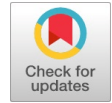# Unmasking Aadhar Authentication Issues: A Case Study of Biometric and PDS Access in Mundoti, Rajasthan

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Abstract: This paper goes into great depth about how hard India's Aadhaar-based identification system is to understand, especially when it comes to how important it is for people to be able to access simple services. Most of the study is about Mundoti, a village in Kishangarh, Rajasthan, where people's farming and hard work-based lives have made it hard to use Aadhaar. The paper looks at how common negative fingerprinting is and how it affects people's ability to use the Public Distribution System (PDS). It does this through a case study and direct and indirect research methods. Through conversations, it looks into the connection between having to wear fingerprints at work, demographics, and any possible effects on PDS. The study says that the people of Mundoti have trouble with Fingerprint authentication because of work in agriculture. This means that they are facing problems in getting important food aid. The study makes it clear that these problems need to be fixed. The people who live in Mundoti have trouble verifying their Aadhaar cards because their fingerprints are worn down from working hard in agriculture. The study also shows that age, gender, and job have a big effect on how likely it is that you will have identification problems. The paper argues that these fingerprint-related problems should be fixed so that important social aid programs can be carried out successfully in rural India. It suggests creating different ways to prove your identities, like eye scans or private biometric-based solutions so that vulnerable people aren't kept from important services like PDS as much as possible. This paper adds to the larger conversation about local ecosystems that includes everyone. It stresses how important it is to change rules and procedures to fit the needs of people living in rural areas.

Keywords - Aadhar Authentication, PDS Access, Rural Exclusion, E-Governance

I. INTRODUCTION

India's Aadhaar-based identification system, the biggest digital ID system in the world, has changed how services are provided and how people can get them [1]. But there are some problems with the method. The problem of Aadhaar authentication in rural places is what this paper is about. As an example, the village of Mundoti in Rajasthan is used. States across the country are taking steps towards providing digital identities to beneficiaries of their Public Distribution System. In doing so, the use of Aadhaar-based biometrics seems to be the preferred choice of method [2][10].

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Aadhaar has become India's most important way to prove who you are. It is an important part of how government social aid programs pay for services. However, the system's reliance on biological data, especially fingerprints, has caused problems that were not expected.

The physical stress on workers in rural places like Mundoti. where most of the people work in hard-to-reach agricultural jobs, causes fingerprints to be Negative. This decline makes it much harder to authenticate Aadhaar.

Previous research has looked into the security issues with the Aadhaar identification process and suggested several ways to fix them. But we need a deeper understanding of the real problems that people in rural areas face. This Research tries to fill this gap by looking at the specific problems that the population of Mundoti is having and suggesting useful, solutions.

This paper talks about inclusive grassroots ecosystems by stressing how important it is to change technical and policy models to fit the needs of rural people like those in Mundoti [3][11]. It shows how important it is to come up with different ways to prove your identity so that no one gets left behind in the goal of social welfare.

However, it is very important for society as a whole, especially in a state like Rajasthan. In this paper, we will look at the issue in the village of Mundoti.

II. BACKGROUND

Under the PDS, food grains are disbursed at subsidized prices in Fair Price Shops (FPSs) to households. A major reform in the PDS was its transition from universal to targeted delivery was implemented in 1997 due to the significant welfare expenditure, which was inconsistent with the economic challenges the state was experiencing at that period. The PDS in India has witnessed several technology-enabled performance improvement initiatives over the last decade [4].

A. Detailed Description of Mundoti

The 2011 Census says that Mundoti is a village in the agricultural area. It is in the Kishangarh Tehsil of the Ajmer district in Rajasthan. There are about 374 households in the village. 1215 hectares of land make up the village. The village's main industry is farming, and many of its people work in jobs that require a lot of physical effort [5].

B. Demographics and Lifestyle

1892 people are living in the village, with 992 men and 900 women.

The village's literacy rate is 51.37%, with 65.02% of men and 36.33% of women having basic education. Most of the people who live there work in farmland or in jobs that require a lot of physical labor, which has a big effect on how they live [5].

C. Impact of Agriculture & Labour-Dominated Lifestyle on Aadhaar Authentication

In farming work, fingerprints get worn down over time because of the hard physical work [6]. This makes Aadhaar authentication very difficult. This problem is especially common in Mundoti, where most people work in jobs that require a lot of physical effort. Fingerprints are getting worse because of this lifestyle, which makes Aadhaar verification harder. As in result, these people aren't able to access PDS Easily [6].

They say that we need more than one way to show who we are, like private biometric solutions or IRIS scans. so that these people can use important services like the Public Distribution System [6].

This study contributes to the broader discourse on inclusive grassroots ecosystems and highlights the significance of developing technical and policy frameworks. That adapts to the requirements of rural populations [6].

III. METHODOLOGY & DATA COLLECTION

Phase 1: Review of the literature and background research, visit to the field to learn about the current technologies; creation of a process timeline for how the PDS and Aadhar authentication work.

Phase 2: Interviews with stakeholders Create a structure and look into how Aadhaar authentication and PDS access work. Then, make suggestions for how to solve the problems you found. The sample size is 40 People from Mundoti Village.

This case study-based study is about the village of Mundoti in Rajasthan, India. Case studies provide helpful insight into the root causes of the particular problems faced by this group regarding Aadhaar identification.

The study uses qualitative and quantitative methods to get clarity on the issue. Part of the qualitative part is talking to people in the area to find out how they used Aadhaar identification.

Personal information and the number of failed attempts at authentication are looked at as part of the numeric part. This information is used to find patterns and trends and figure out how big the problem is. By combining these two approaches, you can get a full picture of the problem, taking into account both the specifics of each case and the overall trends.

"A 68-year-old woman describes her PDS Aadhaar authentication issues. Over time, her fingerprints have deteriorated, causing multiple Aadhaar authentication failures. The story shows how it affected her Public Distribution System food access. She accesses the PDS with a mobile OTP from her son's phone."

There were several steps in the process of gathering the info. First, tax records and the census were used to get information about the village's people. This gave details about the population size, the breakdown of men and women, the learning rate, and the amount of work that was done in agriculture.

Next, some locals were chosen at random and interviewed. The people interviewed were chosen to be a cross-section of the village's people, with a range of ages, genders, and jobs. The talks took place in person, in the local language, and were only somewhat structured so that the conversation could go in any direction.

The interview questions were mostly about the peasants' experiences with Aadhaar authentication, especially problems they had with fingerprint scanning. The people who were interviewed were also asked what happened when their login failed and they couldn't get into the Public Distribution System (PDS).

The interview data and demographic data were then looked at together to find trends and draw conclusions about how bad the Aadhaar authentication problems are in Mundoti and how they affect people.

Participant ID	Age	Gender	Occupation	Education Level	Aadhaar Authentication Experience	PDS Access Experience
1	40	Male	Farmer	Uneducated	Authentication issues	Limited PDS access
2	28	Female	Laborer	Primary School	Successful authentication	Easy access to PDS
3	55	Male	Farmer	Uneducated	Negative fingerprinting issues	Difficulty accessing PDS
4	32	Female	Private Teacher	Graduate	Successful authentication	Smooth PDS access
5	48	Male	Laborer	Middle School	Authentication failures	Limited PDS access
6	35	Female	Farmer	Middle School	Successful authentication	Easy access to PDS
7	42	Male	Farmer	Uneducated	Negative fingerprinting issues	Difficulty accessing PDS
8	30	Female	Laborer	Primary School	Negative fingerprinting issues	Limited PDS access
9	50	Male	Private Teacher	Graduate	Successful authentication	Easy access to PDS
10	36	Female	Farmer	Uneducated	Negative fingerprinting issues	Limited PDS access

IV. FINDING

A. Extent of Negative Fingerprinting in Mundoti

Our research showed that there is a lot of bad fingerprinting in Mundoti. Most of the people in the area work in agriculture, which requires a lot of physical labor and has made their marks less clear. There have been a lot of problems with Aadhaar identification because of this degradation. People over 65 and people who do heavy work lose their fingerprints the fastest, so this problem affects them more than anyone else. Studies have shown that doing hard work with your hands can wear down your fingerprints very quickly. This can make unique identification systems less accurate. This is now proven to be true.

This was the most commonly observed exclusion problem that we encountered in Mundoti. Beneficiaries come to the FPS (Fair Price Shop) only to find that their fingerprints cannot be authenticated. They would be instructed to wash their hands. If that does not work, wait for a few beneficiaries to authenticate, and then attempt again.

B. Impact of PDS Status in Mundoti

It makes a big difference how the Public Distribution System (PDS) works in Mundoti. A lot of efforts to use Aadhaar have failed, so many people and families can't use the PDS's important services. Everyone is having a harder time getting food because of this. It's been harder for the weakest people to get food. People in Mundoti who want to use PDS benefits have a hard time because they can't prove their identity with Aadhaar. It's important to find other ways to make sure of their identity [7].

C. Relationship Between Fingerprint Wear, Demographic Factors, and PDS Benefits

There is a strong link between having to wear fingerprints at work, social factors, and possible PDS benefits that we found in government statistics. It was found that the fingerprints of people who do hard physical work, especially those who work on farms, are the most worn. This, along with things like your age and gender, makes it much more likely that you will have trouble with your Aadhaar identification. It's because of this that these people often can't get PDS benefits, which widens social and economic gaps.

It's clear from these data that we need new ways to quickly check people's identities for important social aid programs in rural India to work. They also show how important it is to change tools and rules so they work better for people who live in rural places like Mundoti.

V. DISCUSSION

A. Interpretation of the Findings

Our research shows that there is a big problem with Aadhaar authentication in Mundoti, Rajasthan. This is mostly because fingerprints get worn down from hard work in agriculture [8]. Many people and families can't get essential services through the Public Distribution System (PDS) because of the high rate of Aadhaar authentication failures. This makes it harder for the most vulnerable people to get food and other necessities [8]. The information shows a strong connection between wearing fingerprints at work, demographic factors, and possible PDS benefits [8]. It was

found that people who did manual labor, especially those who worked in agriculture, had the most worn fingerprints [8]. This, along with demographic factors like age and gender, has a big effect on how likely it is that you will have problems with Aadhaar identification.

B. Challenges in Aadhaar Verification Due to Deterioration of Fingerprints

The main problem with verifying Aadhaar in Mundoti is that fingerprints get worse over time because of hard work in agriculture. Over time, the workers' fingerprints wear off because of the stress these tasks put on their [8]. Because of this, biometric readers have a hard time reading fingerprints correctly, which means that a lot of attempts to log in fail[12][13][14].

C. Analysis of How Age, Gender, and Performance Influence the Likelihood of Facing Integrity Challenges

Our study of government data and public research papers shows that age, gender, and occupation have a big effect on how likely it is that you will have problems with Aadhaar authentication. People who are older or who work with their hands a lot, especially in agriculture, are more likely to have fingerprints that are worn down. This makes Aadhaar authentication harder for them [9]. In addition, gender plays a part. Because men are more likely to do physical work, they face more problems than women. These results make it clear that we need new ways to verify identities right away so that important social aid programmes in rural India can work. They emphasize the significance of adapting technical and policy frameworks to cater to the requirements of individuals residing in rural regions, such as those in Mundoti.

VI. RECOMMENDATIONS

Many people work hard in agriculture, which makes fingerprints worse over time. This is a big problem with the Aadhaar-based tracking system that was studied in Mundoti, Rajasthan. It is now harder to check Aadhaar, which makes it harder to use the Public Distribution System (PDS), a very important scheme that helps people.

A. Suggestions for Addressing Barriers Related to Fingerprinting

States are increasingly using biometrics based on Aadhaar to provide digital identities to PDS beneficiaries [2]. Getting rid of the problems that come with fingerprinting needs more than one method. First, residents should be taught how important it is to keep the integrity of their fingerprints through public awareness programs. Second, service providers should be taught what to do when fingerprint authentication doesn't work. This way, residents won't be turned away from important services.

Also, the government should spend money on research and development to make fingerprint-based recognition systems more accurate and reliable. This could mean looking into new technologies or methods that make it easier to recognize fingerprints, even if the fingerprints are damaged or worn down.

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B. Proposal for Alternative Authentication Mechanisms

Because fingerprint-based security has problems, it is important to look into other ways to prove your identity. One option that could be thought about is iris scans. You can trust iris scans more than fingerprints because they don't change with age or hard work.

They could also use biometric choices that are safe and secure instead. These could include technologies that recognize your words or face, which are always getting smarter and better.

1. Create and carry out campaigns to make people aware of how important it is to keep their fingerprints safe.

2. Give service providers training on how to handle situations where fingerprint recognition doesn't work well.

3. Look into adding other methods of authentication to the Aadhaar system, like iris scans or more advanced biometric-based options.

VII. CONCLUSION AND SUMMARY

Their fingerprints aren't as clear as they used to be because of stress at work, which makes Aadhaar recognition harder. People who live in India's rural areas and work hard probably have this problem all over the country, not just in Mundoti.

Age, gender, and job are some of the demographics that the study shows have a big impact on how likely it is to face integrity issues. People over 65 and those who do a lot of hard work tend to have fingerprints that are worn out or broken more often. This means that people in these groups are more likely to be turned away from basic services because their Aadhar doesn't work.

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