A Study on Distribution Challenges and Innovative Models for Improving Access to Essential Medicine in Rural Gujarat

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***Abstract*—Medical supply is significant to the well-being of humans particularly in the rural regions where hospitals and physicians are difficult to locate. India produces large quantities of medicines yet people in the rural areas still find it difficult to access desired medicines. This paper examines the issues of supply of medicines to regions in Gujarat. We interviewed a total of 101 individuals among whom pharmacists and medicine distributors to find out more about the issues. We also discovered that there is a shortage of drugs and distributors fail to deliver on time. It is very expensive and it takes time to transport medicines to the rural areas. We also learned that the methods of storing and handling medicines are not good and this leads to problems. Individuals in the localities find it difficult to access chronicle illness drugs such as high blood pressure and diabetes. Most individuals in regions cannot afford medicines hence preferring cheap alternatives. In our opinion, these issues can be resolved with the help of such technology as systems and a regular routine of delivering medicines. When we collaborate and do a better planning, we will be able to ensure that people, in areas receive the medicines they need.**

***Index Terms*—Essential medicines; Rural healthcare; Pharmaceutical distribution; Stock-outs; Supply chain management; Gujarat.**

I. INTRODUCTION

A healthcare system is dependent on the essential medicines. The World Health Organization indicates that the essential medicines are those that people need most and must always be in the quantity and form that is easy to share and at a price that people can afford. Simmons (2021) is of this view. Although much has been done in producing medicines and reforming policies, it is still the case that two billion people in the world continue to lack access to essential medicines on a regular basis particularly in those countries that are not very rich. That is what Bigdeli and others learned in 2013.

India is a case. It is referred to as the Pharmacy of the World since it manufactures a lot of medicines and provides a lot of the pharmaceutical demands of the world. According to Leisinger and others this is what was said in 2012. Maiti and others said in 2015. Nevertheless, obtaining the required medicines is not simple among people in India. The government does not incur huge expenditure on health and people have to make huge out of their own pocket expenditure on health care. It was an issue among rural dwellers as discovered by Bansal and Purohit in 2013 and Raza in 2023. In places people frequently lack the required medicines and it takes much time to replenish them. Its storage facilities are poor. Medications are difficult to maintain at low temperatures and this implies that the treatment needed by individuals is not guaranteed. That was the statement of Selvaraj and Karan in 2014. Wales and others said in 2014.

Gujarat is a state in India which produces a large amount of medicines. It is difficult to access medicines that their people in rural areas require. This is what was said by Maiti and others in 2015. Roy said in 2025. The issue is that the mode of delivering medicines to the locations is not the best. There is no effective cooperation between the people supplying the medicines. They lack an effective system on how they follow up on the medicines they possess. This

implies that individuals in regions are not always in a position to have medicines they require. And this is what was discovered by Bigdeli and others in 2013. Kaplan and others said in 2023.

Over the past few years, some new concepts have emerged on how to deliver medicines to the rural locations. These are monitoring medicines with the use of computers by storing medicines in various locations using mobile medical units and monitoring medicines using information technology. This is what Yadav said in 2025. Adefolaju and others said in 2024. But there is little known of the practical effectiveness of these ideas, particularly in the country. This is what Onyango said in 2024.

This paper is attempting to work out what is wrong with the current system of delivering medicines to the rural Gujarat population and whether there are any innovative concepts that can be applied. The research is communicating with pharmacists and distributors to seek their opinions. It is even considering what other individuals have written about this subject matter. The idea is to brainstorm on how to ensure that the rural people are able to access the medicines they require and to ensure everyone has equal rights as far as healthcare is concerned. Necessary drugs are truly significant. This research is attempting to assist in ensuring that they are accessible to every person.

II. LITERATURE REVIEW

The availability of medicines is not only about getting the necessary quantity of them. It indicates the performance of a health system. Others such as Bigdeli conducted a study in 2013 and they established that the availability of medicines is based on a lot of factors. These are the nature of how the system is operated, how they are financed, the way medicines are purchased and whether the individuals are responsible towards their deeds as well. When any of them fail to work well then this impacts the people in the community. They may be without the medicines they require. They are forced to pay higher to them or they have to wait to be treated long before they get treated. Things are more complex in India. India produces numerous medicines yet individuals in the rural areas continue to struggle with access to the required medicines. Certain researches conducted by Bansal and Purohit (2013) and Selvaraj and Karan (2014) determined that individuals in regions are forced to pay high prices on medicines and that the community-related system does not operate effectively. India has a list of medicines but even at times when people need them, they are not available. The reason is that there are issues in the functionality of the system. Not all individuals know the definition of generic medicines and the regulations concerning prices are not properly implemented.

The other issue of great concern is that the pharmaceutical distribution mechanism is not performing well. Certain scholars such as Wales discovered in 2014 that the lack of accountability of the system and the presence of issues with its functioning may lead to unavailability of medicines. There are other researchers such as Maiti who discovered in 2015 that India excels in the production of medicines. They are difficult to reach in the rural areas. Such issues include lack of knowledge on how many medicines to order, inability to deliver the medicines to the destinations on time, and lack of the appropriate equipment to cool the medicines. These issues complicate the delivery of medicines to individuals of medicines that require refrigeration.

Some researchers have attempted ideas in order to rectify these problems. They have attempted to collaborate with companies that produce new methods of purchasing medicines and discover other means of pricing medicines. They have also attempted to use systems to track medicines and real time tracking of medicines. These have helped to some extent. Other individuals have gone to the extent of using drones to deliver medicines and telemedicine in locations. The questions concerning the extent of their cost and whether they can be used over a long period are still open.

Majority of the research undertaken has been concerning what governments can do or what other nations are doing. Information is not much on what is going on on the ground, especially the rural areas. Not much is known regarding the experiences of pharmacists and distributors in such locations as Gujarat. This complicates the process of knowing what is actually happening and what to do to remedy the situation.

All in all, the supply of medicines to people does not have to do with producing more of them. It is concerning the better use of technology in planning and seeking solutions that can fit the rural areas. This paper is attempting to know more, concerning these

matters by examining what is occurring in rural Gujarat. Necessary drugs are significant. We must learn how to get them to people that need them. It is important to ensure that people have essential medicines and that they are accessible to the people in case of their need.

III. PROBLEM STATEMENT

India is a country that is reputed to produce large quantities of medicines. The rural people continue to find it difficult to access the medicines they require. Government plans, lists of essential drugs and schemes to assist the rural populations are frequently unable to bring the medicines they need in time. They are challenged by issues such as unavailability of medicines taking long becoming too costly and failure to reach the last mile. A study by Maiti et al. These issues were depicted in 2015 and another one by Roy in 2025. This indicates that there is an issue and the distribution of medicines in the rural regions despite India being a major producer of medicines.

In Gujarat the issue never lies in the non-production of medicines but the non-delivery of the medicines to those in need. The reason behind this is due to difficulties in the delivery of the medicines to the locations that keep the records of the medicines stores the medicines in the right places and made sure that all the parties involved work in unison. There is occasionally a problem with timely delivery of medicines. How many are required it is difficult to know. Individuals are also required to place an order on medicines manually and find it difficult to keep the medicines cool on the transit. This is expensive. Ways through which citizens in the countryside could fail to receive the required medicines. This is particularly unhealthy to individuals with illness, such as hypertension and diabetes since they have to take their medication at all times as opined by Selvaraj and Karan in 2014.

The time that rural patients need to spend on paying things is very often due to lack of sufficient money and coverage of their insurance. This implies that they desire to seek alternatives or they may simply cease to receive care as Bansal and Purohit mentioned in 2013. Others have arrived with some concepts such as the use of computers to trace the supplies that store things at numerous locations and the tracing of things by use of technology. It is not actually known whether these concepts are effective in the rural settings in 2025 as Yadav stated. There is still the problem of rural distribution settings. We should see how suitable these new ideas are in practice to rural patients, rural distribution settings.

The central problem of the areas of Gujarat that this study is investigating is that the population is not obtaining the required medicine when they require it. It is an issue as Gujarat produces a lot of medicine and there are rules conceived by the government that can assist people to get the required medicine. Despite all this people in rural areas are still struggling to be able to get the medicine they require at a price they can afford and on a regular basis. The rural medicine delivery systems, in Gujarat are simply not functioning.

IV. OBJECTIVE

To determine the primary obstacles to the distribution of necessary medications in rural areas (Roy, 2025).

To examine the supply chain models currently in use in rural healthcare (Bigdeli et al., 2013).

To assess the accessibility, availability, and cost of m edications in underprivileged areas (Bansal & Purohit, 2013; Selvaraj & Karan, 2014).

To investigate novel approaches and technological sol utions to enhance the availability of necessary medica tions (Yadav, 2025; Adefolaju et al., 2024).

V. HYPOTHESIS

Null Hypothesis (H_0): The regular supply of necessary medications in rural locations is not significantly impacted by the effectiveness of wholesalers, distributors, and inventory management procedures. (Bigdeli et al., 2013).

Alternative Hypothesis (H_1): The regular supply of necessary medications in rural locations is significantly improved by effective wholesalers, distributors, and inventory management procedures. (Bigdeli et al., 2013).

VI. RESEARCH METHODOLOGY

Research Design: The research examines the distribution of medicines in Gujarat rural. It attempts to understand what issues occur when delivering medicines to individuals in these regions and how

medicines are delivered to them. The research also examines the level at which the distributors are performing their duties well and how they are handling their stocks and whether individuals are able to achieve their medication requirements when they are required. The research is interested in the relationship between these things and their influence on the supply of medicines, in rural Gujarat. (Bigdeli et al., 2013; Simmons, 2021; Yadav, 2025).

Sources of Data: We obtained our data through the people owning medical stores in the rural communities and, through people who deliver medicines to the stores. They completed forms which contained a list of questions to assist us to get the information we needed on the rural pharmacists and the people who distribute medicines to the rural pharmacists the pharmaceutical distributors. It is expected to be served by streams and surface runoffs. <|human|>Streams and surface runoffs are supposed to serve it.

I acquired the information through articles by the World Health Organization, the supply chain research of the World Bank, the Government of India policy reports and documents by the PMBJP scheme, and the reports by the companies such as KPMG and IQVIA well, as what the academic literature states about the World Health Organization and the PMBJP scheme as well as the Government of India and the Gujarat Medical Services Corporation Ltd. (Simmons, 2021; Gupta et al., 2025; Roy, 2025; Angeli and Jaiswal,

Data Collection Method: We gathered the information through question asking to people. We administered two sets of questions to pharmacists and distributors. We did so via Google Forms and by going out there in person. By posing these questions this way, we can arrive at numbers that indicate the effectiveness of the supply chain and whether people are able to obtain the medicine they require. The survey is good, the reason why is because it enables us to know the efficiency of supply chain and the supply of medicine. (Bigdeli et al., 2013; Kaplan et al., 2023).

Study Population: The population under study is that of pharmacists who own their stores in the rural regions of Gujarat and the people who supply them with medicines. The significance of these pharmacists and suppliers is that it is them who sell and distribute medicines to the people in these regions and a large proportion on how medicines reach the people who need them. The pharmacists are, just like the stores where people purchase the medicines and the suppliers are the ones who ensure that the stores get the medicines that they require. (Bigdeli et al., 2013; Roy, 2025).

Sampling Method: We employed a means of selecting individuals we interviewed. We selected individuals that are directly engaged in delivering medicine to locations. In this fashion we could obtain intelligence respecting the actual state of affairs as far as medicine distribution goes, in country districts. We wanted to speak with people who are doing rural medicine distribution work. (Bigdeli et al., 2013; Kaplan et al., 2023).

Sampling Frame: The individuals in charge created a list of pharmacies and distributors on registered areas. These pharmacies and distributors they identified by groups which pharmacies are members of and by networks of distributors list of businesses and individuals that they know who are in the field. The list consists of registered pharmacies and distributors. (Selvaraj & Karan, 2014; Roy, 2025).

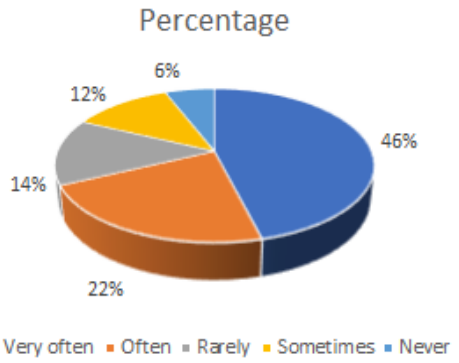
Sample Size: We have 100 people in our sample, and our sample is comprised of 50 pharmacists and 50 distributors or stockists. We can afford a sample size of 100 people on the supply chain to carry out research and extract some information. This sample can be used to learn about the supply chain. (Bansal & Purohit, 2013; Bigdeli et al., 2013).

Data Collection Instrument: It was a questionnaire containing choice and short answer questions.The questionnaire was prepared by using WHO access frameworks, World Bank supply chain models were also used. Consideration was also given to government public health systems and best practices, to be distributed. The following frameworks formed the basis of the questionnaire. (Simmons, 2021; Yadav, 2025; Gupta et al., 2025; Kaplan et al., 2023).

VII. DATA ANALYSIS

A. What is the frequency of stock-outs of essential medicines in rural pharmacies?

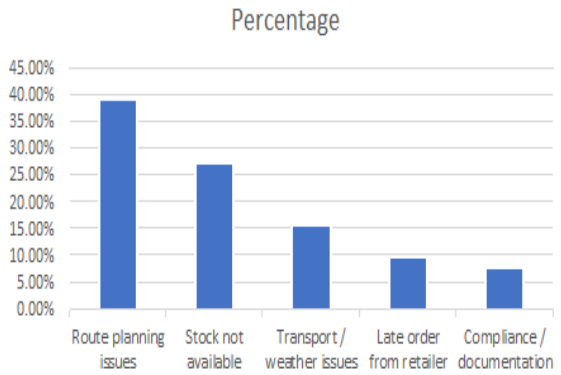
Frequency	Percentage	Frequency (n=50)
Very often	46%	23
Often	22%	11
Rarely	14%	7
Sometimes	12%	6
Never	6%	3
Total	100%	50



Most respondents (68%) stated that stock-outs happen frequently, suggesting that rural pharmacies frequently run out of medications. Just 6% never experience stock-outs, indicating that availability is still a major issue.

B. What is the most common cause of delayed supply to rural retailers?

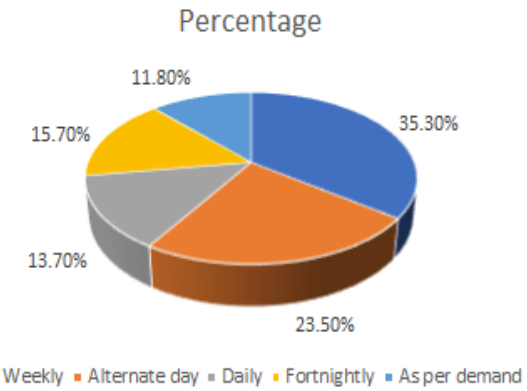
Cause	Percentage	Frequency (n=51)
Route planning issues	39.2%	20
Stock not available	27.5%	14
Transport / weather issues	15.7%	8
Late order from retailer	9.8%	5
Compliance / documentation	7.8%	4
Total	100%	51



Delays in delivery are mostly caused by problems with route planning (39.2%), followed by stock shortages (27.5%). This demonstrates that the main causes of delays in rural locations are supply-side and logistical inefficiencies.

C. What is the typical rural delivery cycle followed by distributors?

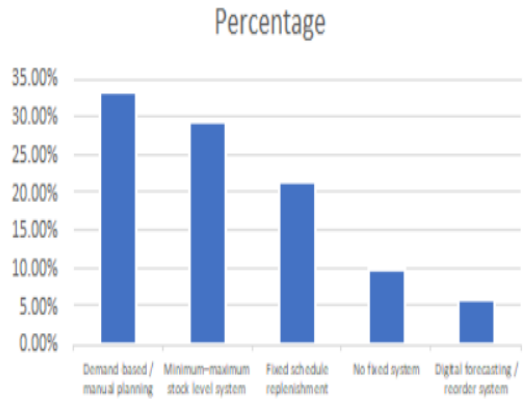
Delivery Cycle	Percentage	Frequency (n=51)
Weekly	35.3%	18
Alternate day	23.5%	12
Daily	13.7%	7
Fortnightly	15.7%	8
As per demand	11.8%	6
Total	100%	51



Weekly delivery is the most popular delivery cycle in rural areas (35.3%), followed by alternate-day delivery (23.5%). Of them, only 13.7% offer daily deliveries; the rest operate on demand or every two weeks. This suggests that remote areas have fewer deliveries, which could raise the possibility of stock-outs.

D. What inventory replenishment system is mainly followed for rural retailers?

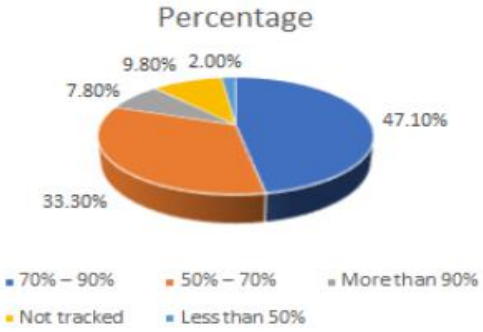
Replenishment System	Percentage	Frequency (n=51)
Demand-based / manual planning	33.3%	17
Minimum–maximum stock level system	29.4%	15
Fixed schedule replenishment	21.6%	11
No fixed system	9.8%	5
Digital forecasting / reorder system	5.9%	3
Total	100%	51



The minimum–maximum stock level technique is used by 29.4% of rural shops, while demand-based/manual planning is used by 33.3% of them. Digital forecasting systems are used by just 5.9% of people. This demonstrates that most inventory management in rural areas is still done by hand, raising the possibility of stock imbalances and stock-outs.

E. What is the average order fill rate for rural retailers?

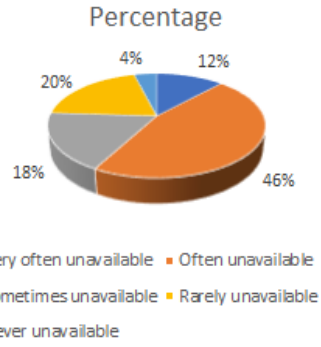
Order Fill Rate	Percentage	Frequency (n=51)
70% – 90%	47.1%	24
50% – 70%	33.3%	17
More than 90%	7.8%	4
Not tracked	9.8%	5
Less than 50%	2.0%	1
Total	100%	51



While 33.3% of rural stores only obtain 50%–70% of their ordered quantities, the majority (47.1%) receive 70%–90%. Only 7.8% of them obtain more than 90% of their orders. This suggests that incomplete order completion is frequent, which exacerbates the scarcity of medications in rural areas.

F. How often are essential medicines from the Essential Drug List (EDL) unavailable when needed?

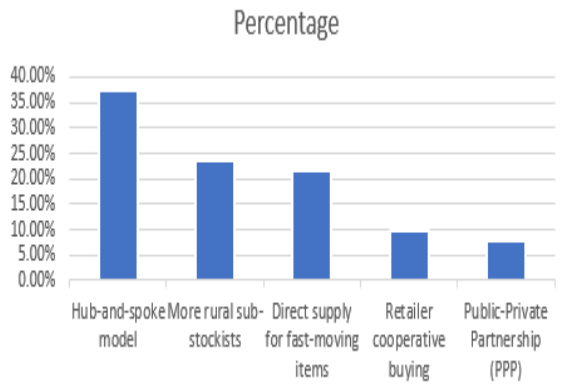
Availability Frequency	Percentage	Frequency (n=50)
Very often unavailable	12%	6
Often unavailable	46%	23
Sometimes unavailable	18%	9
Rarely unavailable	20%	10
Never unavailable	4%	2
Total	100%	50



46% of respondents say essential medications from the EDL are frequently unavailable, and 12% say they are frequently unavailable. Just 4% claim to never be unavailable. This demonstrates how regular patient access is impacted by EDL medication shortages in rural pharmacies.

G. Which distribution model is considered most effective to improve rural medicine availability?

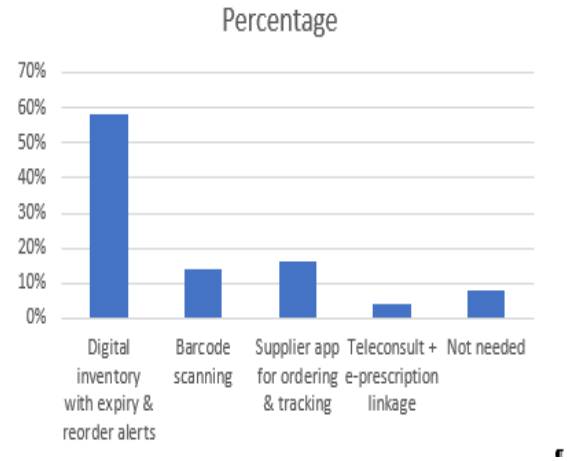
Model Option	Percentage	Frequency (n=51)
Hub-and-spoke model	37.3%	19
More rural sub-stockists	23.5%	12
Direct supply for fast-moving items	21.6%	11
Retailer cooperative buying	9.8%	5
Public-Private Partnership (PPP)	7.8%	4
Total	100%	51



The hub-and-spoke model (37.3%) is thought to be the best distribution strategy for increasing the accessibility of medications in rural areas. Direct supply for fast-moving goods (21.6%) and growing rural sub-stockists (23.5%) come next. The results indicate that to improve rural access, decentralized and organized distribution systems are recommended.

H. Which technology is most useful at the pharmacy level to reduce medicine shortages?

Technology Option	Percentage	Frequency (n=50)
Digital inventory with expiry & reorder alerts	58%	29
Barcode scanning	14%	7
Supplier app for ordering & tracking	16%	8
Teleconsult + e-prescription linkage	4%	2
Not needed	8%	4
Total	100%	50



The most effective technology to lessen drug shortages is thought to be digital inventory systems with expiration and reorder warnings (58%). Barcode scanning (14%) and supplier apps (16%) come next. This suggests that prompt restocking and improved stock monitoring are viewed as critical solutions at the pharmacy level.

VIII. FINDINGS

As clearly indicated in the study, the problem of medicine in Gujarat is not only a policy problem but also a daily challenge that the people living in the state have to deal with. Gujarat rural drug stores often run out of stock. It is said by many of them that the necessary medicines are not available, or at any rate not often available. That implies that the supply chain is not consistent particularly in terms of delivering medicines to those in need.

Among the significant issues the research identified is that difficulty with planning delivery paths and the absence of a consistent schedule to deliver medicines are significant causes of delays in supplies. In most cases, medicines are given on a basis and not daily. This leads to a disproportion between medicine needs. The frequency of their delivery, which poses a greater risk of shortage during peak seasons when more people are ill.

In Gujarat, most of the rural pharmacies keep their stock manually. With very little prior experience of using digital tools to predict what they will need. Consequently, instead of planning, they reorder stock when it is already on its knees. When it fills orders only half, about 70 to 90 percent of the time it is a source of medicines that are not always available.

Keeping temperature- medicines cool also causes problems during power cuts and insufficient storage space. The most commonly unavailable medicines are the ones used to treat diseases such as hypertension and diabetes, and this is a big concern since patients with such diseases have to take their medicine at any given time.

There is also the issue of the medicines cost. Most patients in Gujarat demand cheap options since they lack the sufficient money to do so which indicates how vulnerable, they are financially.

It is positive that those surveyed are solidly in favor of inventory setting up distribution centers using systems and establishing a more decentralized supply system.

This demonstrates that the inhabitants of the regions are receptive to the use of technology to enhance the way medicines are shipped.

In general, the research indicates that the availability of medicine in Gujarat can be tackled by organizing the deliveries more effectively enhancing the way the inventory is managed with more frequent deliveries and by employing electronic tools. This has the potential to change the access that people have to the medicine that they require.

IX. SUGGESTIONS

The point is that to deliver medicine to rural population we have to make some real changes. We are not able to announce it.

First, we need to ensure that those who administer the medicine do a job. They must be on a schedule and plan their routes in such a way that they do not miss out on any places. When they bring the medicine frequently and the type that people use regularly then we will not spend as much time short of it.

Second, we should assist the pharmacies in regions to use some simple computer programs to trace their medicine. Even a basic setup which informs them when something is about to expire or when they have to get more can be helpful. We can educate pharmacists on how to use these systems to avoid guessing which medicine to order.

And third we may have storage spaces at each taluka so we can deliver the medicine to people quicker. This is similar to a hub and spokes on a wheel it assists us in delivering the medicine to the people who need it in the tribal areas.

Fourth we want to maintain the medicine at neither too hot nor too cold. To prevent spoilage of medicine, we can use frigates that are powered by solar energy or batteries.

Fifth the medicine-makers and the medicine-givers and the medicine-sellers must all discuss with one another. By letting us know how much they have of the medicine and how much they believe they will require we can prevent the scarcity of medicine.

Lastly, we should inform the people in areas about the programs which could assist them to access medicine which they can afford such as Jan Aushadhi. When individuals can obtain the medicine, they require without paying a lot of money, they will be in better shape.

Therefore, when we can implement such transformations such as getting the medicine to people at the right time using computers to trace the medicine where it is stored and making it affordable, then we are able to make sure that people, in rural areas receive the medicine they need.

X. CONCLUSION

This research demonstrates a fact: India produces a lot of medicines and in rural areas still people cannot easily access medicines due to issues with delivery of medicines to the last mile. In Gujarat the medicines are not always delivered in time, people count inventory by hand and the cold chain is not operating properly.

Such issues render access to medicines required by people difficult. The fact is not that the country lacks medicines but rather that planning, coordination, and implementation are a problem in the countryside. Drugs are not shipped on weekly schedules. In some occasions orders are not met exactly. This leads to shortages, of drugs to treat chronic illnesses such as high blood pressure and diabetes which is quite alarming after all since patients have to continue taking them.

People also find it difficult to access medicines due to the cost of medicines. A lot of country patients request options since they lack sufficient funds. This demonstrates that there is a strong linkage between the amount of money in the hands of people and the ease with which they can access medicines. But the study also offers hope. Rural pharmacists and distributors are willing to improve, including systems to track inventory, new methods of distributing medicines and holding medicines in more locations.

These are feasible solutions. Can do a lot of good in alleviating shortages. To conclude the delivery of medicines in rural areas requires more policy support but also improved planning, coordination, and technology. It should also come with a promise of providing healthcare to the last mile. People, in areas can have the medicines they need in a more reliable, affordable and fair way, with targeted changes.

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