KNOWLEDGE AND BEHAVIORS RELATED TO THE COVID–19 PANDEMIC IN MALAWI

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ABSTRACT

Background: There are limited data on knowledge and behaviors related to COVID–19, and on the adoption of preventive behaviors, in sub-Saharan countries.

Methods: Between April 25th and May 23rd, we contacted 793 individuals aged 18 and older, who previously participated in studies conducted in the Karonga Health and Demographic Surveillance Site in Karonga District, Malawi. During an interview by mobile phone, we ascertained respondents’ sources of information about COVID–19 and we evaluated their knowledge of the transmission and course of SARS-CoV-2/COVID–19. We also asked them to evaluate their own risk of infection and severe illness. Finally, we inquired about the preventive measures they had adopted in response to the pandemic. We describe patterns of knowledge and behaviors among survey respondents, by area of residence (rural vs. urban).

Results: We interviewed 630 respondents (79.5% response rate) which included 260 men and 370 women. Four hundred and eighty-nine respondents resided in rural areas (77.6%) and 141 resided in urban areas (22.4%). Only one respondent had never heard of COVID–19. Respondents reported on average 4 distinct sources of information about COVID–19. Misconceptions about the modes of transmission of SARS-CoV-2, and about the course and severity of COVID–19, were common. For example, two thirds of respondents believed that everyone with COVID–19 would eventually become severely ill. Increased hand washing and avoiding crowds were the most reported strategies to prevent the spread of SARS-CoV-2. Use of face masks was more common among urban residents (22.5%) than among rural residents (5.0%).

Conclusion: Despite widespread access to information about the COVID–19 pandemic, gaps in knowledge about COVID–19 persist in this population. The adoption of preventive strategies remains limited, possibly due to limited perceived risk of infection among a large fraction of the population.

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INTRODUCTION

The COVID–19 pandemic has already caused more than 200,000 recorded cases and 6,000 deaths in African countries [1]. Epidemiological models have projected that close to 25% of Africa’s population could become infected with SARS-CoV-2 in 2020 [2], resulting in significant burden on health systems and between 82,000 and 189,000 deaths. As of early June 2020, the progression of the pandemic appears to be accelerating in several areas of the continent.

In the absence of an effective vaccine, behavioral changes are essential for mitigating the impact of the pandemic. According to the World Health Organization [3], controlling the spread of the novel coronavirus (SARS-CoV-2) in local communities requires adopting preventive behaviors that either a) reduce the extent of contacts between population members or b) limit the likelihood that the coronavirus will be transmitted if such contact occurs. This includes, for example, maintaining an increased distance between individuals, enhancing hand hygiene or limiting mass gatherings [3]. Wearing facial masks is also increasingly recommended to limit the emission of infective droplets [4,5].

The adoption of such behaviors requires having adequate information about patterns of disease transmission and the severity of symptoms. According to standard frameworks in public health [6,7], adoption also depends on whether individuals perceive themselves as susceptible to acquiring a new disease or health threat, and whether they consider that this disease would have serious consequences for their health and well-being. In this paper, we investigate sources of information, knowledge and risk perceptions related to the COVID–19 pandemic among a sample of Malawian adults. We then measure the prevalence of preventive behaviors during the first few weeks of the pandemic in the country.
DATA AND METHODS

Study setting: Malawi is a low-income country located in East Africa. It registered its first COVID-19 case on the 1st of April 2020. As of June 10th, 2020, 481 confirmed cases had been recorded, in 24 out of 28 districts of the country. Among confirmed cases, according to the ministry of health, 382 cases were imported infections, primarily in travelers returning from South Africa. Eighty-six infections had been acquired locally.

We worked primarily in Karonga District, in the Northern region of the country. Karonga District is a predominantly rural district, where sources of income include fishing, farming and small-scale trading. A major highway crosses the district, leading from the Songwe border with Tanzania to Mzuzu and other large cities in the country. As of June 10th, 2020, there had been 2 confirmed cases in Karonga district. There had also been one case in neighboring Chitipa District.

The Karonga Health and Demographic Surveillance Site (KHDSS) is a data collection system that operates in the southern part of Karonga District [8,9]. Since 2002, it monitors vital events (e.g., births, deaths) that occur within a population of approximately 47,000 individuals. Prior to the COVID–19 pandemic, we have conducted several methodological studies focused on the measurement of mortality among the KHDSS population [10]. During the course of these studies, we have collected the mobile phone numbers of a number of respondents to enable recruitment and/or follow-up. We used these lists of phone numbers to enroll participants into a follow-up study of attitudes and behaviors towards the COVID–19 pandemic. This strategy has been used in other contexts to conduct mobile phone surveys about COVID–19 attitudes and behaviors [11].
**Sampling:** Phone numbers were available for 3 groups of respondents. First, we had the phone numbers of 230 migrants who had left the KHDSS area. These migrants (KHDSS migrants thereafter) were selected at random among the lists of all former KHDSS residents who had migrated out of the area since 2002. We obtained their mobile number(s) to confirm interest in participating in the parent study and arrange a meeting. We then visited them in their new place of residence to conduct an in-person interview in December 2019/January 2020. Second, we had phone numbers of participants in a sub-study focused on the feasibility of collecting data on mortality by mobile phone. These participants included 106 residents of the KHDSS area (KHDSS residents thereafter) who were interviewed in person in February 2020. They were selected at random among residents of several population clusters located in the vicinity of Chilumba, in Karonga district. They referred 457 of their maternal siblings to the study, by providing their mobile phone numbers. In February/March 2020, we contacted these referred siblings by mobile phone to conduct a short interview about health and mortality.

All individuals aged 18 years and older for whom a phone number was available were eligible for the COVID–19 study. The study sample thus included residents of the KHDSS area, as well as individuals dispersed throughout Malawi and residing in rural or urban areas. Migrants and siblings who had migrated outside of Malawi were not included in this study. In total, 793 individuals were eligible for the COVID-19 follow-up study. We sought the oral consent of respondents prior to participation in the COVID-19 follow-up study. The protocol for this study was approved by institutional review boards at the Malawi Ministry of Health (National Health Sciences Research Committee), at the Johns Hopkins University School of Public Health, and at the London School of Hygiene and Tropical Medicine.
**Data collection:** Due to health risks posed by in-person interviews during the COVID–19 pandemic, all data collection occurred remotely. We recruited five interviewers who had previously worked on the pre-COVID–19 mortality studies. To ensure the continuity of data collection during potential lockdowns, and to abide by local social distancing guidelines, they conducted phone interviews from their own home. Prior to the start of the study, a supervisor visited each home to ensure that a private space was available where interviewers could conduct interviews.

The questionnaire covered the socio-demographic characteristics of respondents, as well as their current economic activity. We inquired about their recent use of healthcare services and their attendance of various places and events (e.g., churches). We then asked a series of questions about the COVID–19 pandemic, including sources of information, knowledge of transmission patterns and disease course, and preventive behaviors. Finally, the questionnaire included several modules about the survival of various relatives of the respondent (e.g., spouse, siblings) and the respondent’s own health. The median duration of interviews was 30 minutes (Inter-Quartile Range = 24 minutes to 38 minutes). After each completed interview, respondents were provided with 1,200 Malawian Kwachas in mobile phone credit (approximately, 1.50 US dollars). In this paper, we focus solely on data pertaining to knowledge and behaviors related to the COVID–19 pandemic.

**Data analysis:** we present descriptive analyses of several variables measuring knowledge and behaviors related to the COVID–19 pandemic. First, we asked respondents to list all the sources of information from which they had heard about COVID–19. We created a continuous variable that counts the number of information sources reported by respondents, as well as binary variables that took a value of one if a respondent heard about COVID–19 from a specific source of information (e.g., radio) and zero otherwise. Second, we analyzed a series of
questions that asked respondents whether they agreed with several statements about the transmission of SARS-CoV-2 (5 statements), and the course and risk factors of COVID–19 (6 statements). Statements about the transmission of the coronavirus included, for example, affirmations that the novel coronavirus was a respiratory virus, a waterborne virus or a bloodborne disease. Statements about the course and severity of COVID–19 included, for example, affirmations that everybody infected with the coronavirus would develop severe symptoms, or that the risk of developing severe disease was higher among the elderly. We created two variables that counted the number of correct answers the respondent provided about transmission patterns and disease course. Third, we investigated the risk perceptions of individuals. We described the distribution of respondents across categories of self-perceived risk of infection. We also described individual expectations about the severity of disease, if they were to become infected themselves. Finally, we described the strategies that respondents reported using for preventing the spread of SARS-CoV-2/COVID–19. We created a continuous variable that counts the number of strategies reported by respondents, as well as binary variables that take a value of one if a respondent reported a specific strategy (e.g., wearing a face mask) and zero otherwise. We compared the distributions of these variables between rural and urban residents using \( \chi^2 \) tests for binary variables and t-tests or non-parametric tests for continuous variables.

RESULTS

Between April 25\textsuperscript{th} and May 23\textsuperscript{rd} 2020, 630 of the 793 individuals we contacted accepted to complete an interview (79.5\%). The main reasons for not participating included being unable to reach the respondent (n = 110) and having a wrong number (n = 23). Five potential participants
refused to be interviewed, one was reported to have died, and two others had migrated outside of Malawi.

The socio-demographic characteristics of respondents are reported in Table 1, by place of residence. Close to 60% of respondents were women. Among rural residents, 95% resided in the Northern Region of Malawi. Urban residents were dispersed throughout the country, with 31.4% and 17.9% residing in the Central and Southern regions, respectively. The districts of residence of respondents are described in appendix A1. One in 5 respondents were young adults aged 18–24 years old, whereas <3% were adults aged 55 years and older. Respondents in rural areas were more likely to be married than in urban areas (64.7% vs. 55.7%).

[TABLE 1 ABOUT HERE]

Only one respondent reported that he had never heard of COVID–19. Other respondents reported 3 distinct sources of information about COVID–19 in rural areas vs. 4 sources in urban areas (p<0.001). The most common sources of COVID-related information were the radio and conversations with friends (figure 1). There were large differences in sources of information between rural and urban residents. In urban areas, respondents reported relying more extensively on the television (64% vs. 18%), WhatsApp (43% vs. 14%), Social Media (31% vs. 9%), newspapers (16.5% vs. 5%) and the Internet (18% vs. 4%). In rural areas, respondents reported obtaining COVID-related information more frequently from relatives (37% in rural areas, vs. 27% in urban areas) and health facilities (37% vs. 24%). Very few respondents reported obtaining COVID-related information from the hotline(s) established by the Ministry of Health (<1%).

[FIGURE 1 ABOUT HERE]
Close to 90% of respondents knew that the coronavirus is a respiratory virus (figure 2), which can also be transmitted by contact with contaminated surfaces. Three out of 4 respondents knew that the coronavirus can be transmitted even if the person who is infected is not showing any symptoms. A third of respondents however believed that the coronavirus is a bloodborne virus, whereas close to half of respondents believed that the coronavirus is a waterborne virus. Knowledge of transmission patterns was more limited among rural respondents for 3 of the 5 questions that were asked. The mean number of correct answers about transmission patterns per respondent was 3.4 (out of 5).

[FIGURE 2 ABOUT HERE]

One in six respondents believed that there is an effective treatment against COVID–19 and two out of three respondents believed that everyone affected by COVID–19 will ultimately become severely ill (Figure 3). Close to 40% of respondents did not know that it is possible to have COVID–19 without showing symptoms. Large proportions also did not know that the risk of becoming (severely) ill varies by age: 44.8% of respondents disagreed that children under age 12 years old are less likely to become ill, whereas 32.8% of respondents disagreed that the elderly were at higher risk of severe disease. Knowledge of the course of the disease was more limited among rural respondents for 4 of the 6 questions that were asked (figure 3, p<0.05). The mean number of correct answers about the course of the disease per respondent was 3.0 (out of 6). The complete distribution of scores, by place of residence, is shown in appendix A2.

[FIGURE 3 ABOUT HERE]
Slightly less than half of respondents perceived themselves to be at low risk of infection (Figure 4a). In rural areas, only 5.3% of respondents reported being “almost certain” to become infected, vs. 12.1% in urban areas (p=0.04). Few respondents expected to experience “no symptoms” if they ever became infected with SARS-CoV-2 (2.1%). A greater proportion of urban residents expected to experience no or only mild symptoms (Figure 4b). Overall, close to 3 out of four respondents expected to experience “severe” or “life threatening” symptoms if they became ill with COVID–19.

Seven respondents reported not having adopted any strategy to prevent the spread of SARS-CoV-2 (1.1%). Among the rest of the respondents, rural residents reported adopting an average of 2.6 strategies, vs. 3.2 for urban residents (p<0.001). More than 95% of respondents reported washing their hands more frequently (Figure 5), and approximately 50% reported avoiding crowds. Only one out of five rural residents and one out of four urban residents reported staying at home. The use of face masks and hand sanitizers was more prevalent among urban residents (22.3% and 27.3%, respectively) than in rural areas (5.0% and 10.6%, respectively). Very few respondents reported avoiding hospitals to prevent the spread of SARS-CoV-2.

DISCUSSION

Our study documented widespread access to information about COVID–19 among this population in Malawi. Sources of information were more diversified among residents of urban areas, but even in rural areas, respondents frequently reported multiple sources. Despite
available information, respondents had imperfect knowledge of the patterns of SARS-CoV-2 transmission, and particularly of the course and severity of COVID–19. Knowledge was more limited among residents of rural areas. Close to half of study respondents perceived themselves at a low risk of acquiring the novel coronavirus. The level of perceived risk of infection reported by respondents appeared lower than in prior studies. Even in urban areas, only 1 in 8 respondents reported perceiving themselves at high risk, whereas in recent studies in Nairobi slums, this proportion was as high as 1 in 3 [11]. Most respondents in our study believed that if they were to become infected, they would experience severe illness. This is paradoxical since most mathematical models suggest that the risk of infection is high in African countries, including Malawi, but the likelihood of severe disease is much lower [2].

In part due to knowledge gaps and inaccurate risk perceptions, the adoption of preventive behaviors was limited in this population. Whereas virtually everybody reported washing hands more often, fewer respondents reported implementing more effective strategies including social distancing or wearing masks. This was particularly so in rural areas, where respondents reported having adopted fewer strategies to prevent COVID–19.

Our study has important limitations. First, it is based on a sample of individuals who can be reached by mobile phone. As a result, it might exclude members of the more impoverished members of the study communities. Second, our sampling frame was constituted from lists of participants in studies conducted in 2019/2020. Only approximately 45% of the sample was randomly selected (HDSS migrants and HDSS residents). Other respondents were referred to this study by their (randomly selected) siblings. As such, our sample is not representative of specific populations in Karonga District or elsewhere in Malawi. In particular, whereas our sample included respondents in a number of urban areas of the country (e.g., Lilongwe, Mzuzu), it was not representative of cities/towns in Malawi. Third, we did not investigate other
determinants of the adoption of preventive behaviors according to the health belief model. For example, we did not systematically investigate the barriers and constraints that might prevent individuals from maintaining social distancing norms or from consistently using hand sanitizer.

Fourth, our analyses are based on self-reported data on attitudes and behaviors. These data might be affected by social desirability biases. For example, respondents might over-report the number of preventive behaviors they adopted if they believe that this might be the more acceptable answer. Finally, our study results might be affected by non-response during the mobile survey. Only 80% of the individuals for whom a phone number was available participated in the mobile interview. If their characteristics and behaviors differed systematically from those of other respondents, the results from the study might be biased.

Despite these limitations, our study has important implications. On the one hand, they indicate that additional information campaigns might be needed to fill knowledge gaps about the transmission and course/severity of the disease. Such campaigns might use the radio as their primary medium, but they could also make use of other media including social media platforms to reach individuals in urban areas. On the other hand, these information campaigns, along with other interventions, should aim to better align individual risk perceptions with epidemiological estimates of transmission risk.
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|                          | Rural Residents | Urban Residents |
|--------------------------|-----------------|-----------------|
| **Gender**               |                 |                 |
| Men                      | 201 (41.0)      | 60 (42.9)       |
| Women                    | 289 (59.0)      | 80 (57.1)       |
| **Region of residence**  |                 |                 |
| Northern                 | 467 (95.3)      | 71 (50.7)       |
| Central                  | 12 (2.5)        | 44 (31.4)       |
| Southern                 | 11 (2.2)        | 25 (17.9)       |
| **Recently moved in HH?**|                 |                 |
| Yes                      | 28 (5.7)        | 6 (4.3)         |
| No                       | 462 (94.3)      | 134 (95.7)      |
| **Age**                  |                 |                 |
| 18–24                    | 94 (19.2)       | 27 (19.3)       |
| 25–34                    | 169 (34.6)      | 50 (35.7)       |
| 35–44                    | 150 (30.6)      | 43 (30.7)       |
| 45–54                    | 62 (12.7)       | 16 (11.4)       |
| ≥55                      | 14 (2.9)        | 4 (2.9)         |
| **Marital Status**       |                 |                 |
| Currently married        | 317 (64.7)      | 78 (55.7)       |
| Separated                | 59 (12.0)       | 7 (5.0)         |
| Divorced                 | 25 (5.1)        | 4 (2.9)         |
| Widowed                  | 22 (4.5)        | 4 (2.9)         |
| Never married            | 66 (13.5)       | 47 (33.6)       |
| **Economic activity**    |                 |                 |
| Worked in past 7 days    | 171 (34.9)      | 80 (57.1)       |
| Did not work in past 7 days | 319 (65.1)   | 60 (42.9)       |
| **Mode of recruitment**  |                 |                 |
| HDSS migrants            | 97 (19.8)       | 73 (52.1)       |
| HDSS residents           | 86 (17.6)       | --              |
| Referred siblings        | 307 (62.6)      | 67 (47.9)       |

**Table 1: characteristics of study participants**

*Notes:* numbers in parentheses are column percentages
Figure 1: reported sources of information about COVID-19, by place of residence.

Notes: “Phone messages” refers to informational messages sent by mobile operators (e.g., Airtel); “Hotline” refers to the toll-free numbers set up by the ministry of health to provide COVID-related information.
Figure 2: respondents' knowledge about transmission of the coronavirus that causes COVID–19, by place of residence.
Figure 3: respondents' knowledge about the course and severity of COVID–19, by place of residence.
Figure 4: self-perceived risk of disease outcomes, by place of residence
Figure 5: adoption of preventive strategies, by place of residence
Notes: percentages are calculated among respondents having adopted at least one prevention strategy (n = 622).