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Review Article

Strategies to improve the vaccine distribution and community awareness of taking COVID-19 vaccine in rural areas in Indonesia

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Abstract

COVID-19 has spread worldwide, and several governments, including Indonesia, are actively vaccinating. However, numerous factors may contribute to decreased vaccination administration, including hesitation, a lack of information, and demographic considerations. Therefore, this review provides insights on maximizing vaccine distribution and raising community awareness about COVID-19 vaccination in rural regions with difficulty in transportation access, a lack of health care workers, and limited vaccine storage facilities. It was discovered that numerous potential methods, such as the Internet of Things (IoT), bio-tracking and bio-detect, P-median, and Vehicle Routing Problem (VRP), can monitor vaccination delivery in rural parts of Indonesia. The correct vaccine distribution system can monitor situations during distribution by combining IoT technology with bio-tracking and bio-detect in airborne transportation. Besides enhancing vaccine distribution technologies, healthcare professionals play a critical role in maintaining vaccine quality and improving community awareness of diseases. In particular, as a healthcare professional, a pharmacist has an essential role in ensuring the quality of the vaccine until it is administered to the patient and improving patients' awareness of COVID-19 and the vaccinations. Pharmacists can collaborate with other healthcare professionals to educate the community to identify important information related to wrong perceptions about COVID-19 and vaccinations.

Keywords

COVID-19 vaccines, vaccine distribution, internet of things (IoT), health education, community awareness, pharmacist

Introduction

SARS-CoV-2, the seventh human coronavirus, was discovered in January 2020 in Wuhan, Hubei Province, China. Since then, the virus has spread worldwide, infecting 4,806,299 people and killing 318,599 on May 20, 2020 (Ciotti et al. 2020; WHO 2020). The COVID-19 pandemic has caused havoc on the country and its people, and effective measures are needed to break the chain of transmission. Furthermore, the government of Indonesia has developed several strategies against the pandemic, including using masks, tracing positive case contacts, education and self-quarantine preparation, hospital isolation, and vaccination programs (Roziqin et al. 2021; Wulandari et al. 2021). Vaccination is a primary preventive measure that is highly effective at preventing disease. Simultaneously, secondary prevention averts an infection's onset, mitigates its severity, and prevents its spread to others. It can be

accomplished through screening tests, early disease detection, follow-up testing, and monitoring (van Seventer and Hochberg 2016).

The vaccination campaign has been widely implemented throughout Indonesia's various regions (Pronyk et al. 2019; WHO 2021b). However, numerous obstacles remain in providing health services to the community, including the technical vaccine distribution process, which begins with collection at the provincial health office and ends at the vaccination center (Great 2021; UNICEF 2021a). Vaccine distribution issues can be classified into strategic and operational. Strategic issues ensure that vaccines are distributed evenly throughout the region by estimating the number of infected people and allocating the appropriate number of vaccines (Lemmens et al. 2016).

Operational difficulties arise when vaccines are distributed from the reception centers to other cities, particularly in rural areas with limited transportation. Additionally, the distribution can result in counterfeit vaccines, directly impacting public health services' safety and quality (Jarrett et al. 2020). The issue of vaccine distribution has developed into a critical one and poses a significant challenge in dealing with COVID-19, a global outbreak that morphed into a national disaster. Therefore, it should be addressed immediately because it can directly increase COVID-19 cases.

Furthermore, the COVID-19 vaccination program is hampered by widespread doubt about its effectiveness and efficacy (Center for Digital Society 2021; Faturohman et al. 2021). Several factors contribute to Indonesians' reluctance to participate in the vaccination program. These include distrust of the virus, a lack of vaccine information, held beliefs and values, and the influence of the environment (Dubé et al. 2013; Fadda et al. 2020). For example, numerous areas in Papua's central highlands, particularly in Nduga Regency, adhere to the moral value of public figures. This example affects how the local community views COVID-19.

Papua, Aceh, West Sumatra, Maluku, and Central Sulawesi are the provinces with the lowest response rates to the first dose of the vaccine. Furthermore, West Sumatra, Aceh, North Maluku, Lampung, Maluku, and Papua provinces responded inadequately to the second dose. For instance, Nduga Regency in Papua Province has a low vaccination rate of 0.79% (542 people) at the first dose and 0.42% (292 people) at the second dose (Ministry of Health of Indonesia 2020; Satuan Tugas Penanganan COVID-19 2021a; WHO 2021a).

In September 2021, approximately 41,703 cases were confirmed in Papua, with 2,489 receiving treatments, 38,059 declared cured, and 1,155 dead. The data demonstrate that low vaccination rates result in a high risk of COVID-19 virus spread (Department of Health Papua Province 2021). Besides health problems, the pandemic has resulted in a significant economic contraction, increasing the unemployment rate to 7.07% in 2020 (UNICEF 2021b). In Nduga, vaccine availability may also be a concern due to the regency's limited facilities and geographical location. However, the advancement of distribution technology increased vaccine stock for effective vaccination programs to reach the targeted number (Ministry of Health of Indonesia 2020; Nugraha et al. 2021).

This review discusses how to overcome the vaccine distribution problem to ensure it is effectively delivered, specifically in areas with limited transportation systems and vaccine storage facilities. Furthermore, it takes the Nduga Regency as the targeted location for improving distribution and community awareness of the COVID-19 vaccination.

Methods

Data search

The literature search was conducted in October–November 2021 using the MEDLINE and EMBASE databases. The keywords used included "COVID-19 vaccinations", "vaccine distribution", "the internet of things (IoT)", "health education", and "community awareness". The literature search report flow diagram follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Study selection

We included published articles and the National Health Reports and Guidelines related to vaccine distribution published by the Ministry of Health of Indonesia and WHO. The inclusion criteria for articles are original articles, full papers, articles in English, and published in 2000–2021.

Articles excluded have criteria that do not discuss vaccine distribution systems and/or community awareness-related vaccinations and do not contain the desired keywords.

Results and discussion

Fig. 1 illustrates the PRISMA flow diagram displaying the article selection process. The selection process used predetermined keywords and resulted in 1369 articles, 517 retrieved from the MEDLINE database, 852 from the EMBASE database, and seven guidelines and National Health Reports. Duplicate articles were deleted following the initial selection phase until 1301 items were acquired. Additionally, 1245 items that did not fulfill the inclusion or exclusion criteria were eliminated in a second selection. Consequently, 56 papers were gathered on vaccination distribution and community awareness.

The administration of COVID-19 vaccines

The government of Indonesia has been rolling out a COVID-19 vaccination campaign since January 2021, as the elderly have been given priority since the campaign's

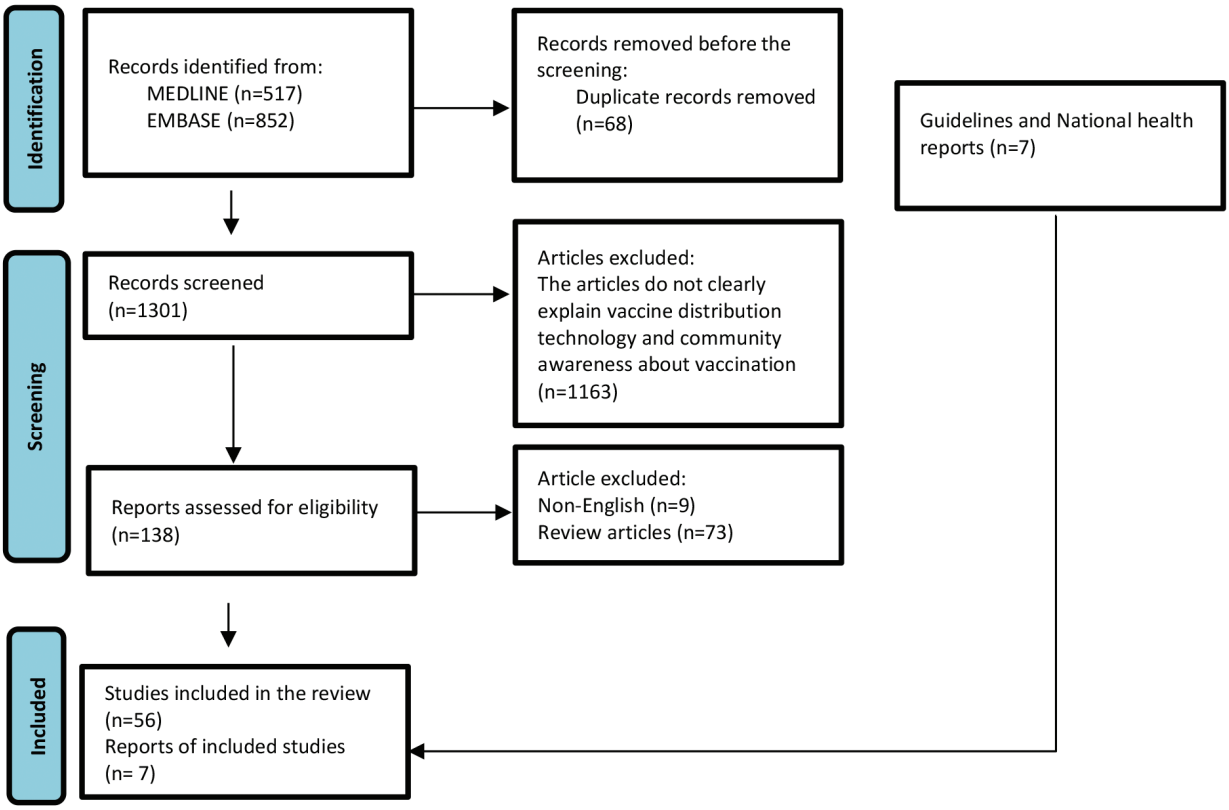

Figure 1. PRISMA Flow Diagram of Literature Search.

launch. It became the world's most extensive immunization campaign to vaccinate 181.5 million people (two-thirds of its population) within 15 months (Nugraha et al. 2021; UNICEF 2021a). That makes Indonesia a frontrunner amongst low-and middle-income countries in securing vaccines for its population and deciding to provide them free of charge. However, vaccine hesitancy may become an increasingly significant barrier as the rollout progresses. Most people who did not get vaccinated because they were worried about side effects, safety, or effectiveness said that was the main reason (Ali et al. 2021; UNICEF 2021a).

The COVID-19 vaccines used in Indonesia consist of Sinovac, Pfizer, AstraZeneca, Moderna, Sinopharm, and Novavax vaccines (Ministry of Health of Indonesia 2021a; WHO 2022). These vaccines are given in different doses according to the type of platform of each vaccine (Table 1). It was reported that Pfizer-BioNTech and Moderna vaccines triggered a relatively weak immune response when given just one dose during the initial study (Forni et al. 2021; WHO 2022). However, there was a more robust immune response when a second dose was added. The first dose of vaccination starts the process of building protection, and the double dose works to strengthen this protection significantly (WHO 2022).

While Moderna and Pfizer vaccines use mRNA technology, Johnson & Johnson vaccines use viral vectors, i.e., modified viruses that cannot cause infection (Forni et al. 2021; WHO 2022). However, viruses are good at getting into cells, making them attractive for delivering vaccines (Park et al. 2021). Specifically, the Johnson & Johnson vaccine is made with a virus called Adenovirus (Sadoff et al. 2021; Shay et al. 2021). Adenoviruses are being explored as vaccines because they can induce a robust immune response. In addition, a recent study mentioned that the adenovirus vaccine is good at producing high antibody titers because viral vectors seem like real viruses to the immune system. That is why the Johnson & Johnson vaccine requires only one dose (Crommelin et al. 2021; Mendonça et al. 2021).

The COVID-19 vaccine storage method is adapted to the proper storage conditions for each vaccine (Ministry of Health of Indonesia 2021a; Fahrni et al. 2022). It can be

Table 1. Types of COVID-19 Vaccines in Indonesia (Forni et al. 2021; Ministry of Health of Indonesia 2021a; Park et al. 2021; WHO 2022).

Platforms	Vaccine Developer	Number of Administration	Storage Condition
Inactivated virus	Sinovac Research and Development Co., Ltd	Twice (0.5 mL per dose)	2–8 °C
Inactivated virus	Sinopharm + Beijing Institute of Biological Products	Twice (0.5 mL per dose)	2–8 °C
Viral vector (non-replicating)	AstraZeneca+University of Oxford	Once-twice (0.5 mL per dose)	2–8 °C
Subunit proteins	Novavax	Twice (0.5 mL per dose)	2–8 °C
RNA based Vaccine	Moderna + National Institute of Allergy and Infectious Diseases (NIAID)	Twice (0.5 mL per dose)	2–8 °C
RNA based Vaccine	Pfizer Inc.+BioNTech	Twice (0.3 mL per dose)	2–8 °C

divided into three groups: vaccine storage at a temperature of 2–8 °C, -20 °C, and -70 °C (Crommelin et al. 2021; Fahrni et al. 2022). Climate or weather conditions are one factor that could significantly impact the vaccine distribution system, particularly the storage technology. Indonesia is the world's largest archipelagic state, with over 17,500 islands and year-round high humidity and temperatures (World Bank Group and Asian Development Bank 2021). As a result, an excellent vaccine storage system is required to ensure the vaccine's quality is maintained until it is administered to patients (Ministry of Health of Indonesia 2021a; UNICEF 2021a).

Technology to improve vaccine distribution in rural areas

In Indonesia, vaccine distribution is divided into three distribution channels: from the center to the province, from the province to the district/city, and from the district/city to community health centers and other health service facilities (Fig. 2).

Not only in Indonesia, but vaccine-related issues also happened during clinical trials of vaccinations for meningitis in Africa. The Meningitis Vaccine Project (MVP) was established to develop, test, license, and implement a meningococcal conjugate vaccine in Sub-Saharan Africa. MenAfriVac™ was clinically evaluated from phase 1 in India through phase 2/3 in Africa (Mali, Senegal, the Gambia, and Ghana) and India. All testing locations are in rural or isolated areas of Africa (Yakum et al. 2015; CDC 2018; European Commission 2020). The clinical team faced numerous logistical and operational problems in adhering to the International Conference on Harmonization Good Clinical Practice (ICH-GCP) project requirements and timetable, as the three studies were conducted concurrently in four countries. Several points potentially generate discoveries during the clinical development process (Table 2).

Table 2. Main lessons learned and suggestions for improvement (European Commission 2020).

Activity area	Lesson learned	Suggestion for improvement
Quality	Institutions have various structures in place for documenting concern data. Those structures will not be suitable for gathering all the study-particular data.	On-site source documentation must be customized, and a well-designed study should be established before the study starts.
Capacity building	When it comes to capacity building, having a space to share skills and knowledge can be more beneficial.	Organize training sessions across many locations and hire site representatives as trainers. The sponsoring enterprise's role is to organize logistics and provide global coordination.
Monitoring	Effective collaboration between site monitors and site workers is necessary to ensure high-quality clinical testing.	Regular collaborative monitoring is essential to guide the study process and facilitate on-site engagement.
Audit	Expert audits have significantly improved the quality and accountability of research conducted.	Audits must be scheduled so that each research site is involved or included in the process at least once.
Vaccine management	Logistics support must be identified to reduce risks with vaccine distribution.	Simulating onsite deliveries prior to vaccine testing can significantly reduce study timelines.

Storage spaces that comply with the parameters of each vaccine are required to monitor the distribution process (European Commission 2020). Vaccines are tem-

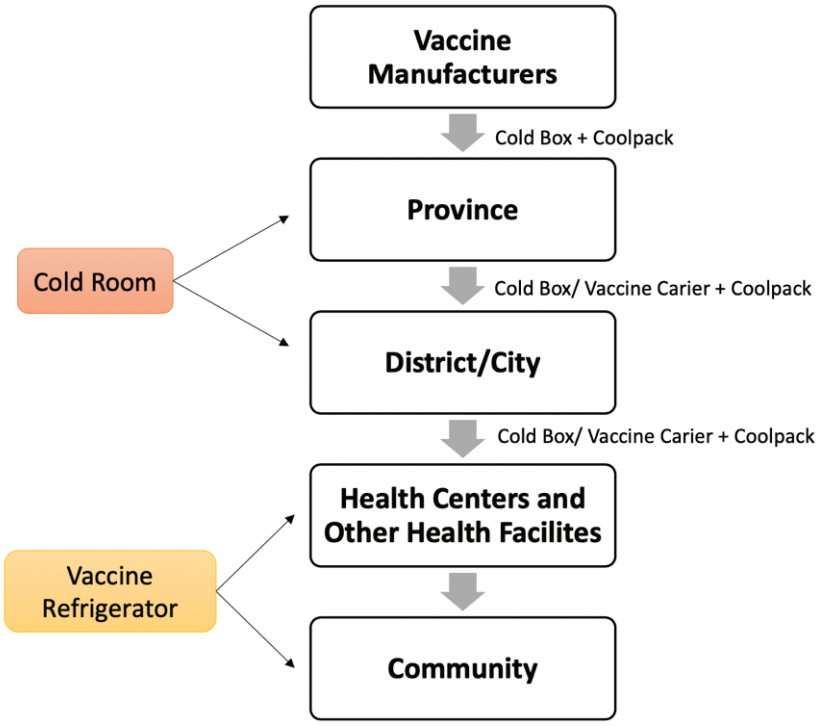

Figure 2. Vaccine Distribution Flowchart in Indonesia (Ministry of Health of Indonesia 2021a).

perature-sensitive pharmaceutical goods, with a two-dimensional data matrix used in primary, secondary, and tertiary packaging to assure traceability (identity) and product authenticity (authentication) (Leloglu 2017). Bio Farma has developed a Bio Tracking application to verify the products' manufactured validity (PT Bio Farma (Persero) 2020). Bio Tracking is a portable application used on smartphones to verify the authenticity and information about products. Bio tracking and Bio Detect give immediate notification when there is a substantial temperature change that may affect the vaccine's quality, allowing it to be handled quickly and responsibly (Jarrett et al. 2020; PT Bio Farma (Persero) 2020).

Bio Farma also utilizes Internet of Things (IoT) technology by installing temperature sensors and a global positioning system (GPS) on refrigerated vaccine transport vehicles (Jarrett et al. 2020). It monitors the vaccine storage room temperature and the vehicle's position during the trip (PT Bio Farma (Persero) 2021a). Furthermore, National Pharmaceutical Holding (BUMN) has developed a Vaccine Distribution Management System (SMDV) to fulfill authentication requirements and monitor vehicle position and vaccine temperature (PT Bio Farma (Persero) 2021b). The SMDV is integrated with other systems within and outside of National Pharmaceutical Holding (BUMN), including a Command Center equipped with an IoT dashboard to monitor all conditions during transit. These include real-time monitored temperature limits, location, speed, and other emergency conditions. Also, the IoT dashboard can be used to monitor all situations during transit (Leloglu 2017; PT Bio Farma (Persero) 2021b).

Other technologies developed at Institut Teknologi Sepuluh November (ITS), Surabaya, Indonesia, to solve vaccine distribution problems include P-median technology and the Vehicle Routing Problem (VRP) (Institut Teknologi Sepuluh Nopember 2021). It calculates the distribution routes, allowing for a more efficient and structured delivery procedure. The P-median model is used for facility selection, intending to select p facilities to reduce the total distance between each demand point and the nearest facility (Jia et al. 2014; Boonmee et al. 2017; Institut Teknologi Sepuluh Nopember 2021). Furthermore, VRP is a distribution problem that focuses on moving items from a company's depot (warehouse) to customers (Fauzan et al. 2018). The solution consists of paths that cars can follow to fulfill all customer demands, with each track being handled by a single-vehicle (Mahardika et al. 2014; Fitriani et al. 2021). The comparison of COVID-19 vaccine distribution can be seen in Table 3.

Therefore, three distribution technologies can resolve issues in rural areas that have difficulties accessing limited facilities such as Bio Detect and Bio Tracking, IoT, as well as P-median, and VRP. Bio Detect and Bio Tracking include freeze alerts, camera sensors, two-dimensional code printing technologies, authenticity checks, and product information. At the manufacturing level, it adapts packaging lines and barcodes for primary, secondary, and tertiary packaging (Darwish et al. 2019; Dwivedi et al. 2022)

Table 3. Comparison of the Types of COVID-19 Vaccine Distribution Technologies (PATH 2013; Mahardika et al. 2014; Leloglu 2017; Darwish et al. 2019; Jarrett et al. 2020; Forni et al. 2021; PT Bio Farma (Persero) 2021b).

Available features	Bio Tracking & Bio Detect	Internet of Things (IoT)	P-median & Vehicle Routing Problem (VRP)
Freeze Alert	✓		
Camera sensors	✓		
A 2D code printing system	✓		
Temperature sensor		✓	
Global Positioning System (GPS)		✓	✓
Check the authenticity of the product	✓		
Product Information	✓		
Vehicle speed		✓	
Vaccine movement		✓	✓

The bottom line has been enhanced with 2D barcode printing technology, appropriate camera sensors, and mechanical changes. Smart printers are used to print 2D barcodes, and the technology can be incorporated through an interface into track and trace software. The camera can consistently read 2D barcodes at production speeds and be integrated into track and trace software through an interface. Validating data on quality control (QC) ensures no untraceable items or inability to trace data back to the vaccinated individual. The validation report details are related to the installation's quality (IQ), operational quality (OQ), and performance quality (PQ). This invention includes vaccinations within established norms and complies with WHO requirements for packaging to bear the standard GS1 barcode (Jarrett et al. 2020; Vander Stichele et al. 2021)

Some vials were not stable in one position, making label reading and verification more difficult. The initial step between label verification and labeling is a manual adjustment to ensure that the vial can be precisely read (Jarrett et al. 2020). The capacity to read labels and verify data is critical to ensure the matching of labels. Inconsistent with similar studies conducted elsewhere, the accuracy of barcode reading has not been evaluated compared to earlier manual logging. Additionally, the ampoule label and Uniject™ have not been tried since they may create issues due to the label area's tiny size and the impossibility of adding 2D barcodes (PATH 2013). Therefore, the lead packaging or labels around each unit necessary to add 2D barcodes should be considered since new issues may arise in authenticating and packaging label data (Jarrett et al. 2020).

IoT has been widely used to connect accessible medical resources and assist patients with various ailments with trustworthy, effective, and intelligent healthcare services (Pradhan et al. 2021). Significant progress was recorded when IoT was used in health monitoring (Yin et al. 2016 ; Pradhan et al. 2021). IoT technology includes temperature sensors, GPS tracking, vehicle speed monitoring, and vaccination movement monitoring (Yin et al. 2016; Singh et al. 2020). At this command center, the movement

of vaccines was monitored through a process flow. At the time of vaccine delivery, the total number of Delivery Orders (DOs), the number of DOs to be sent, the number of DOs on their way, and the number of DOs that have arrived can all be monitored. The steps include comparing DO for government and independent routes, viewing the DO delivery map, the percentage of DO shipments that arrive late or on time, and considering the details of DO (No DO, Tertiary Code, Secondary Code, and Vial Code). Finally, the information shown at the Command Center is a foundation for decision-making by appropriate parties to assure the quality and safety of vaccines. It allows the swift, effective, and efficient distribution of vaccines (PT Bio Farma (Persero) 2021a).

Meanwhile, P-median technology and VRP are utilized to estimate the distribution path. This is achieved by removing all GPS features and focusing only on vaccine movement (Hu et al. 2007). IoT has several security issues, classified into four categories: privacy, credibility, integrity, and information accessibility (Rekha et al. 2021). Encryption is required to address privacy and information security concerns. Another issue is that only authorized personnel (legal users) have access to sensitive systems or information, complicating the coordination process. In contrast, this characteristic is beneficial for preventing illegal devices from connecting, increasing privacy, and ensuring the quality of information (Leloglu 2017).

After weighing the benefits and drawbacks, IoT technology, Bio Detect, and Bio Tracking remain the primary options for vaccine distribution technologies in rural areas, such as Nduga, Papua. Therefore, it is considered that the shortcomings of these technological features are not critical and have no direct effect on the barriers to vaccine distribution. Instead, it is caused by the primary impediment to vaccine distribution, which is the requirement for vaccine movement characteristics and product information. As a result, the most successful strategy for distributing vaccines is to combine IoT technology with Bio Detect and Bio Tracking to leverage the two technologies' capabilities.

Along with the issue of vaccine distribution, a lack of public awareness about vaccination is a significant issue, particularly in rural areas where health services are still limited (Wong 2011; MacDonald et al. 2015). Numerous variables can contribute to this lack of public awareness, including inadequate information, misinformation about vaccines, and limited access to healthcare facilities (Mohamed et al. 2021). Therefore, it is essential to improve public understanding and acceptance of the COVID-19 vaccine by identifying the elements influencing public awareness of vaccinations in rural areas.

Improving community awareness about COVID-19 and its vaccines

The health office and medical personnel face numerous challenges in providing health services to the citizens. These include limited access to transportation, a shortage of health professional workers, and safety concerns (Rural Policy Research Institute 2014). Another impediment to Nduga's security is the ongoing conflict between armed groups and the Indonesian National Armed Forces. It is estimated that many health workers are hesitant to work in the area, despite being promised a relatively high salary by the local government. Also, only two districts are accessible by roads, small aircraft, and helicopters (Pademme 2020).

This district lacks hospitals, primary care physicians, dentists, clinics, or pharmacies connected to national health insurance (BPJS Kesehatan). Therefore, the only health facilities associated with BPJS are community health centers, which are Keneyam District, Mapenduma District, Wosak District, Yogi District, Gearek Health Center Complex, Geselema Health Center Complex, Mbua Health Center Complex, and Mugi Health Center Complex (Pemerintah Kabupaten Nduga 2017; Dinas Kesehatan Provinsi Papua 2020; Pademme 2020). According to the Health Service's data on health service facilities, Nduga Regency has only 34 health human resources (HR). These include six nurses, one health epidemiologist, two health administration and policy officers, three public health officers, three sanitation environment officers, one nutritionist, one head of service, one secretary, four heads of division, nine section heads, as well as one in finance, reporting, data management, and archiving. Meanwhile, there are 2,200 vaccine doses available in Nduga Regency, Papua (Pemerintah Provinsi Papua 2016; BPS Provinsi Papua 2019; Satuan Tugas Penanganan COVID-19 2021a).

The awareness of COVID-19 can be assessed through the community's knowledge, attitude, and behavior (Khan et al. 2020). The primary strategy for raising community awareness is to emphasize the role that everyone in the community, including parents, healthcare workers, policymakers, and the media, plays in ensuring that everyone is vaccinated and has accurate information about COVID-19 and its vaccines (MacDonald et al. 2015; Bavel et al. 2020).

The media mainly influences vaccines' historical, political, and sociocultural contexts and vaccination decision-making. It can serve as a conduit for previously unavailable vaccination information sources. The vaccination is a source of fear in the community and a target for misinformation (Dubé et al. 2013; MacDonald et al. 2015). In this case, the media, and subjective norms, such as social pressure and social responsibility, significantly influence the hesitancy (Dubé et al. 2013; MacDonald et al. 2015). According to the history of vaccinations, the media plays an essential role in disseminating wrong information, despite solid evidence demonstrating their safety and effectiveness. Scientific studies indicate that the media has a detrimental effect on vaccinations (Wilson and Wiysonge 2020).

Additionally, subjective norms influence the Nduga community's perception of vaccines and vaccinations. The majority of the subjective standard is "the role model of local community leaders (Rami et al. 2017; Archer

2019). Subjective norms are determinants of the desire to behave. It functions as an individual's beliefs to improve or disapprove of a particular behavior. Individual belief functions are constructed based on local normative beliefs, which can be affected by environmental factors. Individuals will behave when others view their actions positively because their behavior is admirable and should be emulated (Hussey 2012). These factors all contribute to understanding how the subjective standard of "exemplary local community leaders" can be believed by every member of the Nduga community (Rami et al. 2017). Healthcare professionals should improve the inherent subjective norms and shift in the right direction since they are ardent proponents of vaccination. However, several barriers should be overcome while counseling in the Nduga area, most notably the language barrier (Archer 2019; Al Shamsi et al. 2020). There has been no study on the Nduga area's literacy, language use, economic status, or education. As a result, the extension may not meet its full potential because the methods and details are not for the area's description of literacy, language use, economic status, and education.

The role of pharmacists in improving community awareness about COVID-19 and its vaccines

The COVID-19 vaccination program in Indonesia has a centered system. The government collects data on prospective vaccine recipients through an information system based on a one-vaccination database sourced from the Ministry of Health of Indonesia, which includes the name, population registration number, and address of residence of the vaccine recipient (Ministry of Health of Indonesia 2021a; b). People who want to get vaccinated can be registered through a website provided by the government, or they can visit a primary health care center. Vaccinations can be carried out at health centers, sub-health centers, clinics, hospitals, or health service units at the Port Health Office (KKP). Vaccines will be administered by doctors, certified nurses, or midwives in healthcare facilities (Ministry of Health of Indonesia 2021a; Satuan Tugas Penanganan COVID-19 2021b).

The role of pharmacists in increasing community awareness about COVID-19 may be divided into three categories: facilitator, motivator, and host (Mohiuddin 2019). As facilitators, pharmacists have a role in storing and processing medicines, drug production, and patient care. Therefore, knowing pharmacotherapy and pharmacoepidemiology alone is not enough to maximize the pharmacist's role in healthcare services, especially in remote areas (Eades et al. 2011). Furthermore, based on the regulations, the pharmacist's role in public health service can be categorized into those focused on community service itself and those focused on ensuring the rational and appropriate use of drugs, including prescription services, vaccinations, and counseling (Ilardo and Speciale 2020; Basheti et al. 2021).

At the higher level, public health services are carried out by pharmacists in collaboration with other health workers. Several problems accompany the development of public health services during the COVID-19 pandemic (Eades et al. 2011; Basheti et al. 2021). Such as the community's perception, which they believed to be rational, turned out to be wrong and affected their understanding of everything related to COVID-19 (Jin et al. 2021; Yáñez et al. 2021). This problem challenges pharmacists and other healthcare workers in using communication skills and choosing the most suitable method to achieve maximum health services and increase public understanding of COVID-19, especially in remote areas.

As a motivator, pharmacists should have excellent communication skills. Good communication plays an essential role in collaborating with other healthcare professionals in pharmacy practice. Good communication skills related to the community can prevent errors in receiving information and prevent the healthcare system's failure to achieve maximum results (Johnson et al. 2015). This ability enables one to build trust in the community and become a trusted consultant in using over-the-counter (OTC) drugs, vitamins, and health products during the COVID-19 pandemic (Yáñez et al. 2021). Also, be able to persuade the public to comply with the guidelines from the government that must be followed in preventing the transmission of COVID-19 and be able to communicate and straighten out important information related to wrong perceptions about COVID-19 (Ecarnot et al. 2019; Marwitz 2021).

As a host, the pharmacist plays a role in counseling to increase community awareness of COVID-19 and its vaccine. Counseling is the activity of educating individuals or groups, providing knowledge, information, and abilities to form attitudes and behaviors in life that should be. For example, several counseling methods can be used to provide education and information related to COVID-19 to the community in rural areas, such as in Nduga Regency, Papua Province. The first method is comprehensive activities in each district (32 districts). Healthcare professionals must be able to convince everyone of the importance of implementing outreach methods at the community health centers by collaborating with the local government to notify the counseling program. Second, counseling is carried out through direct door-to-door visits by health care professionals. The door-to-door counseling method was combined with conventional techniques such as oral presentation and audiovisual media to avoid discrepancies in methods and details.

The most effective method is door-to-door counseling, directly conducted from house to house. According to the study, consecutive door-to-door health education sessions were superior to the methods above (Geoffroy et al. 2017; Ko et al. 2021). The findings corroborate those of other studies conducted in Korea, indicating an increase in knowledge and the development of attitudes and perceptions toward counseling provided (Kang et al. 2020). A national training program for human resources, particularly healthcare professionals, is required to improve rural health education and

maximize the effectiveness of this door-to-door approach (Willis-Shattuck et al. 2008; Wurie et al. 2016). This method requires a significant financial investment and many human resources. However, it can potentially enhance the Nduga public health education system significantly.

Third, begin advocacy with community leaders, including religious leaders (church leaders) and local traditional leaders, and community organization administrators at the village and sub-district levels. The success of advocacy and partnership-raising will motivate these community leaders or leaders to take an active role in creating the correct perception and understanding of COVID-19 and the COVID-19 Vaccine for the Nduga community.

Direct counseling can be combined with indirect counseling through media such as leaflets, posters, and banners, and electronic media in the form of audiovisual media. The counseling material broadly consists of four parts: COVID risk factors, the severity of COVID-19, the benefits of vaccination, and healthy living behavior in preventing COVID-19. For the group of children (5–11 years old), audiovisual media is used in educational videos for 5 minutes. Educational videos are equipped with various animated characters and accompanied by music to attract their attention. A previous literature review (Masters 2013) stated that extension media support health promotion or education because their effectiveness determines the success of health education. Humans retain only 20% to 30% of what is seen and heard. Therefore, sight and hearing can increase information retention by 50%. Additionally, what is seen and heard can boost the ability to retain information by up to 80% (Kessels 2003; Masters 2013; Wakefield et al. 2010). Therefore, the most effective method of increasing the Nduga community's knowledge level is through audiovisual media and knowledge testing after counseling sessions.

Conclusion

The most effective techniques to distribute the COVID-19 vaccines in rural areas are integrating IoT technology with Bio Detect and Bio Tracking to maximize both available features. These features include freeze alert, camera sensor, 2D code printing system, temperature sensors, GPS, product authenticity check, product information, vehicle speed, and vaccine movement. Moreover, healthcare professionals are needed to improve community awareness about the importance of getting vaccinated. In particular, as one healthcare professional, a pharmacist has an essential role in ensuring the quality of the vaccine until it is administered to the patient and improving patients' awareness of COVID-19 and the vaccinations. Pharmacists can collaborate with other healthcare professionals to educate the community to identify important information related to wrong perceptions about COVID-19 and vaccinations.

Conflict of Interest

All authors declare no conflict of interest.

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