Health seeking behaviour for acute respiratory illness among adults in rural Malawi: implication to emerging respiratory infections surveillance

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Research Article

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Abstract

Background: Emerging respiratory infections threaten the global population, especially as we are experiencing the COVID-19 Pandemic. Such novel respiratory infections usually target the young adult population. In Malawi, the national surveillance system is in place, but no evidence to know if we can capture their incidents at the community level. Little is known about adults' acute respiratory illness (ARI) health-seeking behaviour in Malawi and Africa, as it is usually the presented symptom when these novel respiratory pathogens attack young adults. Our study was to fill the knowledge gap to understand the adult's health-seeking behaviour and pathway to guide future surveillance system enhancement.

Methods: This was a qualitative study in which we applied a focus ethnographical methodology with a grounded approach to collect data from formal health service providers from the facility and community level, general adults from the community and traditional healers to triangulate the study aims. The study was conducted in a rural area of northern Malawi during 2016-2018. We used Colvin's model as the initial framework for data analysis to understand the adult ARI health-seeking behaviour process and the roles of different social actors along the path.

Results: After the analysis, we considered that self-cognition and constant evaluation of the severity is a constant process determining an adult's decision to access formal services. Homemade remedies, especially herbal medicines, were widely used by adults as the immediate response to the illness. Among the other two processes, surrounding social actors played a role when negotiating support for accessing formal biomedical service, while the "middle layer" was the main process patient used prior to accessing services at facilities. The ARI incidents and mortality surveillance gaps exist at community and facility levels.

Conclusions: Health surveillance assistants could fulfil their community surveillance function by expanding their care and treatment capacity. Furthermore, future surveillance system enhancement shall consider engaging drug vendors and traditional healers inclusively to become an essential event-based surveillance data source from the community. The ongoing development of the digital health systems in the country shall also provide its readiness for emerging respiratory infection surveillance.

Research Highlights

- This is the first adult health-seeking behaviour pathway study focused on acute respiratory illness in a rural Malawi setting, providing knowledge for future disease surveillance system strengthening in the country and beyond in responding to potential emerging respiratory diseases.
- Self-recognition of the illness severity is a critical factor for adults to decide on their access to formal health services and affects the national surveillance system’s capability to detect community-level unusual acute respiratory illness episodes or outbreaks.
- The “middle layer” actors played an essential role in the pathway, while their functions were not well defined and fully utilized to enhance community-based surveillance for timely ARI surveillance.

Background

Global Concerns of Emerging Respiratory Infections

Respiratory tract infections remain one of the leading causes of death worldwide, where lower respiratory infections (LRI) account for 5.2% of global mortality [1]. People with upper and lower respiratory tract infections may present acute respiratory illness (ARI) within the immunocompetent and immunocompromised population of all ages [2, 3]. Besides traditional etiological pathogens, emerging respiratory infections threaten the population's health globally [4, 5]. These emerging respiratory infections include severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV), novel influenza A viruses and *Legionella spp.* Such infections present similar symptoms as common respiratory infections at the early stage and subsequently cause acute illness and severe outcomes.

The 2002–2003 SARS outbreak emerged in China in November 2002 and rapidly spread to 29 countries, with 8,096 cases and 774 fatalities by its end [6]. The same family of the coronavirus, SARS-COV-2, caused the novel coronavirus disease (COVID-19) pandemic to date [7]. While another coronaviral disease, MERS, emerged in April 2012 in Jordan and is still circulating in the Middle East [8]. Epidemiologically, the median age of SARS-CoV, COVID-19, and MERS-CoV infections were below 45, 30.6 and 46 years old, respectively [7, 9, 10]. The young-adult population further sustained the transmission of the infections during the novel coronavirus disease (COVID-19) pandemic [11].

Another emerging respiratory infection pathogen is the novel influenza A virus. Caused by different strains, the outbreaks from the late 20th century presented diverse epidemiological characteristics. A high pathogenicity avian influenza A H5N1 virus was first identified in 1996 in China, and human infection outbreaks were detected in 16 countries between 1997 to 2015 [12]. The median age of the H5N1-infected cases was 19 years old, with a high case-fatality ratio (CFR) of 53.5% [13]. Another avian influenza A H7N9 virus emerged in 2013 in China mortality (CFR = 39.2%) and attacked the middle-aged group [14, 15]. Avian influenza viruses posed threats to a global pandemic, yet the first twenty-first-century pandemic emerged in 2009 with a triple-reassortant strain (H1N1pdm) originating from swine caused about 10 to 200 million infections and mostly occurred in the younger age group [16–18]. The emergence of Legionnaires' disease has been observed since 2000 and is trending to infect the younger population, with case fatality rates ranging from ~ 5–40% [4, 19]. These new respiratory infections presented different epidemiological patterns by affecting the more young-adult population, in contrast to traditional community-acquired pneumonia (CAP) [20].

Health-Seeking Behaviour Impacts on Surveillance

In order to timely detect emerging respiratory infections, a functioning and integrated surveillance system is necessary for the public health system [21, 22]. Traditional surveillance systems are designed using the passive method, which relied on facility-based reporting. In Africa, many countries have adopted the integrated disease surveillance and response (IDSR) framework as the system for surveillance [23].

However, the timeliness of IDSR systems to detect community-level events remains a challenge in most African countries [24–27]. Under the passive surveillance notion, data came from people seeking treatment at health facilities to be reported [28]. However, acute respiratory illness may not trigger patients or their caregivers to seek formal healthcare services promptly, and little is known about adults' behaviour in Africa [29, 30]. Especially adults with ARI are usually not seeking care at health facilities in Africa. The traditional surveillance approach would underestimate the actual disease rates and would be unable to timely detect potential outbreaks [31, 32]. Health-seeking behaviour for ARI patients, hence, act as a significant factor in determining whether the public health system can detect community emerging respiratory incidence or not.

Behaviours toward acute illness mitigation is a complex phenomenon intertwined with biomedical, social, cultural, economic, psychological and environmental causal factors. Such health-seeking behaviour involves a constant evaluation by the illness actor with internal and external assessments during the episode [33, 34]. Individual-level health behaviour theories were developed in the late 1970s and further expanded with the social organisation strategy, social capital and social networks aspects [35–38]. Specific studies of ARI health-seeking behaviour around the world has focused on under-five children and their caregivers [29, 31, 39–41]. However, only few studied about the adult and elder population or with full age spectrum in ARI health-seeking behaviour were found, and none in Africa [30, 42–45].

In responding to the potential threats of emerging respiratory infections, knowing adults' ARI health-seeking pathway is critical. Colvin's study established a conceptual model with four recognition and response stages to illustrate possible pathways of health-seeking behaviour for child illness before they reach formal biomedical services [39]. Although the model focused on child illness, it still provided insights into understanding the possible pattern of how adults might seek health services in Malawi. Hence, we conducted this study aiming to obtain knowledge from the field to inform surveillance-strengthening in Malawi and beyond.

Material And Methods

Setting of the Study

We conducted this study in Malawi - an African country located in the southeastern part of the sub-Saharan region. The country is bordering with Zambia, Tanzania and Mozambique. According to the 2018 Malawi population and housing census result, the population size is 17.6 million, and 84% live in rural areas [46]. The major tribes are Chewa, Tumbuka, Lomwe, Yao and Ngoni. We conducted the study in Rumphi district - one of the 29 health districts residing in the northern region of Malawi. The selection of the study district was based on the previous finding of good surveillance practices found in the IDSR system assessment study in the region [24]. The district has roughly 224 thousand inhabitants, most of them from the Tumbuka tribe, who are famous for their traditional healing dance [46, 47]. The majority of the economic activities in this district are agriculture, mainly tobacco farming. The district has the lowest population density in the country, and hills and streams separate villages. Malawi has a relatively

homogeneous healthcare system, socioeconomical status and geographical environment. Hence the selected study district can provide insights from its rural setting. We focused the study in the rural setting in order to (1) avoid too many options for adult individuals to choose for illness mitigation; and (2) reflect the more frequent possibility for human-animal interaction that may introduce emerging pathogens such as zoonotic infections, experienced from the Western Africa Ebola outbreak. The specific study site was along the Henga Valley, where the local inhabitants are known as the Phoka group [48]. Referencing the ARI studies in the 1990s, we intentionally selected the study community which could be linguistically and culturally representative of a large population block – Tumbuka people [40, 49] .

The definition of ARI is a combination of all respiratory infection symptoms from Malawi's IDSR technical guideline-related diseases, including cough, sore throat, shortness of breath, difficulty breathing, chest pain, and sudden onset of fever [50]. No ARI is reported in the current IDSR system. However, severe acute respiratory infections (SARI) currently fall under case-based surveillance for immediate notification and statistical summaries in the weekly IDSR reports in country. The SARI reporting only happens at the facility level, and Malawi has yet to implement the community-based surveillance components fully. Hence, the earliest time for the health authority to be notified of the SARI incident is at the primary health facility.

Method and Data Collection

To understand what can happen before an ARI case can be detected and reported by the health personnel at the health facility, we applied a focus ethnographical methodology to interview community members and key informants from the health care system to triangulate the possible ARI health-seeking behavioural pathways of the adult population [40, 51]. he community members were invited from and through the Area Development Committees (ADC) of one Traditional Authority (TA) to participate in focus group discussions and individual interviews. Inviting ADC members were recommended by the local researcher (MSK) for ADC's representativeness and leadership roles in the community. The key informants invited to the study were:

(1) community health workers, known as Health Surveillance Assistants (HSA) in Malawi’s context;

(2) health service providers at the primary and secondary health facilities; and

(3) traditional healers.

The principal investigator (TSJW), who has resided in Malawi for 15 years and is familiar with social conduct, led the data collection. Although he has local language ability, he collaborated with a local researcher (MSK) and a translator to ensure smooth communication and minimise translation errors. All participants consented to the study by verbal explanation and signed the consent form afterwards. All interviews were conducted by the principal investigator and co-facilitated by the local researcher. The researchers applied the standardised interview guides (Annex 1) for guiding the interviews. The digital audio recording was done with dual devices to ensure data was captured, and all recordings were transcribed and translated by the translator into text files for further analysis. The local researcher verified

translated files to ensure the accuracy of the meaning of the words. Additionally, the researcher took field notes to capture non-verbal expressions and interactions between participants in the focus group discussions. Among all interviews, the interaction with one traditional healer was exceptional without audio recording. That traditional healer was considered a specialist healer, *Wamizuula Ng'anga* in the *Tumbuka* language, who required time for communication and gaining trust. We used the roleplay method for the local researcher to act as a patient for the healer to demonstrate the health consultation and treatment procedures, while the principal investigator observed the performance, probed with interview questions and jotted down the notes. Photos and videos were taken with consent from the healer for further analysis.

Analysis

Social cognition theory models of health-seeking behaviour inadequate incorporate and interpret the social, economic and environmental factors to fully explain or predict human behaviours [52]. Therefore, instead of choosing a specific health-seeking behaviour model, we applied a grounded approach to collect data from providers, communities and individuals to explore the complex construct and pathways of ARI health-seeking behaviour in rural Malawi. We modified Colvin's model as the lens for data analysis to obtain the local knowledge and perceptions from different social actors for future surveillance system improvement recommendations [39]. We stored data in the Nvivo software for referencing and analysis. Interview records were coded in 4 key thematic areas based on the original model with further modifications, namely:

(1) self-recognition and response to ARI,

(2) seeking advice and negotiating for health-seeking,

(3) “middle layer” usage between home and formal clinic, and

(4) accessing formal biomedical services.

We further analysed the patterns and pathways of adult ARI health seeking from the data processed. Findings from the study were interpreted and confirmed with the researchers (MSK, YN, JJK and GAB).

Results

The primary data collection lasted for 12 months, from August 2016 to July 2017. The prolonged period of the collection process was due to the lengthy communication with the ADC and traditional healers to obtain their consent and support for the study. Through the interview that happened in 2017, we had permission and access to a senior traditional healer. The senior traditional healer's in-depth interview occurred in July 2018 and allowed researchers to observe the healer's knowledge and experience on ARI consultation, diagnosis and treatment process. We conducted four focus group discussions and 24 key informant interviews with 48 informants (Table 1). Data collected were processed and coded according to the thematic areas and detailed in the following findings.

Table 1
Qualitative data collection results from a health district in Malawi for adult's ARI health seeking behaviour pathways study, 2016–2017

Type of data collection	Participating social actors	Number of participants	Time of the data collection
Focus group discussion	Health care providers in village clinic	2	August 2016
	Health care providers in rural hospital	4	September 2016
	Health care providers in district hospital	8	September 2016
	ADC members from the community	10	March 2017
Key informant interview	Adults from community	9	August 2016 (1), November 2017 (8)
	Community health care workers	13	August and September 2016
	Traditional healer	1*	March 2017
In-depth interview	Specialist traditional healer	1	July 2018

*The traditional healer interviewed was identified during the ADC focus group discussion, hence we had a separate key informant interview with the healer

Self-recognitions and response of Acute Respiratory Illness in Local Context

Recognition of acute respiratory illness

Community members identified the symptoms using local terminology distinguishing between acute upper respiratory illness and acute lower respiratory illness. Regarding the upper ARI (UARI), the term "*chikhoso* or *kukhosomola*" refers to the distinct symptom of "cough". We also found other local vocabularies for upper ARI symptoms, including the runny nose (*kusulula mamphina*), stuffy nose (*kupenkha/ mphuno zajara*), sneezing (*wakuyethyemula*) and sore throat (*pasingo apa pali tuvilonda*). Community informants claimed:

"To us, ARI all we see is a person starts to cough, rise in body temperature and has general body pains and the patient complains about headache then chest pains follow." – KII/CO06

"*The ARI I know is a cough which is at times related to headache and pneumonia eventually.*" – KII/CO07

Meanwhile, the term *"chilaso"* represents the concept of "pneumonia" as lower ARI (LARI). Another severe symptom sign, "*befuu"*, representing shortness of breath, was found. The "prickle pain" in the lower chest was the most significant symptom presentation. Multiple informants explained the pain with gestures of fingers pricking upwards from the side of the abdomen to the ribs. At the facility level, healthcare workers claimed the community members might mix the concept of upper respiratory illness with lower respiratory illness. However, the results showed a clear distinction in the local knowledge domain, and the most significant differences are "prickle pains" and shortness of breath. Members who attended the focused group claimed:

"*In the village when we talk about pneumonia we mean, in the chest one has pricking pain. The way in which one breathes then always has difficulties, is failing to breathe properly as does always.*" – FGD/THR2

The acuteness was perceived when the symptoms suddenly occurred and usually in combination with fever. However, we observed a considerable alteration in individuals' cognition of the UARI and LARI in the community. Coughing and other UARI symptoms were considered as a common phenomenon that happened naturally, while "*chilaso*" can represent supernatural power influences beyond medical explanations, based on a statement made by one community healthcare informant:

"*…but chilaso, if we say chilaso, people will think of munthu or wakulowa has bewitched you. …for local people…they think of two things (pneumonia and) someone has bewitched them.*" – KII/RU05

Response to acute respiratory illness

Homemade remedies and herbs were adults' immediate responses when having ARI. The common practices mentioned were drinking more water, hot compress with herbs at the chest and using medicinal plantations. The plants mentioned including blue gum tree, lemon, Aristolochiaceae *"matulisa"*, Zanha Africana *"mzakaka"*, Berberis *"kayunga"*, Parinari *"mbula"*, "*pokoto"*, Trichilia *"msikizi"*, and *"mnyina"*. Based on the responses, how people use these plants was inhaling the steams while boiling, drinking as tea and making powders for intake. Most of these home remedies were used for treating UARI, while the responses toward LARI was a different scenario due to the different perception of the episode. Detailed descriptions were provided by community informants:

"If I am coughing maybe just for one day, I don't just jump to the conclusion that this is really cough and take medicine, no. I encourage myself maybe to take plenty of water……in my catchment area we have a herbal garden, this is mzobala (lemon tree)*… some can take some leaves and pound it when they have got chikhos* (cough), *after pounding it becomes like flour. Then they take that flour and boil it in water and then drink."* – KII/MH02

"Largely we Africans, use our traditional medicines. The herbs are: Mbula, pokoto, msikizi, mzakaka, zobara (Lemon), *mnyina. This is how we use them. We get a bit of each, mix with ufuuu* (Maize flour) *and let to boil. We then filter into a bottle. Add a bit of salt. That is for a cough."* – KII/CO01

Seeking advice and negotiating health-seeking behaviour

We found that adults have a high level of autonomy regarding ARI health-seeking behaviour. Most informants made their own decisions in responding to the ARI episodes, while some negotiated on access to formal health services with close family members and other actors in the community. The negotiation was mainly related to financial needs, including money, food and logistical support for transportation. Several informants provided their experiences:

"If I get sick today may depend on the condition. Either I may go alone if I am able to or I may have to ask people to identify transportation to take me there depending the condition I am in." – KII/CO03

"It was my father looking at the situation with no improvement, then he decided that it would be better if I were brought to the hospital. From home we used a car…we had money for food, flour and fire wood." – KII/CO04

"We do focus about those things (logistics to support patient) *much. Health and life first. When you do not have enough, all you can start with is flour for porridge. The guardians will have to say our friend is at the hospital probably s/he needs this and that and they may bring afterwards."* – KII/CO08

Using the "middle layer" between home and clinic

We found three actors contributed as the middle layer between ARI patients' homes and formal health services: grocery shops, health surveillance assistants (HSAs) and traditional healers. A few informants disclosed that they purchased over-the-counter medicines from shops or drug vendors, including Panadol, Kofrid, Bactrim and *amoxicillin*. The HSAs work as community health care workers in the village. However, they only provide care and treatments to the under-five children as an integrated community case management for childhood illnesses programme. Some adults might seek health support from the HSAs; however, they can only refer patients to the health facility yet to provide care and treatment. According to the national tuberculosis programme protocol, the HSAs were instructed to educate the community to access formal health services when a person has consecutive coughing symptoms and encourage adults to get to the hospital for diagnosis. The HSAs claimed:

"I don't treat them. Because the drug which am keeping is only for the under-five, just counselling them, after counselling them, I then make a referral to the health facility for further assessment which will be done at the health facility." – KII/MH01

"If adults come here with cough problems and if I see that the cough is serious, I also refer them… If an adult coughs for maybe 3 consecutive days, producing mucus, we suspect them have TB (Tuberculosis), *I send them to the hospital. … They are given small containers for collection of sample for TB test."* – FGD/MH05

The traditional healers were widely utilized by adults in the community while contracting ARI. All informants confirmed the presence of the healers and acknowledged their vital role in providing herbal

medicines (*mizuula*) in treating UARI and LARI. The herbal medicine and *tattoo* – making small cuts to the prickle pain points and applying medicine to them, were provided as the treatment. The community informants openly disclosed the usage of this middle layer for health support. Several informants provided their statements:

"I have ever had pneumonia. Medicine was sought from home. I got healed. … At times we take traditional medicine. We get assisted by herbalist/ traditional healers. … The traditional healer who was available then sought the medication for me and I got healed. " – KII/CO02

"Locally we get tattoos. They cut and apply the medicine on the tattoos. Tattoos for pneumonia, wherever it is indeed pneumonia, it goes and you get healed. But at times it fails. Once it fails, we think of going to the hospital. Coughing leads to pneumonia, we also look for medicine locally, we look for mizuura and it manages it." – KII/CO08

The formal health service providers had mixed views of the role and practices of the traditional health healers in the community. All providers knew the existence of the healers and their assistance to the community. However, their primary concern was the delay of ARI-affected adults accessing formal health services – particularly patients with LARI. At the community level, the HSAs advised adult patients to formal health facilities, yet they were challenged. The HSAs provided insights on how they interact with and engage the traditional healers for ARI patient referral:

"(For adults with ARI) *we just refer them, the challenges are there because we may advise those people to go to the hospital but sometimes they don't go. They just ignore the advice. …They go to traditional healers."* – FGD/MH06

"In counselling system, they tell us to advise people against going to the herbalists if they have problems…we are advising people to rush to the hospital.... (So will the herbalist also refer them?) *yes, the herbalists mainly treat people in the community who have come with diseases that have to do with witchcraft, but not diarrhoea, pneumonia or acute respiratory diseases… we are counselling the herbalists."* – KII/MH01

"Nowadays we teach one another (meaning with traditional healers), *we work hand in hand. …We tell them if you see that you cannot treat, refer them. … we tell them if they see signs like this and that, they must refer those people to the hospital."* – FGD/MH05

Also, the primary and secondary level facilities' service providers explained the understanding of the detailed practice of the traditional healers and how the adults might fear disclosing their previous history:

"…they will extract the roots and then they will dry them in order to produce powder… and that powder is used as medicine. … then they will make two cuts on their skin and apply that powder with the idea of it getting inside their bodies… also burn the roots and produce black ashes and use that ash the same way they use the powder. …for ARI and pneumonia. …when they come they don't disclose because they know

that what they believe in is not what we believe in as medical practitioners. …so they say oooooh! These guys are going to scold us, they will be angry with us, so they don't disclose." – FGD/MHRH01-04

We further investigated the perceptions and practices of traditional healers in handling ARI in the community. Through the interview, the first traditional healer informant explained how he obtained knowledge of herbal medicines by "studying how trees are behaving by nature" and providing middle-layer support to the community. The traditional healer informant demonstrated an understanding of the differences between UARI and LARI:

"ARI is not be missed when who has it has come to you, one presents with: at time one has signs of coughing, or complains of headache, general body pains or fever… But with pneumonia; One complains, complains of; I have pains here or I have pricking pains here!" – KII/TH01

The informant further explained the way of physical examination of the patient's situation:

"… so you ask that patient, may be you had problems with your movements, … you did not walk well and you bent this part. If he says no; it is just pricking… when we have done this… you know that this is pneumonia." – KII/TH01

An intriguing diagnostic tool, *"Vyakuukwila"*, was mentioned to decide the cause of the disease: natural or supernatural factors. The informant described the assessment process:

"… you take your materials you use to come up with a diagnosis. Vyakuukwila. Using these we make a diagnosis … I also give treatment… Other ARI conditions, if with your Vyaukwila you have seen that for that condition you don't have medication, those are referred to hospital… For these made pneumonia; when confirmed as such we give medication, at times they will respond to oral medication, at times will not. If it has failed it needs the tattoos' medication." – KII/TH01

During the in-depth interview with the traditional specialist healer, we observed how he practised with a wooden diagnostic device (*Vyakuukwila*) to perform his diagnostic consultation process and preparation of the herbal medicine (Figs. 1a and 1b). Upon issuing the medication for the tattoo, the healer explained in detail about using a new razor blade for cutting, applying medicine with gloves if available and rushing to the hospital if the symptoms worsened. He mentioned that the infection prevention control measurements were educated by the education programme offered by the HIV&AIDS program of the Ministry of Health. The healer also expressed his willingness to be included in the health system for LARI patient referral.

Accessing formal biomedical services

We inquired under what conditions adults will access formal health services when having ARI. The responses identified three sub-themes that affect the individual's decision to access the service.

Severity of illness

The adult individual's tipping point of accessing formal health care services is the severity of the illness. This includes a critical level of the condition and duration of the illness based on self-cognition decisions and surrounding social actors' recommendations. The duration of tolerance of ARI was 3 to 7 days. The community informants stated:

"I started coughing for three days, then I started having pneumonia, I was failing to breathe. I was feeling like I have befuu (shortness of breath); *this was when I decided that I should go to the hospital… It took me three days."* – KII/CO04

"… if one is sick today, tomorrow, then the third day, taking our traditional medicine if no improvement, we say time is passing… in this case that we say let us go with this person to the hospital… When I was sick with the cough, it was prolonging; then I said to myself would rather go to the hospital…when we see that the traditional medicine is not proving to be effective, we accept defeats and think of going to the hospital." – KII/CO01

"It took about a week. I was living with my aunt; that time I was going to school. Daddy was coming to see me. They agreed that since I had medicine from a herbalist, we had to wait and see the effect of that. So, we had to wait. When aunt saw no improvement, she suggested that we should go to the hospital." – KII/CO05

Financial and logistical challenges

Although adult individuals could decide to access the service based on their own will, the financial and logistical challenges remained to constrain the actual action. Monetary factors related to the daily needs during the hospitalization and the transportation logistic were the major factor influencing the act, according to the informants:

"With regard to nsima (maize powder for food) *it does not affect much, thinking of money to buy relish at the hospital… that affects. On that we take time to think twice… then we borrow from anybody around who may happen to have."* – KII/CO01

"You need to help us. We are suffering. People die in villages just because of distances to access medical help. You need always to have money. The poor die because of that. Finding money is not easy at all." – KII/CO08

"… others will accept to have traditional medicine simply because there is no means of transport for them to go to the hospital." KII/NY01

Experiential expectations from formal health facilities

Apart from the abovementioned factors, the personal experience and belief in formal health care services could affect an adult's decision to access services. The informants from the community described:

"The younger generation have all the trust in the hospital but old people from 50 up wards it is not easy to bring them to the hospital. Those below 35 once sick think primarily of going to the hospital. The elders believe in the roots that they dig." – KII/CO05

"When I suffer from ARI, personally, I go to the hospital because I usually get severely attacked. No one can help me well at the village… I suffer but I get healed..." – KII/CO07 (young adult)

"I lost my parents some time back… I learnt that if a person is sick, one should always rush to the hospital. The volunteers teach us that once things are not changing its time to go to the hospital in good time." – KII/CO06

The fear of being refused and blamed by the service provider might cause a delay in accessing service but wouldn't stop adult individuals from going to the hospital. The service providers shared their observations:

"They do come to the hospital. They may be using traditional medicine but we are not sure because they come and they don't disclose that information to us…because they know it's not advisable to do that… we can see they have tattoos on their chest cavity… usually they will come when things are complicated… when they will realize to say that things are not okay, then they come to the hospital… their perception that when they disclose to us, we will get angry with them and probably not give them treatment at all or they think that we will not give them the right treatment… in practice, it's good to know… because it helps us to know what to do next" – FGD/MHRH01-04

The group of service providers further expressed their concern and how to manage the expectations from the community to reduce the potential delays through community sensitizations:

"… community sensitization… the understanding of people in villages is different from people in town… but I hope with intensive community sensitization on the implications of maybe delaying to seek medical care… it will help and bit by bit people will get their minds opened up." – FGD/MHRH01-04

Adult's ARI health-seeking pathways and implication to IDSR system

We synthesised the findings from these four thematic areas to understand the health-seeking behaviour for acute respiratory illness among adults in the rural community of Malawi. As illustrated in Fig. 2, we used the pathway width to denote the respondents' findings of their most possible actions. In the end, only small fractions of the ARI patients might reach the health facilities, and only SARI patients might further be reported in the national IDSR system. The national surveillance system missed the ARI recovered incidents for those who utilised homemade remedies and middle-layer services at the community level, and there was a lack of mild ARI reporting requirements at the facility level. While the vital registration system to digitally capture ARI deaths that occurred at the community and facility level was yet to be fully developed and implemented [53, 54]. The results showed the ARI incidents and mortality surveillance gaps at both levels.

Discussion

The self-cognition of an ARI episode is the beginning of an adult's ARI health-seeking behaviour. We found a clear terminology distinction between UARI and LARI in the local context. More terms were found related to UARI, which may be due to the direct perception of the symptoms. In contrast, only two local vocabularies, *chilaso* and *befuu*, were identified to express the LARI. The limited terminology hindered the difficulties for locals to comprehend the cause of the LARI, therefore making people believe supernatural cause or bewitched when they have it. The mismatch of local ARI terms with the biomedical concepts of diseases was also reported previously [41, 55]. However, the critical terminology difference between UARI and LARI allowed adults to constantly assess the severity until the tipping point for an adult to seek health care outside of home remedy.

The local community demonstrated vast knowledge and experience using homemade remedies, especially herbal medicines, to overcome ARI illness. More than two hundred southern African plant species were documented for treating viral respiratory diseases [56]. However, very few of these plants were screened and tested for their treatment effectiveness. Echoing Langeder's proposed strategies, we need more rigours studies to explore potential antiviral and antibacterial compounds from these local plants used for ARI in Malawi [57]

According to our findings, similar to the study done by Levin, the social actors surrounding the adults were not a strong determinant for their decision to access formal health services [58]; instead, negotiating logistical resources from these actors is critical to determining whether an ARI patient may reach the health facility. The financial and logistical challenges were identified as the key factors affecting adults' health-seeking behaviour in Malawi [59, 60]. Therefore, the authorities must improve the social and structural status of health service accessibility.

In this resource-constrained context, the "middle layer" actors played essential roles in providing health support to ARI patients. Although adults might seek help from formal community health care workers - HSAs, their roles and responsibilities in treating adults' ARI were not included [61]. The health authorities may consider clarify the HSAs' role in handling adults with ARI, including treatment, critical cases referral, most importantly, enable the HSAs to perform their surveillance function to identify community-level SARI incidents, unlike the state of quo [24].

The complicated role of drug vendors is a common phenomenon in Malawi and other African countries [62, 63]. In Malawi's context, they serve as one of the middle-layer actors in the ARI health-seeking pathway. In contrast, traditional healers are the most crucial middle-layer actors by providing spiritual and herbal treatment to the community for an aeon in the African community [64]. However, similar to the TB scenario, the adults' choice to seek ARI treatments from them further caused absence or delayed treatment in the health facility [65]. Harmony is possible. The HIV and TB programmes have already involved traditional healers for case detection, referral, and infection prevention since the 1990s [66–68]. At the same time, a positive attitude of traditional healers toward collaborating with health authorities for patient referral was found in our study and elsewhere [42, 69]. This situation provides an excellent

opportunity for the health authority to engage traditional healers in ARI patient referral and community-based surveillance [70]. Mobile technology and appropriate digital solution may serve the interface function between middle-layer community health actors and the formal healthcare system to enhance the event-based surveillance function in the nation's IDSR system [71–74].

Despite self-cognition to perceive ARI severity and combat the structural challenges for adults to decide to access formal biomedical services, other epidemiological and psychological factors still affected the actual behaviour from this study context. The gender difference was not standing out from our study, unlike in other contexts [43]. In comparison, the fear of being refused or blamed by service providers was highlighted as a crucial affecting factor and similar to Kelly's study finding about the fear of unpleasant treatment procedures [30]. In contrast, the healthcare workers cleared the myth and expressed the importance of cooperation with the traditional healers to enhance the referral and surveillance, similar to other study findings [42, 45].

Colvin's conceptual model provided helpful insight for data analysis [39]. We expanded the model, considering that self-cognition and assessment of the ARI severity is a constant process for an individual. Adults continuously evaluate the external situation from each process, providing the most rational choice in accessing or non-attendance to formal health services [75]. Each decision process of an individual is essential to the national health surveillance system. As studied previously, the HSAs could not fully perform their community surveillance functions [24]. Though the under-five children's SARI cases could be reported via the HSAs, there is no surveillance mechanism to know recovered adults supported by middle-layer actors. Adults' SARI cases could only be reported at a facility equipped with adequate resources, capacity and enhanced infrastructure [24].

Concerning community-level ARI deaths, Malawi has started the implementation of the civil registration and vital statistic system with digital solutions, which can be a potential source for community-level ARI mortality surveillance [76]. The ongoing development and implementation of the nation's integrated community health information system can be another vital surveillance instrument for use [77]. At the national level, preparing an affordance digital solution ready for integration, interoperation and accommodation of the community-level ARI surveillance data are essential.

Our study was limited by its setting, and the results may not be generalized to all Malawi rural communities; however, other studies found similar patterns [59, 65, 78]. Hence, the model from our study may guide future studies in this field, especially to quantify the actual probabilities of missing ARI reporting and provide insight for future surveillance system enhancement.

Conclusions

Self-recognition of the acute respiratory illness severity is a critical factor in influencing an adult's health-seeking pathway. Most adults use the middle layer actors' solution before accessing formal health services. There is no proper mechanism and sufficient surveillance function at the community level to detect unusual ARI episodes. Among all middle-layer actors, it is crucial to proactively engage the

traditional healers and equip them with adequate knowledge and resources to act on the community-based surveillance role for timely acute respiratory illness event detection, such that acute respiratory illnesses are also reported from traditional healers and other middle layer actors.

Abbreviations

ADC Area Development Committees

AIDS Acquired Immunodeficiency Syndrome

ARI Acute Respiratory Illness

COVID-19 Novel Coronavirus Disease

HIV Human Immunodeficiency Virus

HSAs Health Surveillance Assistants

IDSR Integrated Disease Surveillance and Response

LARI Lower Acute Respiratory Illness

LRI Lower Respiratory Infections

MERS-Cov Middle East Respiratory Syndrome Coronavirus

SARI Severe Acute Respiratory Infections

SARS-Cov Severe Acute Respiratory Syndrome Coronavirus

TA Traditional Authority

TB Tuberculosis

UARI Upper Acute Respiratory Illness

Declarations

Ethics approval and consent to participate

This study was part of TSJW's PhD study with the protocol number: 16/4/1563 in title of "Can we use unusual respiratory infections incidence as detected by the electronic medical records systems to provide early warning signal for a community outbreaks?" with the approval number of NHSRC # 16/4/1563 by the National Health Sciences Research Committee of the Ministry of Health of Malawi. The same

protocol was also reviewed and approved by the Norwegian Center for Research Data (NSD) with the Prosjektnr: 48180 and approval reference number Vår ref: 48180/3/BGH.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

TSJW led the study design, conducted the filed data collection, analysed the data and was responsible for the manuscript writing. MSK contributed to the filed data collection, organised the fieldwork in the community and health facilities and assisted in the data analysis and manuscript writing. YN provided insights to inform the study design and contributed to interpreting the analysed results and discussion points. JJK provided informatics domain knowledge in analysing the health-seeking behaviour pathways, interpretation of the finding, discussion points and manuscript editing. GAB provided global health and medicine insights for data analysis, results interpretation, discussion points and manuscript editing. All authors read and approved the final manuscript.

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Figures

Figure 1

(a). The diagnostic tool (circled in white) of the healer while performing the consultation to a patient; (b). The preparation of the treatment from the plant's root for the *tattoo* treatment.

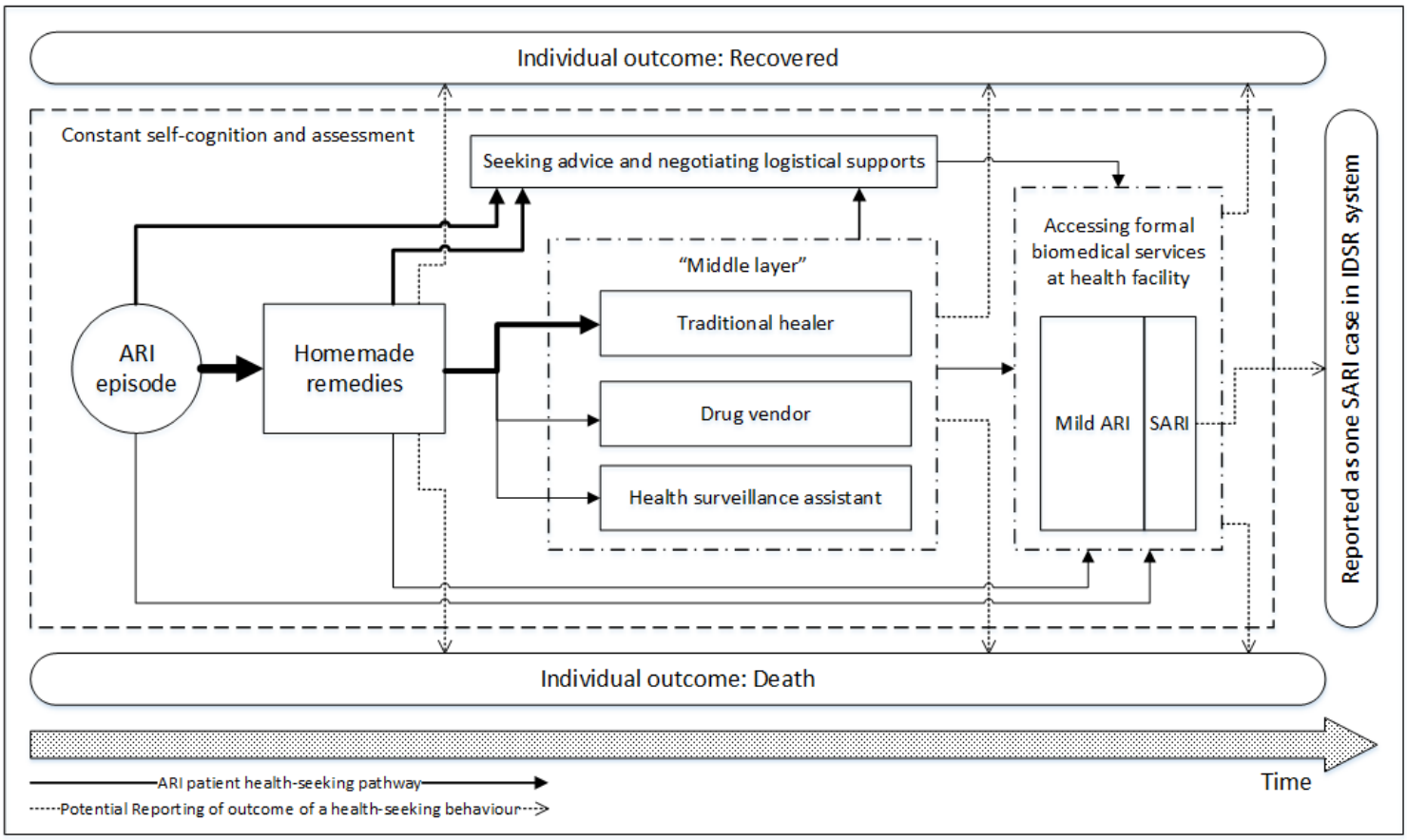

Figure 2

Adult ARI patient health-seeking pathways and potential outcomes of the behaviours