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Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and Access to Essential Resources and Health Services in Somali IDP Camps

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3 **Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and**
4 **Access to Essential Resources and Health Services in Somali IDP Camps**
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Abstract

Objectives: This study examined knowledge of COVID-19, self-reported prevalence of preexisting conditions, and access to essential health services among residents of internally displaced persons (IDP) camps in Somalia, where overcrowded settlements with weakened infrastructure, inadequate water, sanitation, and hygiene facilities, and inaccessible health services make this vulnerable population particularly susceptible to a COVID-19 outbreak.

Design: A descriptive, cross-sectional survey design assessing demographics, current health profiles, knowledge and perceptions of COVID-19, and access to essential resources was used.

Setting: Twelve IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi, Carbiska, and Afgooye) of the Lower Shabelle region in Somalia.

Participants: 401 adult Somali IDP camp residents.

Results: Though 77% of respondents reported taking at least one COVID-19 preventative public health measure, respondents reported a severe lack of access to adequate sanitation, an inability to practice social distancing, and nearly universal inability to receive a COVID-19 screening exam. Questions assessing knowledge surrounding COVID-19 prevention and treatment yielded answers of “I don’t know” for roughly 50% of responses. The majority were not familiar with basic information about the virus or confident that they could receive medical services if infected. Those who perceived their health status to be “fair,” as opposed to “good,” showed 5.69 times higher odds of being concerned about contracting COVID-19. Respondents who felt more anxious or nervous and those who introduced one behavioral change to protect against COVID-19 transmission showed 10.16 and 5.20 times increased odds of being concerned about disease contraction, respectively.

Conclusion: This study highlights immense gaps in the knowledge and perceptions of COVID-19 and access to treatment and preventative services among individuals living in Somali IDP camps. A massive influx of additional resources is required to adequately address COVID-19 in Somalia, starting with educating those individuals most vulnerable to infection.

Key Words: COVID-19, Conflict, Internally Displaced Persons, Somalia, Humanitarian Health; Infectious Diseases; WASH

Strengths and Limitations of This Study

- To the best of our knowledge, this study is one of the first to explore knowledge of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in any African country, including Somalia.
- This study drew upon a diverse and expansive set of measures and involved a relatively large sample of internally displaced persons that are often understudied and neglected in public health research and interventions, especially during the COVID-19 pandemic.
- Respondent health profiles collected in this study rely on self-reported data, which may have introduced bias.
- Participants were recruited from twelve Somali IDP camps across six areas of the Lower Shabelle region and were predominantly women, which may limit the generalizability of the study findings.

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Introduction

There are more than 41 million internally displaced persons (IDPs) and 25 million refugees around the world according to the United Nations High Commissioner for Refugees (UNHCR)[1]. Many of these displaced people live in large-scale camps with conditions that could undermine public health guidelines for the control of COVID-19, such as social distancing, and are thus especially vulnerable to emerging infectious diseases[2]. Additional legal, financial, and linguistic barriers often inhibit displaced residents from accessing their host country's health care system, exacerbating conditions precipitated by an absence of basic amenities, such as soap, running water, and medical personnel[2]. Eighty-four percent of displaced people reside in low- or middle-income countries, and these host countries are often ill-equipped to rapidly institute health management protocols and response teams within IDP communities, especially amidst the COVID-19 pandemic[3]. Providing continuity of care for chronic conditions as well as infection prevention and control measures within displaced communities are necessary to ensure the well-being of both displaced and host communities[2, 4].

The Ministry of Health in Somalia announced the first confirmed case of COVID-19 in Somalia on March 16, 2020[5]. As of July 8, 2020, the Ministry of Health of Somalia reported 3,015 confirmed COVID-19 cases, 1,827 of which are active and 92 of which have resulted in death[5]. Although the prevalence of COVID-19 remains low at the moment, the nation's health system is extremely underprepared for a further outbreak of COVID-19[6].

In Somalia, thirty years of civil war and natural disasters have resulted in nearly three million internally displaced persons who now inhabit over 2,100 overcrowded settlements[7]. The prolonged conflict has severely damaged Somalia's healthcare infrastructure, leaving its inhabitants vulnerable to climate related disasters, malnourishment, infectious disease outbreaks, and other humanitarian crises[8, 9].

Somalis face several barriers in utilizing their country's healthcare system. Several reports inculcate that health worker shortages and a nonexistent health information system leave its residents without reliable access to care[8, 9]. Somali physicians have also reported that there are no ventilators and only two intensive care units with a total of 31 beds across the country, which is alarming given that these resources are regarded as necessary to treat severe COVID-19 infections[10]. In addition, it has been reported that two in three Somalis have difficulties accessing safe water and approximately 50% of health care centers do not have reliable access to electricity[11, 12]. Qualitative reports also signal that care-seeking behavior is very poor among Somalis, as a result of distrust towards the system's lack of regulation and unaffordable prices[13]. Consequently, Somalia has some of the lowest health indicators in the world with life expectancies of 54 years for males and 57 years for females[11, 14]. Studies in Somalia have reinforced a predisposition of internally displaced persons to infectious and water-borne diseases[15]. IDPs are

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3 among the most vulnerable to infectious disease outbreaks as they face circumstances such as
4 overcrowding, uncontained sewage and waste, limited access to health services, contaminated
5 water, low immunization coverage, and stigmatization.
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8 According to the Global Health Security Index, Somalia ranks 194 out of 195 countries in
9 preparedness for a globally catastrophic biological event[16]. To address the dire threat COVID-
10 19 poses to IDPs in Somalia, ongoing efforts have primarily focused on scaling up water,
11 sanitation, and hygiene (WASH) services, increasing monitoring, and disseminating information
12 about COVID-19[6, 7, 17-19]. Many organizations have also helped obtain equipment such as
13 personal protective equipment (PPE) and ventilators for providers, as well as soap and chlorine
14 tablets for community members[7, 10, 19]. Several organizations have reported that the country's
15 health system has no capacity to make early case detections, isolate and care for patients, and trace
16 contacts, and have thus focused their efforts on preventive measures to mitigate the virus's
17 impact[13].
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23 Among these efforts, few have incorporated IDP knowledge and perceptions of COVID-19 in their
24 planning and implementation. However, studies on Bangladeshi IDP camps similar to those in
25 Somalia warn of the profound consequences of COVID-19 on those without a strong healthcare
26 infrastructure[20]. The scarcity of IDP-focused COVID-19 data has not prevented various
27 international health authorities from warning of the grave threats the pandemic poses to these
28 vulnerable populations[21, 22]. Nevertheless, there is an international information gap about IDP
29 knowledge and perceptions that inhibit providers from implementing sustainable, culturally
30 appropriate health interventions.
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35 This study aims to explore knowledge and perceptions of the symptoms, transmission, prevention,
36 and treatment of COVID-19 among persons living in IDP camps and to understand the unique
37 structural barriers that inhibit a comprehensive public health response in this setting. We hope that
38 our study findings contribute to the development of potential interventions to improve the response
39 to COVID-19 in Somali IDP camps, where some of the world's most vulnerable individuals reside.
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Methods

Design and Instrument

A descriptive, cross-sectional survey tool was used to assess the current health profile, living conditions, and knowledge and perceptions surrounding COVID-19 among adults living in Somali IDP camps. To design the survey tool, guidance was drawn primarily from published WHO and CDC information on COVID-19 symptoms and transmission, a 2019 Displacement Severity Assessment among forcibly evicted Somalis conducted by the Internal Displacement Monitoring Centre, and two previously published survey studies which evaluated COVID-19 knowledge and risk factors in limited-resource settings[23-27].

Our adapted survey tool begins with a section collecting demographic information on participants, including sex, age, displacement status, geographic location of their camp, household size and status, education, and employment. Responses for educational status reflect the education system in Somalia, and included options for “no formal education” and for all levels from primary through tertiary schools, as well as options for graduate degrees and Qur’anic education. The next section of the survey gathers information on participants’ health profile, with questions on self-rating of current health, existing conditions, and current symptoms if applicable. This section also employs a 12-item tool to gauge concerns brought on by COVID-19, such as potential effects on mental wellbeing, contracting COVID-19, or ability to buy essential food items. The third section of the survey measures knowledge of COVID-19, most commonly used sources of information, and trust in various knowledge sources and community efforts against COVID-19. An open-ended question on COVID-19 knowledge was followed by a 23-item tool which assesses knowledge of COVID-19, and consists of true-or-false statements regarding key facts or misconceptions surrounding the disease. The final section of the survey evaluates access to medical resources, COVID-19 tests and treatments, and essential services.

Because many participants did not speak English, this survey tool was translated into Somali. The Somali version of the survey was then reviewed for its content and suitability in the given context. Minor changes to the language of the Somali version were made to improve readability.

Sample and Setting

A convenience sample of 401 individuals living in twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi, Carbiska, and Afgooye) of the Lower Shabelle region in Somalia, often referred to as the world’s capital of IDPs, was obtained in June 2020. Participants must have been older than 18 years of age, physically able to complete the survey, and willing to take part in the study. If they agreed to be included in the study, a brief presentation of the purpose, procedure, and requirements for participation was given privately. Prior to the survey being interviewer-administered by multilingual and trained staff from the Hagarla Institute, verbal consent was obtained from each participant. The Hagarla Institute is a non-profit organization

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3 dedicated to furthering clinical research, capacity-building, and skills transfer for medical
4 personnel across Africa. Participants were informed that they had the right to withdraw at any time
5 and that there would be no consequences for withdrawal. All information collected was kept
6 confidential and anonymized by removing all identifiable information. This study received
7 approval from the ethics board at SIMAD University in Somalia and was deemed exempt from
8 review by the Yale IRB (ID #2000028344).
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11 12 **Data Analysis**

13 Responses from each survey were manually input onto Qualtrics survey software in English and
14 analyzed using SAS Studio 3.8[28]. Sample descriptive statistics were used to report median and
15 standard deviation calculations for continuous variables, along with frequency and percentages of
16 responses for categorical variables. Bivariate and multivariate logistic regressions were also
17 conducted to demonstrate the relationships between concern about contracting COVID-19 and sex,
18 age (dichotomized), education, food access, employment status, pre-existing conditions,
19 symptoms present, actions taken, and healthcare utilization. These findings are presented with 95%
20 confidence intervals.
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Results

Sample Demographics

The demographic characteristics of survey participants are shown in **Table 1**. Of the 401 eligible participants who recorded responses, 382 (96%) identified as IDPs and 15 (4%) identified as refugees. The survey had a completion rate of 99%. The vast majority of the participants were female (86%, n=344) and the median age of the participants was 32.0, with a standard deviation of 13.2 years. Most participants either had no formal education (89%, n=353) or received Qur'anic education (32%, n=126), with only 10 participants (3%) having received education past secondary school.

Respondent Health Profile

Participant responses concerning perceptions of their personal health status, pre-existing health conditions, use of nicotine substances, and COVID-19 symptoms are displayed in **Table 2**. While 58% (n=224) reported being in “good” health and only 3% (n=13) reported using cigarettes or tobacco products, 50% (n=197) (not shown in tables) of participants reported having one or more of the listed pre-existing conditions. In regards to symptoms being experienced, headache (49%, n=188) and fever (23%, n=88) were reported as the most common. Furthermore, 63% (n=243) of respondents were concerned about getting adequate physical exercise, and 51% (n=198) had concerns about job security (**Table 3**), indicating physical and financial precarities. Five percent (n=21) of respondents also knew someone experiencing violence in their household (not shown in tables), and 27% (n=106) anticipated contracting the virus at some point (not shown in tables). Additionally, 235 participants (59%) indicated that the nation-wide lockdown as a result of COVID-19 had decreased their income or caused them to lose their jobs when asked how COVID-19 had changed their daily lives (not shown in tables).

Knowledge of COVID-19

Table 4 presents participants' responses to true or false questions regarding COVID-19 susceptibility and preventative measures. Roughly 50% of responses to the question series were "I don't know," indicating a lack of information surrounding COVID-19 among IDPs. Most notably, the majority of participants displayed a lack of knowledge regarding the treatment of COVID-19, with about 79% of participants responding "I don't know" when asked whether antibiotics could be used to treat or prevent COVID-19 (**Table 4**).

Furthermore, the majority of participants marked that they did not know the current possible treatment (83%, n=327), the symptoms (50%, n=201), or the incubation period of COVID-19 (79%, n=313) (all not shown in tables). Another 60% (n=237) reported being unfamiliar with the practice of social distancing (not shown in tables), and 63% (n=250) did not know that asymptomatic individuals could spread the virus (**Table 4**). However, a sizable proportion of participants were able to recognize headache (34%, n=135), fever (45%, n=179), cough (35%, n=139), and shortness of breath or difficulty breathing (31%, n=12) as symptoms of COVID-19 (not shown in tables). Still, the proportion of participants who were not familiar with basic background information surrounding COVID-19 was higher than the proportion who answered questions correctly.

When respondents were asked what role religion played in the COVID-19 outbreak, approximately 34% wrote in short answer responses that religion played an "important" or "very important" role and another 22% specified that reading the Qur'an was of particular importance (not shown in tables). Additionally, 49% of the participants (n=190) reported that they trusted religious officials to provide information about COVID-19, while only 37% (n=144) and 5% (n=19) said that they similarly trusted health officials and humanitarian aid workers, respectively (**Table 5**). In contrast, 90% (n=360) reported accessing traditional media services (radio, television, and newspapers), with only radio being indicated as a more trustworthy source than religious officials (57%, n=225). Additionally, only 4% (n=11) of respondents stated that they would go to health information providers in IDP camps if they suspected they had contracted the virus (not shown in tables). As a majority of respondents indicated that they felt that healthcare workers and the government were working together "moderately" or "a lot" to prevent the spread of COVID-19 (**Table 6**), participants' lack of initiative to approach health care workers seems to indicate a lack of COVID-19 related information and services in refugee camps instead of a distrust of such.

Access to Treatment and Preventative Services

Table 7 reports participants' access to essential services, preventative resources, and treatments for COVID-19. Thirty-four percent (n=135) of respondents reported not being able to buy essential food items in the last week and, of those, 74% (n=100) reported having either to skip and eat smaller meals or buy lower quality food (not shown in tables). A majority lacked ease of access to washing facilities (71%, n=277), soap (67%, n=256), disinfectants (98%, n=382), and face masks (89%, n=373). Although respondents lacked access to such resources, they still reported carrying out basic preventative procedures such as washing hands more often (74%, n=292) and avoiding shaking hands (57%, n=222) (not shown in tables). While only 5% (n=20) and 25% (n=98) of participants reported using more disinfectants and practicing social distancing, 77% (n=296) took at least one preventative action (not shown in tables).

Additionally, 185 (47%) respondents indicated that camp living conditions needed to change to prevent the spread of COVID-19 (not shown in tables). In short answer responses, 142 (80%) respondents expressed desires for improved sanitation, hygiene, or housing conditions, and 14 (8%) specifically indicated their desire for more stringent social distancing practices (not shown in tables). Maintaining physical space from others was also reported to be difficult, as 40% (n=159) and 32% (n=128) indicated that it be impossible or only somewhat possible to self-isolate if taken ill, respectively (not shown in tables). An additional 10 (6%) respondents indicated their desire for the distribution of more information regarding COVID-19 (not shown in tables).

Similarly, respondents' self-reported access to COVID-19 screening and medical services was also low, with 97% (n=381) saying that they could not access screening and only 20% (n=79) stating that they were "Strongly Confident" or "Moderately Confident" that they could receive medical services if infected (**Table 7**). However, most participants had received a vaccination for any condition within the past few years (59%, n=232) (not shown in tables), and a further 54% (n=215) responded "Moderately" or "A lot" when asked how available vaccinations were to them, suggesting that COVID-19 specific services would be harder to access. Participants also reported accessibility issues, with 48% (n=191) stating that there was no healthcare facility nearby and, of those, 31% (n=61) said that it would take over an hour to reach it (not shown in tables).

Bi- and Multivariate Analyses Examining Concern about COVID-19 Contraction

Lastly, in an adjusted model (**Table 8**), those who were concerned about contracting COVID-19 were more likely to perceive their current health status as fair, describe an increased presence of anxiety or stress, and introduce behavioral changes to protect themselves against the virus compared to those who weren't concerned with contracting COVID-19. Compared to those who perceived their current health status as good, those who perceived their health status to be fair showed 5.69 (95% CI: 2.36-13.71) times higher odds of being concerned about contracting COVID-19, while those who felt more anxious or nervous and those who introduced one behavioral change showed 10.16 (95% CI: 4.83-21.36) and 5.20 (95% CI: 1.99-13.58) times increased odds of being concerned about disease contraction, respectively. In addition, a dose-response relationship in the number of distancing and sanitization behavioral changes implemented was observed, with those who introduced two or more behavioral changes showing 9.89 (95% CI: 4.88-20.02) times higher odds of being concerned about contracting COVID-19 when compared with those without any introduced behavioral changes. Lastly, the older half of our sample (older than 32 years of age) showed 1.93 (95% CI: 1.06 - 3.51) times higher odds in being concerned about contracting COVID-19.

Discussion

This study is the first to explore knowledge of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in Somalia. To our knowledge, it is also one of two studies that document knowledge of COVID-19 and prevalence of COVID-19 symptoms and risk factors among displaced populations globally, with the other study conducted in Cox's Bazar, Bangladesh[27]. Overcrowding, limited access to WASH services, and a lack of health infrastructure leave displaced populations living in IDP camps particularly vulnerable to the spread of infectious disease such as COVID-19[2].

Respondent Health Profile

Although a majority of our sample (57.6%) reported that they were in good health, a considerable proportion of our sample reported experiencing symptoms that could potentially be attributed to COVID-19, including headache (48.5%), fever (23.0%), or muscle or body aches (13.6%)[29]. Previous studies on health profiles of displaced populations or individuals living in such settings are unavailable in Somalia and are sparse in international settings, limiting the potential for cross-comparison. However, compared to a similar study conducted in refugee camps in Bangladesh, our sample exhibited higher proportions of individuals experiencing fevers, headaches, shortness of breath, loss of taste or smell, and muscle or body aches[27]. In addition, our study findings reinforce concerns put forward in the literature regarding the spread of COVID-19 in humanitarian settings, with participants reporting concerns including the following: getting adequate exercise (62.6%), their mental health and well-being (22.1%), job security (51.2%), practicing social distancing (18.7%), experiencing conflict within the home (9.6%), and their ability to buy essential foods in the last 7 days (65.9%). These concerns could serve as priority areas for health and social service providers to engage with and address, particularly food insecurity, job security, mental health, and physical exercise.

Only 3.3% of our sample reported use of tobacco or cigarettes, which appears to be consistent with smoking prevalence in Somalia, especially considering that the majority of our sample consisted of women[30]. That being said, our study reports a lower rate of tobacco use when compared to other studies conducted in similar limited-resource settings[31]. Furthermore, though little information is available regarding the health conditions of individuals living in IDP camps, self-reported pre-existing conditions from our sample appear to be considerably low, particularly for chronic and mental health conditions, when compared to values expected from the literature[32-35]. Health staff administering surveys reported that many participants did not know what the surveyed conditions were, had little recollection of previous diagnoses, and had rarely visited a health professional in the past, which would be consistent with the significant lack of formal education (88.7%) among participants and lack of access to a nearby healthcare facility (48.2%) and may explain the lower reported prevalence of chronic, pre-existing conditions found in this study.

Knowledge and Perceptions of COVID-19

This study found very poor knowledge related to COVID-19 and relevant universal safety measures among individuals living in IDP camps, with significant knowledge gaps in COVID-19 symptoms, treatment, and prevention measures such as social distancing. Though there is limited literature on this topic, especially in camp-like or humanitarian contexts, our sample exhibited significantly poorer knowledge of COVID-19 and safety measures, as compared to studies conducted in China, the United States, the United Kingdom, and Nepal[36, 37, 26]. And, although related literature in humanitarian settings is severely limited, this discrepancy persists among the sparse COVID-related published research in camp-like settings, such as that of a study conducted in Cox's Bazar, Bangladesh[27]. These findings may also be attributed to the lack of formal education (88.7%) among study participants, as well as the reality that Somalia has some of the lowest health indicators in the world and low levels of health literacy stemming from decades of conflict, civil strife, and limited access to healthcare and education – particularly for displaced populations like IDPs[38-41].

The older half of our sample, those who had implemented at least one COVID-19-related behavior change, and those who characterize their health as “fair” were significantly more likely to be concerned about getting infected by COVID-19. While these results demonstrate possible increased apprehension by those who are physically or mentally vulnerable to the changes imposed by the COVID-19 pandemic, our data interestingly demonstrate that those who characterized their health as “fair” were significantly more likely to be concerned about COVID-19 contraction, while those who characterize their health as “poor” were less likely, albeit insignificantly. These results may be explained by a small sample size, as only 58 respondents perceived their health status as “poor.”

The importance of education as a preventative measure in controlling the transmission of COVID-19 in camp settings cannot be understated. Given significant gaps in COVID-19 knowledge among Somali IDP camp residents, instituting precautionary measures, such as public awareness, is paramount. Knowledge is a critical determinant of health behaviors, and through targeted educational interventions, IDP camp residents can play an essential role in preventing community spread of the virus among those displaced and not displaced[42]. Ninety percent of our study sample utilized news and media outlets, such as the radio, to access information about COVID-19, and 40.3% used informational calls or text messages. Using such platforms to educate camp residents may be effective in disseminating information about COVID-19 prevention and treatment. Similarly, trusted sources, such as religious officials (48.5%), health officials (36.7%), or the radio (57.4), should be mobilized to engage with community members and to dispel misinformation about COVID-19.

Access to Treatment and Preventative Services

This study's results reveal a significant lack of access to treatment and preventative services for COVID-19 among individuals living in IDP camps, which is consistent with other assessments of access to health and water, hygiene, and sanitation services in Somalia and in camp-like settings in other countries[2, 43-45]. Of particular note, only 1.5% of participants reported having access to COVID-19 screening tests, and 43.8% reported not having access to any vaccines which may inhibit adequate uptake of a future COVID-19 vaccine. In addition, these findings reflect not only the lack of access to services necessary to prevent COVID-19 transmission and to identify and treat existing cases, but also the lack of access to services that may exacerbate known comorbidities of COVID-19, such as hypertension, cancer, cardiovascular disease, and diabetes, which are increasingly difficult to provide continuous care for during the COVID-19 pandemic[1, 4]. Generally, respondents reported an inability to participate in preventative measures due to a lack of material resources such as face masks and disinfectants, lack of information about COVID-19 and such measures, and inadequate living conditions to enforce social distancing protocols. Additionally, respondents reported limited confidence that they would be able to be treated if they contracted the virus. These findings reinforce the necessity for substantial investment in improving access to water, sanitation, and hygiene services, as well as healthcare services, for displaced populations living in camps.

Limitations

This study's sampling methodology is subject to several limitations. First, participants were recruited from twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi, Carbiska, and Afgooye) of the Lower Shabelle region, which limits the generalizability of the study findings to IDP camps in other areas of Somalia. That being said, the Lower Shabelle region harbors one of the largest IDP populations in Somalia, as well as one of the highest concentrations of individuals in need of humanitarian support[46]. Second, because an overwhelming majority of participants surveyed (86.2%) were women, the generalizability of the study results to males living in IDP camps may be limited. Third, the respondent health profiles reported (**Table 2**) consist exclusively of self-reported data. As such, the limited reliability of participant responses for pre-existing conditions must be noted. Fourth, because our multivariate analysis did not adjust for potential confounding factors, residual confounding may have been introduced. Finally, given that this study utilizes a cross-sectional survey design, it cannot be used to analyze the evolution of COVID-19 knowledge, health conditions, and access to services in Somali IDP camps over an extended period of time.

Conclusion

Ultimately, this study provides strong evidence for immense gaps in knowledge and perceptions of COVID-19 and access to treatment and preventative services among individuals living in Somali IDP camps. In addition, this study also provides insight into the health profile of IDP camp residents, as well as their concerns during the COVID-19 pandemic. A massive influx of additional resources and targeted interventions will be required to adequately address COVID-19 in Somalia, starting with educating those individuals most vulnerable to infection. Future research is needed to further elucidate the health profile of camp residents and the most at-risk individuals and to identify entry points to facilitate the implementation of COVID-19 preventative and treatment measures. International organizations operating within Somalia, as well as the Somali government, should view investments in addressing COVID-19 as long-term investments in sustainable health infrastructure, as well as the health and prosperity of its population.

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Tables and Figures

Table 1. *Respondent Characteristics*

Characteristic	N (%) ^{a,b}
Sex	
Female	344 (86.2)
Male	55 (13.8)
Age	32.0 ± 13.2
Status	
IDP	382 (96.2)
Refugee	15 (3.8)
Area	
Bismillah	46 (11.7)
Iskaashi	146 (37.6)
Marko	37 (10.0)
Other	167 (40.7)
# of People in Household	7 ± 5.1
# of People in Household over 65	0 ± 3.0
House or Dwelling	
Own	97 (24.3)
Rent	38 (9.5)
Not Sure	265 (66.3)
Highest Level of Education	
No Formal Education	353 (88.7)
Primary School	26 (6.5)
Lower Secondary School	5 (1.3)
Upper Secondary School	4 (1.0)
Post-secondary/tertiary school	7 (1.8)
Graduate Degree (e.g. Master's, Doctorate)	3 (0.8)
Qur'anic Education	126 (31.7)
Work in the Past 7 days	
Yes	190 (47.5)
No	210 (52.5)

^a Values are frequency (percentage) for categorical variables; median ± SD for continuous variables

^b Values may not add to 100%

Table 2. *Respondent Health Profile*

Characteristic	N (%) ^{a,b}
Perception of Health Status	
Good	224 (57.6)
Fair	101 (26.0)
Poor	64 (16.5)
Pre-Existing Health Conditions	
Diabetes	5 (1.6)
Anemia	76 (23.6)
Hypertension	5 (1.4)
Lung Disease (COPD)	3 (0.8)
Cancer	1 (0.3)
Asthma	7 (1.8)
Malaria	52 (14.1)
Dengue Fever	3 (0.8)
Oral/Tooth Disease	7 (1.8)
Disability or Injury from Accident	18 (4.7)
STI or Fertility Disorder	84 (23.4)
Mental Illness or Psychiatric Condition	2 (0.6)
Other Health Condition	36 (10.0)
Use of Tobacco or Cigarettes	
Yes	13 (3.3)
Exhibiting Symptoms	
Headache	188 (48.5)
Fever	88 (23.0)
Skin Rash	23 (6.0)
Dry Cough	19 (5.0)
Wet Cough or Sputum/Mucus Production	5 (1.3)
Sore Throat	10 (2.6)
Runny Nose or Nasal Congestion	3 (0.8)
New Loss of Taste and/or Smell	19 (4.9)
Shortness of Breath or Difficulty Breathing	10 (2.6)
Diarrhea	9 (2.3)
Muscle or Body Aches	52 (13.6)
Fatigue or Malaise	20 (5.2)
One of the following: Fever, Dry Cough, Fatigue	49 (12.8)
Two of the following: Fever, Dry Cough, Fatigue	22 (5.7)
All of the following: Fever, Dry Cough, Fatigue	6 (1.8)
At least one of the following: Fever, Dry Cough, Fatigue	53 (13.7)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 3. *Concerns Brought on by COVID-19*

Question	Yes N (%) ^{a,b}	No N (%) ^{a,b}	Not Sure N (%) ^{a,b}
Getting adequate exercise/movement	243 (62.6)	135 (34.8)	10 (2.6)
Mental health and wellbeing	85 (22.1)	244 (63.5)	55 (14.3)
Job security	198 (51.2)	155 (40.1)	34 (8.8)
Social distancing	71 (18.7)	292 (77.0)	16 (4.2)
Social isolation in the case of infection	53 (13.6)	321 (82.5)	15 (3.9)
Covering living expenses	39 (10.0)	277 (71.0)	74 (19.0)
Caring for children	36 (9.5)	332 (87.6)	11 (2.9)
The education of your child(ren)	45 (11.6)	330 (85.3)	12 (3.1)
Social dynamics/conflict within the home	37 (9.6)	271 (70.0)	79 (20.4)
Worried about getting COVID-19/Coronavirus	259 (65.6)	99 (25.1)	37 (9.4)
Worried about loved ones getting COVID-19/Coronavirus	265 (68.0)	93 (23.9)	32 (8.2)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 4. Knowledge of COVID-19 disease and prevention

Statement	Correct N (%) ^{a,b}	Incorrect N (%) ^{a,b}	Not Sure N (%) ^{a,b}
People showing no symptoms of being sick can spread a virus or contagious disease (True)	150 (37.5)	30 (7.5)	220 (55.0)
It is possible to contract a virus or contagious disease by touching a surface or object that has the virus on it (True)	191 (48.0)	6 (1.5)	201 (50.5)
Antibiotics can be used to treat COVID-19/Coronavirus (False)	36 (9.1)	51 (12.8)	311 (78.1)
Antibiotics can be used to prevent infection from COVID-19 (False)	37 (9.4)	44 (11.2)	313 (79.4)
People of all ages can become infected with COVID-19/Coronavirus (True)	206 (51.8)	19 (4.8)	173 (43.3)
People of all racial, religious, and ethnic groups can become infected with COVID-19/Coronavirus (True)	199 (50.4)	17 (4.3)	179 (45.3)
Eating garlic, ginger, black pepper, or lemon can lower your chances of getting infected with COVID-19/Coronavirus (False)	12 (3.0)	248 (62.8)	135 (34.2)
Coronavirus spread from humans to humans, mainly through respiratory droplets (True)	199 (50.6)	13 (3.3)	181 (46.1)
Coronavirus can also spread from feco-oral route (True)	111 (28.1)	34 (8.6)	250 (63.3)
COVID-19/Coronavirus is just like the flu (False)	20 (5.1)	214 (54.0)	162 (40.9)
Maintaining good personal hygiene and being socially responsible would help limit the spread of COVID-19/Coronavirus (True)	252 (64.5)	56 (14.3)	83 (21.2)
Washing hands frequently using soap or the use of sanitizer would help limit the spread of COVID-19/Coronavirus (True)	253 (64.9)	55 (14.1)	82 (21.0)
Avoiding handshaking behavior would help limit the spread of COVID-19/Coronavirus (True)	219 (56.7)	65 (16.8)	102 (26.4)
Avoiding placing fingers into eyes, nose, and mouth would help limit the spread of COVID-19/Coronavirus (True)	181 (47.0)	74 (19.2)	130 (33.8)
Coughing and sneezing into the elbow or within the clothing is a good practice in helping to limit the spread of COVID-19/Coronavirus (True)	209 (54.4)	64 (16.7)	111 (28.9)
Limiting eating meat, eggs, and fishes would help limit the spread of COVID-19/Coronavirus (False)	153 (39.8)	116 (30.2)	115 (30.0)
Following social distancing measures and avoiding crowded places would help limit the spread of COVID-19/Coronavirus (True)	172 (44.7)	76 (19.7)	137 (35.6)
For someone without any symptoms of COVID-19/Coronavirus, wearing a face mask is considered an appropriate and protective measure against COVID-19/Coronavirus (True)	144 (37.4)	100 (26.0)	141 (36.6)
Proper usage of face mask during an outbreak should include covering nose, mouth, and chin with the colored side facing outside (True)	167 (43.4)	64 (16.6)	154 (40.0)
Staying at home would play a significant role in helping to limit the spread of COVID-19/Coronavirus (True)	215 (56.0)	84 (21.9)	85 (22.1)
A person with pre-existing medical conditions such as heart diseases, diabetes, hypertension, and cancer are at greater risk of COVID-19/Coronavirus related infection (True)	172 (44.7)	64 (16.6)	149 (38.7)
COVID-19/Coronavirus can only infect old people (False)	195 (50.9)	69 (18.0)	119 (31.1)
There is no chance of survival once the person is infected with COVID-19/Coronavirus (False)	195 (52.3)	67 (18.0)	111 (29.8)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 5. *Respondent Trusted Sources of Information Surrounding COVID-19*

Source	N (%) ^a
Sources of Information	
News, Media (e.g. TV, Radio, Newspapers)	360 (90.0)
Informational calls/SMS	161 (40.3)
Social Media (e.g. Facebook, Twitter, WhatsApp, YouTube, Instagram, Snapchat)	21 (5.3)
Official Government/International Websites (e.g. MoH, DoH, WHO, CDC)	10 (2.5)
Family Members, Colleagues, Friends	38 (10.0)
Employer, Work Colleagues, and Others at Work	7 (1.8)
Non-Governmental Organizations (NGOs)	21 (5.3)
Informational Campaigns	17 (4.3)
Local or Community Leaders	8 (2.0)
Journals	8 (2.0)
Trust in Sources to Provide COVID-19 Information	
Family Members	162 (41.3)
Religious Official	190 (48.5)
Community Elder	31 (8.0)
Health Official	144 (36.7)
Humanitarian Aid Worker	19 (4.8)
Social Media	17 (4.3)
Web News	9 (2.3)
Television	41 (10.5)
Radio	225 (57.4)

^a Values are frequency (percentage)

Table 6. *Faith in Community Action Against COVID-19*

Question	Not at all^a	Somewhat^a	Moderately^a	A lot^a
To what extent do you feel like your community is working together to prevent the spread of COVID-19/Coronavirus?	65 (16.4)	119 (30.0)	102 (25.7)	111 (28.0)
To what extent do you feel like the healthcare workers, your government, and other providers are working together to prevent the spread of COVID-19/Coronavirus?	46 (11.6)	61 (15.4)	90 (22.7)	200 (50.4)

^a Values are frequency (percentage)

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Table 7. *Essential Resources for COVID-19 Response*

Question	Yes N (%)^{a,b}	No N (%)^{a,b}
Access to Clean Water or a Clean Water Source	362 (91.6)	33 (8.4)
Access to Washing Facilities	113 (29.0)	277 (71.0)
Access to Soap	129 (33.6)	256 (66.5)
Access to Disinfectants, such as Hand Sanitizers and Cloth Wipes	8 (2.1)	382 (98.0)
Ability to Buy Essential Food Items	261 (65.9)	135 (34.1)
Access to Face Masks	43 (10.9)	351 (89.1)
Ability to Maintain Clean and Sanitary Conditions at Home	325 (81.9)	69 (17.4)
Access to Nearby Healthcare Facility	194 (49.0)	191 (48.2)
Confident in Ability to Access Healthcare Facility if Infected with COVID-19	79 (20.0)	275 (69.4)
Access to Vaccines	215 (54.2)	174 (43.8)
Access to COVID-19/Coronavirus Screening	6 (1.5)	381 (96.9)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 8. Bivariate and multivariable associations between study variables and concern regarding COVID-19 contraction

Characteristic	N ^a (40 1)	N(%) concerned about COVID contraction	Unadjusted OR (95% CI)	Un- adjusted p-value	Adjusted OR (95% CI) ^b	Adjusted p-value
Gender						
Male	52	38 (73.1)	1.00		1.00	
Female	304	221 (72.7)	0.98 (0.51 – 1.90)	0.955	-	-
Age (years)						
18-32	182	122 (67.0)	1.00		1.00	
33-80	176	137 (77.8)	1.73 (1.08 – 2.77)	0.023	1.93 (1.06 – 3.51)	0.032
Formal Education						
0 years	314	229 (72.9)	1.00		1.00	
1+ years	43	29 (67.4)	0.77 (0.39 – 1.53)	0.452	-	-
Qur'anic Education						
No	245	177 (72.2)	1.00		1.00	
Yes	112	81 (72.3)	1.00 (0.61 – 1.65)	0.988	-	-
Currently Employed						
No	184	127 (69.0)	1.00		1.00	
Yes	174	132 (75.9)	1.41 (0.88 – 2.25)	0.149	-	-
Current Health Perception						
Good	202	137 (67.8)	1.00		1.00	
Fair	88	79 (89.8)	4.57 (2.19 – 9.53)	<0.001	5.69 (2.36 – 13.71)	<0.001
Poor	58	34 (58.6)	0.49 (0.27 – 0.87)	0.016	0.57 (0.25 – 1.31)	0.185
Pre-existing Conditions						
0	175	128 (73.1)	1.00		1.00	
1	110	83 (75.5)	1.27 (0.76 – 2.11)	0.370	0.80 (0.39 – 1.62)	0.531
2+	72	47 (65.3)	0.66 (0.38 – 1.15)	0.140	0.50 (0.23 – 1.10)	0.084
Tobacco Use						
No	340	245 (72.1)	1.00		1.00	
Yes	11	8 (72.7)	1.03 (0.27 – 3.98)	0.962	-	-
Present COVID-19 symptoms						
0	153	110 (71.9)	1.00		1.00	
1	91	59 (64.8)	0.60 (0.36 – 1.01)	0.053	0.60 (0.30 – 1.21)	0.153
2+	111	89 (80.2)	1.80 (1.05 – 3.08)	0.034	1.73 (0.83 – 3.64)	0.147
Received COVID Info						
None / Somewhat	262	186 (71.0)	1.00		1.00	
Moderately / A lot	96	73 (76.0)	1.30 (0.76 – 2.22)	0.345	-	-
New Stress or Anxiety						
No	54	21 (38.9)	1.00		1.00	
Yes	300	235 (78.3)	5.68 (3.08 – 10.48)	<0.001	10.16 (4.83 – 21.36)	<0.001
New actions to protect self						
0	78	39 (50.0)	1.00		1.00	

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3	1			1.25 (0.64 – 3.44)	0.520	5.20	
4		54	41 (75.9)			(1.99 – 13.58)	<0.001
5	2+			2.49 (1.54 – 4.01)	<0.001	9.89	
6		222	176 (79.3)			(4.88 – 20.02)	<0.001
7	Belief that camp needs						
8	to be improved to						
9	handle COVID						
10	No	171	115 (67.3)	1.00		1.00	
11	Yes	181	141 (77.9)	1.72 (1.07 – 2.76)	0.026	-	-
12	Past Vaccinations						
13	No	131	95 (72.5)	1.00		1.00	
14	Yes	216	157 (72.7)	1.01 (0.62 – 1.64)	0.973	-	-

^a Numbers may not sum to total due to missing data.

^b For the fully-adjusted model, N = 341

Declarations

Ethics approval and consent to participate: This study received approval from the ethics board at SIMAD University in Somalia and was deemed exempt from review by the Yale IRB (ID #2000028344). Verbal consent to participate in the study was obtained privately from each participant prior to the survey being interviewer-administered by trained staff from the Hagarla Institute. If a participant consented, they were informed of their right to withdraw at any time without any consequences and were presented with a brief overview of the study before any survey questions were administered. All information collected was confidential and anonymized.

Consent for publication: Not applicable

Patient and Public Involvement: The research questions identified and explored in this study were informed by concerns raised by Somali community members arising from COVID-19. In consultation with community members, as well as community organizers, the research team designed the survey tool and highlighted key research priorities. Relevant results from this study will be disseminated to community members, operating organizations within the area, and governmental agencies to facilitate and improve current actions to address COVID-19 among those displaced within Somalia.

Availability of data and materials: All data generated or analyzed during this study are included in this published article. No additional data are available.

Competing interests: The authors declare that they have no competing interests.

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60STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page Number
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8, 22-30
Outcome data	15*	Report numbers of outcome events or summary measures	8-11, 22-30
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	8-11, 22-30

		which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	8-11, 22-30
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11, 30
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	31

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and Access to Essential Resources in Somali IDP Camps: a Cross Sectional Study

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3 **Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and**
4 **Access to Essential Resources in Somali IDP Camps: a Cross Sectional Study**
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Abstract

Objectives: This study examined knowledge and perceptions of COVID-19, prevalence of preexisting conditions, and access to essential resources among residents of internally displaced persons (IDP) camps in Somalia, where overcrowded settlements with weakened infrastructure, inadequate water, sanitation, and hygiene facilities, and limited access to health services make this vulnerable population particularly susceptible to a COVID-19 outbreak.

Design: A descriptive, cross-sectional survey.

Setting: Twelve IDP camps across six areas of the Lower Shabelle region in Somalia.

Participants: 401 adult Somali IDP camp residents.

Results: The majority of participants were female (86%) and had received no formal education (89%). While 58% reported being in “good” health, half of the participants reported have one or more pre-existing conditions. Though 77% of respondents reported taking at least one COVID-19 preventative public health measure, respondents reported a lack of access to adequate sanitation, an inability to practice social distancing, and nearly universal inability to receive a COVID-19 screening exam. Questions assessing knowledge surrounding COVID-19 prevention and treatment yielded answers of “I don’t know” for roughly 50% of responses. The majority were not familiar with basic information about the virus or confident that they could receive medical services if infected. 185 (47%) respondents indicated that camp living conditions needed to change to prevent the spread of COVID-19.

Conclusion: This study highlights low levels of COVID-19 knowledge and limited access to essential prevention and treatment resources among individuals living in Somali IDP camps. A massive influx of additional resources is required to adequately address COVID-19 in Somalia, starting with co-designing interventions to educate those individuals most vulnerable to infection.

Key Words: COVID-19; Conflict; Internally Displaced Persons; Somalia; Humanitarian Health; Infectious Diseases; WASH

Strengths and Limitations of This Study

- To the best of our knowledge, this study is one of the first to explore knowledge of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in any African country, including Somalia.
- This study drew upon a diverse and expansive set of measures and involved a relatively large sample of internally displaced persons that are often understudied and neglected in public health research, especially during the COVID-19 pandemic.
- Respondent health profiles collected in this study rely on self-reported data, which may introduce bias.
- Participants were recruited from twelve Somali IDP camps across six areas of the Lower Shabelle region and were predominantly women, which may limit the generalizability of the study findings.

peer review only

Introduction

According to the United Nations High Commissioner for Refugees (UNHCR), there are more than 41 million internally displaced persons (IDPs) and 25 million refugees globally[1]. Many of those displaced live in camp settings with conditions that undermine public health guidelines for the control of infectious diseases, making them especially vulnerable to an outbreak of COVID-19[2]. Additional legal, financial, and linguistic barriers often inhibit displaced residents from accessing their host country's healthcare system, exacerbating conditions precipitated by an absence of basic amenities, such as soap, running water, and medical personnel[2]. Eighty-four percent of displaced people reside in low- or middle-income countries, which are often ill-equipped to institute health management protocols and response teams within IDP communities[3]. Providing continuity of care for chronic conditions as well as infection prevention measures within displaced communities are necessary to ensure the well-being of both displaced and host communities[2, 4].

The Ministry of Health in Somalia announced the first confirmed case of COVID-19 in Somalia on March 16, 2020[5]. As of April 6th, 2021, the Ministry of Health of Somalia reported 11,908 confirmed COVID-19 cases, 568 of which have resulted in death[5]. It is well-established that Somalia's health system is extremely underprepared for a further outbreak of COVID-19[6]. In Somalia, thirty years of civil war and natural disasters have resulted in nearly three million internally displaced persons who now inhabit over 2,100 overcrowded settlements[7]. The prolonged conflict has severely damaged Somalia's health infrastructure, leaving its inhabitants vulnerable to climate related disasters, malnourishment, infectious disease outbreaks, and other humanitarian crises[8, 9].

Somalis face several barriers in utilizing their country's healthcare system. Several reports inculcate that healthcare worker shortages and a nonexistent health information system leave its residents without reliable access to care[8, 9]. Somali physicians have indicated that there are no ventilators and only two intensive care units with a total of 31 beds across the country, which is alarming given that these resources are regarded as necessary to treat severe COVID-19 infections[10]. In addition, two in three Somalis have difficulties accessing safe water, and approximately 50% of health centers do not have reliable access to electricity[11, 12]. Qualitative reports signal that care-seeking behavior is very poor among Somalis, as a result of distrust towards the system's lack of regulation and unaffordable prices[13]. Consequently, Somalia has some of the lowest health indicators in the world with life expectancies of 54 years for males and 57 years for females[11, 14]. Studies in Somalia have reinforced a predisposition of internally displaced persons to infectious and water-borne diseases[15]. IDPs are among the most vulnerable to infectious disease outbreaks as they face circumstances such as overcrowding, uncontained sewage and waste, limited access to health services, contaminated water, low immunization coverage, and stigmatization.

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3 According to the Global Health Security Index, Somalia ranks 194th out of 195 countries in
4 preparedness for a globally catastrophic biological event[16]. To address the dire threat COVID-
5 19 poses to IDPs in Somalia, ongoing efforts have primarily focused on scaling up water,
6 sanitation, and hygiene (WASH) services, increasing monitoring, and disseminating information
7 about COVID-19[6, 7, 17-19]. Many organizations have also helped obtain equipment such as
8 personal protective equipment (PPE) and ventilators for providers, as well as soap and chlorine
9 tablets for community members[7, 10, 19]. Several organizations have reported that the country's
10 health system has no capacity to make early case detections, isolate and care for patients, and trace
11 contacts, and have thus focused their efforts on preventive measures to mitigate the virus's
12 impact[13].
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18 Among these efforts, few have incorporated IDP knowledge and perceptions of COVID-19 in their
19 planning and implementation. Studies in IDP camps similar to those in Somalia warn of the
20 profound consequences of COVID-19 in areas without a strong healthcare infrastructure, and
21 various international health authorities have drawn attention to the grave threat the pandemic poses
22 to these vulnerable populations[20-22]. An international information gap about IDP knowledge
23 and perceptions of COVID-19 exists and inhibits providers from implementing sustainable,
24 culturally appropriate health interventions. As such, this study examined knowledge of COVID-
25 19, prevalence of preexisting conditions, and access to essential health services among residents
26 of internally displaced persons (IDP) camps in Somalia. We hope that our study findings contribute
27 to the development of potential interventions to improve the response to COVID-19 in Somali IDP
28 camps, where some of the world's most vulnerable individuals reside.
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Methods

Design and Instrument

A descriptive, cross-sectional survey was used to assess the current health profile, living conditions, and knowledge and perceptions surrounding COVID-19 among adults living in Somali IDP camps. Survey questions were designed using published WHO and CDC information on COVID-19 symptoms and transmission, a 2019 Displacement Severity Assessment among forcibly evicted Somalis conducted, and two published studies evaluating COVID-19 knowledge in Bangladesh and Nepal[23-27]. Additionally, questions specific to the Somali and IDP contexts were included.

The first section of the survey focuses on demographic information, including sex, age, displacement status, household size and status, education, and employment. Response options for educational status reflect the education system in Somalia, including an option for Qur'anic education. The next section focuses on participants' health profiles, with questions probing current health status, existing conditions, and symptoms. This section also includes a 12-item tool to gauge concerns brought about by COVID-19, such as potential effects on mental wellbeing, contracting COVID-19, or ability to buy essential food items. The third section of the survey assesses knowledge of COVID-19, most commonly used outlets for information, trusted sources of COVID-19 information, and perceptions of community efforts against COVID-19. An open-ended question on COVID-19 knowledge was followed by a 23-item tool which assesses knowledge of COVID-19 and consists of true-or-false statements regarding key facts or misconceptions surrounding the disease. The final section of the survey evaluates access to WASH, COVID-19 screening, and health services.

Because participants did not speak English, this survey tool was translated into Somali. Though this survey was not assessed for reliability or validity, the Somali version of the survey was piloted in Somali IDP context and reviewed for its content and suitability. Minor changes to the language of the Somali version were made to improve readability.

Sample and Setting

A convenience sample of 401 individuals living in twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi, Carbiska, and Afgooye) of the Lower Shabelle region in Somalia, often referred to as the world's capital of IDPs, was obtained in June 2020. Participants must have been older than 18 years of age, physically able to complete the survey, and willing to take part in the study. A brief presentation of the purpose, procedure, and requirements for participation was given privately to each participant. Prior to the survey being interviewer-administered by multilingual and trained staff from the Hagarla Institute, verbal consent was obtained. The Hagarla Institute is a non-profit organization dedicated to furthering clinical research, capacity-building, and skills transfer for medical personnel across Africa. Participants

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3 were informed that they had the right to withdraw at any time and that there would be no
4 consequences for withdrawal. All information collected was kept confidential and anonymized.
5 This study received approval from the ethics board at SIMAD University in Somalia and was
6 deemed exempt from review by the Yale IRB (ID #2000028344).
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10 **Data Analysis**

11 Responses from each survey were manually input onto Qualtrics survey software in English and
12 analyzed using SAS Studio 3.8[28]. Sample descriptive statistics were used to report median and
13 standard deviation calculations for continuous variables, along with frequency and percentages of
14 responses for categorical variables.
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Results

Sample Demographics

The demographic characteristics of survey participants are shown in **Table 1**. Of the 401 eligible participants, 382 (96%) identified as IDPs and 15 (4%) identified as refugees. The vast majority of participants were female (86%, n=344) and the median age of the participants was 32.0, with a standard deviation of 13.2 years. Most participants either had no formal education (89%, n=353) or received Qur'anic education (32%, n=126), with only 10 participants (3%) having received education past secondary school.

Respondent Health Profiles & Concerns Arising from COVID-19

Participant perceptions of their health status, pre-existing health conditions, use of nicotine substances, and COVID-19 symptoms are displayed in **Table 2**. While 58% (n=224) reported being in “good” health and only 3% (n=13) reported using cigarettes or tobacco products, 50% (n=197) of participants reported having one or more of the listed pre-existing conditions. In regard to COVID-19 symptoms experienced, headache (49%, n=188) and fever (23%, n=88) were most common. Furthermore, participant concerns arising from COVID-19 are displayed in **Table 3**. Sixty-three percent (n=243) of respondents were concerned about getting adequate physical exercise, and 66% (n=259) were worried about getting COVID-19. When asked how COVID-19 has changed their daily lives, 235 participants (59%) indicated that the nation-wide lockdown as a result of COVID-19 had decreased their income or caused them to lose their job (not shown). In addition, approximately 10% (n=37) of respondents expressed concerns surrounding social dynamics and conflict within the household stemming from COVID-19.

Knowledge and Perceptions of COVID-19

Table 4 presents participant responses to true or false questions surrounding COVID-19. Roughly 50% of responses to the question series were “I don't know.” The majority of participants indicated that they did not know the current possible treatment (83%, n=327), symptoms (50%, n=201), or incubation period of COVID-19 (79%, n=313), and 60% (n=237) reported being unfamiliar with social distancing (not shown). Similarly, 63% (n=250) did not know that asymptomatic individuals could spread the virus. However, a sizable proportion of participants were able to recognize headache (34%, n=135), fever (45%, n=179), cough (35%, n=139), and shortness of breath or difficulty breathing (31%, n=12) as symptoms of COVID-19 (not shown). Still, the proportion of participants who were not familiar with basic background information surrounding COVID-19 was higher than the proportion who answered questions correctly.

Participants most used and trusted sources of information surrounding COVID-19 are displayed in **Table 5**. About 49% (n=190) and 57% (n=225) of participants reported that they trusted religious officials and the radio, respectively, to provide information about COVID-19, while only 37% (n=144) and 5% (n=19) said that they trusted health officials and humanitarian aid workers,

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3 respectively. Ninety percent (n=360) of participants reported receiving information on COVID-19
4 from traditional media services (radio, television, and newspapers). A majority of respondents
5 indicated that they felt that healthcare workers and the government were working together
6 “moderately” or “a lot” to prevent the spread of COVID-19 (Table 6). However, only 4% (n=11)
7 of respondents stated that they would go to health information providers in IDP camps if they
8 suspected they had contracted the virus (not shown).
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11 12 **Access to Treatment and Preventative Services**

13 **Table 7** reports participants’ access to essential services, preventative resources, and treatments
14 for COVID-19. A majority lacked access to washing facilities (71%, n=277), soap (67%, n=256),
15 disinfectants (98%, n=382), and face masks (89%, n=373). Although respondents lacked access to
16 such resources, they still reported carrying out basic preventative procedures such as washing
17 hands more often (74%, n=292) and avoiding shaking hands (57%, n=222) (not shown). While
18 only 5% (n=20) and 25% (n=98) of participants reported using more disinfectants and practicing
19 social distancing, 77% (n=296) reported having taken at least one preventative action (not shown).
20 Moreover, 34% (n=135) of respondents reported not being able to buy essential food items in the
21 last week. Of those, 74% (n=100) reported having either to skip and eat smaller meals or buy lower
22 quality food (not shown).
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28 Additionally, 185 (47%) respondents indicated that camp living conditions needed to change to
29 prevent the spread of COVID-19 (not shown). In short answer responses, 142 (80%) respondents
30 expressed desires for improved sanitation, hygiene, or housing conditions, and 14 (8%) specifically
31 indicated their desire for more stringent social distancing practices. However, 40% (n=159)
32 indicated that it would be impossible to self-isolate if taken ill, respectively (not shown).
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36 Furthermore, respondents’ self-reported access to COVID-19 screening and medical services was
37 low, with 97% (n=381) saying that they could not access screening and only 20% (n=79) stating
38 that they were confident that they could receive medical services if infected. Participants reported
39 accessibility issues, with 48% (n=191) stating that there was no healthcare facility nearby and, of
40 those, 31% (n=61) said that it would take over an hour to reach it (not shown). However, most
41 participants indicated that they had received a vaccination for any condition in the past few years
42 (59%, n=232) (not shown), with 54% (n=215) expressing that vaccines were accessible to them.
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Discussion

This study is the first to explore knowledge of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in Somalia. To our knowledge, it is also one of few studies that document knowledge of COVID-19 and prevalence of COVID-19 symptoms and risk factors among displaced populations globally. Overcrowding, limited access to WASH services, and a lack of health infrastructure leave displaced populations living in IDP camps particularly vulnerable to the spread of infectious disease such as COVID-19[2].

Respondent Health Profile

A considerable proportion of our sample reported experiencing symptoms that could potentially be attributed to COVID-19, including headache, fever, or muscle or body aches[29]. Previous studies on health profiles of displaced populations living in such settings are unavailable in Somalia and are sparse in international settings, limiting the potential for cross-comparison. However, compared to a similar study conducted in refugee camps in Bangladesh, our sample exhibited higher proportions of individuals experiencing fevers, headaches, shortness of breath, loss of taste or smell, and muscle or body aches[27]. In addition, our study findings reinforce concerns put forward in the literature regarding the spread of COVID-19 in humanitarian settings, including getting adequate exercise, mental health and well-being, job security, social distancing, conflict within the home, and food insecurity. These concerns should serve as priority areas for health and social service providers to engage with and address.

Though the rate of tobacco and cigarette use in our sample appears to be consistent with smoking prevalence in Somalia, especially when considering the majority of our sample consisted of women, our study found a lower rate of tobacco use when compared to other studies conducted in similar limited-resource settings[30,31]. Furthermore, although little information is available regarding the health conditions of individuals living in IDP camps globally, self-reported pre-existing conditions from our sample appear to be considerably low, particularly for chronic and mental health conditions, when compared to values expected from the literature[32-35]. Health staff administering surveys reported that many participants did not know what the surveyed conditions were, had little recollection of previous diagnoses, and had rarely visited a health professional in the past. This is consistent with the significant lack of formal education among participants and lack of access health facilities and may explain the lower reported prevalence of chronic, pre-existing conditions found in this study.

Knowledge and Perceptions of COVID-19

This study found very poor knowledge related to COVID-19 and relevant universal safety measures among individuals living in IDP camps. Though there is limited literature on this topic, especially in camp-like or humanitarian contexts, our sample exhibited significantly poorer

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3 knowledge of COVID-19 and safety measures, as compared to studies conducted in China, the
4 United States, the United Kingdom, and Nepal[36, 37, 26]. And, although related literature in
5 humanitarian settings is severely limited, this disparity persists among the sparse COVID-related
6 published research in camp-like settings, such as that of a study conducted in Cox's Bazar,
7 Bangladesh[27]. These findings may be attributed to the lack of formal education among study
8 participants, as well as the reality that Somalia has some of the lowest health and health literacy
9 indicators in the world, stemming from decades of conflict, civil strife, and limited access to
10 healthcare and education – particularly for displaced populations like IDPs[38-41].
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15 The importance of education as a preventative measure in controlling the transmission of COVID-
16 19 in camp settings cannot be understated. Given significant gaps in COVID-19 knowledge among
17 Somali IDP camp residents, instituting precautionary measures, including public awareness
18 campaigns, is paramount. Knowledge is a critical determinant of health behaviors, and through
19 targeted educational interventions, IDP camp residents can play an essential role in preventing
20 community spread of the virus among those displaced[42]. Through highly utilized information
21 platforms identified in this study, such as news and media outlets and informational calls or text
22 messages, educational programs can be co-designed with those living in IDP camps to address
23 COVID-19 knowledge gaps, to disseminate information about COVID-19 prevention and
24 treatment, and to build trust between health providers and IDPs. Similarly, trusted sources, such
25 as religious officials, health officials, and the radio, can be mobilized to engage with community
26 members and to dispel misinformation about COVID-19.
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32 *Access to Treatment and Preventative Services*

33 Our study reveals a significant lack of access to treatment and preventative services for COVID-
34 19 among individuals living in IDP camps, which is consistent with other assessments of access
35 to health and WASH services in Somalia and camp-like settings in other countries[2, 43-45]. Of
36 particular note, the lack of access to COVID-19 screening tests suggests that cases may go
37 undetected and spread rapidly within overcrowded camp settings. Similarly, our sample's reported
38 lack of access to any vaccines may inhibit adequate uptake of a COVID-19 vaccine among this
39 vulnerable population. These findings not only reflect the lack of access to services necessary to
40 prevent COVID-19 transmission, but also suggest a lack of access to services that may exacerbate
41 known comorbidities of COVID-19, such as hypertension, cancer, cardiovascular disease, and
42 diabetes, which are increasingly difficult to provide continuous care for during the COVID-19
43 pandemic[1, 4]. Generally, respondents reported limited confidence that they would be able to be
44 treated if they contracted the virus, as well as an inability to participate in preventative measures
45 due to a lack of material resources such as face masks and disinfectants, lack of information about
46 COVID-19 prevention measures, and inadequate living conditions to enforce social distancing
47 protocols. Consistent with similar studies conducted with displaced populations in the Democratic
48 Republic of the Congo and Syria, these findings reinforce the necessity for substantial investment
49 in improving access to health and WASH services for those living in camps, beginning with
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3 providing consumables such as soap and facemasks to implement COVID-19 precautions and
4 individual family accommodations such as tarpaulin tents to allow IDPs to practice distancing
5 measures[46,47].
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8 **Limitations**

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11 This study's sampling methodology is subject to several limitations. First, participants were
12 recruited from twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi,
13 Carbiska, and Afgooye) of the Lower Shabelle region, which limits the generalizability of the
14 study findings to IDP camps in other areas of Somalia. That being said, the Lower Shabelle region
15 harbors one of the largest IDP populations in Somalia, as well as one of the highest concentrations
16 of individuals in need of humanitarian support[48]. Similarly, our analysis did not disaggregate
17 data by IDP camp. Future studies should not only identify the challenges faced by IDP
18 communities outside of the Lower Shabelle region but should also explore circumstances unique
19 to each camp setting, such that tailored interventions can be effectively designed. Second, because
20 an overwhelming majority of participants surveyed (86.2%) were women, the generalizability of
21 the study results to males living in IDP camps may be limited. Third, the respondent health profiles
22 reported (**Table 2**) consist exclusively of self-reported data. As such, the limited reliability of
23 participant responses for pre-existing conditions must be noted. Finally, given that this study
24 utilizes a cross-sectional survey design, it cannot be used to analyze the evolution of COVID-19
25 knowledge, health conditions, and access to services in Somali IDP camps over an extended period
26 of time.
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Conclusion

Ultimately, this study provides strong evidence for immense gaps in knowledge of COVID-19 and access to treatment and preventative services among individuals living in Somali IDP camps. In addition, this study also provides insight into the health profile of IDP camp residents, as well as their concerns during the COVID-19 pandemic. A massive influx of additional resources and targeted interventions will be required to adequately address COVID-19 in Somalia, starting with educating those individuals most vulnerable to infection. Future research is needed to further elucidate the health profile of camp residents and the most at-risk individuals and to identify entry points to facilitate the implementation of COVID-19 prevention and treatment measures, taking into account the perspectives of IDP camp residents and relevant stakeholders. International organizations operating within Somalia, as well as the Somali government, should view investments in addressing COVID-19 as long-term investments in sustainable health infrastructure, as well as the health and prosperity of its population.

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Tables and Figures

Table 1. *Respondent Characteristics*

Characteristic	N (%) ^{a,b}
Sex	
Female	344 (86.2)
Male	55 (13.8)
Age	32.0 ± 13.2
Status	
IDP	382 (96.2)
Refugee	15 (3.8)
# of People in Household	7 ± 5.1
# of People in Household over 65	0 ± 3.0
House or Dwelling	
Own	97 (24.3)
Rent	38 (9.5)
Not Sure	265 (66.3)
Highest Level of Education	
No Formal Education	353 (88.7)
Primary School	26 (6.5)
Lower Secondary School	5 (1.3)
Upper Secondary School	4 (1.0)
Post-secondary/tertiary school	7 (1.8)
Graduate Degree (e.g. Master's, Doctorate)	3 (0.8)
Qur'anic Education	126 (31.7)
Work in the Past 7 days	
Yes	190 (47.5)
No	210 (52.5)

^a Values are frequency (percentage) for categorical variables; median ± SD for continuous variables

^b Values may not add to 100%

Table 2. *Respondent Health Profiles*

Characteristic	N (%) ^{a,b}
Perception of Health Status	
Good	224 (57.6)
Fair	101 (26.0)
Poor	64 (16.5)
Pre-Existing Health Conditions	
Diabetes	5 (1.6)
Anemia	76 (23.6)
Hypertension	5 (1.4)
Lung Disease (COPD)	3 (0.8)
Cancer	1 (0.3)
Asthma	7 (1.8)
Malaria	52 (14.1)
Dengue Fever	3 (0.8)
Oral/Tooth Disease	7 (1.8)
Disability or Injury from Accident	18 (4.7)
STI or Fertility Disorder	84 (23.4)
Mental Illness or Psychiatric Condition	2 (0.6)
Other Health Condition	36 (10.0)
Use of Tobacco or Cigarettes	
Yes	13 (3.3)
Exhibiting Symptoms	
Headache	188 (48.5)
Fever	88 (23.0)
Skin Rash	23 (6.0)
Dry Cough	19 (5.0)
Wet Cough or Sputum/Mucus Production	5 (1.3)
Sore Throat	10 (2.6)
Runny Nose or Nasal Congestion	3 (0.8)
New Loss of Taste and/or Smell	19 (4.9)
Shortness of Breath or Difficulty Breathing	10 (2.6)
Diarrhea	9 (2.3)
Muscle or Body Aches	52 (13.6)
Fatigue or Malaise	20 (5.2)
One of the following: Fever, Dry Cough, Fatigue	49 (12.8)
Two of the following: Fever, Dry Cough, Fatigue	22 (5.7)
All of the following: Fever, Dry Cough, Fatigue	6 (1.8)
At least one of the following: Fever, Dry Cough, Fatigue	53 (13.7)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 3. *Concerns Brought on by COVID-19*

Question	Yes N (%) ^{a,b}	No N (%) ^{a,b}	Not Sure N (%) ^{a,b}
Getting adequate exercise/movement	243 (62.6)	135 (34.8)	10 (2.6)
Mental health and wellbeing	85 (22.1)	244 (63.5)	55 (14.3)
Job security	198 (51.2)	155 (40.1)	34 (8.8)
Social distancing	71 (18.7)	292 (77.0)	16 (4.2)
Social isolation in the case of infection	53 (13.6)	321 (82.5)	15 (3.9)
Covering living expenses	39 (10.0)	277 (71.0)	74 (19.0)
Caring for children	36 (9.5)	332 (87.6)	11 (2.9)
The education of your child(ren)	45 (11.6)	330 (85.3)	12 (3.1)
Social dynamics/conflict within the home	37 (9.6)	271 (70.0)	79 (20.4)
Worried about getting COVID-19/Coronavirus	259 (65.6)	99 (25.1)	37 (9.4)
Worried about loved ones getting COVID-19/Coronavirus	265 (68.0)	93 (23.9)	32 (8.2)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 4. Knowledge of COVID-19

Statement	Correct N (%) ^{a,b}	Incorrect N (%) ^{a,b}	Not Sure N (%) ^{a,b}
People showing no symptoms of being sick can spread a virus or contagious disease (True)	150 (37.5)	30 (7.5)	220 (55.0)
It is possible to contract a virus or contagious disease by touching a surface or object that has the virus on it (True)	191 (48.0)	6 (1.5)	201 (50.5)
Antibiotics can be used to treat COVID-19/Coronavirus (False)	36 (9.1)	51 (12.8)	311 (78.1)
Antibiotics can be used to prevent infection from COVID-19 (False)	37 (9.4)	44 (11.2)	313 (79.4)
People of all ages can become infected with COVID-19/Coronavirus (True)	206 (51.8)	19 (4.8)	173 (43.3)
People of all racial, religious, and ethnic groups can become infected with COVID-19/Coronavirus (True)	199 (50.4)	17 (4.3)	179 (45.3)
Eating garlic, ginger, black pepper, or lemon can lower your chances of getting infected with COVID-19/Coronavirus (False)	12 (3.0)	248 (62.8)	135 (34.2)
Coronavirus spread from humans to humans, mainly through respiratory droplets (True)	199 (50.6)	13 (3.3)	181 (46.1)
Coronavirus can also spread from feco-oral route (True)	111 (28.1)	34 (8.6)	250 (63.3)
COVID-19/Coronavirus is just like the flu (False)	20 (5.1)	214 (54.0)	162 (40.9)
Maintaining good personal hygiene and being socially responsible would help limit the spread of COVID-19/Coronavirus (True)	252 (64.5)	56 (14.3)	83 (21.2)
Washing hands frequently using soap or the use of sanitizer would help limit the spread of COVID-19/Coronavirus (True)	253 (64.9)	55 (14.1)	82 (21.0)
Avoiding handshaking behavior would help limit the spread of COVID-19/Coronavirus (True)	219 (56.7)	65 (16.8)	102 (26.4)
Avoiding placing fingers into eyes, nose, and mouth would help limit the spread of COVID-19/Coronavirus (True)	181 (47.0)	74 (19.2)	130 (33.8)
Coughing and sneezing into the elbow or within the clothing is a good practice in helping to limit the spread of COVID-19/Coronavirus (True)	209 (54.4)	64 (16.7)	111 (28.9)
Limiting eating meat, eggs, and fishes would help limit the spread of COVID-19/Coronavirus (False)	153 (39.8)	116 (30.2)	115 (30.0)
Following social distancing measures and avoiding crowded places would help limit the spread of COVID-19/Coronavirus (True)	172 (44.7)	76 (19.7)	137 (35.6)
For someone without any symptoms of COVID-19/Coronavirus, wearing a face mask is considered an appropriate and protective measure against COVID-19/Coronavirus (True)	144 (37.4)	100 (26.0)	141 (36.6)
Proper usage of face mask during an outbreak should include covering nose, mouth, and chin with the colored side facing outside (True)	167 (43.4)	64 (16.6)	154 (40.0)
Staying at home would play a significant role in helping to limit the spread of COVID-19/Coronavirus (True)	215 (56.0)	84 (21.9)	85 (22.1)
A person with pre-existing medical conditions such as heart diseases, diabetes, hypertension, and cancer are at greater risk of COVID-19/Coronavirus related infection (True)	172 (44.7)	64 (16.6)	149 (38.7)
COVID-19/Coronavirus can only infect old people (False)	195 (50.9)	69 (18.0)	119 (31.1)
There is no chance of survival once the person is infected with COVID-19/Coronavirus (False)	195 (52.3)	67 (18.0)	111 (29.8)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 5. *Respondent Trusted Sources of Information Surrounding COVID-19*

Source	N (%) ^a
Sources of Information	
News, Media (e.g. TV, Radio, Newspapers)	360 (90.0)
Informational calls/SMS	161 (40.3)
Social Media (e.g. Facebook, Twitter, WhatsApp, YouTube, Instagram, Snapchat)	21 (5.3)
Official Government/International Websites (e.g. MoH, DoH, WHO, CDC)	10 (2.5)
Family Members, Colleagues, Friends	38 (10.0)
Employer, Work Colleagues, and Others at Work	7 (1.8)
Non-Governmental Organizations (NGOs)	21 (5.3)
Informational Campaigns	17 (4.3)
Local or Community Leaders	8 (2.0)
Journals	8 (2.0)
Trust in Sources to Provide COVID-19 Information	
Family Members	162 (41.3)
Religious Official	190 (48.5)
Community Elder	31 (8.0)
Health Official	144 (36.7)
Humanitarian Aid Worker	19 (4.8)
Social Media	17 (4.3)
Web News	9 (2.3)
Television	41 (10.5)
Radio	225 (57.4)

^a Values are frequency (percentage)

Table 6. *Faith in Community Action Against COVID-19*

Question	Not at all^a	Somewhat^a	Moderately^a	A lot^a
To what extent do you feel like your community is working together to prevent the spread of COVID-19/Coronavirus?	65 (16.4)	119 (30.0)	102 (25.7)	111 (28.0)
To what extent do you feel like the healthcare workers, your government, and other providers are working together to prevent the spread of COVID-19/Coronavirus?	46 (11.6)	61 (15.4)	90 (22.7)	200 (50.4)

^a Values are frequency (percentage)

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Table 7. *Essential Resources for COVID-19 Response*

Question	Yes N (%)^{a,b}	No N (%)^{a,b}
Access to Clean Water or a Clean Water Source	362 (91.6)	33 (8.4)
Access to Washing Facilities	113 (29.0)	277 (71.0)
Access to Soap	129 (33.6)	256 (66.5)
Access to Disinfectants, such as Hand Sanitizers and Cloth Wipes	8 (2.1)	382 (98.0)
Ability to Buy Essential Food Items	261 (65.9)	135 (34.1)
Access to Face Masks	43 (10.9)	351 (89.1)
Ability to Maintain Clean and Sanitary Conditions at Home	325 (81.9)	69 (17.4)
Access to Nearby Healthcare Facility	194 (49.0)	191 (48.2)
Confident in Ability to Access Healthcare if Infected with COVID-19	79 (20.0)	275 (69.4)
Access to Vaccines	215 (54.2)	174 (43.8)
Access to COVID-19/Coronavirus Screening	6 (1.5)	381 (96.9)

^a Values are frequency (percentage)

^b Values may not add to 100%

Declarations

Ethics approval and consent to participate: This study received approval from the ethics board at SIMAD University in Somalia and was deemed exempt from review by the Yale IRB (ID #2000028344). Verbal consent to participate in the study was obtained privately from each participant prior to the survey being interviewer-administered by trained staff from the Hagarla Institute. If a participant consented, they were informed of their right to withdraw at any time without any consequences and were presented with a brief overview of the study before any survey questions were administered. All information collected was confidential and anonymized.

Consent for publication: Not applicable

Patient and Public Involvement: The research questions identified and explored in this study were informed by concerns raised by Somali community members arising from COVID-19. In consultation with community members, as well as community organizers, the research team designed the survey tool and highlighted key research priorities. Relevant results from this study will be disseminated to community members, operating organizations within the area, and governmental agencies to facilitate and improve current actions to address COVID-19 among those displaced within Somalia.

Availability of data and materials: All data generated or analyzed during this study are included in this published article. No additional data are available.

Competing interests: The authors declare that they have no competing interests.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Authors' contributions: JA, SA, LW, KK, AA, and DM contributed to the design of the study. AA and DM contributed to the collection of data. JA, SA, LW, EW, and NH each contributed to the analysis of data. All authors contributed to the interpretation of data and the development of the manuscript.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page Number
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8, 22-30
Outcome data	15*	Report numbers of outcome events or summary measures	8-11, 22-30
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	8-11, 22-30

		which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	8-11, 22-30
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11, 30
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	31

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and Access to Essential Resources in Somali IDP Camps: a Cross Sectional Study

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3 **Knowledge and Perceptions of COVID-19, Prevalence of Pre-Existing Conditions, and**
4 **Access to Essential Resources in Somali IDP Camps: a Cross Sectional Study**
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Abstract

Objectives: This study examined knowledge and perceptions of COVID-19, prevalence of preexisting conditions, and access to essential resources among residents of internally displaced persons (IDP) camps in Somalia, where overcrowded settlements with weakened infrastructure, inadequate water, sanitation, and hygiene facilities, and limited access to health services make this vulnerable population particularly susceptible to a COVID-19 outbreak.

Design: A descriptive, cross-sectional survey.

Setting: Twelve IDP camps across six areas of the Lower Shabelle region in Somalia.

Participants: 401 adult Somali IDP camp residents.

Results: The majority of participants were female (86%) and had received no formal education (89%). While 58% reported being in “good” health, half of the participants reported have one or more pre-existing conditions. Though 77% of respondents reported taking at least one COVID-19 preventative public health measure, respondents reported a lack of access to adequate sanitation, an inability to practice social distancing, and nearly universal inability to receive a COVID-19 screening exam. Questions assessing knowledge surrounding COVID-19 prevention and treatment yielded answers of “I don’t know” for roughly 50% of responses. The majority were not familiar with basic information about the virus or confident that they could receive medical services if infected. 185 (47%) respondents indicated that camp living conditions needed to change to prevent the spread of COVID-19.

Conclusion: This study highlights low levels of COVID-19 knowledge and limited access to essential prevention and treatment resources among individuals living in Somali IDP camps. A massive influx of additional resources is required to adequately address COVID-19 in Somalia, starting with co-designing interventions to educate those individuals most vulnerable to infection.

Key Words: COVID-19; Conflict; Internally Displaced Persons; Somalia; Humanitarian Health; Infectious Diseases; WASH

Strengths and Limitations of This Study

- To the best of our knowledge, this study is one of the first to explore knowledge and perceptions of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in any African country, including Somalia.
- This study drew upon a diverse and expansive set of measures and involved a relatively large sample of internally displaced persons that are often understudied and neglected in public health research, especially during the COVID-19 pandemic.
- Respondent health profiles collected in this study rely on self-reported data, which may introduce bias.
- Participants were recruited from twelve Somali IDP camps across six areas of the Lower Shabelle region and were predominantly women, which may limit the generalizability of the study findings.

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Introduction

According to the United Nations High Commissioner for Refugees (UNHCR), there are more than 41 million internally displaced persons (IDPs) and 25 million refugees globally[1]. Many of those displaced live in camp settings with conditions that undermine public health guidelines for the control of infectious diseases, making them especially vulnerable to an outbreak of COVID-19[2]. Additional legal, financial, and linguistic barriers often inhibit displaced residents from accessing their host country's healthcare system, exacerbating conditions precipitated by an absence of basic amenities, such as soap, running water, and medical personnel[2]. Eighty-four percent of displaced people reside in low- or middle-income countries, which are often ill-equipped to institute health management protocols and response teams within IDP communities[3]. Providing continuity of care for chronic conditions as well as infection prevention measures within displaced communities are necessary to ensure the well-being of both displaced and host communities[2, 4].

The Ministry of Health in Somalia announced the first confirmed case of COVID-19 in Somalia on March 16, 2020[5]. As of April 6th, 2021, the Ministry of Health of Somalia reported 11,908 confirmed COVID-19 cases, 568 of which have resulted in death[5]. It is well-established that Somalia's health system is extremely underprepared for a further outbreak of COVID-19[6]. In Somalia, thirty years of civil war and natural disasters have resulted in nearly three million internally displaced persons who now inhabit over 2,100 overcrowded settlements[7]. The prolonged conflict has severely damaged Somalia's health infrastructure, leaving its inhabitants vulnerable to climate related disasters, malnourishment, infectious disease outbreaks, and other humanitarian crises[8, 9].

Somalis face several barriers in utilizing their country's healthcare system. Several reports inculcate that healthcare worker shortages and a nonexistent health information system leave its residents without reliable access to care[8, 9]. Somali physicians have indicated that there are no ventilators and only two intensive care units with a total of 31 beds across the country, which is alarming given that these resources are regarded as necessary to treat severe COVID-19 infections[10]. In addition, two in three Somalis have difficulties accessing safe water, and approximately 50% of health centers do not have reliable access to electricity[11, 12]. Qualitative reports signal that care-seeking behavior is very poor among Somalis, as a result of distrust towards the system's lack of regulation and unaffordable prices[13]. Consequently, Somalia has some of the lowest health indicators in the world with life expectancies of 54 years for males and 57 years for females[11, 14]. Studies in Somalia have reinforced a predisposition of internally displaced persons to infectious and water-borne diseases[15]. IDPs are among the most vulnerable to infectious disease outbreaks as they face circumstances such as overcrowding, uncontained sewage and waste, limited access to health services, contaminated water, low immunization coverage, and stigmatization.

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3 According to the Global Health Security Index, Somalia ranks 194th out of 195 countries in
4 preparedness for a globally catastrophic biological event[16]. To address the dire threat COVID-
5 19 poses to IDPs in Somalia, ongoing efforts have primarily focused on scaling up water,
6 sanitation, and hygiene (WASH) services, increasing monitoring, and disseminating information
7 about COVID-19[6, 7, 17-19]. Many organizations have also helped obtain equipment such as
8 personal protective equipment (PPE) and ventilators for providers, as well as soap and chlorine
9 tablets for community members[7, 10, 19]. Several organizations have reported that the country's
10 health system has no capacity to make early case detections, isolate and care for patients, and trace
11 contacts, and have thus focused their efforts on preventive measures to mitigate the virus's
12 impact[13].
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18 Among these efforts, few have incorporated IDP knowledge and perceptions of COVID-19 in their
19 planning and implementation. Studies in IDP camps similar to those in Somalia warn of the
20 profound consequences of COVID-19 in areas without a strong healthcare infrastructure, and
21 various international health authorities have drawn attention to the grave threat the pandemic poses
22 to these vulnerable populations[20-22]. An international information gap about IDP knowledge
23 and perceptions of COVID-19 exists and inhibits providers from implementing sustainable,
24 culturally appropriate health interventions. As such, this study examined knowledge and
25 perceptions of COVID-19, prevalence of preexisting conditions, and access to essential health
26 services among residents of internally displaced persons (IDP) camps in Somalia. We hope that
27 our study findings contribute to the development of potential interventions to improve the response
28 to COVID-19 in Somali IDP camps, where some of the world's most vulnerable individuals reside.
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Methods

Design and Instrument

A descriptive, cross-sectional survey was used to assess the current health profile, living conditions, and knowledge and perceptions surrounding COVID-19 among adults living in Somali IDP camps. Survey questions were designed using published WHO and CDC information on COVID-19 symptoms and transmission, a 2019 Displacement Severity Assessment among forcibly evicted Somalis conducted, and two published studies evaluating COVID-19 knowledge in Bangladesh and Nepal[23-27]. Additionally, questions specific to the Somali and IDP contexts were included.

The first section of the survey focuses on demographic information, including sex, age, displacement status, household size and status, education, and employment. Response options for educational status reflect the education system in Somalia, including an option for Qur'anic education. The next section focuses on participants' health profiles, with questions probing current health status, existing conditions, and symptoms. This section also includes a 12-item tool to gauge concerns brought about by COVID-19, such as potential effects on mental wellbeing, contracting COVID-19, or ability to buy essential food items. The third section of the survey assesses knowledge of COVID-19, most commonly used outlets for information, trusted sources of COVID-19 information, and perceptions of community efforts against COVID-19. An open-ended question on COVID-19 knowledge was followed by a 23-item tool which assesses knowledge of COVID-19 and consists of true-or-false statements regarding key facts or misconceptions surrounding the disease. The final section of the survey evaluates access to WASH, COVID-19 screening, and health services.

Because participants did not speak English, this survey tool was translated into Somali. Though this survey was not assessed for reliability or validity, the Somali version of the survey was piloted in Somali IDP context and reviewed for its content and suitability. Minor changes to the language of the Somali version were made to improve readability.

Sample and Setting

A convenience sample of 401 individuals living in twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi, Carbiska, and Afgooye) of the Lower Shabelle region in Somalia, often referred to as the world's capital of IDPs, was obtained in June 2020. Participants must have been older than 18 years of age, physically able to complete the survey, and willing to take part in the study. A brief presentation of the purpose, procedure, and requirements for participation was given privately to each participant. Prior to the survey being interviewer-administered by multilingual and trained staff from the Hagarla Institute, verbal consent was obtained. The Hagarla Institute is a non-profit organization dedicated to furthering clinical research, capacity-building, and skills transfer for medical personnel across Africa. Participants

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3 were informed that they had the right to withdraw at any time and that there would be no
4 consequences for withdrawal. All information collected was kept confidential and anonymized.
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7 **Data Analysis**

8 Responses from each survey were manually input onto Qualtrics survey software in English and
9 analyzed using SAS Studio 3.8[28]. Sample descriptive statistics were used to report median and
10 standard deviation calculations for continuous variables, along with frequency and percentages of
11 responses for categorical variables.
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15 **Ethics Approval**

16 This study received approval from the ethics board at SIMAD University in Somalia and was
17 deemed exempt from review by the Yale IRB (ID #2000028344).
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Results

Sample Demographics

The demographic characteristics of survey participants are shown in **Table 1**. Of the 401 eligible participants, 382 (96%) identified as IDPs and 15 (4%) identified as refugees. The vast majority of participants were female (86%, n=344) and the median age of the participants was 32.0, with a standard deviation of 13.2 years. Most participants either had no formal education (89%, n=353) or received Qur'anic education (32%, n=126), with only 10 participants (3%) having received education past secondary school.

Respondent Health Profiles & Concerns Arising from COVID-19

Participant perceptions of their health status, pre-existing health conditions, use of nicotine substances, and COVID-19 symptoms are displayed in **Table 2**. While 58% (n=224) reported being in "good" health and only 3% (n=13) reported using cigarettes or tobacco products, 50% (n=197) of participants reported having one or more of the listed pre-existing conditions. In regard to COVID-19 symptoms experienced, headache (49%, n=188) and fever (23%, n=88) were most common. Furthermore, participant concerns arising from COVID-19 are displayed in **Table 3**. Sixty-three percent (n=243) of respondents were concerned about getting adequate physical exercise, and 66% (n=259) were worried about getting COVID-19. When asked how COVID-19 has changed their daily lives, 235 participants (59%) indicated that the nation-wide lockdown as a result of COVID-19 had decreased their income or caused them to lose their job (not shown). In addition, approximately 10% (n=37) of respondents expressed concerns surrounding social dynamics and conflict within the household stemming from COVID-19.

Knowledge and Perceptions of COVID-19

Table 4 presents participant responses to true or false questions surrounding COVID-19. Roughly 50% of responses to the question series were "I don't know." The majority of participants indicated that they did not know the current possible treatment (83%, n=327), symptoms (50%, n=201), or incubation period of COVID-19 (79%, n=313), and 60% (n=237) reported being unfamiliar with social distancing (not shown). Similarly, 63% (n=250) did not know that asymptomatic individuals could spread the virus. However, a sizable proportion of participants were able to recognize headache (34%, n=135), fever (45%, n=179), cough (35%, n=139), and shortness of breath or difficulty breathing (31%, n=12) as symptoms of COVID-19 (not shown). Still, the proportion of participants who were not familiar with basic background information surrounding COVID-19 was higher than the proportion who answered questions correctly.

Participants most used and trusted sources of information surrounding COVID-19 are displayed in **Table 5**. About 49% (n=190) and 57% (n=225) of participants reported that they trusted religious officials and the radio, respectively, to provide information about COVID-19, while only 37% (n=144) and 5% (n=19) said that they trusted health officials and humanitarian aid workers,

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3 respectively. Ninety percent (n=360) of participants reported receiving information on COVID-19
4 from traditional media services (radio, television, and newspapers). A majority of respondents
5 indicated that they felt that healthcare workers and the government were working together
6 “moderately” or “a lot” to prevent the spread of COVID-19 (Table 6). However, only 4% (n=11)
7 of respondents stated that they would go to health information providers in IDP camps if they
8 suspected they had contracted the virus (not shown).
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11 12 **Access to Treatment and Preventative Services**

13 **Table 7** reports participants’ access to essential services, preventative resources, and treatments
14 for COVID-19. A majority lacked access to washing facilities (71%, n=277), soap (67%, n=256),
15 disinfectants (98%, n=382), and face masks (89%, n=373). Although respondents lacked access to
16 such resources, they still reported carrying out basic preventative procedures such as washing
17 hands more often (74%, n=292) and avoiding shaking hands (57%, n=222) (not shown). While
18 only 5% (n=20) and 25% (n=98) of participants reported using more disinfectants and practicing
19 social distancing, 77% (n=296) reported having taken at least one preventative action (not shown).
20 Moreover, 34% (n=135) of respondents reported not being able to buy essential food items in the
21 last week. Of those, 74% (n=100) reported having either to skip and eat smaller meals or buy lower
22 quality food (not shown).
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28 Additionally, 185 (47%) respondents indicated that camp living conditions needed to change to
29 prevent the spread of COVID-19 (not shown). In short answer responses, 142 (80%) respondents
30 expressed desires for improved sanitation, hygiene, or housing conditions, and 14 (8%) specifically
31 indicated their desire for more stringent social distancing practices. However, 40% (n=159)
32 indicated that it would be impossible to self-isolate if taken ill, respectively (not shown).
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36 Furthermore, respondents’ self-reported access to COVID-19 screening and medical services was
37 low, with 97% (n=381) saying that they could not access screening and only 20% (n=79) stating
38 that they were confident that they could receive medical services if infected. Participants reported
39 accessibility issues, with 48% (n=191) stating that there was no healthcare facility nearby and, of
40 those, 31% (n=61) said that it would take over an hour to reach it (not shown). However, most
41 participants indicated that they had received a vaccination for any condition in the past few years
42 (59%, n=232) (not shown), with 54% (n=215) expressing that vaccines were accessible to them.
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Discussion

This study is the first to explore knowledge and perceptions of COVID-19, access to essential services, and COVID-19 symptoms and risk factors among individuals living in IDP camps in Somalia. To our knowledge, it is also one of few studies that document knowledge of COVID-19 and prevalence of COVID-19 symptoms and risk factors among displaced populations globally. Overcrowding, limited access to WASH services, and a lack of health infrastructure leave displaced populations living in IDP camps particularly vulnerable to the spread of infectious disease such as COVID-19[2].

Respondent Health Profile

A considerable proportion of our sample reported experiencing symptoms that could potentially be attributed to COVID-19, including headache, fever, or muscle or body aches[29]. Previous studies on health profiles of displaced populations living in such settings are unavailable in Somalia and are sparse in international settings, limiting the potential for cross-comparison. However, compared to a similar study conducted in refugee camps in Bangladesh, our sample exhibited higher proportions of individuals experiencing fevers, headaches, shortness of breath, loss of taste or smell, and muscle or body aches[27]. In addition, our study findings reinforce concerns put forward in the literature regarding the spread of COVID-19 in humanitarian settings, including getting adequate exercise, mental health and well-being, job security, social distancing, conflict within the home, and food insecurity. These concerns should serve as priority areas for health and social service providers to engage with and address.

Though the rate of tobacco and cigarette use in our sample appears to be consistent with smoking prevalence in Somalia, especially when considering the majority of our sample consisted of women, our study found a lower rate of tobacco use when compared to other studies conducted in similar limited-resource settings[30,31]. Furthermore, although little information is available regarding the health conditions of individuals living in IDP camps globally, self-reported pre-existing conditions from our sample appear to be considerably low, particularly for chronic and mental health conditions, when compared to values expected from the literature[32-35]. Health staff administering surveys reported that many participants did not know what the surveyed conditions were, had little recollection of previous diagnoses, and had rarely visited a health professional in the past. This is consistent with the significant lack of formal education among participants and lack of access health facilities and may explain the lower reported prevalence of chronic, pre-existing conditions found in this study.

Knowledge and Perceptions of COVID-19

This study found very poor knowledge related to COVID-19 and relevant universal safety measures among individuals living in IDP camps. Though there is limited literature on this topic, especially in camp-like or humanitarian contexts, our sample exhibited significantly poorer

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3 knowledge of COVID-19 and safety measures, as compared to studies conducted in China, the
4 United States, the United Kingdom, and Nepal[36, 37, 26]. And, although related literature in
5 humanitarian settings is severely limited, this disparity persists among the sparse COVID-related
6 published research in camp-like settings, such as that of a study conducted in Cox's Bazar,
7 Bangladesh[27]. These findings may be attributed to the lack of formal education among study
8 participants, as well as the reality that Somalia has some of the lowest health and health literacy
9 indicators in the world, stemming from decades of conflict, civil strife, and limited access to
10 healthcare and education – particularly for displaced populations like IDPs[38-41].
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15 The importance of education as a preventative measure in controlling the transmission of COVID-
16 19 in camp settings cannot be understated. Given significant gaps in COVID-19 knowledge among
17 Somali IDP camp residents, instituting precautionary measures, including public awareness
18 campaigns, is paramount. Knowledge is a critical determinant of health behaviors, and through
19 targeted educational interventions, IDP camp residents can play an essential role in preventing
20 community spread of the virus among those displaced[42]. Through highly utilized information
21 platforms identified in this study, such as news and media outlets and informational calls or text
22 messages, educational programs can be co-designed with those living in IDP camps to address
23 COVID-19 knowledge gaps, to disseminate information about COVID-19 prevention and
24 treatment, and to build trust between health providers and IDPs. Similarly, trusted sources, such
25 as religious officials, health officials, and the radio, can be mobilized to engage with community
26 members and to dispel misinformation about COVID-19.
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32 *Access to Treatment and Preventative Services*

33 Our study reveals a significant lack of access to treatment and preventative services for COVID-
34 19 among individuals living in IDP camps, which is consistent with other assessments of access
35 to health and WASH services in Somalia and camp-like settings in other countries[2, 43-45]. Of
36 particular note, the lack of access to COVID-19 screening tests suggests that cases may go
37 undetected and spread rapidly within overcrowded camp settings. Similarly, our sample's reported
38 lack of access to any vaccines may inhibit adequate uptake of a COVID-19 vaccine among this
39 vulnerable population. These findings not only reflect the lack of access to services necessary to
40 prevent COVID-19 transmission, but also suggest a lack of access to services that may exacerbate
41 known comorbidities of COVID-19, such as hypertension, cancer, cardiovascular disease, and
42 diabetes, which are increasingly difficult to provide continuous care for during the COVID-19
43 pandemic[1, 4]. Generally, respondents reported limited confidence that they would be able to be
44 treated if they contracted the virus, as well as an inability to participate in preventative measures
45 due to a lack of material resources such as face masks and disinfectants, lack of information about
46 COVID-19 prevention measures, and inadequate living conditions to enforce social distancing
47 protocols. Consistent with similar studies conducted with displaced populations in the Democratic
48 Republic of the Congo and Syria, these findings reinforce the necessity for substantial investment
49 in improving access to health and WASH services for those living in camps, beginning with
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3 providing consumables such as soap and facemasks to implement COVID-19 precautions and
4 individual family accommodations such as tarpaulin tents to allow IDPs to practice distancing
5 measures[46,47].
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8 **Limitations**

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11 This study's sampling methodology is subject to several limitations. First, participants were
12 recruited from twelve Somali IDP camps across six areas (Ceelasha, Lafoole, Xaawo Cabdi,
13 Carbiska, and Afgooye) of the Lower Shabelle region, which limits the generalizability of the
14 study findings to IDP camps in other areas of Somalia. That being said, the Lower Shabelle region
15 harbors one of the largest IDP populations in Somalia, as well as one of the highest concentrations
16 of individuals in need of humanitarian support[48]. Similarly, our analysis did not disaggregate
17 data by IDP camp. Future studies should not only identify the challenges faced by IDP
18 communities outside of the Lower Shabelle region but should also explore circumstances unique
19 to each camp setting, such that tailored interventions can be effectively designed. Second, because
20 an overwhelming majority of participants surveyed (86.2%) were women, the generalizability of
21 the study results to males living in IDP camps may be limited. Third, the respondent health profiles
22 reported (**Table 2**) consist exclusively of self-reported data. As such, the limited reliability of
23 participant responses for pre-existing conditions must be noted. Finally, given that this study
24 utilizes a cross-sectional survey design, it cannot be used to analyze the evolution of COVID-19
25 knowledge, health conditions, and access to services in Somali IDP camps over an extended period
26 of time.
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Conclusion

Ultimately, this study provides strong evidence for immense gaps in knowledge and perceptions of COVID-19 and access to treatment and preventative services among individuals living in Somali IDP camps. In addition, this study also provides insight into the health profile of IDP camp residents, as well as their concerns during the COVID-19 pandemic. A massive influx of additional resources and targeted interventions will be required to adequately address COVID-19 in Somalia, starting with educating those individuals most vulnerable to infection. Future research is needed to further elucidate the health profile of camp residents and the most at-risk individuals and to identify entry points to facilitate the implementation of COVID-19 prevention and treatment measures, taking into account the perspectives of IDP camp residents and relevant stakeholders. International organizations operating within Somalia, as well as the Somali government, should view investments in addressing COVID-19 as long-term investments in sustainable health infrastructure, as well as the health and prosperity of its population.

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Tables and Figures

Table 1. *Respondent Characteristics*

Characteristic	N (%) ^{a,b}
Sex	
Female	344 (86.2)
Male	55 (13.8)
Age	32.0 ± 13.2
Status	
IDP	382 (96.2)
Refugee	15 (3.8)
# of People in Household	7 ± 5.1
# of People in Household over 65	0 ± 3.0
House or Dwelling	
Own	97 (24.3)
Rent	38 (9.5)
Not Sure	265 (66.3)
Highest Level of Education	
No Formal Education	353 (88.7)
Primary School	26 (6.5)
Lower Secondary School	5 (1.3)
Upper Secondary School	4 (1.0)
Post-secondary/tertiary school	7 (1.8)
Graduate Degree (e.g. Master's, Doctorate)	3 (0.8)
Qur'anic Education	126 (31.7)
Work in the Past 7 days	
Yes	190 (47.5)
No	210 (52.5)

^a Values are frequency (percentage) for categorical variables; median ± SD for continuous variables

^b Values may not add to 100%

Table 2. *Respondent Health Profiles*

Characteristic	N (%) ^{a,b}
Perception of Health Status	
Good	224 (57.6)
Fair	101 (26.0)
Poor	64 (16.5)
Pre-Existing Health Conditions	
Diabetes	5 (1.6)
Anemia	76 (23.6)
Hypertension	5 (1.4)
Lung Disease (COPD)	3 (0.8)
Cancer	1 (0.3)
Asthma	7 (1.8)
Malaria	52 (14.1)
Dengue Fever	3 (0.8)
Oral/Tooth Disease	7 (1.8)
Disability or Injury from Accident	18 (4.7)
STI or Fertility Disorder	84 (23.4)
Mental Illness or Psychiatric Condition	2 (0.6)
Other Health Condition	36 (10.0)
Use of Tobacco or Cigarettes	
Yes	13 (3.3)
Exhibiting Symptoms	
Headache	188 (48.5)
Fever	88 (23.0)
Skin Rash	23 (6.0)
Dry Cough	19 (5.0)
Wet Cough or Sputum/Mucus Production	5 (1.3)
Sore Throat	10 (2.6)
Runny Nose or Nasal Congestion	3 (0.8)
New Loss of Taste and/or Smell	19 (4.9)
Shortness of Breath or Difficulty Breathing	10 (2.6)
Diarrhea	9 (2.3)
Muscle or Body Aches	52 (13.6)
Fatigue or Malaise	20 (5.2)
One of the following: Fever, Dry Cough, Fatigue	49 (12.8)
Two of the following: Fever, Dry Cough, Fatigue	22 (5.7)
All of the following: Fever, Dry Cough, Fatigue	6 (1.8)
At least one of the following: Fever, Dry Cough, Fatigue	53 (13.7)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 3. *Concerns Brought on by COVID-19*

Question	Yes N (%) ^{a,b}	No N (%) ^{a,b}	Not Sure N (%) ^{a,b}
Getting adequate exercise/movement	243 (62.6)	135 (34.8)	10 (2.6)
Mental health and wellbeing	85 (22.1)	244 (63.5)	55 (14.3)
Job security	198 (51.2)	155 (40.1)	34 (8.8)
Social distancing	71 (18.7)	292 (77.0)	16 (4.2)
Social isolation in the case of infection	53 (13.6)	321 (82.5)	15 (3.9)
Covering living expenses	39 (10.0)	277 (71.0)	74 (19.0)
Caring for children	36 (9.5)	332 (87.6)	11 (2.9)
The education of your child(ren)	45 (11.6)	330 (85.3)	12 (3.1)
Social dynamics/conflict within the home	37 (9.6)	271 (70.0)	79 (20.4)
Worried about getting COVID-19/Coronavirus	259 (65.6)	99 (25.1)	37 (9.4)
Worried about loved ones getting COVID-19/Coronavirus	265 (68.0)	93 (23.9)	32 (8.2)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 4. Knowledge of COVID-19

Statement	Correct N (%) ^{a,b}	Incorrect N (%) ^{a,b}	Not Sure N (%) ^{a,b}
People showing no symptoms of being sick can spread a virus or contagious disease (True)	150 (37.5)	30 (7.5)	220 (55.0)
It is possible to contract a virus or contagious disease by touching a surface or object that has the virus on it (True)	191 (48.0)	6 (1.5)	201 (50.5)
Antibiotics can be used to treat COVID-19/Coronavirus (False)	36 (9.1)	51 (12.8)	311 (78.1)
Antibiotics can be used to prevent infection from COVID-19 (False)	37 (9.4)	44 (11.2)	313 (79.4)
People of all ages can become infected with COVID-19/Coronavirus (True)	206 (51.8)	19 (4.8)	173 (43.3)
People of all racial, religious, and ethnic groups can become infected with COVID-19/Coronavirus (True)	199 (50.4)	17 (4.3)	179 (45.3)
Eating garlic, ginger, black pepper, or lemon can lower your chances of getting infected with COVID-19/Coronavirus (False)	12 (3.0)	248 (62.8)	135 (34.2)
Coronavirus spread from humans to humans, mainly through respiratory droplets (True)	199 (50.6)	13 (3.3)	181 (46.1)
Coronavirus can also spread from feco-oral route (True)	111 (28.1)	34 (8.6)	250 (63.3)
COVID-19/Coronavirus is just like the flu (False)	20 (5.1)	214 (54.0)	162 (40.9)
Maintaining good personal hygiene and being socially responsible would help limit the spread of COVID-19/Coronavirus (True)	252 (64.5)	56 (14.3)	83 (21.2)
Washing hands frequently using soap or the use of sanitizer would help limit the spread of COVID-19/Coronavirus (True)	253 (64.9)	55 (14.1)	82 (21.0)
Avoiding handshaking behavior would help limit the spread of COVID-19/Coronavirus (True)	219 (56.7)	65 (16.8)	102 (26.4)
Avoiding placing fingers into eyes, nose, and mouth would help limit the spread of COVID-19/Coronavirus (True)	181 (47.0)	74 (19.2)	130 (33.8)
Coughing and sneezing into the elbow or within the clothing is a good practice in helping to limit the spread of COVID-19/Coronavirus (True)	209 (54.4)	64 (16.7)	111 (28.9)
Limiting eating meat, eggs, and fishes would help limit the spread of COVID-19/Coronavirus (False)	153 (39.8)	116 (30.2)	115 (30.0)
Following social distancing measures and avoiding crowded places would help limit the spread of COVID-19/Coronavirus (True)	172 (44.7)	76 (19.7)	137 (35.6)
For someone without any symptoms of COVID-19/Coronavirus, wearing a face mask is considered an appropriate and protective measure against COVID-19/Coronavirus (True)	144 (37.4)	100 (26.0)	141 (36.6)
Proper usage of face mask during an outbreak should include covering nose, mouth, and chin with the colored side facing outside (True)	167 (43.4)	64 (16.6)	154 (40.0)
Staying at home would play a significant role in helping to limit the spread of COVID-19/Coronavirus (True)	215 (56.0)	84 (21.9)	85 (22.1)
A person with pre-existing medical conditions such as heart diseases, diabetes, hypertension, and cancer are at greater risk of COVID-19/Coronavirus related infection (True)	172 (44.7)	64 (16.6)	149 (38.7)
COVID-19/Coronavirus can only infect old people (False)	195 (50.9)	69 (18.0)	119 (31.1)
There is no chance of survival once the person is infected with COVID-19/Coronavirus (False)	195 (52.3)	67 (18.0)	111 (29.8)

^a Values are frequency (percentage)

^b Values may not add to 100%

Table 5. *Respondent Trusted Sources of Information Surrounding COVID-19*

Source	N (%) ^a
Sources of Information	
News, Media (e.g. TV, Radio, Newspapers)	360 (90.0)
Informational calls/SMS	161 (40.3)
Social Media (e.g. Facebook, Twitter, WhatsApp, YouTube, Instagram, Snapchat)	21 (5.3)
Official Government/International Websites (e.g. MoH, DoH, WHO, CDC)	10 (2.5)
Family Members, Colleagues, Friends	38 (10.0)
Employer, Work Colleagues, and Others at Work	7 (1.8)
Non-Governmental Organizations (NGOs)	21 (5.3)
Informational Campaigns	17 (4.3)
Local or Community Leaders	8 (2.0)
Journals	8 (2.0)
Trust in Sources to Provide COVID-19 Information	
Family Members	162 (41.3)
Religious Official	190 (48.5)
Community Elder	31 (8.0)
Health Official	144 (36.7)
Humanitarian Aid Worker	19 (4.8)
Social Media	17 (4.3)
Web News	9 (2.3)
Television	41 (10.5)
Radio	225 (57.4)

^a Values are frequency (percentage)

Table 6. *Faith in Community Action Against COVID-19*

Question	Not at all^a	Somewhat^a	Moderately^a	A lot^a
To what extent do you feel like your community is working together to prevent the spread of COVID-19/Coronavirus?	65 (16.4)	119 (30.0)	102 (25.7)	111 (28.0)
To what extent do you feel like the healthcare workers, your government, and other providers are working together to prevent the spread of COVID-19/Coronavirus?	46 (11.6)	61 (15.4)	90 (22.7)	200 (50.4)

^a Values are frequency (percentage)

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Table 7. *Essential Resources for COVID-19 Response*

Question	Yes N (%)^{a,b}	No N (%)^{a,b}
Access to Clean Water or a Clean Water Source	362 (91.6)	33 (8.4)
Access to Washing Facilities	113 (29.0)	277 (71.0)
Access to Soap	129 (33.6)	256 (66.5)
Access to Disinfectants, such as Hand Sanitizers and Cloth Wipes	8 (2.1)	382 (98.0)
Ability to Buy Essential Food Items	261 (65.9)	135 (34.1)
Access to Face Masks	43 (10.9)	351 (89.1)
Ability to Maintain Clean and Sanitary Conditions at Home	325 (81.9)	69 (17.4)
Access to Nearby Healthcare Facility	194 (49.0)	191 (48.2)
Confident in Ability to Access Healthcare if Infected with COVID-19	79 (20.0)	275 (69.4)
Access to Vaccines	215 (54.2)	174 (43.8)
Access to COVID-19/Coronavirus Screening	6 (1.5)	381 (96.9)

^a Values are frequency (percentage)

^b Values may not add to 100%

Declarations

Ethics approval and consent to participate: This study received approval from the ethics board at SIMAD University in Somalia and was deemed exempt from review by the Yale IRB (ID #2000028344). Verbal consent to participate in the study was obtained privately from each participant prior to the survey being interviewer-administered by trained staff from the Hagarla Institute. If a participant consented, they were informed of their right to withdraw at any time without any consequences and were presented with a brief overview of the study before any survey questions were administered. All information collected was confidential and anonymized.

Consent for publication: Not applicable

Patient and Public Involvement: The research questions identified and explored in this study were informed by concerns raised by Somali community members arising from COVID-19. In consultation with community members, as well as community organizers, the research team designed the survey tool and highlighted key research priorities. Relevant results from this study will be disseminated to community members, operating organizations within the area, and governmental agencies to facilitate and improve current actions to address COVID-19 among those displaced within Somalia.

Availability of data and materials: All data generated or analyzed during this study are included in this published article. No additional data are available.

Competing interests: The authors declare that they have no competing interests.

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Authors' contributions: JA, SA, LW, KK, AA, and DM contributed to the design of the study. AA and DM contributed to the collection of data. JA, SA, LW, EW, and NH each contributed to the analysis of data. All authors contributed to the interpretation of data and the development of the manuscript.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page Number
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	6-7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	7
		(b) Describe any methods used to examine subgroups and interactions	7
		(c) Explain how missing data were addressed	7
		(d) If applicable, describe analytical methods taking account of sampling strategy	7
		(e) Describe any sensitivity analyses	-
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	6,8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8, 22-30
Outcome data	15*	Report numbers of outcome events or summary measures	8-11, 22-30
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	8-11, 22-30

		which confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	8-11, 22-30
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11, 30
Discussion			
Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-16
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	31

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.