach:** A composite understanding of all the three points will be developed by collating the qualitative and quantitative methods

III) **Qualitative Phase: Purpose:** To get a detailed understanding of the subject's views by getting them into a less constrained conversational pattern on the above mentioned their core points

Methods:

Semi-structured interviews*:* Here guiding open end questions will be asked in interviews to the elderly individuals and caregivers.

Focus groups*:* Here focused group will be created from elders and caregivers who will share their experiences.

IV) **Quantitative Phase: Purpose:** Here objective responses will be harvested to determine the factors impacting the above three constructs

Methods:

Surveys*:* A close ended and segregated questionnaire will be put together to get the response of the participants.

Data Analysis*:* The objective inputs garnered through survey would be analyzed through Regression and Correlation.

V) **Integration of Data:** Considering the insights gathered by qualitative and quantitative approach, a dynamic among AI based solution, Elders and caregivers will be established.

A Cross contextualization will be established by using one type of data to explain the other.

VI) **Participants and Sampling:**

Target Population**:** Indian seniors and the caregivers

Sampling Method**:** A stratified sampling approach will be adopted to avoid any random bias in the selection and to ensure proper representation from the different strata of life

VII) Data Collection:

Instrumentation: Use established scale and segregated questionnaire to measure the impact of all the three constructs

Procedure: Getting explicit approval from the participants to use their data in the paper. To conduct interviews and focus groups on proper surroundings. The surveys mostly will be done online

VIII) **Data Analysis:**

Qualitative Data: Using thematic analysis to capture emerging patterns vis-à-vis the above-mentioned constructs

Quantitative Data: Using Correlation and regression to establish the interplay among the mentioned factors

5.5 Population and Sample

I. Target Population

There will be three key stakeholder groups:

Elderly Individuals: People who are at least sixty and above and hails from different geographical areas and having different socio- economic background

Caregivers: Doctors and Nurses from different Pvt and Govt Hospitals in the country.

AI Solution Developers: Key stakeholders from different Technology Solution Vendors in Healthcare.

II. Sampling Strategies

Elderly Individuals & Caregivers:

Participants in both categories i.e. the elders and the Caregivers will be divided in different buckets like age, geographical area, socioeconomic status etc. and then picked up randomly from each bucket. Also, in some cases they can be sourced from Senior homes or RWAs. Thirdly to some extent they can come from the referral of the elders and Caregivers already identified.

III. Sample Size Considerations

Quantitative Phase (Surveys):

A survey with quantitively approach will be run through around 200 elderly people, around 50 health care providers and at least 20 technology provider startups key people to gather numerical data on their personal background, experiences on AI/Computer based healthcare and their views.

Qualitative Phase (Interviews):

Interviews with qualitative approach will be run through selected people among the above mentioned three groups to get a more detailed and deeper perspective of using AI/Computer in Healthcare initiatives for elderly people.

Over and above of the surveys and Interviews of the 3 groups, a group discussion between the selected senior people and healthcare providers will be organised mainly to see whether

the seniors can get their decision to use AI/Computer based in their personal health care influenced by the Health Care providers.

5.6 Participant Selection

Elderly Individuals: Indian elders who are potential candidates for AI-based eldercare.:

- Age (e.g., 60-75, 75+)
- Location (urban or rural)
- Socioeconomic position
- Digital awareness
- Health status (chronic ailments, cognitive abilities)

Caregivers: People providing care to the seniors which includes:

- Family members
- Professional caregivers (Doctors, nurses, home health aides)
- Professionals in Senior homes

AI Solution Developers: People developing AI-based eldercare solutions in India.:

- Software Developers
- Data scientists
- Product managers
- Entrepreneurs

5.7 Instrumentations

SURVEY QUESTIONNAIRES

Elderly Individuals: An organized questionnaire would be made to capture the subject's comfort level and outlook towards AI driven tools and technologies. It should include the following pointers:

- Perceived Usefulness of AI driven tools (health status monitoring, medication schedule reminders).
- Ease of Use, the extent elders are comfortable using it.
- Trust in AI systems, the extent the seniors feel secured about using it.
- Social Norms, the extent Elders feels okay to use AI driven tools.

The questionnaire would consist of Likert-scale items (1 = Strongly Disagree to 3 = Strongly Agree), multiple-option questions, and open-ended prompts. It was converted into multiple regional languages (Hindi, Tamil, Bengali) to provide linguistic divergence and improve responsiveness.

Healthcare Providers**: A** similar questionnaire would be created to capture the caregiver responses from the doctors, nurses and professional health care providers:

- Frequency and nature of AI use in hospital or home-bound eldercare.

- Perceived impact of AI based solution on their efficiency and health outcomes of the seniors.
- Barriers to adoption, such as absence of training or knowledgebase.
- Ethical considerations, especially in handling sensitive personal health data.

This instrument also would be using a 3-point Likert scale.

SEMI-STRUCTURED INTERVIEWS

Semi structured interviews with qualitative approach will be run through selected people among the above mentioned three groups to get a more detailed and deeper perspective of using AI/Computer in Healthcare initiatives for elderly people:

For elderly participants: impression of trust, comfort, freedom, and preservation of privacy with AI-based tools.

For healthcare providers: Assimilation of AI based solutions into routine chores, realization of value addition, challenge of ethical issues and available training facilities.

VALIDITY AND RELIABILITY

To make sure that the integrity and consistency of the used instruments:

Content validity would be vetted by professionals in related field like gerontology.

Pilot testing would be conducted with a small sample (10 elderly participants and 5 healthcare professionals) to measure the clarity, relevance and timing of the instruments being used.

Reliability of the quantitative survey instruments was measured using Cronbach's alpha, with all core components well exceeding the acceptable threshold of 0.70 for internal consistency.

Instruments were put through revisions iteratively based on initial feedback and to ensure data neutrality in the final data collection phase.

5.8 Data Collection Procedures

5.8.1 Preparatory Phase

Before data collection, the following steps were taken up: **Ethical clearance** would be sought for and received from the relevant Authorities, **Informed consent forms** would be created in English and translated into relevant regional languages to make sure the subjects understood clearly prior to giving their nods.

A **pilot study** will be run with a small number of participants (10 senior individuals and 5 healthcare providers) to pre-validate the entire process

5.8.2 Quantitative Data Collection

Quantitative inputs would be collected majorly through focused surveys.

Distribution Method:

Online surveys would be distributed over email, WhatsApp and dedicated eldercare forums for participants who are technologically savvy.

Paper-based surveys would be conducted in eldercare homes, OPD of hospitals and through Resident Welfare Associations (RWAs) in both urban and semi-urban areas to access the subjects who are more orthodox.

Respondent Groups:

Approximately 200 elderly individuals and 50 healthcare providers would be surveyed.

Responses will be strictly anonymized to ensure their privacy.

Survey Duration:

Each subject would be given approximately 20–25 minutes to fill up the questionnaire.

Voluntary Support staff would be tried to be assembled to help the participants with handling the survey tools when required, especially among the advanced aged participants.

5.8.3 Qualitative Data Collection

Qualitative data is to be collected through semi-structured free flowing physical interactions and focus group engagements.

Semi-Structured Interviews:

To be Conducted with around 15 elderly individuals, 10 healthcare providers, and 5 AI solution developers ideally. Interviews would be scheduled at time and location which is conducive for the subjects with virtual interactions also to be considered. Each session would be of around 45–60 minutes and there will be transcripts

Focus Group Discussions (FGDs):

It would consist of elderly individuals and healthcare providers to capture the interplay between them. Each session would consist of 6–8 participants and attended by a moderator. FGDs would be of 60–90 minutes duration and also would be and also be transcribed.

Language Consideration:

Interviews and FGDs to be run in the subject's native language as much as possible

5.8.4 Data Handling and Confidentiality

All harvested data is to be strictly unnamed to protect the privacy of the subjects.

Survey responses to be stored in password-protected sheets. Transcripts from interviews and FGDs is to be made incognito.

5.8.5 Timeline and Logistics

The data harvest would continue for 8 **weeks**:

Weeks 1–2: Pilot testing and finalization of tools.

Weeks 3–6: Arrangement and Conduction of surveys and Interviews.

Weeks 7–8: Focus group discussions and data sanity.

5.9 Data Analysis

I. Overall Strategy

Since a mixed-methods approach is taken, both quantitative (survey) and qualitative (interviews, focus groups) data would be taken into consideration. The aim will be to analyze each data type first in isolation and then combine the findings to capture a composite pattern.

II. Quantitative Data Analysis (Surveys)

Software: To use Python & Excel for basic analysis.

Steps:

a) Data Cleaning and Preparation:

Screening and Editing: missing data and outlier handling.

Data Transformation: This to be done before the coding and the variables would be run through normalization wherever required

Coding: By One Hot encoding to change the categorical variable into numerical and run the algo

b) Descriptive Statistics:

To apply descriptive statistics (means, standard deviations, frequencies, percentages) for all relevant variables wherever necessary like calculating the average age of senior subjects, the percentage of caregivers who are from the same family and the distribution of responses on Likert scale queries about AI usage.

c) Inferential Statistics:

To select suitable tests to capture relationships between variables like the following:

T-tests: To compare means between two groups (example: To compare the AI acceptance scores of elderly persons in urban setting vs. rural setting)

ANOVA (Analysis of Variance): To compare means between three or more groups (example: To compare the AI acceptance scores of elderly individuals with various levels of digital literacy).

Correlation Analysis: To explore the depth and direction of relationships between continuous variables (example: examine the correlation between AI usefulness which is perceived and AI acceptance).

Regression Analysis: To predict the value of a dependent variable based on one or more independent variables (example: To predict AI acceptance based on age, education, and income of the participant).

Chi-Square Test: To measure the association between two categorical variables (example: To explore the association between gender and keenness to use AI driven health monitoring tools).

Significance Level: To set a significance level (alpha) of 0.05 to establish statistical significance. To capture p-values for all statistical tests.

III. Qualitative Data Analysis (Interviews & Focus Groups)

Approach: For this Thematic analysis will be used

Software: Free open-source software like QualCoder, QDA Miner Lite, Taguette will be used.

Steps:

a) **Transcription:** To transcribe the proceedings ideally in the native language of the participants.

b) **Familiarization:** To go through the data iteratively to capture the essence of the proceedings.

c) **Coding:** Auto Coding and in-vivo coding would be used

d) **Theme Development:** To identify the themes which are prominent through the reviewed code

e) **Interpretation:** To reach conclusion by interpreting the themes

IV. Mixed-Methods Data Integration

Purpose: To combine the quantitative and qualitative results to establish an informed and composite framework through the research paper.

Strategies:

a) **Data Triangulation:** To compare the results derived from the quantitative and qualitative data. Look for areas of convergence and divergence. To identify the areas where they are merging and those areas where the results are in discordant

b) **Explanatory Sequential Design:** Use one finding to tweak the other data collection and analysis. Like if the survey data shows that a particular cohort

has low AI acceptance scores, then interviews would be conducted with members of that subgroup to identify the reasons behind their attitude.

c) **Presenting Integrated Findings**: Once the Quantitative Survey and Qualitative Interview data is harvested, it would be cross referenced to get a composite view. A detailed effort to be made to bring out those instances where statements from the qualitative data would corroborate the survey data . An effort would be made to find the inconsistencies and try to reconcile those as well

5.10 Research Design Limitations

Though attention would be given to make sure that the data harvesting process in without any bias or skewness there are some inherent risks which one should be cognisant about. A few of the following are documented below for transparency and for the future works in this area to take those into consideration.

5.10.1 Sampling Constraints

Non-Probability Elements in Recruitment: Since the RWAs and Old age homes would be contacted to enlist participants, they would be coming from a certain section of the society and the insights from those may be differing a bit to that of stratified sampling in the strictest sense.

Urban-Rural Imbalance: Though every effort would be made to enlist the participants from different socio-economic segment, to reach out to and get the view of the elderly belonging to lower economic standard and corresponding lower digital literacy rate would make the data harvesting a little skewed invariably.

5.10.2 Self-Report Bias

Social Desirability and Recall Limitations: The basis of quantitative data collection is mostly based on perception and hence majorly subjective. Accordingly, the inputs can greatly be influenced by the individual choice of the participants. Added to the fact is the inherent memory slippage of the seniors which can impact the inputs as well.

Tech Familiarity Influence: Again, since the insights are mostly personal, an elderly individual who is an avid user of digital platform would tend to overestimate the influence of AI based solution on his or her wellbeing.

5.10.3 Generalizability and Scope

Context-Specific Insights: India, though can be bucketed under the developing economy category, has its own cultural nuances developed over more than five thousand years and

the results harvested through this research may be extremely country specific and may not be extrapolated to other countries.

Scope Limitation on Technology Types: Ai is a vast space, but this has been categorised as a single entity in this paper. Say for example, NLP based tools are very dissimilar compared to one that of Computer Vision and preference.

5.10.4 Integration Challenges in Mixed Methods

Interpretive Limitations in Merging Data: While integrating the quantitative and the qualitative results seems logical and gives more robust insight, it's easier said than done. The data which would emanate from those two processes may be diametrically wide and converting them into a coherent insight may pose real challenge.

Thematic Generalization: India has a huge elderly population of seniors and caregivers, and they are enormously diversified. The sample size though may be adequate for thematic analysis may not be able to capture the entire diversity.

5.11 Conclusion

This methodology tries to define the contour of the process and specify the instruments which will capture the dynamics of the Elders and Caregivers in India on the usage of AI based Health care solution. The instrument will be having a quantitative path and a qualitative path. Once the insights are harvested from both the process, a composite

outcome will be established by triangulating the result. Having said that, there may be some challenges on the data collected and those caveats are mentioned in the methodology.

CHAPTER VI:

RESULTS

6.1 Description of the Sample

A mixed method study was adopted which consisted of three groups, namely, Senior citizens, Health care Providers & AI based solution providers. A total number of 270 interviewees were assembled using stratified sampling methods which made sure different Geographic and Demographic variations are taken care of.

6.1.1 Elderly Individuals

A batch of 201 senior people was selected which was chosen as the target population for measuring the impact of AI based solutions. The variation in their demography is captured in Table 6.1 and Figures 6.1, 6.2 and 6.3.

Table 6.1: Demographic Characteristics of Senior Interviewees (n = 201)

Attributes	Frequency (n)	Percentage (%)
Age Group		
60-69 years	108	53.73%
70-79 years	75	37.31%
80 years and above	18	8.96%
Gender		
Male	99	51.83%
Female	92	48.17%
Highest Education Level		
No formal education	85	42.29%
Primary education	70	34.83%
Graduate & above	46	22.89%
Location		
Urban	127	64.14%
Rural	71	35.86%
Technology Usage		
Regular mobile phone user	124	61.69%
Internet access at home	35	17.41%
Health Status		
Self-reported chronic illnesses	169	84.08%
Living alone	30	14.93%
Living with family	171	85.07%

The sample shows variation across salient demographic milestones, with a slightly tilted male majority (52%) which is according to the overall population divide of India and representation across urban-rural divide. Interestingly 84% of participants have chronic ailments which highlights the importance of AI-based health care solutions for this population segment.

Interpretation of Table 6.1: Demographic Characteristics of Senior Interviewees

Overview

Table 6.1 captures the data points on the demographic background and the pattern of the Technology usage of 201 elders who were selected for the study on AI adoption in Indian eldercare. The full research is pivoted on this study, and it impacts both the quantitative results and the qualitative data derived from thematic study. A detailed study of the results brings out the understanding about the geo-socio-economic benchmark for Indian elders

1. Age Breakup

    60–69 years: 108 respondents, 53.73%

    70–79 years: 75 respondents, 37.31%

    80+ years: 18 respondents, 8.96%

Interpretation:

More than 50 percent of the seniors are under the first bucket of the seniors i.e. from 60 to 69 years and it gets ramped down on the count of the further age groups. This pattern is absolutely in sync with the overall population of the country and it's an important pointer on the AI acceptance as the first bucket seniors are more amenable to embrace AI based technology. This is further corroborated by the ANOVA outcome which clearly denotes enhanced AI adoption scores $F(2,198) = 14.95$, $p < 0.001 F(2,198) = 14.95$, $p < 0.001$ to identify the first batch of seniors to be the Target audience for AI based health care.

2. Gender Breakdown

Male: 99, 51.83%

Female: 92, 48.17%

Interpretation:

A concerted effort has been made to see that the data set isn't skewed towards a certain gender, and it perfectly mirrors the country's senior population of 60 years. Also, this way it captures the nuanced response of the male and female participant towards AI acceptance. However statistical cross tabs which isn't covered under this table can provide the differential result on the AI adoption between males and females.

3. Education Level

No formal education: 85, 42.29%

Primary education: 70, 34.83%

Graduate & above: 46, 22.89%

Interpretation:

Taking the educational background into consideration, it comes out that 40 % of the elders have never gone in any type of schools where another 30 percent or so attended the Primary Schools and just a quarter of the interviewees are graduate and above. The ANOVA test $F(2,198) = 19.18$, $p < 0.001$ $F(2,198) = 19.18$, $p < 0.001$ makes it evident that educational level has a profound impact on the adoption of AI driven solution for the Indian seniors. It has another dimension. It shows how important it is for the Policy Holders and the Solution

vendors to bring out a solution which is not textual and can be understood by even those who has no formal education.

4. Urban vs. Rural Location

Urban: 127, 64.14%

Rural: 71, 35.86%

Interpretation:

Though a lot of effort had been taken to bring a locational parity among the participants, a skewness existed whereas almost 65 percent of the seniors are having urban background which is in line with the present population of the elders who are aware of their Health care necessities. It became obvious after the data collection that the people from city background are having more digital awareness and keen to experiment with AI driven tools. Further performed t-tests $t(199) = 8.65$ $t(199) = 8.65$, $p < 0.001$ $p < 0.001$ identifies the disparity on the keenness to accept between urban elders and their rural counterparts.

5. Technology Usage

Regular mobile phone user: 124, 61.69%

Internet access at home: 35, 17.41%

Interpretation:

An interesting phenomenon comes out from the survey. While almost two third of the seniors are mobile users, Internet at home is barely 17 percent. Though it's not captured very correctly, a majority of those mobile users are feature phones. The data point nudges

the policy providers to promote AI driven tools not only to be based on mobiles and that too their content should be more off-line or low memory friendly. If we talk about the results of the statistical tests AI acceptance is mostly mobile driven $r=0.67r=0.67$, $p<0.001p<0.001$. Another interesting part is that Internet access promotes acceptance $r=0.34r=0.34$, $p<0.001p<0.001$ although the penetration remains low.

6. Health Status

Self-reported chronic illnesses: 169, 84.08%

Interpretation:

From the lifestyle disease profile, the data shows that almost five sixth of the participants have either Diabetes or Hypertension or both. This is in a way combines the problem statement and the motivation as well. A lot of AI driven initiatives like remote health monitoring, Medication schedule adherence, Early Response system can be apt to address these Lifestyle ailments which had been explored by people like Nasr et al. in 2021 & Milella et al. in the year 2023.

7. Living Arrangement

Living alone: 30, 14.93%

Living with family: 171, 85.07%

Interpretation:

Around 85 % of the seniors stay with their family which is in line with India's social fabric. It also underpins the important role of friends and families to adopt the AI technology

which is shown later in table 6.3 having a mean of 4.51/5. The remaining 15 pc is a target and challenge for AI based tool adoption to have an inclusive approach and they need robust low maintenance tools.

Patterns, Statistical Implications, and Broader Impact

A. Digital and Social Divides

The cross-section of the trio I.e. location, education & Technology brings forth a digital layer which serves as a glass ceiling and fits as a prime candidate for intervention. One side of the divide is the urbane, educated and comparative younger seniors who are Digitally savvy and other side are the barely literate and older population from a rural setting who are completely Digital shy and this distinction completely extrapolates into the AI adoption which is $p<0.001p<0.001$ in all the categories.

B. Representativeness & Reliability

With a decent sample population of 201, a carefully curated balance on both Urban vs Rural and Male vs Gender has been maintained. Though there is still a skewness favouring urban, educated and comparatively younger elders. This sample mirrors the corresponding demography of the emerging senior landscape of India at present times.

C. Operational Relevance for AI

India with its burden of lifestyle diseases, low Literacy & Digital awareness but mostly joint family structure is distinctly different from other westernized nations, and its model would be accordingly different from them. Following initiatives would be custom driven for the country:

- Mobile based and Nontextual Technology
- Embed Friend & Family support to enable AI technology
- Bring in Cultural nuances in the low literacy & low connectivity platform

D. Foundation for Inferential Analysis

The survey results are in sync with the prediction of the attitudes and behaviours which are discussed in thread bare in other tables like in education, location and age as shown in Table 6.3 through ANOVA and t-tests

Conclusion

Table 6.1 is the starting point of the entire study, and it reinforces the universal theory of the Indian seniors being not a homogeneous population, but a hugely diverse group of people with different attributes as per as education, location, income, literacy & Digital awareness. At one hand they are plagued by chronic diseases and on the other hand they are supported by the joint family structure - This uniqueness calls for a tailor-made AI driven tools for this country. Also, the division of the population as per age, location and education exhibit differential AI adoption patterns which is further deliberated in Table 6.3

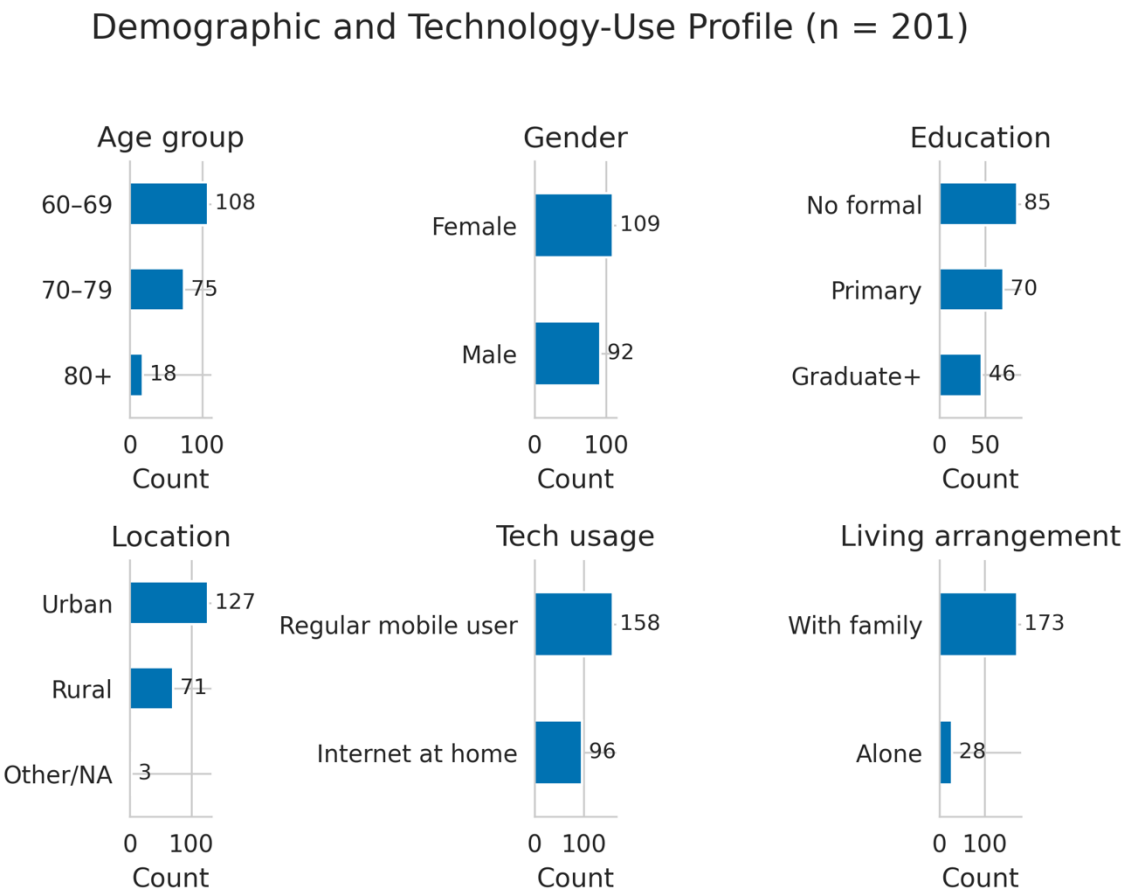

Figure 6.1: Demographic & Technology Use Profile (n=201)

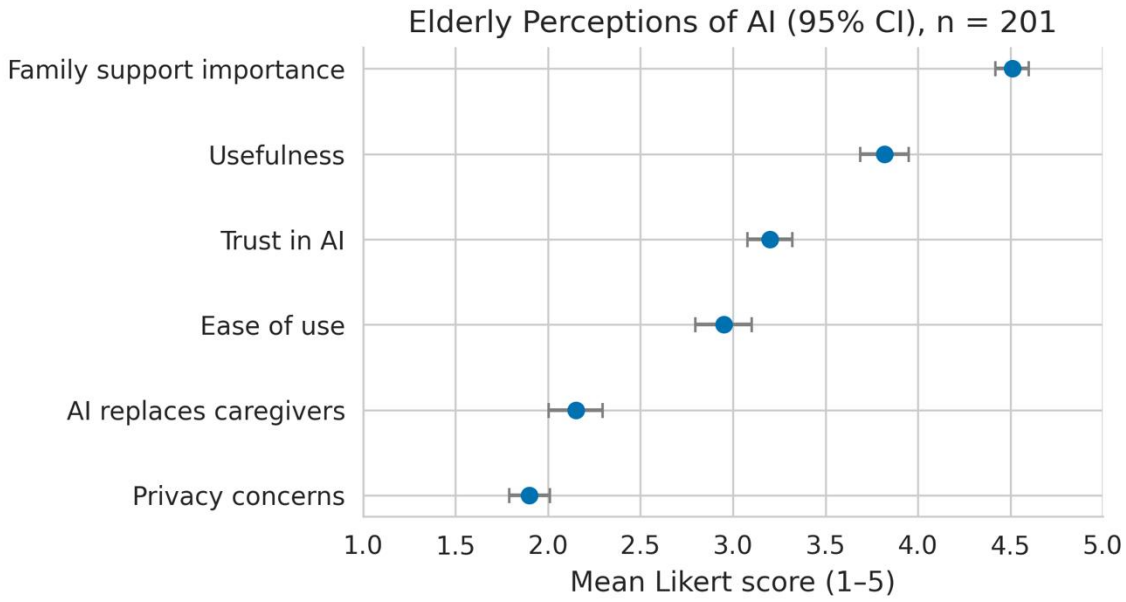

Figure 6.2: Elderly Perceptions of AI (95% CI), n=201

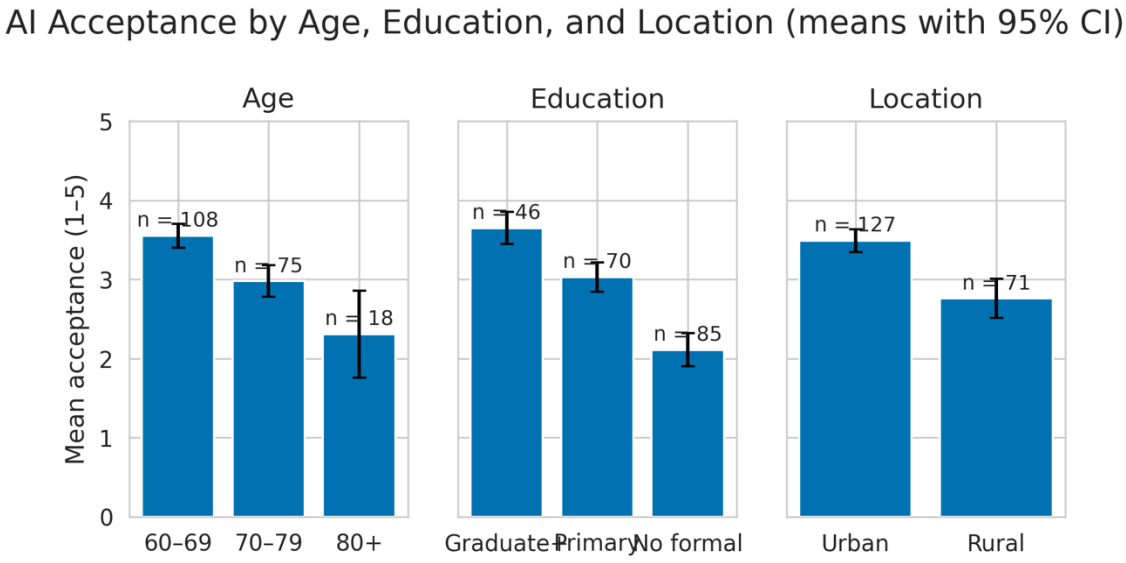

Figure 6.3: AI acceptance by Age, Education & Location (means with 95% CI)

6.1.2 Healthcare Providers

52 healthcare providers participated in the study, including doctors, nurses, and healthcare administrators from both public and private sector Hospitals. Their professional characteristics are detailed in Table 6.2.

Table 6.2: Professional Characteristics of Healthcare Provider Respondents (n = 52)

Attribute	Frequency (n)	Percentage (%)
Professional Role		
Doctors (MBBS, MD, specialists)	25	48.08%
Nurses	17	32.69%
Hospital Administrators/Managers	10	19.23%
Years of Experience		
1-5 years	12	23.08%
6-15 years	23	44.23%
16+ years	17	32.69%
Institution Type		
Public Hospital/Clinic	22	42.31%
Private Hospital/Clinic	25	48.08%
NGO/Community Health Center	5	9.62%
Geographic Location		
Metro/Urban cities	37	71.15%
Tier-2/Tier-3 cities	15	28.85%

The Healthcare Provider pool was carefully selected to avoid the skewness as much as possible. Both the Private and Government hospitals were represented in the mix, and their experience level also has different slab with a median experience of around 14 years**.**

6.1.3 AI Solution Developers

20 numbers curated pool of Professionals from Technology Organizations active in Indian Elder care space was picked up and following are their broad-based profiles:

Software Developers/Engineers: 9 (45%)

Data Scientists/AI Researchers: 6 (30%)

Product Managers: 3 (15%)

Founders/Senior Leadership: 2 (10%)

These professionals were based in major Indian technology hubs (Bangalore, Hyderabad, Delhi NCR & Mumbai) with their relevant experience between 3-12 years

6.2 Presentation and Explanation of Results by Research Question

This section provides the insights organized by each of the 3-research question combining both quantitative survey data and qualitative findings from interviews and corresponding focus group discussions.

6.2.1 Research Question 1: How do elderly people in India perceive the usage of AI-driven solutions and how is acceptance varied as per their socio-economic background?

This research question examined senior people's perception and embracing of AI-based solutions in eldercare taking into consideration variations in socio-economic backgrounds.

6.2.1.1 Quantitative Findings

Descriptive statistics from the senior survey (n=201) brought out different degrees of assumption and acceptance of AI based applications. Different Statistical methods including Chi-Square tests and ANOVA were used to capture variations across different socio-economic background. Table 6.3 captures the descriptive statistics of the RQ1.

Table 6.3: Elderly Perceptions of AI-Driven Solutions – descriptive statistics (RQ1)

Perception/Attitude Dimension	Positive Response (%)	Mean Score (1-5 Scale)	Std. Dev.	Key Insights
Perceived Usefulness of AI tools	72%	3.82	0.95	Strong inclination to adopt AI based Heathcare solutions
Ease of Use (perceived)	35%	2.95	1.1	A long way to go on the ease of use factor
Trust in AI based Systems	54%	3.2	0.88	Almost midway and definitely can be improved
Importance of Family Support	90%	4.51	0.65	Absolutely vital for the adoption of AI based solutions
Privacy Concerns	21%	1.9	0.8	Mostly naïve on the importance of Data integrity
AI Replacing Human Caregivers	18%	2.15	1.05	AI has a long way to go vis-à-vis Human for adoption as a caregiver

Variations by Socio-Economic Background:

Statistical analysis published certain variations in AI acceptance in different demography bucket. The differences were tested with the ANOVA and t test.

Age wise statistics ($F(2,198) = 14.95$, $p < .001$):

60-69 years: Higher adoption (M=3.55, SD=0.81)

70-79 years: Mid-level adoption (M=2.98, SD=0.87)

80+ years: Lower adoption (M=2.31, SD=1.19)

Description: A high F -statistic (14.95) means that the inter-group difference is more than that of intra group and also the $p < .001$ denotes the group means are substantially different overall. The difference in SD value means the dispersion within the group increases along with the increasing the age bracket like the 80+ age standard dispersion within the group (1.19) is highest among all the age groups and in effect shows more heterogeneous pattern in adoption

Education Level influence ($F(2,198) = 19.18$, $p < .001$):

Graduate or above: Highest acceptance (M=3.65, SD=0.69)

Primary education: Mid-level acceptance (M=3.03, SD=0.79)

No formal education: Lowest acceptance (M=2.11, SD=0.98)

Description: A high F -statistic (19.18) means that the inter-group difference is more than that of intra group and also the $p < .001$ denotes the group means are substantially different overall. The steady difference in SD value means the dispersion within the group decreases along with the higher level of education like the respondents with no formal education, standard dispersion within the group (0.98) is highest among all the education groups and in turn shows more heterogeneous pattern within that education group in adoption of AI based Technologies

Rural Urban distinction ($t(199) = 8.65$, $p < .001$):

Urban Seniors: Higher acceptance (M=3.49, SD=0.83)

Rural Seniors: Lower acceptance (M=2.76, SD=1.06)

Description: A high F -statistic (19.18) means that the inter-group difference is more than that of intra group and also the $p < .001$ denotes the group means are substantially different overall. The steady difference in SD value means the dispersion within the group decreases along with the higher level of education like the respondents with no formal education, standard dispersion within the group (0.98) is highest among all the education groups and in turn shows more heterogeneous pattern within that education group in adoption of AI based Technologies

Correlation on Technology adoption:

Regular mobile users showed substantial higher AI adoption ($r = .67$, $p < .001$)

Internet access correlated positively with assumed utility ($r = .34$, $p < .001$)

Interpretation of Table 6.3: Elderly Understanding of AI-driven Solutions Overview and Structure

Table 6.3 represents the data points of the Descriptive Statistics harvested from the participants to find out the elderly perceptions and attitudes toward AI-driven healthcare

solutions. It has a mean score on a 1to 3 Likert scale, Standard Deviations and the positive perception percentage against the parameters. By using different statistical tools, it also sums up the contrast in perception because of different geo-socio-economic features.

The key captured parameters are: Perceived Usefulness of AI tools, Ease of Use (perceived), Trust in AI-based Systems, Importance of Family Support, Privacy Concerns, AI Replacing Human Caregivers. Down below the interpretation of these parameters are presented.

Quantitative Results—Core Statistical dimensions

Perceived Usefulness

Mean Score: 3.82 (SD=0.95) with 72% of seniors stated a solid leaning towards adopting AI centric healthcare solutions.

Interpretation: The high mean in Likert scale and the overwhelming positive perception percentage denotes a robust sense of trust in Ai based system to be integrated in Indian elder care

Ease of Use

Mean: 2.95 (SD=1.1) with barely 35% projecting positive attitudes on the ease of use.

Interpretation: Ease of use is a challenge. Only one third of the respondent find the tools conducive to use which shows a major space to cover

Trust in AI Systems

Mean: 3.2 (SD=0.88), positive: 54%.

Interpretation: It's absolutely clear that AI driven tools have half a way to cross to gain the trust … This is promising and challenging together depending on the way it is viewed

Importance of Family Support

Mean: 4.51 (SD=0.65), positive: 90%.

Interpretation: The importance of Friends and Families in adopting AI based solutions is undeniable. Luckily, this support is abundant in Indian context and it's a boon for AI initiatives

Privacy Concerns

Mean: 1.9 (SD=0.8), positive concern: 21%.

Interpretation: Unlike other advanced nations, the issue of Privacy doesn't bother the Indian seniors that way. Unfortunately, this stems from the combination of poverty and lack of education & Digital awareness

AI Replacing Human Caregivers

Mean: 2.15 (SD=1.05), positive: 18%.

Interpretation: Though most of the participants acknowledge the utility of the AI driven solutions, they really don't think that it's a substitute of human touch but more of an add on service

Variations by Socio-Economic and Demographic Background

Analysis through ANOVA & t test brings out the following distinct results which is captured in Table 6.3

Age Group (ANOVA, F (2,198) =14.95, p<0.001)

Entry Level (60-69): M=3.55 (SD=0.81)

Mid-level (70-79): M=2.98 (SD=0.87)

Oldest (80 plus): M=2.31 (SD=1.19)

Interpretation: The population at the threshold of 60 years are more open to embrace AI driven solution. The more seniority they garner, they become more afraid to try something new, especially something like AI.

Education Level (ANOVA, F (2,198) =19.18, p<0.001)

Graduate+: M=3.65 (SD=0.69) (highest acceptance)

Primary: M=3.03 (SD=0.79)

No formal: M=2.11 (SD=0.98) (lowest)

Interpretation: Education level strongly correlates with adoption of AI based system. The more educated the subject is, the greater is the affinity to embrace AI.

Urban against Rural ($t(199) = 8.65$, $p < 0.001$)

Urban: M=3.49 (SD=0.83)

Rural: M=2.76 (SD=1.06)

Interpretation: Compared to Urban seniors, the Rural elders are much more tentative in adopting AI driven tools because of their lack of exposure and inherent distrust on Technology.

Technology Exposure (Correlation)

Mobile usage: $r = .67$ ($p < .001$)

Internet access: $r = .34$ ($p < .001$)

Interpretation: It appears that those seniors who are adept in using Mobile or web are far more confident in accepting AI driven tools since they have already overcome the fear of Technology

Qualitative Insights and Thematic Analysis

Other than the quantitative findings a series of semi-structured interviews and focus groups augment the insights:

Early apprehension turning into Adoption: It's always the same story. A huge resistance being overcome by larger curiosity and then gradual acceptance and finally the loyalty. The entire journey becomes possible or at least smooth when a dependable Friend or Family champions it.

Language and Cultural comfort level: It becomes much easier for the seniors, especially with a rudimentary education level when the content is developed in the vernacular language and it becomes even more palatable when its syncs up with the subject's cultural nuances.

Important Role of Family Support: whenever the families rally in to teach the elders the usage of AI, the more statistically distinct number of AI adoption happens.

Ease of Use being a Show stopper: Whatever value addition an AI tool brings in, it would be unlocked only when its used properly and it's facilitated through simplicity and user -friendliness in design

Human touch is non-negotiable: AI driven tools are at the best an appendage to human interactions but, at least for now, is not in a position to replace it completely.

Integrated Interpretation and Implications

Table 6.3 gives the following critical understandings which can be acted on in the heterogeneous social fabric of the Indian seniors in their daily care.

AI acceptance is happening with varying degrees: The adoption pattern is relatively decent among the privileged section of the society and narrowed down drastically at the tail where the spectrum of rural, under educated and economically challenged population is there.

Family as a Promoter of Technology: Survey based quantitative Data and Interview based discussions both clearly attest to the importance of Family & Friends as an enabler for AI adoption.

Digital Chasm to be crossed over: Digital Divide is real, and it is really 2 countries out there. One educated, relatively younger and economically affluent and the other part who are miles away from anything Technology. To bridge this huge gap is of paramount importance for the AI based health care to succeed

Global quality with a local thinking: The more the tools are embedded with vernacular languages & local customs Solutions, the larger is the chance of its success. Incidentally initiatives like Bharat Gen by Government of India is in the

right direction must be in local languages, with friendly interfaces and risk transparency to accelerate adoption and trust.

Measurement Reliability and Validity

The veracity of these insights is bolstered by:

Mean and SD Analysis: The lay out of the scores expresses both the potential and irregularity in understanding.

High Statistical Significance (p<.001 in majority of the tests): Strong ANOVA and t-tests highlight that the distinction among groups is substantial and not coincidental.

Correlations: The strong positive correlation between the exposure in Technology and the adoption of AI based tools gives a pointed direction for the Authorities and Solution vendors.

Expanded Research and Policy Connotation

Social Initiatives must integrate Friends & Families: Any drive to promote AI based tools like Training events, awareness movement and product launches should enlist friends' family members as enablers

Simplicity is the key: The software vendors should develop the tools keeping in mind the weaker section of the population. The textual UI should give way to voice command and icon centric design.

Promoting Privacy Awareness: Though at this point of time it's easier for both the Policy makers and Developers to mature AI based Health Care solutions, going forward it would be detrimental to the very people it has been developed for unless proper safeguard is brought in

Conclusion:

The insight which comes out from Table 6.3 is that the though the Indian elders aren't averse to Technology at a broad level, the adoption varies as per their age, education, proximity to metros, financial position among other issues. To make the AI adoption widespread the Authorities and the Developers mostly need to focus tools which are easy to use. Also, the tools need to be low bandwidth friendly and mostly visual, or voice control based on the local language

6.2.1.2 Qualitative Findings

A series of 25 semi structured interviews and 4 focus group discussions were held with senior citizens. It provided significant insight in their psyche and the factors which influences the AI adoption. These could be bucketed in 5 themes:

Theme 1: Early skepticism giving way to tentative acceptance: It was revealed that a lot of elderly subjects initially was apprehensive of using AI. However, they slowly but gradually started using it when it was demonstrated by someone they trust and are familiar with.

Theme 2: Language familiarity as potential adoption Drivers It's observed that the adoption rate zooms up when the subject finds a tool in his native language and has adjacency with his own culture.

Theme 3: Family Support being crucial It's seen that whenever there is a family member who is keen to assist, the adoption rate of AI driven solution increases.

Theme 4: Ease of Use remains a factor Though most of the interviewees acknowledged the utility of AI based tools, a few of them expressed the sense of overwhelming

Theme 5: Human interaction is preferred over AI Though the participants admitted the usefulness of AI, they preferred human care over AI based solutions

6.2.2 Research Question 2: What is the result of AI tool-based interventions on the physical and mental health of the seniors of India?

The response to this question measured the effect of AI based solutions on the physical and mental health of the elders.

6.2.2.1 Quantitative Findings

Following is the result against the quantitative questionnaire on the outcome of Mental and Physical health after using AI based tools (n=156; Table 6.4).

Table 6.4: Impact of AI Interventions on Elderly Health Outcomes (RQ2)

Health Outcome Index	Positive outcome (%)	Neutral (%)	Negative outcome (%)	Key Findings
Overall, well being	67%	29%	4%	Positive Impact
Chronic ailment management	71%	24%	4%	Positive Impact

Less health anxiety	78%	18%	4%	Positive Impact
Medicine schedule adherence	79%	17%	4%	Positive Impact
Enhanced proactive monitoring	55%	32%	13%	Mildly positive impact
Loneliness reduction	15%	58%	27%	No Impact

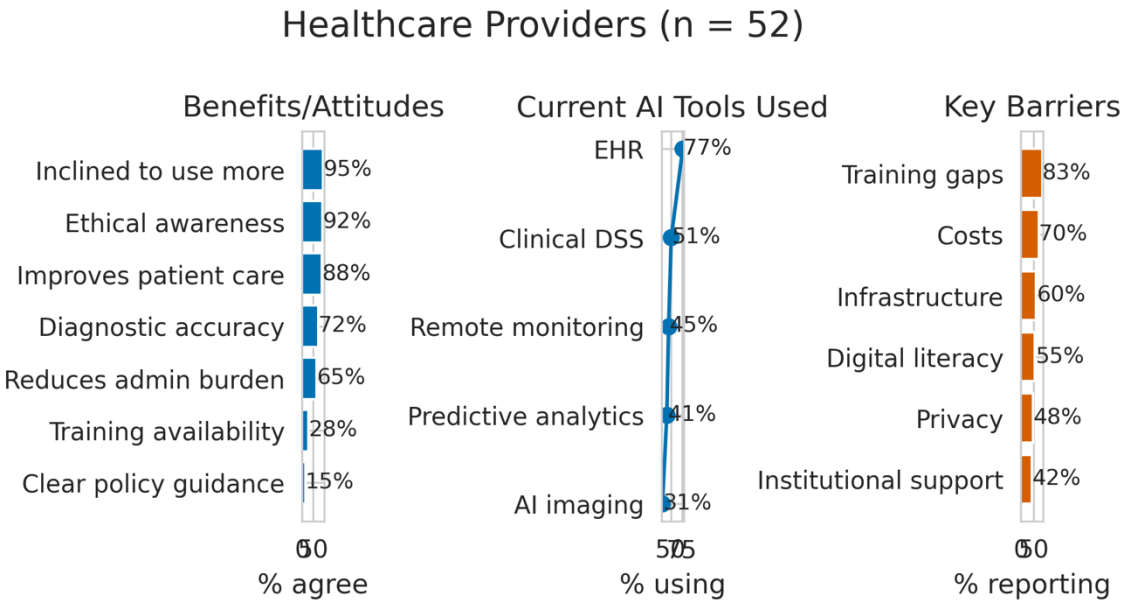

Figure 6.4: Findings from the Healthcare Providers

Statistical Significance Testing: After conducting Paired t-tests comparing self-reported health indicators before and after AI tool usage showed the following:

Medication adherence: Significant improvement ($t(155) = 11.74$, $p < .001$)

Health monitoring frequency: Significant increase ($t(155) = 8.29$, $p < .001$)

Health related anxiety: Modest but significant reduction ($t(155) = 3.67$, $p < .01$)

Interpretation of Table 6.4: Impact of AI Interventions on Elderly Health Outcomes

The responses received against RQ2 i.e. What is the result of AI tool-based interventions on the physical and mental health of Indian seniors, forms the basis of table 6.4 and it's extremely important to capture the actual impact the AI based tools have on elder health

The response data points harvested from 156 elderly respondents are captured in this table where the seniors reported their own experience on the impact of using AI based tool on their wellbeing. To make the categorisation easier, it was divided in 3 basic categories Positive, neutral and negative

Expanded Statistical Analytics

a) **Physical Health Marker**

The elders reported the maximum positive impacts in Chronic disease and Medicine taking discipline which are 71 % positive and 79 % positive respectively

These are the areas in lifestyle diseases like High Blood Pressure and Diabetes where they felt the strongest benefit of using AI based technology and this realization perfectly resonates with the findings of Nasr et al. in 2021 & Milella et al. in 2023 who also stressed the AI 's role in managing the lifestyle ailments

Statistical Confirmation on Paired t-tests

Medication schedule adherence: t (155) =11.74, p<.001t (155) =11.74, p<.001 (Strongly relevant growth)

Chronic ailment management: t (155) =8.29, p<.001t (155) =8.29, p<.001 (relevant improvement)

Interpretation: A strong and statistically significant improvement in both medication schedule discipline and chronic disease management among Indian elders post of their adoption of AI based tools after adopting AI tools.

Enhanced Proactive Monitoring (55% Positive, 13% Negative)

Though a little more than half of the respondents convey an improvement , around one eights of the participants expressed dissatisfaction for not being able to get that advantage from AI

Interpretation: While the AI powered devices helping a substantial number of elders to self-manage their conditions, a lot of practical constraints like connectivity, power cut makes them unable to realise the benefits

Overall Well-being (67% Positive)

This is an undisputedly a positive outcome where exactly two third of the respondents felt better in an overall sense after using the AI based tools. And it's not having a one dimension only -medication discipline, proactively reporting on health conditions and remote monitoring advantage improve their quality of life in a broad way.

The overall composite experience causes a tangible feel good perception to the elders.

b) Mental Health and Psychosocial Indices

Reduced Health Anxiety (78% Positive)

Again, an outstanding insight – it clearly shows the all-round anxiety, which is a bane of old age, gets noticeably addressed by the usage of AI tools. The reduction in anxiety was statistically relevant ($t(155) = 3.67$, $p < .01$ $t(155) = 3.67$, $p < .01$).

This finding is in line with Matheny et al. who in their paper in 2019 mentioned the effect of real time input on health anxiety.

Loneliness Reduction (Majority neutral, 15% Positive and 27% Negative)

The limitation of AI as whole – end of the day its machine and fails miserably to provide the emotional connect extremely useful for the elders.

Interpretation: The respondent elders had been very lukewarm in their endorsement of AI based tools as Loneliness alleviator. It is extremely clear from the Survey result that AI at the best can augment Human connect but can replace it any way. This view is aligned with

the ones expressed by Chu et al. in 2022 and Malik in 2023 , who focused on the inadequacy of Digital to handle social isolation typically faced by the elders across the globe, Indian being no exception .

3. Supporting Qualitative findings

The patterns which emerged from quantitative data set is further supported by the narrative harvested from interviews and arranged focus group discussions:

Theme 1: Being in Control

Most of the senior respondents felt that they are somewhat in control of their health, courtesy the AI enabled tools. This confidence works like a placebo an ego a long way toward actually keeping the seniors lively

Theme 2: The Great Digital Barrier

India, unfortunately, will be able to achieve a holistic improvement in elder care through AI intervention only when the constraints like poverty, lack of education and ICT infrastructure would be uniform across the land

Theme 3: Negligible Social Appeal

The participants were unequivocal on the importance of AI driven tools for the betterment of their physical health. But not so much on the impact of it for mental agility or contentment. This continues to be a limitation

4. Statistical Significance and their Practical interpretation

Statistical analysis through paired t-tests throw up the following insights:

Drastic improvement in medical schedule discipline & Chronic Disease management

Health related anxiety also shows decent reduction

Loneliness alleviation doesn't happen at all through AI

In short, Table 6.4 shows that though AI driven tools are no cure all with its obvious limitations, but it is significant enabler for greater good

6.2.2.2 Qualitative Findings

In-depth interviews revealed nuanced perspectives on health impacts, organized into four main themes: 25 Interviews & 4 discussions were held on this question, and they gave the following 3 insights/themes

Theme 1: Control on self-Health due to usage of AI The interviewees expressed confidence that they feel more in control of their health after using AI based solution

Theme2: Very low influence on social engagement Though AI based tools helped the participants on their physical health, the impact on mental health was partial as it did very little to address the loneliness of the elders

Theme 3: AI tools is extremely dependent on connectivity A lot of times the participants were constrained in using AI based tools because of the sub optimal connectivity at their respective locations

6.2.3 Research Question 3: Where all the caregivers in India use AI-based tools in their work and how can the overall caregiving experience be improved through AI-based solutions?

This question was focused on Health care providers, both from Private and Government hospitals on the understanding of using AI based tools to bring positive change in elder care.

6.2.3.1 Quantitative Findings

Here quantitative Survey was done on 52 interviewees and following is the outcome.

Table 6.5: Healthcare Providers' Experiences with AI in Eldercare (RQ3)

Key Performance Index	Agree (%)	Mean Score (1-5)	Std. Dev.	Key Insights
Patient care significantly impacted by AI	88%	4.15	0.7	Postive Perception
Diagnostic Accuracy Enhancement	72%	3.8	0.85	Postive perception
Administrative burden Reduction	65%	3.55	0.9	Postive perception
Optimum AI training availability	28%	2.5	1.15	Not positive
Ethical concerns Awareness	92%	4.25	0.65	Postive perception
Clear policy guidance in place	15%	2.1	1	Not positive
Incliation to use more AI tools	95%	4.3	0.6	Postive perception

Current AI Tool Usage Among Healthcare Providers:

EHR Database: 77%

DSS based on clinical data: 51%

Tools based on Predictive Analysis: 41%

AI based diagnostic imaging: 31%

Remote & Automated Patient monitoring: 45%

Major Constraints presently:

1. Insufficient training and skill gaps: 83%
2. Prohibitive implementation costs: 70%
3. Inadequate technological infrastructure: 60%
4. Digital literacy obstacles: 55%
5. Data Confidentiality issues: 48%
6. Shortage of institutional help: 42%

Interpretation of Table 6.5: Healthcare Providers' Experiences with AI in Indian Eldercare (RQ3

The usage pattern of AI based tools by the Indian Healthcare providers which includes Doctors, Nurses and Admin workers are captured in Table 6.5. Also captured is their perception on their impact and the challenges they face as on date. Some of the salient features which comes out of the survey is the inclination to embrace AI based tools, irregular deployment and adoption, lack of training and infrastructure which is consistent with the findings by different Researchers in recent times. Following are the some of the broader points which emerge out of the interviews.

1) Robust Positive feedback on usage

Almost nine out of ten respondents felt that usage of AI improves the quality of elder care, almost three fourth of them reported to have an improved diagnostic accuracy quotient and

almost two third of them perceived a lesser administrative burden. This positive feedback resonates with the study of Chen et al. in 2022 and Lambert et al. in 2023

Tool usage corresponds to these positive figures but with varying degree. EHR tools are the most dominant ones used by more than three fourths of the attendees, DSS in clinics by fifty percent of them and then the remote monitoring, predictive analytics on diseases forecasting and AI based imaging a little lesser than that. This is so uncannily aligned with the findings of López et al. who in their paper in 2022 who predicted the AI adoption would happen in a pyramidal way. first the heavily used EHRs, followed by complex DSS and finally the fancy Imaging AI and predictive analytics.

2) Gap between inclination and practicalities- A reality check

Almost the entire batch of caregivers are for using more AI in their work but only a quarter of them vouched for enough training and only one seventh of them are aware of clear policy on AI usage. This wish-readiness gap is a huge sobering phenomenon which was articulated earlier by authors like Pedro et al. in 2023 or Ammi et al. in 2024 who pointed out clearly that without the infrastructure support most of the AI driven initiatives in elder care will remain unfulfilled

3) Gap between Ethical awareness and following - an alarming issue

Unlike the elderly who are mostly naive on the ethics and privacy dimension of AI usage, the Care Providers are mostly conversant about this and that’s the good part. However,

when it comes to the implementation part of those ethical guidelines, Indian has a long way to go. The fifteen percent confirmation on the Clear Policy guideline is a strategy reminder of the affairs of state in Indian elder care. Again, this finding is in line with Researchers like Matheny et al. who raised this point in 2019, and it shows the relevancy of the issue in 2025 through the work of Lamem et al.

Uniqueness of the Study

The data points harvested through the Care givers are extremely important as it sort of supplement the inputs received against the questionnaire RQ1 & RQ2 which primarily focused on the Indian elders. The Seniors reported the outcomes mostly like Medication schedule adherence, Chronic ailment Management, overall wellness realisations - RQ3 focuses on the back-end factors of the chain contributing to that result like wide usage of EHR and a reasonable penetration of DSS tools, AI imaging and Disease prediction. This harmony in finding is the net discovery of the study.

6.2.3.2 Qualitative Findings

There had been 15 interviews and four Focus Group Discussions conducted among the selected Healthcare providers and three major insights came out of it.

Theme/Insight 1: Clinical Effectiveness definitely gets improved by AI Its was unequivocally expressed by the Healthcare providers that they were able to handle larger workload in a shorter time period by the usage of AI based tools.

Theme/Insight 2: Augmented Monitoring and quicker TAT Through AI based remote monitoring system the Healthcare provider felt that the quality of remote monitoring improved and they had been able to provide timely intervention to the needy patients.

Theme/Insight 3: Enhanced Training and Infrastructure Requirement Though the Health Care Providers had been using the AI driven tools, they feel that they needed more customised training. Also, the lack of adequate Infrastructure, mainly the available bandwidth beyond the metros needs to be spruced up.

6.3 Summary of Findings

This section summarizes the salient insights gathered from the responses against all the 3 Research questions and deliberated through the quantitative and qualitative questionnaire and it brings out the difference in data points gathered through the quantitative and qualitative process.

6.3.1 Overall Perception and Acceptance Insights

It is clear from the study that the Indian elders are gradually adopting AI based tools albeit slowly. Interestingly, though almost three fourth of the seniors recognizes the importance

of AI driven applications, the actual usage is just one third denoting a significant gap vis-a-vis potential. Also, a strong variation is observed across geo-socio-economic spectrum. The comparatively younger, educated and urban segment of the elders are embracing the AI based solution much more actively compared to others. Another extremely important aspect is the availability and active assistance of the family members on the adoption rate of AI tools

6.3.2 Health Outcome Metrics

The study brings out marked difference on the resultant outcome of using AI based tools on the Physical and mental well-being . While a significant part of the elderly population is clearly getting benefited in their physical health side by using AI based tools, the result isn't so tangible in case of their mental health. Especially in case of social isolation, it's clear AI can't replace the human engagement with the elders. Finally, the available Infra (read signal bandwidth) is stunting the adoption rate of the AI based tools

6.3.3 Healthcare Provider viewpoints and pain points

The study firmly establishes the utility of AI based tools usage from the perspective of the Healthcare providers. Also, equally evident the requirements mainly augmented training and Infrastructure. Also, they strongly feel on the absence of a robust and composite Policy framework from the Policy Holders. However, they paint a positive outlook on the future process of using AI based tools in Eldercare

6.3.4 Universal Themes

A few of the findings were common from all the groups:

Variable Adoption factors: Location, Education and Age prominently influence the adoption rate of the AI based tools.

Infrastructure as a Constraint: Two major Infrastructure inadequacy namely available internet bandwidth and lack of 24X7 power supply invariably mars the impact of AI in Indian eldercare.

Human-Centered Design Requirement: Irrespective of their geo-social-economic-professional background, the concerned people stressed the importance of human touch as an enabler to adopt AI and not something to be replaced.

Policy and Training Necessity: Two issues are extremely evident from the study

1. There has to be a robust policy framework consisting of different stakeholders in the society and it should be iterated by taking continuous feedback
2. The Training of the Care givers should be focused, and this responsibility lies with Govt Authorities and Pvt Hospitals alike

6.4 Conclusion

This study examined the different aspects of AI based tool's utilization in case of Indian health care through mixed method approach. It sort of establishes the complex dynamics of the entire Indian senior care ecosystem. On one hand it projects a very positive outlook. In spite of being a developing country with a significant part of the population under financial constraint, a significant part of the population has already accepted AI driven Technology and likely to adopt more going forward. On the other hand, unless some of the

critical factors like Infrastructure, Policy framework, exhaustive training and customised design are taken care of, the whole momentum of AI adoption would seriously be impacted.

CHAPTER VII:

DISCUSSION & RECOMMENDATIONS

7.1 **Discussion of Findings**

RQ1: Perceptions and Acceptance of AI among Elderly Indians

Overall acceptance is evident but not linear. Almost 72% of senior's population feel AI is useful but only 35% of them use and 54% expresses trust, thereby showing a gap between considered efficacy and willingness to accept

Results vary very distinctly based on geo-socio- demographic background. Entry level age bracket (60–69), College education, urban location and mobile savvy users show substantially higher adoption level (ANOVA and t-tests; $p < .001$), commiserating with earlier papers that digital awareness and social background influence acceptance (Ho, 2020; Chu et al., 2022; López et al., 2022)

One prominent issue is the Human Companionship . Not only it often gets featured in Interviews and Focused Group Discussions , it got a high mean of 4.5 out of 5 . It is an enabler that turns reluctance into tentative acceptance and gradually into regularity. his syncs with custom made designs and social support findings from the Research paper of Bradwell et al. in 2019 and that of Adus et al. in 2023

Vernacular language and cultural nuances carry weight in decision making. Qualitative data reveals that native languages and culturally familiar initiatives improve trust by driving the doubts away. This acceptance input resonates with India's linguistic plurality as has been explored by Morrison et al., in their paper of 2017

People are mostly naïve on the data ownership issues. Only 21% expressed concern on data privacy which is very dissimilar vis-à-vis to the developed nations. This strengthens the proposition of Ho (2020) & López et al. (2022) that some dedicated initiative should be undertaken to teach the Indian seniors on their rights for the welfare of them.

RQ2: Impact of AI Interventions on Elderly Physical and Mental Health

The impact of AI on Physical health of the Indian Seniors is very much evident. Substantial boost was seen in maintaining medication schedule ($t(155) = 11.74$, $p < .001$), prevalence of health monitoring ($t(155) = 8.29$, $p < .001$) and lesser number of health anxiety incidences ($t(155) = 3.67$, $p < .01$). These observations are perfectly in line with the data on remote monitoring, reminders and alerts based on predictive pattern and thereby having better prognosis in addressing chronic ailments (Nasr et al., 2021; Milella et al., 2023; Bradwell et al., 2019)

However, the outcome on Mental health through AI isn't that distinct. Though it revealed that anxiety level came down with the usage of AI driven tools, the reduction on loneliness was minimal (15% positive, 58% neutral, 27% negative). This corroborate the prevalent

concept that AI assort of adds additional layer of comfort but can't substitute physical proximity of family and friends and that is in line with (Chu et al., 2022; Malik, 2023)

The criticality of Infrastructure in the success of AI driven initiatives is undeniable. Internet Speed and Connectivity along with uninterrupted power supply emerged as the deciding factor on propagating the adoption of AI driven tools in eldercare in India. This dependency factor was shown in the papers of Guo et al. in 2018, Wang et al. in 2021 & Lamem et al. in 2025.

RQ3: AI Use by Healthcare Providers and Enablers/Barriers

The POV of the Caregivers on the usage of AI is pretty positive. Most clinicians had experience of enhanced patient care (88%), better diagnostic accuracy (72%), and lesser administrative overhead (65%) which is perfectly in sync with the data of other nations (Chen et al., 2022; Lambert et al., 2023).

Readiness gaps are evident. Training, whatever is not there is clearly not sufficient. Only 28% stated to have requisite training on AI. Added to that is the clarity and lucidity on policy was on the lower side (15%). Though for a change Ethical awareness among Care givers were extremely height (92%) which is hugely reassuring. If the maximum obstacles are listed then training deficits (83%), costs (70%), infrastructure (60%), digital awareness (55%), privacy concerns on privacy (48%) and institutional support deficiency (42%) feature in that.

The current usage of tools is promising. EHR usage is high (77%), Decision Support reached mid-way (51%), remote monitoring yet to catch up big way (45%) and so is use of predictive analytics (41%) and AI imaging (31%). This again is in line with the findings Matheny et al. (2019) and Adus et al. (2023) which shows the adoption in other countries being gradual

Common Insights

AI acceptance happens through handholding mostly. Family, Friends and Familiar Care giver are the ones who imitates the elders in their journey, and it helps more when the applications are in their native language. This results in multiple tangible benefits like not missing out on alerts, taking medication on schedule and finally reduction in the occurrence of getting sick.

AI tools help the senior to be more in control of their life but in no way, it replaces the human engagement. The Social engagement is extremely necessary along with AI interface.

AI in a siloed manner can’t work. The entire ecosystem needs to be developed for it to be most effective. It includes network connectivity, power and training to the stakeholders

7.2 Recommendations for the Stake holders

For the Authorities

- Develop a Senior Care -AI policy framework
- Initiate setting up standards for safety, reliability, explainability and human oversight for AI faced towards the Seniors.
- Commission privacy-first consent-based flows in native languages and role-based access control for harvested elder data points.
- Publish medical validation and focusing on use cases which is of high risk.
- Work towards building a robust Infrastructure
- Making a good last mile connectivity through Bharat Net and uninterrupted power supply via solar cells in locations beyond metro and especially to remote & rural

Health Care centers

- Facilitate compatible health data points via NDHM/ABDM standards to provide elder analytics based on latitudinal and longitudinal coordinates
- Introduce Insurance and incentive framework
- Start insurance cover for certified AI-based remote monitoring and telehealth bundles for elder care under PMJAY or derivative State Schemes and incentivizing the Primary Health Cares on the outcome of the diseases like

Diabetes & Blood Pressure

- Initiate GST rebates as an incentive for validated AI based eldercare solutions with the parameters being language, ease of use & accessibility.
- Open up funding to build up an AI enabled workforce

- Provide Central funding for new and upskill initiatives for Health care professionals and make the ASHA workers AI savvy by providing them low-cost Tablets

For Healthcare Providers and Institutions

Initiation of a Hybrid implementation structure:

- Medication schedule reminders with Care giver call back periodically. Remote Vital logging with ASHA workers visit.
- Bring all the stake holders like Medical , IT , Legal & Ethics to form a Nodal Body on AI Governance who will create a comprehensive framework.

Customised training and trust building initiatives:

- Deliver tailored training to the healthcare providers which is befitting to their respective roles and run on simulated environments. Use a loop back mechanism to capture the input of them to build up elder trust on the tools and the care givers
- Privacy & agreement immersed in constructs
- Elder's consent to be taken in native language, capture bare minimum data points and transparently share the AI based tool's data capturing with the seniors, again in vernacular way
- Measurable outcomes
- Capture ABHA card transactions to measure pre and post AI tool usage. Also capture the time spent in workplace to measure the workload at the pre and post stage

For AI Solution Providers

Rural centric Design

- User Experience
- Voice based command in native languages, bigger than usual fonts, easily recognizable icon-based navigation, single Tap system and voice back system
- Frugal engineering on Resources
- Edge based AI devices, lightweight apps with majority offline features. Fallback mechanism on SMS
- Senior safety features
- Help button for Voice call & SMS separately. Dedicated ASHA app button for escalation
- Integration and interoperability

- ABDM compliance: ABHA ID & Voice based Consent Manager integration with AI based tools and queue & retry feature for intermittent connectivity

7.3 Recommendations for Government of India

Following three phase strategy to be adopted

Phase 1 (1 year):

Promote the ABDM Enrolment strategy

a) Making the enrolment process simplified and encourage Family/Friends enablers like the way Government has done for Tax returns
b) The consent flow should be through verified voice based
c) Introduce an incentive scheme for the village Health Care centre workers and ASHA workers on ABDM enrolment

Augment AI integration with NPHCE

a) Conduct AI driven CDSS in the geriatric units initially on a Pilot basis and then expand
b) Introduce AI based tools and systems in the village and District level gradually for the Chronic Ailment Management
c) Introduce an Incentive scheme for integrating AI into NPHCE units by defining the metrics

Phase 2 (1 to 2 year):

Replicating the successful state models in at least another 5 states

a) National Centre of Ageing (NCA) initiatives of Tamil Nadu to be copied in 5 states which has a majority single language
b) Pick up 5 states which has high literacy percentage like Kerala and replicate Kerala AI (K-AI) model
c) Pick up 5 states and implement multi-party collaboration like that of Maharashtra Arogya Mitra

Introducing Financial Sustenance Modelling

a) Include validated AI based solution to be reimbursed under PMJAY Insurance
b) Promote the AI developers in Elder Health Care in the line of India AI Mission and extend hosting facilities to them till the Product goes Live
c) Replicate the Private Partner model undertaken by state of Karnataka in other states

Phase 3 (2 to 3 year):

Regulation & Standardisation

a) Introduce AI specific clauses under Digital Personal Data Protection bill to safeguard unsuspecting Senior Population

b) The AI Health care applications to be brought under BIS framework

c) Frame a Responsibility framework for the user's getting subsidy under India AI Mission

Augmentation of the Training modules

a) Integrating the AI based tools in the MBBS curriculum

b) Publish a full-fledged AI training content for different levels of Health Workers

c) Provide a career advancement path for Government Health Care providers

7.4 Recommendations for different States

For Technologically Advance States (Andhra Pradesh, Karnataka)

a) To promote the AI based Health Care developers actively by harnessing the India AI Mission Program

b) To promote the collaboration between Academic Institutions and IT industry by providing incentives

c) Develop AI based elder care models which can be replicated in other states

For States with higher literacy level (Kerala, Goa)

a) Include the other AI solutions like Computer Vision or Predictive Analytics apart from the regular NLP solution to the Adult Health Care eco system
b) Earmark some of the Premier Institutions as Adult Care CoE and provide funding
c) Using the existing Infra Structure scaling up the Telemedicine program

For States with lower per Capita Income (Bihar, UP)

a) Introducing at least the low-cost rudimentary Health Care solutions
b) Tie up with an advanced 'Brother' state for ToT on AI based adult care
c) Aggressively using the federal grant and utilising them in Rural Senior Care

7.5 Research Limitations

Sampling challenges: Dependency on Resident Welfare Associations and Senior shelters for population which makes the rural and underprivileged segment may not get truly represented. Also there could be a bias towards urban segment.

Self-report and recall bias: The veracity of the inputs gathered is very subjective and heavily dependent on the mental state of the participants.

Context fitment: India is as heterogeneous as it can be on language, religion & culture. Accuracy on models based on generalisation may be having the issue of under fitment.

Technology ensemble: Many different algo like NLP, DSS, CV etc are all put together under "AI" umbrella where all the components will have different utilities, bundling them together may obfuscate the individual benefits

Mixed-method integration: Quantitative and Qualitative differences aren't always reconciled to a great extent in spite of using Triangulation method

CHAPTER VIII:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

8.1 Summary

Purpose and design: This explorative study examined the dynamics of usage of AI through the perception of Indian elders and Healthcare providers and the derived suggestions from Research to augment the adaption for the Seniors, Caregivers & AI solution providers

Key results:

- Elders perceive the AI as useful but a bit tentative to adopt it wholeheartedly because of ease of use and trust factor. There is a difference in acceptance rate depending on age, education, location & digital awareness.
- AI based tools have shown to improve medical schedule follow-up through remote monitoring and definitely reduced Health anxieties among elders but did precious little to alleviate their loneliness till date.
- Healthcare Providers reported enablement of enhanced eldercare quality, improved diagnostic accuracy and lessened administrative workload. However, at the same time, they expressed the need of customised training, clarity on policy and lack of infrastructure in the sub metros.

- It is very clear that AI tools acceptance rate would increase when it's associated with the handholding of Family & Friends, a robust infrastructure and a local flavor in design

8.2 Inference

Theoretical

Local language & culture embedded in the AI tool along with initiation by family members make the adoption faster.

AI based tools enhances the performances based on process but have very limited impact on social belonging clearly marking the boundary between the utility of man and machines.

Geo-social-economic background determines the efficacy of the acceptance rate of AI based tools.

Policy and practice

A Government sponsored AI framework for elders consisting of India specific standards, Customised training for the care givers and robot privacy policy with an active involvement of the elders is the need of the hour.

At this point AI should be expected to fly solo but should be adopted as a hybrid model and nurtured by humans.

Instead of trying to push Global products, the Software vendors should come out with India specific model which is sensitized with local customs, cultures and languages and also the present delivery condition taken into consideration.

Market and innovation

AI based tools are particularly effective to handle the lifestyle diseases which plagues the Indian elders like High Blood Pressure and Diabetes if it's backed up with empirical data and payor framework

Loneliness, which is another major curse of advanced years, unfortunately, can't be fully addressed by AI tools alone, though to some extent it makes the elders gets engaged - however human engagement is substitutable

8.3 Socio-Ethical Implications

While the introduction of AI in adult health care in India would do it a world of good, one must address the corresponding social and ethical challenges evolving from the deployment. This is even more critical for a country like India which is extremely diverse with economic and educational status, cultural norms and with the inherent skepticism of the economically backward rural elders with limited literacy. This diversity needs to be honoured and taken into consideration while devising the AI road map for elder care

8.3.1 Privacy & Ownership of Health Data

If India wants to protect its citizens from exploitation, then it needs to take a very firm step with the huge amount resultant health data from the use of AI based tool in Health care. Though the country has taken some right steps by introducing Digital Personal Data Protection Act in 2023 and the ABDM program describes permission-based harvesting of the interoperable health data, in practicality their adherence remains ambiguous at the best. As warned by Ho in 2020 and López et al. in 2022 the ignorance and casual approach towards personal rights or the potential danger of misusing health data is rampant among the village elderly in small suburbs and villages.

A lot of instances are galore where the ASHA workers are distributing the ABHA ID during enrolment without apprising them about the entire pros and cons. This is exactly what Adus, Macklin, and Pinto mentioned in their paper in 2023 where they stated that in the design of AI based systems should include the view of the patients and the monitoring of the same would require certain level of literacy where India lacks presently

8.3.2 ML Bias and Cultural Plurality

Chu et al. in 2022 & Yu et al. in 2024 spoke about this algo bias in length. India being a hugely diverse country on culture and Language may have a huge accuracy issue on AI based tools based on vanilla dataset in English. This is the primary reason on NLP based models as it fails to capture the dialect even its spoken in a single language like Hindi as its spoken with different accent from a native Hindi state like UP to a non-native state like

Karnataka. Similar issue arises in facial image capture which is used for remote monitoring of patient physical & mental condition where the facial tone differs significantly from a star like Kashmir to that one of Kerala.

Another bias crops up from the so called 'Digital Chasm' where the data set is harvested from the urban educated and economically well-off elders and the model is used on the rural elders who has limited literacy and generally weaker economically. Both Wubineh et al. and Kiss et al. in their papers of 2024 reiterated the importance to embed the social and cultural contexts into the AI modelling which is the need of the hour for country like India where the data sets should not only be multiple lingual but should be graph based to accommodate cultural nuances as well

8.3.3 Dignity and Reliance

India is very unlike the western civilisation where barring a few instances the families and extended families tend to stay together for generations and the family elders are expected to be taken care of by the family members and consider it as a slight when they are tended to by outsiders, let alone by AI based tools. As pointed out by Bradwell et al. in 2019 and Arunachalam in 2023 this phenomenon creates a lot of issues on elder's mind in India on their values in the family and whether their family members are shrugging off their responsibility

Van Kemenade and Xuereb in their respective papers in 2020 argued that there should be a distinct dividing line between Technology supplement and replacement by Technology. The family care is deeply embedded in Indian psyche and cultural lores and it can't be replaced by machines which theoretically can predict impending sickness or help to walk. So, the verdict is clear, the AI based tools should be an assistant to the family members for bestowing physical and emotional support to the elders but not substitute them

8.3.4 Equality through Accessibility

India is a land of plurality and has enough heterogenicity on its own. Now AI can greatly enhance the disparity further in case of Adult Health Care if the infrastructure on which its hosted isn't uniform. This phenomenon is clearly articulated by Guo et al. in 2018 and as recent as in 2025 by Lamem et al. where they mentioned that the effectiveness of AI is as dependent on the connectivity as it is on the accuracy of the algorithm it is built on. The Senior population residing in Rural segment often faces this negative amplification by AI because of the connectivity and lack of access to usable smart devices.

The best way to democratise the good impact of AI is to make offline devices which mostly works on voice command and has UI/UX which is not at all bandwidth hungry. The term "Rural health intelligence frameworks" coined by Pérez et al. in 2025 can be achieved in

India through those low-cost devices and when that's trained to the village community by ASHA workers and NPHCE folks.

8.3.5 Synthesis

Summarising the above points, it could be said that the ethical modelling in an India focused AI model should be having the following 5 pillars

I. **Diversity**: The AI models developed should be having Muti lingual and assortment of cultural sensitivities taken care of
II. **Simplification**: The consent flow should be based voice and images instead of being textual
III. **Priority**: Focusing on the backward segment of the population first
IV. **Supplement**: AI should supplement the Friends and Families and not replace them
V. **Governance**: The AI based tools should governed continuously to make sure that the health data isn't misused

8.4 Recommendations for Future Research

Tangible outcomes in a real-world scenario:

1) Measure the performance of the AI based tools in a more definitive way by following up the major markers of lifestyle diseases like Hospitalization numbers, Blood Pressure & Blood Sugars for a prolonged duration of 12-18 months and with much larger number of samplings

2) Comparative analysis of Tool categories along with the Cost Co-ordinate

3) Detailed analysis of different tools on the Risk vs benefit parameter associated with cost of ownership

Provider workforce impact

An elaborate study on the Caregiver segment which gives the heuristic results on various aspects of their professional and personal lifelike quality of care, quality of life and compensation benefits.

8.5 Conclusion

AI is definitely impacting the different facets of senior care in India like Medication schedule, routine based monitoring system and in time intervention . However at the same time it stresses the fact of need of human empathy to complement the AI tools . The study also show the mantra of faster adoption of AI tools by the elders lies in designing the system

more elder friendly and in local languages and customs . It becomes more acceptable when endorsed and trained to use by family members . Also a dynamic policy on AI adoption and a robust Delivery Infra for the tools will go a long way for it to move up to the chart . If the entire ecosystem is managed then it will lead a better quality of life for the seniors in India which is safe and secure for them as well.

APPENDIX A

SURVEY COVER LETTER

Survey Invitation Letter

Dear Madam/Sir

My name is Amar Nath Chattopadhyay, DBA candidate at the Swiss School of Business and Management, Geneva. I am conducting a research study titled "Explorative Study on the Role of Artificial Intelligence in Indian Eldercare: Insights from Elderly Individuals and Healthcare Providers." To get a comprehensive view I am seeking your time for a survey and/or a possible Interview.

This study examined the dynamics of usage of AI through the perception of Indian elders and Healthcare providers and the derived suggestions from Research to augment the adaption for the Seniors, Caregivers & AI solution providers

The expected outcome of this study is to provide awareness on the ground realities which would finally enhance the quality of living standard for Indian elders

You are being asked to participate because you are one of the following:

Adult with age of 60 years or more (Potential user of AI based Elder Care Technology)

Healthcare provider (Doctor/Nurse/Health Administrator)

AI solution vendor in Eldercare

The Participation involves the following

Survey: Approximately 10–20 minutes to complete a structured questionnaire

Optional Interview/Focus Group: 30–45 minutes for an in-depth discussion about your views & experiences

Location/Mode: Online/phone/in-person, as applicable.

Voluntary Questions: You may skip any question you are not comfortable answering.

Thank you for considering this invitation in advance. Sharing your experiences & expertise my help to build up a safer and enabled life for the Indian elders

With sincere regards,

Amar Nath Chattopadhyay
DBA Candidate, Swiss School of Business and Management, Geneva
Study: AI in Indian Eldercare
Email: anc238@gmail.com

Phone: + 91 9999440072

APPENDIX B

INFORMED CONSENT

Informed Consent Form for the Study

Explorative Study on the Role of Artificial Intelligence in Indian Eldercare: Insights from Elderly Individuals & Healthcare Providers

Research Student

Name: Amar Nath Chattopadhyay

Program/Institution: DBA Candidate, Swiss School of Business and Management, Geneva

Email: anc238@ymail.com

Phone/WhatsApp: +91 9999440072

You are requested to participate in a research study of mine conducted as part of a Doctor of Business Administration (DBA) program. I request you to please go through this form

and ask any questions to me, if you have any, before participating. Your participation is strictly voluntary

Purpose of the Study

This research has goal to add to the ongoing research on the use of AI in eldercare and more specifically focusing on Indian population with the viewpoint of elders, Caregivers and AI solution developers taken into consideration

Why You Were Invited

You are being asked to participate because you are one of the following:

Adult with age of 60 years or more (Potential user of AI based Elder Care Technology)

Healthcare provider (Doctor/Nurse/Health Administrator)

AI solution vendor in Eldercare

What Participation Involves

Survey: Approximately 10–20 minutes to complete a structured questionnaire

Optional Interview/Focus Group: 30–45 minutes for an in-depth discussion about your views & experiences

Location/Mode: Online/phone/in-person

Voluntary Questions: You may skip any question you are not ready to answer

Benefits

No monetary benefit.

Sharing your experiences & expertise my help to build up a safer and enabled life for the Indian elders

Confidentiality

Anonymity: Your identity and any directly identifying information will be kept secret

Data handling: Data will be stored securely on password-protected systems accessible only to the Researcher only

Reporting: Findings will be reported in an aggregated form. Any direct reference will require your explicit consent.

Voluntary Participation and Right to Withdraw

Participation is **completely voluntary**.

You may withdraw at any time without citing any reason

Costs and Compensation

No cost to participate.

No monetary compensation would be given for your time spent on this Survey/Interview.

Consent Options

Please read each statement and tick your choice.

1. I have read and understood the information above
    - Yes - [] No
2. I voluntarily agree to participate in this study.
    - Yes - [] No

Participant Details and Signature

Participant Name: _____

Role: Elder / Healthcare Provider / Vendor / Other: _____

Organization (if applicable): _____

Email/Phone (optional): _____

Signature: _____

Date:

Researcher Declaration

I hereby confirm that I have explained the context in detail to the participant to the best of my ability

Researcher Name: Amar Nath Chattopadhyay

Signature: _____

Date:

APPENDIX C

SAMPLE QUESTIONS

Sample questions:

RQ1 (elderly quantitative)

1.What is your age?

a) 60-69

b) 70-79

c) 80 and above

2.What is your gender?

a) Male

b) Female

3.What is your highest level of education?

a) No school education

b) Primary education

c) Graduation & above

4. How often do you use a mobile phone?

a) Never

c) Sometimes

d) Often

5. AI-based tools (like health monitoring apps) are useful for my health.

1: Yes

2: No

3: Don’t know

6. I feel comfortable using an AI-based health monitoring application.

1: Yes

2: No

3: Not sure

Perceived Barriers

7. I think that AI tools can and may replace the need for human caregivers.

1: Yes

2: No

3: Don’t know

8. To have support from family or friends is important for me when learning to use new technologies.

1: Yes

2: No

3: May be

9. AI could improve my daily life quality

1: Yes

2: No

3: May be

10. I would recommend AI-based solutions to other seniors.

1: Yes

2: No

3: May be

RQ2 (elderly quantitative)

1. Have you sensed positive results in your health after you have started using AI based health applications

1: Yes

2: No

3: Can’t say

2. Do you feel that you are in a position to manage your chronic ailments better after you started using AI based tools

1: Yes

2: No

3: Can’t say

3. Do you feel less anxious about your health because of presence of AI monitoring tools.

1: Yes

2: No

3: Not Sure

3: Not Sure

4. Are you being more proactive with your health monitoring after starting to use AI based tools.

1: Yes

2: No

3: Not Sure

5.Which all of the following AI based tools have you used? (Select all that apply):

a) Health monitoring applications

b) AI based Virtual health assistants

c) AI based Medication reminder tools

d) AI based Telehealth platforms

e) AI based Cognitive training programs

f) None of the above

6.How often do you use AI based health applications?

a) Daily

c) Once a week

e) Never

7.Do you feel that AI based tools can address the feeling of isolation for elders like you

1: Yes

2: No

3: Not sure

8.Do you feel AI based tools will play crucial role in your healthcare in the future.

1: Yes

2: No

3: Can’t say

9. Do you believe AI based tools can send timely reminders for your medications and appointments.

1: Yes

2: No

3: Not Sure

10. Do you feel that the use of AI based tools in your healthcare would increase over time.

1: Yes

2: No

3: May be

RQ3 (Health Provider quantitative)

1. **Do you believe that AI based technologies can improve patient care for elderly patients substantially**
    - 1: Yes
    - 2: No
    - 3: Not sure
2. **AI tools have increased my ability to diagnose and treat senior patients.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
3. **Do you receive continuous training on how to implement AI solutions in your practice.**
    - 1: Yes
    - 2: No
    - 3: Not sure
4. **Do you think the addition of AI in your profession has eased communication with elderly patients.**
    - 1: Yes
    - 2: No

- 3: Not Sure

5. **Do you feel confident using AI based tools in my clinical decision-making.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
6. **Have you seen improved patient results after using AI-driven solutions.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
7. **AI based tools help reduce my workload related to regular administrative chores.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
8. **Do you believe that AI can help identify and manage chronic conditions in elderly patients.**
    - 1: Yes
    - 2: No
    - 3: Not Surel
9. **Are you aware of the ethical conundrum of using AI based solutions in healthcare.**
    - 1: Yes

- 2: No
- 3: Not sure

10. **I believe that AI tools can personalize & provide customised care for senior patients more effectively than the usual way.**
    - 1: Yes
    - 2: No
    - 3: Not Sure

11. **What are the main challenges you face in using AI based solutions in your practice? (Select all that apply):**
    - a) Lack of proper training
    - b) High usage costs
    - c) Reluctance from staff
    - d) Privacy issues
    - e) technical challenges
    - f) Other (please mention)
12. **How often do you use AI based technologies in your profession?**
    - a) Daily
    - c) Once a week
    - e) Never
13. **What type of AI based tools do you use in your healthcare practice? (Select all that apply):**
    - a) Decision support systems

- b) Predictive analytics
- c) Clinical workflows
- d) Patient monitoring tools
- e) None of the above

14. **How do you measure the effectiveness of AI based applications in patient care? (Select all that apply):**
    - a) Patient feedback
    - b) Clinical outcomes
    - c) Workflow efficiency
    - d) Staff feedback
    - e) Other (please specify)
15. **What improvements do you believe AI based solutions can deliver to elderly care? (Select all that apply):**
    - a) better patient results
    - b) Enhanced patient engagement
    - c) More accurate diagnoses
    - d) Lower costs
    - e) Improved communication
16. **Do you believe that patients are comfortable with AI being involved in their healthcare?**
    - a) Yes
    - b) No

- c) Not sure

17. **How strong is your organization's support for adopting AI in healthcare?**
    - a) Very sufficient
    - c) Neutral
    - e) Very insufficient
18. **I believe that AI can help to reduce healthcare differences among senior patients.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
19. **Are you encouraged by your institution to examine and use AI based technologies.**
    - 1: Yes
    - 2: No
    - 3: Can't say
20. **Do you think that AI based solutions are necessary for the future of healthcare delivery in India.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
21. **Do you think patient data collected through AI technologies is secure and protected.**

- 1: Yes
- 2: No
- 3: Not Sure

22. **Do you think AI based applications facilitate better collaboration among healthcare providers.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
23. **Do you believe that continued research is important to improve AI applications for elderly care.**
    - 1: Yes
    - 2: No
    - 3: Not Sure
24. **Would you like more opportunities for professional development regarding AI based applications**
    - 1: Yes
    - 2: No
    - 3: May Be
25. **Do you believe that the inclusion of AI in healthcare is important for improving senior patient care in the coming ten years.**
    - 1: Yes
    - 2: No

- 3: Not sure

RQ12 (Elder Qualitative)

25 Qualitative Questions for Elderly Individuals

Questions Related to RQ1: Perceptions and Acceptance of AI-Driven Solutions

1) What do you feel about using AI based tools to help you in your daily health status monitoring and taking steps accordingly ?
2) What all AI based solutions or tools have you used and what was your initial reaction to them?
3) Can you share any experiences you had when using AI based applications chosen for your health?
4) What factors would make you use AI based solutions for your health care?
5) How critical is it for you to have your family and friends support when using AI based tools?
6) Are there any particular features or functions of AI based tools that you feel are critical for your needs? What are those if they exist?

Questions Related to RQ2: Effects of AI-Driven Interventions

1) How you believe AI based tools have influenced your physical health? Can you share some examples?
2) Do you think that your mental health can be improved if AI based solutions are included by your hospital?
3) Do you remember any incident when AI based tools helped you manage a health issue?
4) Do you feel that you can control your health in a better way if you use AI based tools ? Why and why not?
5) What changes have you noticed in your health regimen since you started using AI based solutions?
6) Can you cite any challenge you faced while using AI based solutions for your health care?
7) What's your idea on AI can enhance the quality of life for elders in the future?
8) Is there any negative experience you have come across with AI based tools that you want to share?
9) What sort of knowledge base do you think would help you feel more comfortable using AI based tools?
10) What do you foresee the future of healthcare for elders with the usage of AI based solutions?
11) Do you want to share any suggestions you will give to Software Developers of AI based tools targeted at seniors?

12) What social or emotional influence do you believe AI based tools can have on seniors I in caregiving situations?
13) If you can change one thing about the AI based solutions presently available for senior care, then what would it be and why?

RQ3 (Healthcare Provider Qualitative)

Questions Related to Challenges and Barriers in Implementing AI-Driven Interventions

1. What's is your perspective on AI based Health Care solution and its impact?
2. What all AI based solutions or tools have you used and what was your initial reaction to them?
3. What benefits do you think AI based tools can offer to seniors?
4. Can you cite some instances of resistance you faced while using AI based solutions in your profession?
5. Do you think that both the Care Givers and Elderly patients are ready to use AI based solution?
6. Can you cite some incidents you came across where using AI based tools definitely impacted the prognosis to a positive side of the elderly?

7. What apprehensions do you have on the use of AI based technologies in your profession?
8. How do your regular work schedule got impacted after you started using AI based system?
9. What training have you received to make you understand and use AI based solutions in your profession?
10. According to you how the use of AI based system improve the delivery of Elder Care?
11. What institutional roadblocks do you face in using AI based solutions for senior care?
12. What do you think of your Organisation's role in promoting or demoting usage of AI based solution in health care and why?
13. Do you consciously adhere to ethical standards when you use AI based system?
14. Please share your take on the impact of Policy changes on the prevalent use of AI in elder care.
15. Please share your idea on the cost impact of using AI based solutions in your profession.
16. Can you please recollect some practical challenges like software compatibility , understanding UI etc you faced while using AI based solutions?
17. What's your view on the ethical considerations on use of AI in healthcare for seniors?

19. What incremental advancements should be done on the existing AI based solutions so that the adoption rate in elder care increases?
20. What's your idea on AI can improve the quality of life for seniors in the future?
21. Do you think how the elders use AI based tools to manage their well-being in their own space like homes?
22. What sort of knowledge base do you think would help you feel more comfortable using AI based tools?
23. What do you think it would take to build up a collaborative ecosystem -system among Caregivers to provide AI based Health care solution to the elders?
24. Do you want to share any suggestions you will give to Software Developers of AI based tools targeted at seniors?
25. What social or emotional influence do you believe AI based tools can have on seniors in caregiving situations?
26. If you can change one thing about the AI based solutions presently available for senior care, then what would it be and why

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