Original Article

Adherence to COVID -19 protective practices in Ethiopia: Use and predictors of face mask-wearing

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Abstract

Introduction: The Ethiopian Ministry of Health strongly recommends that anyone, regardless of vaccination status, wears a standard face mask consistently when in public. This study aimed to assess the self-reported use and predictors of wearing face masks in the general population in Ethiopia.

Methods: This was a population-based cross-sectional study using a telephone survey. Adults living in Ethiopia were randomly selected from the Ethio Telecom list of mobile phone numbers and interviewed about their mask-wearing practice and individual and household-level factors that could impact on the use of face masking. Multivariable logistic regression was used to measure associations.

Results: A total of 614 participants were interviewed from September to November 2021. The prevalence of self-reported face mask use when in public was 81.1%. Living outside Addis Ababa, including Oromia [adjusted odds ratio [(AOR) 0.30, 95% confidence interval (CI) (0.14, 0.63)], Amhara [AOR 0.11, 95% CI (0.05, 0.23)], and Southern Nations, Nationalities and People's Region [AOR 0.31, 95% CI (0.12-0.79)] and being divorced or widowed [AOR 0.18, 95% CI (0.06, 0.62)] were found to be inversely associated with face mask use. Female gender [AOR 1.91, 95% CI (1.02, 3.58)] and older age [age ≥ 50, AOR 2.96, 95% CI (1.09-7.97)] were positively associated with the use of face masks. Attending social events [AOR 0.51, 95% CI (0.31-0.82)], was negatively associated with the use of face masks.

Conclusion: Self-reported use of face masks was relatively high nationally, but inconsistent among different regions and demographics. The findings imply that policies and messaging campaigns may need to focus on specific populations and behaviors in this ongoing pandemic.

Keywords: COVID-19,, personal protective equipment, face mask, Ethiopia

Introduction

The novel coronavirus disease 2019 (COVID-19) was declared a pandemic on March 11th 2020 by the World Health Organization (WHO)(1). In an effort to reduce the spread of COVID-19, health . authorities have recommended the use of various public health control measures. These include use of face masks, physical distancing, hand washing, use of hand sanitizers and avoiding body contact (2). Even with the development of effective vaccines for COVID-19, it is still important to adhere

to these control measures as the vaccines do not confer full protection(3). Their effectiveness is also decreasing with new variants(4). In addition, vaccine inequity, particularly in low-resource countries meaning that population coverage remains low (5). Vaccine hesitancy has also hampered access to vaccines substantially(6, 7).

Although the different types of control measures play a role in curbing the spread of COVID-19, the lifestyle and economic constraints that force people to continue in work, make compliance to physical distancing and related control measures difficult. In such context, use of face masks in public settings is critical to curb the spread of COVID-19. Growing evidence has shown the effectiveness of using face masks in reducing the transmission of COVID-19 (8-14). The use of face masks has also been associated with better mental wellbeing (15, 16). However, there are still differences in face mask usage across different countries, regions and socio-demographic characteristics. A cross-sectional online survey on global trends and predictors of face mask usage during the COVID-19 pandemic has shown that socio-demographic factors such as older age, female gender, education and living in urban areas were significantly associated with higher mask usage in public settings (17). But not all studies have confirmed these associations between mask wearing and gender or residences(18).

In Ethiopia, there is still a lack of knowledge regarding mask-wearing behaviors at a national level. This study aimed to explore the use of face masks and its predictors in Ethiopia. Although there have been a few studies conducted in Ethiopia to investigate COVID-19 control measure compliance in different regions of the country and different target groups (19-23); this study explores the use of face masks as a preventive measure against COVID-19 on a national scale. Such studies will help to understand and target behaviors that are considered risky in the context of this pandemic, across individuals and regions to clarify and refine public health messaging around the use of face masks during the pandemic.

Methods
Study Design and period
This study was a population-based cross-sectional study using mobile call surveys. This survey was a pilot for a population-based prospective cohort study that has gone on to recruit 10,000 participants. The pilot survey was conducted from September to November 2021.

Study setting and population
This national study was conducted across Ethiopia, including ten regions and two city administrations (Addis Ababa and Dire Dawa). Potential participants were selected randomly from the population of individuals with mobile phones, registered centrally with the federal or the regional authorities. Eligible participants were adults (age 18 and above) with mobile phones, speaking one or more of the Ethiopian working languages (Amharic, Afan Oromo or Tigrigna), and with no hearing or cognitive impairment or serious mental illness that impeded interview.

Sample size and sampling procedure
This study is a pilot national survey and no formal sample size calculation was considered. For this pilot report, the data were collected within a specified period to inform policy and practice earlier.

Nevertheless, the result from power analysis shows that the considered sample size (n=614) will give a power of at least 80% at 5% level of significance and enables detection of a minimum difference of 5% in testing a prevalence of face masking ranging from 20% to 80% in the population.

All participants that were selected randomly from mobile phones and those who were answering their phones during the data collection period were included in the study.

Data collection procedures
A mobile phone interview was used to collect the data. The data were collected on an electronic data capture platform using Open Data Kit. The recruitment included a rigorous evaluation of the data collectors.

The data collectors were trained before they started data collection. In addition to the data collection instruments, they were also trained about good clinical practice and research ethics. The survey procedures and tools were pre-tested with 50 interviews for utility, feasibility and acceptability.

Measurements
Participants' behavior of use of face masks when outside or in public was assessed for the previous month (the month prior to the interview). Participants who reported to wear face mask when they were out in public were considered to use face mask when outside. Several individual and household level factors that could be associated with the use of face masks were included based on a priori hypotheses and existing literature.

Individual-level predictors assessed were: age, gender, level of education, residence (defined as living in an urban or rural area), region, marital status, occupation, and perceived risk for COVID-19. Household level risk factors assessed included self-reported economic status of the household of the participants, having people aged 65 and older in the household, having a person living with a medical condition (hypertension, diabetes or asthma, physically frail, underweight or overweight/obese).

Data processing and analysis
Data were analyzed using Stata version 14.0(24). Demographic and other factors were stratified by face mask use and tested for any significant differences using Pearson's chi-square test. Further association of potential risk factors, and wearing of face masks was assessed using multivariable logistic regression. Magnitude of association was determined using the odds ratio or Adjusted odds ratio (AOR) and 95% confidence interval (95% CI).

Ethical considerations
Ethical approval was obtained from the Institutional Review Board of the College of Health Sciences, Addis Ababa University, Ethiopia. The items in the information sheet were read and clarification was given to the participants. All participants were informed that their identity would be kept confidential, and all the collected information would be anonymized during the phone call. In addition, the respondents were also informed that participation in the study was voluntary and that they could stop the interview at any time. Verbal informed consent was then obtained from the participants.

Results
In this phone call survey, 4180 calls, selected randomly from a pool of 30,000 phone numbers, were attempted. Of 4180 attempted calls, 1194 calls were answered. The rest, 2986 calls, were unavailable , unanswered, switched off, disconnected, or hung up. Out of the 1194 calls answered, we completed successful interviews with 614 participants, yielding a response rate of 51.4%.

General characteristics of participants
Among the 614 participants, most were male (71.1%; n=440) with 12.4% (n=76) aged 50 years or older. Most participants were from urban areas (77.9%) where more than half reportedly had an average economic status (54.7%) and received at least secondary level education (91%). Almost half (48.4%) of the participants believed they were at risk of getting COVID-19.

Use of face mask and factors associated with the use of face mask
The prevalence of self-reported face mask use when in public was 81.1% with 95% CI (77.8 – 84.0). Significantly more women (87.9%) than men (78.4%) reported wearing face masks (p=0.01) (Table 1; P values not shown in the table).

There was also a significant trend in wearing face masks with increasing age (z=2.45, p=0.014). The highest proportion of those wearing face masks were from Addis Ababa (93.7%) and the lowest among those from the Amhara region (62.6%), with significant difference between the two groups (p<0.001). Married persons (83.3%) also had higher levels of face mask compared to those who were divorced or widowed (p=0.001). Although not statistically significant, those who live in a household with average and above economic status were more likely to use face masks compared to those living in a household with low economic status.

Table 1: Socio-demographic and household characteristics and use of a face mask when outside the house in Ethiopia, September to November, 2021 (N=614)

Characteristics	Category	No.	%
Age	< 30	207	33.7
	30-39	213	34.7
	40-49	118	19.2
	≥ 50	76	12.4
Gender	Male	440	71.7
	Female	174	28.
Residence	Urban	478	77.8
	Rural	136	22.2
Region	Addis Ababa	222	36.2
	Oromia	144	23.5
	Amhara	139	22.6
	SNNPR*	66	10.8
	Others**	43	7.0
Level of education	Primary school or less	55	9.0
	Secondary school	124	20.2
	Certificate	148	24.1
	College/ University	287	46.7
Marital status	Single	172	28.0
	Married	419	68.2
	Divorced/Widowed	23	3.8
Occupation	Farming/Pastoralist	56	9.1
	Self-employed/ daily laborer	260	42.4
	Government employee/ Pensioner	178	29.0
	Housewife/ Homemaker	30	4.9
	Unemployed	45	7.3
	Other	45	7.3
Household economic status	Very low	53	8.6
	Low	225	36.6
	Average and above	336	54.7

Although there were more people living with older people or someone with a chronic condition (hypertension, asthma and diabetes) who wore face masks, this was not statistically significant. Similarly, increased personal risk perception did not appear to enhance wearing of face masks (Table 2; P values not shown in the table). On the other hand, more people who had attended social events in the previous month were less likely to wear face masks (p=0.01)

Table 2: Household risk factors for COVID-19 and use of face mask when outside the house in Ethiopia, September to November, 2021 (N=614)

Risk factors		No.	%
People aged 65 and above in HH	No	491	80.0
	Yes	123	20.0
Think they are at risk for COVID-19	No	317	51.6
	Yes	297	48.4
Attended any social related events in the past month	No	295	48.1
	Yes	319	51.9
Hypertension	No	542	88.3
	Yes	72	11.7
Diabetes	No	564	91.9
	Yes	50	8.1
Asthma	No	566	92.2
	Yes	48	7.8
Physically frail	No	604	98.4
	Yes	10	1.6
Underweight	No	602	98.1
	Yes	12	1.9
Overweight/obese	No	598	97.4
	Yes	16	2.6

Results from the multivariable logistic regression analysis showed female gender (AOR 1.91, 95% CI [1.02, 3.58]), and older age (age ≥ 50 AOR 2.96, 95% CI [1.09 -7.97]) were significantly associated with higher levels of face mask wearing in public. Being divorced or widowed (AOR 0.18, 95% CI [0.06-0.62]) and living outside of Addis Ababa (Oromia: AOR 0.30, 95% CI [0.14, 0.63]; Amhara: AOR 0.11, 95% CI [0.05, 0.23]; SNNPR: AOR 0.31, 95% CI [0.12-0.79]; others: AOR 0.16, 95% CI [0.06-0.41]) were found to be negatively associated with the use of face masks (**Table 3**).

Multivariable logistic regression controlling for other household risk factors also showed that attending social events in the past one month (AOR 0.51, 95% CI [0.31-0.82]), was negatively associated with the use of face masks. Other household risk factors (living with people aged 65 and older, perceived risk for COVID-19, having

a person in the household living with hypertension, diabetes or asthma, and physical frailty, or being underweight or overweight/obese) did not have a significant association with the use of face masks (**Table 4**).

DISCUSSION

This national survey indicates that an encouraging proportion of people are wearing face masks in Ethiopia although this varied with demographic and geographic characteristics. About nine in ten residents of Addis Ababa, the capital of Ethiopia and the political hub of Africa, wore face masks during the study period. . If this level of adherence is maintained along with additional public health control measures, COVID-19 control may be achieved in the not-so-distant future. Similar or slightly higher levels of use of face masks has been reported in Uganda (25, 26) and India (27).

Such relatively high proportion of the public wearing facemasks is important to control the spread of COVID-19, which is mostly transmitted through asymptomatic infections(28, 29). The high hopes that vaccines may control the spread of the disease is now tempered with the realization that the efficacy of vaccines in preventing reinfections is onlymodest(30) and short lived(31). Despite the initial promise to distribute the vaccine globally, there is extreme inequity with most African countries having extremely limited access to the vaccines(5). Moreover, vaccine acceptance is relatively low and well below what is required for ending the pandemic(32). In this context, universal face masking is a critical measure. Equally encouraging is the fact that people who wear face masks are also adherent to other public health control measures such as social distancing and hand hygienic practices. Ensuring continued adherence to these public health control measures must be at the forefront of the fight to end this pandemic.

The survey also showed that certain demographic groups, such as women and those aged 50 and above, and those living in Addis Ababa were more likely to wear face masks. The finding of association with female sex and older age is in conformity with other studies that hypothesized that adherence may be due to tendency of these groups in general to engage more with health-preventive behaviours, social role modelling and peer pressure (33).

Table 3: Factors associated with use of face masks when outside and socio-demographic and household characteristics in Ethiopia, September to November, 2021 (N=614)

Variable		Characteristics		COR (95% CI)	AOR (95% CI)	P value
Age (years)		No.	%			
	< 30	207	33.7	Reference	Reference	
	30-39	213	34.7	1.31 (0.81-2.09)	1.28 (0.71-2.29)	0.411
	40-49	118	19.2	1.48 (0.83-2.64)	1.54 (0.76-3.39)	0.217
	≥ 50	76	12.4	2.57 (1.15-5.71)	2.96 (1.09-7.97)	0.033*
Gender	Male	440	71.7	Reference	Reference	
	Female	174	28.3	2.0 (1.21-3.34)	1.91 (1.02-3.58)	0.042*
Residence	Urban	478	77.8	Reference	Reference	
	Rural	136	22.2	0.69 (0.44-1.10)	1.19 (0.67-2.11)	0.550
Region	Addis Ababa	222	36.2	Reference	Reference	
	Oromia	144	23.5	0.31 (0.15-0.61)	0.30 (0.14-0.63)	0.001*
	Amhara	139	22.6	0.11 (0.06-0.21)	0.11 (0.54-0.23)	<0.001*
	SNNPR	66	10.8	0.34 (0.15-0.78)	0.31 (0.12-0.79)	0.015*
	Others	43	7.0	0.16 (0.07-0.36)	0.16 (0.06-0.41)	<0.001*
Level of education	Primary school or less	55	9.0	0.55 (0.28-1.07)	0.53 (0.20-1.42)	0.209
	Secondary school	124	20.2	1.01 (0.58-1.77)	0.95 (0.46-1.97)	0.900
	Certificate	148	24.1	0.78 (0.47-1.28)	0.64 (0.35-1.18)	0.153
	College/University	287	46.7	Reference	Reference	
Marital status	Single	172	28.0	Reference	Reference	
	Married	419	68.2	1.37 (0.86-2.13)	1.19 (0.65-2.13)	0.581
	Divorced/ Widowed	23	3.8	0.43 (0.17-1.06)	0.18 (0.06-0.62)	0.006*
Occupation	Farming/ Pastoralist	56	9.1	0.68 (0.33-1.39)	1.27 (0.45-3.62)	0.648
	Self-employed/ daily laborer	260	42.4	1.01 (0.62-1.64)	0.86 (0.47-1.60)	0.643
	Government employee/ Pensioner	178	29.0	Reference	Reference	
	Housewife/ Homemaker	30	4.9	2.05 (0.59-7.16)	1.13 (0.25-5.10)	0.871
	Unemployed	45	7.3	1.48 (0.58-3.78)	1.44 (0.49-4.22)	0.507
	Other	45	7.3	0.63 (0.29-1.34)	0.74 (0.30-1.80)	0.509
Household economic status	Very low	53	8.6	Reference	Reference	
	Low	225	36.6	0.97 (0.46-2.02)	0.85 (0.36-1.99)	0.704
	Average and above	336	54.7	1.28 (0.62-2.64)	1.00 (0.43-2.33)	0.992

Table 4: Factors associated with use of face mask and household risk factors for COVID-19 in Ethiopia, September to November, 2021 (N=614)

Risk factors		Characteristics		COR (95% CI)	AOR (95% CI)	P-value
People aged 65 and above in HH		No.	%			
	No	491	80.0	Reference	Reference	
	Yes	123	20.0	1.17 (0.69-1.96)	1.17 (0.62-2.21)	0.629
Think they are at risk for COVID-19	No	317	51.6	Reference	Reference	
	Yes	297	48.4	0.75 (0.50-1.12)	0.83 (0.50-1.37)	0.460
Attended any social related events in the past month	No	295	48.1	Reference	Reference	
	Yes	319	51.9	0.58 (0.38-0.87)	0.51 (0.31-0.82)	0.006*
Hypertension	No	542	88.3	Reference	Reference	
	Yes	72	11.7	1.19 (0.62-2.29)	1.19 (0.52-2.70)	0.680
Diabetes	No	564	91.9	Reference	Reference	
	Yes	50	8.1	2.21 (0.86-5.68)	1.69 (0.56-5.13)	0.352
Asthma	No	566	92.2	Reference	Reference	
	Yes	48	7.8	0.77 (0.38-1.55)	1.03 (0.44-2.39)	0.945
Tuberculosis	No	611	99.5	Reference	Reference	
	Yes	3	0.5	0.12 (0.10-1.28)	0.15 (0.10-2.04)	0.153
Physically frail	No	604	98.4	Reference	Reference	
	Yes	10	1.6	0.54 (0.14-2.11)	0.34 (0.69-1.67)	0.184
Underweight	No	602	98.1	Reference	Reference	
	Yes	12	1.9	0.46 (0.14-1.54)	0.49 (0.10-2.38)	0.376
Overweight/obese	No	598	97.4	Reference	Reference	
	Yes	16	2.6	1.01 (0.28-3.60)	1.16 (0.23-5.78)	0.860

Overall, this suggests that more needs to be done among men and those living in regions other than Addis Ababa to encourage compliance to public health control measures. However, it may not be surprising that participants outside Addis Ababa (the capital) are less likely to use face masks as the COVID-19 transmission rate has been lower in other regions of the country when compared to Addis Ababa (19, 22). Although marital status was associated with wearing face masks as observed in previous studies from Ethiopia (22) the mechanism for this association has not yet been explored.

In this survey, interestingly, there was no significant association between the use of face masks and education levels or occupation. This is different from what was found among west Ugandans where the practices of wearing face masks in public places differed across education levels and occupation of participants (P<0.05) (26).

Furthermore, there was no difference in the use of face masks by socioeconomic status unlike a study from South Africa that found significantly lower odds of wearing masks amongst the poor than the wealthiest (18).

Among the household risk factors, attending social events, which has been considered to be one of the most risky social behaviors during the pandemic (34), was associated with lower use of face masks. This finding is in line with a study conducted on a global scale (17). This result indicates that those who voluntarily engage in risky social activities during the pandemic are also less likely to use face masks. Social gatherings form an important part of life in Ethiopia and so measures like face mask assume even greater importance to allow people to socially participate in a safer way.

Hence, there is a need to target these groups for public health intervention as they are likely to contribute to the spread of COVID-19.

The lack of association between wearing of face masks and perceived personal or family risk was not anticipated although perceived personal risk was also not found to be associated with mask wearing in other studies (18). This implies more effort is required to educate the public regarding risk factors and that the severity of the COVID-19 symptoms increases with such risk factors (35).

This study has, however, some limitations. A phone call survey was used in this study and it was difficult to ascertain some of the exclusion criteria. The decision was based on the judgment of the interviewers. Such survey is also prone to selection bias in that the phone survey participants may be different from the general adult population in a range of socio-demographic characteristics (36). This was compounded by the relatively low response rate among contacted individuals. Moreover, the study is also prone to the short comings of self-reported questionnaires, such as recall bias and verification concerns. In this study, social desirability bias may also be important given the government recommendations to wear a face mask. Moreover, we did not inquire about the type of face mask the participants used and about proper use to indicate their effectiveness. It is worth noting that the survey was conducted during the third surge of the COVID-19 pandemic in Ethiopia, which may have overestimated the practice compared to non-surge periods. In addition, we asked participants specific questions about their economic status, social related events in the past one month, weight, physical status, other COVID-19 measures and other variables without an operational definition. They were all self-reported answers based on the perception of the participant and no actual measurement was done.

Conclusion
This study examined the use of face masking during the COVID-19 pandemic in Ethiopia. About four out of five participants reported they use face masks when in public, which is an encouragingly high proportion although based on a self-reported data during a surge. However, it should be of major concern that people with risk behaviors are less likely to use face masks. These findings imply policies and messaging campaigns should better target specific populations and behaviors in this ongoing pandemic and future public health emergencies.

Abbreviations
COVID-19: Coronavirus Disease 2019
SNNPR: Southern Nations, Nationalities and People's Region
WHO: World Health Organization

Declarations
Ethics approval and consent to participate
The study was approved by the Institutional Review Board of the College of Health Sciences, Addis Ababa University (086/20/CDT). Data collectors were trained in Good Clinical Practice and phone interviews were conducted after informed verbal consent was obtained. The data were kept confidentially and used for the purpose of the study only.

Consent for publication
Not applicable

Availability of data and material
The datasets supporting the conclusions of this article are included within the article and its additional files. Any additional material can be obtained upon reasonable request.

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

Authors' contributions
HN analyzed the data and wrote the first draft; ST, BF, MS, EG, AW, TE and RB contributed contents to include into the draft. AF, TM, CH and EM supervised the study and revised the draft; and all authors approved the final version for publication.

Supplementary Material
None

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