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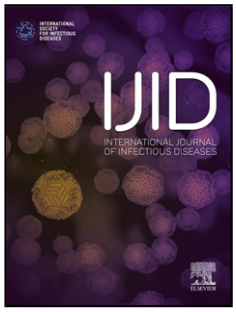

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Evidence for important COVID-19 community transmission in Somalia using a clinical case definition

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Study highlights

- Current COVID-19 surveillance strategies, as recommended by the World Health Organization (WHO), may be underestimating the real burden of the disease.
- A clinical definition taking into account anosmia as a diagnostic symptom increases the sensitivity of the WHO clinical definition.
- The proposed clinical definition can complement existing COVID-19 surveillance measures particularly in resource-poor settings where testing and contact tracing capacities are limited.

One reason underpinning the global magnitude of the novel coronavirus disease (COVID-19) is its transmissibility by asymptomatic or pre-symptomatic persons.[1] Thus, early detection and isolation of infected individuals is crucial to contain the ongoing pandemic. Currently, the World Health Organization (WHO) recommends surveillance by screening for acute respiratory illness with/without fever, and/or a recent contact with COVID-infected individuals or communities.[2] We applied the WHO COVID-19 case definition in Somalia and suggest ways to improve its performance.

In March 2020, researchers at the University of Antwerp (Belgium) launched the International Citizen Project COVID-19 (ICPCovid) which uses web-based surveys to investigate the impact of COVID-19 and associated restrictions on residents of several countries.[3] The survey tool was translated to the Somali language and locally disseminated via social media platforms. Participants in Somalia were consecutively recruited using a snow-ball approach from April 23rd to May 7th, 2020; responses were submitted using mobile phones. The questionnaire included questions about the presence or absence of flu-like symptoms during the last 14 days, and the specific symptom(s) experienced by the respondents. Participants were asked whether they had been tested for COVID-19 within the last month (tests performed by the government using nucleic acid amplification techniques), and eventual test results. The protocol was approved by the University of Antwerp Ethics Committee and Mogadishu University's Institutional Review Board. Informed e-consent (checkbox) was required before submitting responses.

Overall, 4124 entries were analysed. Of the 182 participants (65.9% male, mean age: 22±4) with available test results, 49 (26.9%) had tested positive for COVID-19. 16 (32.7%) of the 49 confirmed COVID-19 cases reported no flu-like symptoms. Fever and anosmia were the most frequent symptoms, being reported respectively by 45/182 (24.7%) and 23/182 (14.3%) of participants with test results (Table 1). Applying the WHO COVID-19 diagnostic criteria with the assumption that all tested individuals were contacts of a confirmed or probable case, 25 (13.7%) were classified as suspected COVID-19 cases (presence of respiratory symptoms with/without fever)[2]; sensitivity: 32.7% [95% CI 20-48], specificity: 88.7% [82-94]. Adding anosmia as diagnostic criterion for COVID-19, alongside other respiratory symptoms, increased the sensitivity of the WHO definition to 38.8% [25-54] (Table 1). Based on these findings, we propose the following clinical criteria for COVID-19 suspicion: Any individual presenting at least one major sign (fever and/or anosmia) with one or more respiratory symptoms (cough, shortness of breath, sore throat, coryza), with an epidemiological context of COVID-19 transmission. Upon applying these criteria on all 4124 respondents and making abstraction of any previous COVID-19 contacts, the participants' self-reported symptoms predicted 334 (8.1%) suspected cases as opposed to 259 (6.3%) detected by the WHO definition ($p<0.0001$).

These results strongly suggest a high level of community transmission of COVID-19 in Somalia, which is most likely under-reported using current approaches. This implies that a significant portion of infected Somalis go undetected and unwittingly serve as asymptomatic spreaders. We demonstrate that the inclusion of anosmia into a case definition for COVID-19 may result in fewer false negatives, thus ensuring that a larger number of cases are quarantined

until they no longer pose a public health threat. It appears that the onset of anosmia precedes the full-blown clinical disease,[4] thereby enabling the early detection of infected persons. Several studies have shown that hyposmia/anosmia is very prevalent in COVID-19 patients.[5,6] These observations are supported by two meta-analyses[7,8] which further highlighted that validated methods to evaluate smell and taste in COVID-19 patients are more sensitive than subjective self-reporting. Therefore, objectively assessing these symptoms could prove useful in screening for COVID-19 even in primary healthcare settings. Notably, hyposmia/anosmia is seldom reported spontaneously by the patients themselves and should be intentionally investigated during history taking, especially during an ongoing COVID-19 outbreak.

The major weaknesses in our study include: the web-based, anonymous data collection technique with no possibility of verifying the information for accuracy; a small sample size; no information on the ear-nose-throat medical history of respondents which may affect their sense of smell; and a possible selection bias of respondents when assessing the performance of the screening tools (those who had been tested were most likely symptomatic or were contacts of an index case, and may not be representative of the general population). By June 16th 2020, 2642 COVID-19 cases and 88 deaths had officially been reported in Somalia.[9] Our study suggests that these numbers seriously underestimate the COVID-19 disease burden in Somalia. Applying the new definition via online surveys could provide important information about the actual disease spread. The proposed case definition can complement existing COVID-19 surveillance measures particularly in resource-poor settings where testing and contact tracing capacities are limited. As many countries are gradually tapering off the confinement measures, this clinical definition adds to various COVID-19 detection strategies that are being instituted in different communities to rapidly identify suspected cases, thus preventing a possible resurgence.[10]

Author Statements

Conflict of interest

The authors declare no conflicts of interest

The authors declare that they have no conflicts of interest.

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Ethical Approval

This study was approved by the Ethics Committees of the University of Antwerp (Belgium) and the Mogadishu University (Somalia)

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Table 1. Reported COVID-19 symptoms and performance in the screening of suspected cases in Somalia

	All respondents (N=4124)	**Tested respondents (n=182)**	**COVID test positive (n=49)**	**COVID test negative (n=133)**	**Odd's Ratio [95% CI]**	**Sensitivity [95% CI]**	**Specificity [95% CI]**	**Positive predictive value [95% CI]**	**Negative predictive value [95% CI]**
Prevalence of individual symptoms									
Fever	360 (8.7%)	45 (24.7%)	29 (59.2%)	16 (12.0%)	10.4 [4.85-23.1]	59.2% [44-73]	88.0% [81-93]	64.4% [49-78]	85.4% [78-91]
Anosmia	278 (6.7%)	26 (14.3%)	15 (30.6%)	11 (8.3%)	4.82 [2.03-11.8]	30.6% [18-45]	91.7% [86-96]	57.7% [37-77]	78.2% [71-84]
Dry cough	155 (3.8%)	17 (9.3%)	13 (26.5%)	4 (3.1%)	11.2 [3.65-43.0]	26.5% [15-41]	97.0% [92-99]	76.5% [50-93]	78.2% [71-84]
Productive cough	146 (3.5%)	7 (3.9%)	3 (6.1%)	4 (3.0%)	2.12 [0.38-10.5]	6.1% [1-17]	97.0% [92-99]	42.9% [10-82]	73.7% [67-80]
Shortness of breath	86 (2.1%)	11 (6.0%)	6 (12.2%)	5 (3.8%)	3.52 [0.99-13.2]	12.2% [5-25]	96.2% [91-99]	54.5% [23-83]	74.9% [68-81]
Sore throat	216 (5.2%)	16 (8.8%)	8 (16.3%)	8 (6.0%)	3.03 [1.03-8.87]	16.3% [7-30]	94.0% [88-97]	50.0% [25-75]	75.3% [68-82]
Coryza	300 (7.3%)	11 (6.0%)	7 (14.3%)	4 (3.0%)	5.23 [1.47-21.6]	14.3% [6-27]	97.0% [92-99]	63.6% [31-89]	75.4% [68-82]
Headaches	442 (10.7%)	24 (13.2%)	14 (28.6%)	10 (7.5%)	4.85 [1.98-12.3]	28.6% [17-43]	92.5% [87-96]	58.3% [37-78]	77.8% [71-84]
Fatigue/weakness	254 (6.2%)	16 (8.8%)	9 (18.4%)	7 (5.3%)	3.99 [1.38-12.1]	18.4% [9-32]	94.7% [89-98]	56.3% [30-80]	75.9% [69-82]
Ageusia	230 (5.6%)	21 (11.5%)	11 (22.4%)	10 (7.5%)	3.52 [1.37-9.20]	22.4% [12-37]	92.5% [87-96]	52.4% [30-74]	76.4% [69-83]
Body pains	305 (7.4%)	11 (6.0%)	9 (18.4%)	2 (1.5%)	13.7 [3.29-102]	18.4% [9-32]	98.5% [95-100]	81.8% [48-98]	76.6% [70-83]
Nausea	119 (2.9%)	9 (5.0%)	7 (14.3%)	2 (1.5%)	10.2 [2.29-78.0]	14.3% [6-27]	98.5% [95-100]	77.8% [40-97]	75.7% [69-82]
Diarrhea	70 (1.7%)	6 (3.3%)	4 (8.2%)	2 (1.5%)	5.56 [0.99-46.2]	8.2% [2-20]	98.5% [95-100]	66.7% [22-96]	74.4% [67-81]
Prevalence of suspected cases based on clinical definitions (assuming previous contacts in all cases)									
WHO[a]	482 (11.7%)	31 (17.0%)	16 (32.7%)	15 (11.3%)	3.78 [1.68-8.57]	32.7% [20-48]	88.7% [82-94]	51.6% [33-70]	78.1% [71-84]
WHO + anosmia[b]	545 (13.2%)	39 (21.4%)	19 (38.8%)	20 (15.0%)	3.55 [1.67-7.57]	38.8% [25-54]	85.0% [78-91]	48.7% [32-65]	79.0% [71-85]
Prevalence of suspected cases based on clinical definitions (ignoring previous contacts)									
WHO[c]	259 (6.3%)	22 (12.1%)	14 (28.6%)	8 (6.0%)	6.12 [2.40-16.7]	28.6% [17-43]	94.0% [88-97]	63.6% [41-83]	78.1% [71-84]
WHO + anosmia[d]	290 (7.0%)	27 (14.8%)	16 (32.7%)	11 (8.3%)	5.29 [2.25-12.9]	32.7% [20-48]	91.7% [86-96]	59.3% [39-78]	78.7% [71-85]
New definition[e]	334 (8.1%)	24 (13.2%)	14 (28.6%)	10 (7.5%)	4.85 [1.98-12.3]	28.6% [17-43]	92.5% [87-96]	58.3% [37-78]	77.8% [71-84]

[a]WHO definition (assuming contacts)[2]: Individuals presenting at least one respiratory symptom (dry cough, productive cough, shortness of breath, sore throat, coryza), with or without fever

[b]WHO + anosmia definition (assuming contacts): Individuals presenting at least one respiratory symptom (dry cough, productive cough, shortness of breath, sore throat, coryza) or anosmia, with or without fever

[c]WHO definition (ignoring contacts)[2]: Individuals presenting fever, AND at least one respiratory symptom (dry cough, productive cough, shortness of breath, sore throat, coryza)

[d]WHO + anosmia definition (ignoring contacts): Individuals presenting fever, AND at least one respiratory symptom (dry cough, productive cough, shortness of breath, sore throat, coryza) or anosmia

[e]New definition: Individuals presenting fever and/or anosmia, with at least one respiratory symptom (dry cough, productive cough, shortness of breath, sore throat, coryza)