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COVID-19 prevention practices in urban setting during early introduction of the disease: results from community survey in SNNP Region, Ethiopia

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COVID-19 prevention practices in urban setting during early introduction of the disease: results from community survey in SNNP Region, Ethiopia

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Abstract

Objective: To assess community practices related to COVID-19 prevention methods and its associated factors during early introduction of the disease to the study area.

Setting and participants: Community based cross sectional study was conducted in Southern, Nations, Nationalities and People's Region, Ethiopia. Ten zonal towns with high population density and mobility and 1239 participants were included in the study.

Outcome measure: Semi-structured questionnaire was uploaded to SurveyCTO data collection system with security patterns. Mask use was assessed by observation while social distancing and hand washing were assessed by interview. Data was collected by health professionals who have BSc and above and analyzed using SPSS version 25. Descriptive statistics and binary logistic regression was performed.

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3 **Results:** From 1239 individuals, about half, 657 (53%), of respondents were females and about
4 two thirds, 795 (64.2%), were married. Nearly nine from 10 (90.3%) and about eight from 10
5 (82.0%) of respondents reported that they frequently wash hands with soap and/or use sanitizer
6 and keep social distancing as means to prevent COVID-19 respectively. Less than three fifths
7 (57.8%) of respondents wore mask during interview. In summary, about half (48.9%) of
8 respondents were practicing the three recommended methods (social distancing, clean hands and
9 wearing mask). Sex, educational status, family size and overall knowledge about COVID-19 were
10 associated with practicing COVID-19 prevention measures.
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18 **Conclusion:** COVID-19 prevention practice was low as only about half of participants were
19 practicing social distancing, clean hands and wear mask. Sex, educational status, family size and
20 overall knowledge about COVID-19 were associated with practicing COVID-19 prevention
21 measures. Although awareness creation has been implemented through different medias, it should
22 be strengthened in different local languages. Concerned government bodies should strictly follow
23 mask use in public gatherings.
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29 **Key words:** COVID-19, knowledge, attitude, practice
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34 **Strengths and limitations of this study**

- 35 • Current study is first to cover multi-centers (ten towns with adequate sample size) and
36 report regional level COVID-19 prevention practices at community level
- 37 • The result shows poor community practice to prevent COVID-19 pandemic needing
38 organized response
- 39 • Even though this study covered majority of towns in the region, this study was limited in
40 addressing smaller towns and rural areas that account for majority of regional population.
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50 **Introduction**

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52 The global pandemic, COVID-19 (Coronavirus disease 2019), is highly infectious viral disease,
53 and its main clinical symptoms include fever, dry cough, fatigue, myalgia, and dyspnea[1, 2].
54 COVID-19 as a global pandemic continue causing huge social and economic impact and stress on
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3 the health care system of all countries in the world[3, 4] though many efforts have been carried
4 out to contain the virus since declaration of the disease as pandemic[5].
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7 Prevention of COVID-19 in African setting, especially in urban setting is challenging because of
8 dense population, with small informal dwellings, lack of access to clean water, comprised of multi-
9 generational households with shared sanitation facilities, high level of social mixing, and transient
10 residents[6, 7] and presence of non-specific symptoms of endemic illnesses such as malaria and
11 influenza that make it difficult to differentiate from COVID-19 symptoms[6].
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17 In Ethiopia, the first case of COVID-19 was registered in March, 2020 and in the study region, it
18 was registered in early May, 2020. Since then, the ministry of health and regional bureau in
19 collaboration with different stakeholders have been doing different activities to prevent and control
20 the spread of the disease but there was no community based evidence showing COVID-19
21 prevention practices. To assist these responses, this study assessed practices related to COVID-19
22 prevention activities and its associated factors in selected zonal towns in Southern, Nations,
23 Nationalities and People's Region (SNNPR), Ethiopia.
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31 **Methods**

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34 Community based cross sectional study was carried out from May 18 to June 10, 2020 in selected
35 towns of SNNPR. SNNPR is the third largest region representing nearly 20% population of the
36 country. The region has more than 56 ethnic groups and languages making it the most diverse
37 region in the country. The region is administratively sub divided in to 18 zones, one city
38 administration and seven special woredas. Woreda is administrative structure equivalent to district
39 with approximately 100000 population. According to the census of 2007, the total population of the
40 region is projected to be about 20.5 million.
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47 Sample size was estimated using a single population proportion formula at 95% confidence level
48 assuming proportion of population with good knowledge to be 50% and considering 5% margin
49 of error, design effect of three and 10% non-response rate and the final sample size was 1268. The
50 calculated sample size was allocated to ten zonal towns based on the size of population. Ten towns
51 were purposely selected considering potential risk of COVID-19, crowdedness and high mobility.
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3 At the time of data collection, the country declared state of emergency that was not strict and some
4 people were moving in towns. To include both population staying at home and out of home, one-
5 third of estimated sample size was allocated to out of home population in towns and the rest two-
6 thirds were allocated to population staying at home.
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10 In study setting, towns are structured to the smallest administrative unit, kebeles. Kebeles in the
11 towns were listed and two kebeles random samples were selected from each town. To select
12 individual respondents, data collectors went to the center of selected kebeles and pin pen to select
13 the direction to start first house. The next household was selected from next adjacent block in
14 parallel position and continued until sample size was fulfilled. Concerning out of home population,
15 every other person that data collectors met while moving to next block were selected and
16 interviewed and continued until sample size was fulfilled. Residing in the selected kebeles for at
17 least for six months was considered as eligibility criteria.
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25 The questionnaire was prepared by reviewing relevant literatures [7-9] and pretested. Almost all
26 questions had “others” options and space to type other responses. The questionnaire was initially
27 prepared in English, and then translated to Amharic. The tool consisted socio-demographic
28 characteristics, exposure to COVID-19 messages and knowledge, attitude and practice about
29 COVID-19 and its prevention. The data collection tool uploaded to SurveyCTO data collection
30 system with security patterns. Training with field exercise was given to data collectors to have
31 common understanding on data collection tools and process. Nine data collectors who had BSc
32 degree and above and experience in data collection conducted face-to-face interview keeping
33 COVID-19 prevention measures. Field supervision and online monitoring was done daily to
34 maintain data quality.
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43 Excel file downloaded from SurveyCTO server was exported to SPSS version 25 for data
44 management. Those respondents with no information about COVID-19 were excluded from main
45 analysis. Univariate analysis was done to describe variables and binary logistic regression was
46 performed to identify factors associated with practice.
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51 Ethical clearance was obtained from the ethical review committee of the regional health bureau
52 (Reference number: £'6-19/6193). The study participants were informed about the purpose of the
53 study and informed verbal consent was taken. All collected data are kept confidential.
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Patient and Public Involvement

Even though respondents were not involved in design, we disseminated the findings to stakeholders working on COVID-19 prevention and control and findings were also disseminated through local media (radio).

Results

Overall 1239 respondents were included in the study, with response rate of 97.7%. The reason for non-response, mainly, was the fear of COVID-19 transmission during interview.

Socio-demographic characteristics of respondents

About half, 657 (53%), of respondents were females and about two thirds, 795 (64.2%), were married (Table 1).

Table 1: Socio-demographic characteristics of respondents

Variables	Category	Frequency	Percent
Sex	Male	582	47.0
	Female	657	53.0
Age	<=25	304	24.5
	26-30	214	17.3
	31-35	145	11.7
	36-40	148	11.9
	41-45	74	6.0
	46+	213	17.2
Marital status	I don't know	141	11.4
	Single	370	29.9
	Married	795	64.2
	Divorced	36	2.9
	Widowed	31	2.5
Educational status	Living separately	7	.6
	No formal education	126	10.2
	Primary (1-8)	249	20.1
	Secondary (9-12)	375	30.3
Occupation	Certificate and above	489	39.5
	Student	172	13.9
	Farmer	29	2.3
	Merchant	315	25.4
	Employee	340	27.4

	House wife	208	16.8
	Daily laborer	42	3.4
	Pensioner	30	2.4
	Private	52	4.2
	Other	51	4.1
Family size	≤ 5	858	69.2
	≥ 6	381	30.8
Religion	Orthodox	475	38.3
	Protestant	594	47.9
	Muslim	137	11.1
	Others	33	2.7

Knowledge about and attitude towards COVID-19

Seven knowledge questions about signs and symptoms, diagnosis of the disease, what to do if there is a suspect, drug to cure the disease, transmission mechanisms, prevention methods and most at risk groups were asked to determine level of knowledge. In summary, the mean score of knowledge was 52.3% (SD=18.9). Knowledge score was categorized using quartile and first quartile was labeled as poor and fourth quartile was labeled good while second and third quartiles were labeled as medium.

Eleven different attitude statements about seriousness of disease, being at risk, possibility of prevention and benefits of staying at health facilities were given to respondents and their agreement to statements was measured using Likert's scale out of five, from strongly disagree to strongly agree. The overall sum of attitude responses showed that mean score was 80.8% (SD=6.48). The overall score was categorized to quartiles and first quartile was considered as negative attitude, second and third quartiles were considered as neutral while fourth quartile was labeled as positive attitude.

Practice regarding COVID-19 prevention

Nearly nine from 10 (90.3%) and about eight from 10 (82.0%) of respondents reported that they frequently wash hands with soap and/or use sanitizer and keep social distancing as means to prevent COVID-19 respectively. Less than three fifths (57.8%) of respondents wore mask during interview (Figure 1).

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3 [Insert Figure 1]
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6 Figure 1: Respondents measures to prevent COVID-19, SNNPR, 2020
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9 **Mask use**

10 About two fifths, 521 (42.2%), were not using any kind of mask during interview. From those who
11 wore mask, 212 (29.7%) were using medical masks (any kind) while others were using non-
12 medical masks. Unavailability of mask was the major reason (58.6%) for not wearing mask and
13 other reasons were presented in Figure 2.
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19 [Insert Figure 2]
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21 Figure 2: Reasons for not wearing mask, SNNPR, 2020
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23 In summary, 605 (48.9%) were practicing social distancing, clean hands and wearing mask.
24 The practice was highest in Hawassa (88.1%) and lowest in Mizan (9.0%) (Figure 3).
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28 [Insert Figure 3]
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30 Figure 3: COVID-19 prevention practice among towns, SNNPR, 2020
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33 **Factors associated with COVID-19 prevention practice**

34 After running multivariate binary logistic regression, sex, educational status, family size and
35 overall knowledge about COVID-19 were associated with practicing COVID-19 prevention
36 measures (Table 2).
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40 Females were 44% more likely to practice COVID-19 prevention measures as compared to male
41 respondents (AOR at 95CI: 1.44 (1.08-1.92)). Those who attended primary, secondary and
42 certificate and above education were 89%, 74% and 89% more likely to practice COVID-19
43 prevention measures respectively as compared to those who never attended education.
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48 Respondents from larger (≥ 6 members) were 39% more likely to practice COVID-19 prevention
49 measures as compared to those from lesser number of family (≤ 6 members) (AOR at 95%CI: 1.39
50 (1.04-1.84)).
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Respondents who have medium and high level knowledge scores were 2.04 and 2.47 times more likely to practice COVID-19 prevention measures as compared to respondents with poor knowledge scores (AOR at 95%CI: 2.04 (1.51-2.75) and 2.47 (1.80-3.40) respectively.

Table 2: Binary and multivariate binary logistic regression

Variable	Category	Practice COVID-19 prevention		COR 95%CI	AOR 95%CI
		No	Yes		
Respondent status	Walking	213	192	1	
	At home	418	413	1.09 [0.86-1.39]	
Sex	Male	321	261	1	
	Female	310	344	1.36 [1.09-1.71]	1.44 [1.08-1.92]
Marital status	Single	191	179		
	Married	406	388	1.02 [0.79-1.31]	
	Others	34	38	1.19 [0.72-1.98]	
Educational status	No formal education	87	36	1	
	Primary (1-8)	127	122	2.32 [1.46-3.68]	1.89 [1.10-3.25]
	Secondary (9-12)	192	183	2.30 [1.49-3.57]	1.74 [1.02-2.98]
	Certificate and above	225	264	2.84 [1.85-4.35]	1.89 [1.07-3.35]
Occupation	Student	97	75	1	
	Farmer	25	3	0.15 [0.05-0.53]	
	Merchant	154	161	1.35 [0.93-1.97]	
	Employed	156	184	1.53 [1.06-2.21]	
	House wife	106	100	1.22 [0.81-1.83]	
	Daily laborer	32	10	0.40 [0.19-0.87]	
	Pensioner	15	15	1.29 [0.59-2.81]	
	Private	23	29	1.63 [0.87-3.05]	
Age category	Other	23	28	1.57 [0.84-2.95]	
	≤ 25	171	133	1	
	26-30	130	84	0.83 [0.58-1.19]	
	31-35	81	64	1.02 [0.68-1.51]	
	36-40	77	70	1.17 [0.79-1.74]	
	41-45	42	32	0.98 [0.59-1.64]	
	46+	122	89	0.94 [0.66-1.34]	
I don't know	8	133	21.37 [10.11-45.19]		
Family size	≤ 5	452	404	1	
	≥ 6	179	201	1.25 [0.99-1.60]	1.39 [1.04-1.84]
Overall knowledge	Poor	377	213	1	
	Medium	142	196	2.44 [1.86-3.21]	2.04 [1.51-2.75]
	Good	112	196	3.09 [2.33-4.13]	2.47 [1.80-3.40]
Overall attitude	Negative attitude	168	168	1	
	Neutral	277	324	1.17 [0.89-1.53]	
	Positive attitude	186	113	0.61 [0.44-0.83]	

Discussion

This study was done with the objective of assessed practices related to COVID-19 prevention methods and its associated factors and major findings included that only about half of respondents (48.9%) were practicing social distancing, clean hands and wearing mask. Sex, educational status, family size and overall knowledge about COVID-19 were associated with practicing COVID-19 prevention measures.

Nearly nine from 10 (90.3%) and about eight from 10 (82.0%) of respondents reported that they frequently wash hands with soap and/or use sanitizer and keep social distancing as means to prevent COVID-19 respectively. Less than three fifths (57.8%) of respondents wore mask during interview and in summary, only about half (48.9%) of respondents were practicing the three recommended methods (social distancing, clean hands and wearing mask). This result was low as compared to studies done in China [9] that showed practice of more than 95% and Saudi Arabia[8] that showed practice of 75% or more. This less practice as compared to other studies may be due less attention given by the community due to smaller cases in the region.

Respondents who attended primary, secondary and certificate and above education were 89%, 74% and 89% more likely to practice COVID-19 prevention measures respectively as compared to those who never attended education. In addition, respondents who have medium and high level knowledge scores were 2.04 and 2.47 times more likely to practice COVID-19 prevention measures as compared to respondents with poor knowledge scores (AOR at 95%CI: 2.04 (1.51-2.75) and 2.47 (1.80-3.40) respectively. This indicated that level of awareness is important to prevent the disease.

Females were 44% more likely to practice COVID-19 prevention measures as compared to male respondents (AOR at 95CI: 1.44 (1.08-1.92)). Moreover, respondents from larger families (≥ 6 members) were 39% more likely to practice COVID-19 prevention measures as compared to those from lesser number of family size (≤ 5 members) (AOR at 95%CI: 1.39 (1.04-1.84)). This may be due to familial responsibilities to prevent the disease.

Even though this study was conducted early after introduction of the disease to the region, awareness creation has been in place after early detection of the disease in China and declaration of the disease as pandemic. Response activities have been led in organized way by ministry of health and regional health bureaus since introduction of the disease to the country. As part of response, state of emergency

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3 was declared and mask use was must in some cases like while using public transport and banks.
4 Although there were misconceptions about mask use, major reason for not using mask (58.6%) was its
5 unavailability, which lowered mask use and overall practice among participants. In addition to overall
6 low practice, there was huge variation of practice ranging from as low as 9% to 88.1%. Improving
7 access to mask and strengthening awareness creation on mask is crucial.
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12 Even though this study covered majority of towns in the region, this study was limited in
13 addressing smaller towns and rural areas that account for majority of regional population.
14 Moreover, some of reported practices like social distancing might have been knowledge and may
15 not be actual practice of respondents due to social desirability bias.
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21 **Conclusion**

22 COVID-19 prevention practice was low as only about half of participants were practicing social
23 distancing, clean hands and wear mask. Sex, educational status, family size and overall knowledge
24 about COVID-19 were associated with practicing COVID-19 prevention measures. Although
25 awareness creation has been implemented through different medias, it should be strengthened in
26 different local languages. Concerned government bodies should strictly follow mask use in public
27 gatherings.
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34 **Acknowledgements**

35 We would like to thank Dability Inc. for availing free data collection system for COVID-19 survey
36 as part of its response to tackle the pandemic. Special thanks to Audra E. Blanchfield, SurveyCTO
37 team member in Dability Inc., for her support by converting community subscription server to
38 “COVID-19 dedicated server” in the mid of data collection.
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46 **Contributorship statement**

47 All authors contributed to design and conceptualization. ME developed SurveyCTO form and
48 followed daily submitted data, managed data, wrote report and manuscript. AK, MH and ES
49 facilitated financial support. AA reviewed manuscript. All authors read and approved final version.
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54 **Competing interests**

55 All authors have no competing interest and declare that this study is original article.
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57

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Data sharing statement

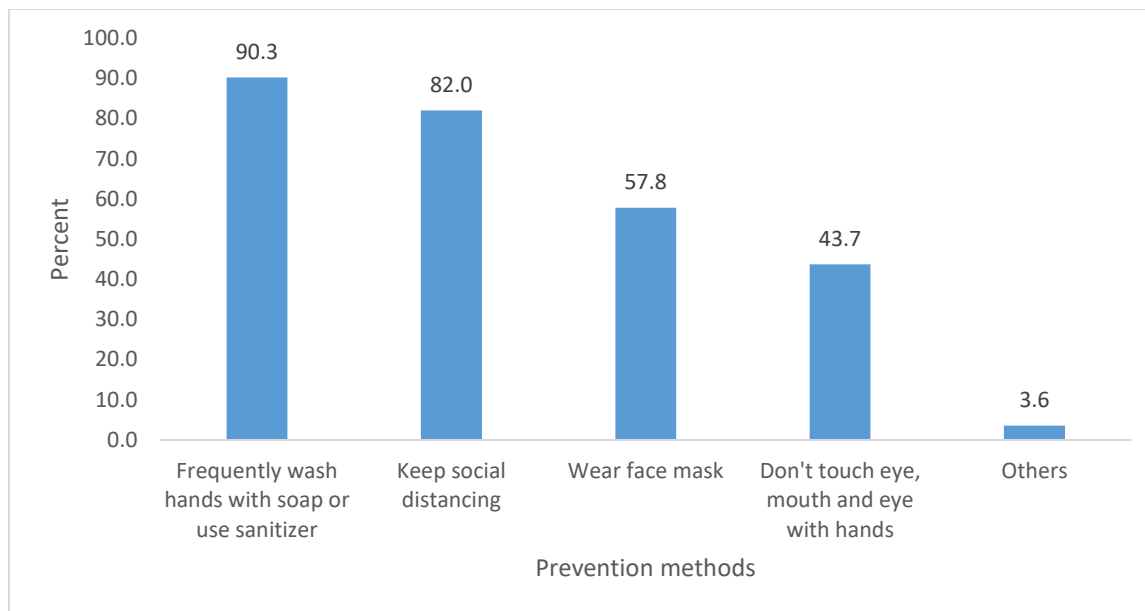
All relevant data are within the manuscript. The datasets analyzed during the current study available from the corresponding author on reasonable request.

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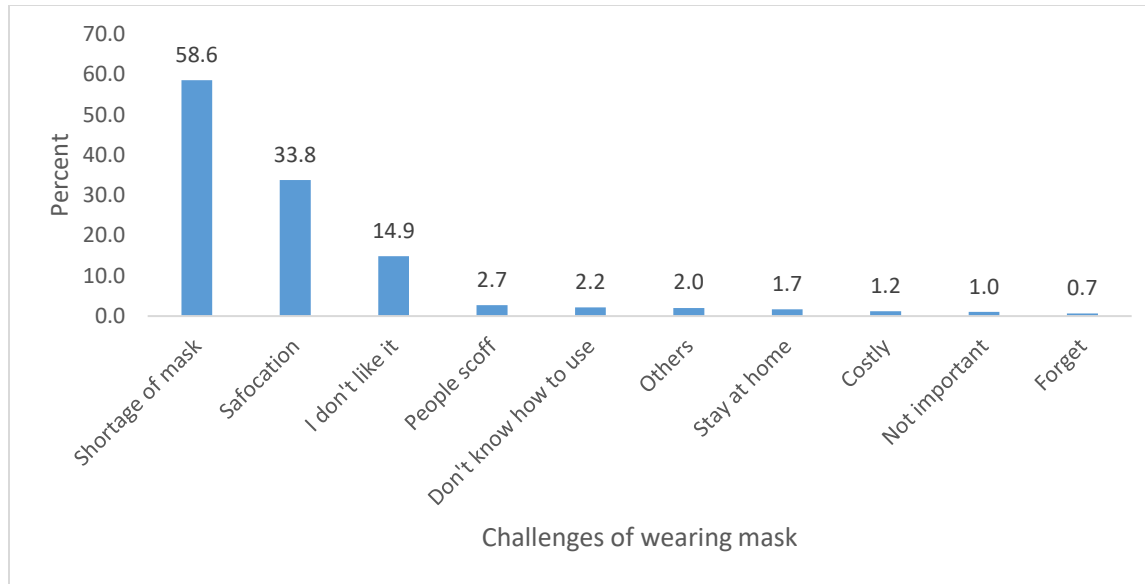
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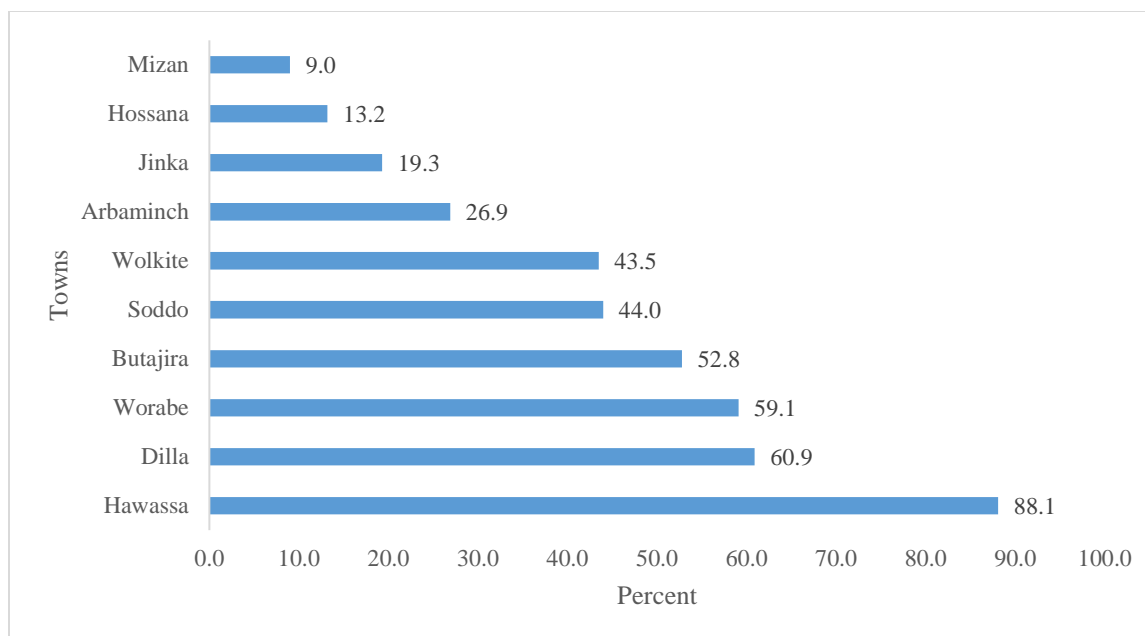
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Others*- cover coughs and sneezes with elbow, wear glove, take hot drinks, keep outdoor clothes out, stopped eating raw food, pray, do sport, frequently check temperature and take vitamin C



*-Others: allergy, don't know where to get, hot environment, medical problem, negligence, not sure of quality, think it (itself) brings the disease



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

	Item No	Recommendation	Assessment result**
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	√ (Page 1)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	√ (Page 1)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	√ (Page 3)
Objectives	3	State specific objectives, including any prespecified hypotheses	√ (Page 3)
Methods			
Study design	4	Present key elements of study design early in the paper	√ (Page 3)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	√ (Page 3)
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	√ (Page 4)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	√ (Page 4)
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	√ (Page 3)
Bias	9	Describe any efforts to address potential sources of bias	√ (Page 4)
Study size	10	Explain how the study size was arrived at	√ (Page 3)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	√ (Page 4)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	√ (Page 4)
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	NA
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
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	√ (Page 5)
		(b) Give reasons for non-participation at each stage	√ (Page 5)
		(c) Consider use of a flow diagram	X
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	√ (Page 5)
		(b) Indicate number of participants with missing data for each variable of interest	√ (Page 5)
Outcome data	15*	Report numbers of outcome events or summary measures	√ (Page 7)

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2	Main results	16	(a) Give unadjusted estimates and, if applicable, confounder- adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
3			√ (Page 8)
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*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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COVID-19 prevention practices in urban setting during early introduction of the disease: results from community survey in SNNP Region, Ethiopia

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COVID-19 prevention practices in urban setting during early introduction of the disease: results from community survey in SNNP Region, Ethiopia

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Abstract

Objective: To assess community practices related to COVID-19 prevention and its associated factors during early introduction of the disease to the study area.

Setting and participants: Community based cross-sectional study was conducted in Southern, Nations, Nationalities and People's Region, Ethiopia. Ten zonal towns with high population density and mobility and 1239 participants were included in the study.

Outcome measure: Semi-structured questionnaire was uploaded to SurveyCTO data collection system with security patterns. Mask use was assessed by observation while social distancing and handwashing were assessed by interview. Data were collected by health professionals who have BSc and above and analyzed using SPSS version 25. Descriptive statistics and binary logistic regression were performed.

Results: From 1239 individuals, about half, 657 (53%), of respondents were females and about two thirds, 795 (64.2%), were married. Nearly nine out of 10 (90.3%) and about eight out of 10

(82.0%) respondents reported that they frequently wash hands with soap and/or use sanitizer and keep social distancing as means to prevent COVID-19, respectively. Less than three fifths (57.8%) of respondents wore mask during interview. In summary, about half (48.9%) of respondents were practicing the three recommended methods (social distancing, handwashing and wearing mask). Sex, educational status, family size and overall knowledge about COVID-19 were associated with practicing COVID-19 prevention measures.

Conclusion: COVID-19 prevention practice was low as only about half of participants were practicing social distancing, handwashing and wearing mask. Although awareness creation has been implemented through different media, it should be strengthened in different local languages. Concerned government bodies should strictly follow mask use in public gatherings.

Key words: COVID-19, knowledge, attitude, practice

Strengths and limitations of this study

- Current study was first to cover multi-centers (ten zonal towns) and report regional level COVID-19 prevention practices at community level
- The study could reach to adequate sample in the community during early introduction of the disease to the study setting while there was high fear
- Even though this study covered majority of towns in the region, this study was limited in addressing smaller towns and rural areas that account for majority of regional population
- In addition, though the tool was checked for content and face validity, construct validity was not performed using statistical tests.

Introduction

The Coronavirus disease 2019 (COVID-19) is highly infectious viral disease, and its main clinical symptoms include fever, dry cough, fatigue, myalgia, and dyspnea[1, 2]. COVID-19 as a pandemic continues causing huge social and economic impact and stress on the health care system of all countries in the world[3, 4] though many efforts have been carried out to contain the virus since declaration of the disease as pandemic[5].

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3 Prevention of COVID-19 in urban setting of developing countries is challenging because of dense
4 population, small informal dwellings, lack of access to clean water, multi-generational households
5 with shared sanitation facilities, high level of social mixing, and transient residents[6, 7]. In
6 addition, presence of non-specific symptoms of endemic illnesses such as malaria and influenza
7 in developing countries make it difficult to differentiate from COVID-19 symptoms[6].
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12 In Ethiopia, the first case of COVID-19 was registered in March, 2020 and in the study region, it
13 was registered in early May, 2020. Since then, the ministry of health and regional health bureau in
14 collaboration with different stakeholders have been doing different activities to prevent and control
15 the spread of the disease but there was information gap on communities COVID-19 prevention
16 practices. To assist these responses, this study assessed practices related to COVID-19 prevention
17 activities and its associated factors in selected zonal towns in Southern, Nations, Nationalities and
18 People's Region (SNNPR), Ethiopia.
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27 **Methods**

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30 Community based cross sectional study was carried out from May 18 to June 10, 2020 in selected
31 towns of SNNPR. SNNPR was the third largest region representing nearly 20% population of the
32 country. The region had more than 56 ethnic groups and languages making it the most diverse
33 region in the country. The region was administratively sub divided in to 18 zones, one city
34 administration and seven special woredas. Woreda is administrative structure equivalent to district
35 with approximately 100000 population. According to the census of 2007, in 2019/2020, the total
36 population of the region was projected to be about 20.5 million [8].
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43 Sample size was estimated using a single population proportion formula at 95% confidence level
44 assuming proportion of population with good practice to be 50% and considering 5% margin of
45 error, design effect of three and 10% non-response rate and the final sample size was 1268. The
46 calculated sample size was allocated to ten zonal towns based on the size of population. Ten towns
47 were purposely selected considering potential risk of COVID-19, crowdedness and high mobility.
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52 At the time of data collection, the country declared state of emergency that was not strict and some
53 people were moving in towns while majority stay at home. To include both population staying at
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3 home and out of home, one-third of estimated sample size was allocated to out of home population
4 in towns and the rest two-thirds were allocated to population staying at home.

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6 In study setting, towns are structured to the smallest administrative unit, kebeles. Kebeles in the
7 towns were listed and two sample kebeles were selected randomly from each town. To select
8 individual respondents, data collectors went to the center of selected kebeles and pin pen to select
9 the direction to start first house. The next household was selected from next adjacent block in
10 parallel position and continued until sample size was fulfilled. Concerning out of home population,
11 every other person that data collectors met while moving to next block were selected and
12 interviewed and continued until sample size was fulfilled. Residing in the selected kebeles for at
13 least for six months and age above 18 years were considered as eligibility criteria.
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21 The questionnaire (Supplementary file1) was prepared by reviewing relevant literatures [7, 9, 10].
22 The tool consisted socio-demographic characteristics, exposure to COVID-19 messages and
23 knowledge, attitude and practice about COVID-19 and its prevention. Almost all questions had
24 “others” options and space to type other responses. The prepared tool was then shared with
25 members of Emergency Operation Center (EOC) of COVID-19 response at regional level and
26 Hawassa University Scientific Advisory Committee (SAC) to address face and content validity of
27 questionnaire and to understand that questions can capture required data. EOC consists experts
28 from regional health bureau, local and international partners working on COVID-response,
29 Hawassa Health Science College and Hawassa University. The questionnaire was initially
30 prepared in English, and then translated to Amharic parallelly by investigators that comprise
31 different public health experts and complemented for better version. The data collection tool was
32 then uploaded to SurveyCTO data collection system with security patterns. Training was given to
33 data collectors to have common understanding on data collection tools and process. Tool pretest
34 was done in urban settings not included in actual study to familiarize data collectors and to test if
35 there were any challenges during interview and modifications were made based on field feedbacks.
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37 Nine data collectors who had BSc degree and above and experience in data collection conducted
38 face-to-face interview keeping COVID-19 prevention measures like social distancing and wearing
39 mask. Field supervision and online monitoring was done daily to maintain data quality.
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53 Excel file downloaded from SurveyCTO server was exported to SPSS version 25 for data
54 management. Those respondents with no information about COVID-19 were excluded from main
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analysis. Descriptive statistics (like frequency, percentages, mean and standard deviation) were used to describe study participants and variables. Potential predictors of practice were determined using binary logistic regression. Independent variables with p-value of less than 0.20 during bivariate binary logistic regression analysis were included in multivariate binary logistic regression model. Finally, variables with p-value of less than 0.05 during multivariate binary logistic regression were considered to have statistically significant association and were reported with adjusted odds ratio (AOR) and 95%CI.

Ethical clearance was obtained from the ethical review committee of the regional health bureau (Reference number: £'6-19/6193). The study participants were informed about the purpose of the study and informed verbal consent was taken. Verbal consent was preferred and approved because of its popularity in the study setting and to minimize contamination during the pandemic. All collected data are kept confidential.

Patient and Public Involvement

Even though respondents were not involved in design, we disseminated the findings to stakeholders working on COVID-19 prevention and control and findings were also disseminated through local media.

Results

Overall 1239 respondents were included in the study, with response rate of 97.7%. The reason for non-response, mainly, was the fear of COVID-19 transmission during interview.

Socio-demographic characteristics of respondents

About half, 657 (53%), of respondents were females and about two thirds, 795 (64.2%), were married (Table 1).

Table 1: Socio-demographic characteristics of respondents

Variables	Category	Frequency	Percent
Sex	Male	582	47.0
	Female	657	53.0
Age	≤ 25	304	24.5

	26-30	214	17.3
	31-35	145	11.7
	36-40	148	11.9
	41-45	74	6.0
	46+	213	17.2
	I don't know	141	11.4
Marital status	Single	370	29.9
	Married	795	64.2
	Divorced	36	2.9
	Widowed	31	2.5
	Living separately	7	.6
Educational status	No formal education	126	10.2
	Primary (1-8)	249	20.1
	Secondary (9-12)	375	30.3
	Certificate and above	489	39.5
Occupation	Student	172	13.9
	Farmer	29	2.3
	Merchant	315	25.4
	Employee	340	27.4
	House wife	208	16.8
	Daily laborer	42	3.4
	Pensioner	30	2.4
	Private	52	4.2
	Other	51	4.1
Family size	≤ 5	858	69.2
	≥ 6	381	30.8
Religion	Orthodox	475	38.3
	Protestant	594	47.9
	Muslim	137	11.1
	Others	33	2.7

Knowledge about and attitude towards COVID-19

Seven knowledge questions about signs and symptoms, diagnosis of the disease, what to do if there is a suspect, drug to cure the disease, transmission mechanisms, prevention methods and most at risk groups were asked to determine level of knowledge. In summary, the mean score of knowledge was 52.3% (SD=18.9). Knowledge score was categorized using quartile and first quartile was labeled as poor and fourth quartile was labeled good while second and third quartiles were labeled as medium.

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3 Eleven different attitude statements about seriousness of disease, being at risk, possibility of
4 prevention and benefits of staying at health facilities were given to respondents and their agreement
5 to statements was measured using Likert's scale out of five, from strongly disagree to strongly
6 agree. The overall sum of attitude responses showed that mean score was 80.8% (SD=6.48). The
7 overall score was categorized to quartiles and first quartile was considered as negative attitude,
8 second and third quartiles were considered as neutral while fourth quartile was labeled as positive
9 attitude.

16 **Practice regarding COVID-19 prevention**

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18 Nearly nine from 10 (90.3%) and about eight from 10 (82.0%) of respondents reported that they
19 frequently wash hands with soap and/or use sanitizer and keep social distancing as means to
20 prevent COVID-19 respectively. Less than three fifths (57.8%) of respondents wore mask during
21 interview (Figure 1).
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23

24 [Insert Figure 1]

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28 Figure 1: Respondents measures to prevent COVID-19, SNNPR, 2020
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31 **Mask use**

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33 About two fifths, 521 (42.2%), were not using any kind of mask during interview. From those who
34 wore mask, 212 (29.7%) were using medical masks (any kind) while others were using non-
35 medical masks. Unavailability of mask was the major reason (58.6%) for not wearing mask and
36 other reasons were presented in Figure 2.
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40 [Insert Figure 2]

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43 Figure 2: Reasons for not wearing mask, SNNPR, 2020
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46 In summary, 605 (48.9%) were practicing social distancing, clean hands and wearing mask.

47 The practice was highest in Hawassa (88.1%) and lowest in Mizan (9.0%) (Figure 3).
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50 [Insert Figure 3]

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53 Figure 3: COVID-19 prevention practice among towns, SNNPR, 2020
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Factors associated with COVID-19 prevention practice

After running multivariate binary logistic regression, sex, educational status, family size and overall knowledge about COVID-19 were associated with practicing COVID-19 prevention measures (Table 2).

Females were 44% more likely to practice COVID-19 prevention measures as compared to male respondents (AOR at 95CI: 1.44 (1.08-1.92)). Those who attended primary, secondary and certificate and above education were 89%, 74% and 89% more likely to practice COVID-19 prevention measures respectively as compared to those who never attended education.

Respondents from larger (≥ 6 members) were 39% more likely to practice COVID-19 prevention measures as compared to those from lesser number of family (≤ 5 members) (AOR at 95%CI: 1.39 (1.04-1.84)).

Respondents who have medium and high level knowledge scores were 2.04 and 2.47 times more likely to practice COVID-19 prevention measures as compared to respondents with poor knowledge scores (AOR at 95%CI: 2.04 (1.51-2.75) and 2.47 (1.80-3.40) respectively).

Table 2: Binary and multivariate binary logistic regression

Variable	Category	Practice COVID-19 prevention		COR 95%CI	AOR 95%CI
		No	Yes		
Respondent status	Walking	213	192	1	
	At home	418	413	1.09 [0.86-1.39]	
Sex	Male	321	261	1	
	Female	310	344	1.36 [1.09-1.71]	1.44 [1.08-1.92]
Marital status	Single	191	179		
	Married	406	388	1.02 [0.79-1.31]	
	Others	34	38	1.19 [0.72-1.98]	
Educational status	No formal education	87	36	1	
	Primary (1-8)	127	122	2.32 [1.46-3.68]	1.89 [1.10-3.25]
	Secondary (9-12)	192	183	2.30 [1.49-3.57]	1.74 [1.02-2.98]
	Certificate and above	225	264	2.84 [1.85-4.35]	1.89 [1.07-3.35]
Occupation	Student	97	75	1	
	Farmer	25	3	0.15 [0.05-0.53]	
	Merchant	154	161	1.35 [0.93-1.97]	
	Employed	156	184	1.53 [1.06-2.21]	
	House wife	106	100	1.22 [0.81-1.83]	
	Daily laborer	32	10	0.40 [0.19-0.87]	
	Pensioner	15	15	1.29 [0.59-2.81]	

	Private	23	29	1.63 [0.87-3.05]	
	Other	23	28	1.57 [0.84-2.95]	
Age category	≤ 25	171	133	1	
	26-30	130	84	0.83 [0.58-1.19]	
	31-35	81	64	1.02 [0.68-1.51]	
	36-40	77	70	1.17 [0.79-1.74]	
	41-45	42	32	0.98 [0.59-1.64]	
	46+	122	89	0.94 [0.66-1.34]	
	I don't know	8	133	21.37 [10.11-45.19]	
Family size	≤ 5	452	404	1	
	≥ 6	179	201	1.25 [0.99-1.60]	1.39 [1.04-1.84]
Overall knowledge	Poor	377	213	1	
	Medium	142	196	2.44 [1.86-3.21]	2.04 [1.51-2.75]
	Good	112	196	3.09 [2.33-4.13]	2.47 [1.80-3.40]
Overall attitude	Negative attitude	168	168	1	
	Neutral	277	324	1.17 [0.89-1.53]	
	Positive attitude	186	113	0.61 [0.44-0.83]	

Discussion

This study was done with the objective of assessing practices related to COVID-19 prevention methods and its associated factors and the major finding was that only about half of respondents (48.9%) were practicing social distancing, clean hands and wearing mask. Sex, educational status, family size and overall knowledge about COVID-19 were associated with practicing COVID-19 prevention measures.

Nearly nine from 10 (90.3%) and about eight from 10 (82.0%) of respondents reported that they frequently wash hands with soap and/or use sanitizer and keep social distancing as means to prevent COVID-19, respectively. Less than three fifths (57.8%) of respondents wore mask during interview and in summary, only about half (48.9%) of respondents were practicing the three recommended methods (social distancing, clean hands and wearing mask). This result was low as compared to studies done in China [10] that showed practice of more than 95% and Saudi Arabia [9] that showed practice of 75% or more. This less practice as compared to other studies may be due less attention given by the community due to smaller (less than hundred) cases in the region.

Respondents who attended primary, secondary and certificate and above education were 89%, 74% and 89% more likely to practice COVID-19 prevention measures respectively as compared to those

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3 who never attended education. In addition, respondents who have medium and high level knowledge
4 scores were 2.04 and 2.47 times more likely to practice COVID-19 prevention measures as compared
5 to respondents with poor knowledge scores (AOR at 95%CI: 2.04 (1.51-2.75) and 2.47 (1.80-3.40)
6 respectively. The level of education was also reported as significant factor in the study conducted in
7 Sidama and Tigray regions of Ethiopia [11, 12]. Moreover, study done in South West Ethiopia [13],
8 Tigray [12] and Palestine [14] added that level of knowledge is significant factor of COVID-19
9 prevention. This indicated that level of awareness is important to prevent the disease.

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12 Females were 44% more likely to practice COVID-19 prevention measures as compared to male
13 respondents (AOR at 95CI: 1.44 (1.08-1.92)). Moreover, respondents from larger families (≥ 6
14 members) were 39% more likely to practice COVID-19 prevention measures as compared to those
15 from lesser number of family size (≤ 5 members) (AOR at 95%CI: 1.39 (1.04-1.84)). Similar finding
16 was reported by a study done in South West Ethiopia [13]. This may be due to familial responsibilities
17 to prevent the disease and opportunities to discuss about the disease.

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20 Even though this study was conducted early after introduction of the disease to the region, awareness
21 creation has been in place after early detection of the disease in China and declaration of the disease
22 as pandemic. Response activities have been led in organized way by ministry of health and regional
23 health bureaus since introduction of the disease to the country. As part of response, state of emergency
24 was declared and mask use was must in some cases like while using public transport and banks.
25 Although there were misconceptions about mask use, major reason for not using mask (58.6%) was its
26 unavailability, which lowered mask use and overall practice among participants. In addition to overall
27 low practice, there was huge variation of practice ranging from as low as 9% to 88.1%. Improving
28 access to mask and strengthening awareness creation on mask is crucial.

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31 Because of the urgency of information needed during early introduction of the pandemic to the
32 study area, the tool used was limited as we did not validate it using statistical tests. Even though
33 this study covered majority of towns in the region, this study was limited in addressing smaller
34 towns and rural areas that account for majority of regional population. In addition, though we
35 included respondents staying at home and those moving in towns, the sample size allocation may
36 not exactly represent respective population segment. Moreover, some of reported practices like
37 social distancing might have been knowledge and may not be actual practice of respondents due
38 to social desirability bias.

Conclusion

COVID-19 prevention practice was low as only about half of participants were practicing social distancing, clean hands and wear mask. Sex, educational status, family size and overall knowledge about COVID-19 were associated with practicing COVID-19 prevention measures. Although awareness creation has been implemented through different medias, it should be strengthened in different local languages. Concerned government bodies should strictly follow mask use in public gatherings.

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Contributorship statement

All authors contributed to conceptualization, design and data collection. ME developed SurveyCTO form and followed daily submitted data, managed data, wrote report and manuscript. AK, MH and ES facilitated financial support and managed overall survey. AA reviewed manuscript. All authors read and approved final version.

Competing interests

All authors have no competing interest and declare that this study is original article.

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Data sharing statement

All relevant data are within the manuscript. The datasets analyzed during the current study available from the corresponding author on reasonable request.

Supplementary file

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3 SNNPR COVID-19 tool (English)
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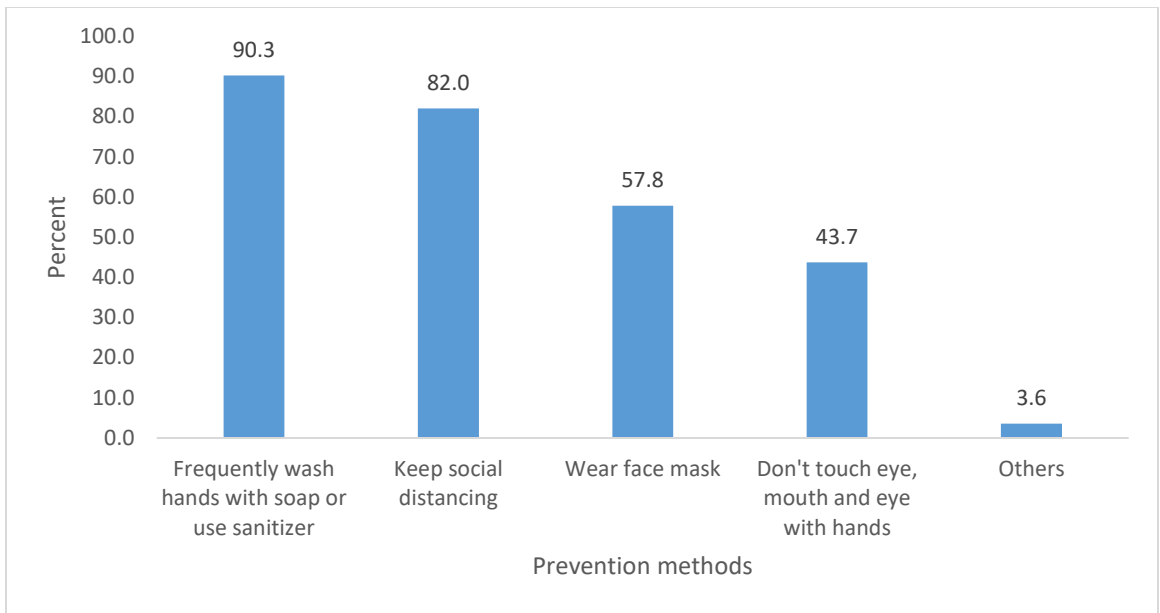
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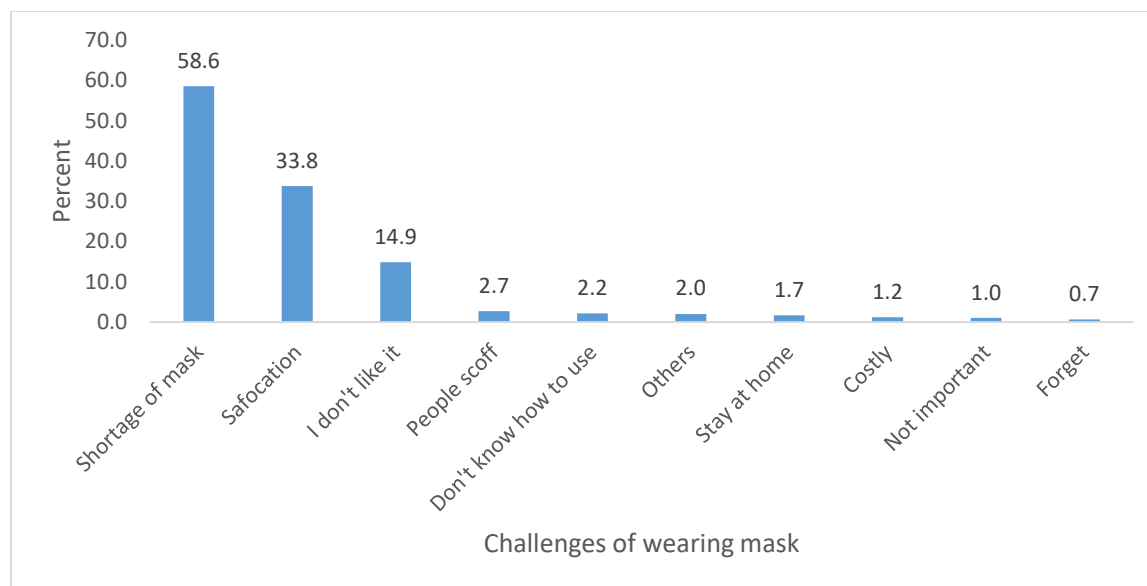
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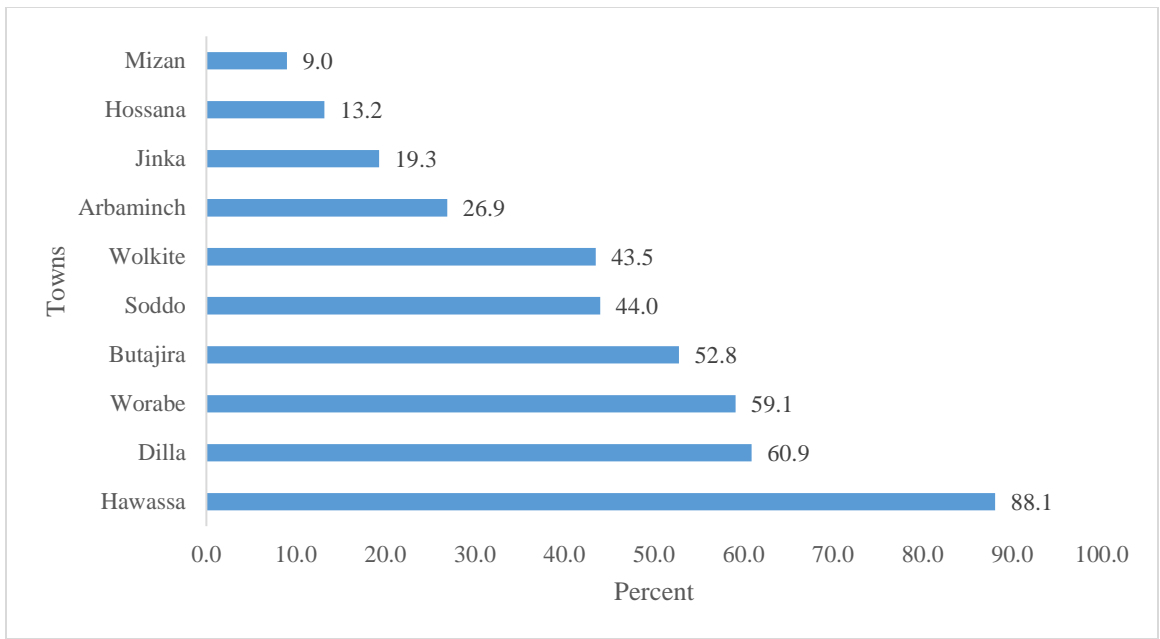


Others*- cover coughs and sneezes with elbow, wear glove, take hot drinks, keep outdoor clothes out, stopped eating raw food, pray, do sport, frequently check temperature and take vitamin C



*-Others: allergy, don't know where to get, hot environment, medical problem, negligence, not sure of quality, think it (itself) brings the disease

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Peer review only

Tool for assessment of knowledge, attitude and practice related to COVID-19 and its prevention in SNNPR, Ethiopia

Town _____

Interviewee status: 1. Walking 2. Staying at home

Good day! My name is _____. SNNNP regional health bureau is performing a lot of activities to prevent and control COVID-19 pandemic. Now, the bureau is conducting a research on knowledge and attitude of residents towards COVID-19 to help it in planning for the disease prevention and control and am here to collect the data for this study.

We don't collect personal identifiers and all your responses are confidential. Your participation is voluntary and you have right to leave at any time and also skip any question you don't want to answer.

Are you willing to participate in the interview?

1. Yes → Go to question 1
2. No → Finish the interview

	Question	Response	Skip
	Knowledge		
1.	Have you heard about COVID-19?	1. Yes 2. No	2 → 38
2.	If yes, what is/are your sources of information? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Radio 2. Television 3. Social media 4. Ethio telecom 5. Leaflet 6. Health workers 7. Community meetings 8. Friends 9. Family members 10. School 11. Other (Specify) _____	
3.	Do you know signs and symptoms of COVID-19?	1. Yes 2. No	2 → 5
4.	If yes, what are signs and symptoms of COVID-19? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Fever 2. Cough 3. Difficulties in breathing 4. Tiredness 5. Chest pain	

		6. Other (Specify) _____	
5.	How we can confirm that a person has COVID-19?	1. By signs and symptoms 2. By lab test 3. Impossible 4. Other (Specify) _____	
6.	What should be done if there is a suspect of COVID-19? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Report to health facilities 2. Isolate at home 3. Give traditional medicine (spices) 4. Take to holy water 5. Take to religious organization 6. Give anointing oil 7. Other (Specify) _____	
7.	I pray not to happen, but what would you do if have signs and symptoms of COVID-19? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Go to health facilities 2. Isolate myself at home 3. Take traditional medicine (spices) 4. Go to holy water 5. Go to religious organization 6. Take anointing oil 7. Other (Specify) _____	
8.	Is there drug to cure COVID-19?	1. Yes 2. No	2 → 10
9.	If yes, what is the drug to cure COVID-19?	1. Modern medicine (any list) 2. Traditional medicine (spices) 3. Holy water 4. Taking to religious organization (praying) 5. Anointing oil 6. Other (Specify) _____	
10.	Is COVID-19 transmissible person to person?	1. Yes 2. No	2 → 12
11.	If yes, how it is transmitted from person to person? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Touching eye, mouth and/or nose with unclean hands 2. Being within 2 meter distance with infected person 3. Other (Specify) _____	

12.	What one should do to prevent COVID-19 transmission? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	<ol style="list-style-type: none"> 1. Keeping social distancing 2. Washing hands with soap or using sanitizer 3. Not touching eye, nose and/or mouth with unclean hands 4. Wearing face mask 5. Other (Specify) _____ 	
13.	What are groups of people that are most at risk of COVID-19? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	<ol style="list-style-type: none"> 1. Old ages 2. People with underlying diseases like diabetes, cancer etc. 3. Highly exposed groups (like health workers, caregivers, mobile groups) 4. Other (Specify) _____ 	
	Attitude		
	Now, I'll read some statements about COVID-19. Tell me your degree of agreement to the statements by saying strongly agree, agree, neutral, disagree or strongly disagree.		
14.	I think COVID-19 is serious disease	<ol style="list-style-type: none"> 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree 	
15.	I think that I may get infected with COVID-19	<ol style="list-style-type: none"> 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree 	
16.	I think that my family member/s may get infected with COVID-19	<ol style="list-style-type: none"> 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree 	
17.	I fear to go to crowded places	<ol style="list-style-type: none"> 1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree 	
18.	If I take care, I think I can prevent COVID-19	<ol style="list-style-type: none"> 1. Strongly agree 	

		2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
19.	If people take care, I think it is possible to prevent COVID-19	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
20.	I don't believe that COVID-19 patient can be cured if they get care from health facilities	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
21.	I think there is no benefit of taking a person with COVID-19 symptoms and signs to health facility	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
22.	I think we can prevent COVID-19 if we keep our hands clean	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
23.	I think corona cases should stay at COVID-19 treatment center	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
24.	If I get corona, I think I would stay at COVID-19 treatment center	1. Strongly agree 2. Agree 3. Neutral 4. Disagree 5. Strongly disagree	
25.	Is your view towards COVID-19 changed over time since you first heard about it?	1. Yes 2. No	2 → 27
26.	If yes, what is/are your reason/s for changing views?	_____	
	Media preferences		
27.	What is/are your common source of information? (MULTIPLE RESPONSES, DO NOT READ OPTIONS)	1. Radio 2. Television 3. Social media 4. Ethio telecom	

		<ol style="list-style-type: none"> 5. Leaflet 6. Health workers 7. Community meetings 8. Friends 9. Family members 10. School 11. Other (Specify) _____ 	
28.	<p>If you want to know more about COVID-19, what will be your choice of information source? (SELECT ONE, DO NOT READ OPTIONS)</p>	<ol style="list-style-type: none"> 1. Radio 2. Television 3. Social media 4. Ethio telecom 5. Leaflet 6. Health workers 7. Community meetings 8. Friends 9. Family members 10. School 11. Other (Specify) _____ 	
	Practice		
29.	<p>From health messages delivered to prevent and control COVID-19, what prevention method do you practice? (MULTIPLE RESPONSE, DONOT READ OPTIONS, FILL MASK USE ONLY BY OBSERVATION)</p>	<ol style="list-style-type: none"> 1. Social distancing 2. Usually wash had with soap or use sanitizer 3. Do not touch eye, mouth and nose with dirty hands 4. Wear face mask 5. Drink hot drinks 6. Keep hygiene and sanitation 7. Take spices 8. Do sport 9. Others (Specify) _____ 	
30.	<p>Type of mask (fill by observation)</p>	<ol style="list-style-type: none"> 1. Medical (N95, surgical) 2. Non-medical 	
31.	<p>If mask is not medical, how often you wash it?</p>	<ol style="list-style-type: none"> 1. Never cleaned 2. Use and throw 3. Twice a day 4. Daily 5. Every other day 6. Every third day 7. Others (Specify) _____ 	
32.	<p>If mask is not medical, how do you wash it?</p>	<ol style="list-style-type: none"> 1. Never washed 2. Using water 3. Using water and soap 	

		4. Others (Specify)	
33.	What are challenges you face to wash your hands with soap for at least 20 seconds or clean hands with sanitizer frequently?	1. No problem 2. Shortage of water 3. Shortage of soap 4. Shortage of sanitizer 5. Others (Specify)	
34.	What are challenges for you to keep social distancing?	1. No problem 2. Nature of job 3. People discourage 4. Difficult because of culture 5. Others (Specify)	
35.	What are challenges for you to stay at home?	1. No problem 2. Nature of job 3. Social life 4. Medical appointment 5. Others (Specify)	
36.	What are challenges you face to wear mask?	1. No problem 2. No mask 3. Suffocation 4. Dislike it 5. People scoff 6. Costly 7. Others (Specify)	
37.	What are challenges you face not to handshake?	1. No problem 2. People oppress me 3. Frequently forget 4. I don't think there is problem with handshaking 5. It is difficult since it is God's goodwill 6. Others (Specify)	
	Socio-demographic data		
38.	Age (If doesn't know, type 999)	_____	
39.	Sex	1. Male 2. Female	
40.	Marital status	1. Single 2. Married 3. Divorced 4. Widowed 5. Living separately	
41.	Educational status	1. Can't read and write	

		<ol style="list-style-type: none"> 2. Read and write only 3. Primary (1-8) 4. Secondary (9-12) 5. Certificate 6. Diploma and above 	
42.	Occupation	<ol style="list-style-type: none"> 1. Student 2. Farmer 3. Merchant 4. Employee 5. Housewife 6. Other (Specify) _____ 	
43.	Living condition	<ol style="list-style-type: none"> 1. Private 2. Rental 3. Cohabitant 4. Other (Specify) _____ 	
44.	Number of rooms		
45.	Total family size		
46.	Monthly income		
47.	Religion	<ol style="list-style-type: none"> 1. Orthodox 2. Protestant 3. Muslim 4. Catholic 5. Other (Specify) _____ 	

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

	Item No	Recommendation	Assessment result**
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	√ (Page 1)
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	√ (Page 1)
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	√ (Page 3)
Objectives	3	State specific objectives, including any prespecified hypotheses	√ (Page 3)
Methods			
Study design	4	Present key elements of study design early in the paper	√ (Page 3)
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	√ (Page 3)
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	√ (Page 4)
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	√ (Page 4)
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	√ (Page 3)
Bias	9	Describe any efforts to address potential sources of bias	√ (Page 4)
Study size	10	Explain how the study size was arrived at	√ (Page 3)
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	√ (Page 4)
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	√ (Page 4)
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	NA
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
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	√ (Page 5)
		(b) Give reasons for non-participation at each stage	√ (Page 5)
		(c) Consider use of a flow diagram	X
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	√ (Page 5)
		(b) Indicate number of participants with missing data for each variable of interest	√ (Page 5)
Outcome data	15*	Report numbers of outcome events or summary measures	√ (Page 7)

1			
2	Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-
3			adjusted estimates and their precision (eg, 95% confidence interval).
4			Make clear which confounders were adjusted for and why they were
5			included
6			
7			(b) Report category boundaries when continuous variables were
8			categorized
9			
10			(c) If relevant, consider translating estimates of relative risk into
11			absolute risk for a meaningful time period
12	Other analyses	17	Report other analyses done—eg analyses of subgroups and
13			interactions, and sensitivity analyses
14			
15	Discussion		
16	Key results	18	Summarise key results with reference to study objectives
17			
18	Limitations	19	Discuss limitations of the study, taking into account sources of
19			potential bias or imprecision. Discuss both direction and magnitude
20			of any potential bias
21	Interpretation	20	Give a cautious overall interpretation of results considering
22			objectives, limitations, multiplicity of analyses, results from similar
23			studies, and other relevant evidence
24			
25	Generalisability	21	Discuss the generalisability (external validity) of the study results
26			
27	Other information		
28	Funding	22	Give the source of funding and the role of the funders for the
29			present study and, if applicable, for the original study on which the
30			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.