BMC Health Services Research

RESEARCH

Open Access

Walking a tightrope: perspectives of non-degree allopathic providers (NDAPs) on providing diabetes and hypertension care in urban informal settlements of Mumbai Metropolitan Region

Manjula Bahuguna[1], Jennifer Spencer[1], Sudha Ramani[1], Sweety Pathak[1], Sushma Shende[1], Shanti Pantvaidya[1], Vanessa D'Souza[1] and Anuja Jayaraman[1*]

Abstract

Background In India, Non-Degree Allopathic Providers (NDAPs), who do not have formal training in allopathic medicine, play a prominent role in basic healthcare delivery in both rural areas and urban informal settlements. Often recognized as providers of 'first contact' care for minor acute ailments, there is little information regarding the roles they play in providing services for non-communicable diseases (NCDs). In this study, we explore the roles played by NDAPs in diagnosing and managing two NCDs—diabetes and hypertension—in urban informal settlements of the Mumbai Metropolitan Region.

Methods This is a qualitative study involving data collection with 25 NDAPs (19 males and 6 females). Data was collected between December 2022 and September 2023. Data was coded inductively, and an iterative process of coding was followed to derive key themes. These themes were further refined through reflections within the author group. The qualitative software NVivo Version 10.3 was used to facilitate the analysis process.

Results All NDAPs we spoke to noted an increase in diabetes and hypertension patients in the urban informal settlements they worked in. All of them provided medication for 'quick relief' to patients from the bothersome symptoms of the two diseases. But in some cases, NDAPs also reported acting as counsellors, patient navigators, and local supervisors of therapy initiated by other doctors. Generally, risk-averse, NDAPs were cautious about how much of the diagnosis and treatment process they participated in. Those with informal and formal connections with private, qualified allopathic providers involved themselves more extensively in the management of the two NCDs. NDAPs had limited ties with the public health system and preferred sending patients to other private doctors if they felt a case was beyond their purview.

Conclusion The informal health sector in India is currently offering a range of services to address the needs of patients with NCDs. Our study suggests that the strong presence of this sector in resource-constrained communities can be leveraged by the public health system to enable community-level screening for NCDs, facilitate access

*Correspondence:
Anuja Jayaraman
anuja.jayaraman@gmail.com
Full list of author information is available at the end of the article

to specialist care, improve treatment adherence, and promote wellness initiatives. In light of the changing epidemiological burden, our study underscores that despite the contentious nature of practices in the informal health sector, overlooking this group of providers is no longer an option for health policies.

Keywords Informal providers, Informal health sector, Non-degree allopathic providers (NDAPs), Non-communicable diseases, Primary health care, Diabetes, Hypertension, Urban slums, Informal settlements

Background

Informal health providers play a prominent role in healthcare service provision in many low- and middle-income countries (LMICs), particularly in South Asia and Sub-Saharan Africa [1, 2]. Many concerns have been expressed about the quality of care provided by them, but they are ubiquitously encountered, often having a strong presence in communities [3, 4]. While there is no single definition for informal health providers, they usually lack formal training as doctors, collect fees for services rendered directly from patients, and often operate outside of government registration or oversight [3].

In pluralistic health systems like India, where this study is based, defining precisely who informal health providers are becomes even more complicated, since there are *"varying levels of official legitimacy and informality of practice"* in the health workforce [5]. Practitioners who are formally trained to various extents in one system of medicine often practice other systems in which they are not formally trained [6]. In some states within the country, limited cross-practice across different systems of medicine has been legally allowed [7]. Given these challenges in defining who is informal and who is not, some researchers have used the term Non-Degree Allopathic Providers (NDAPs) to refer to the providers who practice allopathic medicine without having formal qualifications to practice in this system of medicine [8, 9]. Some NDAPs have degrees from traditional Indian systems of medicine such as Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy (clubbed together as AYUSH) and have obtained additional training in allopathic medicine, satisfying state-specific legal mandates for cross-practice. However, there also exist many NDAPs who lack any form of medical qualification or possess diplomas of questionable validity in alternate medicine streams that have no statutory recognition [10]. Irrespective of qualification, it has been well recognized that NDAPs are often the first contact points for healthcare in India in both underserved rural areas, and in urban informal settlements [11–13]. Literature from the country also notes their accessibility, affordability, and cultural acceptability to communities, even while questioning their knowledge and quality of their allopathic practice [14–17].

In this study, we explore the roles played by NDAPs in the management of two NCDs- diabetes and hypertension in urban informal settlements of the Mumbai Metropolitan Region. Further, we attempt to comprehend the rationale behind their actions in relation to the two NCDs. We focus specifically on diabetes and hypertension since these are two NCDs highly prevalent in India and increasingly found in urban informal settlements [18, 19].

This study is important in the light of increasing burden of NCDs in India [20]. Effective management of NCDs in the country requires early detection, prompt initiation of treatment, and regular check-ups, in addition to continuous efforts to raise awareness and counselling for lifestyle modification [21, 22]. Since NDAPs are often first contact providers in both remote settings and rural settlements, the advice they offer can influence, to a large extent, the pathway of care that patients follow. While previous literature on NDAPs has often revolved around first contact care provided by NDAPs for acute ailments [8, 11], to the best of our knowledge, none have focussed on NCD care. At present, there is less empirical evidence on the roles that NDAPs play in NCD care.

Further, most studies on informal providers in LMICs have been done from the patient's point of view, focusing on factors that influence their care-seeking from this set of providers [23–25]. However, there are very few studies that have explored the perspectives of these practitioners, with some notable exceptions [26–28]. This study adds to literature that brings the voices of NDAPs into prominence and understands the complex contexts that they navigate to provide care.

Methods

Maharashtra context

In 2017, the central government of India introduced the National Medical Commission Bill, which included a proposal for a bridge course allowing AYUSH professionals to legally practice allopathy to a limited extent. However, faced with opposition from the Indian Medical Association, a Parliamentary Standing Committee dismissed the proposal, deferring this decision to individual states [29]. Several states, including Maharashtra, where this study has been conducted, have allowed cross-practice to boost human resources and healthcare accessibility in low-resource areas. Some private allopathic healthcare providers in Maharashtra also employ AYUSH graduates as

assistant service providers; and these AYUSH graduates get hands-on experience of working with patients [30].

Study setting

The study was conducted in three urban informal settlements situated within a Municipal Corporation in the Mumbai Metropolitan Region, Maharashtra, India. The study area has one secondary-level 100 bedded public hospital which serves as a referral center for 15 primary-level facilities. In terms of the private sector, the study area has a diverse range of healthcare facilities, including clinics, nursing homes, and big hospitals. Some doctors with a degree in allopathic medicine had clinics outside the informal settlements but none practiced in the by lanes of these informal settlements. In our previous study within the same settlements, residents predominantly mentioned seeking treatment for common ailments from NDAPs, a mix of formal and informal AYUSH providers, as the formal allopathic sector was perceived as unaffordable [31].

Study design and data collection

This is a qualitative study involving purposive data collection from NDAPs who practiced in the by lanes of three informal settlements in the Mumbai Metropolitan Region. This research was carried out in the field areas of the Society for Nutrition, Education, and Health Action (SNEHA), a non-governmental organization (NGO) working in urban informal settlements in Mumbai since 1999. The data collection was done between December 2022 and September 2023.

To capture broader perspectives on the study topic, we used purposive sampling, a commonly employed technique in qualitative research for identifying and selecting cases rich in information [32, 33]. In our initial exploratory field visits, most NDAPs we encountered in the study setting reported having a background in Unani followed by Homeopathy. Despite actively seeking practitioners from different backgrounds, we could not find informal providers with other degrees in our study area. To ensure the diversity of the perspectives among these NDAPs, we purposively selected participants based on gender and years of clinical practice. The recruitment of participants for this study was done in three ways. For the initial few interviews, we took the help of community-level field workers from the NGO who had a good rapport with some of the NDAPs practicing in the area. Second, we employed snowballing techniques by seeking referrals to other NDAPs from initially identified NDAPs. Third, we located small clinics during our field visits and purposively selected female NDAPs to enhance the diversity of our sample since most NDAPs in this setting were male.

The initial two Top of Form

During our initial interactions with all participants, we explained the study's purpose and sought their willingness to participate. NDAPs were reassured regarding the confidentiality and the anonymity of their participation. This was crucial since the majority of NDAPs had concerns about their names getting published in a report or scrutiny of their practice by the government. After ascertaining their willingness to participate, we discussed suitable times and locations for the interviews with NDAPs. On the day of data collection, we reaffirmed verbal consent for the interviews and audio recording. The interviews were conducted at the providers' clinics. The interviews were conducted by authors MB and JS who are trained in qualitative data collection and acquainted with urban informal settlements. The individual interviews lasted approximately 20–30 min, excluding the time for informal interactions with NDAPs for establishing rapport and getting contextual information.

The total sample consisted of 25 NDAPs of which 19 were male and 6 were female. The majority of the providers reported having training in alternative medicine, 18 in Unani medicine followed by 6 in Homeopathy. One practitioner called himself a 'general practitioner' without specifying a qualification (Table 1). We could not verify the qualifications reported by NDAPs.

We used an in-depth interview guide for data collection. This interview guide was developed for our prior study aimed at understanding the care-seeking journeys of NCD patients within the informal settlements [31]. While we used the same interview guide, additional interviews with NDAPs were done for this study. The main themes discussed during our interactions are summarized in Table 1. We employed the concept of information redundancy as a criterion to ensure data saturation, after which the recruitment of additional participants was concluded.

Of 25, 6 NDAPs did not grant permission to record the conversation. In such cases, we took notes during and after the interview.

Data analyses

As commonly followed qualitative study practices, data analysis commenced concurrently with data collection. All recorded conversations were transcribed into English for further analysis. Individuals proficient in Hindi and English handled the translation and transcription process. The transcripts and field notes were sorted and coded using the qualitative software NVivo Version 10.3. We used these codes to collate data into groups which allowed us to assess the main points that reappeared throughout the data. Preliminary ideas emerging

Table 1 Details of the study participants and themes covered during interaction

Total NDAPs interviewed	**25**
Gender	
Male	19
Female	6
Degree/Diploma as reported by NDAPs	
Bachelor of Unani Medicine & Surgery	16
Bachelor of Homeopathic Medicine & Surgery	4
Diploma in Unani Medicine	2
Diploma in Homeopathy	2
General Practitioner	1
Number of years in clinical practice	
1 to 5	9
6 to 15	9
> 15	7
Themes covered during interactions with NDAPs - Their clinical practice in the urban informal settlements and their experiences - Their views about the community's health and NCDs - Their views about diabetes and hypertension in the community - Their clinical practice related to diabetes and hypertension- identifying initial symptoms, screening, testing, medical and dietary advice, referral and follow-up - The aspects influencing their practice related to diabetes and hypertension - Their relationships with patients, allopathic doctors and the public health system	

from the transcripts were discussed by authors in a group which helped us iteratively build on our themes. For instance, we explored differences in the ways NDAPs approached suspected cases of diabetes and hypertension as well as the diverse networking methods by which NDAPs connected with senior private allopathic doctors in the area. Data was sorted to form main themes that were further summarized using data display techniques like tables to aid interpretation [34]. Findings were synthesized thematically to be presented in the paper. In the supplement, we have reported on Lincoln and Guba's criteria for evaluating the quality of qualitative research [35].

Ethical considerations

Ethical approval for the study was obtained from Sigma Research and Consulting Pvt. Ltd. Verbal informed consent was sought from all participants, and in cases where consent for audio recording was not provided, non-recorded verbal consent was obtained.

Findings

The study area had many NDAPs practicing within the narrow lanes of the informal settlements. NDAPs' clinics were small, usually comprising one or two rooms with separate spaces designated for consultations and patient waiting areas. Each clinic had a signboard that displayed the practitioners' names and their degrees or diplomas. Most clinics we visited had basic clinical equipment like thermometers, stethoscopes, and blood pressure machines. During our visits, we often observed a long queue of patients waiting for consultations. It was common to see patients receiving intravenous rehydration drips in these clinics. While some NDAPs had one or two support staff to help them, most managed both the consultation and the dispensing of medication on their own.

How do NDAPs see themselves and their roles as healthcare practitioners in the community

NDAPs called themselves '*general practitioners' or 'family doctors'*, and reported being the first contact points for most basic health-related concerns in the community they practiced in. They mentioned providing basic treatment for patients across all age groups for common ailments like fever, common cold, diarrhea, and minor injuries. Female NDAPs also reported assisting female patients with obstetric or gynecological problems. NDAPs viewed themselves as doctors who were socially well-accepted by the community in urban slums, unlike more qualified doctors who were professionally distant and had less interpersonal connections with the community. NDAPs reported charging patients a fee of INR 50–100 per consultation, and this fee often included the cost of medicines provided by them. This amount was significantly less in comparison to INR 500–1000 per consultation charged by allopathic doctors in the area. In addition, they complied with patients' requests to delay fees, pay reduced fees, and made efforts to be accessible

to patients. Ease of access and affordable fee structures were considered essential to a thriving clinical practice in this area, as were the efforts made to build long-term relationships with the community (see Table 2).

NDAPs and their roles in diabetes and hypertension care

All NDAPs we spoke to noted a change in the disease profile of people living in urban informal settlements. While they still reported getting a large number of patients suffering from infectious ailments, they also mentioned seeing an increase in the number of patients with diabetes and hypertension in the study area. NDAPs often linked this increase to the stressful living and working conditions in urban slums, as well as changing lifestyles. NDAPs also pointed out a significant rise in these diseases among younger individuals and those who were involved in daily labour.

NDAPs engaged in diabetes and hypertension care in diverse ways. We have tried to bring out the various ways in which NDAPs engaged with diabetes and hypertension through four case-studies in Table 3.

Case 1 is the story of an NDAP, Ashok (name changed), who reported providing only treatment to relieve bothersome symptoms that his patients experienced. In fact, the provision of care for relief from symptoms was the main modus operandi of almost all NDAPs when patients

Table 2 Quotes illustrating how NDAPs view their role in the community

"As I am their family doctor, they first call me and tell me their problem. All my patients respect me because they think I give them good advice. Patients come to me repeatedly only because they get benefits; otherwise, they will not come back to me." (Male NDAP practicing for the last 25 years)
"This is a slum area, and at the maximum, people are ready to spend around 40–50 rupees. If they had more money, they won't be coming to us. They will go to big doctors." (Male NDAP practicing for the last 10 years)
"Many people tell me to treat them instead of going to a bigger hospital, as they can't afford to go to the hospital. Patients in this area avoid going to a doctor in a big hospital. They want everything from general practitioners only." (Female NDAP practicing for the last 8 years)

Table 3 Case stories illustrating diverse ways in which NDAPs engaged with patients

Case 1: Ashok, (name changed) has been practicing in the urban informal settlement for ten years. He has a degree in Unani medicine. He shared that people mostly sought his advice for getting immediate relief from bothersome symptoms like fever, cough, and weakness. He also treated minor cases that could be easily dealt with symptomatic medicines as he feared negative publicity in the community due to any adverse event in dealing with serious cases. He expressed satisfaction with his practice, highlighting that it was enough to cover the clinic rent and provide for his children's needs. In the case of diabetes and hypertension, he did advice people to get themselves tested for diabetes or hypertension from specialists, but he also acknowledged that people did not always listen to him. In his opinion, people did not take initial symptoms seriously and avoided testing since they feared that diagnosis may necessitate long-term medication. "I am here to take care of people for basic issues and also to provide immediate care during any emergency. I do check blood pressure when necessary, but people are reluctant to go through any further process of testing. They'll say just give something for today, we'll see about everything else later. They just don't want to worry about such things."
Case 2: Raza (name changed) has been practicing in the urban informal settlement for six years. He has a degree in Homeopathic medicine. He keeps small diagnostic machines like digital blood pressure, glucometer, and ECG set-up, and uses these tools to screen patients, refer, or prescribe medicines accordingly. Before opening his clinic in the area, he had worked in a big private hospital nearby. This experience, he shared, had helped him connect with senior doctors in the locality, to whom he refers patients, and who in turn, support him with medical advice. Raza also guides patients who get diagnosed elsewhere in understanding their medication better and advises on future course of treatment. *"Once patients tell me about their symptoms like excessive thirst, urination or feeling too sleepy or restless, I check their blood pressure and sometimes sugar with my machines. In primary testing if a patient has an increased level of sugar, I tell them to do a random blood sugar test, then I decide whether they require medicine or not. After checking the report of fasting sugar, I decide which medicine should be started."*
Case 3: Shaheen (name changed) has been practicing in the informal settlements for the last eight years and holds a degree in Unani medicine. She has observed a rise in cases of diabetes and hypertension in her practice. She shared that patients often do not disclose their complete symptoms, making it challenging to understand underlying conditions like diabetes and hypertension. Whenever she suspects such cases, she promptly measures blood pressure or refers patients for blood sugar testing. After confirming her suspicions, she reported initiating basic medication and advising dietary control. If symptoms persisted and did not come under control, she referred patients to a senior doctor. She mostly left the choice of senior doctor to the patient but noted that having a proper network with good senior doctors would help her continue managing the patients in the community. *"I have a big dilemma about referral. Which doctor should I refer to? I have to think a lot about it. I can't get satisfied easily. Those who are very good are very costly and patients don't want to go to them and those who fit into their budget are not very qualified."*
Case 4: Nadeem (name changed), a resident of the area himself, holds a degree in Unani medicine. He has been practicing in the area for the past 1.5 years. He received patients with minor ailments including common infections, which he treated using symptomatic medicines. He reported receiving a few diabetes and hypertension patients who regularly visited his clinic. These patients were diagnosed elsewhere mostly by a senior allopathic doctor, and they brought their prescriptions with them. They came to him for regular check-up of blood pressure and sugar for which he used his digital equipment. After checking, he informed these patients to either continue with the prescribed medication or to visit the senior doctor if he felt that their readings were abnormal. He shared that patients often do not take their medication regularly, leading to fluctuations in their readings. *"I get diabetes and hypertension patients. I test but I don't write any medicine. They mostly have their own prescribed medicine which I tell them to continue. If I see that their sugar levels are high, I tell them to go to their doctor. I personally don't send them anywhere; they can go wherever they want to."*

visited them for the first time. This care typically included the provision of basic medication for headaches, fever, diarrhea, anxiety, weakness, and various other symptoms. Further, NDAPs often reported mixing modern medicine with traditional medicine to relieve symptoms. While all NDAPs shared that they provided medicines for relief from symptoms, NDAPs like Ashok limited themselves to only this role.

Unlike Ashok, there were other NDAPs who managed and coordinated more curative aspects of diabetes and hypertension care for patients, seeking support when needed from specialists. Case 2 is an example of one such NDAP, Raza (name changed). Like in case 1, Raza provided treatment to patients to obtain instant relief from symptoms. But additionally, he had made provisions for the basic diagnosis of diabetes and hypertension in his clinic. Raza had obtained knowledge about working on these two conditions when he worked as an assistant in an allopathic clinic. Working under allopathic doctors or more experienced NDAPs appeared to be a common practice among NDAPs looking to gain experience in treatment. NDAPs like Raza used the connections they made with allopathic doctors judiciously. They played a role akin to that of a primary care 'gatekeeper' in the community by cautiously connecting patients to specialists when needed and managing the referral process.

We also came across NDAPs who played the role of being partial 'gatekeepers' to care for diabetes and hypertension. Case 3 is the story of Shaheen (name changed), who reported managing the initial diagnosis and initiating basic treatment for diabetes and hypertension. Unlike Raza, she limited her role to doing only basic diagnosis and treatment. She did not have connections with the formal private sector in the vicinity and, hence, did not involve herself in the referral process.

Sometimes, patients who had previously consulted allopathic doctors came to NDAPs for follow-up care. For instance, Case 4 is the story of Nadeem (name changed), who, unlike Raza and Shaheen, did not involve himself in testing, treatment, or referrals for NCDs. But he played the role of a counsellor by following up on the diagnosis and explaining the importance of adherence to medication. Similarly, another NDAP shared that he demanded empty strips of medicines from diabetes and hypertension patients as part of follow-up visits. He had learnt this 'trick' from working with the public sector program against tuberculosis, wherein he had been asked to monitor adherence of tuberculosis patients to medication.

The four case studies in Table 3 illustrate that NDAPs played a variety of roles in NCD care. These roles included providing immediate relief from symptoms, either doing or enabling diagnosis, facilitating treatment, referring for specialist care and acting as a gatekeeper, and doing follow-up treatment. In the next section, we attempt to explain why these roles varied between NDAPs.

Explaining the varied roles that NDAPs play in diabetes and hypertension care

As seen in Table 3 in the previous section, NDAPs played varied roles in diabetes and hypertension care. Multiple factors influenced the roles they played, including their desire to meet the expectations of the community, the private sector network they had established for support, and their personal inclinations to take on more complex service provision. In the section below, we have tried to detail the rationale behind the decisions NDAPs take regarding diabetes and hypertension care.

Why did all NDAPs resort to 'quick relief' treatments?

All NDAPs we spoke to offered some form of 'quick relief' from bothersome symptoms to patients, irrespective of diagnosis. Over years of practice, NDAPs had realized that if the patient did not get quick relief from symptoms, there was a tendency for the patient to seek care elsewhere. NDAPs also understood why their patients needed relief quickly; for in these settings, people often did not have the luxury of being absent from work:

> *"There are many laborers in this area. They work till seven in the evening. You have to give them medicine in such a way that they can get ready to work in the next hour. If a patient does not get relief in one dose, they will request a change in medicine or will opt to change their provider." (Male NDAP practicing for last 25 years).*

Much of NDAPs practice depended on the reputation they had built in communities as low-cost doctors who brought about quick relief. Hence, from their perspective, meeting the expectations that communities had from them was key to the survival of their practice in these settings.

Why did many NDAPs not engage in diabetes and hypertension care beyond providing 'quick relief'?

Many NDAPs (like Ashok in case 1, Table 3) limited themselves to providing only symptomatic treatment for diabetes and hypertension. Despite knowing the initial symptoms of diabetes and hypertension, they played a superficial role in further diagnosis by giving advice to patients on getting tested. 14 of the 25 NDAPs we interviewed reported that they did not actively participate in preliminary testing or treatment processes pertaining to NCDs.

These NDAPs felt that they had limited autonomy in dictating the NCD care journey of patients beyond

treating symptoms. They noted that it was useless to recommend routine check-ups to monitor sugar or blood pressure levels since patients in this setting often ignored early symptoms and sought assistance only when their discomfort became intolerable. They also believed that patients were reluctant to undergo testing, and would rather not receive a diagnosis that would involve long-term expensive care:

> *"No one does routine check-ups here in this community. Many times, I tried telling them to get checked even without symptoms. But it is only when they suffer or symptoms get worse, they get it done." (Male NDAP practicing for last 5 years).*

> *"The reality in this community is, that even if you tell people to do a test, they won't do it. Many such cases come. I keep telling them again and again, but only when their health gets bad, then they get the test done. Their thinking is that then (if diagnosed) they'll have to take medicines, and what if they actually have this disease?" (Male NDAP practicing for last 25 years).*

The legal position of NDAPs in the healthcare system also contributed to their predominant preference for the provision of symptomatic relief. Although NDAPs were permitted to administer allopathic medication in Maharashtra to some extent, the boundary of their scope of practice was less defined in practice. NDAPs were always concerned about not taking any risks that would endanger their business. They worried about the repercussions of getting involved in treating ailments that they viewed as being more complex than what they could handle (see Table 4). Further, NDAPs did not always know which doctor to refer to and did not want the patients to blame them if the referral ended up being too costly for patients. In summary, being averse to taking business risks and not having adequate connections for referral and treatment of patients, NDAPs limited themselves to a modus operandi that had worked for them for many years—the provision of symptomatic relief.

What enabled NDAPs who 'managed' diabetes and hypertension in patients?

All NDAPs acknowledged that diabetes and hypertension were increasing in the community. This increase presented to some of them a new opportunity to expand their practice; around 11 NDAPs of the 25 we spoke to felt that it would make sense for them to get involved in testing for and providing basic treatment for these two ailments. These NDAPs also felt that it was their responsibility to provide some form of NCD care at a low cost since people from urban informal settlements did not have money to access the formal private health sector:

> *"Since people don't have enough money to pay a diabetologist's fees, I provide them with some prescriptions to start their medicines. If they feel the need to see a diabetologist, I can refer them, but it would cost them between RS. 2,000 and 3,000 for a single visit." (Male NDAP practicing for last 40 years).*

Given the newness of their involvement in this set of diseases, NDAPs expressed concerns about their abilities to provide NCD care. Those who were connected to a 'network' felt more confident of their abilities and engaged with care for NCDs more extensively. The networks that NDAPs had were of three kinds:

1. Informal networks- One important source of support for NDAPs like Raza (case 2 in Table 3) in providing NCD care was having professional connections with allopathic general physicians and specialists in the vicinity doing private practice. NDAPs often shared patients' medical history and symptoms with these doctors and took their advice. In case of complications, NDAPs referred patients to allopathic doctors, while also requesting fee concessions in some cases.
2. Formal associations: Some NDAPs belonged to formal bodies like local medical associations. In meetings organized by these bodies, senior allopathic doctors were often invited to give disease-specific lectures. NDAPs used this opportunity to learn about different ailments, diagnostics, and medications. Personal meetings with senior doctors

Table 4 Quotes illustrating NDAPs aversion to taking risks

"I don't take much risk. Patients do not belong to anyone. Customers are not attached to you emotionally. If anything goes wrong, they will not leave you. That is why, it is better not to take any risk." (Male NDAP practicing for last 25 years)
"These are very complex diseases. I don't indulge in such treatment. It is a lifelong treatment. See, BP is related to the heart. Suppose I start the medicine and then the patient suffers in the future, who would be responsible?" (Male NDAP practicing for last 4 years)
"I don't want to risk anything. If it is a minor case then I treat, otherwise I refer them. If I treat a serious case and succeed then good, if I don't then people will blame me. This is a slum area, so then everyone will know about it. Somehow, I am practicing cautiously." (Male NDAP practicing for last 10 years)
"I don't keep any big instruments in my clinic, unlike other doctors. They might have a very good practice, so they are taking risks. I simply refer patients to MD doctors. We also understand things like ECG but what an MD doctor can find out we can't". (Female NDAP practicing for last 1 years)

through these associations also allowed NDAPs to establish an informal referral network. Some female NDAPs mentioned that regular participation in such meetings was challenging for them due to family responsibilities.

3. Marketing agents: Representatives of big private hospitals in the area, also called Public Relations Officers (PROs), often approached NDAPs with the request to refer patients to their hospitals and offered various benefits to them in return. These agents made NDAPs aware of specialists and facilities available for different diseases in nearby hospitals. Similarly, representatives of pharmaceutical companies who visited NDAPs explained to them about their newly launched medicines for various diseases and gave them free samples.

The table below illustrates the various ways in which 'formal' and 'informal networks' enabled NDAPs to provide care:

As Table 5 illustrates, NDAPs used their networks to build better relationships with the community and found these useful. But they also cautioned that managing relationships with the formal private sector was not easy and had to be carefully done. NDAPs were especially cautious about engaging with PROs and expressed concerns about feeling pressured by them to exclusively send patients to their hospital.

> *"Once you refer patients through PRO then they come to you to say thanks but expect more patients. This gets you involved in a complicated practice that doesn't make sense. I prefer to stay away from it. It's a business where hospitals sell their services." (Male NDAP practicing for last 10 years).*

NDAPs also felt a sense of responsibility towards the community. They had concerns about patients receiving poor quality and costly treatment in the hospitals they referred them to, which could also potentially tarnish their reputation in the community.

> *"It is risky to send them to a private hospital. What if their case gets worse after going there? They'll blame us saying, where did you send us, they took so much*

Table 5 Examples from the field highlighting how networks helped NDAPs in their practice

Networks and how these enabled the practice of NDAPs	Examples from the field
Networks build confidence of doctors to work on NCDs in their clinical practice	NDAPs worked with senior doctors in their clinics/hospitals some opting for the night shift. There they observed various cases, learned standard approaches and sometimes got the opportunity to handle patients on their own. *"When I was working in the hospital, I used to receive so many patients with hypertension. Some of the patients had resistant hypertension, they did not recover even after taking multiple medicines." (Female NDAP practicing for last 3 years)*
Networks help in managing patients with severe symptoms and in emergencies	NDAPs received referral support from their networks that helped them manage patients. *"If I can't diagnose or need any help, I take help from other doctors and send my patients to them. There is a cardiologist, I often send my patients to. Once I had a patient with chest pain, after checking him, I realized that he had a heart attack. I gave him an emergency tablet and sent him to that doctor." (Male NDAP practicing for last 6 years)*
Networks enable follow-up of the patient	Patients sometimes returned to NDAPs after consulting senior doctors. They returned to show the prescribed medicines and understand the next steps. As shared by Shaheen (case 3 in Table 3) NDAPs felt that they could handle follow-ups if there was a network available to help them. *"My patients trust me, but they should go to other senior doctors at least once. I can follow up based on the medicine they give." (Male NDAP practicing for last 4 years)*
Networks help NDAPs get concessions on behalf of the patient.	While making referrals in their network NDAPs often asked for concessions for poor patients. They reported that if a patient goes to the senior doctor via them, they get a consultation, or any procedure done at much less cost. It helped NDAPs build their reputation in the community. One NDAP explained one of the ways of getting concession: *"Suppose there is a poor patient I am referring. So, I will ask the senior doctor to not give me my cut (incentive for referral) but to reduce the fee for the patient." (Female NDAP practicing for last 2 years)* *"I have worked under MD doctors so if I send a patient from my clinic, they readily accept them. Suppose there is a patient who needs to do angiography but is unable to do so because of high cost. Now, if he goes to a senior doctor with my reference, it benefits him." (Female NDAP practicing for last 3 years)*

fee and still this happened." (Male NDAP practicing for last 10 years).

Why did NDAPs usually not refer patients to the public health system?

Most NDAPs who involved themselves in NCD care had formal or informal ties with the private health sector, but not with the public health sector for this set of diseases. NDAPs were generally aware of free screening as well as medicines being provided for diabetes and hypertension in the public sector, but they preferred not to send patients there. The main reason they reported for this preference was that patients were reluctant to spend money on commuting to the public hospital that was far away, and their patients would lose wages if they had to spend time in queues there.

"Although many say that medicine is free in public hospitals, going there can be problematic. If someone is working for 12 hours, they must drop their 12-hour shift and wait in queue for one day. Preparing a case paper is tiring and sometimes, after going all the way, medicines are also not available there. So, it is problematic." (Male NDAP practicing for last 40 years).

NDAPs in this area had limited interactions with the public sector, cautiously avoiding any case that could result in the government interfering with their practice:

"I don't take any risks. I know that if anything goes wrong, I will be in trouble." (Male NDAP practicing for the last 25 years).

Sometimes, outreach workers from the public health system who visited urban informal settlements asked them for space to conduct vaccination camps for children. Some NDAPs reported having tie-ups with the tuberculosis program, and that their role was to follow up on tuberculosis patients in the community to ensure adherence to medicine. Beyond this, NDAPs mentioned maintaining a distance from the public health system.

Discussion

Informal providers pose both challenges and opportunities for health systems in LMICs [2, 36]. They cover a gap in service provision, that is not met by the formal private sector or the public sector, particularly in places where qualified health workers are inaccessible [15, 37]. In rural remote areas and in urban slums they are the prominent providers of basic care, having a strong presence in the community [12, 38]. However, there have been legitimate concerns about the quality of services they provide, and about their incomplete knowledge and skills [39, 40].

The changing epidemiology of diseases in countries and increasing NCDs in LMICs [41] add even more complexity to the current situation of informal providers. Conventionally, across LMICs, these providers have been dealing with minor ailments, providing relief from acute symptoms that bother patients [8, 23, 25]. Our study's findings from urban informal settlements in Mumbai suggest that this role is undoubtedly expanding. We found that while many informal providers are only providing basic symptomatic care, others clearly see a business opportunity in working more closely with NCDs. In particular, informal providers (NDAPs in our setting) with stronger networks with the private allopathic sector made efforts to use these connections to expand service provision to include NCDs and thereby retain patients. Our research also suggests that the roles played by these providers in diabetes and hypertension care were diverse and included identifying initial symptoms, conducting diagnostic tests, initiating medications, enabling referrals, and doing follow-up care. At present, informal providers in these settings are acting- to variable extents- as first contact points of care, counsellors, patient navigators, and at times even as local supervisors of treatment initiated by specialists. Additionally, we came across few providers who felt confident to diagnose and treat uncomplicated diabetes and hypertension independently. Most providers were circumspect about the cases they felt they could handle and averse to taking 'risks', much in the manner pointed out by another study from India [26].

As our study findings note, the informal private sector in India has recognized a market in NCD care. At the same time, public health policies in India have also been attentive to the increasing burden of NCDs in the country [42]. In the last few years, efforts have been made to deliver comprehensive care for NCDs through public primary health facilities [43]. However, it has been recognized that primary care facilities are yet not able to deliver comprehensive care for NCDs [44]. Particularly, in urban areas, where it has been challenging for public health resources to keep up with ever increasing urbanization [45], providing care for NCDs has been even more of a challenge.

Reflecting on the above two distinct happenings- one, the public health system efforts to deliver comprehensive care for NCDs and two, the venture of NDAPs into NCD care- we feel that there is potential for the informal health sector and public health system to work together to combat this set of diseases. At present, the Indian health system, as in the case of other LMICs as well [46, 47], is fragmented, making the navigation of care challenging for NCD patients in low-resource settings [48, 49]. In our study, we saw efforts made by some NDAPs to connect with private specialists and establish 'informal networks'

for training and routine guidance, similar to what others have found as well [50]. However, we didn't see any such linkages with the public system concerning NCD care.

We believe there is merit in establishing links between informal providers in urban informal settlements and the public health sector, particularly for NCD care. There is already precedence from India's tuberculosis elimination and COVID-19 programs [51, 52]. Similarly, in other countries like Uganda, informal providers have facilitated HIV testing uptake [53], while in Nigeria, they have helped improve medicine availability in communities [54]. Further, from the perspective of informal providers, collaboration with the government implies a pathway to improving their legal status. This is because these providers often work on the borderlines of legitimacy, and in constant fear of crossing a 'porous boundary' of legality [50]. They also have concerns regarding government-led supervision and how it might potentially affect their professional practice [27]. Nevertheless, interventions that help informal providers gain legitimacy as well as expand their practice have, in the past, been welcomed by them [55]. Hence, there is reason to believe that informal providers will be open to establishing links with the public health system for NCD care. We go one step further and delineate ways in which these engagements can take place in Table 6.

Of importance to note is that some NDAPs are treating patients with basic diabetes and hypertension medicine. There have always been concerns about overprescriptions by NDAPs, and general inconsistencies of treatments prescribed by them with clinical guidelines [59]. In the case of NCDs, the long-term nature of these treatments makes these issues important, for deviations from standardized protocols could lead to poor patient outcomes, increased risk of complications, and further strain on the healthcare system. A recent trial has shown that training does help NDAPs with better case management [60], but it has also been recognized that training cannot solve all issues [60, 61]. This is partly because, in addition to knowledge, community expectations from informal providers and the need to meet these expectations also influence their behaviors with respect to NCDs. Thus, in addition to training, establishment of linkages with the public health system, as a means of both support and regulation, becomes important. These linkages may provide NDAPs with access to essential resources, enhance the quality of care they deliver, and help in regulation.

Our study has a few limitations. First, our findings are based on our interaction with NDAPs we could recruit in our setting. Our interactions were about their roles in diabetes and hypertension care and the relationships that influenced their roles. We did not validate their degrees or the roles they reported to play. Second, recruiting NDAPs for the study was difficult. Helping them to open up to discuss their practice was even more challenging and needed extensive rapport building on the part of the interviewers. Some providers did not permit recording during discussions, which may have resulted in some information loss. Some NDAPs were also hesitant to openly discuss the features of the informal market that support their practice, as they feared potential regulatory repercussions. Third, our study sample was drawn from three urban informal settlements located within a Municipal Corporation. The unique socioeconomic, cultural, and healthcare dynamics of these particular settlements may limit the applicability of the results to other areas with different characteristics.

Top of form

Finally, we do believe there is no substitute for a strong well-functioning public health system in India, to improve NCD care and outcomes, and move towards

Table 6 How can the informal providers support the public health sector in providing primary care for NCDs?

Enable community-level screening Informal providers can be equipped, trained and incentivized to facilitate early community-level screening for conditions like diabetes and blood pressure. Supporting them in this capacity can aid in preventing delays in diagnosis, which can significantly impact patient outcomes.
Act as community-level patient navigators Informal providers can act as patient navigators to enhance timely access to formal primary care by patients.
Enable access to specialist care through e-consultations India's national telemedicine platform eSanjeevani has trained nurses in the public health system to access specialists through a digital platform [56]. Informal providers can be trained to use similar technology to connect patients with specialists in the public healthcare system.
Managing treatment post diagnosis Trained informal providers can follow up with diagnosed NCD patients and facilitate routine check-ups. Additionally, they can also facilitate community-based distribution of medicines and follow up with patients to ensure adherence to prescribed medications, addressing one of the significant challenges in managing NCDs [57]. Such engagements have been tried previously by the tuberculosis elimination program in India [51].
Holistic disease management and wellness Providers who have degrees in alternate medicine streams and trained in individualized approaches and holistic lifestyle management [58] - are uniquely positioned to offer these services to communities.

health equity. But at the same time, we recognize that informal providers are a reality in many resource-constrained settings in India and other countries. They have a strong presence in the community that can be leveraged for the development of health systems that are organized around people's health needs rather than illnesses [54, 62]. While interventions have been tried for recognizing, upskilling, and regulating informal providers across LMICs, much more efforts in this direction are needed and more such interventions need to be evaluated [55, 63]. At present, public health systems have largely refrained from engaging with the informal sector except in a few cases. In the light of changing epidemiological burden, our study re-emphasizes, as many others have done before, that however contested the roles of informal providers may be, ignoring them is not an option for health policies in LMICs.

Positionality statement

The authors of this study come from diverse fields, including medicine, public health, public policy, social work, and developmental economics. Though originally from different parts of the country, all authors have resided in the city where the study site is located for over ten years. At the time of data collection, all researchers were associated with the NGO SNEHA and were well-acquainted with the local context. Some authors were part of the SNEHA's implementation team responsible for designing a NCD care program in informal settlements, in collaboration with the public health system. This study was done to inform the program team about the practices of NDAPs regarding NCD care, given their significant presence in the community. We acknowledge that each researcher brings inherent biases to the study. For example, some authors may have preconceptions that could affect their stance on considering NDAPs' inclusion in the formal healthcare system. Others may have community-level experiences that shape their views on the role NDAPs can play in NCD care positively. However, the inclusion of individuals from various disciplines in the study helped mitigate these biases, ensuring the findings were grounded in the data. Debriefing sessions throughout the study process encouraged us to challenge our interpretations and refine our analysis.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-024-11919-8.

Supplementary Material 1.

Acknowledgements
The authors express their gratitude to all participants in this study for sharing their stories with us. We thank SNEHA's maternal health program team for their dedicated support in the field. Finally, we acknowledge the invaluable feedback from members of the SNEHA Research Group.

Clinical trial number
NA.

Authors' contributions
M.B., S.R., J.S, A.J., S.S., and Sw.P. conceptualized the project. M.B., J.S., S.R., and AJ worked on the methodology, curated the data, conducted formal analysis and wrote the original draft. M.B., J.S., S.R., AJ and Sw.P. administered the project. S.R., A.J., Sh.P., V.D'S., S.S. supervised the project administration and validated the findings. A.J. managed funding and resources. All authors reviewed the manuscript.

Funding
This research was conducted by the Society for Nutrition, Education and Health Action, Mumbai, using institutional funds.

Data availability
No quantitative datasets were used in this study. De-identified transcripts of the interviews with participants can be provided by the corresponding author upon reasonable request. The applicant must have clearance from their local ethics board before accessing this data.

Declarations

Ethics approval and consent to participate
The study was approved by the Institutional Review Board of Sigma Research and Consulting Pvt Ltd. (IRB Number: 10056/IRB/22–23). All participants gave their verbal consent to participate in the study.

Consent for publication
NA.

Competing interests
The authors declare no competing interests.

Author details
[1]Society for Nutrition, Education and Health Action, Mumbai, India.

Received: 10 April 2024 Accepted: 11 November 2024
Published online: 22 November 2024

References

1. Mackintosh M, Channon A, Karan A, Selvaraj S, Cavagnero E, Zhao H. What is the private sector? Understanding private provision in the health systems of low-income and middle-income countries. Lancet. 2016;388(10044):596–605 Available from: https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)00342-1/fulltext.
2. Bloom G, Standing H, Lucas H, Bhuiya A, Oladepo O, Peters DH. Making health markets work better for poor people: the case of informal providers. Health Policy Plann. 2011;26(Suppl 1):i45-52.
3. Sudhinaraset M, Ingram M, Lofthouse HK, Montagu D. What is the role of informal healthcare providers in developing countries? A systematic review. Derrick GE, editor. PLoS One. 2013;8(2):e54978 Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3566158/.
4. Das J, Daniels B, Ashok M, Shim EY, Muralidharan K. Two Indias: the structure of primary health care markets in rural Indian villages with implications for policy. Soc Sci Med. 2020;112799. Available from: https://www.sciencedirect.com/science/article/pii/S0277953620300186.
5. Sheikh K, Josyula LK, Zhang X, Bigdeli M, Ahmed SM. Governing the mixed health workforce: learning from Asian experiences. BMJ Global Health. 2017;2(2): e000267.

6. Rao KD, Sundararaman T. Medical pluralism and cross practice in India. Soc Sci Med. 2014;102:203–4. https://doi.org/10.1016/j.socscimed.2013.11.053. Epub 2013 Dec 21. PMID: 24423877.
7. Bada Math S, Moirangthem S, Kumar CN. Public health perspectives in cross-system practice: past, present and future. Indian J Med Ethics. 2015;12(3):131–6. https://doi.org/10.20529/IJME.2015.041.
8. May C, Roth K, Panda P. Non-degree allopathic practitioners as first contact points for acute illness episodes: insights from a qualitative study in rural northern India. BMC Health Serv Res. 2014;14:1.
9. Gautham M, Binnendijk E, Koren R, Dror DM. First we go to the small doctor: first contact for curative health care sought by rural communities in Andhra Pradesh and Orissa, India. Indian J Med Res. 2011;134(5):627–38 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3249960/.
10. Ranga V, Panda P. Private non-degree practitioners and spatial access to out-patient care in rural India. GeoJournal. 2015;81(2):267–80.
11. Raza WA, Van de Poel E, Panda P, Dror D, Bedi A. Healthcare seeking behaviour among self-help group households in Rural Bihar and Uttar Pradesh, India. BMC Health Serv Res. 2015;16:1.
12. Abdul Azeez EP, Selvi GA, Sharma G, AP SK. What attracts and sustain urban poor to informal healthcare practitioners? A study on practitioners' perspectives and patients' experiences in an Indian city. Int J Health Plann Manag. 2020;36(1):83–99.
13. Das J, Chowdhury A. Improving primary healthcare: an evidence-based approach towards informal providers. Indian J Med Res. 2024;159(3):385–9.
14. Nair M, Tripathi S, Mazumdar S, Mahajan R, Harshana A, Pereira A, et al. Knowledge, attitudes, and practices related to antibiotic use in Paschim Bardhaman District: a survey of healthcare providers in West Bengal, India. Angelillo IF, editor. PLoS One. 2019;14(5):e0217818.
15. Rao KD, Sundararaman T, Bhatnagar A, Gupta G, Kokho P, Jain K. Which doctor for primary health care? Quality of care and non-physician clinicians in India. Social Science and Medicine. 2013;84:84(30-4. https://doi.org/10.1016/j.socscimed.2013.02.018. Epub 2013 Feb 19. PMID: 23517701.):30–4.
16. Das S, Barnwal P. The need to train uncertified rural practitioners in India. The Journal of International Medical Research. 2018;46(1):522–5 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6011317/. Cited 2024 Mar 21
17. Thapa P, Jayasuriya R, Hall JJ, Mukherjee PS, Beek K, Briggs N, et al. Are informal healthcare providers knowledgeable in tuberculosis care? A cross-sectional survey using vignettes in West Bengal, India. Int Health. 2022;15(4):389–96.
18. Geldsetzer P, Manne-Goehler J, Theilmann M, Davies JI, Awasthi A, Vollmer S, et al. Diabetes and hypertension in India. JAMA Internal Med. 2018;178(3):363 https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2670035.
19. Ramani V, Suresh K. Prevalence of hypertension and diabetes morbidity among adults in a few urban slums of Bangalore city, determinants of its risk factors and opportunities for control – a cross-sectional study. J Family Med Prim Care. 2020;9(7):3264.
20. Ramesh S, Kosalram K. The burden of non-communicable diseases: a scoping review focus on the context of India. J Educ Health Promot. 2023;12:41 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10127498/.
21. Ministry of Health and Family Welfare (MoHFW), Government of India. Operational guidelines prevention, screening and control of common non-communicable diseases: hypertension, diabetes and common cancers (Oral, Breast and Cervix). main.mohfw.gov.in. Available from: https://main.mohfw.gov.in/sites/default/files/Operational%20Guidelines%20on%20Prevention%2C%20Screening%20and%20Control%20of%20Common%20NCDs_1.pdf.
22. Jose N, Sruthi M, Rachel J, Jerome K, Vaz C, Saju C. Barriers and facilitators of noncommunicable disease (NCD) prevention in Kerala: a qualitative study. J Family Med Prim Care. 2022;11(6):3109.
23. Amin AA, Marsh V, Noor AM, Ochola SA, Snow RW. The use of formal and informal curative services in the management of paediatric fevers in four districts in Kenya. Tropical Med Int Health. 2003;8(12):1143–52.
24. Kiapi-Iwa L, Hart GJ. The sexual and reproductive health of young people in Adjumani district, Uganda: qualitative study of the role of formal, informal and traditional health providers. AIDS Care. 2004;16(3):339–47.
25. Yadav K, Awasthi S. Care-seeking behavior of families of north Indian children suffering from WHO-defined severe community-acquired pneumonia: a hospital-based prospective study. Cureus. 2023;15(7): e41953. https://doi.org/10.7759/cureus.41953.
26. George A, Iyer A. Unfree markets: socially embedded informal health providers in northern Karnataka, India. Soc Sci Med. 2013;96:297–304. https://doi.org/10.1016/j.socscimed.2013.01.022.
27. Onwujekwe O, Mbachu C, Onyebueke V, Ogbozor P, Arize I, Okeke C, et al. Stakeholders' perspectives and willingness to institutionalize linkages between the formal health system and informal healthcare providers in urban slums in southeast, Nigeria. BMC Health Serv Res. 2022;22(1):583.
28. Nair M, Tripathi S, Mazumdar S, Mahajan R, Harshana A, Pereira A, et al. "Without antibiotics, I cannot treat": a qualitative study of antibiotic use in Paschim Bardhaman district of West Bengal, India. PLoS One. 2019;14(6). Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6597109/. Cited 2021 Feb 27.
29. Press Information Bureau. Government of India. Ministry of Health and Family Welfare (MoHFW). Cabinet approves certain official amendments to the National Medical Commission (NMC) Bill [Internet]. Pib.gov.in. 2018. [cited 2024 Nov 13]. Available from: https://pib.gov.in/newsite/PrintRelease.aspx?relid=178176.
30. Chandra S, Patwardhan K, Allopathic. AYUSH and informal medical practitioners in rural India – a prescription for change. J Ayurveda Integr Med. 2018;9(2):143–50.
31. Ramani S, Bahuguna M, Spencer J, Pathak S, Shende S, Pantvaidya S, et al. Many hops, many stops: care-seeking loops for diabetes and hypertension in three urban informal settlements in the Mumbai Metropolitan Region. Front Public Health. 2024;11:1257226. https://doi.org/10.3389/fpubh.2023.1257226.
32. Patton MQ. Qualitative research and evaluation methods. 3rd. Thousand Oaks, CA: Sage; 2002.
33. Creswell JW, Poth CN. Qualitative inquiry & research design: choosing among five approaches. Thousand Oaks: Sage Publications, Inc; 2016.
34. Miles MB, Huberman AM. Qualitative data analysis an expanded sourcebook. 2nd ed. Thousand Oaks: Sage Publications; 1994.
35. Lincoln YS, Guba EG. But is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. New Dir Program Eval. 1986;1986(30):73–84 https://onlinelibrary.wiley.com/doi/10.1002/ev.1427.
36. Cross J, MacGregor HN. Knowledge, legitimacy and economic practice in informal markets for medicine: a critical review of research. Soc Sci Med. 2010;71(9):1593–600.
37. Dalal N, Baskin A, Silberstein S, Svenson J. Reflections on informal and formal sector providers in rural Uttar Pradesh, India. Stanford J Public Health. 2015. Available from: https://web.stanford.edu/group/sjph/cgi-bin/sjphsite/reflections-on-informal-and-formal-sector-providers-in-rural-uttar-pradesh-india/. Cited 2024 Mar 21.
38. Gautham M, Shyamprasad KM, Singh R, Zachariah A, Singh R, Bloom G. Informal rural healthcare providers in North and South India. Health Policy and Plann. 2014;29(Suppl 1):i20–9. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4095923/.
39. Ahmed SM, Hossain MA. Knowledge and practice of unqualified and semi-qualified allopathic providers in rural Bangladesh: implications for the HRH problem. Health Policy. 2007;84(2–3):332–43.
40. Nayak PR, Oswal K, Pramesh CS, Ranganathan P, Caduff C, Sullivan R, et al. Informal providers—ground realities in South Asian association for regional cooperation nations: toward better cancer primary care: a narrative review. JCO Glob Oncol. 2022;8:e2200260.
41. The World Bank. Responding to the challenge of non-communicable diseases. Available from: https://documents1.worldbank.org/curated/en/208501570807014679/pdf/Responding-to-the-Challenge-of-Non-Communicable-Diseases.pdf.
42. Ministry of Health and Family Welfare (MoHFW), Government of India. National health policy 2017. New Delhi: Ministry of Health and Family Welfare; 2017. https://main.mohfw.gov.in/sites/default/files/9147562941489753121.pdf.
43. Ministry of Health and Family Welfare (MoHFW), Government of India. Operational guidelines National Programme for prevention and control of noncommunicable diseases. 2023. [cited 2024 Nov 13]. Available from: https://www.mohfw.gov.in/sites/default/files/NPNCD%20Operational%20Guidelines.pdf.

44. Krishnan A, Mathur P, Kulothungan V, Salve HR, Leburu S, Amarchand R, et al. Preparedness of primary and secondary health facilities in India to address major noncommunicable diseases: results of a National Noncommunicable Disease Monitoring Survey (NNMS). BMC Health Serv Res. 2021;21(1):1–2.
45. Kumar S, Sharma A, Sood A, Kumar S. Urban health in India. J Health Manage. 2016;18(3):489–98. https://doi.org/10.1177/0972063416651608.
46. Chawla NS. Unveiling the ABCs: identifying India's healthcare service gaps. Cureus. 2023;15(7). https://doi.org/10.7759/cureus.42398.
47. Mladovsky P. Fragmentation by design: universal health coverage policies as governmentality in Senegal. Soc Sci Med. 2020;260: 113153.
48. Devi R, Kanitkar K, Narendhar R, Sehmi K, Subramaniam K. A narrative review of the patient journey through the lens of non-communicable diseases in low- and middle-income countries. Adv Ther. 2020;37:4808–30. https://doi.org/10.1007/s12325-020-01519-3.
49. Mendoza JA, Lasco G, Renedo A, Palileo-Villanueva L, Seguin M, Palafox B, et al. (De)constructing therapeutic itineraries of hypertension care: a qualitative study in the Philippines. Social Science and Medicine. 2021;114570. Available from: https://www.sciencedirect.com/science/article/pii/S0277953621009023.
50. Ecks S, Basu S. We always live in fear: antidepressant prescriptions by unlicensed doctors in India. Medicine, and Psychiatry. 2014;38(2):197–216. https://doi.org/10.1007/s11013-014-9368-9. PMID: 24705978.
51. Thapa P, Narasimhan P, Beek K, Hall JJ, Jayasuriya R, Mukherjee PS, et al. Unlocking the potential of informal healthcare providers in tuberculosis care: insights from India. BMJ global health. 2024;9(2):e015212 https://pubmed.ncbi.nlm.nih.gov/38413099/. Cited 2024 Mar 20
52. Meghani A, Hariyani S, Das P, Bennett S. Public sector engagement of private healthcare providers during the COVID-19 pandemic in Uttar Pradesh, India. Mendez CA, editor. PLOS Global Public Health. 2022;2(7):e0000750.
53. Ponticiello M, Mwanga-Amumpaire J, Tushemereirwe P, Nuwagaba G, Nansera D, King R, et al. How informal healthcare providers improve uptake of HIV testing: qualitative results from a randomized controlled trial. AIDS. 2022;36(8):1161–9. Available from: https://journals.lww.com/aidsonline/Fulltext/2022/07010/How_informal_healthcare_providers_improve_uptake.12.aspx. Cited 2022 Dec 5.
54. Sieverding M, Beyeler N. Integrating informal providers into a people-centered health systems approach: qualitative evidence from local health systems in rural Nigeria. BMC Health Serv Res. 2016;16(1): 526. https://doi.org/10.1186/s12913-016-1780-0.
55. Shah NM, Brieger WR, Peters DH. Can interventions improve health services from informal private providers in low and middle-income countries? A comprehensive review of the literature. Health Policy Plann. 2010;26(4):275–87. https://doi.org/10.1093/heapol/czq074. Epub 2010 Nov 19. PMID: 21097784.
56. eSanjeevani - National Telemedicine Service. Observatory of public sector innovation. Available from: https://oecd-opsi.org/innovations/esanjeevani/.
57. Yuvaraj K, Gokul S, Sivaranjini K, Manikandanesan S, Murali S, Surendran G, et al. Prevalence of medication adherence and its associated factors among patients with noncommunicable disease in rural Puducherry, South India – a facility-based cross-sectional study. J Family Med Prim Care. 2019;8(2):701.
58. Kumar S, Gopal KM, Choudhary A, Soman A, Namburi URS. Advancing the one health approach through integration of Ayush systems: opportunities and way forward. Journal of Family Medicine and Primary Care. 2023;12(9):1764 https://journals.lww.com/jfmpc/fulltext/2023/12090/advancing_the_one_health_approach_through.3.aspx.
59. Khare S, Purohit M, Sharma M, Tamhankar AJ, Lundborg CS, Diwan V, et al. Antibiotic prescribing by informal healthcare providers for common illnesses: a repeated cross-sectional study in Rural India. Antibiot (Basel). 2019;8(3): 139. https://doi.org/10.3390/antibiotics8030139.
60. Das J, Chowdhury A, Hussam R, Banerjee AV. The impact of training informal health care providers in India: a randomized controlled trial. Science. 2016;354(6308):aaf7384-7384.
61. Sujon H, Sarkar MHR, Uddin A, Banu S, Islam MR, Amin MR, et al. Beyond the regulatory radar: knowledge and practices of rural medical practitioners in Bangladesh. BMC Health Serv Res. 2023;23(1):1322.
62. World Health Organization. WHO global strategy on people-centred and integrated health services: interim report. iriswhoint; 2015. Available from: https://iris.who.int/handle/10665/155002.
63. Goodman C, Brieger W, Unwin A, Mills A, Meek S, Greer G. Medicine sellers and malaria treatment in sub-Saharan Africa: what do they do and how can their practice be improved? Am J Trop Med Hyg. 2007;77(6Suppl):203–18.

Publisher's Note