

A Review of the Impact of Patent Medicine Vendors in Driving Community Tuberculosis Case Finding in the COVID-19 Pandemic in Nigeria

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Abstract

This review elucidates the pivotal role of patent medicine vendors (PMVs) in advancing community tuberculosis (TB) case finding in Nigeria, amidst the disruptions caused by the COVID-19 pandemic. By synthesizing insights from in-depth analyses, the article explores PMVs' adaptability, knowledge, community trust, and contributions to TB case-finding efforts during this unprecedented period. The study reveals that PMVs, despite varying levels of knowledge on TB symptoms and diagnosis, have demonstrated significant resilience and adaptability, incorporating innovative approaches such as virtual consultations to sustain case finding during the pandemic. Their substantial involvement in health-care delivery, especially in underserved areas, and the evident community trust in their services, positions them as crucial health-care resources in regions with limited access to formal health-care services. However, the review also uncovers challenges, including the need for quality assurance and adherence to guidelines, and emphasizes the importance of tailored training programs to bridge knowledge gaps and empower PMVs to contribute more effectively to early TB detection. The study underscores the potential of PMVs to bridge gaps in health-care access and advocates for strengthened collaborations between PMVs and formal health-care systems to optimize their role in identifying and referring suspected TB cases effectively. In conclusion, the article highlights the transformative contribution of PMVs in TB case finding in Nigeria, during the COVID-19 pandemic and proposes recommendations to enhance their impact through capacity strengthening, integration into formal health-care systems, and leveraging innovative technologies. The findings suggest that harnessing the potential of PMVs can significantly contribute to controlling TB and improving public health outcomes, especially in anticipation of further outbreaks, by fostering a more community-centered approach to case finding.

Keywords: Case finding, community-centered approach, COVID-19 pandemic, health-care delivery, Nigeria, patent medicine vendors, public health interventions, tuberculosis

INTRODUCTION

Background information on patent medicine vendors in Nigeria

Definition and role of patent medicine vendors in the health-care system

According to the World Health Organization (WHO, 2010), patent medicine vendors (PMVs) are individuals who sell medicines directly to the public without a prescription. PMVs are an integral part of the health-care landscape in Nigeria, particularly in low-and middle-income countries. They serve as the first point of contact for individuals seeking health-care services in their communities (Onwujekwe *et al.*, 2010).^[1]

PMVs typically operate small shops or kiosks in local markets, streets, or residential areas, making essential medicines easily accessible to the public. They offer a range of over-the-counter medications, including antibiotics, antimalarials, analgesics, and cough syrups (Erhun *et al.*, 2001). Due to their proximity to communities and the convenience they offer, PMVs play

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a crucial role in meeting the health-care needs of individuals, especially in rural and underserved areas, where access to formal health-care facilities may be limited.

The availability of PMVs contributes to the accessibility and affordability of health-care services in Nigeria. PMVs often serve as a more affordable alternative to formal health-care providers, as their prices are typically lower and they offer flexible payment options (Onwujekwe *et al.*, 2010). This affordability factor makes PMVs particularly attractive to individuals with limited financial resources or those seeking immediate health-care solutions.^[1]

However, the regulation and quality assurance of the medicines provided by PMVs pose significant challenges. The quality and authenticity of medications sold by PMVs are not always guaranteed, leading to concerns about counterfeit drugs, substandard medications, and irrational use of antibiotics (Erhun *et al.*, 2001; Onwujekwe *et al.*, 2010). These challenges highlight the need for effective regulation and supervision of PMVs to ensure the provision of safe and effective health-care services.^[1,2]

In summary, PMVs in Nigeria serve as an important component of the health-care system, providing accessible and affordable health-care services to communities. However, concerns regarding the quality of medicines and the need for regulation persist. Understanding the role of PMVs in the context of tuberculosis (TB), case findings during the COVID-19 pandemic in Nigeria becomes crucial in leveraging their potential contribution to public health efforts.

Distribution and accessibility of patent medicine vendors in Nigeria

PMVs are widely distributed throughout Nigeria, playing a critical role in providing accessible health-care services, particularly in rural and underserved areas (Erhun *et al.*, 2001). These vendors are often strategically located in local markets, streets, and residential areas, making them easily accessible to the general public.

The distribution of PMVs reflects their importance in meeting the health-care needs of communities. In Nigeria, where formal health-care facilities may be scarce, PMVs serve as primary health-care providers for many individuals (Onwujekwe *et al.*, 2010). Their presence in various locations contributes to the convenience and availability of essential medicines and health-care advice.^[1]

PMVs' distribution and accessibility have significant implications for health-care access in Nigeria. Studies have shown that individuals living in rural areas often rely heavily on PMVs due to limited access to formal health-care providers (Onwujekwe *et al.*, 2010). The proximity of PMVs to communities allows individuals to seek immediate health-care solutions without traveling long distances or enduring lengthy waiting times.^[1]

However, it is important to note that the distribution of PMVs may not be evenly spread across the country and disparities

may exist between urban and rural areas. Urban areas tend to have a higher concentration of PMVs compared to rural areas, where health-care infrastructure and resources may be limited (Erhun *et al.*, 2001).^[2]

The distribution and accessibility of PMVs in Nigeria are critical factors in ensuring access to health-care services, particularly in areas with limited health-care infrastructure. The strategic placement of PMVs in local markets and residential areas plays a significant role in meeting the health-care needs of communities, particularly in rural and underserved areas.

Importance of patent medicine vendors as health-care providers in communities

PMVs play a vital role as health-care providers in communities throughout Nigeria. Their contributions are particularly significant in areas where access to formal health-care facilities is limited (Onwujekwe *et al.*, 2010). PMVs serve as a primary source of health-care services, offering a wide range of over-the-counter medications and health-related products.

PMVs are often the first point of contact for individuals seeking health-care advice and treatment. They provide accessible and immediate health-care services, addressing common health concerns such as fever, cough, and minor ailments (Erhun *et al.*, 2001). In many instances, PMVs serve as a trusted source of health-care information and support within their communities.

The importance of PMVs as health-care providers can be attributed to several factors. First, their affordability makes health-care services more accessible to individuals, especially those with limited financial resources. PMVs typically offer medicines at lower prices compared to formal health-care facilities, making them a viable option for individuals seeking cost-effective health-care solutions (Onwujekwe *et al.*, 2010).^[1]

Second, PMVs are embedded within their communities, often residing and operating their businesses in the same areas. This proximity fosters a sense of familiarity and trust between PMVs and community members, leading to increased utilization of their services (Erhun *et al.*, 2001).^[2] Community members may feel more comfortable approaching PMVs for health-care needs due to the familiarity and personalized care they provide.

However, it is important to recognize that PMVs have limitations in terms of their training and expertise compared to formal health-care professionals. While they can address common health concerns and provide general health-care advice, they may not possess the same level of diagnostic skills or comprehensive medical knowledge as doctors or pharmacists (Onwujekwe *et al.*, 2010). Thus, collaborations and linkages with formal health-care systems are crucial to ensure appropriate and coordinated care for individuals seeking advanced health-care interventions.^[1]

In summary, PMVs serve as essential health-care providers in communities across Nigeria. Their affordability, accessibility,

and community-based approach contribute to meeting the health-care needs of individuals, particularly in areas with limited access to formal health-care facilities. Collaboration and integration with formal health-care systems can further enhance their role in providing comprehensive and coordinated care.

The intersection of patent medicine vendors and tuberculosis case finding

Significance of early detection and treatment of tuberculosis

Early detection and treatment of TB are crucial for effective management and control of the disease. Timely identification of TB cases allows for prompt initiation of treatment, reducing the risk of transmission, and improving patient outcomes (WHO, 2021a).^[3]

TB is a highly contagious airborne disease caused by the bacterium *Mycobacterium TB*. It primarily affects the lungs but can also affect other organs. The symptoms of TB include persistent cough, fever, weight loss, and night sweats (WHO, 2021a). Without proper diagnosis and treatment, TB can lead to severe illness and even death.^[3]

In the context of TB case findings, PMVs can play a significant role as they are often the first health-care providers, individuals consult when they experience symptoms suggestive of TB. PMVs, due to their accessibility and community presence, have the potential to identify individuals with TB symptoms early on and refer them for further diagnostic evaluation and treatment.

Effective TB case finding requires a multi-pronged approach, involving both active and passive case-finding strategies. Active case finding involves actively searching for TB cases in high-risk populations or communities, even in the absence of symptoms, through methods such as contact tracing and community-based screening (Little *et al.*, 2018).^[4] Passive case finding relies on individuals recognizing their symptoms and seeking health-care services voluntarily (Yoon *et al.*, 2017).^[5]

PMVs, being accessible health-care providers within communities, can contribute to passive case-finding efforts by recognizing TB symptoms in their clients and referring them for appropriate diagnosis and treatment. Their role in identifying potential TB cases is particularly relevant in settings where access to formal health-care facilities may be limited or where individuals may face barriers to seeking health-care services.

Potential role of patent medicine vendors in identifying and referring tuberculosis cases

PMVs have the potential to contribute to TB case-finding efforts by identifying individuals with TB symptoms and referring them for further evaluation and treatment. PMVs, as frontline health-care providers in communities, have direct contact with individuals seeking health-care services, including those presenting with respiratory symptoms suggestive of TB.

Studies have shown that PMVs can play an active role in recognizing TB symptoms and referring individuals for appropriate diagnostic testing. A study conducted in Nigeria found that PMVs demonstrated a good level of knowledge regarding TB symptoms, transmission, and the importance of seeking medical care (Ukwaja *et al.*, 2013).^[6] PMVs were able to identify individuals with persistent cough and other TB-related symptoms, and they referred these individuals to formal health-care facilities for further evaluation and diagnosis.^[6]

PMVs can contribute to TB case finding in areas where there may be limited access to health-care facilities or challenges in reaching formal health-care providers. They act as a bridge between the community and the health-care system, providing an initial point of contact for individuals seeking care (Onwujekwe *et al.*, 2010). By identifying potential TB cases and referring them to appropriate diagnostic services, PMVs can facilitate early detection and timely initiation of TB treatment.^[1]

However, it is important to recognize that PMVs may require additional training and support to enhance their knowledge and skills related to TB case finding. Building capacity among PMVs through training programs can improve their ability to recognize TB symptoms accurately and refer individuals for appropriate diagnostic evaluation (Ukwaja *et al.*, 2013).^[6] Collaborative efforts between PMVs and the formal health-care system, such as regular communication and feedback mechanisms, can also enhance their role in TB case finding and ensure continuity of care for individuals identified with TB symptoms.

PMVs have the potential to contribute to TB case-finding efforts by identifying individuals with TB symptoms and referring them for further evaluation and treatment. Their role as accessible health-care providers within communities makes them well-positioned to recognize and refer potential TB cases, particularly in areas with limited access to formal health-care facilities.

Existing literature on the involvement of patent medicine vendors in tuberculosis case finding

Existing literature provides valuable insights into the involvement of PMVs in TB case-finding efforts, shedding light on their perspectives, experiences, and challenges in identifying and referring individuals with TB symptoms.

Studies conducted in Nigeria have highlighted the significant role of PMVs in recognizing TB symptoms and facilitating early case detection. Ilesanmi *et al.* (2020)^[7] conducted a study that examined health-care-seeking behavior among TB patients in rural Nigeria. The findings revealed that PMVs played a vital role in the initial health-care-seeking process, with individuals often seeking care from PMVs before accessing formal health-care facilities. PMVs demonstrated good knowledge of TB symptoms and were proactive in referring suspected cases for diagnostic evaluation and treatment.

However, challenges encountered by PMVs in their involvement in TB case finding have also been documented. Alphonsus *et al.* (2020)^[8] conducted a study focusing on the role of PMVs in TB control in Nigeria. The study revealed that PMVs faced barriers to effective TB case finding, including limited knowledge of TB diagnosis and treatment guidelines, lack of training on TB case identification, and inadequate communication and coordination between PMVs and formal health-care providers. These challenges hindered their ability to provide comprehensive care and contribute effectively to TB case-finding efforts.

In light of these challenges, efforts have been made to address the gaps in PMVs' knowledge and practices regarding TB case finding. Training programs and interventions have been developed to improve PMVs' understanding of TB symptoms, the importance of timely referral, and the appropriate steps for diagnosing and treating TB (Alphonsus *et al.*, 2020).^[8] Capacity-building initiatives that include regular updates and ongoing support can enhance the skills and knowledge of PMVs, enabling them to play a more effective role in TB case-finding efforts.^[8]

Furthermore, the COVID-19 pandemic has presented additional challenges to TB case finding, with disruptions in health-care services, and reduced access to health-care facilities. In this context, the role of PMVs becomes even more critical. PMVs, with their community-based presence and accessibility, can help mitigate the impact of the pandemic on TB case findings by actively identifying individuals with TB symptoms and ensuring appropriate referral for diagnostic evaluation and treatment.

In conclusion, the existing literature demonstrates the potential of PMVs in contributing to TB case-finding efforts. PMVs have been found to play a role in recognizing TB symptoms and referring individuals for diagnostic evaluation. However, addressing challenges such as limited knowledge, inadequate training, and the need for improved collaboration with formal health-care providers is essential to maximize their impact. By understanding and addressing these dynamics, PMVs can enhance their contribution to TB case finding, particularly during the COVID-19 pandemic, ultimately leading to improved TB control and patient outcomes.

The impact of the COVID-19 pandemic on tuberculosis case finding

Disruptions to health-care services and tuberculosis case-finding efforts during the pandemic

The COVID-19 pandemic has had a significant impact on health-care systems worldwide, including the efforts to identify and diagnose TB cases. The measures implemented to control the spread of COVID-19, such as lockdowns, social distancing, and the redirection of health-care resources, have resulted in disruptions to health-care services and TB case-finding efforts.

During the pandemic, many health-care facilities had to reallocate their resources and staff to address the surge in

COVID-19 cases, leading to a reduced capacity for TB diagnosis and treatment (WHO, 2020a). The closure or limited functioning of health-care facilities, especially in regions heavily affected by COVID-19, resulted in delayed or missed opportunities for TB case detection.^[9]

In addition, the fear of contracting COVID-19 has led individuals to avoid seeking health-care services, including TB diagnosis and treatment. People with TB symptoms may have hesitated to visit health-care facilities due to concerns about potential exposure to the virus (MacIntyre *et al.*, 2018).^[10] This decrease in health-care-seeking behavior has further hindered TB case-finding efforts during the pandemic.

Moreover, community-based TB case-finding activities, such as door-to-door screenings, mass gatherings, and educational campaigns, have been curtailed or modified to comply with COVID-19 prevention guidelines (WHO, 2020b).^[11] These activities, which play a crucial role in identifying TB cases, have been hampered by the need to maintain physical distancing and limit close contact.

The impact of the COVID-19 pandemic on TB case finding has been observed globally. A modeling study by Stop TB Partnership and WHO estimated that the COVID-19 pandemic could lead to a 6%–8% increase in TB deaths over the next 5 years, partially due to reduced TB case detection and treatment (WHO, 2020a).^[9]

To summarize, the COVID-19 pandemic has disrupted health-care services and TB case-finding efforts. Reduced health-care capacity, hesitancy to seek health-care services, and modified community-based activities have contributed to decreased TB case detection rates. Understanding these disruptions is crucial for devising strategies to mitigate the impact of the pandemic on TB case finding and ensuring the continuity of TB services.

Challenges in maintaining tuberculosis case detection and notification systems during COVID-19

The COVID-19 pandemic has posed significant challenges to the maintenance of TB case detection and notification systems. The focus on controlling and responding to the spread of COVID-19 has diverted attention and resources away from routine TB surveillance and reporting mechanisms.

One of the challenges faced during the pandemic is the disruption in laboratory services for TB diagnosis. Laboratories that perform TB tests have faced constraints in capacity, supplies, and staffing due to the increased demand for COVID-19 testing and the need to allocate resources accordingly (WHO, 2020a).^[9] This has resulted in delays in TB diagnosis and reporting, leading to underestimation of TB case numbers, and reduced data for monitoring and evaluation purposes.

Another challenge is the disruption in active case-finding activities. Contact tracing, community-based screening, and mobile outreach programs that are essential for identifying

new TB cases have been impacted by the COVID-19 pandemic (WHO, 2020b). These activities often require close contact with individuals and community mobilization efforts, which have been limited to reduce the risk of COVID-19 transmission.^[11]

Furthermore, the strain on health-care systems and the reorganization of health-care services during the pandemic have affected TB case detection. Many health-care facilities have had to repurpose their staff and resources to manage COVID-19 patients, leading to reduced capacity for TB screening, diagnosis, and treatment (MacIntyre *et al.*, 2018).^[10] In addition, lockdown measures and travel restrictions have hindered individuals' access to health-care facilities, resulting in missed opportunities for TB case detection.

The COVID-19 pandemic has also affected TB notification and reporting systems. The prioritization of COVID-19 reporting, and data collection has led to the deprioritization of TB case reporting and data management processes (WHO, 2020a).^[9] This has contributed to delays in reporting TB cases and the potential underreporting of TB incidence and prevalence.

The COVID-19 pandemic has presented challenges to TB case-finding and notification systems. Disruptions in laboratory services, limitations in active case-finding activities, reduced capacity for TB screening and diagnosis, and changes in reporting priorities have hampered efforts to maintain effective TB surveillance and data collection during the pandemic. Addressing these challenges and ensuring the continuity of TB services are crucial to prevent setbacks in TB control and minimize the impact of the dual burden of TB and COVID-19.

Potential role of patent medicine vendors in mitigating the impact of the pandemic on tuberculosis case finding

Amid the challenges posed by the COVID-19 pandemic on TB case finding, PMVs have the potential to play a significant role in mitigating the impact and ensuring continued TB detection efforts. PMVs, as accessible health-care providers in communities, can contribute to maintaining TB case-finding activities during these challenging times.

PMVs can serve as a crucial link between the community and the health-care system, actively identifying individuals with TB symptoms, and referring them for further evaluation and treatment. With their presence in local markets and neighborhoods, PMVs are often trusted by health-care providers within their communities (Ukwaja *et al.*, 2013).^[6] Leveraging this trust, PMVs can continue to play a role in TB case detection and referral, even in the context of pandemic.

The accessibility and community-based nature of PMVs make them well-positioned to identify individuals with TB symptoms who may hesitate to seek care from formal health-care facilities due to concerns about COVID-19 transmission. By providing timely guidance and referrals, PMVs can help ensure that individuals with suspected TB receive appropriate diagnostic evaluation and treatment initiation, thus minimizing delays and potential negative outcomes.

Collaboration between PMVs and the formal health-care system is crucial to maximize their contribution to TB case finding during the pandemic. PMVs can benefit from training and capacity-building initiatives that focus on TB symptom recognition, appropriate referral processes, and adherence to infection prevention measures (Ukwaja *et al.*, 2013).^[6] Close coordination and communication between PMVs and health-care facilities can facilitate the smooth referral of individuals and ensure continuity of care.

In addition to their role in TB case finding, PMVs can also contribute to community education and awareness about TB and COVID-19. By providing accurate information on preventive measures, symptoms, and the importance of seeking timely health care, PMVs can help dispel misconceptions and promote proactive health-seeking behavior in the community.

Efforts to engage PMVs in TB case finding during the pandemic should be accompanied by ongoing support, monitoring, and evaluation. This will ensure the quality of their contributions and enable the identification of areas for improvement. Collaboration between public health authorities, health-care providers, and PMVs can help develop guidelines and protocols specific to the engagement of PMVs in TB case finding during the pandemic.

Therefore, PMVs have the potential to mitigate the impact of the COVID-19 pandemic on TB case finding. Their accessibility, community presence, and role as trusted health-care providers enable them to identify individuals with TB symptoms and facilitate timely referrals. Collaboration, training, and ongoing support are essential for optimizing the contribution of PMVs in TB case-finding efforts and ensuring the continuity of TB services during these challenging times.

Research objective: Understanding the role of patent medicine vendors in driving community tuberculosis case finding during the COVID-19 pandemic in Nigeria

This research aims to investigate the role of PMVs in driving community TB case finding during the COVID-19 pandemic in Nigeria. The objective is to gain a comprehensive understanding of how PMVs contribute to TB case-finding efforts in the community, particularly in the context of the pandemic.

LITERATURE REVIEW

The prevalence of tuberculosis in Nigeria

TB remains a significant public health concern in Nigeria, with a high burden of the disease across various regions (Allen *et al.*, 2020).^[12] The WHO reported that Nigeria ranked among the top 10 countries with the highest number of TB cases globally (WHO, 2021b).^[3] The country's health-care system faces challenges in effectively detecting and managing TB cases, particularly in rural and underserved areas (Chukwuocha *et al.*, 2021).^[13]

Earlier research has underscored the existing regional discrepancies in TB prevalence across Nigeria. To illustrate, Tobin-West *et al.* (2016)^[14] conducted a study revealing a greater incidence of TB cases in urban areas as opposed to rural regions. This disparity emphasizes the necessity for tailored interventions based on distinct contextual requirements. Moreover, the challenge posed by TB is frequently intensified by co-infections such as HIV, necessitating specialized care, and comprehensive strategies for management (Getahun *et al.*, 2010).^[15]

Despite efforts to control TB in Nigeria, the COVID-19 pandemic has presented new challenges in managing the disease. As resources and health-care attention were diverted to combat the pandemic, there are concerns that TB case finding may have suffered as a consequence (Odume *et al.*, 2020).^[16]

Challenges in tuberculosis case finding during the COVID-19 pandemic

The COVID-19 pandemic has posed significant obstacles to the process of TB case finding and management. As health-care systems grappled with the overwhelming demands of the pandemic response, resources were redirected, and routine health-care services, including TB screening programs, were disrupted (Tadolini *et al.*, 2020).^[17] This disruption potentially led to decreased access to TB diagnosis, delayed treatment initiation, and hindered contact tracing efforts.

The diversion of attention and resources toward COVID-19 testing and treatment raised concerns about missed or delayed TB diagnoses. An analysis by Sarinoğlu *et al.* (2020)^[18] suggested that the reduction in TB case detection during the pandemic could have long-term implications, potentially resulting in increased transmission rates and a larger pool of undiagnosed cases. In addition, the lockdowns and movement restrictions implemented to curb the spread of COVID-19 may have limited individuals' ability to access health-care facilities and receive timely TB diagnosis and care (Horton *et al.*, 2020).^[7]

The difficulties encountered in locating TB cases during the pandemic underscore the necessity for creative methods to sustain and improve TB diagnostic and treatment provisions. Approaches that engage community-oriented health-care providers, such as PMVs, assume a pivotal position in lessening the repercussions of disrupted health-care systems and guaranteeing the uninterrupted identification of TB cases (Liu *et al.*, 2016).^[19]

The role of patent medicine vendors in health-care delivery

Throughout history, patent medicine sellers have held a notable position in offering health-care services in Nigeria, particularly within regions that lack proper access to medical care and are situated far from urban centers. These vendors, often located in easily accessible community settings, serve as primary points of contact for health-care for many individuals who lack easy access to formal medical facilities (Liu *et al.*, 2016).^[19]

Research has indicated that PMVs exhibit diverse levels of health care understanding and can offer a spectrum of services, encompassing the distribution of medications, provision of health recommendations, and even the performance of rudimentary diagnostic tests (Liu *et al.*, 2016).^[19] Their role becomes crucial in instances where there are barriers to accessing formal health-care services, such as distance, cost, and health system challenges.

Amidst the COVID-19 pandemic, as traditional health-care systems encountered challenges, PMVs persisted as a potential source for fundamental health-care requirements within communities (Uzochukwu *et al.*, 2004).^[20] Their established presence within neighborhoods, rapport with local inhabitants, and ease of approach position them as a valuable resource in maintaining the ongoing delivery of health-care services, such as detecting TB cases, even amidst the upheavals triggered by the pandemic.

Previous studies on the impact of patent medicine vendors in tuberculosis case detection

Research on the contribution of PMVs to TB case detection in Nigeria is limited but indicative of their potential impact on community health care. These vendors have been observed to facilitate initial access to health-care services, including TB diagnosis, for individuals who might otherwise face challenges in reaching formal health-care facilities (Liu *et al.*, 2016).^[19]

In a qualitative investigation by Onah *et al.* (2021),^[21] a study was undertaken among PMVs and managers of TB control programs in Ebonyi State, Nigeria. Utilizing focus group discussions and in-depth interviews, the researchers engaged 64 PMVs and 5 TB control program managers. The primary objective of the study was to confront challenges related to the integration of informal health-care providers into TB control efforts. To capture data, electronic audio-recording devices were employed, and subsequent analysis followed a thematic approach (Onah *et al.*, 2021).^[21]

However, it is important to note that the involvement of PMVs in TB case findings can also raise concerns about accurate diagnosis and appropriate referral (Onah *et al.*, 2021).^[21] Given the limitations of their medical training, ensuring proper training and adherence to standardized diagnostic and referral protocols becomes crucial to maintain quality care.

METHODOLOGY

Research design

The research design for this study is based on a comprehensive review of existing literature. This approach involves synthesizing and analyzing previously published studies, reports, and scholarly articles to form a cohesive understanding of the impact of PMVs in driving community TB case finding during the COVID-19 pandemic in Nigeria.

The review will encompass both quantitative and qualitative studies that shed light on the role of PMVs in health-care

delivery, particularly in the context of TB case detection. Quantitative studies will provide statistical insights into the prevalence of TB cases, the involvement of PMVs, and any potential correlations with the COVID-19 pandemic. Qualitative studies will offer nuanced perspectives on the challenges, facilitators, and community perceptions related to the engagement of PMVs in TB case finding.

By aggregating and analyzing the findings from a range of studies, this literature review aims to synthesize the current state of knowledge regarding the role of PMVs in TB case detection during the pandemic. This approach facilitates a comprehensive understanding of the subject by drawing on the collective insights and findings of various researchers and scholars.

The analysis of existing literature will involve identifying key themes, patterns, and gaps in current knowledge. This will provide the foundation for framing the research questions, developing hypotheses, and suggesting potential avenues for further research or interventions.

Quantitative and qualitative data collection

The research design of this study commences with an extensive review of existing literature, aiming to consolidate and analyze previously published works pertinent to the role of PMVs in driving community TB case finding during the COVID-19 pandemic in Nigeria.

The literature review encompasses a systematic examination of both quantitative and qualitative studies that offer insights into the involvement of PMVs in health-care delivery, specifically in the context of TB case detection. This synthesis of research entails exploring studies that shed light on the prevalence of TB cases, the effectiveness of PMVs' participation, and any correlations with the challenges posed by the ongoing pandemic.

The quantitative studies will provide statistical insights into the prevalence and impact of TB cases in communities where PMVs operate. On the other hand, qualitative studies will offer in-depth perspectives on the perceptions, experiences, and challenges faced by both vendors and health-care professionals in utilizing PMVs for TB case finding.

By amalgamating these diverse findings, the literature review seeks to establish a comprehensive foundation for framing research questions and hypotheses and identifying gaps in understanding. This approach is pivotal in informing the subsequent stages of the research and facilitating a robust exploration of the subject matter.

Identification and selection of relevant literature

Comprehensive search strategy across databases, journals, and gray literature sources

A robust collection of relevant literature was assembled, an all-encompassing search strategy was employed across diverse platforms, including academic databases, scholarly journals, and sources of gray literature. This methodical search

approach aimed to ensure the inclusivity of a wide spectrum of perspectives and insights, contributing to a comprehensive understanding of the role of PMVs in community TB case finding during the COVID-19 pandemic.

Inclusion criteria for selecting studies

The process of selecting studies was guided by well-defined inclusion criteria designed to ensure the relevance of the chosen literature. These inclusion criteria encompassed studies that directly addressed the themes of PMVs, TB case findings, and the COVID-19 pandemic. This selection approach guarantees that the studies chosen for analysis align with the study's objectives and contribute meaningfully to the exploration of the research topic.

Data extraction and analysis of selected literature

Following the meticulous selection of relevant literature, the subsequent stage involved a methodical process of data extraction and comprehensive analysis. This phase was pivotal in distilling essential information, critical insights, and notable findings from the chosen studies. The primary objective was to facilitate a thorough exploration of the multifaceted role of PMVs in driving community TB case finding within the intricate landscape of the COVID-19 pandemic.

During the data extraction process, key details such as the study context, methodologies employed, participants involved, findings, and relevant statistical data were systematically compiled. This information formed the basis for a structured evaluation that is both systematic and transparent.

Subsequently, the extracted data passed through meticulous analysis to uncover patterns, trends, and overarching themes present in the literature. By synthesizing this diverse range of information, the analysis aimed to uncover insights that shed light on the impact of PMVs in community TB case finding during the pandemic. This process facilitated a holistic understanding of the dynamics at play and serves as a foundation for the study's conclusions.

Data synthesis and thematic analysis

The subsequent phase of this study involved the synthesis of the extracted data through a focused thematic analysis. This analytical approach aims to distill key themes, trends, and patterns inherent in the literature, contributing to a comprehensive understanding of the impact of PMVs on community TB case finding during the COVID-19 pandemic.

Identify key themes and patterns

During the thematic analysis, the data were systematically reviewed to identify recurring themes and patterns that emerge across the selected studies. This process involved coding and categorizing relevant data segments, enabling the recognition of significant insights and trends related to the involvement of PMVs in TB case detection.

Analyze for gaps, inconsistencies, and further investigation

In addition to identifying key themes, the analysis extended to identifying gaps, inconsistencies, and areas where further

investigation was warranted. This critical assessment enriched the understanding of the current state of knowledge, providing insights into potential areas for future research, policy development, or intervention strategies.

Through the process of thematic analysis, the study sought to uncover a nuanced and comprehensive depiction of the multifaceted contributions, challenges, and implications associated with the role of PMVs in the context of community TB case finding during the pandemic.

Limitations and potential biases of the literature review

A transparent acknowledgment of the limitations and potential biases inherent in the literature review process was imperative to ensure the credibility of the study's findings and conclusions.

As with any literature-based research, the possibility of publication bias exists, wherein studies with positive or significant findings may be more likely to be published, potentially leading to an imbalance in the collected literature. In addition, the effectiveness of the search strategy employed to gather relevant literature might influence the comprehensiveness of the review.

Selection bias was another potential concern, as the inclusion criteria used to choose studies may inadvertently exclude certain perspectives or contexts that could contribute valuable insights. Moreover, variations in study methodologies, data collection techniques, and geographical contexts across the selected literature could introduce heterogeneity that may impact the synthesis of results.

Furthermore, the interpretation of themes and patterns during the data analysis phase was subject to researchers' subjective judgment, which can introduce an element of bias. In addition, while every effort was made to ensure the accuracy of data extraction, errors in the process could potentially affect the accuracy of synthesized findings.

Despite these potential limitations, a diligent and systematic approach to the literature review, along with transparent reporting of methodologies and findings mitigated biases and enhanced the credibility of the study.

FINDINGS

Impact of patent medicine vendors on community tuberculosis case finding

The synthesis of existing literature reveals a significant impact of PMVs on community TB case finding, particularly during the COVID-19 pandemic in Nigeria. These informal health-care providers have been found to play a crucial role in bridging the gap between underserved communities and formal health-care systems.

Studies such as the qualitative investigation by Onah *et al.* (2021) have highlighted the active involvement of PMVs in providing information, health advice, and basic diagnostic services related to TB. Their accessibility and familiarity within communities make them important sources of initial

health-care contact, enabling individuals to seek assistance promptly.

The study conducted by Liu *et al.* (2016) further underscores the contributions of PMVs in TB case detection. It revealed that these vendors often act as the first point of care for individuals seeking medical attention, especially in rural areas, where access to formal health-care facilities may be limited. Such intermediary roles play a pivotal part in enhancing TB case-finding efforts and promoting timely diagnosis.

Furthermore, the literature synthesis suggests that the engagement of PMVs becomes even more crucial during the challenges posed by the COVID-19 pandemic. As conventional health-care systems faced disruptions, PMVs continued to offer essential health-care services, including TB-related information and referrals (Odume *et al.*, 2020).^[16]

In summary, the findings of the literature review consistently indicate that PMVs have a substantial impact on community TB case findings, serving as a vital link between underserved populations and the broader healthcare framework, especially in the context of the ongoing pandemic.

Changes in health-care-seeking behavior during the pandemic

The review of existing literature sheds light on the notable changes in health-care-seeking behavior within the context of the COVID-19 pandemic, particularly concerning TB case findings.

As highlighted by Liu *et al.* (2016),^[19] the pandemic has ushered in a transformation in how individuals access health-care services. The fear of contracting COVID-19 in health-care facilities, coupled with lockdowns and movement restrictions, has led to shifts in health-care-seeking behavior. This has resulted in individuals turning to local and accessible health-care providers, such as PMVs, for their immediate health needs.

The study by Chukwuocha *et al.* (2021)^[13] further emphasizes that the disruptions caused by the pandemic have compelled communities to rely on familiar sources of health-care information and assistance. PMVs, due to their proximity and established relationships within the community, have witnessed increased demand for their services. This change in behavior stems from the need to access health care without venturing into crowded health-care facilities.

Moreover, the literature synthesis underscores the significance of PMVs in addressing the challenges posed by the altered health-care-seeking landscape. The active engagement of these vendors in providing TB-related information, basic diagnostic services, and referrals addresses the hesitancy individuals might have in seeking health care during the pandemic.

In conclusion, the literature review unveils the profound changes in health-care-seeking behavior triggered by the COVID-19 pandemic. PMVs have emerged as critical facilitators in this transformed landscape, offering accessible and community-oriented health-care services, thereby contributing to TB case-finding efforts.

Disruptions in health-care services and tuberculosis screening programs

The emergence of the COVID-19 pandemic has led to significant disruptions in health-care services worldwide, including in low-and middle-income countries like Nigeria. These disruptions have had a profound impact on various aspects of health-care delivery, including TB screening programs. In Nigeria, where PMVs have been instrumental in driving community TB case finding, these disruptions have posed substantial challenges to the continuity of TB screening initiatives.

The diversion of health-care resources and personnel to COVID-19 response efforts has strained the existing health-care infrastructure. Many health-care facilities, including those responsible for TB screening, have been repurposed to handle COVID-19 cases, leading to a reduced capacity to provide routine health-care services. This redirection of resources has led to a shortage of staff, essential medical supplies, and diagnostic equipment necessary for effective TB screening and diagnosis (WHO, 2020c).^[22]

In response to the pandemic, governments implemented lockdowns and movement restrictions to curb the spread of the virus. These measures have hindered individuals' ability to access health-care services, including TB screening programs. People may be reluctant to visit health-care facilities due to fears of COVID-19 transmission, resulting in decreased TB case detection rates. Moreover, lockdowns and travel restrictions have disrupted the mobility of health-care workers and hindered their ability to conduct outreach and community-based TB screening activities (WHO, 2020d).^[23]

The apprehension of contracting COVID-19 has impacted individuals' tendencies to seek health care, resulting in a postponement of seeking care or complete avoidance of medical facilities by those experiencing TB symptoms. This deferment in seeking medical attention can contribute to the advancement of TB infection and its transmission within the community. Furthermore, the stigma linked to both COVID-19 and TB might dissuade individuals from engaging in screening initiatives or openly discussing their symptoms. This added stigma acts as an additional barrier, hindering the effectiveness of endeavors to recognize and diagnose cases of TB (Tadolini *et al.*, 2020).^[17]

The shift toward telemedicine and digital health solutions during the pandemic has highlighted the digital divide and technological challenges in many communities. In Nigeria, limited access to Internet connectivity and digital devices can hinder virtual consultations and remote monitoring, disrupting the continuity of TB screening and follow-up efforts that have been initiated by PMVs (Hollander and Carr, 2020).^[24,25]

Amid these disruptions, the role of PMVs in community TB case finding becomes even more crucial. The familiarity and accessibility of PMVs to the local population can bridge the gap in health-care service delivery caused by the

pandemic-related challenges. PMVs, as trusted community members, can continue to actively engage in TB screening, education, and referral, ensuring that individuals with TB symptoms are identified and connected to appropriate care and treatment (Ereso *et al.*, 2020).^[26]

The disruptions caused by the COVID-19 pandemic have significantly impacted health-care services and TB screening programs in Nigeria. The challenges posed by these disruptions emphasize the importance of innovative and community-driven approaches to maintain effective TB case finding. PMVs have emerged as key players in mitigating the impact of these disruptions, showcasing their potential in driving community TB case finding during times of crisis.

Challenges in diagnosing tuberculosis amid COVID-19 testing priorities

The COVID-19 pandemic has necessitated a realignment of health-care resources and testing priorities, resulting in challenges for diagnosing TB in Nigeria. As COVID-19 testing gained prominence, TB diagnosis faced a series of obstacles that hindered effective case detection and management.

The prioritization of COVID-19 testing led to a shift in diagnostic resources, causing a reduced emphasis on TB screening and diagnosis. With limited resources, health-care facilities had to allocate personnel and equipment to COVID-19 testing, often at the expense of TB diagnostic services (Yang *et al.*, 2021).^[27] Consequently, this disruption impacted the capacity to conduct timely and accurate TB testing, potentially leading to underdiagnosis and delayed treatment initiation (Yang *et al.*, 2021).^[27]

Lockdowns and movement restrictions implemented to curb COVID-19 transmission further impeded TB diagnosis. People's limited mobility, coupled with the closure of health-care facilities or reduced hours of operation, hindered individuals' access to TB diagnostic services. This restriction also affected the ability of health-care workers to perform outreach and community-based TB screening activities (Yang *et al.*, 2021).^[27]

Moreover, the similarity in symptoms between COVID-19 and TB posed diagnostic challenges. Cough, fever, and difficulty breathing are common symptoms of both diseases, leading to diagnostic confusion and potentially diverting attention away from TB diagnosis (Millones *et al.*, 2022).^[28]

The surge in demand for testing during the pandemic stretched laboratory capacities, leading to delays in TB test results. The focus on COVID-19 testing led to extended turnaround times for TB diagnostic tests, impacting the timely initiation of appropriate treatment for TB patients (Millones *et al.*, 2022).^[28]

Health-care workers' safety concerns also affected TB diagnosis efforts. Fears of contracting COVID-19 while conducting TB diagnostic procedures led to reduced health-care worker engagement in TB-related activities, including sputum collection and diagnostic procedures, further hampering TB case identification (Millones *et al.*, 2022).^[28]

The integration of COVID-19 and TB testing infrastructure presented logistical challenges. The establishment of parallel testing systems for COVID-19 and TB strained available resources and added complexity to sample collection, transportation, and laboratory processing (Millones *et al.*, 2022).^[28]

The COVID-19 pandemic has introduced challenges to TB diagnosis in Nigeria, due to shifting health-care priorities, movement restrictions, diagnostic overlap with COVID-19, laboratory strain, health-care worker safety concerns, and logistical complexities. Addressing these challenges requires a comprehensive approach that ensures the continued availability of TB diagnostic services while effectively managing the demands of COVID-19 testing.

THE ROLE OF PATENT MEDICINE VENDORS IN TUBERCULOSIS CASE FINDING

The synthesis and analysis of existing literature provide compelling insights into the pivotal role played by PMVs in driving community TB case finding, particularly amid the challenges posed by the COVID-19 pandemic in Nigeria. This section highlights the multifaceted contributions of these informal health-care providers in the context of TB case detection.

PMVs, often operating in underserved and remote communities, have emerged as significant health-care intermediaries. Their accessibility and presence within local communities grant them a unique position to facilitate the identification of TB cases. Studies such as that conducted by Onwujekwe *et al.* (2010)^[1] illuminate how PMVs serve as a crucial initial point of contact for individuals seeking medical attention, especially in regions with limited access to formal health-care facilities.

The proactive engagement of PMVs in TB case finding extends beyond mere accessibility. Their roles encompass providing information, health advice, and even basic diagnostic services related to TB symptoms. Onah *et al.* (2021)^[21] underscore the fact that these vendors, despite potential knowledge gaps, are instrumental in promoting early health-care-seeking behavior, which can significantly contribute to timely TB diagnosis and treatment initiation.

Furthermore, the literature synthesis suggests that the contributions of PMVs have proven indispensable, particularly during the ongoing COVID-19 pandemic. As the pandemic strained conventional health-care systems, these vendors continued to bridge the health-care gap by offering essential services, including disseminating TB-related information and referrals, as emphasized by Liu *et al.* (2016).^[19]

While their contributions are substantial, challenges also exist. The study by Ibitoye (2022)^[29] reveals that knowledge gaps among PMVs regarding TB symptoms and appropriate referral pathways could lead to misdiagnosis or delayed care. Challenges related to limited diagnostic capabilities and integration into formal health-care systems have also been identified.

In conclusion, PMVs have emerged as integral players in the community TB case-finding landscape, functioning as accessible sources of information, care, and referrals. Their roles have proven crucial, particularly in the context of the COVID-19 pandemic. However, addressing challenges through collaborative strategies, enhanced training, and effective integration into formal health-care systems will be pivotal in optimizing their contributions to TB case detection efforts in Nigeria.

The extent of patent medicine vendors' involvement in healthcare delivery

PMVs play a significant and often indispensable role in health-care delivery within Nigeria. Their involvement in providing essential health-care services has been well-documented and has contributed to filling gaps in access to medical care, particularly in underserved and rural communities.

PMVs have emerged as important health-care providers, especially in areas where formal health-care infrastructure is limited (Liu *et al.*, 2016).^[19] Their proximity and accessibility make them the first point of contact for individuals seeking medical assistance. They offer a range of services, including dispensing over-the-counter medications, basic diagnosis of common ailments, and health counseling (Liu *et al.*, 2016).^[19]

In rural communities, PMVs often serve as the primary source of health care due to the scarcity of health-care facilities and health-care professionals (Uzochukwu *et al.*, 2014).^[30] Many individuals rely on PMVs for timely access to medications and health advice, as these vendors are deeply integrated into the local communities and provide readily available services.

In addition, PMVs play a crucial role in disease awareness and health education. They disseminate information about preventive measures, family planning, and maternal and child health, contributing to improved health literacy within their communities. PMVs' involvement in health education has been observed to positively influence health-seeking behavior and promote better health outcomes.

PMVs have also been recognized as valuable partners in public health initiatives. For instance, in the context of TB control, PMVs have been trained to identify and refer suspected TB cases to appropriate health-care facilities for diagnosis and treatment (Liu *et al.*, 2016).^[19] This collaborative approach enhances early detection and management of diseases, ultimately contributing to improved community health.

However, challenges exist in PMVs' role within the health-care system. Their lack of formal medical training and regulation raises concerns about the quality of care provided and the potential for misdiagnosis or inappropriate medication dispensing (Uzochukwu *et al.*, 2014).^[30] Efforts to integrate PMVs into the formal health-care system while addressing these challenges are crucial for optimizing their contribution to healthcare delivery.

PMVs play a substantial and multifaceted role in health-care delivery in Nigeria. Their accessibility, community engagement, and involvement in health education make them vital assets in bridging health-care gaps and improving health outcomes, especially in underserved areas.

Their knowledge of tuberculosis symptoms, diagnosis, and referral mechanisms

PMVs in Nigeria possess a varied level of knowledge regarding TB symptoms, diagnosis, and referral mechanisms. As critical health-care intermediaries, their understanding of TB-related information influences their ability to identify potential cases, provide accurate advice, and facilitate appropriate referrals.

PMVs' knowledge of TB symptoms is heterogeneous. While some PMVs demonstrate a basic awareness of common TB symptoms such as persistent cough, fever, and weight loss, others may lack comprehensive knowledge of less apparent symptoms or manifestations (Beyeler *et al.*, 2015).^[31] This variation can impact their capacity to recognize and refer suspected TB cases for further evaluation.

In terms of TB diagnosis, PMVs often lack the technical expertise to conduct diagnostic tests themselves. Instead, they rely on their clinical judgment based on symptoms and may sometimes misinterpret these symptoms, leading to either underdiagnosis or unnecessary alarm (Beyeler *et al.*, 2015).^[31] PMVs' limited diagnostic capacity underscores the importance of effective referral mechanisms to ensure suspected cases are properly assessed by trained health-care professionals.

Referral mechanisms are a critical aspect of PMVs' role in TB case detection. Studies have indicated that while PMVs may refer suspected TB cases to nearby health-care facilities, there is variability in the accuracy of these referrals (Beyeler *et al.*, 2015).^[31] Some PMVs may refer patients promptly and appropriately, while others may delay or provide inadequate referrals due to uncertainties or lack of confidence.

Efforts have been made to enhance PMVs' knowledge and referral practices regarding TB. Training programs that provide PMVs with basic knowledge about TB symptoms, diagnosis, and the importance of early referral have been implemented (Beyeler *et al.*, 2015).^[31] These programs aim to equip PMVs with the tools to recognize potential TB cases and direct them to appropriate health-care settings for further evaluation and management.

However, challenges remain in ensuring consistent and accurate TB-related knowledge among PMVs. The lack of standardized training, limited regulatory oversight, and the dynamic nature of health-care information can all contribute to gaps in their knowledge and practices.

PMVs' knowledge of TB symptoms, diagnosis, and referral mechanisms in Nigeria varies across individuals. While some possess a basic understanding, others may lack comprehensive knowledge. Addressing these knowledge gaps through targeted

training and strengthening referral systems is essential to maximize PMVs' contribution to TB case detection and management.

Community trust in patent medicine vendors as healthcare providers

In Nigeria, PMVs have gained a degree of community trust as health-care providers. Their accessibility, familiarity, and cultural proximity often contribute to their acceptance as legitimate sources of health-care services within their communities.

PMVs' role as approachable and accessible health-care providers has fostered a sense of trust among community members. In rural and underserved areas where formal health-care facilities are scarce, PMVs are frequently the most accessible option for medical advice and treatment (Onyeneho, 2010).^[32] This accessibility creates a bond of familiarity and reliance, leading to a perception of trustworthiness among the population.

Cultural factors also play a significant role in shaping community trust in PMVs. In many Nigerian communities, traditional healers and herbal remedies are deeply ingrained in the cultural fabric. PMVs, often hailing from the same communities, may align with these cultural practices, which can enhance their credibility as health-care providers (Uzochukwu *et al.*, 2014).^[30]

Studies suggest that community members trust PMVs to accurately diagnose and provide suitable treatments for common ailments (Uzochukwu *et al.*, 2014).^[30] This trust may arise from a combination of factors, including their accessibility, personalized interactions, and the perception that PMVs prioritize community well-being over profit.

However, this trust is not without limitations. PMVs' lack of formal medical training and regulatory oversight can lead to misconceptions and incorrect information being disseminated, which may inadvertently erode community trust over time (Abdu-Aguye *et al.*, 2017).^[33] Establishing mechanisms for quality assurance, ongoing education, and integration into formal health-care systems can help sustain and enhance community trust in PMVs.

Efforts to build upon this trust have been recognized by health authorities and organizations. Training programs that equip PMVs with accurate health information and diagnostic skills aim to bolster their credibility and enhance their standing as reliable health-care resources within their communities (Abdu-Aguye *et al.*, 2017).^[33]

Community trust in PMVs as health-care providers in Nigeria is influenced by factors such as accessibility, cultural alignment, and their role in delivering services. While trust is a cornerstone of their relationship with the community, addressing limitations through training and quality assurance is essential for maintaining and strengthening this trust.

ASSESSING THE IMPACT OF PATENT MEDICINE VENDORS IN DRIVING TUBERCULOSIS CASE FINDING

The role of PMVs in driving TB case finding has been a critical aspect of health-care delivery in Nigeria. By acting as community-based health-care intermediaries, PMVs have the potential to enhance TB case detection, referral, and overall public health outcomes.

Several studies have examined the impact of PMVs on TB case finding within the Nigerian context. For instance, Chijioke-Akaniro *et al.* (2022)^[34] highlight how PMVs have adapted to the challenges posed by the COVID-19 pandemic, utilizing virtual platforms and technology to continue their role in TB case identification and referral. Their study emphasizes the need for innovative strategies to ensure the continuity of TB case-finding efforts.

Moreover, research by Uzochukwu *et al.* (2014)^[30] underscores the significance of PMVs in bridging health-care gaps in rural areas. The study reveals that PMVs are often the first point of contact for health-care services, including TB case identification, due to their accessibility and community trust. This finding substantiates the pivotal role PMVs play in driving TB case finding in resource-constrained settings.

In contrast, studies have also acknowledged the limitations of PMVs in TB case finding. The study conducted by Liu *et al.* (2016)^[19] suggests that while PMVs contribute to health-care delivery, their lack of formal training can lead to diagnostic inaccuracies and suboptimal referral practices. This highlights the importance of targeted training interventions to improve PMVs' diagnostic skills and ensure proper TB case identification.

Efforts to enhance the impact of PMVs in TB case finding involve collaboration between health-care authorities and PMVs. Liu *et al.* (2016)^[19] discuss the potential for integrating PMVs into formal health-care systems, ensuring adequate training, and establishing mechanisms for supervision and quality control. These strategies are expected to enhance TB case detection and ensure that PMVs' contributions align with established health-care standards.

The impact of PMVs in driving TB case finding in Nigeria is significant, particularly in underserved areas. While their accessibility, community trust, and role as health-care providers contribute positively to TB case identification, addressing knowledge gaps, and aligning their practices with health-care standards is crucial for maximizing their impact.

Analysis of data from patent medicine vendors' perspectives

Analyzing data collected from PMVs provides valuable insights into their perspectives on health-care delivery and their role in driving TB case finding in Nigeria. By delving into PMVs' viewpoints, we can gain a deeper understanding of their practices, challenges, and potential contributions to public health efforts.

Research conducted by Onwujekwe *et al.* (2010)^[1] and Erhun *et al.* (2001)^[2] involve an in-depth analysis of data collected through interviews and surveys with PMVs in Nigeria. The study examines PMVs' perceptions of their roles, responsibilities, and practices within the health-care system. The findings shed light on the extent to which PMVs are considered key health-care providers, particularly in underserved communities. This analysis underscores the significance of PMVs in expanding health-care access and filling gaps in areas with limited formal medical facilities.

In addition, a study by Ukwaja *et al.* (2013)^[6] offers a comprehensive analysis of PMVs' knowledge and practices related to TB case finding. Through qualitative interviews, the researchers explore PMVs' understanding of TB symptoms, their diagnostic approaches, and referral practices. This analysis reveals that while PMVs often possess a basic awareness of TB symptoms, there are variations in their diagnostic accuracy and referral effectiveness. These insights highlight the importance of targeted interventions to enhance PMVs' capabilities in identifying and referring potential TB cases.

Moreover, a study by Onwujekwe *et al.* (2010)^[1] delves into PMVs' engagement with the local communities and their role as health-care educators. By analyzing data collected through focus group discussions, the study showcases PMVs' ability to disseminate health information, including TB awareness, within their communities. This analysis demonstrates the potential for PMVs to act as agents of change in promoting health-seeking behaviors and raising awareness about TB symptoms and available diagnostic services.

However, data analysis also reveals challenges in PMVs' practices. The study by Erhun *et al.*, (2001);^[2] Onwujekwe *et al.* (2010)^[1] present an assessment of PMVs' adherence to standard treatment guidelines and their accuracy in dispensing medications. The findings indicate that while PMVs contribute significantly to health-care access, there are instances of inappropriate medication dispensing and suboptimal adherence to treatment protocols. This analysis underscores the need for ongoing training and quality assurance measures to ensure safe and effective health-care practices by PMVs.

In conclusion, analyzing data from PMVs' perspectives provides crucial insights into their role in health-care delivery and TB case finding. While PMVs contribute significantly to health-care access, addressing challenges related to their knowledge, practices, and adherence to guidelines is essential to harness their full potential and ensure quality health-care services.

Comparison of tuberculosis case detection rates during the pandemic with and without their involvement

The COVID-19 pandemic has posed significant challenges to health-care systems worldwide, potentially impacting various aspects of health care, including TB case detection. An examination of TB case detection rates during the pandemic,

both with and without the involvement of PMVs, provides insights into the potential influence of PMVs on maintaining TB case-finding efforts.

Research by Adigwe and Otoru (2022)^[35] presents a comparative analysis of TB case detection rates during the pandemic period, considering the role of PMVs in Nigeria. The study evaluates data from health-care facilities that collaborated with PMVs and those that did not. The findings suggest that health-care facilities with active PMV involvement demonstrated more consistent TB case detection rates, indicating a potential positive impact of PMVs' contributions during the pandemic.

In contrast, a study by Adewole (2020)^[36] provides insights into the challenges faced by TB case detection efforts during the pandemic. The analysis of health-care data from regions with limited PMV engagement reveals a decline in TB case detection rates. This decline could be attributed to disruptions in health-care services, reduced community outreach, and the diversion of resources to COVID-19-related activities.

The comparison of TB case detection rates with and without PMVs' involvement underscores the potential significance of their role in maintaining consistent case-finding efforts. PMVs' accessibility, community trust, and ability to continue health-care services through innovative approaches, as demonstrated by Odume *et al.* (2020)^[16] could contribute to sustaining TB case detection during challenging periods.

Furthermore, a study by Chaisson *et al.* (2022)^[37] discusses the collaborative efforts between PMVs and formal health-care systems during the pandemic. The analysis of data from such collaborations highlights the potential for PMVs to enhance TB case detection rates by conducting initial assessments and referring suspected cases for confirmation. This collaborative approach suggests that PMVs can serve as an essential bridge in maintaining TB case detection rates, even amidst the pandemic.

The comparison of TB case detection rates during the COVID-19 pandemic with and without the involvement of PMVs reveals the potential impact of PMVs in sustaining case-finding efforts. Collaborative efforts between PMVs and formal health-care systems, along with PMVs' accessibility and adaptability, highlight their importance in maintaining consistent TB case detection rates even in challenging circumstances.

Identification of barriers and facilitators to effective case finding

Efficient and effective case finding is a cornerstone of TB control programs. Understanding the barriers and facilitators that influence case-finding processes is crucial for designing strategies that enhance early detection, treatment initiation, and overall TB management.

Barriers to effective case finding

- i. **Lack of Awareness:** Limited public awareness about TB symptoms, transmission, and available diagnostic services can hinder individuals from seeking health care early.

Misunderstandings and stigma associated with TB may discourage individuals from presenting themselves for testing (Satyanarayana *et al.*, 2016)^[38]

- ii. **Healthcare Access:** Unequal access to health-care services, particularly in rural or remote areas, can prevent individuals from accessing timely TB diagnosis and treatment. Long distances to health-care facilities, transportation challenges, and financial constraints contribute to delayed case detection (Uplekar *et al.*, 2015)^[39]
- iii. **Stigma and Discrimination:** Stigma related to TB can lead to delayed help-seeking behaviors. Individuals fear discrimination, isolation, and social repercussions, which may cause them to hide their symptoms or avoid health-care facilities (Chimbindi *et al.*, 2015)^[40]
- iv. **Health-care Worker Capacity:** Insufficient training of health-care workers in recognizing TB symptoms and conducting proper diagnostic tests can lead to missed opportunities for case identification. Inadequate knowledge can result in delayed diagnosis and treatment initiation (Chimbindi *et al.*, 2015)^[40]
- v. **Diagnostic Challenges:** The overlap of TB symptoms with other common respiratory illnesses can lead to misdiagnosis or delayed recognition of TB cases. The lack of access to accurate and rapid diagnostic tools can contribute to underdiagnosis (Uplekar *et al.*, 2015)^[39]

Facilitators to effective case finding

- i. **Community Engagement:** Engaging communities in TB awareness campaigns and health education programs can improve understanding of TB, its symptoms, and the importance of seeking timely health care. Community involvement also reduces stigma and encourages individuals to access diagnostic services (Chimbindi *et al.*, 2015)^[40]
- ii. **Collaboration with NonHealth Sectors:** Collaborating with other sectors such as education, social services, and housing can help identify TB cases early. Addressing social determinants of health can reduce barriers to healthcare access and increase case detection rates (WHO, 2023)^[41]
- iii. **Mobile Clinics and Outreach:** Establishing mobile clinics and conducting outreach programs can bring diagnostic services closer to remote and underserved populations. This approach increases accessibility and encourages individuals to undergo testing (Uplekar *et al.*, 2015)^[39]
- iv. **Training and Capacity Building:** Providing comprehensive training to health-care workers on TB symptoms, diagnostic techniques, and the importance of early detection enhances their capacity to identify and manage TB cases promptly (WHO, 2023)^[39]
- v. **Use of Innovative Technologies:** Implementing rapid diagnostic tests and telemedicine solutions can expedite TB diagnosis and enable health-care workers to reach patients in remote areas. Digital tools can bridge geographical barriers and ensure timely case detection (Satyanarayana *et al.*, 2016)^[38]

In conclusion, identifying barriers and facilitators to effective TB case finding is essential for optimizing strategies to increase early detection and treatment initiation. Community engagement, improved health-care access, health-care worker training, and innovative approaches are key components in overcoming barriers and enhancing TB case-finding efforts.

RECOMMENDATIONS

Effective TB case finding is pivotal for early diagnosis, treatment initiation, and overall disease control. Based on the analysis of PMVs' perspectives and identified barriers and facilitators, several recommendations are proposed to enhance TB case-finding efforts in Nigeria.

- i. **Strengthening Training Programs:** Develop and implement comprehensive training programs for PMVs to improve their knowledge of TB symptoms, diagnostic methods, and referral procedures. These programs should be tailored to address regional challenges and should be conducted regularly to keep PMVs updated with the latest health-care information (Onah *et al.*, 2021, Berendes *et al.*, 2012, Haleem *et al.*, 2021)^[21,42,43]
- ii. **Community Engagement and Awareness:** Collaborate with PMVs in community-based TB awareness campaigns. Engage PMVs as key influencers to disseminate accurate information about TB symptoms, transmission, and the importance of early diagnosis to their communities. This can help reduce stigma, increase awareness, and encourage individuals to seek timely health care (Chimbindi *et al.*, 2015)^[40]
- iii. **Integration into Formal Healthcare Systems:** Establish mechanisms to integrate PMVs into the formal health-care system while ensuring regulatory oversight and quality control. This can involve collaboration between PMVs, local health authorities, and health-care professionals to harmonize practices and streamline referrals (Uplekar *et al.*, 2015, WHO, 2021)^[39,44]
- iv. **Mobile Clinics and Outreach:** Implement mobile clinics or outreach programs that involve PMVs in underserved and remote areas. This strategy can enhance accessibility to diagnostic services and encourage individuals who might otherwise face barriers to access health-care facilities (Uplekar *et al.*, 2015)^[39]
- v. **Use of Technology:** Explore innovative approaches such as telemedicine and digital tools to enhance PMVs' diagnostic accuracy and referral practices. Virtual platforms can enable PMVs to seek guidance from health-care professionals and ensure that suspected TB cases are properly managed (Shen *et al.*, 2021, Chijioke-Akaniro *et al.*, 2022)^[34,45]
- vi. **Continuous Monitoring and Feedback:** Establish a system for ongoing monitoring, evaluation, and feedback to PMVs. Regular assessments of their practices, accuracy in diagnosis, and referral effectiveness can help identify areas for improvement and ensure that PMVs maintain quality standards (Liu *et al.*, 2016)^[19]
- vii. **Support from Health Authorities:** Collaborate with government health agencies to provide PMVs with the necessary resources and support. This includes access to accurate TB diagnostic tools, medications, and informational materials that empower PMVs to play an effective role in TB case finding (WHO, 2023)^[41]
- viii. **Research and Data Sharing:** Encourage research initiatives to continuously assess the impact of PMVs' involvement in TB case finding. Sharing data on case detection rates, referrals, and treatment outcomes can help refine strategies and inform policy decisions (Satyanarayana *et al.*, 2016).^[38]

These recommendations aim to optimize the role of PMVs in driving TB case-finding efforts in Nigeria. By addressing barriers, capitalizing on facilitators, and fostering collaboration between PMVs and formal health-care systems, it is possible to enhance early TB detection, improve treatment outcomes, and contribute to broader public health objectives.

CONCLUSION

A significant contribution from the PMVs was observed during the period of intervention despite the COVID-19 interruptions. Thus, in anticipation of further outbreaks, TB public health interventions in Nigeria may be tailored to engage more nonorthodox systems to achieve a more community-centered approach to case finding.

The role of PMVs in driving community TB case finding in Nigeria holds significant potential for improving public health outcomes. This article explored the impact of PMVs during the COVID-19 pandemic, their knowledge of TB symptoms and diagnosis, community trust in their services, and their overall contributions to TB case-finding efforts.

The COVID-19 pandemic disrupted health-care services and TB screening programs, necessitating innovative approaches to maintain case detection rates. PMVs demonstrated adaptability by incorporating virtual consultations, contributing to sustained case finding during challenging times. However, challenges in diagnosing TB amid shifting testing priorities highlighted the need for targeted interventions and health-care system collaborations.

PMVs' involvement in health-care delivery was found to be substantial, particularly in underserved areas. Their knowledge of TB symptoms, diagnosis, and referral mechanisms varied, emphasizing the importance of tailored training programs. While community trust in PMVs was evident, quality assurance, and adherence to guidelines remained vital areas for improvement.

Assessing the impact of PMVs on TB case finding revealed their potential to bridge gaps in health-care access. Collaborative efforts between PMVs and formal health-care systems showcased their ability to identify and refer suspected TB cases effectively.

To further harness PMVs' potential, recommendations were proposed. Strengthening their capacity through comprehensive

training, integrating them into health-care systems, and leveraging innovative technologies can enhance their role in TB case finding. Integrating TB screening and awareness campaigns into PMVs' practices, along with collaboration with health authorities, can amplify community engagement and early detection efforts.

In conclusion, PMVs play a crucial role in driving TB case finding in Nigeria. Strengthening their capabilities, fostering collaborations, and implementing targeted strategies can enhance their impact, contributing to the broader goal of controlling TB and improving public health outcomes.

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