NON-GOVERNMENTAL ORGANIZATION AS AN ENABLER TO SUPPLEMENT GAPS IN HEALTHCARE ACCESSIBILITY AND DELIVERY IN RURAL INDIA

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Dedication

I am dedicating this work to my late mother Dr. Vasa Prabhavati who is and has been an inspiration and guiding light for me.

Acknowledgements

The writing of this Dissertation has been a challenging academic experience I faced, in a long time. My special thanks to my guide Dr. Minja Bolesnikov, whoimmensely supportedme and guidedme to be able to complete this Dissertation. I would like to extend my gratitude to my personal advisor, Miroslave Silic, for all the timely help and guidance he provided along with Dr. Mario Silic and Dr. Iva Buljubasic for their excellent welcome advise, coaching and insights. My sincere thanks to all the Dhanvantari Yan Seva Foundation Employees, our research team along with Village Administration and Primary Health Center Officialsfor all their support and cooperation in helping us complete the pilot projectsand alsothe people of Telangana who gave us an opportunity to serve and continue to do so. Lastly, without the support and encouragement from my dear wife and children this work would not have been possible.

ABSTRACT

NON-GOVERNMENTAL ORGANIZATION AS AN ENABLER TO SUPPLEMENT GAPS IN HEALTHCARE ACCESSIBILITY AND DELIVERY IN RURAL INDIA

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The purpose of this research study was to identify and validate gaps in rural healthcare infrastructure and provide a viable operational model for a Non-Governmental Organization to provide solutions to meet the timely needs of socioeconomically challenged rural populations. The study included analysis of 2011 census data from Government of India to understand the demographics and socio-economic conditions. The Data clearly identifiesincredibly low literacy levels with most of the population dependent on agriculture economy.Although a lot of progress has been made to alleviate the poverty problems in India, according to world bank data, about 176M of Indian population still remains below the poverty line.

Three rural locations were identified for a use case for this study which included analysis of the census data of the local populationto understand the demographics. A patient transportation trial service was launched using custom manufactured Bike Ambulances in these three location and patient transport activities were documented

using an Online Service Request system. The trial ran for a seven-month period from March through September 2021. Data collected was used to analyze, to make quick adjustments and find a sustainable NGO operational model. A number of operational adjustments were made to finetune the operations framework to ensure smoother service.A thorough survey of participants from every social class from these locations was conductedpost COVID-19 Second wave from July 2nd week to September 2nd Week, to further analyze the populations view on current healthcare infrastructure and gaps.

Another Use Case was identified to support urban population suffering from Covid-19 Second wave and the lockdowns which stalled the economy. Multiple services were offered during this use case study and valuable data was collected. Although, the census data showedhigher literacy in the urban area but due to lockdowns and slowed downeconomy, people and patients needed a lot of helpwith necessities like medication, groceries, and hot meals. COVID-19 effected patients who were self-quarantined needed COVID-19 Medical kits. Transportation was limited with skyrocketing costs. The poor needed transportation services to the government hospitals with free medical care.

Overall, the research has verified that gaps in the healthcare delivery in rural areas. Also, lower literacy rates have a profound effect on the rural populationshealthcare needs. NGO solutions with a self-sustaining operational model as an extension of the rural infrastructure both public and private is a viable option. The NGO provided services can be customized to the needs of the local populations.NGO solutions with a self-sustaining operational model as an extension of the rural infrastructure both public and

private is a viable option to provide services as per the needs of the local populations. Since affordability has proven to be a big challenge, providing free or near free transportation services to the rural population is a win-win proposition. Delivering services which are need of the hour is essential to serve the community to the best possible extent.

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CHAPTER I:

INTRODUCTION

1.1 Introduction

Last 2 decades have seen an enormous development in rural India, especially in the areas of accessibility to healthcare. However, there are several gaps in the holistic healthcare delivery which needs to be addressed. Some of the healthcare services in rural areas simply cannot be scaled beyond a limit due to socio economic conditions. This study is an attempt to identify such gaps and find creative solutions to fill the gap, hence enhancing the overall patientcare experience. Predominantly, most of the healthcare in rural areas is delivered through government channels. Not every problem can be addressed through the government channels for a multitude of reasons. Few of the reasons we have found are Budgets, Program Priorities, Politician Commitments. Due to these reasons, sometimes, the changes have adverse effects on Healthcare Quality of Service and associated service delivery objectives. There are areas where NGOs can play a big role in enhancing the overall patient experience in accessing the healthcare services. In certain rare situations, NGO channels are used to drive maximum benefit in accomplishing specific targeted objectives. These specific objectives could be of multiple types, like reduction of a particular disease or reduction in mortality rates, meeting family planning targets etc.

One such role is patient transportation, to safely and economically transport patients from their homes to healthcare centers and back home. This is particularly important if the patient is a dependent or financially challenged. With the growing

economy, cities are seeing rapid growth, fourteen of the twenty fastest growing cities in the 2015-19 period will be in India (Source: Oxford Economics). These new urban centers are attracting a complex migrant worker pool.

Oxford Economics research institute published a report which has all the top ten fastest growing cities by GDP from now to 2035 across the globe will be in India.According to the report these cities with a 2.6% per year expansion will drive the growth of the global economy.

Top 10 fastest-growing cities in the world, 2019-35

Rank	Growth (%y/y, 2019-35)	City	GDP 2018 ($ billion, constant 2018 prices)	GDP 2035 ($ billion, constant 2018 prices)
1	9.17	Surat	28.5	126.8
2	8.58	Agra	3.9	15.6
3	8.50	Bengaluru	70.8	283.3
4	8.47	Hyderabad	50.6	201.4
5	8.41	Nagpur	12.3	48.6
6	8.36	Tiruppur	4.3	17.0
7	8.33	Rajkot	6.8	26.7
8	8.29	Tiruchirappalli	4.9	19.0
9	8.17	Chennai	36.0	136.8
10	8.16	Vijayawada	5.6	21.3

Source: Oxford Economics

Figure I – Top 10 fastest-growing cities in the world, 2019-35

A broader shift in economic might is expected from west to east with the dominant Indian's rapidly growing cities. By 2035 an estimated 17% higher GDP is being predicted for these cities and by 2027 the combined GDP of all Asian cities will exceed that of North America and Europeans cities combined. A growth rate of 7.4% was forecasted by IMF which predicts that India's economy will grow faster than that of China.

India most likely will have a very compelling growth story with a large growing consumer market and favorable demographic profile. With increasing foreign investments and growing domestic market India now makes up 15% of the global growth. India ranks 58th out of 140 economies in the world economic forum's Global competitiveness report.

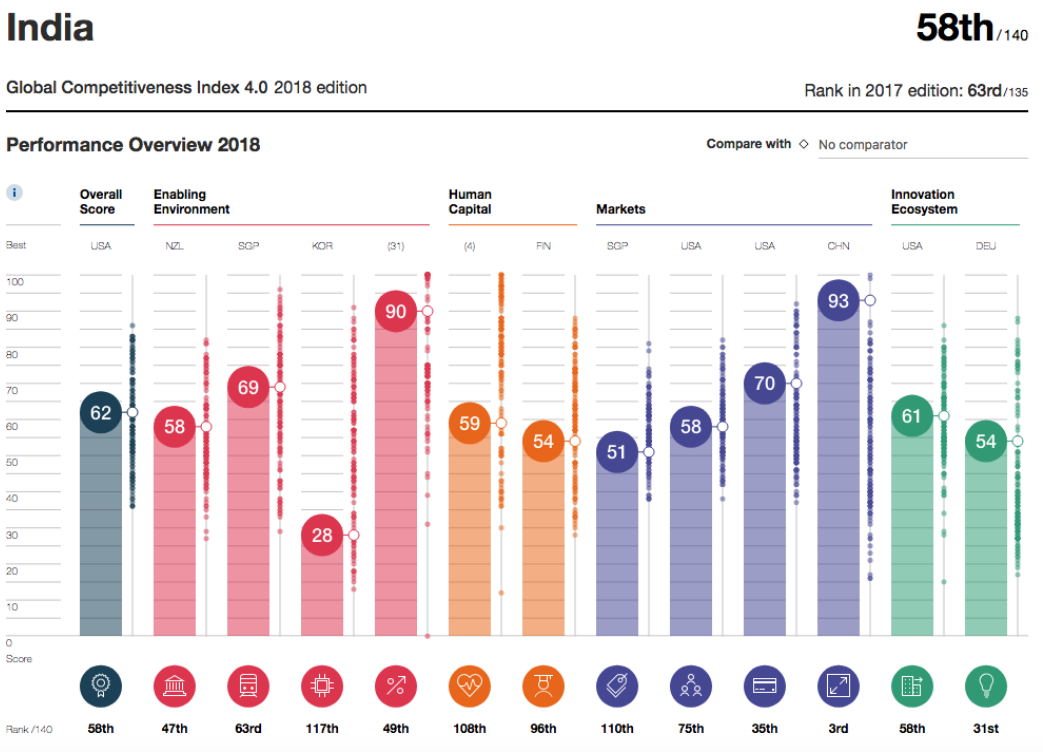


Figure II – Performance Overview 2018

International Monetary Fund (IMF) recently heralded India as "Elephant starting to run" as it made up 15% of the global growth fueled by reforms, foreign investment and strong domestic demand and is on target to become world's third largest economy by 2030.Although India's growth story is very compelling there is another dimension which needs to be looked at to fully appreciate the complex situation India is grappling with. The population of India is estimated to be around 1.4Billion and growing. Substantial progresshas been made in eliminating extreme poverty across the country, but it is still

work in progress. We will briefly discuss the World Bank Data regarding the poverty situation, progress, and complexity due to covid-19. According to World Bank Data, absolute poverty reduction in India has seen tremendous progress since the 2000s. India continued the historical trend of robust poverty reduction between FY 2011/12 and 2015. Poverty at the international poverty line of 2011 PPP $1.90 per person per day, declined from 21.6% to an estimated 13.4% as shown in the CHART BELOW. More than 90 million people escaped extreme poverty and improved their living standards during this period which was also aided by a robust economic growth (Source: World Bank Data).

POVERTY	Number of Poor (million)	Rate (%)	Period
National Poverty Line	273.1	21.9	2011
International Poverty Line US$1.90 (2011 PPP) per day per capita	175.8	13.4	2015
Lower Middle Income Class Poverty Line US$3.20 (2011 PPP) per day per capita	659.8	50.4	2015
Upper Middle Income Class Poverty Line US$5.50 (2011 PPP) per day per capita	1,077.9	82.3	2015
Multidimentional Poverty Measure		N/A	N/A
SHARED PROSPERITY			
Annualized Consumption Growth per capita of the bottom 40 percent		3.20	2004-2011
INEQUALITY			
Gini Index		35.4	2011
Shared Prosperity Premium = Growth of the bottom 40 - Average Growth		-0.49	2004-2011
GROWTH			
Annualized GDP per capita growth		5.35	2004-2011
Annualized Consumption Growth per capita from Household Survey		3.69	2004-2011
MEDIAN INCOME			
Growth of the annual median income/consumption per capita		3.47	2004-2011

Sources: WDI for GDP, National Statistical Offices for national poverty rates, POVCALNET as of Feburary 2020, and Global Monitoring Database for the rest.

WORLD BANK GROUP
Poverty & Equity

Poverty Economist: Sutirtha Sinha Roy

Figure III – World Bank Group Poverty Index

Because of the huge population of India, poverty remains widespread even after the tremendous success. It is estimated that 176 million Indians are still living in extreme poverty which, in itself, is a humongous number. The outbreak of COVID-19 pandemic and the containment measures which were adopted by the government is expected to

exasperate the poverty problem in India. Because of the living standards, poorer households are exponentially exposed to the risk of COVID-19 spread.

Hygiene is a problem in the poorer segment of the population. A 2018 survey highlighter this fact where only 22% of the households in the lowest consumptions decile reported of washing hands with soap before meals. Urban slums in India have remarkably high densities of population which further reduces the efficacy of social distancing measures. The COVID-19 related lockdowns which were extended multiple times to counter spread of COVID-19 first and second waves have an adverse economic impact on self-employed and causal workers, 11% of the populations was immediately impacted due to the closure of Shops, hotels and restaurants which provide them employment.

The greater progress although is a welcome phenomenon, there seems to be an uneven spread of prosperity with states and social communities who were better off to begin compared to the states and communities who were behind. India must do a better job in ensuring the growth is more evenly spread across the segments of the society who are making the stride to go over the poverty line. This effort must be all inclusive of the left behind communities including women and to ensure the human development outcomes related to gender, education, health, and nutrition are more fairly spread.

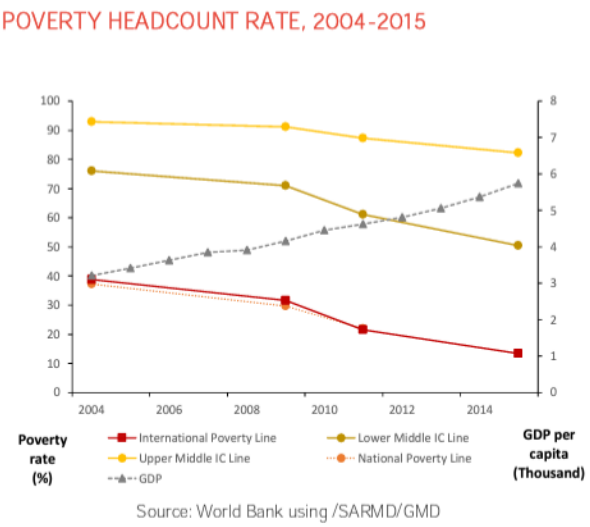


Figure IV – Poverty Headcount Rate 2004-2015

Chart Above shows few noticeable trends. The international poverty line is trending low along with the national poverty line, which shows that the government efforts to eliminate poverty are successful. Another important trend is that the GDP is trending up which shows a gradual increase which signifies a health growth of the economy.

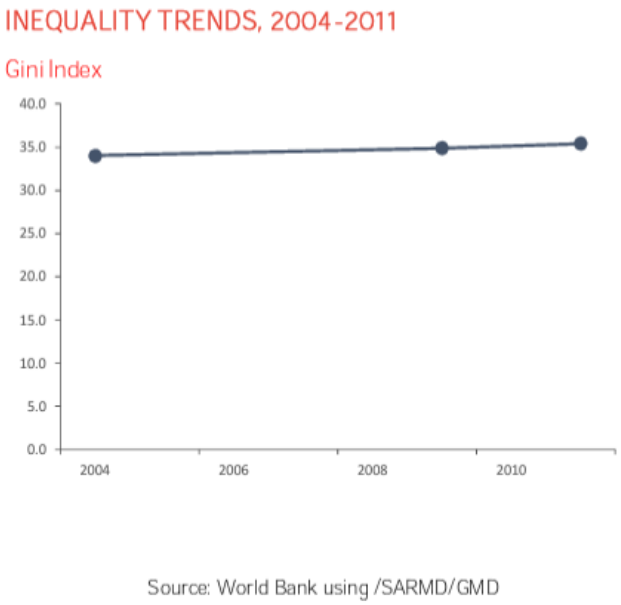


Figure V – Inequality Trends, 2004 - 2011

Chart above shows that the inequality is trending slightly higher which make it clear that government initiatives should cater more to the populations who are behind than the ones who are already doing well.

Despite a well-crafted fiscal and monetary policy support, India's economy has seen a contraction of 7.3% in financial year 2021 due to the effects of COVID-19 related lockdowns. The second wave has been more deadly and the economic growth for financial year 2022 would be closer to the lower bound of 7.5% to 12.5%. This still puts India among the fastest growing economies of the world. The increased pace of vaccinations is only going to complement this growth pace. Mid-term growth will get a boost with the new Agriculture and Labour laws but weakened household and corporate balance sheets due to pandemic will be a drag on the growth. Due to the pandemic and its economic impacts, there is a loss in GDP projections which show the gains made in poverty rate reduction in 2020 may revert back to the 2016 levels. A vast majority of Indian labour force effected by the pandemic is employed in the informal. Youth, women, and migrants who are traditionally excluded groups are impacted more with the pandemic. Urban households who are closer to the poverty lines are in danger of falling below the poverty line because of the economic impact of the COVID-19 pandemic.

The government response to COVID-19 outbreak has been swift and comprehensive. A complete national lockdown was implemented to contain the health emergency. The government also implemented various schemes to benefit the small and medium business with access to liquidity and poorer households with various social security packages.India has to build back a better future with growth-oriented reforms which ensure its citizens of more equality. In this endeavor world bank is partnering with India in ensuring the policies, institutions and investments promote more equality for its citizens through green, resilient, and inclusive development initiatives.

KEY INDICATORS

Distribution among groups: 2015	International Poverty Line(%)	
	Non-Poor	Poor
Urban population	91	9
Rural population	85	15
Males	87	13
Females	86	14
0 to 14 years old	81	19
15 to 64 years old	88	12
65 and older	89	11
Without education (16+)	82	18
Primary education (16+)	87	13
Secondary education (16+)	93	7
Tertiary/post-secondary education (16+)	98	2

Source: World Bank using /SARMD/GMD

Figure VI – Key Indicators

The key indicators of 2015 world bank study shows 9% of the urban population of total India is under the under the international poverty line. On the other hand, the 15% of the rural population, 13% of male population, 14% of female population, 11% of sixty-five and older population and 18% of illiterate population falls under the international poverty line. Hence based on this data presented by 2015 World Bank study, it can be safely concluded that population greater than 14% below poverty line category falls in the category of rural areas and illiterates.

Migrant workers usually are from rural areas, who come to the cities leaving behind their loved ones which usually is aged parents, and sometimes spouses and children. This pool of population who are left behind in rural areas are predominantly dependent. For them, transportation is a big problem, as they rely totally on mass transportation both public and private. Current Public transportation is operated by the State owned Road Transportation Authority which are usually buses. These buses have specific routes to move passangers between the rural areas to either the district headquarters or to the closed metro areas. They rarely cover local patients needs to go to

the local Primary healthcare Centers. On the other hand the private transportation is operated by a small bsuiness owner who typically has a three wheeled automobile to carry passengers. These vehicles cover all the gaps in public transportation as long as they are profitable for them. So in remote areas where population density is very low private transportation option are rare.

This research is an attempt to qualitatively and quantitatively study an NGO operational structure which enables healthcare delivery in impoverished rural areas. This study will be a hypothesis to deploy action research methodology and employ several use cases to address different health care delivery related issues with an attempt to find a scalable self-sustainable solution. It deals with several complex situations employing trial and error methodology to improve the patient transportation service delivery. The goal is to prove the hypothesis and to conclude with a feasible operational model. The solution will take into consideration the entire existing rural healthcare and governance infrastructure including socio economic complexities. There has been a lot of study in rural healthcare delivery in India but little or no effort has been focused on the gaps in the infrastructure of healthcare delivery at the grassroots level of the rural India. Few examples of the gaps are Non-Critical Patient transportation, access to basic vitals measurement equipment at village and hamlet levels.

This Dissertation will focus on an NGO to find its right structure and operational policy, scope of services to meet its goals and objective and will serve as a model for healthcare delivery enablers in rural areas. Although the study is in rural India setting, the solution can be adopted in any socio-economically challenged rural areas where public and private mass transportation is a challenge. This will be an attempt to addresses infrastructure problems at the grass roots level with a bottom-up approach. All current approaches are typically top-down studies based on a healthcare crisis or policy or a

regulation. Not many studies address the complicated socio-economic conditions which exist in these rural areas. In several scenarios one-size-fits-all or one-solution-fits-all does not work. A few use cases will be used to prove that a flexible grassroots level solutions can address the patient transport problems.

The results will establish a proven set of steps to create, operate and enhance a non-governmental organization to serve rural communities with complex socio-economic problems. It will also validate application of high academic standards and validation of the methodologies employed to prove the hypothesis.

1.2Background

There has been some work done related to this topic across few countries. The transportation issues will be further reviewed in Literature review section 2.2.6.

However, evidence shows that not enough work has been done for Rural India. Most of the studies addressed burning issues like pandemics which needed immediate solutions. For example, Cholera, and AIDS received a lot of attention due to high mortality rate and their ability to spread rapidly in rural population. Considering thescale, the studies to enhance patient experience in a self-sustainable fashion havenot been a priority topic.However, with the shift in demographics it is essential that this critical issue be addressed as a rural infrastructure problem than just transportation issue.

The rural healthcare delivery infrastructure is very lean in rural India. None of the studies or research have covered the topic which this dissertation is trying to address. In most cases there is an ASHA worker or village volunteer for few villages based on population and economic state of the rural region. There is little or no healthcare infrastructure in this setting. The closest health facility sometimes could be as far as eighteen kilometers away. There are situations where the Thandas (Hamlets) do not have any kind of transportation which leads to delay in healthcare delivery. Although

government provided 108 Ambulance service exists, it only services emergency and critical trauma patients. Sometimes even these Ambulances take hours before they can respond to do the pickup as they are stationed closer to the Primary Health Center (PHCs), which are usually Mandal(township) headquarters.

Delay in healthcare is caused due to lack of quick transportation, however the problem gets more complicated if the patients do not have the knowledge of where to go to get the right care. The local PHCs are not staffed with specialists and cannot perform many procedures other than simple first aid and medication for common health conditions. In such scenarios the patient loses valuable time, not only to find the care center but also to find the transportation to the care center which can deliver the needed care. In this scenario, an external service to identify appropriate healthcare facility or an option to access a telemedicine hotline is essential to save the valuable time.

The authorhas been in practical research for last 6 years and has done extensive travelling to the rural areas. He has conductedinterviewsand learnt the complex issues facing these rural areas. Travelling across six states and several hundreds of villages, interviewing various rural politicians, villages elders, government administrators, medical officers, nurses, ASHA workers, it was evident that the need to have a stable transportation exists due to shortfalls in the current solutions.

The topic has been validated with grassroots level problem identification and solutions by the target beneficiaries taking into consideration all existing health care delivery infrastructure. Several government projects are inconsistent in delivery as “one size fits all” does not work in most situations. Limited funding and ever-increasing priorities keep the funding away from patient transportation needs to be addressed. Even if there are solutions in place the need far exceeds the funding available to support such

needs. There is evidence that NGOs participate in this space, but the solutions are sporadic and does not scale to provide individual patient experience.

In certain cases, the program could not sustain as a long-term solution even though there was a solution put in place designed by government or an NGOs.The failurewas due to shifting of government priorities. One will begin to realize quickly that whatever the solutions is, it should not be driven by government's shift in policy or funding. The solution should be part of the rural healthcare infrastructure but needs to be self-sustainable to ensure patientcare experience is maintained for long term.

1.3 Research Purpose and Questions

1. The research needs to validate the hypothesis that there is a gap in the current delivery infrastructure which needs to be filled.
2. It needs to validate that an NGO is a viable option apart from a new government solution or the inadequate private solutions which are being followed.
3. Validate the operational model of the NGO with quantitative studies and use cases.
4. Validate the financial model is a viable option for a self-sustained NGO for future expansion into areas beyond the current pilot model.
5. A flexible portfolio of services is necessary to meet the need of the hour in the rural setting.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Introduction

Countries with strong primary healthcare system across the world have lower costs, lower inequalities, and better health care outcomes (Mohan, 2019). Modern healthcare infrastructure which caters to their community needs is complex especially if it includes socially challenged populations centers. Such healthcare systems do require decisions which challenge both politically and administratively. (Ramani, 2006)Robust healthcare infrastructure is a priority for a rapidly growing nationlike India as it plays an integral role in both economic development and reduction of poverty. India's primary healthcare system is facing new challenges with rapid urbanization, changing epidemiology leading to rising people's expectations (Mohan, 2019).

Indianeconomy has been growing steadily over the last decade. This growth has put India's healthcare system at crossroads. Public Health initiatives by the Indian government have made a considerable stride and has made a visible progress, there is still a lot of heavy lifting left in making healthcare robust. India still ranks at 118 among the 191 WHO member countries(Ramani, 2006).India's investment in primary healthcare between 2005 and 2015 increased preventive care and led to equitable health related people behavior (Mohan, 2019). Health and Wellness impact on the population is negatively impacted if there are fragmented and competing healthcare programs and schemes (Mohan, 2019).

Indian government implemented a comprehensive reproductive and child health strategy. Through its local initiatives program a model previously used in Indonesia and Bangladesh was adopted (Paxman, 2005). A new cadre of community volunteers (ASHAs) was created, andan assured referral transport (108) was setup by the National

Rural Health Mission (NRHM). These are newer flexible resources and redesigned elements including ASHAs, 108 service enhanced community engagement through village health and sanitation committees along with Rogi Kalyan Samitis. Ayushman Bharat was launched as part of National Health Policy 2017with an aim to expand the scope and reach of primary healthcare through a network of 150,000 health and wellness centers across the country. (Mohan, 2019)

The extent of family separation varies with respect to the occupational category of the migrant. (Parasuraman, 1986). A large number of the workforce is constantly on the move to find work.This moves results sometimes in separation of families. Although the family separation is directly dependent on the type or category of the work performed by the migrant worker,the degree of family separation also directly dependent on the type of skills of the migrant workers and the jobs they perform. Family separation is observed to be the highest among migrants who held jobs among the lowest paid and requiring little or no education. Jobs which require little or no education which are also among the least paid usually have the most impact onfamilies due to separation.Situations where the entire family moves out of the place of origin in search of work or in the context of conjugal separation is used as a criterion to assess the impact of migration on the family (Parasuraman, 1986).

New opportunities for an integrated healthcare systems are being created to have a greater understanding of innovative ways of healthcare delivery and financing the public healthcare (Mohan, 2019). Emergent opportunities and new challenges arising out of the delivery need addressing making it imperative to develop innovative designs of integrated and comprehensive healthcare delivery systems (Mohan, 2019).

Accessibility is a major problem in rural India, distance to the health care facility directly effects in-facility childbirth (Kumar, 2014).It is less likely for a woman living in

remote areas to give birth in a facility as the distance to the healthcare facility increases. (Kumar, 2014)As the distance between the population and a healthcare facility increases the chances of having clinical birth proportionally decreases there by increasing the chances of post-natal complications to the mothers and newborn.In certain simulated policy results, the institutional birth increased significantly as the distance to healthcare facility reduced. Overall, our findings confirm that distance is an important barrier to in-facility births in rural India (Kumar, 2014).

India ranks among the top twenty healthcare markets in private spending on healthcare, approximately 86% of the private spending is personal out of pocket expense, employers pay 9% of spending on private care, and health insurance share is less than 10%. As much as the bottom three quintiles of the Indian population live at or below the poverty line;Out of pocket expenses for healthcare needs could be a significant burden. A large number of the Indian households reportedly have borrowed money or sold their assets to cover for the healthcare and hospitalization expenses (Deshpande, 2012).

2.2 Literature Review

2.2.1 Current Healthcare situation in India

Ayurveda is a traditional Indian Medical heritage, was a system of medicine and lifestyle that has been practiced since ancient Vedic India, approx. more than 4000 years ago. (Rudrappa, 2019) The progress of India in all sectors including healthcare took backstage due to foreign invasions, mainly British Raj. Due to lack of scientific or health research systems development during the British regime, was a major contributor to the current burden of disease and disability in India.

Today, India is a country with a population of 1.2 billion, spread over 3-lakh sq. km., Indian diversity and widespread cultural influence is quite well-known throughout the world. In spite of a population growth rate of 1.17%, the median age, currently, is at

27.9 years with over 33.5% of the population resides in urban areas. Biggest challenge faced by Indian healthcare delivery systems is that 25% of the Indian population is below the poverty line. The state government has the primary responsibility to provide quality healthcare services to the people of India. India has seen gradual progress in healthcare sector after independence. The current healthcare system of India comprises a set of public and private institutions, controlled by the state government, the central government, and private organizations.

Government spending is reserved for only those institutions owned and run by the central and state governments. India's dynamic medical structure is dominated by those controlled by private organizations. The public healthcare system was originally developed to provide healthcare access regardless of socioeconomic status. When India became independent in 1947, the private health sector provided only 5–10% of total patient care. In 2005 it accounted for 82% of outpatient visits, 58% of inpatient expenditure and 40% of births in institutions. India's challenges with the healthcare system remain skewed to rural areas as compared to the urban areas. This may be due to the focus on rapid development and the increase in the investments that take place on private healthcare development, catering to the evolving shift in incomes across urban settlers. Challenges remain for the Indian healthcare system. Even though 70% of the population is in rural India, hospital infrastructure is concentrated in urban areas. This produces difficulties for accessing beds for rural patients.

Ever since India became independent in 1948 and a new republic in 1951 there has been a continuous and steady progress on all fronts of human and economic development. (Kumar, 2013) Over the last Seven decades India has transformed into the largest democracy the world has ever seen along with the fastest growing economy in the

last two decades. Like any growing economy India, the second largest populated country, is challenged with several pressing problems including healthcare for its population.

Although noteworthy progress has been made in providing primary healthcare to its population still a lot of work is needed to achieve its goals of Universal Health Coverage. Providing universal health care to a 1.4 billion population is not an easy task. India is perhaps the lowest in the world with only 1.2% of GDP being spent on health sector, although there are discussions to double it to 2.5% by the planning commission. Lack of Trained resources in providing clinical care and appropriate governance has been stalling the progress. This problem is much worser in rural areas compared to the urban areas.

The central government of India is working closely with the state governments to start medical colleges in all the 626 districts in Indian republic which will help increase availability of much needed doctors in rural areas. Availability of doctors in rural health centers is a fundamental problem with over 60% of unfilled specialists vacancies and the shortage would further increase in the near term. India has the largest number of medical schools and continues to invest heavily than most countries in the world.

British and US Healthcare systems played a huge role in the evolution of India's current healthcare system. (Sodhi, 2016) Although the preliminary stages of Indian healthcare system were influenced by the British healthcare system, the US healthcare system played a significant role in transforming it to what it is today. Healthcare is increasingly being treated as a commodity to be traded in the market, with the state's role restricted towards provisioning for and facilitating access to the weakest sections of the society through a means-tested insurance system. However, this is being put in place without adequate checks and balances on the private sector to ensure that the needs of the people accessing the system are adequately met.

As healthcare developed in India, the roadmap to today's system put in place has a greater emphasis on providing universal healthcare to people irrespective of the economic status. Unfortunately, with marketization of healthcare the focus has moved from serving people to profiting from provisioning of healthcare. If India aims to make healthcare more equitable and accessible to most of its population, government needs to be more active in this sector to address the underlying inadequacies of the Indian healthcare.

The healthcare system throughout the world consists of both, universal healthcare and consumer paid. (Cancarevic, 2021) Some countries have adopted a hybrid of both. The underlying concept of healthcare exists in some form. In US, most Americans receive healthcare insurance from their employer. Some receive insurance from the government which are for specifically for military veteran, and senior citizen. In US, Healthcare has become a highly political topic today. Politicians and supporters of both the major political parties strongly disagree on the right approach to healthcare. Recently, there have been many calls for complete overhaul of the US healthcare system inclining heavily towards a universal system like that of Canada or the UK. The healthcare outcomes in the USA cannot be compared to other countries due to the considerable number of puzzling factors. Interesting fact that should be noted that the overall life expectancy in the USA is much lower than most of the other developed countries, also on the other hand the infant mortality rate is much higher. The USA as a country leads the world in medical research and development. A substantial portion of its GDP is spent on healthcare, higher than most other countries. Claim have been made that the inefficiencies and the bureaucracy involved in the system is to be blamed for the higher costs. People with health insurance often struggle to pay the bills due to the copays and deductibles which are significantly higher than what most Americans have in savings.

Important fact to be noted that the US physicians graduate with significant debt and therefore generally need higher incomes to pay them off when compared to physicians elsewhere.

All the countries in the European Union, as well as the UK, provide universal healthcare to all residents. There are variations in the system across the countries in EU. Private insurance role is limited in UK, Italy, and Sweden. Medical services are mostly provided and paid for through the public system. Residents pay some of the healthcare costs out of pocket, although significant safety nets exist. Singapore, unlike other countries, also has a mandatory savings program aimed at helping residents cover healthcare costs, an idea that is popular in some circles in America as well. The physicians in all those countries earn good incomes and life expectancy of their patients is relatively higher.

Corporate Social Responsibility (CSR) communication in today's health care systems plays a significant role. (Tomaselli, 2018) Healthcare organizations are using a mixed strategy of both traditional and interactive technologies to communicate their CSR activities. Interactive technologies enable several advantages to organizations than traditional tools (such as better dialogue and interaction with different stakeholders, speed, low costs, easy access to information). They require investments and costs in infrastructures and skills/competencies for their implementation.

COVID-19 pandemic in India, created challenges in multiple aspects. (Hebbar, 2020) Hospitals had to re-prioritize patientcare to respond to Covid-19 cases. Many patients suffering non-Covid conditions had delay in their treatment. Mandated lockdowns, which were necessary, had affected people unfairly. Some were worser than the others. The unraveling of the impacts of Covid-19 on healthcare systems in India

raised moral and ethical questions about the plight of patients to health care access with other medical conditions.

On the initial onset of COVID-19 days, healthcare seemed to have taken unpredictable paths for several types of cases. Trauma cases with comorbid situations had to visit multiple places, to ultimately be sent home. On certain cases trying to stock up on medications for critical pre-existing health conditions due to fear of uncertainty of availability. The reason being that the health facilities were preparing to service Covid-19 patients. Pandemics are not new to humankind. However, our healthcare system gets challenged as it not only has to manage current and existing workload and yet have to manage the new demand. On the onset of Covid-19, the global community was struggling with attempts to contain the virus as new developments occur. Per estimates from the 2009 flu pandemic school closures, quarantine and social distancing are the most expensive interventions as compared to surveillance, contact tracing and face masks which were the least expensive.

India attempted to implement several of these measures, but the pandemic seemed to have beat the operations of the healthcare facilities. Consequently, the lockdowns have created additional challenges to seeking routine care. So, the question still lingers around – “What is the effect of Covid-19 on the access to healthcare systems in India? - for emergency care, conditions requiring contact with health facilities and follow ups”. The search to answer this question pointed towards several difficulties that people are facing in accessing healthcare.

Analyzing the response of the government and major healthcare entities in tackling non-Covid healthcare needs. The government from the national to sub-district level activated the existing systems, developing new systems, adapting to the rapidly changing international guidelines, including all possible existing networks and resources.

After searching websites of major government and private hospitals for guidelines related to healthcare service delivery, a summary of the guidelines was issued for essential health services by these major healthcare organizations:

- Using technology to minimize visits to the health facilities.
- Emergency services to function normally.
- Minimal visits to be made by expectant mothers.
- Precautionary measures to prevent Covid-19 transmission for patients with conditions requiring patients for facility visits such as radiation therapy, chemotherapy, and dialysis.

Since the first detection of first Covid-19 case, India started limiting air travel and issued advisories for health screenings. With increasing number of cases, the government started announcing its series of lockdowns starting March 22, 2020. Since then, India has had four such lockdowns. During this period, the central government joined hands with state government and the health and other ministries to maintain law and order. Guidelines were implemented for social distancing and prosecuting violators for not following protocols. In major cities, efforts were made in arranging adequate medical staff, hiring healthcare workers and ambulances, opening new testing centers, securing PPEs,and testing kits, and converting existing public health infrastructure into selected Covid facilities.

There were other challenges related to healthcare delivery in the middle of a major pandemic. Comorbid conditions increase vulnerabilities and chances of fatality. Patients who do not need urgent care, but still need continued hospital visits are in a trivial situation. If they do not get the necessary regular health check for their existing health conditions, hospital visits in pandemic times could increase their chances of contracting the virus. As pandemic intensifies, hospitals were advising patient to defer

treatment until the situation eases. Such advise can cause an intense situation for patients with acute and/or existing chronic illnesses.

Yet another factor that emerged during the full swing of COVID-19 pandemic is patient privacy and confidentiality and the stigma around it. Although, technologies were extensively used to track hotspots, monitor, and understand the nature of Covid-19 not having a robust data protection system could do more harm than good. Breaches in confidentiality of patients' health data lead to invasion of privacy and can intensify the degree of stigma within and across communities. Healthcare workers, and those from vulnerable communities, were discriminated against. Individuals were made scapegoats for the collective fear and anxiety regarding the spread of the infection. Several cases were found where healthcare workers have been harassed for working in the hospital setting. There were reported instances of non-Covid patients who visited a hospital for treatment having been evicted.

The government had noticed this bigger challenge of fear, mistrust and stigmatization and had begun promoting positive messaging and gratitude towards health and sanitation workers through updated caller tunes and social media. It is time that we begin to reflect on two critical aspects ─ preserving privacy while addressing Covid-19 and looking at social stigma as a public health problem especially in the current context as visiting the healthcare institutions is itself leading to social ostracism. Maintaining essential services while coping with Covid-19 as steps by which health systems can ensure that essential services are not disturbed while dealing with the pandemic.

2.2.2 Socioeconomic conditions in rural India

India is currently the world's seventh largest country in terms of area and the second most populated country. (Jasmin, 2020). With a population of approximately 1.3 billion, roughly 67% of the general public still resides in rural areas which amount to

871,000,000 people (World Population Review, 2019). There is a colossal difference in the quality of life between the urban and rural residents. Moreover, only 3% of doctors live in rural areas whereas 70% of India's population lives in rural areas (Munjal, 2017). The people of India do face challenges in terms of economic well-being, safety, and most importantly proper healthcare. To improve the quality of healthcare it is important to meet the health-related targets of the Sustainable Development Goals. As a developing country, India is unable to ensure quality healthcare throughout the nation. Nevertheless, it is endeavoring relentlessly to become a nation where healthcare services reach to people all around the country. (Jasmin, 2020)

With around 70% of our population still being the rural one, it is more a necessity than choice to seek newer and effective ways of healthcare delivery for this population. If we were to rely on traditional healthcare methods, in India alone, at least 600-700 hospital would need to be built to reach the requirement, but with the current GDP going into healthcare it seems a challenging task to achieve (Bhambere, 2016). The first study of India's development in the twenty-first century gives a fully integrated account of population and development. The study projects the population growth over the next fifty years from the 2001 Census. Demographic growth contributes and leads to poverty and divergent social conditions among different states of India (Dyson, 2005). The Rural Village population across a range of Sociodemographic groups have the prevalence of most risk factors (Kinra, 2010).

Over the past decades, rural Bangladesh has had an increase in availability and availability of modern healthcare services. (Amin, 2010) A key finding was that a household's economic status primarily determined health-seeking behavior. Mothers in higher socio-economic conditions were significantly more likely to use modern trained providers for pre/post-natal care, childbirth, and child healthcare than those in the lower

socio-economic conditions. The socioeconomic indicators of healthcare-seeking behaviors comprised of parents' level of schooling and father's occupation, membership in a microcredit group, and ownership of assets.

In Vietnam, hypertension was identified to be the largest contributor of the number of deaths in hospitals. (Van Minh, 2006) Occurrence of hypertension was identified to be more prominently often in men than in women. Age was also associated as one of the qualifying factors. The relationship between hypertension and socioeconomic status varied between men and women. Men with lower educational and occupational status but with higher socio-economic status were more proned to hypertension. Women with lower occupational and socio-economic status had higher chances of hypertension.

Multilevel analyses of data from the 1994 Human Development Profile Index and the 1991 district-level Indian Census indicate that there exists a positive and significant relationship between the proportion of literate females in a district and a child's complete immunization status within that district. (Parashar, 2005) It goes beyond the child's own mother's education as well as district-level socioeconomic development and healthcare amenities. There is analytical evidence that supports the view that increase in women's overall literacy levels within a community is an effective way of completing children's immunization schedules, especially in environments characterized by apathy and lack of information towards preventive healthcare. Education at both the individual-level and the community-level materialize as effective developmental tools, highlighting the need for simultaneous social and economic change at micro and macro levels of society.

The health status of a population is a sign of the socio-economic progress of a country. (Bandyopadhyay, 2019) It is also an indicator of social well-being. In developing countries, health improvement can be attained only if health services are

capable of delivering effective health care and members of the population use these services. Life expectancy of a population is a big indicator of health status and well-being of a given society. In developing countries, the women health plays a particularly vital role in establishing the overall mortality levels. The health of other children in the family might also be affected, especially of the incredibly young children who may be dependent on maternal feeding and care. The educational levels of men and women is particularly prominent in the rural areas, where about half of all married women are illiterate compared to their husbands. Cultural practices also play a significant role in women health where a lot of the women are married into blood-relations.

Culturally, marital status is linked with individual health awareness among elderly persons in southern India. (Sudha, 2006) For both men and women, widows are associated with poorer health belief. Women are the most impacted ones. In South Asian society, the finding highlights the critical role of marital status for women not only in terms of resource access or economic vulnerability, but also social position. Marriage substantially shapes the lives of women however, remarriage for widowed women is very restricted. Women widowhood has been identified as being connected with lower economic status, community denial and traditional representation of disapproval. Past studies have shown that in some cultures, the benefit of marriage for women is through the conduit of improved socioeconomic status. Current study shows controlling for socioeconomic status does not decrease the magnitude of the marital status self-rated health association among women.

According to WHO in 2004, frequency of depression in adults of age 60 years or greater in developed countries was 0.5 million. In developing countries, it was at 4.8 million. (Sinha, 2013) In India, with increased life expectancy, a significant rise in the older adult population between 2001 and 2011 and is expected to reach 324 million by

2050. With a rapid-aging society, geriatric mental health is set out to be an important public health concern. Some of the consequences are reduced life satisfaction and quality, social deprivation, loneliness, increased use of health and homecare services, cognitive decline, suicide and increased non-suicide mortality. Cardiovascular diseases and associated risk factors have become a prominent spotlight on non-communicable diseases (NCDs) in India and is no longer limited to high-income countries. (Subramanian, 2013) Except smoking, it is predominantly amongst higher socio-economic status individuals with low and medium socio-economic status countries, including India.

Socio-economic Status (SES) can be defines using seven indicators: house, materials possession, education, occupation, monthly income, land, social participation and understanding. (Tiwari, 2005) As country's overall population growth slows down, the labour force growth continues to relatively fast, with complicated effects for employment. (Dyson, 2005)

2.2.3 Migrant Workers in India

There is a huge migrant worker population across India. Most of these migrant workers are in search of jobs which are at scarce in the rural areas they are natives of. Although there are situations where women are the migrant workers significant percentage of the migrating workers are men in search of work to feed their families. There has been a significant study on the issues and problems faced by the male migrant workers. The difficulties faced by the left behind families and especially women who are left behind to manage the families and farms are lesser in subject of most scientific studies. These women, who are mothers, wives are not independent and hence face a lot of challenges in the remote rural areas they reside in. With predominantly male population leaving home as migrant workers in search of work the traditional family responsibilities of the women left behind change drastically without much time to prepare

for the new role and responsibilities. These women if accompanied by aged dependent older family members and young children also face a lot of challenges with respect to healthcare. Illiteracy rates are generally high amongst this population group which makes them even further vulnerable to the tough conditions they are part of.

Male out-migration is commonly seen in rural areas to conquer risks associated with agriculture and to diversify income. (Singh, 2018) The assorted reasons for the high migration of labour from rural areas are underdevelopment, unemployment, less availability of non-farm jobs and population pressure. Persistent absence of male has many consequences on women left behind. Increased in household income resulted in elevation of social status in the village. However, there is an offset of increased workload on women in household and agriculture. Even though women were empowered with decision-making, inability to take decisions on important matters hinders their empowerment due to lack of financial independence. Insecurity, loneliness, and difficulty in access to privileges are other key issues. Due to lack of male presence, women are more prone to abuse in the form of physical, social, and verbal.

Most of the problems that migrants within India face will not go away anytime soon. (Parasuraman, 1986) The negative impact of migration on the family has a negative impact whether the migrant leaves his family or takes his family along with him. Despite of the negative impact, migration will possibly increase. The only way to minimize the family suffering is to create employment opportunities in the rural areas and in the small urban areas. If such opportunities are provided many individuals would stop to migrate. Improved transportation facilities would increase the volume of commuting, and hence, reduce the need for migration.

COVID-19 created a huge crisis for the migrant workers who lacked representation at the local levels where they migrated to find work. Similarly lack of the

male representation in the left behind families and the lockdowns which ensured the COVID-19 crisis caused havoc in the left behind families. With no financial support from the male counter parts who left home to earn living and having limited or no financial reserves these left behind families faced problems in paying for their food, living expenses and any healthcare services needed. Although government provided services are free the ability to reach the healthcare centers was also a significant problem due to the shortages in their finances.

2.2.4 Healthcare Infrastructure in rural India.

Establishment of National Rural Health Mission (NRHM) has been a turning point for Indian rural healthcare sector. NRHM has successfully brought a lot of momentum to the public health systems in India which was accompanied by investments which was never done before. Good governance and activism to mobilize have contributed to the tremendous success. (Nagarajan, 2015). NRHM was instrumental in setting the direction for the country to move towards universal healthcare and has notably reduced infant and neonatal mortality. (Nagarajan, 2015).

The healthcare professionals have a unique way to approach the ever-increasing patient demands and shortages of medication (Kamat, 1995). Although User fees as a possible mechanism to recover costs has been discussed around the health care sector reforms in developing countries the issue was not considered as a possible regressive impact on utilization of healthcare services is a risk which could undermine the entire program benefits (Gupta, 2000). The fact that poor are more price sensitive is indicated in the estimates which reveal extremely low values of elasticities in the government sector as well as for the private qualifies providers and that the elasticities were more income sensitive (Gupta, 2000).

Health and welfare of the population is dangerously impacted with poor health care services and inadequate health care infrastructure (Taqi, 2017). About 68% of India's population still lives in rural areas (Taqi, 2017). Noteworthy progress in the physical infrastructure of healthcare has been made which has improved the lives of rural populations ever since the National Rural Health Mission (NRHM) was created in 2005. (Taqi, 2017). Rural populations need and deserve high quality healthcare services with increased accessibility and availability of such healthcare services (Taqi, 2017). The challenges that are confronting healthcare centers in rural India include the development of infrastructure and healthcare facilities, the quality-of-service delivery, and the position of the workforce (Sreenu, 2019).

It is evident that, the current rural healthcare infrastructure, staff, and accessibility have a number of shortcomings. The problem is instigated by gaps in healthcare budgets and policy which in turn creates room for private sector healthcare solutions (Bhandari, 2007). Percentage of Villages with Access to various Health Care Facilities round the Year are Primary Health Center 68.3%, Sub-center 43.2%, Govt. Dispensary 67.9%, Govt. Hospital 79.0%, Private Clinic 62.7%, Private Hospital 76.7% (Source: RCHS Round II, 2004.) (L Bhandari, 2007)

2.2.5 Healthcare workers in rural India

Rural Healthcare solution is developed in a simple structure based on a predetermined criterion. (Bhandari, 2007). Each Primary Health Center (PHC) has satellite centers which will be the primary contact between the Rural Community and PHC. (Bhandari, 2007). These Satellite centers are called subcenters and are manned by an Auxiliary Nurse Midwife (ANM) and one male Multi-purpose Worker [MPW(M)] (Bhandari, 2007). All the basic needs of men, women, and children across six subcenters

are taken care by a Lady Health Worker (LHV) (Bhandari, 2007). PHCs provide a comprehensive preventive healthcare to all the local rural population (Bhandari, 2007).

Although WHO report shows an inadequate response to the people's needs by developing countries healthcare systems, India has made substantial gains in the space with extremely high satisfactions rate (Vlassoff, 2010). PHC services include all common and essential medications, first aid and family planning supplies. Accredited Social Health Activist (ASHA), a trained female from the community, serve to improve the maternal health is a key strategy. (Paul, 2020). ASHA workers conduct regular health checkups, hygiene overviews with their local rural populations. They also cater to the women and child nutrition related topics.

Institutional delivery is independently emergent as important determinant in rural areas by the exposure to ASHA workers and the frequency of ANC contact. Furthermore, ANC Contacts and institutional delivery association is further strengthened with the crucial role of ASHA workers in promoting the antenatal care among the rural women (Paul, 2020). It has been a practice to use community health workers at local health centers for decades. These community healthcare workers with different designations and roles serve as important liaisons between the healthcare providers and local rural community. The portfolio of services offered by these community healthcare workers includes outreach, health education, translation, transportation, case finding and management (Zuvekas, 1999).

The health departments in several countries and their communities are vitally linked by the indispensable Community Health Workers (CHWs) (Abhay, 2014). Accredited Social Health Activists (ASHAs) who are village level female health care workers largely play a critical role in rural India since 2005 (Abhay, 2014).

2.2.6 Patient Transportation Issues in rural India

Study conducted by (Battista, 2015) in exploring rural Vermont USA's seniors' transportation accessibility to health care found that the access to local health care supply, individual resources at disposal and transportation produced hugely different accessibility results. Accessibility to healthcare was also shaped by less tangible factors like the social connectedness and personal preferences of senior regarding care and transportation.

Another study conducted by (Thomas, 2014) regarding the nonemergency medical transportation, health care visits among chronically ill urban and rural Medicaid beneficiaries found that a particular segment of the population used the free transportation services more than other. This segment was also more likely to make the recommended annual visits for the management of Chronic conditions. Increased and accommodating non-emergency medical transportation was linked to better accessibility to healthcare services.

Patient transportation study conducted by (Young, 2019) in Canada's northern territories concluded that the emergency evacuation services although costly are essential services provided by the Canadian healthcare system which provides access to extensive network of facilities staffed by various categories of health professionals.

(Atuoye, 2015) conducted a study regarding the transportation barriers to maternal and child health care services access in rural Ghana. Endemic poverty and neglect of Road infrastructural development makes patient transport services exceedingly difficult. As a result, pregnant women use risky methods to access obstetric health care services, including use of risky traditional medicines and birth attendants' services.

Study by (Alty, 2020) regarding the barriers to surgical health care access in Rural Burundi showed sociodemographic, transportation, and care-seeking patterns associated with delay in access to much needed care. The rural aged subsistence farmers patient with

lower literacy rates used traditional healers which increased delay in accessing surgical care facilities. Determining such factors contributing to the delay in surgical care and putting intervention processes will enable timely delivery of safe and affordable care to vulnerable populations.

Socioeconomic and demographic barriers do cause people to delay seeking appropriate rapid medical help during certain aliments and also highlights the need for prehospital diagnostics to access the situation and shorten the delays of appropriate care. Overall improvement of healthcare service delivery can only be improved by educating the rural populations about the importance of medical emergency services which help in early diagnostics and detection of such emergencies by appropriately utilizing the emergencies stations designated in such rural healthcare infrastructure. (Mohan, 2018). Timely referral to trained medical staff can avoid a number of complications and death. Lack of institutional delivery infrastructure to manage the obstetric complications during labour can be associated to high maternal and neonatal mortality rates. (Claeson, 2000). An effective referral system can help in reducing the effects of transportation shortages and delays in travelling to healthcare facilities by woman and their families during hours of need. There is compelling evidence of the transportation related delays to get care amongst the rural populations in low-income countries (Babinard, 2006).

Developing nations have been focusing on relevant infrastructure, technology, disease control, and health outcomes in terms of deaths and disability-adjusted life years, largely ignoring the service quality aspect from the patient's viewpoint (Sharma, 2011). However, researchers opine that real improvement in quality of care cannot occur if the user perception is not involved (Sharma, 2011). Patients' perception is significant as it impacts their ‘health-seeking behavior’ including utilization of services, seeks

involvement in issues related to them, enables the service provider to meet their expectations better, and provides relevant information to the policy makers to improve the quality (Sharma, 2011).

Some studies conducted in the recent years have made attempts to develop multi-dimensional scales and measure quality of healthcare services in the developing nations. Some interesting differences in user perception regarding service quality and how they varied between different healthcare centers and according to the demographic status of patients (Sharma, 2011). Healthcare delivery and financial and physical access to care significantly impacted the perception among men while among women it was healthcare delivery and health personnel conduct and drug availability (Sharma, 2011).

With improved income and education, the expectations also increase not merely for the financial and physical access but delivery of quality services (JK Sharma, 2011).

2.2.7 Role of Non-Government Organizations (NGOs) in Indian Healthcare

There is a growing trend of Non-Governmental Organizations (NGOs) participating in the Healthcare sector in India. They are offering solutions in a Public-Private partnership model which is growing in popularity and efficiency. Several research projects have been conducted to study the effectiveness of such NGOs in the healthcare sector in India. We will discuss few of those research studies to construct the real value NGOs are offering to the people and the regions they are operating.

Private-Public partnership (PPPs) has become a norm to manage PHCs in India. The private entities are both for profit and non-profit organizations. (Pal, 2009) PPPs as social entities are harnessing the best of both worlds to offer services which look promising in value, accountability, and results. PHCs not only offer the basic health services but are also addressing the pervasive socioeconomic and political causes of poor health making the associated development more people centric. There is a shift in

national politics and priorities due to a transition from agrarian to urban based economics. The poverty has migrated to Urban slums with deprived settlements which are environmentally, demographically, and socioeconomically vulnerable. Although this reality is overshadowed by the greater urban prosperity. Thus, the urban slum population are statistically living under the shadow of the urban affluent population. Hence the PHCs have to address the urban slums apart from the rural communities.

The PPP started in the last decade but now has become a popular choice of healthcare delivery in India. National Rural Health Mission of Indian government has planned to setup PPPs at various levels of healthcare as critical partners for implantation success. The PPPs have grown to cover 70% of curative care solutions. NGOs and Voluntary organizations have gained popularity in the space.

PPPs have gained popularity not just due to the implantation success but also the shared investment model and revenue models. PPP model does run a risk of creating a monopoly if legal and policy frameworks, service level agreements and enforcement mechanism are compromised. A strong political and civil administrative representations are needed to ensure personal stake do not compromise the goals and objectives of the projects.

PPPs have been the popular choice for the governments to reach the poor and underserved communities. They are increasingly seen as the go to mechanism to improve overall performance of PHCs. The state of Karnataka India is leading in getting medical colleges and NGOs engaged in operating PHCs.

Although India is a vast country with second largest population in the world, there are several services and infrastructure still in a growing face. One of such services is Emergency Medical Services (EMS) in India. (Sharma, 2014). Although healthcare has become a priority in the recent time still India lacks a centralized infrastructure to deal

with setting guidelines and standards for Emergency Medical Services. The Emergency services which exist currently are fragmented and are not uniform across the country. Most of the citizens are aware of how to avail current ambulance services there is a significant gap in the services offered across the country. These different systems have inconsistent operational processes which needed tobe consolidated to make them effective.

EMS can be decentralized and managed effectively with better training and awareness programs amongst the general community. Government alone cannot implement such EMS services hence, a Public-Private partnership is essential for wider deployment and effectiveness. Indian has been steadily growing and it is the third largest in the world in its purchasing power at $4.5Trillion. The GDP is considerably lower at $3,650 per capita which is 126th in the world. The crude birth rate is at 22 per 1000 population and only 57% of the births are attended by skilled health professionals. In the last few decades India has seen a rapid growth and urbanization but still malnutrition and communicable diseases are on rapid growth. Access to quality healthcare is still a major problem. (Sharma, 2014).

Even though there is widespread support for National Health policy through the government the systems suffer due to outdated infrastructure and lack of coordination. The poor continue to suffer, and the rich have abandoned the government healthcare for private state of the art solutions. However, the poor with high illiteracy rates, population density and corruption in the system have contributed to inadequate pre and in-hospital care. Increasing public awareness is a sure way to increase the effectiveness of government services.

Studies report that 80% of trauma patients in India cannot get access to medical care within the first hour. Another study conducted reported that 50% of cases have no

prehospital care or treatment offered by qualified personnel when ambulances were used to transport patients to hospitals. Poor Infrastructure, lack of trained prehospital personnel and access to service have rendered Ambulance system ineffective in India. Pregnant women in many cases deliver at home or on way to hospital increasing the maternity and infant mortality rates. These rates have been positively affected in recent times due to spotty Governments schemes. (Sharma, 2014).

India spends only a fraction compared to other similar GDP nations in the world. This financial constraint impedes the EMS growth. The limited Government Ambulance service is complimented by private ambulance operators who have well equipped Ambulance vehicles but cost far beyond the financial capability of majority of the populations where 81% of the population lives on less than US $2.50 a day.

Lately,several private ambulance vehicles are being deployed and managed by social trusts, volunteer health organizations, and nongovernmental organizations (NGOs). Standardized training and operations throughout India by a central governing body is the need of the hour. Another more frequently encountered issue is multiple referrals across health centers of patients wasting valuable time for treatment. Elaborate first aid and resuscitating training is also needed across all sections of the society to immediately provide first aid in case of emergency instead of waiting for the service. Population awareness is a sure way to increase the ownership and resource management. (Sharma, 2014).

Although Healthcare is believed to be a right of every human being, each individual and the broader society also has the responsibility to actively participate in ensuring proper planning and implementation steps along with a mechanism to check the progress to ensure corrective actions are taken to realize the benefit. Unless the service providers get the needed feedback from the users it is not possible to provide quality

healthcare services. This is more critical in the case of India as it serves 17% of world population in its small land mass of only 2.4% of worlds land. Evidence shows that with pre and post service survey and active writing of the progress in diaries by the patients contributed to significant reduction in noncommunicable diseases. (Kumar, 2018)

Often the process of gathering feedback and entry of such data is cumbersome and error prone. Over a long-term interest fade in inputting such data. Local customs and culturally sensitive tooling often can help in improving the capture of the valuable feedback and progress review. There are a number of NGOs now locally available to ensure progress is being made and local populations are availing the services provided by the government and local healthcare infrastructure. This involvement of the NGOs further enhances the overall effectiveness of the healthcare initiatives started by the government.

Mobile phone technology is further enhancing the healthcare experience. (Prinja, 2017) The mobile technology is quickly and inexpensively replacing the cumbersome old practices of effectively serving the patient community. The technology also is keeping the patient community engaged in ensuring the healthcare services have high success rates. Many NGOs who are locally serving communities in the healthcare space are trying out many mobile applications to simplify and increase the effectiveness of existing government healthcare services. M-health is one of such applications which helps in tracking the progress of neo-natal, post-natal and child development health services. Although the mobile applications are gaining traction there are some intermittent issues faced on the network availability which is deemed a surmountable problem with the growth of the mobile networks in India. The ability to rapidly deploy such mobile applications is making a number of otherwise cumbersome tasks simple and more effective contributing to the overall success of health initiatives. There do exist apprehensive personnel and partners which can be overcome with effective noninvasive

data collection techniques on the mobile applications to ensure progress remain as the primary target than measuring and penalizing for compliance.

From 1999 to 2003, three Indian (NGOs) provided services for 784,000 people in four northern states (Paxman, 2005). The program established health committees in 620 villages, recruited and trained 1,850 community health volunteers, and added 232 sites to extend government services (Paxman, 2005). Using three strategies—demand creation, increased access to services, and local capacity building—the NGOs increased contraceptive-use rates by 78 percent, on average; child immunizations by 67 percent; and antenatal care by 78 percent among the populations served (Paxman, 2005). Community resources—such as local health personnel, community-supplied clinic sites, and community drug funds—added 40 cents to every dollar provided by donors (Paxman, 2005). This model proved to be a suitable platform upon which to build health-care service delivery and create behavioral change, and the NGOs quickly found ways to sustain and expand services (Paxman, 2005). Non-Government Organizations (NGOs) in India have shown a high degree of creativity and innovation in developing varied sources of financing to reduce dependency and enable them to sustain their health care programs (Berman, 1996).

Government funds play a significant role in supporting these voluntary health activities, with less significant roles played by foreign donations, user charges, pre-paid memberships, and public fund raising (Berman, 1996). Some effective methods of assuring access for poor clients while developing self-financing are described (Berman, 1996). Cost studies of the NGOs' health schemes indicate that they operate at least as efficiently as public services and primarily supplement rather than substitute for such services (Berman, 1996). Low-cost replicable healthcare models have been created to bridge the gap in healthcare in the traditional delivery models by Non-Governmental

Organizations (NGOs), which played a significant role in the last few decades. Child mental health, schizophrenia and psychotic conditions, drug and alcohol abuse, dementia etc. are few wide arrays of areas where NGOs have been active. NGOs typical activities have included treatment, rehabilitation, community care, research, training and capacity building, awareness, and lobbying. (R Thara, 2010)

NGO growth across the country has seen a steady rise in the last two decades to fill the large gaps in the government or public healthcare services which are still the key providers of healthcare for the rural populations hence needs strengthening. Most of the NGOs are driven and committed by a particular cause and passion to make difference. The NGOs cannot parallel the government or public healthcare agencies but have a distinct advantage in the quality of healthcare and their efforts to reach out to the various stake holders. They can provide customized healthcare solutions particularly in situations where there is discrimination or lack of focus by the huge public healthcare infrastructure. (R Thara, 2010) Mobile technology is being used by a number of organizations along with the government and NGOs to relieve the burden of public health system making it more portable. To enhance the quality of the healthcare and to bridge the gaps in the health care services many leading organizations in the healthcare industry are relying on modern technology (Vaani, 2013).

2.3 Learning from the Review

Changing epidemiology, rapid urbanization, and rising expectations of populations are creating new challenges and opportunities for India's primary healthcare system(Mohan, 2019).

Indian primary healthcare system in rural areas, consisting of a network of primary health centers (PHCs) and community health centers, was designed almost seven decades ago, based on Bhore Committee recommendations (Mohan, 2019).

Highly Trained medical staff are hard to find in rural areas. It is often difficult to maintain and retain them on a regular basis in rural healthcare infrastructure. This creates a huge gap in the completeness of healthcare infrastructure in rural areas.Typically, the higher the medical training needed the harder it is to find, train and retain such talent in rural healthcare systems. (Bhandari, 2007).

PHC's have contributed significantly in the last 30years. Improvements include a decreased disease rate due to better sanitation, proper waste disposal and better water treatment also contributed to this progress. Increased awareness and health education has contributed to better hygiene, which also contributed to reduced dental problems, skin diseases and parasitic infections. Such improvements are attributes to a successful collaboration effort across Health, Education, Media information and activist local village leaders who are relentless in improving the sanitation needs of the villages.Critical School programs provide much needed nutrients, worm medicines, hemoglobin tablets and folic acid tablets to Students (C Vlassoff, 2010)

To further improve the implementation of government programs in neonatal care and ensure equity of materials,NGO facilitation is a feasible strategy. Household Practices have shown improvements in equity, but healthcare utilizations still showinequities. Addressing the equity is further restricted if the overall program coverage remains low. In the poorer segments of the populations, it is necessary to identify and address any barriers to universal care to ensure the program has a wider equitable coverage. (Baqui, 2008)

Male out-migration is the most often adopted strategy in rural areas to surmount risks associated with agriculture and to diversify income. There are several reasons for the increased exodus of labour from rural areas, such as underdevelopment,

unemployment, less availability of non-farm jobs and population pressure. (R. Singh, 2018)

There is an acute shortage of ambulances in India. Conditions get worse in the rural area due to unavailability of amenities and infrastructure leading to a higher response time(Malhotra, 2019). Apart from inaccessibility, the distance that a person must travel to reach to the nearest health care center is generally large(Malhotra, 2019). These ambulances should be readily available at various locations instead of being parked at the hospital. But this will take a hefty amount of capital investment which is a big constraint(Malhotra, 2019). However, if a vehicle which is easily accessible to the people (i.e., vehicles used for intermediate public transport) is used and made capable enough to accommodate a patient safely and comfortably, then it can have a substantial impact on the ground level. (Malhotra, 2019)

The problems associated with public healthcare due to non-accessibility and low-quality,forces the majority of the population to seek care from private healthcare sector as their first choice of care. 70% of the urban populations prefers private providers for their healthcare needs and in total 92% of the population relies on private healthcare providers dues to the shortcoming in public healthcare infrastructure. (Vaani, 2013). However, private healthcare is unregulatedhence quality is variable and often expensive. These private healthcare solutions are beyond the financial capability of rural low-income populations who are generally illiterate (Vaani, 2013). Healthcare in rural areas needs special attention due to lack of adequate healthcare facilitiesto control the spread of disease and reduce mortality rates in vulnerable populations.

2.4 Conclusion

NRHM’s actions have directly resulted in a humongousexpansion of healthcare infrastructure along with a significant growth in healthcare personnel. The utilization

rates of public healthcare facilities have also seen significant improvement as the demand-side initiatives focus improved to ensure there are high facility-based birth rates. The improved facility-based birth visibly and directly contributes to the maternal and neonatal mortality rates (Nagarajan, 2015). A third of the villages have limitations in the context of road connectivity and adequate transport services to healthcare facilities, public or private. Road Connectivity and Adequate Transport services to healthcare facilities whether public or private is a problem. Approximately 33% of the villages face this problem. (Bhandari, 2007).

Lack of proper mode of transportation and availability for any kind of medical emergencies leads to a lot of causalities in rural areas(Malhotra, 2019). In situations where there are ambulances bad terrain in rural areas make them inaccessible(Malhotra, 2019). A substantial portion of rural deaths are speculated to be attributed to inaccessibility of rural health care centers and also the inability of the rural people to reach the nearest health care center before it is too late for the patient (Malhotra, 2019). Awareness, Accountability, low quality, and limited access to the facilities are some challenges in the current healthcare sector. (Vaani, 2013). Various organizations are coming together for improvements in health care and technology plays a crucial role to facilitate this. Information and communications Technology provides hosts of solutions for successful implementation of these changes (Vaani, 2013).

Presented literature will definitely contribute to overall concepts and I do hope that my research will contribute to NGOs playing a key role in rural patient transportation there by increasing the accessibility to much needed healthcare irrespective of the socioeconomic conditions of the patients.My research also focusses on working very closely with the existing healthcare infrastructure as a natural extension. Having access to the PHC staff is an additional benefit to the patients for any medical advice needed before

or during the patient transportation. Working closely with the village administration also provides a reliable cohesive structure with high trust levels for the rural population.

CHAPTER III:

METHODOLOGY

3.1 Overview of the Research Problem

The purpose of this case research is to identify the gaps in the healthcare delivery in a selected few rural areas. The study conducted will be done as few use cases for specific set of needs which were identified by the local population, social workers who are resident in those areas.

Dhanvantari Yan Seva (DYS) Foundation, a Non-Governamental Organization (NGO) was founded in 2020 by the author in Hyderabad, which is a capital city of Telangana State of India. The primary objective for the NGO is to bridge gaps in the rural healthcare delivery. The author as primary researcher of this dissertation and the research team includes all the employees, contratctors or social workers partnering with to conduct these pilot projects. A number of pilot projects in different conditions have been initiated to find the optimal operational model for DYS Foundation and to ensure the needs for the services are validated scientifically and presented as part of this dissertation. These pilot projects, their scope, and data collected during the projects will be exclusively used as use cases in this desseration.

The research includes a survey of the 3 location where patient transportation service was deployed in the 2nd quarter of 2021. Interpretive research is used in gathering the census demograpgy data to understand the demographics, socioeconomic conditions of the population. This interpretive research results are used in both the Survey Research and Use Case research to ensure the survey questions are in the context of the participants and the services and service levels meet the needs of the target population. Survey research pioneered by sociologist Paul Lazarsfeld in the 1930-40s is a very popular method for quantitative research. Invented by Sir Francis Galton, a questionnaire is a

research instrument consisting of a set of questions (items) intended to capture responses from respondents in a standardized manner(Bhattacherjee, 2012). Psychologist Stanley Smith Stevens (1946) defined four generic types of rating scales for scientific measurements: nominal, ordinal, interval, and ratio scales. Ordinal scales using attribute labels was used in creating the survey questions. (Bhattacherjee, 2012)

Covid-19 second wave overwhelmingly affected entire India. The services focussed in assisting Covid-19 patients working closely with the local medical and administrative officials became a new norm. Case research, also called case study, method was employed for this study across multiple sites. Details of each Use case will be discussed in the Use case sections.

3.2 Operationalization of Theoretical Constructs

DYS is a not-for-profitGrambulance operations organization, which engages in but not limited to managing day to day ambulatory operations, taking patient appointments, ensuring safe transportation, technician training and certification.Grambulance is an innovation designed, created,and personally fabricated by the author of this research. This product's chassis has a number of uses in the rural environment which is out of scope of this research study. The entire unit was fabricated with Mild Steel, with only 2 premanufacture parts:1) the shock absorbers and 2) Wheels with Tires. Since the vehicles were to be placed in remote locations, away from urban centers, there was a mandatory requirement to have the vehicles with near zero maintenance. There was also a desire to use readily available material in these remote areas, so the replacement and maintenance costs remained extremely low.There are a total of seven models of these Grambulance vehicles to suite every terrain and environment in India. Only one model has been used as part of this research study due to the environment and terrain of deployment.

Grambulance, A rural patient transport

The Grambulance is a trailer-based vehicle which transports people,who need medical attention, to Health Centers for treatment, or in some cases provide First Aid or Remote Medical Care. Thesoft topmodel is a lightweight patient transport vehicle. It is built on a trailer chassis with independent suspension with no axels. The vehicle can be attached and detached from a motor bike within minutes andwill be used to provide medical transport for patients with non-critical medical needs. The primary patients profile includes women with prenatal and postnatal care needs, infants, children, and senior citizens. Reservation for pickup and drop-off services can be done ahead of time for regular doctor visits to hospital check-in's, hospital to home transport, infant visits to hospital and back home.

Figure VII – Sideview of Grambulance with Bike

Figure VIII – Front view of Grambulance with Bike

The primary objective of this type of design is to provide a cost-efficient vehicle for transporting patients to & from hospitals and medical assistance as needed in hardship impacted areas. The trailer-based concept addresses two most important aspects of rural India landscape: a) service in remote villages and economically backward locationsb) it can be attached to any two-wheeler to tow and get through narrow roads, difficult accessibility/hard to reach locations and difficult terrain.

The scope of Grambulance is to provide a low-cost ambulatory service vehicle, in which all parts are made with off-the-shelf material which have exceptionally minimal maintenance. Although alternate materials have been used, utmost attention has been paid to the design and features of the Grambulance to sustain the rural culture, economic and social structure.The primary purpose is to provide medical assistance needed in hardship impacted place. The target audience for Grambulance is the economically backward population in rural areas.

The desire is to provide high quality service with dignity in an extremely inexpensive way with an understanding that the vehicles should not have any complex manufactured parts with next to zero maintenance. This patient transport system will supplement the rural village health care infrastructure, improve the living conditions and be self-sustainable.The following are the design considerations and vehicle features:

1. The vehicle was designed as a lightweight trailer to keep the total vehicle weight to a fraction of comparable vehicles. Typical bike ambulances are side cars attached to the motorcycle with a compact space to carry the patients. Trailer based chassis keeps the vehicle weight to a fraction of comparable vehicles. Custom independent suspension, with low ground clearance, will avoid tipping. It will have the ability to manage any

type of road condition in remote villages. Multiple Models are available for different landscapes and needs. It uses power from motorcycle for brake, turn signals, Emergency Lights & Siren.The vehicle has only couple of manufactured parts like Honda's Activa Scooter wheels and tubeless tires. Very few custom partsare usedhence keeping the maintenance low.The patient transport systems will supplement the rural village infrastructure, improve the living conditions and be self-sustainable.

2. A 150CC motorbike is suggested as an appropriate powered motorcycle to tow the Grambulance. It can also be towed by lesser powered motorcycles like the 110cc or 120cc motor bikes. The trailer can be attached and detached from the motorcycle very quickly.Rapid attachment and detachment to the bike is less than 5 minutes for the process. The hitch is a single nut bolt arrangement. A pair of safety chains are being deployed as well to protect the hitch arrangement in case of accidental disengagement. The third wheel is provided for free standing and backup safety. There is a safety 3rd wheel which is provided for multiple reasons: Move the Grambulance freely during attaching and detaching it from the bike; ensure the Gross Trailer Weight is balanced and does not fall on the bike hitch; in case of accidental detachment of the trailer the vehicle still will keep the patient safe, and the trailer will stop naturally with friction of the 3rd wheel.

Figure IX – Grambulance Showing the Hitch setup

Figure X – Hitch Mechanism

3. Grambulance has independent suspension to cope with the rough road conditions of the rural areas but still relatively provide a comfortable ride to the patients.Vehicles have low ground clearance with wheels fitted outside of the body supported by an independent suspension. The body is made of mild steel which shield the patients in a 360-degree support. There are several safety features incorporated in operating Grambulance. The vehicle clearance is low with wheels halfway up the body to maintain the center of gravity within the vehicle under all circumstances. Suggested speeds are a maximum of 40Km/hour. Unless the vehicle is forcibly tipped the vehicle is designed not to tip.Grambulance chassis is supported by a Custom Independent Suspension hence does not have any axle. The total including wheelbase width is 4.8ft.

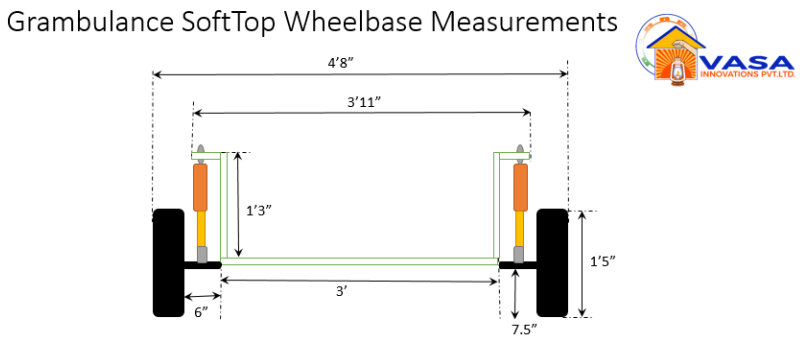


Figure XI – Grambulance Soft Top Wheelbase Measurement

4. The Wheels of the vehicles are place at 2/3rd body length to balance the weight of the trailer and the patient. Patient weight is also distributed and balanced with the stretcher location inside the vehicle. The weight which is distributed to the bike is at most 1/3rd of the total towing weight hence the bike would not tip. As an additional safety feature, there is a 3rd wheel provided in the front of the trailer which will keep the trailer from leaning forward during the rides as well as in parked position. Gross Weight of the Bike, trailer, equipment, and patient is well below the Gross weight allowed for the Towing bikes at all times. Only one additional passenger is allowed to travel in case of transporting children. Grambulance vehicle is used only when there is a need for transporting patients. Other times it can be detached and parked safely, and the Bike Technician can use the bike for other errands.Weather-proofed unit to transport a patient in rain or shine, cold or hot days.

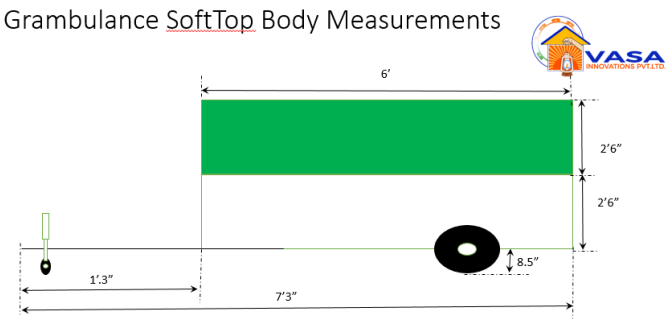


Figure XII – Grambulance soft-top Body Measurement

5. The Trailer is 7.3ft in total length with 1.3ft of front attachment area and 6 feet long cabin to host the Stretcher and any medical equipment. There is a 2.6ft high steel body and another 2.6ft of Canvas soft top.The shell of the body is made of mild steel 1inch rods making it a protective cage for the occupants.The tarp covering serves as a waterproof protection for the inside of the vehicle that way a patient can be sent for treatment no matter what the weather is. Weather proofed unit to transport a patient in rain or shine, cold or hot days.

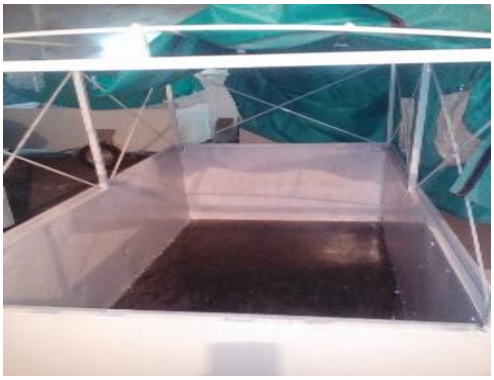


Figure XIII – Inside Framing

6. Grambulance has a full length 6ft and 2ft wide stretcher made of steel frame and Navvar (A multipurpose flat rope made of cotton or plastic) with 6” wheels. Navvar

is locally available in remotest part of the country. The Stretcher is custom built using mild steel. It has Stretcher with safety straps for safe and comfortable ride. The Patient can be secured wo the stretcher with 3 belt which are adjustable in length. Stretcher is locked in place to the body of Grambulance with no movement.

Figure XIV - Stretcher

7. The Grambulance gate opens down and has been reinforced with steel to support the Stretcher loading and unloading as a ramp

Figure XV – Gate and Ramp Mechanism

8. The Occupancy of the trailer is designed keeping in mind the RTA rules and regulation of not allowing too many patients riding in the Grambulance. Only one extra person has been suggested for these legal reasons. There is enough space and seating to accommodate family members.
9. There is provision to have Oxygen Tank, IV hanging hooks, First Aid and Vital Checks equipment. All the equipment is optional and will only be deployed if the Bike Technician has been medically trained to administer and operate such equipment as a Bike Medic.
10. All the Grambulance Vehicles have a unique coded Serial Number similar to VIN numbers with Country, State, Manufacturer, Model and Serial Number combinations.

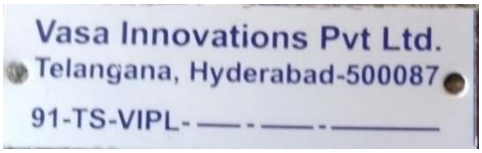


Figure XVI – Grambulance VIN Plate

An attempt is being made to study multiple theories about the inadequacies of Healthcare in rural areas and if services of an NGO would improve the situation along with a workable operational model.Multiple research methods have been employed to generate enough data so the analysis could be more comprehensive and conclusive.

Survey Research methodology supplemented by the census 2011 data was used to gather the socioeconomic situation, current healthcare conditions, rural transportations issues and any healthcare infrastructure related problems.Use case have been designed to be deployed in a staggered schedule. Few precautions have been taken to ensure that the launch of the service was advertised adequately in the village and surrounding. The initial

launch included the village administration heads both elected and bureaucratic staff were engaged. The feedback received from these contacts was very favorable. The pricing of the service was also reviewed with the DYS Gram Sabha team. The pricing was well discussed, and assurance was given by the local officials that the pricing was nominal, and the local population should not have any problem paying. However soon we discovered that people were far more uneducated and had incredibly low buying power.

To understand the population demographics, socioeconomic conditions, literacy rate we quickly devised a plan to obtain the Indian Governments census data. The census data available was from the last time government of India conducted the Census in 2011. The study on 2011 Census data was to explain the situation we were encountering.

The study of the census data highlighted another important problem which took us back to the drawing board to under the inconsistent Grambulance usage. This quest for finding the root cause of the problems like low participation rate highlighted the need to do further research to under the population behavior. The survey was designed to understand the local population behavior towards the rural healthcare solutions and their personal experience in utilizing those services. The next chapter discusses in detail the results from this survey.

Following is the sequence of evolution of the research study.

Step 1: Use Cases Design

The 3 locations in Nalgonda where the service was deployed were identified as potential use case's location by dependable social workers. These three locations were

1. Marriguda, a Mandal headquarter with a local PHC,

2. Venkatampeta, a village with a subcenter with an ANM and PHC in Chintapalli Mandal which is 6 kilometers away
3. Gudipally village with a local PHC.

After meeting with the local leadership both political and government officials it was decided as ideal locations for the patient transport service deployment. The local PHC staff was very cooperative in helping us identify the patient needs and in tailoring the daily operational period. The initial service was launched as a minimal fee-based service. The service was priced at Rs. 50 for the first 5 Kilometers and then Rs7 for every extra kilometer. However, there was a free transport service commitment if the patient could not afford to pay for the service due to financial difficulty. There was also a commitment to transport the patients once a transportation needed was identified without any reservations. Bike technicians were trained to be sensitive to the local population mindset and cultural customs. The patients could have requested for both OnDemand as well as scheduled pickup and drop off service. An 1800 number was provided for the patients or their loved ones to call and request for the pickup service. The Service was advertised across the villages serviced by the PHCs in the locations where Grambulance vehicles office in Marriguda, Venkatampeta and Gudipally villages. Posters and pamphlets were distributed and affixed in all public location in the villages as well as most commonly visited locations like the bus stops, restaurants, medical shops etc. All the Village Panchayat workers, all government officials, local politicians, PHC health workers, ANMs, ASHA, Anganwadi Workers were tasked in referring patients. Grambulance vehicle placed in villages or Mandal headquarters with a local PHC saw a

quick Patient transport service requests response than the village location without a local PHC.

Step2: Need for further Analysis

Although the Service was being used there were problems noticed in few specific areas as follows:

1. Almost all of the patients being transported were illiterate.
2. Most of the patients could not afford to pay for the service but were willing to part with amounts which they could afford to pay.
3. Patients were mostly daily wage earners with limited financial resources.
4. Predominantly the patients both men and women were farm workers or small farmers.
5. Most of the patients had no personal transportation.
6. Some of the remote villages and Thandas serviced by the PHCs has no public transportation.

Problems identified necessitated further study about the demographics, socioeconomic situation of the target population and literacy rates. The response of the Patients, their inability to pay for the services forced us to take look at the socioeconomic status. The quickest way to access authoritative data was from the Census bureau of India.

Step3: India's Census Data Analysis

The Census Bureau of India is the official source of the data we have sourced. The census is collected every 10 years in India. The last data collected was in 2011. The Census Survey due in 2021 has been delayed due to the COVID-19 Pandemic first and

second waves impact on the India government and society. India's 2011 Census Data Analysis to understand the population profile was conducted to further under. The result will be discussed in detail in the next chapter.

Step4: Changes post Census Data Analysis

Although the analysis of the Census data was revealing the data was 10 years old. A need was identified to get a more realistic and latest view of the state of affairs from the use case target population. After the study of the Census Data, it became apparent that we needed to get more realistic and latest view and feedback from the local populations. A survey regarding the healthcare infrastructure and the local population experience with it was designed to further study the situation. The survey was designed to get specific feedback from the local population of their views on the rural healthcare infrastructure, its utilization, transportation, experiences, and issues being faced. The details of the survey and associated analysis will be discussed in detail in the next chapter.

Step 5: Operations redesign need post Survey

Post study we had to make few operation changes to make the solution more effective. The Grambulance vehicles were placed at the PHCs if available. That suited the Marryguda and Gudipally villages which had local PHC. Venkatampeta however did not have a PHC but a subcenter with ANM as the staff member. The PHC medical officer made regular visits to this subcenter. Continuous communication was established between all the ASHA workers and Anganwadi workers to ensure the patients were referred regularly. This referral process had to be revisited and will be discussed in the changes to referral process step below.

Step 6: Customization of Operations:

Operations needed to be customized to fit the local population profile. Based on how the PHC, local Rural Medical Practitioner (RMP) and any private healthcare facilities were being used the patient pickup and drop off service was made flexible. An informal governance team called Salahakaar Sabha was established with Village Politian's, Village administration, Health Officers, Nurses, Social workers, and village teachers to make the operations flexible enough to meet the needs of the local populations. Salahakaar Sabha structure is discussed later in this chapter. This flexible process was immensely helpful during COVID-19 second wave as each location customized the service to fit their needs including using the Grambulance vehicles for transporting deceased patients to crematoriums for last rites.

With the help of the local health officials there were strict protocols established during the COVID-19 second wave to ensure safe transportation of the patients including the protection of the bike technicians who at that time were not vaccinated for COVID-19. These best practices were followed strictly by the bike technicians, and we had no cases of COVID-19 in the Bike Technicians team. The health department and village/Mandal Administration has supplied the necessary PPE gear to protect the bike technicians while transporting the COVID-19 patients maintaining a safe distance and following the hygiene protocols.

Medical Device Deployment:

Since the operations were being funded and managed by a private NGO, we were able to purchase Infrared Thermometers and Oximeters to meet the immediate need which was identified during the peak time of the second wave. As the COVID-19 test kits supplies dwindled the infrared thermometers and Oximeters were used to check local populations to find any infected people.

As depicted in the figure below, the task of checking the temperatures and blood oxygen levels was conducted by various health care workers and Bike technicians in situations when the healthcare workers were not available. A RMP in Marryguda and ANMs in Gudipally and Venkatampeta areas helped in checking the temperatures and Oxygen levels of the people. These checks were done in the PHCs, Subcenter and places like store fronts and bus stops. This activity was used as a prescreening step and few people were asked to visit the PHCs for further checks and PCR tests.

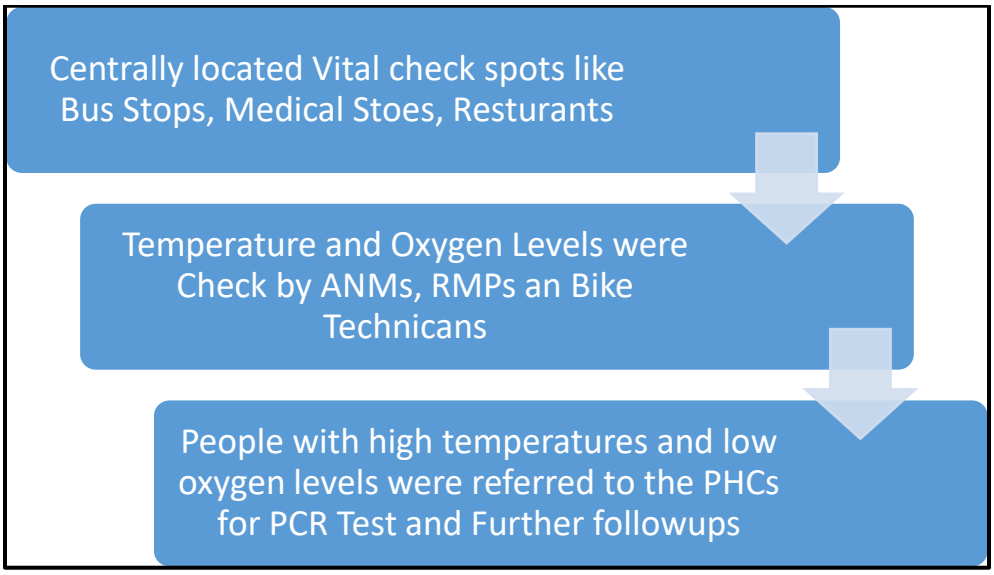


Figure VII – Task Checklist

Step 7: Bike Technicians Selection Process

There were issues identified with the Bike technicians during the Use case windows. Although the Bike Technicians were selected based on recommendation from the local teams and thorough background checks were done there were a number of gaps identified in the selection process and the compensation paid to the bike technicians. This necessitated changes to the Bike Technicians sourcing and selection process. Prior to the initial launch of the Grambulance vehicle the bike technicians were identified and recommended by the local leaders, healthcare staff and any one actively collaborating with us to establish the patient transport service. The Bike technicians were initially contractors and had some responsibility to popularize the patient transport service to increase the awareness and utilization of the service. The Bike technicians had different interest levels in doing this work of increasing the awareness to increase utilization. The compensation provided was inadequate to run their lives. So, there was a conscious decision to make the bike technicians fulltime employees of the NGO. There was an increased focus on training and mentoring of the bike technicians. The Location of the Grambulance vehicles was changed to PHCs to ensure the Bike technicians worked as an extension of the PHC medical infrastructure and staff. This change was very much like by the local population who could find the Grambulance vehicles directly or indirectly through the PHC staff.

There was also a strategic decision made to source the Bike technicians from the financials strapped, backward class communities with limited opportunities. The

unemployed youth are being hired to improve their personal situation as well as the local economy. This decision turned out to be a welcome gesture from the local communitywho saw DYS as a real grassroots level partner.

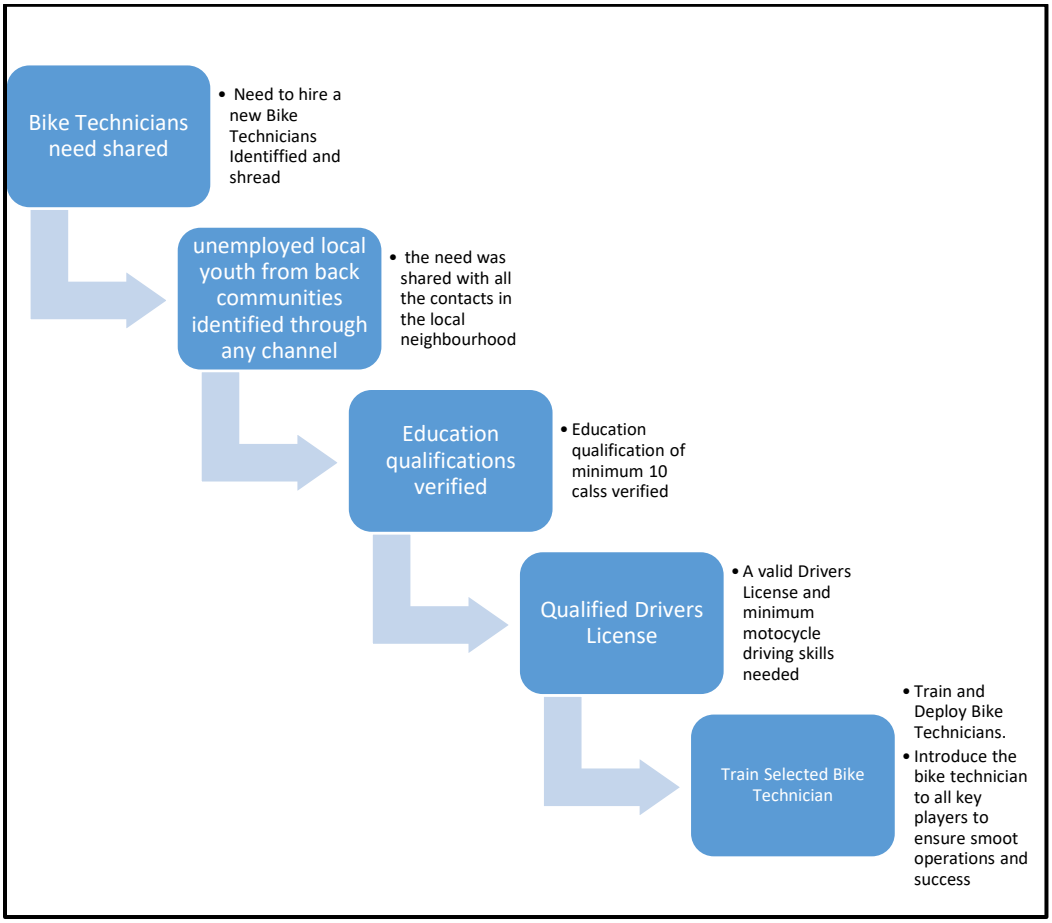


Figure XVII – Bike Technician Selection Process

Bike Technicians

- All Bike Technicians are direct fulltime employees of DYS to provide the transport services.
- Bike Technicians should understand the people and culture, firsthand, with a sense of social responsibility and high integrity.

- The person who operates Bike and is trained to drive with Grambulance attached to the bike and is also trained to transport Patients safely to their destinations with training on First aid and Patient vitals check.

Qualifications

DYS Bike Technician suggested qualifications

- The Bike Technician should have a minimum 10 class degree
- Have good communications skills with local population
- Should be aware of the local culture and customs
- Has to be local resident to the servicing area
- Should have dedication to social service
- Have all legal documents
- A valid driver license.

Bike Technician Training and Certification

1. All drivers are trained to ride Motorcycles with the attached Grambulance.
2. Safely attaching and detaching the Grambulance.
3. Regular Bike and Grambulance Safely loading and unloading patient on the stretcher.
4. All safety features training to ensure patient is secured for transport.
5. Defensive driving techniques to ensure no offensive reactions are performed putting the patient life in danger.

Step 8: Change to Patient Referral Process:

The patient referral process although informal was originally limited to the PHC staff, village administration and political leadership. However, as the gaps were identified changes to the patient referral process with increased sources and participation became a natural evolution.

The requests to transport patients or intake funnel is a method in which Patient transport requests are made either to the DYS Call center or Direct calls to Bike Technicians as referrals. The following are different funnel sources:

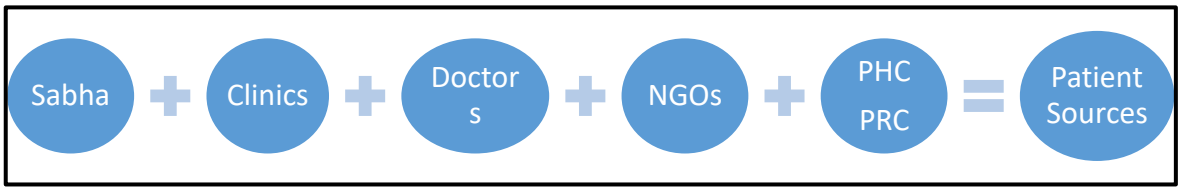


Figure XVIII –Various Funnel Sources

Government Partnership

Working closely with Government institutions like the District Collectors, Health Departments, Women and Child Welfare and Welfare of Disabled and Senior Citizens via Primary Health Center (PHCs); Primary Rehabilitation Centers (PRCs) or local hospitals.

Salahakaar Source

Any of the Salahakaar Sabha members can direct the Call Center or Bike Technician for a patient pickup. This includes any of the Government or Law enforcement organizations.

NGO and/or Community Service

This model is supported by a NGO, organization to provide services to their constituents. The operating model could be a simple MOU where the NGO works with DYS for transporting their Patients either solely or as needed way.

Private Doctors or Hospitals Partnerships

This model is supported by a NGO, organization to provide services to their constituents. The operating model could be a simple MOU where the NGO works with DYS for transporting their Patients either solely or as needed basis.

Direct Patient request via referrals

Patients can directly call DYS Call center and make reservations for a scheduled pickup or on demand pickup service. They could also come as a referral from DYS or Bike Technician referrals.

Step 9: Pricing Model

Initially when the Patient Transport Service was launched there was some feedback collected from the Village administration, local social workers, healthcare professionals. The service was proceeded well below the expenses incurred using a personal transport or charges involved if a private transport was used. However, the segment of the population we started supporting was struggling to pay for the charges. Since we had a transportation guarantee irrespective of the patient's ability to pay for the service, we started having more than 80% patients transported free of charge. This forced us to take look at the pricing model and changes to the pricing model were recommended. The

pricing was reduced to fuel expenses for those who can afford the service and free for those who cannot afford. The Service delivery SLA remains to be the same i.e., once a patient is identified to be transported, they will be transported to their destination irrespective of their socioeconomic condition. Although we are well aware of the possibility of abuse by the patients i.e., those patients who can afford to pay try not to pay understand the socioeconomic conditions of the population makes this service part of an NGO make it more appropriate.

Step 10: Back Office and Service request process

Back Office

The Back office has processes to run most of the DYS operations behind the scenes. This includes interacting with patients, Bike Technicians, Field issues and coordination, partner engagement, partner identification and cooperation solicitations, Reservation, management software and maintenance, Coordination with Sabhas.

Reservation and Service Delivery Process

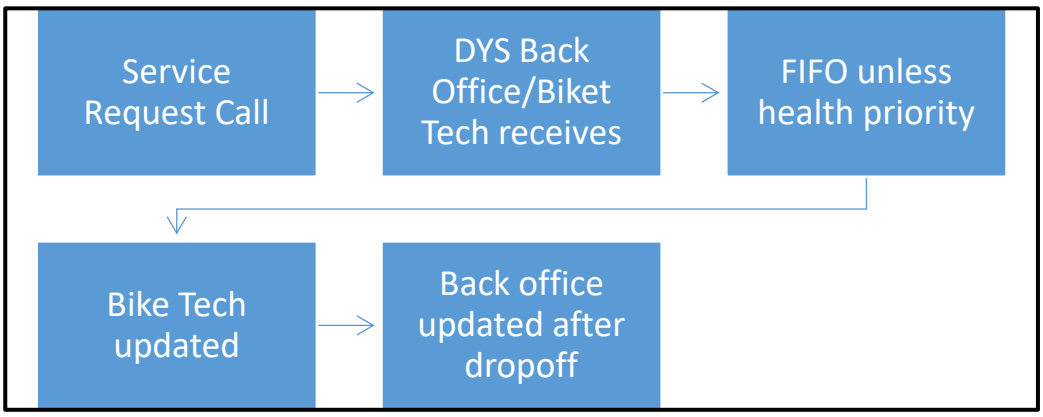


Figure XIX – Reservation & Service Delivery Process

Centrally operated Call Center per region based on the caller to meet local cultural and language.needs.

1. A Patient or a loved one on their behalf can either call for a Scheduled Service or call the DYS call center for an on-demand Service request.
2. Call is answered and serviced first come first serve basis unless there is a health priority.
3. The Bike Technicians are given their pre-scheduled pickups every Friday for the following week.
4. On Demand pickups or Drops offs are informed via SMS/WhatsApp/Direct calling on a as needed basis
5. The Bike Technicians also can bring in Patient Pickups via their networks. All such pickups and drop offs will be reported promptly to the Call Center.
6. All Coordination and Support works are initiated for a project from the Back-Office

Step 11: Patient Pickup and Drop off Process

The following process is used to deliver the services by DYS:

1. The Bike Technicians or Medics get advanced notification of workload which is, all the pickups and drops which have been prescheduled a week before
2. Bike Technicians report to their designated place of stationing of Grambulance every morning.
3. Bike Technicians take OnDemand transport request in first in first out basis if there are no reservations.

4. Enough planning time is provided to ensure availability and timely service delivery.
5. The Bike-Tech/Medic's schedule is scheduled by stacking pickup and drops off in an efficient manner to ensure timely transportations.
6. The Bike Techs/Medics coordination are supported by the DYS back-office including call center and field support.
7. The Bike Techs/Medics are not required to check and record the vitals of the patient at this point before they are boarded for transport to ensure there are no complications during transit. However, they are advised to contact the health officials if they notice any visible signs of patient distress.
8. Services which are prescheduled, with wait times up to 1/2hr, are supported. All return transport services which cannot be fulfilled in this 1/2hr will be managed in a first come first serve basis with priority to the neediest patients being first.
9. The Charges for the services are fixed pre-determined and are paid ahead of time by the patient by the patients who can afford otherwise the service is free of cost to the patient.
10. Patients who have affordability issues will be managed case by case basis by the back office and Bike Tech/Medic with a commitment to not abandon the patient and transport the patient in a reasonable period with utmost importance to their wellbeing.
11. For medical complicated scenarios, the patient's doctor or local medical team is consulted immediately.

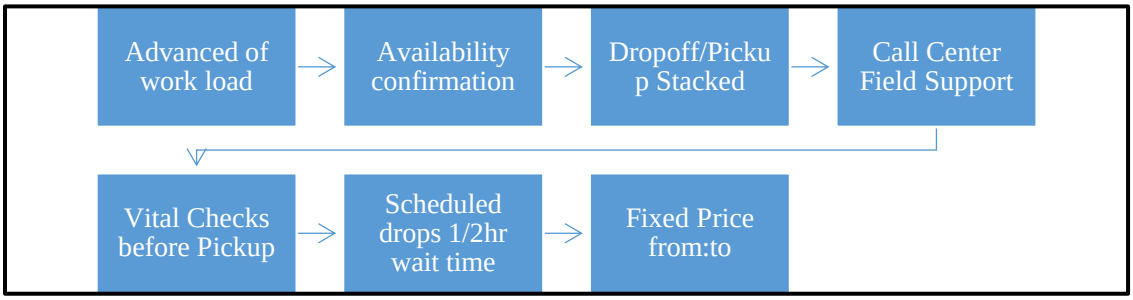


Figure XX – Patient Pickup and Drop-off Process

STEP 12: Patient feedback and data reconciliation

Patient feedback about their experience of the service is collected and actively reviewed to ensure there is responsible and high quality of service levels are maintained. The patients are contact for verbal feedback on their experience as well.

Step 13: DYS field Operational Structure

DYS Field Support

There are distinct roles called Raajya & Jila/district Coordinator who are responsible for making sure the DYS operations and Bike Technicians work is continuing smoothly without any issues in delivering service. They are the first ones on the filed representing DYS interfacing with local Sabha members. They are also responsible for relationship management at the Mandal/Jila/Rajya levels

Salahakar Sabhas: A Voluntary Advisory Council

Following is the structure of the Salahakar Sabhas. It is currently more informal but there are plans to make it a formal structure as the operations mature and there is wider deployment of Grambulance vehicles. All positions are voluntary with representatives

from various sections of the society to help and guide DYS in fine tuning the service delivery and quality. The positions are filled as needed basis and not all positions at each level in the chart below have been filled.

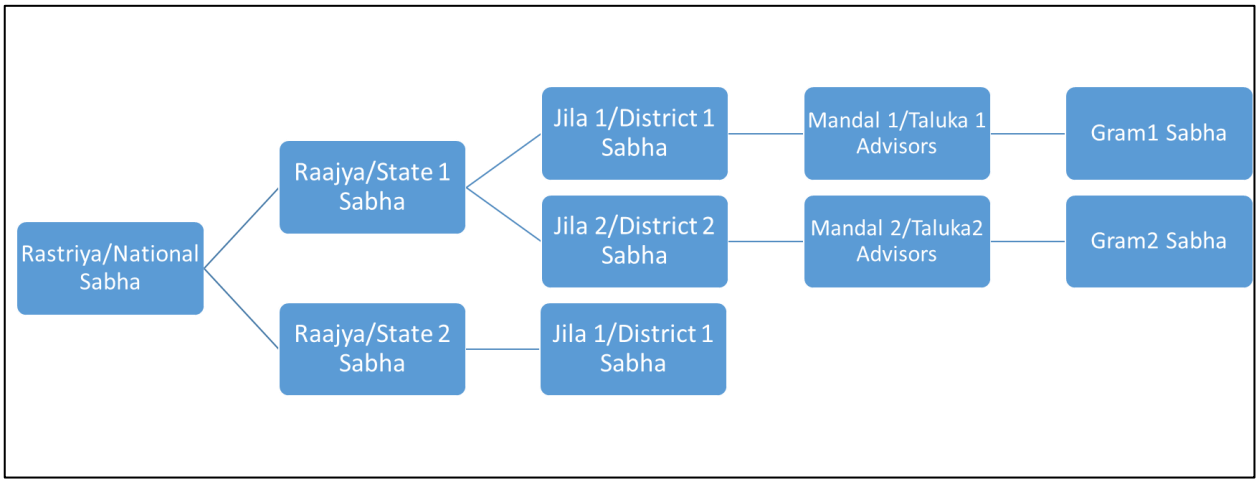


Figure XXI – Field Operation Structure

Each Sabha will have members of the following background and work scope

1. Social Workers: for Sevaks Management; Service coverage advise
2. Health care professionals: for Training Curriculum, Health related Advise
3. Administration; for Training and Management
4. Business Operations management and Service management advise.
5. Donor Relationships; Individual, Corporate, MNC & Government
6. Government Representation with MOUs from DC and DH Dept.

The Scope of responsibilities will be updated as needs are identified. Current Identify Opportunities for the following:

- Areas to deploy new Service

- Ways to make the operations self-sustaining including Bike Technicians as independent business owners
- Monitor and Improves Services
- Find Additional Salahakars across Social Workers; Health care professionals; Administration; Business; Donor Relationships.
- Government Administration and Political Relationships at all levels

Step 14: Hospital & Specialty Database

Another feature which needed to be further developed and enhanced is the ability to maintain a database of Hospitals in the vicinity by their specialty. Since sizable portion of the population is illiterate there is a lot of benefit if DYS can suggest and consult with medical specialists so the patients can be transported to right hospitals for treatment instead wasting valuable treatment window. Inventory and maintain the area hospitals with their specialties to ensure quality Patient Support system.

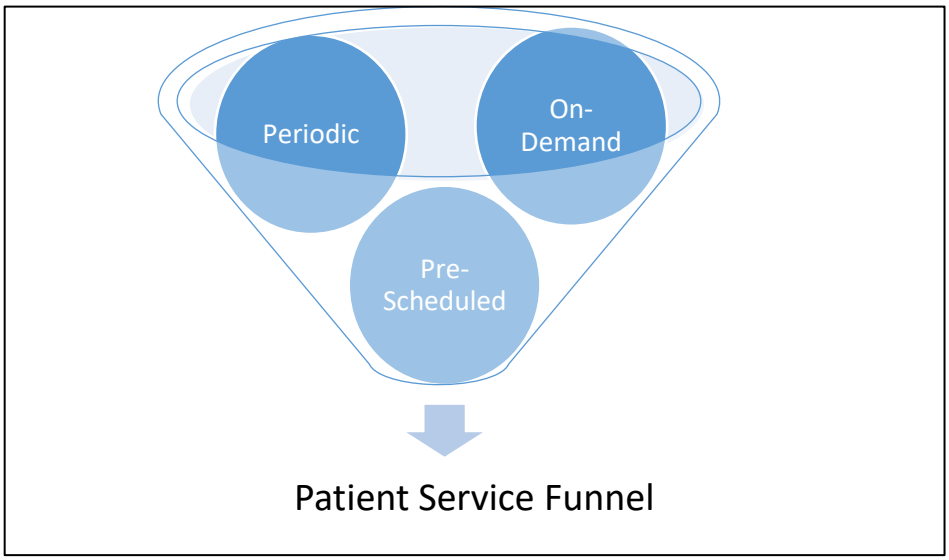
1. Hospital Database is created and maintained
2. Both Government and Private hospitals are recorded
3. Each hospital is identified with Women, Maternity, Pediatric specialty
4. All hospital Specialties information is recorded
5. All Hospital Doctor information is also recorded
6. Special arrangements can be made with hospitals for specialty patient treatment.

STEP 15: Service Types

All DYS operations are managed by Sabha's with Public-Private members overseeing operations and make needed changes locally. There are different service types defined and can be adopted as needed locally.

Service Types

Providing transport service is a complex operation involving different geography, culture, and economics. These factors determine what works at a particular lowest Sabha level whether it is a Gram, Mandal/Taluk Sabha. DYS Operations are suggested operational models only and are very flexible enough to cater to localized solutions to service and support DYS mission. A blend of the ownership and operational models will be supported to ensure the bottom line is being cared for with best of intention and effort, which is unconditionally service in providing transportation to and from healthcare



centers.

Figure XXII – Patient Service Funnel

Multiple Service models will be catered to accomplish this task as follows:

a) Pre-scheduled

The appointment to pick-up or drop of a patient can be pre-scheduled for regular need for someone to visit a PRC, PHC, private doctor, hospital, and diagnostic center. A reservation service is available through a call center currently to schedule such services. Details about the Patient location, destination and any patient special needs are needed to schedule the service. There will be a flat rate for the service.

b) On demand Service

On demand service model enables the transport services to be ordered as needed by the patient or recommendations through any of the members of Salahakaar Sabha. Since Grambulances are deployed in a strategically identified location, time to pick a patient is predictable and will be within reasonable limits excluding extenuating circumstances.

c) Periodic Service

Patients who need periodic transportation for certain treatments can either preschedule the service or Salahakaar members can refer the service request for the patient pickup.

STEP 16: New Deployment Location

Based on the experiences we had in deploying Grambulance vehicles in these three locations and the data which was collected a thorough vetting process was designed to qualify a newly identified location. Similarly, there was a new process to identify and select new bike technicians as follows:

New location identification was followed by a number of data gathering, validating, meetings and interviewing all the stake holders to ensure the key players are identified along with highlighting the local transportation methods and gaps.

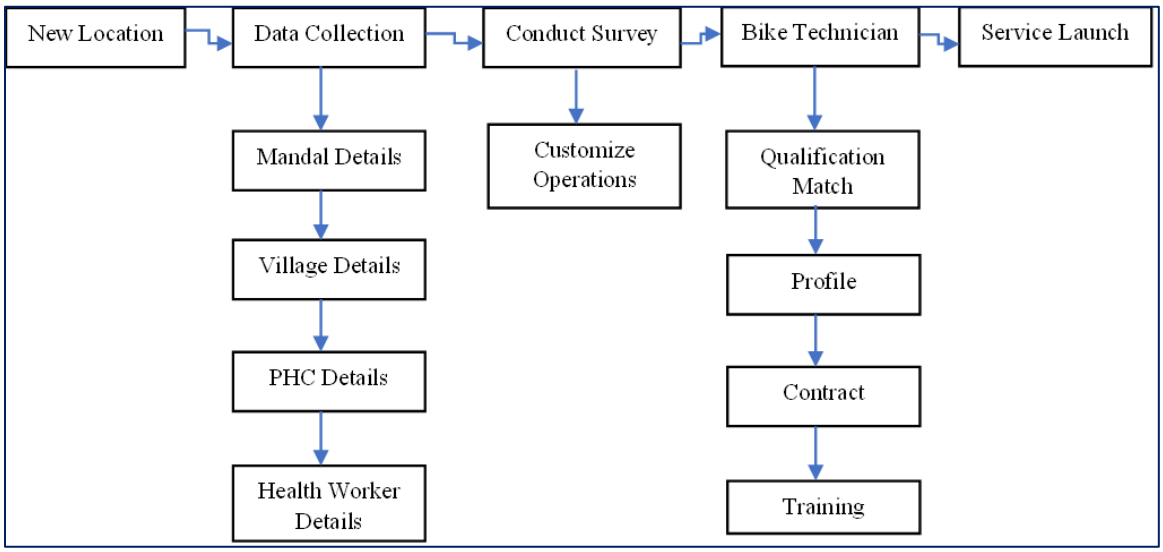


Figure XXIII –Steps for New location Service Launch

Following sequence of steps are followed for a new Service Launch at a new Location:

1. Identify a new location through the network sources
2. Data Collection:
    a. Mandal Details

b. Total Villages in Mandal; Names, Population; Sarpanch Names and Contact details
c. PHC Details.
d. Health worker contacts details.

3. Conduct Survey
4. Find Bike Technician from local unemployed youth
    a. Qualifications Match
    b. Profile Match
    c. Contract
    d. Training
5. Service Launch

Case Research methodology was used in creating multiple use cases (Bhattacherjee, 2012) and providing services with well documented data getting generated at every step of the way.The solutions were provided with complete support from the rural political, administrative, healthcare officials and village population. Elaborate Gramsabhas (Open Village Meeting) were conducted with me as the prime researcher explaining the project's roles, responsibilities and benefits to the villagers. Pilot Projects were initiated only after getting concurrence from everyone. The selection of the Bike Technician, who would be responsible for transporting the patients, was contracted for a monthly stipend of Rs. 5000. The Bike Technicians were trained and tested for their driving skills as part of the onbaording process. Google Forms were created in English and Telugu languages to ensure that the DYS local staff were able to capture the details and share them in a comfortable communication language. An 1800

Service and Jio Cell Services were subscribed to ensure that calls can be received for patient pickup. A dedicated DYS employee is responsible to attend calls to schedule the pickup and drop-off service 7x24. All requests for service were logged in the Service Request form and Bike Technicians were updated about the request for service. DYS Dispatcher stayed in contact with the Bike Technicians through the process of pickup and drop-off of the patients. Request for a Patient pickup could come from any one in the serving area. If the Bike Technician received calls directly they would update the DYS dispatcher about the request with complete details as in the Service Request form referred in APPENDIX D.

3.3 Research Purpose and Questions

The rural healthcare delivery infrastructure is very lean in rural India. None of the studies or research have covered the topic which this dissertation is trying to address. In most cases there is an ASHA worker or village volunteer for few villages based on population and economic state of the rural region. There is little or no healthcare infrastructure in this setting. The closest health facility sometimes could as far as 18 kilometers. There are situations where the Thandas (Hamlets) do not have any kind of transportation which leads to delay in healthcare delivery. Although government provided 108 Ambulance service exists, it only services emergency and critical trauma patients. Sometimes even these Ambulances take hours before they can respond to do the pickup as they are stationed closer to the Primary Health Center (PHCs), which are usually Mandal(township) headquarters.

Delay in healthcare is caused due to lack of quick transportation, however the problem gets more complicated if the patients do not have the knowledge of where to go to get the right care. The local PHCs are not staffed with specialists and cannot perform many procedures other than simple first aid and medication for common health

conditions. In such scenarios the patient loses valuable time, not only to find the care center but also to find the transportation to the care center which can deliver the needed care. In this scenario, an external service to identify appropriate healthcare facility or an option to access a telemedicine hotline is essential to save the valuable time.

1. The research needs to validate the hypothesis that there is a gap in the current delivery infrastructure which needs to be filled.
2. It needs to validate that an NGO is a viable option apart from a new government solution or the inadequate private solutions which are being followed.
3. Validate the operational model of the NGO with quantitative studies and use cases.
4. Validate the financial model is a viable option for a self-sustained NGO for future expansion into areas beyond the current pilot model.
5. A flexible portfolio of services is necessary to meet the need of the hour in the rural setting.

3.4 Research Design

The pilot projects and details are being gathered by Bike Technicians and Project Coordinators of the NGO and updated into Google Forms, which is the primary source of the data. All personally identifiable information related to any personnel involved with the pilot projects will be redacted. Only data releated to the research will be presented and analysed.

To validate the gap in healthcare delivery and to understand the socioeconomic conditions, issues with transportation, current healthcare infrastructure and workers we will do the following research studies:

a. collect the census information for Marriguda, Gudipally, Venkatampeta and Siddipet from Indian Government Census website. https://censusindia.gov.in/pca/Searchdata.aspx . The data used is from the 2011 Census as the 2021 Census data collection is still in progress.

b. Conduct a google online Survey covering the Sarpanch, Deputy Sarpanch, ANM, ASHA Workers, Anganwadi Workers (AWW) and local population from every Village and Thanda (Hamlet). Survey questions will be focussed on the following topics

    i. Current Healthcare situation
    ii. Rural Socio Economic Situation
    iii. Patient Transportation Issues

    Since we are in a rural and remote areas with low literacy rates and access to internet is a challenge, the Survey is taken with DYS team asking the questions and updating the online survey form with the answers provided by the survey participent.

c. Use Cases to study the impact

    i. Grambulance Deployment: fee based deployment with Bike Tech stipend for Gudipally, Marriguda,Venkatampeta.
    ii. Siddipet Covid Patient transport: During COVID's 2nd wave, Grambulance transported patient free of charge for 45 days in partnership with Volunteers and City Officials. This pilot program included fully vaccinated local social workers and DYS teams to deploy the service. The social workers shared contact numbers via word of mouth and social media. The city officials were also involved in supplying medication packets to the infected Covid-19 Patients. The services provided included free patient transport from homes to private or government hospitals upon request.

3.5 Population and Sample

Interpretive research

Census data for the four use case locations was collected from the official indian government census website to analyze the population demography. Understanding the financial conditions, literacy, skill levels is extremely important to create a successful Survey Research as well as the Services offered during the Use case pilot projects.

Survey Research

As discussed previously, the Survey research with Ordinal Scales questions would be directed towards all the key players for each village serviced for the pilot project which includes the Sarpanch, Secretary, Other Political and Admisinitrative officials, Healthcare workers and village population. A target of 20 people per village serviced, will generate over 200 respondants for each of the location which will approximately generate a size of 600 responses, which is the overall target.

Case Research

Each use case, based on the scope and length of the pilot, will generate data which will be analysed seperately. Following are the high-level demographics across the 4 locations we have selected for the pilot. The detailed demographics are in 4 tables in Appendix C. The source of the data is Official Census Data collected in 2011 by Indian government found at https://censusindia.gov.in/pca/Searchdata.aspx. Census 2021 is still under progress hence data from Census 2011 is being used. There are few changes like Andhra Pradesh state getting divided into Telangana and Andhra Pradesh. Although all the pilot locations we have identified are shown as in state of Andhra Pradesh they are physically in the new state of Telangana created in 2014. Similarly number of districts got reorganised and subdivided in the new state of Telangana in October 2016. So the list of villages in the mandals also has updated. We will consider the updated list of Villages

and population for the use case purpose. The local population numbers will be obtained from the mandal revenue department and the PHCs we will be working with.

State Name	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh	Andhra Pradesh
District Name	Nalgonda	Nalgonda	Nalgonda	Medak
SubDistrict	Marriguda	Pedda Adiserla Palle	Chintha Palle	Siddipet
Total Number of Household	9,031	11,931	10,907	26,065
Total Population	36,968	50,338	45,058	114,091
Detailed Data Table	Table 1	Table 2	Table 3	Table 4

Table O – 2011 Census Data

3.6 Participant Selection

Survey research includes all the key stake holders of village and PHC. Effort is being made to ensure every single village, covered by the individual PHCs, is included in the survey so there is equal representation of the participants.

Use case services are offered to patients who want to utilize the service as per their needs and hence cannot be predetermined. The Service request data is collected to ensure the patient details are captured for analysis.

3.7 Instrumentation

The research conducted as part of this dissertation includes multiple research methods and hence mutiple research instruments are being used. The Census Data collected from the Government of India website for the 4 locations will be analysed using standard statistical methods.The Survey research used has both Free-Answer and Guided Response type questions to effectively capture the participants healthcare experience, problems faced and associated solutions. The data captured will be analysed using standard statistical methods.The Use Case pilot projects used Google forms to effectively

capture enough details about the patient, condition and destination. The data captured will be analysed using standard statistical methods.

3.8 Data Collection Procedures

Google Forms is being used to gather the responses of the survey as in Appendix A(English) and B(Telugu). The Survey questions are written in English and translated to the native Telugu language for the participants' convenience.

All patients' details, who are getting transported either on-demand or scheduled, are captured via a Google Form with 4 sections called Service Request shown in APPENDIX D. The Service Request form is in Both English and Telugu for the ease of use by the Bike Techncians and the DYS Foundation Staff.

3.9 Data Analysis

The gathered responses from the Survey will then be analisyed using standard statistical methods. The details of the analysis of the data collected will be discussed in more in the next chapter.

3.9 Research Design Limitations

Case research is a difficult research method that requires advanced research skills on the part of the researcher, and is therefore, often prone to error. (Benbasat,1987) describes five problems frequently encountered in case research studies which are being addressed accordingly by the researcher as follows. However, the results, data collected, analysis of the data will influence the findings and conclusions of this research.

1. Many case research studies start without specific research questions, and therefore end up without having any specific answers or insightful inferences. Multiple research methods and multiple use cases are being used to ensure the research questions are being effectively addressed.

2. Case sites are often chosen based on access and convenience, rather than based on the fit with the research questions and are therefore cannot adequately address the research questions of interest. The use cases have been identified through a vast social worker network and an initial data gathering process along with Gram Sabha (Village Meeting) to ensure the use cases are validated against the research questions.
3. Researchers often do not validate or triangulate data collected using multiple means, which may lead to biased interpretation based on responses from biased interviewees. Data gathered during the use cases if unbiased data gathered on the service provided and the patient conditions.
4. Many studies provide very little details on how data was collected (e.g., what interview questions were used, which documents were examined, what are the organizational positions of each interviewee, etc.) or analysed, which may raise doubts about the reliability of the inferences. All the Survey questions, data collection forms are part of this dissertation so the process can be easily replicated for authenticity and validate the scientific process used.
5. Despite its strength as a longitudinal research method, many case research studies do not follow through a phenomenon in a longitudinal manner, and hence present only a cross-sectional and limited view of organizational processes and phenomena that are temporal in nature. The research methods include Survey research as well as Case research to ensure multiple data collection processes are used to validate the hypothesis and consequently answer the research questions.

3.9 Conclusion

Survey – Population sample size is large enough. Questions follow a scientifc methdology and are precise. To ensure large participation effort has been put to provide the survey in person with cell phones so respondant lack of access to internet or tools nor literacy become an obsticle to gather the survey responses.

Use Cases have been identified a clear gaps validated by elaborate meeting with all the stake holders. Measurements and data gathering proceeses were setup. Operational process was kept flexible to ensure maximum participation and success of the pilot projects.

CHAPTER IV:

RESULTS

4.1 Introduction

Overall, the research and data collection has gone fairly well. Analyzing the census data and the survey conducted highlighted a number of socio-economic issues which were also visible in the use cases data. The Use Cases uses census data from 2011 census to identify critical demographics of the towns in focus. The socio-economic factorissomewhat identified by factors like literacy rates, employment rate, employment types. The lower the literacy rates the more lower levels of employment rate and employment types. Higher levels of unemployment rate shows two indications – families of migrant workers or senior citizen on social benefits.Based on an average payrates of agricultural workforce and literacy levels, adverse socio economic conditions can be identified.

The use cases were started with help of local social workers, village administration and health officials. After long deliberations with the village administration and health officials, a low premium was originally setup for charging the patient for transportation. There were 2 important service level agreements provided to the local population as follows:

1. After a patient is identified by any source, they will be transportation to health facility and back home will be a guaranteed service

2. If a patient cannot afford to pay for the ride, they have the option of providing a portion of the fee to their comfort level or it can be a total free ride.

After the first few weeks of the Service launch, we encountered few anomalies as follows:

1. Most of the patients could not afford to pay for the rides.
2. They were not sure where to go and needed help and guidance from the bike technicians.
3. Senior patients needed a lot of guidance and comforting while transportation.

The results data shows that if we have to serve these communities and many more like these it was evident that the service cannot have profit motives but should have service as the primary objective. Providing free or almost free services can only be accomplished by NGOs who primary motivation is to serve the community for a cause.

The anomalies above made us look at the census data and it was revealing. Significant portion 52% of the population was illiterate. Major portion 32% of the working population was engaged in low paying agricultural labour, 32% worker labourers and 10% small cultivators or farmers who predominantly had rain dependent crops. Since the available census data was from 2011, we have developed another iteration of study through a through survey to find details about the local population, their views on the healthcare infrastructure available for them and feedback about their experiences and gaps in the infrastructure. The results validate the hypothesis that there

are gaps in the rural healthcare infrastructure being availed by the local population. Among them transportation with 53.57% respondents feeling in-adequate is a major issue. Significant portion of the local population want better transportation services with 64.12% of them having their own transportation.

It is clearly evident that an NGO can operate in these rural areas where there are gaps in the rural healthcare infrastructure. Each use case operated with a customized operational model to fit the needs of the localpopulation and the operational governance was also at the local level to fit the needs of the local population which proves that a NGO with a flexible operation model is a good option to deliver patient transportation services among others types of services to fit the need of the hour.

Operational Evolution

1. The evolution of the pricing model from a Rs. 50 for first 5 km and Rs. 7/km there after was reduced to fuel charges only for patients who can afford to pay and none for patients who do not have the financial ability to pay for the services. The data shows that most of the patients are able to afford just the fuel charges and the ones who cannot pay is being offset by the ones who can afford to pay.

2. Finding bike technicians was another challenge in these rural areas. Initially the Bike Technicians were contractors and during the pricing model evolution it became evident that the bike technicians need to focus purely on meeting the objectives of the service instead of anything else.

3. The NGO now has the responsibility to have fully operational fleet of Grambulances with periodic maintenance and payroll of the bike technicians.

The Operational model of working in a public-private partnership mode was very successful. Inclusion of all the critical players at the grassroots level which included the village administration, local Politian's, health officials and healthcare workers at individual village level along with active social workers and village elders made the combination very fruitful. Patients were referred by any one of the sources to be transported. Hiring unemployed youth as the bike technicians from the local communities made the service work like a well-oiled machine.

Even through the operational evolution this operational model and the processes became stronger to make the projects successful. This Strength was visible during the peak time of the COIVD-19 second wave. Training to the bike technicians on how to transport COIVD-19 patients, providing access to the PPE and training on how to use them. Patient referral worked through the entire referral network. Healthcare destinations staff coordinated with the bike technicians well before the patients arrived at their locations reducing the check in delays and anxiety. Having local youth providing the transport services even the patients were at ease. Overall, the organizational structure throughout its evolution during the trials was very flexible and performed well proving that it is a viable operational model.

The financial model in the long run will provide much needed transportation services and offer a great value at the grass roots level. With fuel expenses being shared by the traveling patients as appropriate, maintenance of the vehicles and the Bike Technician compensation being paid by the NGO the operational model is least risky and self-sustaining model in the long run. The NGO will need to raise minimal amounts of

capital to run a vehicle to service a Mandal with up to up to 30,000 population which includes the remote Thanda's / Hamlets. This is a far cheaper proposition than having a government program run similar service. Private solutions for this problem is a nonstarter if the services have to be provided for free.

Although the Siddipet project was a last-minute plan. The number services offered through the project was very helpful to the local population and were the need of the hour. The Vehicle and Bike technician services were flexible to include any service within a short time frame to implement and benefit the patients. This is possible because there is no commercial interest other than serving the local population and no complicated beaurocratic process to get permissions to implement such solutions. This validates the hypothesis that having flexible services to meet the need of the hour by an NGO with a decentralized operational model can deliver exceptional value to the society.The results for each of the research questions are discussed below.

4.2 Census Data Analysis – Nalgonda Use Case

Combined view of the census data revealed a number of data points as shown in charts and tables below. Total population across the 3 locations in the Nalgonda Use case was 132,364.00 with following breakdown - 51% of the populations is male and 49% of the populations is female as shown in Figure II represented by the first column in the stacked column chart.

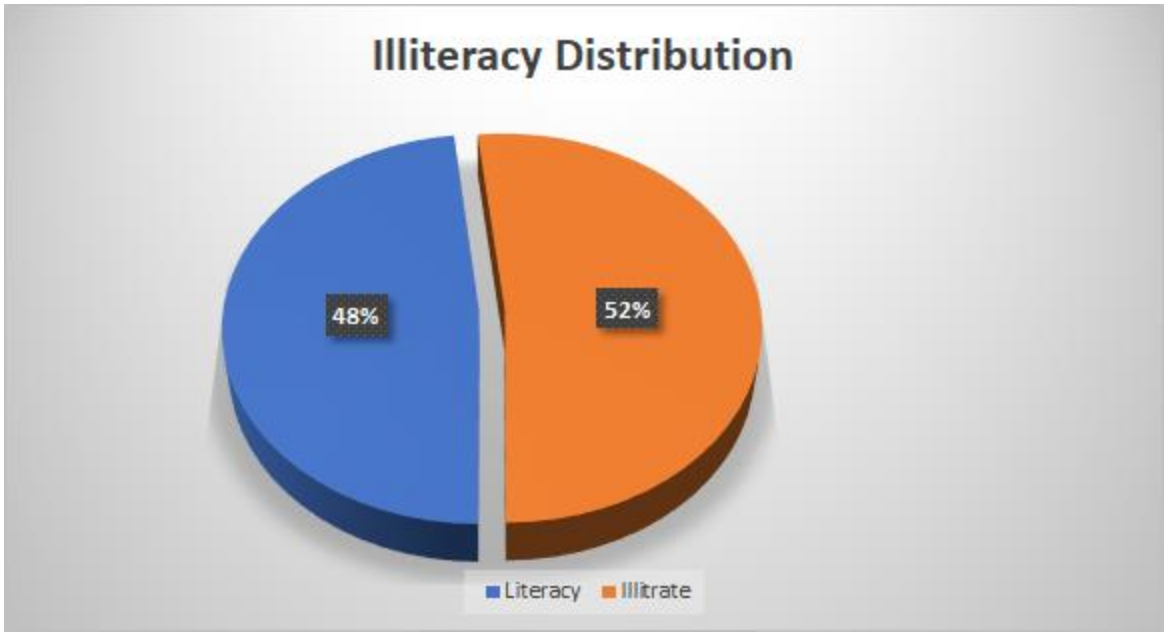


Figure XXIV – Nalgonda Use Case Illiteracy Distribution

Census data also revealed that 52% of the population was illiterate while literacy rate was at 48% of the population as shown in the pie chart in Figure I. Literacy rate in men was at 61% and for women it was at 39%.

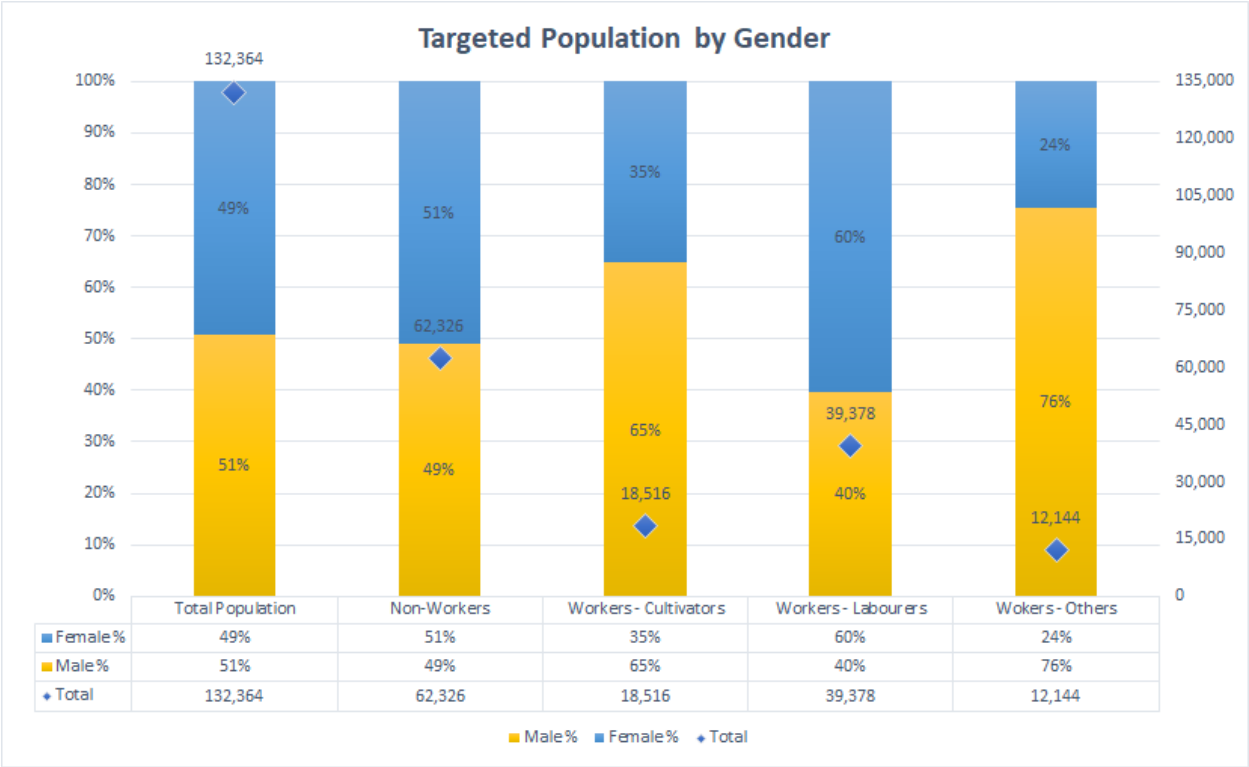


Figure XXV–Nalgonda Use Case Population Distribution by Gender

Local economy across the locations in Nalgonda Use Case is predominantly Agriculture based. 47% of the population are non-workers so this constituted as dependent population pool as shown in the pie chart in Figure III below.

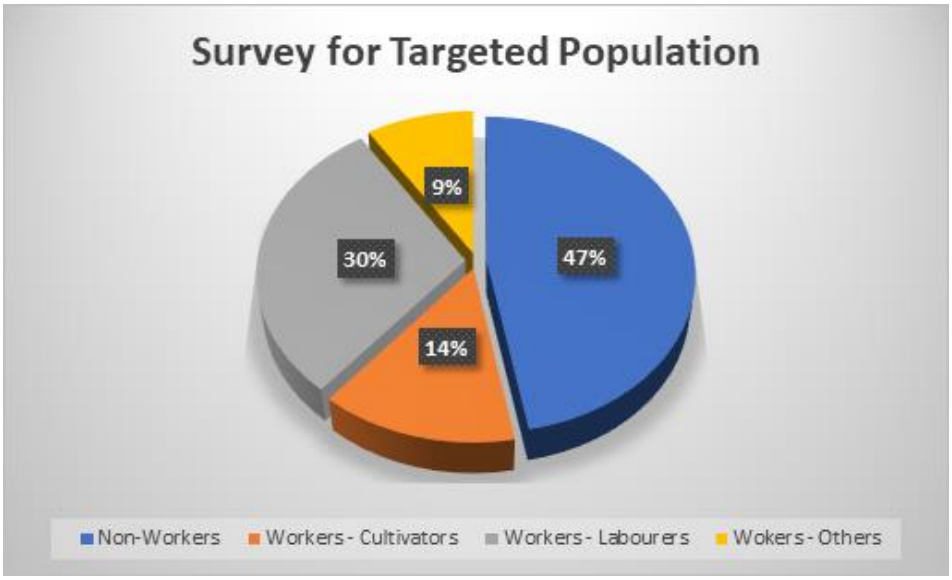


Figure XXVI –Nalgonda Use Case Population Distribution by Workforce

14% of the population is Cultivators or small farmers, 30% of the population is farm labourers. Only 9% of the population did non-agriculture related work.

4.3Survey Data – Nalgonda Use Case

Survey was remarkably successful. Participants were overwhelmingly cooperative and enthusiastic in taking the survey and shared their experiences and views about our research. A total of 600 participants have participated in the survey. The questions were answered mostly.

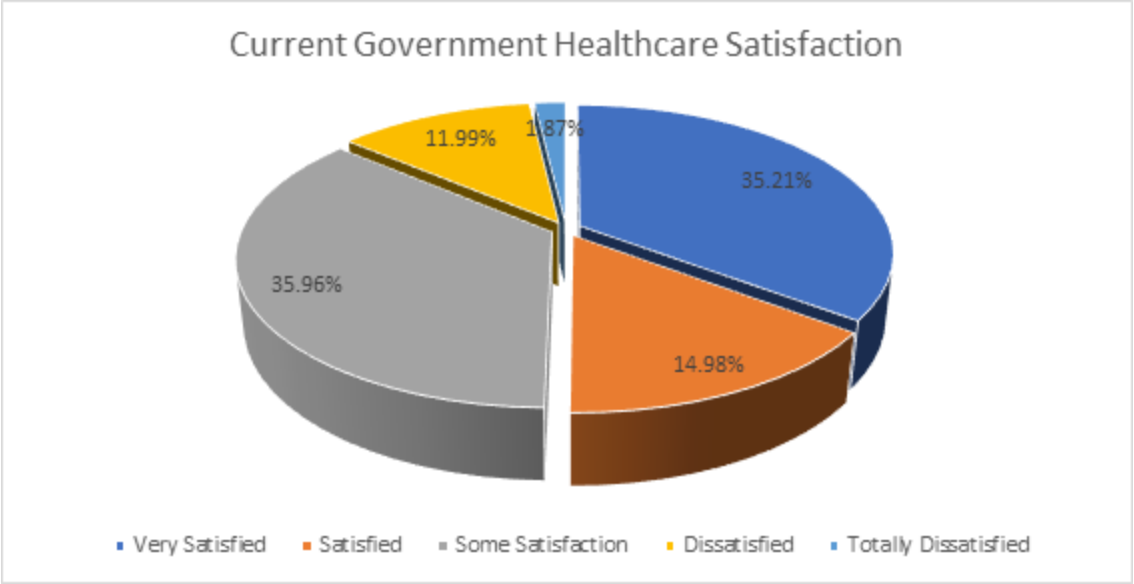


Figure XXVII – Nalgonda Use Case Survey for Government Healthcare Satisfaction

As shown in figure IV, 35.21% of the participants were very satisfied with the government provided free healthcare in rural areas primarily though Primary Health Centers (PHC's). Referring to Table I, it shows that 14.98% of them were satisfied and 35.96% of them had some satisfaction. Only 11.99% were dissatisfied and 1.87% were totally dissatisfied.

How satisfied are you with government health care?	
Very Satisfied	35.21%
Satisfied	14.98%
Some Satisfaction	35.96%
Dissatisfied	11.99%
Totally Dissatisfied	1.87%

Table I - Nalgonda Use Case Survey for Government Healthcare Satisfaction

Overall, 86.15% of the respondents overwhelmingly agreed that the Government services were satisfactory.

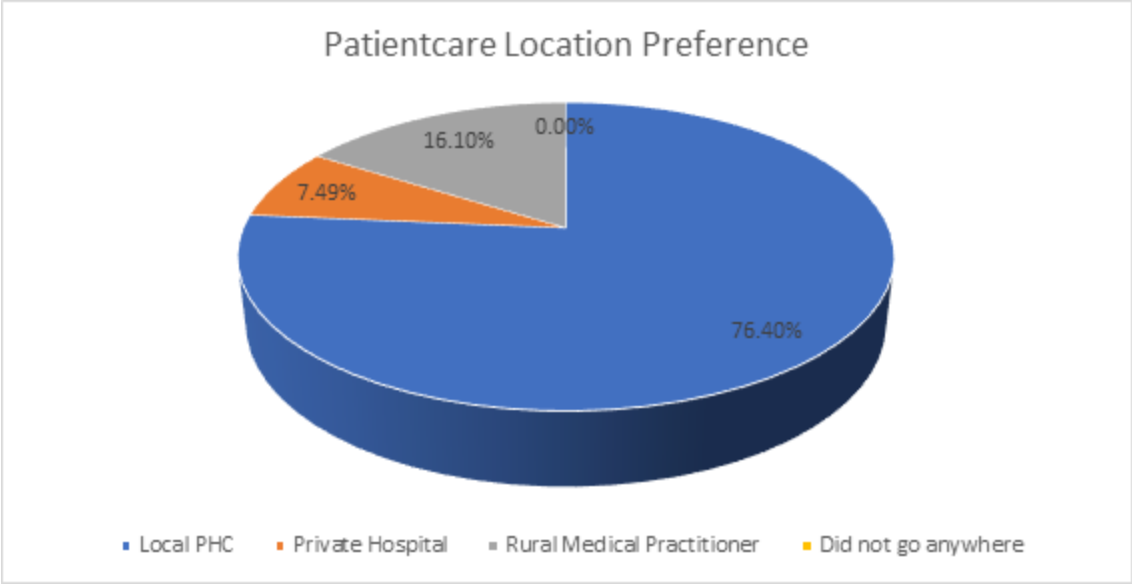


Figure XXVIII –Nalgonda Use Case Survey for Healthcare Facility Preference

As we see in figure V, 76.4% of the participants preferred PHC as their health treatment facility while 7.49% preferred private hospitals and 16.1% preferred a Rural Medical Practitioner. The good news was all the participants used some form of healthcare solution available with 0% of them neglecting healthcare.

Where do you go for health treatment?	
Local PHC	76.40%
Private Hospital	7.49%
Rural Medical Practitioner	16.10%
Did not go anywhere	0.00%

Table II - Nalgonda Use Case Survey for Healthcare Facility Preference

As we see in Table II, PHCs have an exceedingly high impact on these rural communities with over 3/4th of the population dependent on them solely making them most visited health facility in these rural areas.

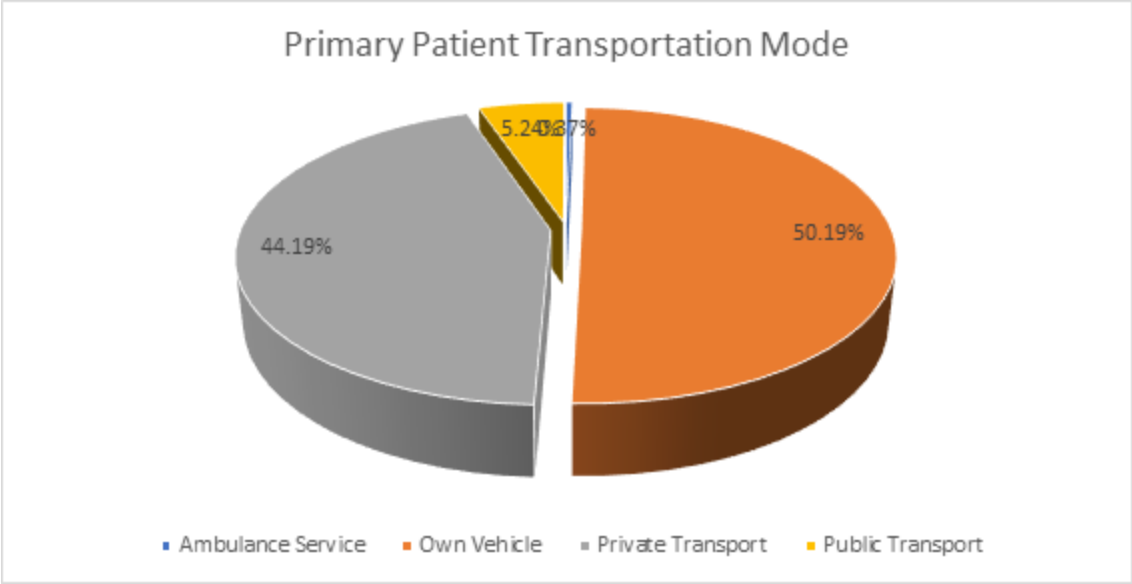


Figure XXIX – Nalgonda Use Case Survey for Primary Transportation Mode

As seen in Figure VI and Table III, only 0.37% of the participants use ambulance services as the availability and affordability is a concern. 50.19% use their own vehicle and 44.19% use private transportation. Typically, a 3-wheel vehicle operated by private individuals as a ride share service constitutes private transportation. Only 5.24% of them use public transport which seems to have availability problems.

How do you get to the hospital if you are sick?	
Ambulance Service	0.37%
Own Vehicle	50.19%
Private Transport	44.19%
Public Transport	5.24%

Table III - Nalgonda Use Case Survey for Primary Transportation Mode

A sizable percentage of the participants use personal transportation which is of a risk on who will transport them if they need help.

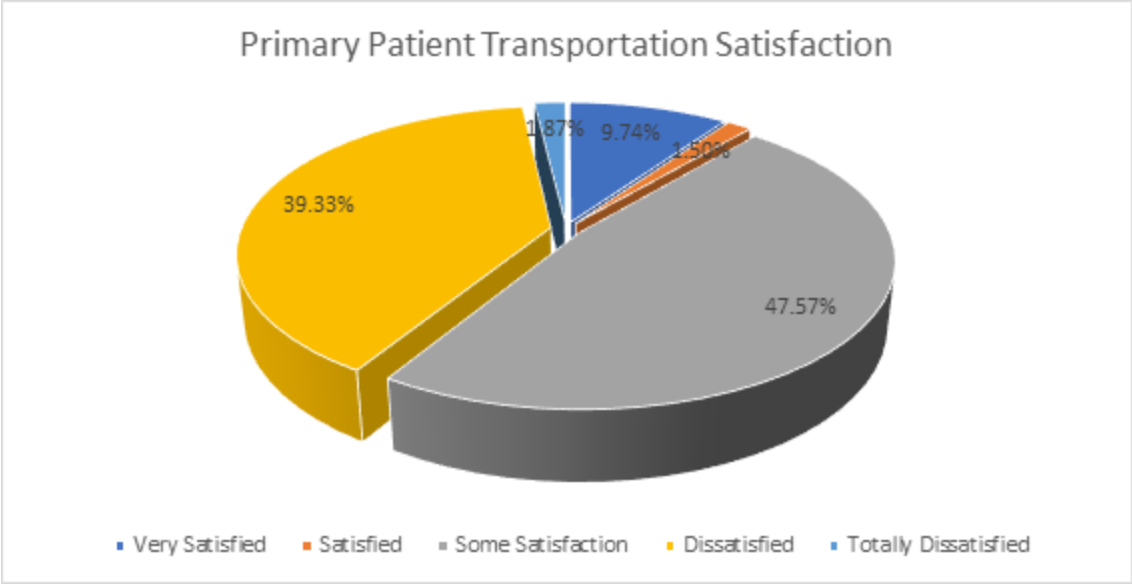


Figure XXX – Nalgonda Use Case Survey for Transportation Mode Satisfaction

As seen in Figure VII and Table IV, only 9.74% is very satisfied and 1.5% satisfied with the current mode of transportation. We also see 47.57% of them have some satisfaction while 39.33% is dissatisfied and only 1.87% totally satisfied. Overall data shows that patient transportation seems to be a concern for the participants.

How satisfied are you with the current patient transportation system?	
Very Satisfied	9.74%
Satisfied	1.50%
Some Satisfaction	47.57%
Dissatisfied	39.33%
Totally Dissatisfied	1.87%

Table IV - Nalgonda Use Case Survey for Transportation Mode Satisfaction

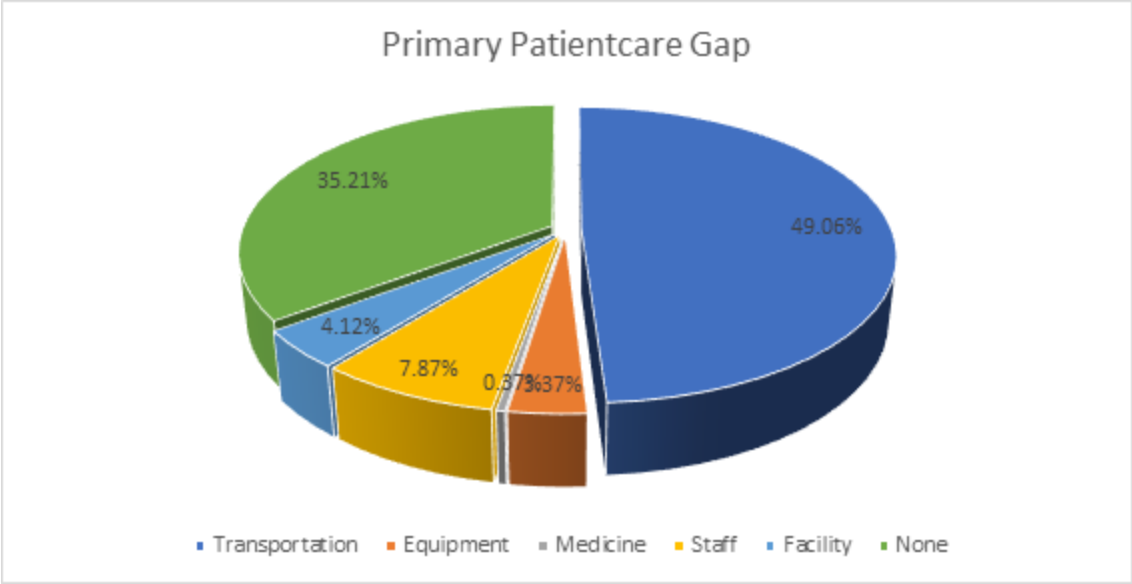


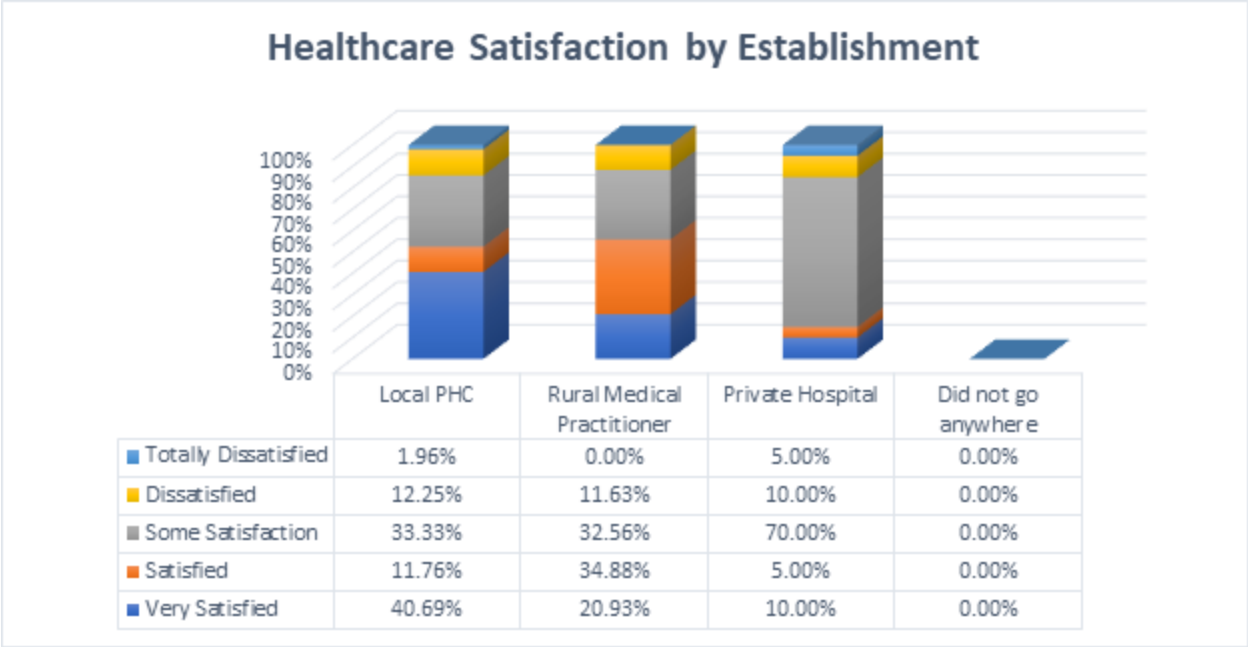
Figure XXXI – Nalgonda Use Case Survey for Patientcare Gap

Response to the Primary patientcare gap was overwhelmingly at 49.06% for Transportation as we see in Figure VIII and Table V. Other areas of concern were at 3.37% for Equipment, 0.37% for medications, 7.87% for PHC Staff, 4.12% for Facility. 35.21% indicated no concern.

Primary Patientcare Gap	
Transportation	49.06%
Equipment	3.37%
Medicine	0.37%
Staff	7.87%
Facility	4.12%
None	35.21%

Table V - Nalgonda Use Case Survey for Patientcare Gap

Transportation was highlighted as the biggest gap in the healthcare infrastructure.



	Local PHC	Rural Medical Practitioner	Private Hospital	Did not go anywhere
Totally Dissatisfied	1.96%	0.00%	5.00%	0.00%
Dissatisfied	12.25%	11.63%	10.00%	0.00%
Some Satisfaction	33.33%	32.56%	70.00%	0.00%
Satisfied	11.76%	34.88%	5.00%	0.00%
Very Satisfied	40.69%	20.93%	10.00%	0.00%

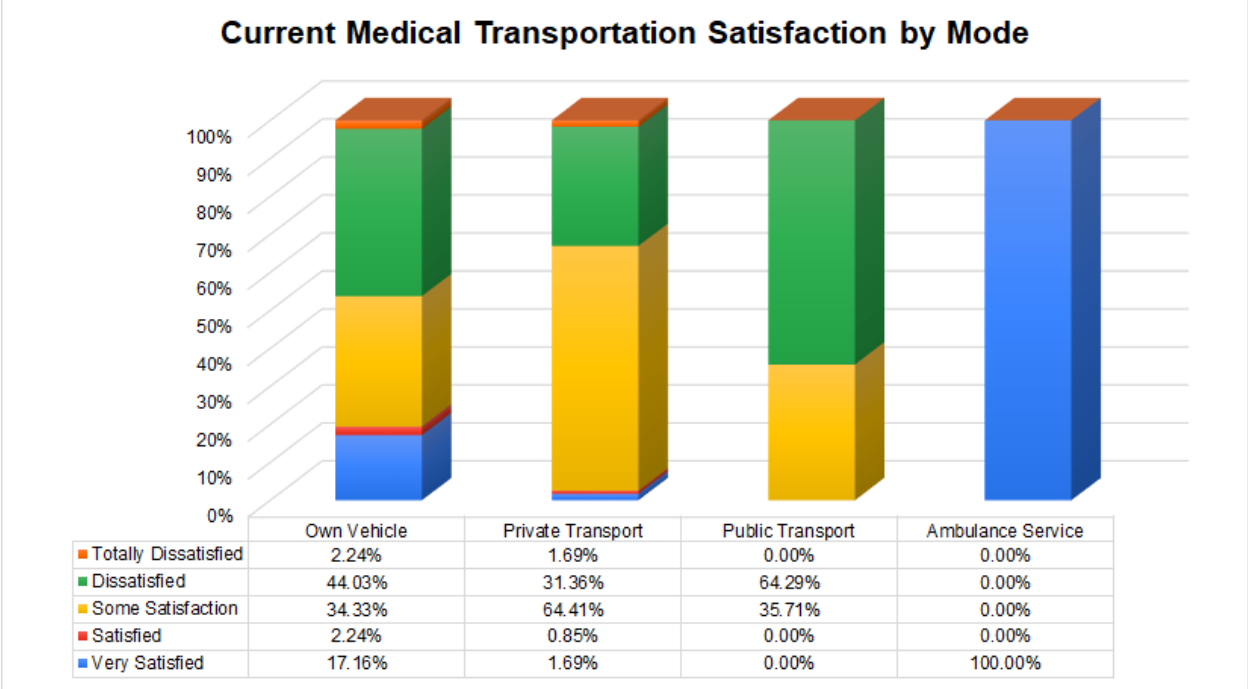
Figure XXXII –Nalgonda Use Case Survey for Healthcare Facility Satisfaction

Figure IX shows healthcare satisfaction level and use of healthcare facilities. The results indicate that 1.96% of Local PHC users were totally Dissatisfied, 12.25% were dissatisfied. Whereas 33.33% are some satisfied, 11.76% are satisfied and 40.69% are very satisfied.

Participants using Rural Medical Practitioner for their healthcare needs show that 0% were Totally Dissatisfied and 11.63% were Dissatisfied. Whereas 32.56% had Some Satisfaction, 34.88% were satisfied and 20.93% were Very Satisfied.

Participants using Private Hospitals for their healthcare needs show that 5% were Totally Dissatisfied, 10% Dissatisfied. However, 70% had Some Satisfaction, 5% were satisfied and 10% were Very Satisfied. Since everyone who participated in the survey used healthcare services the column for did not go anywhere shows 0% for all.

Data above suggests that PHCs and Rural Medical Practitioners cater to sizable portion of the rural population. 83% of the people visiting PHC for their healthcare needs have a favourable opinion. Similarly, 88% of the people visiting Rural Medical Practitioner have favourable opinion.



	Own Vehicle	Private Transport	Public Transport	Ambulance Service
Totally Dissatisfied	2.24%	1.69%	0.00%	0.00%
Dissatisfied	44.03%	31.36%	64.29%	0.00%
Some Satisfaction	34.33%	64.41%	35.71%	0.00%
Satisfied	2.24%	0.85%	0.00%	0.00%
Very Satisfied	17.16%	1.69%	0.00%	100.00%

Figure XXXIII – Nalgonda Use Case Survey for Current Medical Transportation Satisfaction

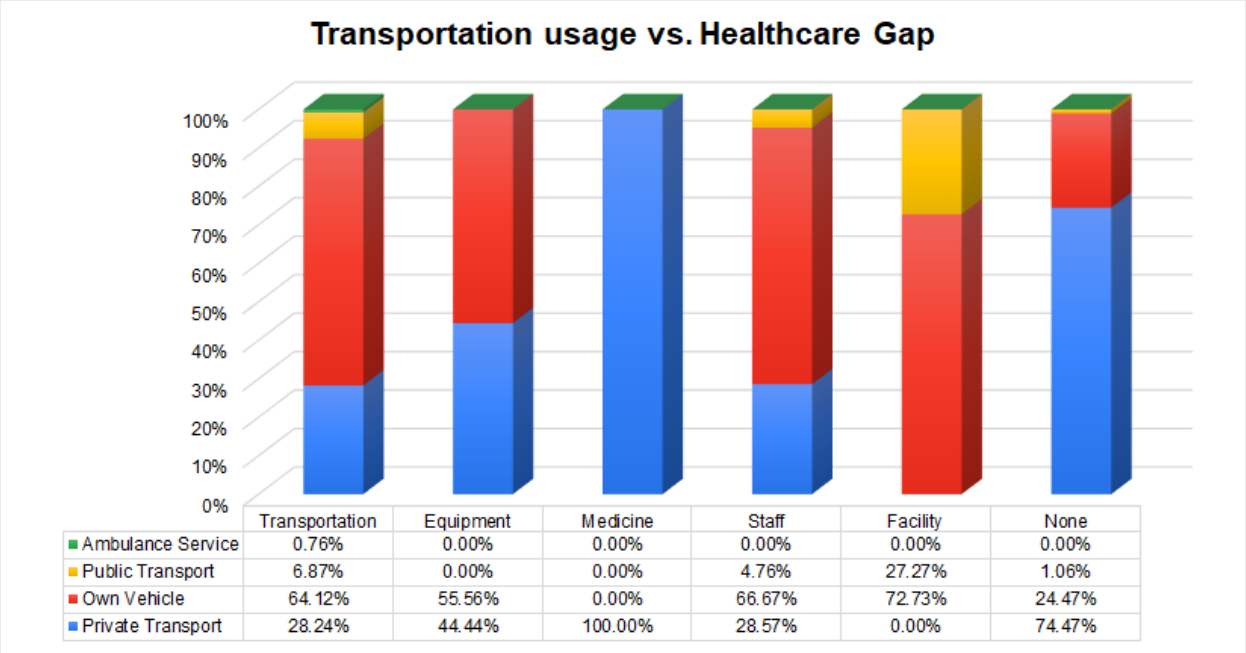
Based on the Medical Transportation satisfaction level and use of transportation methods, as shown in Figure X, we see the following results. 2.24% of Own Vehicle users were totally Dissatisfied, 44.03% were dissatisfied, 34.33% had some satisfaction, 2.24% were satisfied and 17.16% are very satisfied.

Participants using Private Transport for their healthcare needs were 1.69% Totally Dissatisfied, 31.36% Dissatisfied, 64.41% had Some Satisfaction, 0.85% were satisfied and 1.69% were Very Satisfied.

Participants using Public Transportation for their healthcare needs were 0% Totally Dissatisfied, 64.29% Dissatisfied, 35.71% had Some Satisfaction, 0% were satisfied and 0% were Very Satisfied.

Although the Ambulance usage is low the satisfaction level for 100% Very Satisfied and 0% for rest of all.

Data shows that, although ambulance usage is low, satisfaction levels are exceedingly high.



	Transportation	Equipment	Medicine	Staff	Facility	None
Ambulance Service	0.76%	0.00%	0.00%	0.00%	0.00%	0.00%
Public Transport	6.87%	0.00%	0.00%	4.76%	27.27%	1.06%
Own Vehicle	64.12%	55.56%	0.00%	66.67%	72.73%	24.47%
Private Transport	28.24%	44.44%	100.00%	28.57%	0.00%	74.47%

Figure XXXIV – Nalgonda Use Case Survey for Transportation usage versus Healthcare Gap

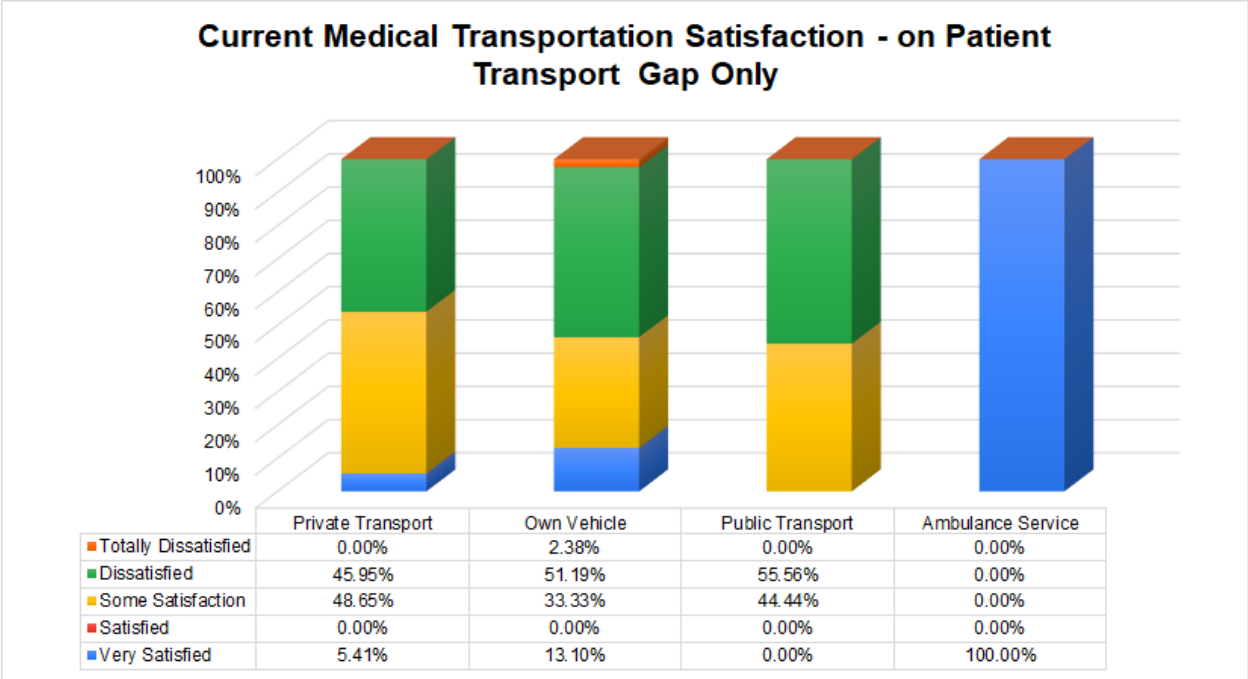
Figure XI shows that participants who identified Transportation as a gap in healthcare, only 0.76% use Ambulance Service, 6.87% use Public Transport, 64.12% use their own Vehicles and 28.24% use private Transport.

Participants who identified Equipment as a gap in healthcare, 0% use Ambulance Service& Public Transport, 55.56% use their own Vehicles and 44.44% use private Transport.

Participants who identified Medicine availability as a gap in healthcare, 0% use Ambulance Service, Public Transport and use their own vehicle, 100%use private Transport.

Participants who identified Staff as a gap in healthcare, 0% use Ambulance Service, 4.75% use Public Transport, 66.67% use their own vehicle and 28.57% use private Transport.

Participants who identified Facility as a gap in healthcare, 0% use Ambulance Service and Private Transport, 27.27% use Public Transport, 72.73% use their own vehicle.



	Private Transport	Own Vehicle	Public Transport	Ambulance Service
Totally Dissatisfied	0.00%	2.38%	0.00%	0.00%
Dissatisfied	45.95%	51.19%	55.56%	0.00%
Some Satisfaction	48.65%	33.33%	44.44%	0.00%
Satisfied	0.00%	0.00%	0.00%	0.00%
Very Satisfied	5.41%	13.10%	0.00%	100.00%

Figure XXXV–Nalgonda Use Case Survey for Current Transportation on Transportation Gap Only

Based on the Transportation method used for healthcare needs, Fiver XII shows the satisfaction levels as follows. 0% of Private Transport users were totally Dissatisfied, 45.95% were dissatisfied, 48.65% had some satisfaction, 0% were satisfied and 5.41% were very satisfied.

Participants using Own Vehicle for their healthcare related transportation needs were at 2.38% Totally Dissatisfied, 51.19% Dissatisfied, 33.33% had Some Satisfaction, 0% were satisfied and 13.10% were Very Satisfied.

Participants using Public Transport for their healthcare related transportation needs were at 0% Totally Dissatisfied, 55.56% Dissatisfied, 44.44% had Some Satisfaction, 0% were satisfied and Very Satisfied.

Participants using Ambulance Service for their healthcare related transportation needs were at 100% Very Satisfied, 0% Totally Dissatisfied, Dissatisfied, Some Satisfaction and Satisfied.

4.4Nalgonda Use Case – Pilot Project

Pilot projects were run for 7 months and was extremly successful. All the vehicles were stationed in local PHCs which made them adequately accesible to patients and word got around about the service mainly via word of mouth. Since it was a pilot projects not a lot of investment was made in advertizing the services but enough personal meetings and village level Gramsabha were used to share details about the project. A total of 75 patients were transported for the duration. The projects generated enough data between post first wave of COVID-19 and during the second wave in India. Although the scope was to transport patient who had non-critical health conditions there were instances where certain critical patients had to be transported due to lack of any other option.

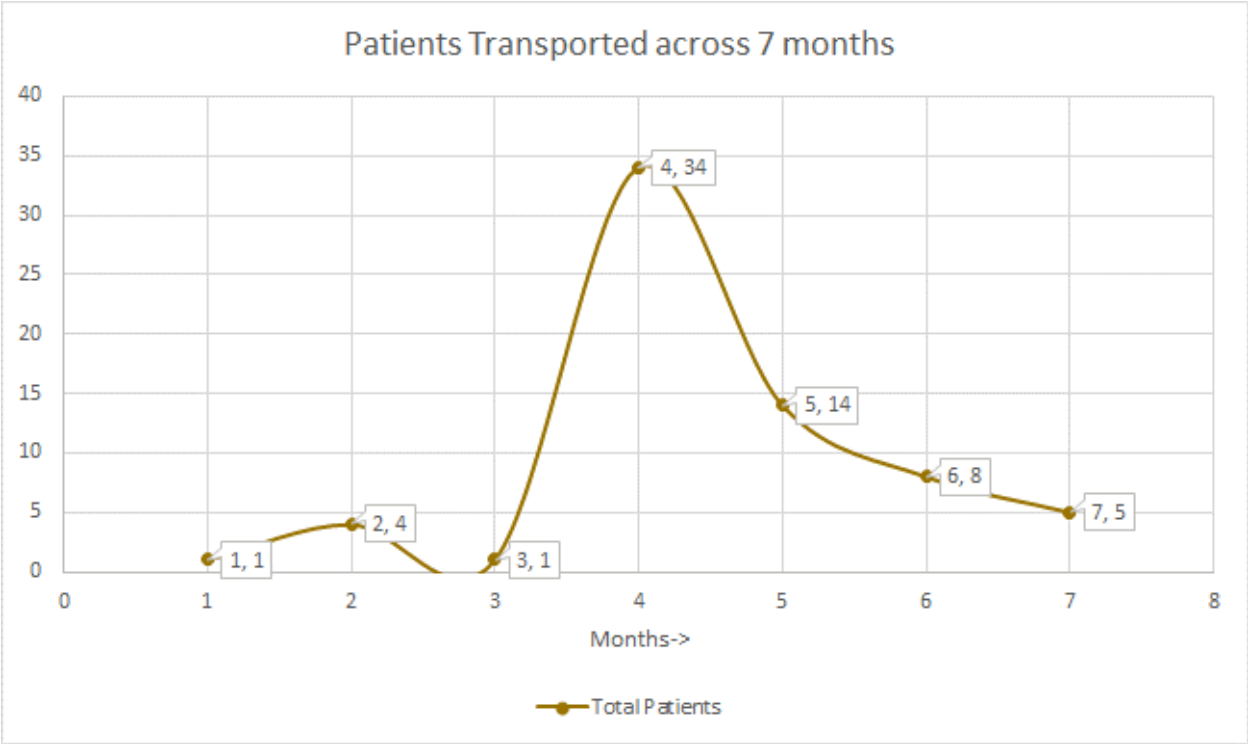


Figure XXXVI –Nalgonda Use Case View of number of patients transported across 7 months in the during Pilot Project

Figure XIII shows the patients transported across the 7 months period. Maximum patients were transported during the peak COVID-19 second wave in India. We transported 1 patient the first month, 4 the second month, 1 in third, 34 in fourth, 14 in fifth, 8 in sixth and 5 in seventh month.

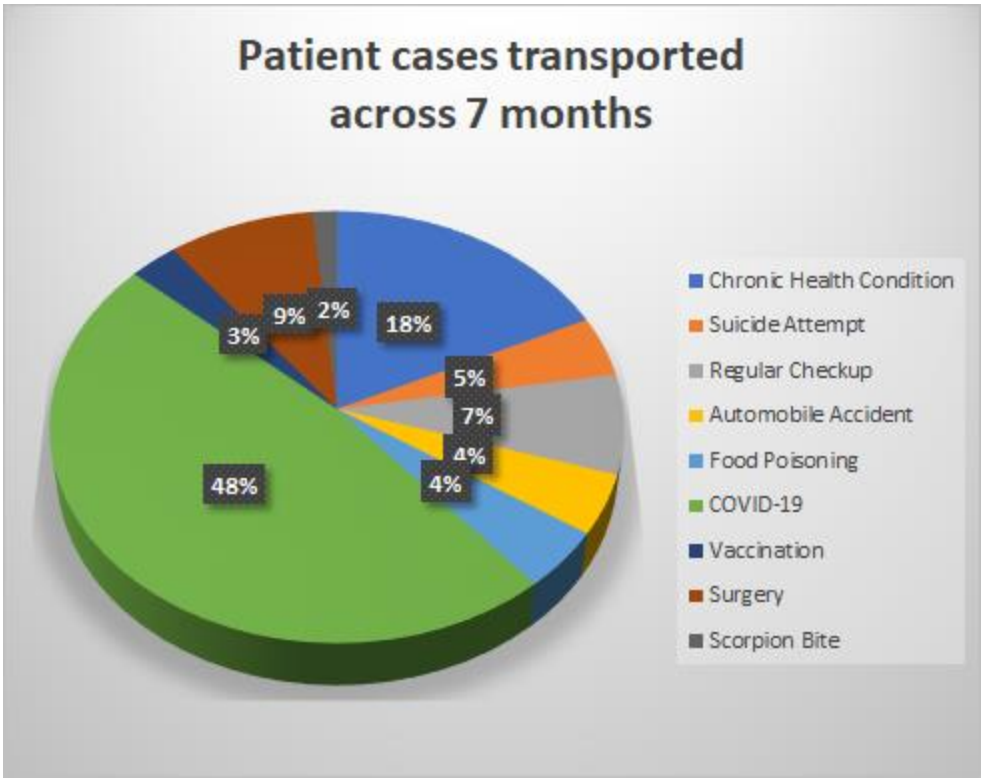


Figure XXXVII – Nalgonda Use case View of categories of patients transported

The Pie chart in figure XIV and Table VI, show that 17.91% of the patients transported had health conditions; 4.48% were suicide attempts and all of these patients survived due to timely care. 7.46% elderly visited for regular health checkup. 4.48% were transported from automobile accident scene to local hospitals. 4.48% had Food Poisoning and were transported from home to hospitals. 47.76% of them were COVID patients who were transported from homes to hospitals during second wave of COVID-19 in India. 2.99% were transported for Vaccination, 8.96% for post Surgery from Hospitals to home and 1.49% for Scorpion bite. 35% of the transported patients were female and 65% were men.

Patient Condition Distribution by Case Type	
Health Condition	18%
Suicide Attempt	4%

Regular Checkup	7%
Automobile Accident	4%
Food Poisoning	4%
COVID-19	48%
Vaccination	3%
Surgery	9%
Scorpion Bite	1%

Table VI - Nalgonda Use case View of categories of patients transported

Although DYS project operated the service as a fee based service none of the patients could afford to pay for the transport services. DYS being a NGO offered free service to patients who could not afford as a objective. However, it truned out none of the patients transported could afford to pay.

4.5Siddipet Use case

Although servicing metro area was not part of DYS portfolio, Siddipet Use case developed very quickly in the preliminary stages of COVID-19 2nd wave in India. The team started entire project knowing very well that there are a lot of unknowns hence it was agreed to be a completely flexible services portfolio project. The need for few items was discovered very quickly by the social workers who were also engaged in operating the DYS Grambulance vehicles. The original scope of the services involved transportation of Covid-19 patients who needed transportation from their homes to public hospitals in Siddipet. A need to transport Covid-19 patients from private hospitals to Government Hospitals was identified and quickly adopted. Due to complete lockdown in Siddipet, a number of daily wage workers needed food which was also added to the list. There was a request to add medical kits to home quarantined COVID-19 patients this involved support from the city administration which promptly helped in getting access to

the medical kits. Although the project lasted for a short duration of 31 days it was considered a tremendous success by everyone as it was done during the peak days of the Covid-19 second wave in India and the entire infrastructure was under distress. The services offered to transport patients were all free of charge as well as food and medical kits. Social Media platforms like Facebook, Twitter, WhatsApp were extensively used to propagate the service availability with individual cell number for the patients to contact for transportation request.

4.5.1 Siddipet Urban Census Data Analysis

Siddipet census data revealed an interesting set of data points. Total population of Siddipet was 114,091 with following breakdown. 50% of the populations is male and 50% of the populations is female as shown in Figure XVI represented by the first column in the stacked column chart.

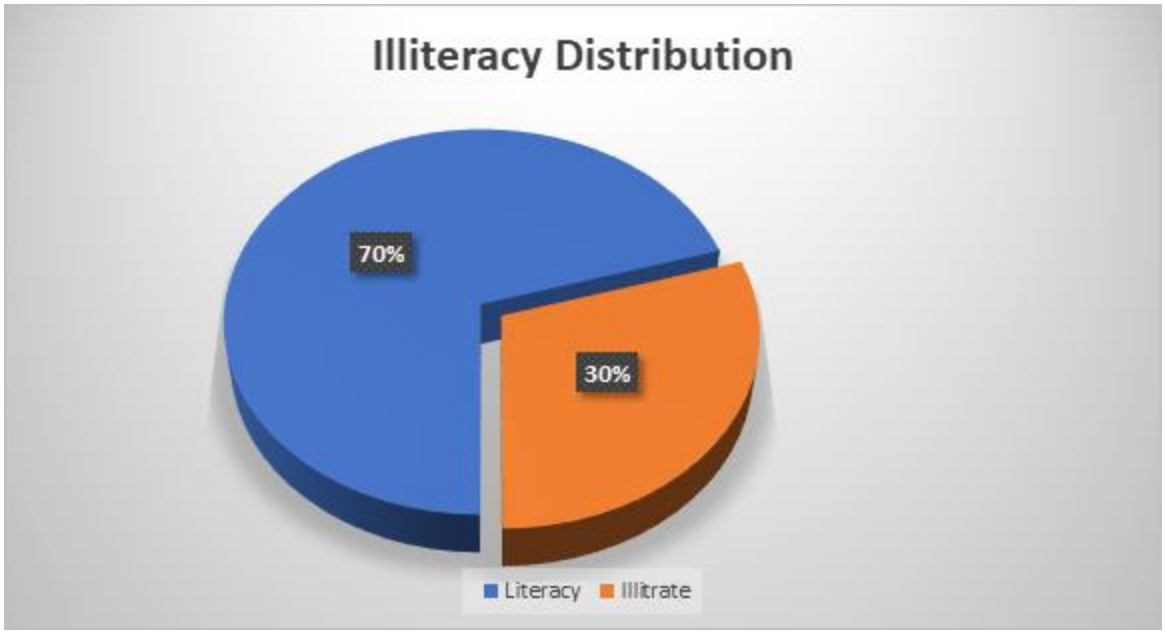


Figure XXXVIII –Siddipet Use Case Illiteracy Distribution

Census data revealed that 70% of the population was literate while illiteracy was at 30% of the population as shown in the pie chart in Figure XV. Literacy rate in men was at 55% and for women it was at 45%.

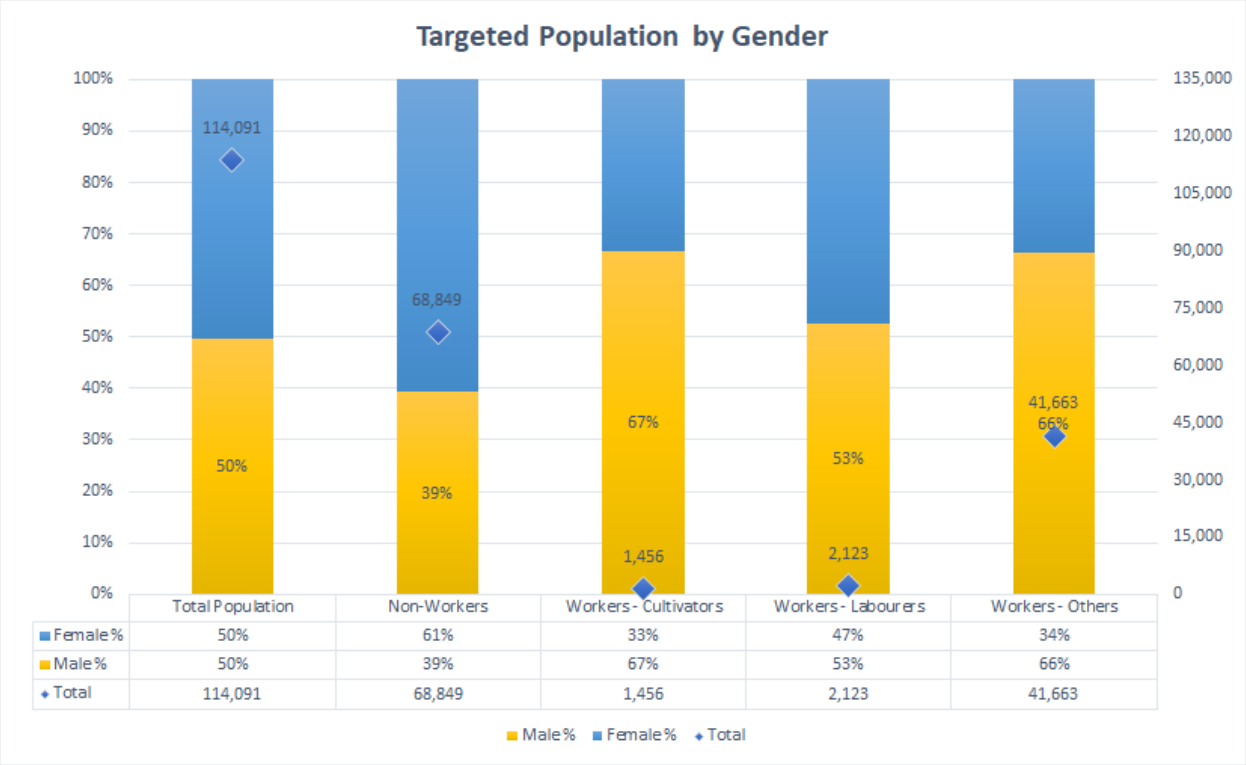


Figure XXXIX – Siddipet Use Case Population Distribution by Gender

Local economy for Siddipet Urban Use Case is pre-dominantly non-Agriculture based. As seen in Figure XVII, 60% of the population were non-workers/dependents. Figure XVI shows 39% of them being male and 61% of them being female.

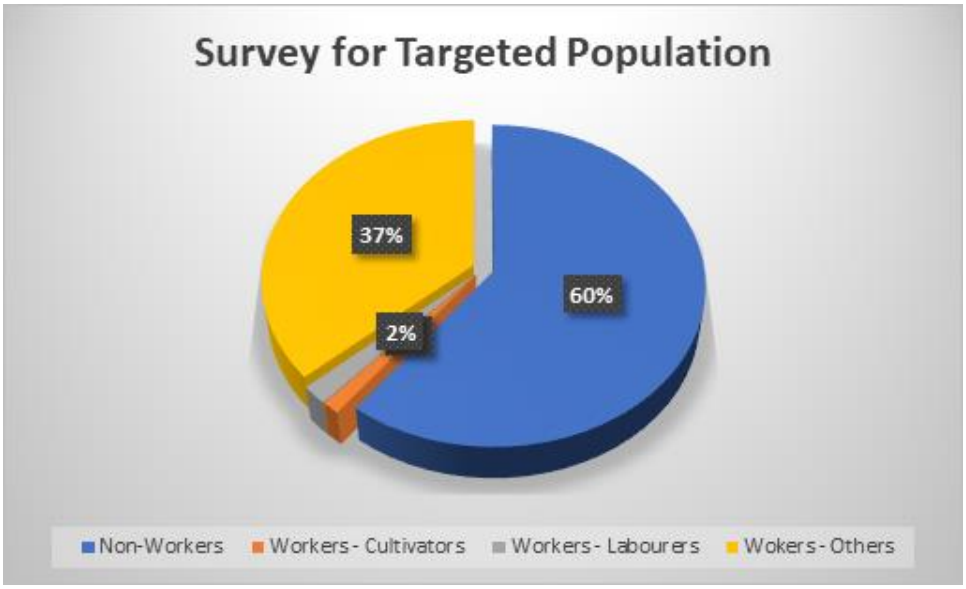


Figure XL – Siddipet Data Population Distribution by Workforce

1% of the population were Cultivators, 2% Labourers and 37% in non-agricultural work force as seen in Table VII below.

Target Population for Service	Total	Male %	Female %
Non-Workers	60%	39%	61%
Workers - Cultivators	1%	67%	33%
Workers - Labourers	2%	53%	47%
Workers - Others	37%	66%	34%

Table VII - Siddipet Data Population Distribution by Workforce

30% of the population is illiterate of which 37% are men and 63% of them are women. As seen in Table VIII, 40% of the population are workers of which 66% were male and 28% female. Of the workers, 35% are main workers and 4.98% are seasonal workers. Main workers have 1% Cultivators, 2% labourers and 32% Others. Seasonal workers have .05% Cultivators, 0.33% Labourers and 4.6% Others.

Category	Total	Male	Female
Population		50%	50%
Literacy	70%	55%	45%
Illiterate	30%	37%	63%
Non-Workers	60%	39%	61%
Workers	40%	66%	28%

Main Workers	35%	68%	32%
Cultivators	1%	66%	34%
Labourers	2%	54%	46%
Others	32%	69%	31%
Seasonal Workers	4.98%	48%	52%
Cultivators	0.05%	72%	28%
Labourers	0.33%	46%	54%
Others	4.60%	48%	52%

Table VIII - Siddipet Use Case Overall Population Distribution

4.5.2Siddipet Use Case Data Analysis

The Service operated for 31 days and the vehicle travelled 1471 kilometers which was within the Siddipet city limits during COVID-19 Second Wave in India.

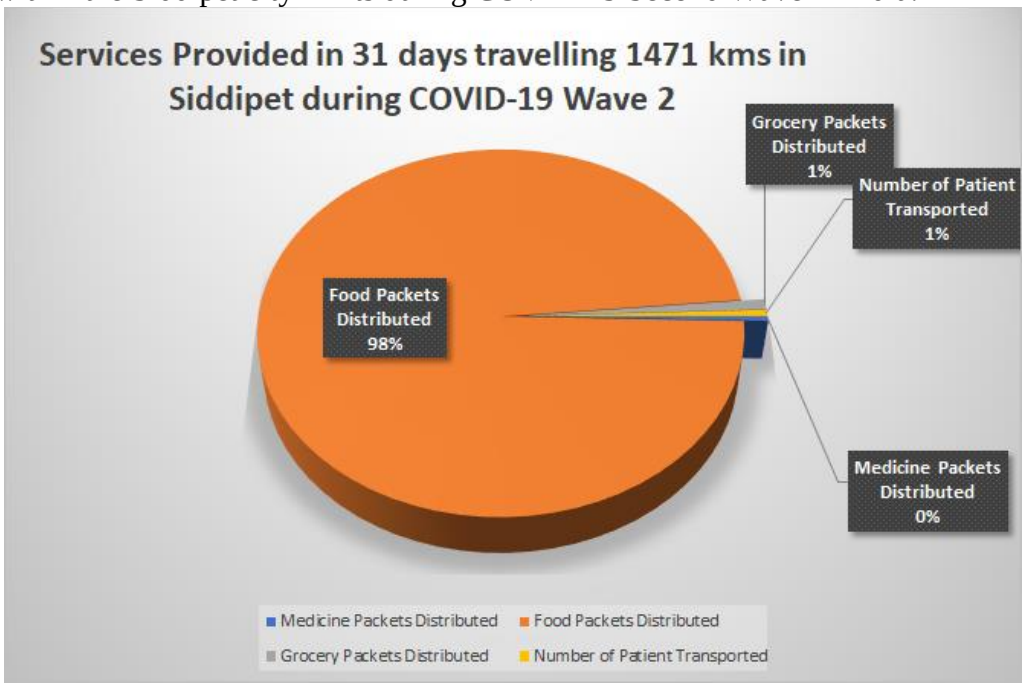


Figure XLI – Siddipet Use Case Distribution of Services Provided

As seen in Figure XVIII and Table IX, 22 COVID-19 Medical kits were distributed to self-quarantined COVID-19 patients. 5,370 food packets were distributed. 50 Grocery packets were distributed. A total of 30 COVID-19 patients were transported from homes or private hospitals to Government hospital for treatment.

No of days in service	31

Total distance travelled	1471
Medicine Packets Distributed	22
Food Packets Distributed	5370
Grocery Packets Distributed	50
Number of Patient Transported	30

Table IX - Siddipet Use Case Project Summary

Focusing on the Medical Transportation in those weeks, Figure XIX, shows number of COVID patients and number of medical kits transported week over week.

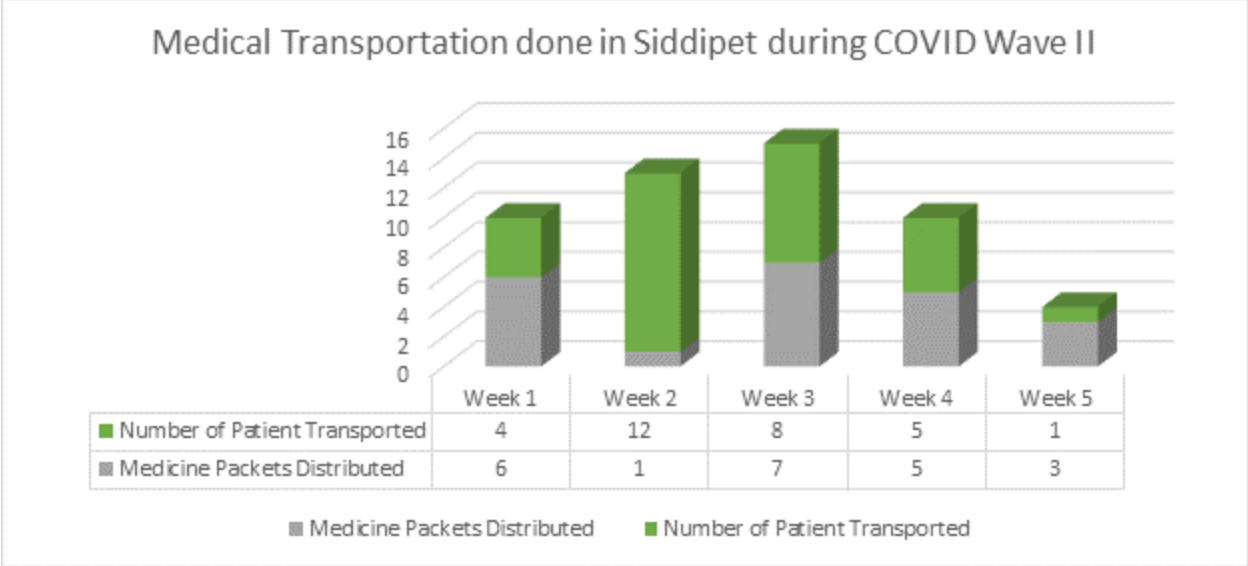


Figure XLII – Siddipet Use Case distribution of medical only transportation services

Table X shows, the distribution of service operated for a 5-weeks. Week1 resulted in 165km of travel with 6 Medicine Packets Distributed to self-quarantined COVID-19 patients, 740 Food Packets Distributed, 3 Grocery Packets Distributed and 4 COVID-19 Patients transported. Week2 resulted in 240km of travel with 1 Medicine Packets Distributed to self-quarantined COVID-19 patients, 770 Food Packets Distributed, 3 Grocery Packets Distributed and 12 COVID-19 Patients transported. Week3 resulted in 306km of travel with 7 Medicine Packets Distributed to self-quarantined COVID-19 patients, 1160 Food Packets Distributed, 10 Grocery Packets Distributed and 8 COVID-19 Patients transported. Week4 resulted in 480km of travel with 5 Medicine Packets Distributed to self-quarantined COVID-19 patients, 2300 Food Packets Distributed, 21

Grocery Packets Distributed and 5 COVID-19 Patients transported. Week5 resulted in 280km of travel with 3 Medicine Packets Distributed to self-quarantined COVID-19 patients, 400 Food Packets Distributed, 13 Grocery Packets Distributed and 1 COVID-19 Patients transported. The service was discontinued as the second wave was brought under control by the government services and the Grambulance was redeployed in another location.

	Week 1	Week 2	Week 3	Week 4	Week 5
Total distance travelled	165	240	306	480	280
Medicine Packets Distributed	6	1	7	5	3
Food Packets Distributed	740	770	1160	2300	400
Grocery Packets Distributed	3	3	10	21	13
Number of Patient Transported	4	12	8	5	1

Table X- Siddipet Use Case distribution of all services transported

CHAPTER V:

DISCUSSION

5.1 Discussion of Results

Nalgonda Use Case census identified 52% illiterate population and 47% nonworkers who are generally dependants and 44% of the population were small farmers or labourers. Nalgonda Census data also provided a lot of insights into the socioeconomic condition of the population in the pilot project areas. Census clearly identified the areas of pilot projects has a number of issues related to socio-economic conditions of the population, More than 75% of the survey participants conducted in Nalgonda Use Case identified Transportation to Primary health care centers to be the single biggest gap in the rural health care infrastructre. Siddipet Use Case data, with the porfolio of services performed which included patient transportation, medicine, food and grocery distribution suggests that socioeconomic problems need to be addressed in urban areas also.The Use Cases data clearly identified that there is a segment of the population who cannot afford to pay for much needed transportation services to reach the government free healthcare facilities.

5.2 Discussion of Research Question One - Healthcare Delivery Gaps

The Survey for use case generated data provides a positive view on the government provided healthcare. However, it also proves that patient transportation is the single biggest problem for the economically challenged rural population. From the data collected in the Use Cases 100% of the patients could not afford the transportation services. COVID-19's effect on people and associated lockdowns called by the

government could have played a major role in people's ability to pay. But looking at the census data there is a lot of population in low paying agriculture economy who would have the same problem of affordability. This was proved in the Use Case results of Nalgonda as the services started post Wave 1 and continued till the end of COVID-19 Second Wave. It is very clear that there is a patient transportation need in all the pilot projects scope. With Socio Economic conditions of the target populations the services offered have to be either free or negligible for the populations to be able to use the services.

5.3Discussion of Research Question Two - NGO as an Option

As discussed earlier, transportation to PHCs is a valid problem but economic conditions of illeterate and labour workers increases the affordability problem. To service such communities the solutions can either be a government or a NGO based service where profits take back seat. However, the service model needs to be self sustainable to continue its operations. For the purpose of this study, NGO is a valid patient transportation supplementing all the exisiting methods. Since affordability is a problem NGO definetly becomes more appealing to fill the patient transportation gap.

5.4Discussion of Research Question Three - NGO as a Value Proposition

Data from both the use cases suggests that DYS Services fit both the Patients needs and Health Care infrastructure gap. With flexible Services portfolio customized to the local population needs, NGO can be a great value add. In cases where the patient is illerate Grambulace bike techs can be of great help in communicating with the health officlas to take precuations as suggested and ensure timely transportation of the patients.

5.5Discussion of Research Question Four – Financial Model

Rural population cannot afford to pay hence the pilot program services were free. Since NGO is a viable business model to provide free patient transport services. The currrent objective of provideing free patient transport services will be provided. There will fundraisers conducted to match the operational expenses. The current fee structure will continue as the economy improves and affordability of the patients grow, the transportation charges can be paid by those patients who can afford.

5.6Discussion of Research Question Five – Flexible Services Portfolio

The Use cases clearly identified that having a flexible services model to utilize availble personnel and equipment maximum benefit can be achieved. Since profit is not a motive for an NGO benfits to the patients is the only critieria to measure success. However, Services levels have to be maitained to keep the contributions at there highest levels.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Summary

Overall, the research was structured with well defined questions and multiple scientific methods have been used to generate enough data to validate the hypothesis. Active participation from the local populations and a real need for the scope of the services offered made the research more productive.

6.2 Implications

Active participation of the Rural Administration, healthcare infrastructure and local population made the research, and the delivery of the services enhance the overall healthcare delivery of the targeted population. Although the benefits are clearly visible a lot more participation of the local population is required to make the services offered to positively affect the overall quality of healthcare delivery thorough the existing healthcare infrastructure.

6.3 Recommendations for Future Research

Further research and investigation are appropriate to further define and refine the financial model of the services offered. Alternate technologies like using electric vehicles instead of the petrol-based vehicles could further reduce the overall cost structure of the NGO operations there by reducing the financial burden on the already stressed rural populations.

6.4 Conclusion

Overall the research has verified that gaps in the healthcare delivery in rural areas. Low earning and literacy rates have a profound effect on the rural populations. NGO

solutions with a self sustaining operational model as an extension of the rural infrastructure both public and private is a viable option to provide services as per the needs of the local populations. Since affordability has proven to be a bigobsticle, providing free or near free trasnportation services within the economic conditions of the rural population is a win win proposition. Delivering services which are need of the hour is essential to serve the community to the best extent. An NGO, with decentralized operations, sustainable revenue generation, abundant local population involvement and as a natural extension of the government health care infrastrucutre is best of breed of both public and private solution. Keeping the process simple and benefitial to the local population is essential to stay focussed and continue to provide value to the community being serviced.

APPENDIX A

RURAL HEALTHCARE SURVEY QUESTIONS

1. Name: _____

2. Role / Profession: _____

3. Village: _____

4. How satisfied are you about Government Healthcare?

☐Very Satisfied ☐Satisfied ☐Somewhat Satisfied ☐Dissatisfied ☐Totally Dissatisfied

5. Where do you go for health treatment?

☐Local PHC ☐Rural Medical Practitioner ☐Private Hospital ☐Do not go anywhere

6. How do you reach the hospital if you are sick?

☐ Own Vehicle ☐ Public Transport ☐ Private Transport ☐ Ambulance Service

7. How satisfied are you with the current Patient transportation options?

☐Very Satisfied ☐Satisfied ☐Somewhat Satisfied ☐Dissatisfied ☐Totally Dissatisfied

8. Are there any known problems with healthcare? Yes/No
Details_____

9. What would be your recommendation for improvements.
Details_____

APPENDIX B

RURAL HEALTHCARE SURVEY QUESTIONS IN NATIVE LANGUAGE TELUGU

గ్రామీణఆరోగ్యసర్వేప్రశ్నలు

1. పేరు : _____
2. పాత్ర / వృత్తి : _____
3. గ్రామం:
4. ప్రభుత్వఆరోగ్యసంరక్షణగురించిమీరుఎంతసంతృప్తిగాఉన్నారు?
   □చాలాసంతృప్తి□సంతృప్తిచెందారు□కొంతసంతృప్తి□అసంతృప్తి□పూర్తిగాఅసంతృప్తి
5. మీరుఆరోగ్యచికిత్సకోసంఎక్కడికివెళ్తారు.
   □స్థానికపిహెచ్సి□గ్రామీణవైద్యనిపుణుడు□ప్రైవేట్హాస్పిటల్□ఎక్కడికీవెళ్లవద్దు
6. రోగులప్రస్తుతరవాణాపైమీఅభిప్రాయంఏమిటి?
   వివరించండి_____
7. మీరుఅనారోగ్యంతోఉంటేఆసుపత్రికిఎలాచేరుకుంటారు?
   □సొంతవాహనం□ప్రజారవాణా□
   ప్రైవేట్రవాణా□అంబులెన్స్సర్వీస్□అత్యవసరపరిస్థితివరకువెళ్లడంమానుకోండి.
8. ఆరోగ్యసంరక్షణలోఏదైనాతెలిసినసమస్యలుఉన్నాయా?
   అవును/లేదువివరించండి _____
9. మెరుగుదలలకోసంమీసిఫార్సుఏమిటి?
   వివరించండి_____

APPENDIX C

CENSUS DATA FOR THE FOUR LOCATIONS

Following are the 2011 offical census data collect by the Government of india for Marriguda, Pedda Adiserla Palle, Chintha Palle, Siddipet Town.

Table 1: Marriguda Census Data

State Name	District Name	SubDistrict	Name	Level
Andhra Pradesh (28)	Nalgonda (539)	Marriguda (04649)	Marriguda	SUB-DISTRICT

Total Number of Household: 9031

Population	Persons	Males	Females
Total	36,968	18,784	18,184
In the age group 0-6 years	4,078	2,160	1,918
Scheduled Castes (SC)	6,803	3,430	3,373
Scheduled Tribes (ST)	3,469	1,827	1,642
Literates	18,946	11,603	7,343
Illiterate	18,022	7,181	10,841
Total Worker	19,174	10,200	8,974
Main Worker	14,983	8,597	6,386
Main Worker - Cultivator	3,701	2,570	1,131
Main Worker - Agricultural Labourers	8,126	3,491	4,635
Main Worker - Household Industries	273	210	63
Main Worker - Other	2,883	2,326	557
Marginal Worker	4,191	1,603	2,588
Marginal Worker - Cultivator	109	59	50
Marginal Worker - Agriculture Labourers	3,631	1,268	2,363
Marginal Worker - Household Industries	82	43	39
Marginal Workers - Other	369	233	136
Marginal Worker (3-6 Months)	3,966	1,519	2,447
Marginal Worker - Cultivator (3-6 Months)	104	57	47
Marginal Worker - Agriculture Labourers (3-6 Months)	3,464	1,214	2,250
Marginal Worker - Household Industries (3-6 Months)	76	41	35
Marginal Worker - Other (3-6 Months)	322	207	115
Marginal Worker (0-3 Months)	225	84	141
Marginal Worker - Cultivator (0-3 Months)	5	2	3
Marginal Worker - Agriculture Labourers (0-3 Months)	167	54	113
Marginal Worker - Household Industries (0-3 Months)	6	2	4
Marginal Worker - Other Workers (0-3 Months)	47	26	21
Non Worker	17,794	8,584	9,210

Table 2: Pedda Adiserla Palle Census Data

State Name	District Name	SubDistrict	Name	Level
Andhra Pradesh (28)	Nalgonda (539)	Pedda Adiserla Palle (04658)	Pedda Adiserla Palle	SUB-DISTRICT

Total Number of Household: 11931

Population	Persons	Males	Females
Total	50,338	25,771	24,567
In the age group 0-6 years	6,586	3,448	3,138
Scheduled Castes (SC)	7,798	3,895	3,903
Scheduled Tribes (ST)	15,414	8,283	7,131
Literates	22,690	14,080	8,610
Illiterate	27,648	11,691	15,957
Total Worker	27,622	14,058	13,564
Main Worker	24,639	13,029	11,610
Main Worker - Cultivator	9,557	5,964	3,593
Main Worker - Agricultural Labourers	12,402	5,111	7,291
Main Worker - Household Industries	269	166	103
Main Worker - Other	2,411	1,788	623
Marginal Worker	2,983	1,029	1,954
Marginal Worker - Cultivator	365	216	149
Marginal Worker - Agriculture Labourers	2,204	583	1,621
Marginal Worker - Household Industries	48	14	34
Marginal Workers - Other	366	216	150
Marginal Worker (3-6 Months)	2,843	980	1,863
Marginal Worker - Cultivator (3-6 Months)	356	214	142
Marginal Worker - Agriculture Labourers (3-6 Months)	2,121	562	1,559
Marginal Worker - Household Industries (3-6 Months)	41	10	31
Marginal Worker - Other (3-6 Months)	325	194	131
Marginal Worker (0-3 Months)	140	49	91
Marginal Worker - Cultivator (0-3 Months)	9	2	7
Marginal Worker - Agriculture Labourers (0-3 Months)	83	21	62
Marginal Worker - Household Industries (0-3 Months)	7	4	3
Marginal Worker - Other Workers (0-3 Months)	41	22	19
Non Worker	22,716	11,713	11,003

Table 3: Chintha Palle Census Data

State Name	District Name	SubDistrict	Name	Level
Andhra Pradesh (28)	Nalgonda (539)	Chintha Palle (04650)	Chintha Palle	SUB-DISTRICT

Total Number of Household: 10907

Population	Persons	Males	Females
Total	45,058	22,757	22,301
In the age group 0-6 years	5,610	2,924	2,686
Scheduled Castes (SC)	8,925	4,464	4,461
Scheduled Tribes (ST)	5,615	2,925	2,690
Literates	22,188	13,406	8,782
Illiterate	22,870	9,351	13,519
Total Worker	23,242	12,513	10,729
Main Worker	19,118	10,862	8,256
Main Worker - Cultivator	4,548	3,058	1,490
Main Worker - Agricultural Labourers	10,030	4,158	5,872
Main Worker - Household Industries	319	238	81
Main Worker - Other	4,221	3,408	813
Marginal Worker	4,124	1,651	2,473
Marginal Worker - Cultivator	236	126	110
Marginal Worker - Agriculture Labourers	2,985	993	1,992
Marginal Worker - Household Industries	257	134	123
Marginal Workers - Other	646	398	248
Marginal Worker (3-6 Months)	3,561	1,422	2,139
Marginal Worker - Cultivator (3-6 Months)	215	116	99
Marginal Worker - Agriculture Labourers (3-6 Months)	2,577	851	1,726
Marginal Worker - Household Industries (3-6 Months)	200	101	99
Marginal Worker - Other (3-6 Months)	569	354	215
Marginal Worker (0-3 Months)	563	229	334
Marginal Worker - Cultivator (0-3 Months)	21	10	11
Marginal Worker - Agriculture Labourers (0-3 Months)	408	142	266
Marginal Worker - Household Industries (0-3 Months)	57	33	24
Marginal Worker - Other Workers (0-3 Months)	77	44	33
Non-Worker	21,816	10,244	11,572

Table 4: Siddipet Town Census Data

State Name	District Name	SubDistrict	Name	Level
Andhra Pradesh (28)	Medak (535)	Siddipet (04459)	Siddipet	SUB-DISTRICT

Total Number of Household: 26065

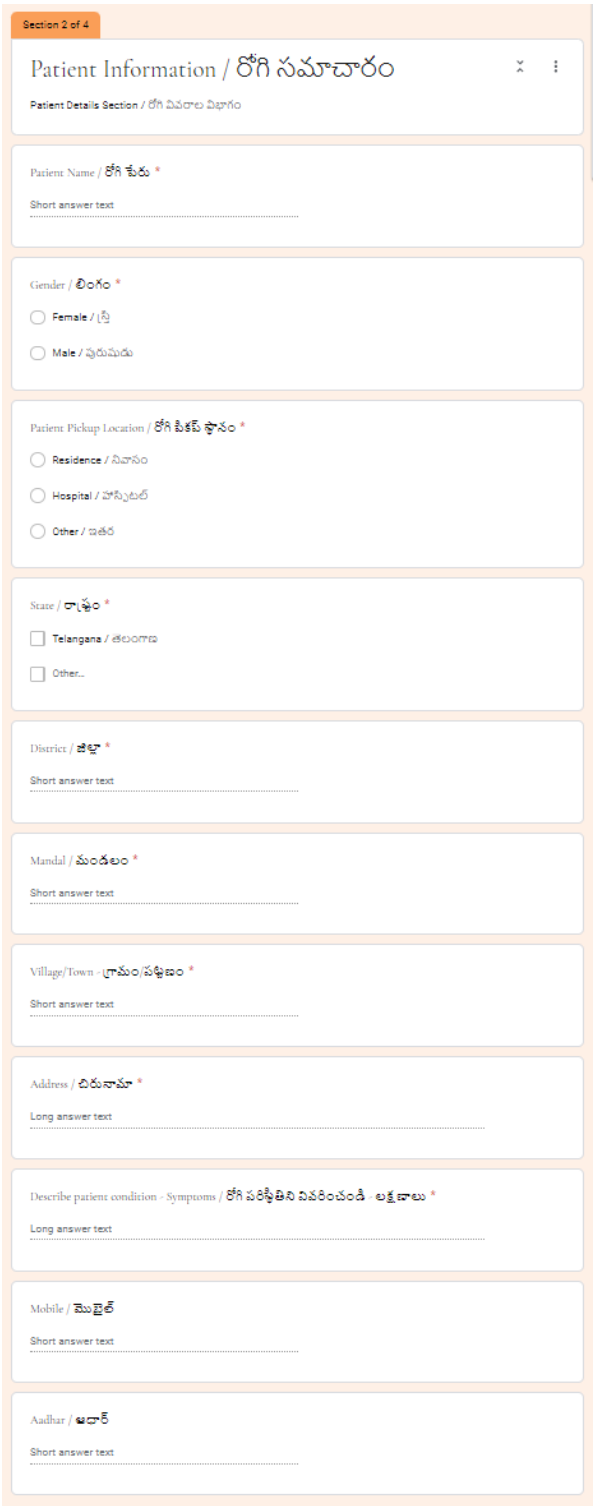
Population	Persons	Males	Females
Total	114,091	56,769	57,322
In the age group 0-6 years	11,816	6,051	5,765
Scheduled Castes (SC)	9,587	4,660	4,927
Scheduled Tribes (ST)	1,088	576	512
Literates	80,266	44,258	36,008
Illiterate	33,825	12,511	21,314
Total Worker	45,242	29,742	15,500
Main Worker	39,560	26,987	12,573
Main Worker - Cultivator	1,399	930	469
Main Worker - Agricultural Labourers	1,744	942	802
Main Worker - Household Industries	5,804	1,372	4,432
Main Worker - Other	30,613	23,743	6,870
Marginal Worker	5,682	2,755	2,927
Marginal Worker - Cultivator	57	41	16
Marginal Worker - Agriculture Labourers	379	176	203
Marginal Worker - Household Industries	1,232	272	960
Marginal Workers - Other	4,014	2,266	1,748
Marginal Worker (3-6 Months)	4,465	2,030	2,435
Marginal Worker - Cultivator (3-6 Months)	43	29	14
Marginal Worker - Agriculture Labourers (3-6 Months)	287	132	155
Marginal Worker - Household Industries (3-6 Months)	893	113	780
Marginal Worker - Other (3-6 Months)	3,242	1,756	1,486
Marginal Worker (0-3 Months)	1,217	725	492
Marginal Worker - Cultivator (0-3 Months)	14	12	2
Marginal Worker - Agriculture Labourers (0-3 Months)	92	44	48
Marginal Worker - Household Industries (0-3 Months)	339	159	180
Marginal Worker - Other Workers (0-3 Months)	772	510	262
Non-Worker	68,849	27,027	41,822

APPENDIX D

THE SERVICE REQUEST FORM IS IN FOUR SECTIONS

Section 1 -Request Details

Section 2- Patient Information


Section 2 of 4

Patient Information / రోగి సమాచారం

Patient Details Section / రోగి వివరాల విభాగం

Patient Name / రోగి పేరు *

Short answer text

Gender / లింగం *

Female / స్త్రీ

Male / పురుషుడు

Patient Pickup Location / రోగి పికప్ స్థానం *

Residence / నివాసం

Hospital / హాస్పిటల్

Other / ఇతర

State / రాష్ట్రం *

Telangana / తెలంగాణ

Other..

District / జిల్లా *

Short answer text

Mandal / మండలం *

Short answer text

Village/Town - గ్రామం/పట్టణం *

Short answer text

Address / చిరునామా *

Long answer text

Describe patient condition - Symptoms / రోగి పరిస్థితిని వివరించండి - లక్షణాలు *

Long answer text

Mobile / మొబైల్

Short answer text

Aadhar / ఆధార్

Short answer text

Section 3- Caller Information

Section 3 of 4

Caller Information / కాలర్ సమాచారం

Description (optional)

Caller Name / కాలర్ పేరు *

Short answer text

Gender / లింగం *

- Female / స్త్రీ
- Male / పురుషుడు

Relationship to Patient / రోగికి సంబంధం *

- Self / నేనే
- Spouse / జీవిత భాగస్వామి
- Children / పిల్లలు
- Sibling / తోబుట్టువు
- Other...

State / రాష్ట్రం *

- Telangana / తెలంగాణ
- Other...

District / జిల్లా *

Short answer text

Mandal / మండలం *

Short answer text

Village/Town / గ్రామం/పట్టణం *

Short answer text

Address / చిరునామా *

Long answer text

Mobile / మొబైల్ *

Short answer text

Section 4- Transportation Service Details

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