

# The effectiveness of visual triaging and testing of suspected COVID-19 cases in primary care setting in Saudi Arabia

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## ABSTRACT

**Introduction:** Asymptomatic individuals could be a source of spreading the infection, especially in their households. Triaging and testing an individual for coronavirus disease (COVID-19) infection rely on the criteria included in the adopted triaging instrument, and adopted case definition of a suspected case. They both may need to be reviewed and modified to make them more effective in making the right decision. **Methods:** A cross-sectional study was used to find out the effectiveness of triaging instrument and the case definition used in the fever clinic (FC) in one of our primary care centers. The data of 630 randomly selected participants who were tested in our center between April 12 and August 12 2020 were analyzed. **Results:** About 36.8% of the 630 tested participants were positive for COVID-19. Symptomatic patients were 3.93 (95% CI; 2.58, 5.98;  $P < 0.001$ ) times more likely to test positive than asymptomatic ones. The participants with a history of contact with a COVID-19 confirmed case were 1.47 (95% CI; 1.03, 2.10;  $P = 0.032$ ) times more likely to test positive compared to those without such history. Symptomatic with and without history of contact were 8.40 (95% CI; 3.23, 21.86;  $P < 0.001$ ) and 4.91 (95% CI; 1.84, 13.09;  $P < 0.001$ ) times more likely to test positive compared to asymptomatic contact, respectively. Moreover, patients with comorbidity were also 1.85 (95% CI; 1.31, 2.60;  $P < 0.001$ ) times more likely to test positive than healthy ones. The mean of the number of the households, and the mean of the number of households tested positive significantly exceeded the means of those tested negative by 1.03 (95% CI; 0.48, 1.57;  $P < 0.001$ ), and 0.98 (95% CI; 0.68, 1.28;  $P < 0.001$ ), respectively. From the studied triaging items only symptoms, comorbidities, and the number of households tested positive were independently associated with testing positive. Moreover, from studied symptoms, only fever, cough, myalgia, and loss of taste and smell were independently associated with testing positive. Finally, from the studied comorbidities, only diabetes mellitus was independently associated with testing positive. **Conclusion:** At the time of outbreak and pandemic, people get worried and need to be reassured, and contacts would then seek testing. However, resources including manpower, material, and money need to be protected and used wisely. Thus, the adoption of an evidence-based updated testing policy is crucially needed. Furthermore, early identification of the potential sources of the infection is also crucially needed to control the spreading of the infection.

**Keywords:** COVID-19, suspected, testing, visual triage

## Introduction

Since first reported in December 2019, cases of coronavirus disease (COVID-19) have escalated dramatically, prompting the World Health Organization (WHO) to declare the pandemic in

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March 2020.<sup>[1]</sup> Globally, by the start of September 2020, a total of as high as 25 million persons get infected and more than 800,000 patients passed away.<sup>[2]</sup> Later on, the WHO declared that symptoms of COVID-19 included fever, dry cough, fatigue, shortness of breath (SOB), sore throat, headache, myalgia or arthralgia, chills, nausea or vomiting, nasal congestion, diarrhea, hemoptysis, and conjunctiva congestion.<sup>[3-5]</sup> Further later, the WHO added loss of smell or taste as well as rash and skin discolorations of fingers and toes as symptoms of COVID-19.<sup>[6]</sup> Asymptomatic persons were demarcated as those who lacked COVID-19 symptoms, but for whom the SARS-CoV-2 was detected on real-time polymerase reverse transcription chain reaction (RT-PCR) test.<sup>[7]</sup> Furthermore, asymptomatic individuals who develop symptoms after testing positive were defined as presymptomatic.<sup>[7,8]</sup> An overall estimate of the mean and median incubation period for SARS-CoV-2 is 6 days, and it ranges between 2 and 14 days.<sup>[9,10]</sup> Corrected infectivity period was suggested to be more or less around 5 days before the onset of symptoms.<sup>[11]</sup> Decisions on how far back to trace contacts and when to test asymptomatic contacts rely on a comprehensive understanding of asymptomatic transmission.<sup>[8]</sup>

Studying the changes in the virus and its communicability is central to know about the most effective ways to contain its spread. Efforts to curtail the COVID-19 virus rely on successful contact tracing to break further transmission.<sup>[7]</sup> The main mode of transmission of COVID-19 is through respiratory droplet and indirect contact of fomites.<sup>[4,5,12]</sup> Asymptomatic people are contagious, especially during the late presymptomatic phase.<sup>[4,13,14]</sup> The reproduction number (R<sub>0</sub>), the expected number of cases directly generated by one case in a susceptible population, is valuable in assessing the spread of the outbreak where all individuals are.<sup>[15,16]</sup> Estimates suggest a basic R<sub>0</sub> of 2–3 or even higher in the early stages of an outbreak, it reached 8 in some countries.<sup>[17]</sup> In Saudi Arabia, R<sub>0</sub> started at 4 before being decreased to fall in the range between 2 and 3, and later towards 1.

Exploring and studying the severe acute respiratory syndrome (SARS) pandemic that occurred in 2003 revealed that above 70% of transmission took place because of super-spreading events.<sup>[18]</sup> Super-spreaders are people who transmit the infections excessively resulting in an expected number of cases.<sup>[19]</sup> It was proposed that similar events may have caused the fast-spreading of SARS-CoV-2.<sup>[10]</sup> As part of their mitigation strategies, many countries have adopted stringent yet blunt community quarantines or “lockdowns” of whole cities and provinces.<sup>[20]</sup> At some point, the Centers for Disease Control and Prevention (CDC) recommended testing of asymptomatic contacts only when they have comorbidities that put them at high risk of developing COVID-19 complications.<sup>[21]</sup> However, the CDC, later on, supported the testing of all asymptomatic with documented contact with SARS-CoV-2 infected persons.<sup>[21]</sup> Viral load is the highest on the day of symptom onset (day 0) and declines thereafter.<sup>[8]</sup> Infectivity in cell culture is the best method to decide if a person is infectious or not. Viral growth occurs from specimens taken from asymptomatic and pre-symptomatic

individuals.<sup>[22]</sup> In the absence of viral culture data, viral load or cycle threshold (Ct) values derived from RT-PCR data have been used as a proxy for the likelihood of transmission.<sup>[7]</sup> The Ct value is inversely proportional to the amount of target viral load in the sample.<sup>[7]</sup> In a study of 90 patients with COVID-19 infection, Bullard and colleagues found that the virus was only successfully isolated when the Ct value was below 24.<sup>[23]</sup>

About 44% of the COVID-19 positive patients reported no symptoms from diagnosis to discharge in Brunei.<sup>[24]</sup> However, household attack rates (ARs) among symptomatic cases were higher than asymptomatic.<sup>[24]</sup> Spouses of positive cases had the highest adjusted relative risk (RR) of getting the infection, and children of positive cases had the lowest.<sup>[24]</sup> The first large-scale reporting of asymptomatic COVID-19 infection occurred on the Diamond Princess Cruise, where an estimated 17.9% of the cases on board were asymptomatic.<sup>[25]</sup> Furthermore, 53% of confirmed COVID-19 cases were asymptomatic when tested.<sup>[26]</sup> Furthermore, asymptomatic cases exposed during travel later transmit the infection to their households or other close contacts.<sup>[27-33]</sup> Asymptomatic parents also could transmit COVID-19 infection to their children resulting in a family cluster.<sup>[34]</sup> In Singapore, the study of seven clusters resulted in the identification of 10 COVID-19 asymptomatic cases following exposure during the late pre-symptomatic phase in the index case.<sup>[35]</sup> In China, contact tracing identified 24 asymptomatic COVID-19 infections, one of them transmitted infection to three relatives, one of them developed severe pneumonia.<sup>[13]</sup> In Japan, 4% of 52 COVID-19 positive cases tested before obstetric appointments were asymptomatic.<sup>[36]</sup> In Malaysia, two asymptomatic cases were identified from a cluster of cases in a Mosque in Kuala Lumpur.<sup>[37]</sup>

## Methods

A cross-section design was used to accomplish this study. The study population included all individuals tested for COVID-19 in the Fever Clinic (FC) in Wazarat Health Center (WHC) between April and August 2020. The clinic started many years back as a flu clinic to control and prevent influenza and Middle East respiratory syndrome (MERS-Co-V) before being expanded to include the COVID-19. The WHC-FC is planned to have a vital role in controlling acute respiratory infections (ARIs) of public health concern, and related epidemics and pandemics. WHC is the largest and main center under the Family and Community Medicine department (FCM) in Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia. The center serves the militaries, employees, and their dependents. Six hundred and thirty participants were selected by simple random sampling from the list of all patients tested in WHC between April 12 and August 12, 2020, obtained prior to the commencement of the study. Pertained data were retrieved using the reporting data productivity sheets and medical records of the patients. For each tested case, we collected and recorded the sociodemographic, clinical, diagnostic, and occupational data, besides baseline health conditions, results of the tests, and history of exposures

using a standardized investigation form. Data collected from the 630 participants were analyzed using a comprehensive analytical package – IBM SPSS statistic 22. The analysis provided descriptive information about the studied participants, besides estimation of the rate of positive tests among the target population. The analysis also examined the univariate and multivariate relations between testing positive for COVID-19 and items used to triage and consequently to influence the decision about the need to test for COVID-19. Statistical significances of the differences between people who tested positive and those tested negative across different continuous variables were tested using t-independent test. Moreover, statistical significance of the differences across different categorical variables was tested using Pearson's Chi-squared test. Crude odds ratios (OR) and adjusted ones (a OR) and their 95% confidence intervals (95% CI) were calculated to estimate the magnitude of association. Binary logistic regression was used to assess the effect of triaging variables and co-variables on the probability of testing positive among triaged and assessed participants. We also calculated the proportions of confirmed infections among all traced households and referred to these proportions as data-based secondary attack rate (SAR) estimates, although they may not necessarily be secondary. Ethical approval was obtained from the IRB-PSMMC, and FCM administration before starting the study. Strict confidentiality was applied to all collected information for all participants. These data were collected as part of a continuing public health response required by the Saudi ministry of health (MOH); thus, the requirement for written informed consent was waived.

### Case definition and testing for COVID-19

A suspected COVID-19 case was defined as an individual who presented with sudden onset of at least one of the following: Fever (measured or by history), cough, or SOB or those presented with sudden onset of at least one of the following: headache, sore throat, rhinorrhea, nausea, diarrhea, or loss of smell or taste AND in the 14 days before symptoms onset, at least either had contact with a confirmed COVID-19 case or working in or attended a health care facility where patients with confirmed COVID-19 were admitted. A confirmed case was defined as a suspected case or screened asymptomatic individual with detection of SARS-CoV-2 nucleic acid by real-time RT-PCR using nasopharyngeal specimens. Suspected cases are triaged using a visual triage checklist which gives a weight of three points to epidemiological link including contact with a confirmed case of COVID-19, working in a health care facility, and/or history of travel abroad in the past 14 days and four points for each of the three main symptoms (fever or history of fever, new or worsening cough, and new or worsening SOB). In addition, a weight of 1 point is given for other ARIs symptoms including headache, sore throat, and/or rhinorrhea. Similarly, a weight of 1 point is given for gastrointestinal symptoms (GIT) including nausea, vomiting, and/or diarrhea. Furthermore, weight of 1 point is given for conditions like chronic renal failure, coronary artery disease or heart failure, or immunocompromised patient.

A patient with a score of  $\geq 4$ , would be asked to perform hand hygiene, wear a surgical mask, and be directed to the FC to be assessed. COVID-19 testing is supposed to be performed according to case definitions. However, clinicians are encouraged to use their judgment to determine if a patient should be tested for COVID-19 based on risk factors and the presence of other COVID-19 symptoms. They are also encouraged to be alert to the possibility of atypical presentations in patients who are immunocompromised, elderly, and people with severe comorbidities and to consider for patients who may present with GIT symptoms such as diarrhea and nausea before developing fever and lower respiratory tract symptoms.

### Epidemiological investigation and contact tracing

Our center is using the Health Electronic Surveillance Network (HESN) to report suspected cases of COVID-19 to the Saudi General Directorate of Communicable Diseases Control. Regarding contact tracing, a household contact is defined as anyone living in the household with a confirmed COVID-19 case from 2 days before the onset of symptoms (from 2 days before the testing in asymptomatic) to 14 days after the onset of symptoms (to 14 days after testing asymptomatic) or until the case is reported as recovered, whichever is earlier. The observation period of household contacts is 14 days after the last exposure. Longer observation may be required if more than one generation of transmission is identified like in household contact, and the follow-up period is reset to 14 days after the last exposure to the new case. In a close contact group, a case with symptom onset 1 day or less from the earliest onset day in the close contact group was considered a primary case; otherwise, this case was considered a secondary case. For asymptomatic infections, the primary or secondary case status was determined by the collection dates of the earliest SARS-CoV-2 positive specimens. We defined household contacts as individuals who were added as family members on the hospital system regardless of the residential address, and regardless of the relationship.

### Results

Males represented 60.5% of the participants, and the mean age of the participants was  $33.20 \pm 17.63$  years. Whereas Saudi citizens represented 97.1% of the participants, nonhealth care workers (non-HCWs) and their dependents represented 83.3% of the participants. Furthermore, whereas 29.5% were fathers, and only 21.3% were sons, 17.1% were mothers, and 17.3% were daughters. Whereas 67.1% of the participants reported having contact with confirmed COVID-19 cases, 69.8% reported having symptoms. On the other hand, whereas 44.4% reported both symptoms and contact, 7.4% were tested for other reasons including travel, pre-admission, pre-procedure, or work requirement. Only 10.8% of the participants had chronic conditions. SARS-CoV-2 was detected among 36.8% of the 630 tested participants. The average number of households per participant was about five and while on average, about two of them were tested, one of them was positive for COVID-19.

Whereas 57.8% were quarantined at home and 24.3% were isolated at home, only 12.4% were isolated in a facility, and 5.6% were neither quarantined nor isolated. The mean duration of isolation/quarantine was 9 days. [Table 1]

Although statistically insignificant, the mean age of those tested positive for COVID-19 exceeded the mean age of those tested negative by 2.7 years ( $P = 0.073$ ). Similarly, males were more likely to test positive for COVID-19 compared to female ( $P = 0.056$ ). The likelihood of testing positive for COVID-19 has not varied significantly by nationality, occupation, and family role. On the other hand, it varied significantly by symptoms, history of contact, and comorbidities. Symptomatic patients were 3.9 times

more likely to test positive for COVID-19 than asymptomatic ones ( $P < 0.001$ ). Similarly, those with a history of contact with COVID-19 positive case were also 1.5 times more likely to test positive compared to those without such history ( $P = 0.032$ ). Furthermore, symptomatic contacts were 4.1 times more likely to test positive for COVID-19 compared to asymptomatic contacts ( $P < 0.001$ ). Moreover, patients with comorbidities were also 1.8 times more likely to test positive than healthy ones ( $P < 0.001$ ). The means of the number of the households, households tested for COVID-19, and households tested positive for COVID-19 for patients tested positive for COVID-19 significantly exceeded the means of those tested negative by 1.0, 0.9, and 1.0, respectively ( $P < 0.001$ ). Table 2

**Table 1: Basic Characteristics of Participants**

Variable	n	%	
Age of The Patient in Years	Mean±(SD)	33.20±(17.63)	
Gender	Male	381	
	Female	249	
Nationality	Saudi	612	
	Non-Saudi	18	
Occupation	HCW	42	
	Non-HCW	297	
	Dependent of HCW	63	
	Dependent of Non-HCW	228	
Family Role	Father	186	
	Mother	108	
	Son	134	
	Daughter	109	
	Other	93	
History of Contact	Yes	423	
	No	207	
Symptomatic	Yes	440	
	No	190	
	Fever	229	
	Cough	236	
	SOB	106	
	Sore Throat	126	
	Runny Nose	37	
	Loss of Taste and Smell	16	
	Vomiting	12	
	Diarrhea	63	
	Myalgia	87	
	Headache	73	
	Comorbidity	Yes	68
		No	424
Bronchial Asthma		70	
Hypertension		57	
Diabetes Mellitus		68	
Cardiac		17	
Immunocompromised		16	
Result of COVID-19 Test	Positive	232	
	Negative	398	
Duration of Isolation/Quarantine	Mean±(SD)	9.08±(4.79)	
Households from The Hospital System	Mean±(SD)	5.07±(3.40)	
Households Tested for COVID-19	Mean±(SD)	1.98±(2.55)	
Households Tested Positive for COVID-19	Mean±(SD)	1.04±(1.72)	

**Table 2: Univariate Analysis: Triaging Items Associated with Testing Positive for COVID-19 Among Suspected Cases in Primary Care Setting**

Variable	Positive	Negative	P	OR (95%CI)
Age in Years Mean±(SD)	34.88±18.34	32.22±17.15	0.073	2.66 (-0.25, 5.56)
Gender				
Male	129 (33.9%)	252 (66.1%)	0.056	0.73 (0.52, 1.009)
Female	103 (41.4%)	146 (58.6%)		
Nationality				
Saudi	223 (36.4%)	389 (63.6%)	0.240	0.57 (0.22, 1.47)
Non-Saudi	9 (50.0%)	9 (50.0%)		
Occupation				
Non-HCW	99 (33.3%)	198 (66.7%)	0.542	0.81 (0.42, 1.59)
Dependent of Non-HCW	88 (38.6%)	140 (61.4%)	0.951	1.02 (0.52, 2.01)
Dependent of HCW	29 (46.0%)	34 (54.0%)	0.421	1.39 (0.63, 3.07)
HCW	16 (38.1%)	26 (61.9%)		
Family Role				
Mother/Wife	41 (38.0%)	67 (62.0%)	0.513	1.18 (0.72, 1.9)
Son	50 (37.3%)	84 (62.7%)	0.593	1.14 (0.71, 1.80)
Daughter	46 (42.2%)	63 (57.8%)	0.193	1.38 (0.85, 2.26)
Other	31 (33.3%)	62 (66.7%)	0.858	0.95 (0.56, 1.61)
Father/Husband	64 (34.4%)	122 (65.6%)		
History of Contact				
Yes	168 (39.7%)	255 (60.3%)	0.032	1.47 (1.03, 2.10)
No	64 (30.9%)	143 (69.1%)		
Symptomatic				
Yes	199 (45.2%)	241 (54.8%)	<0.001	3.93 (2.58, 5.98)
No	33 (17.4%)	157 (82.6%)		
Symptomatic±Contact				
Symptomatic Contact	140 (50.0%)	140 (50.0%)	<0.001	8.40 (3.23, 21.86)
Symptomatic Non-Contact	59 (36.9%)	101 (63.1%)	<0.001	4.91 (1.84, 13.09)
Asymptomatic Contact	28 (19.6%)	115 (80.4%)	0.167	2.05 (0.74, 5.64)
Asymptomatic Non-Contact*	5 (10.6%)	42 (89.4%)		
Comorbidity				
Yes	96 (46.6%)	110 (53.4%)		
No	136 (32.1%)	288 (67.9%)	<0.001	1.85 (1.31, 2.60)
Number of Households Mean±(SD)	5.72±(3.46)	4.69±(3.31)	<0.001	1.03 (0.48, 1.57)
Number of Tested Households Mean±(SD)	2.58±(2.71)	1.64±(2.40)	<0.001	0.94 (0.52, 1.36)
Number of Positive Households Mean±(SD)	1.66±(2.09)	0.68±(1.33)	<0.001	0.98 (0.68, 1.28)

\*Travel, hospital pre-admission, and work related

The patients who reported fever and cough were 2.4 and 2.8 times more likely to test positive for COVID-19 than those who did not report fever and cough, respectively ( $P < 0.001$ ). Moreover, those who presented with a sore throat, loss of taste and smell, and myalgia were more likely to test positive for COVID-19. However, the Mantel–Haenszel test showed evidence of conditional independence of cough ( $P < 0.001$ ), loss of taste and smell ( $P = 0.014$ ), and myalgia ( $P = 0.003$ ) on the result of the COVID-19 test. This means that the association between each of them and testing positive for COVID-19 is significantly different in the presence and absence of fever. On the other hand, Mantel–Haenszel testing showed no evidence of conditional independence of sore throat on the result of the COVID-19 test ( $P = 0.177$ ). This means that the sore throat does not differ in their relationships with the testing positive according to the presence and absence of fever. These findings also existed when cough was used as a conditioning variable of testing positive for COVID-19. Table 3

Diabetics, hypertensive, and patients with bronchial asthma (BA) were significantly 2.4, 1.9, and 1.7 times more likely to test positive for COVID-19 than healthy ones, respectively. However, the Mantel–Haenszel test showed no evidence of conditional independence of hypertension (HTN) ( $P = 0.703$ ) and BA ( $P = 0.128$ ) on the result of the COVID-19 test. This means that the association between HTN and BA as comorbidities and testing positive for COVID-19 is insignificantly different in the presence and absence of diabetes mellitus (DM) as a comorbidity. Furthermore, the patients with comorbidities like cardiac diseases or immunocompromising conditions did not vary significantly from healthy ones regarding testing positive for COVID-19. Table 4

In model-1, from studied triaging items, only symptoms, comorbidities, and the number of households tested positive for COVID-19 were independently associated with testing positive for COVID-19. Moreover, in model-2, from studied

**Table 3: Univariate Analysis: Symptoms Associated with Testing Positive for COVID-19 Among Suspected Cases in Primary Care Setting**

Variable	Positive	Negative	P	OR (95%CI)
Fever				
Yes	114 (49.8%)	115 (50.2%)	<0.001	2.38 (1.70, 3.33)
No	118 (29.4%)	283 (70.6%)		
Cough				
Yes	122 (51.7%)	114 (48.3%)	<0.001	2.76 (1.97, 3.87)
No	110 (27.9%)	284 (72.1%)		
Shortness of Breath				
Yes	42 (39.6%)	64 (60.4%)	0.513	1.154 (0.75, 1.77)
No	190 (36.3%)	334 (63.7%)		
Sore Throat				
Yes	57 (45.2%)	69 (54.8%)	0.029	1.55 (1.05, 2.31)
No	175 (34.7%)	329 (65.3%)		
Other ARI Symptoms				
Runny Nose	18 (48.6%)	19 (51.4%)	0.102	1.75 (0.90, 3.40)
Loss of Taste and Smell	11 (68.8%)	5 (31.3%)		
None	203 (35.2%)	374 (64.8%)	0.010	4.05 (1.40, 11.83)
GIT Symptoms				
Vomiting	4 (33.3%)	8 (66.7%)	0.808	0.86 (0.26, 2.892)
Diarrhea	24 (38.1%)	39 (61.9%)		
None	204 (36.8%)	351 (63.2%)	0.835	1.06 (0.62, 1.811)
Other				
Myalgia	45 (51.7%)	42 (48.3%)	0.002	2.06 (1.30, 3.26)
Headache	26 (35.6%)	47 (64.4%)		
None	161 (34.3%)	309 (65.7%)	0.820	1.06 (0.63, 1.78)

**Table 4: Univariate Analysis: Comorbidities associated with Testing Positive for COVID-19 Among Suspected Cases in Primary Care Setting**

Variable	Positive	Negative	P	OR (95%CI)
Bronchial Asthma				
Yes	34 (48.6%)	36 (51.4%)	0.031	1.73 (1.05, 2.85)
No	198 (35.4%)	362 (64.6%)		
Hypertension				
Yes	29 (50.9%)	28 (49.1%)	0.021	1.89 (1.09, 3.26)
No	203 (35.4%)	370 (64.6%)		
Diabetes Mellitus				
Yes	38 (55.9%)	30 (44.1%)	0.001	2.40 (1.44, 4.00)
No	194 (34.5%)	368 (65.5%)		
Other Comorbidities				
Cardiac	7 (41.2%)	10 (58.8%)	0.667	1.24 (0.47, 3.31)
Immunocompromised	6 (37.5%)	10 (62.5%)		
Others	22 (43.1%)	29 (56.9%)	0.319	1.34 (0.75, 2.40)
None	197 (36.1%)	349 (63.9%)		

symptoms, only fever, cough, myalgia, and loss of taste and smell were independently associated with testing positive for COVID-19. Finally, in model-3, from the studied comorbidities, only DM was independently associated with testing positive for COVID-19. Table 5

## Discussion

The purpose of this study was to gain a better decision about the currently used triaging checklist. The results strongly imply

that testing positive for COVID-19 does not vary significantly by age, gender, nationality, occupation, and family role of the participants. Although males were expected to test positive more likely because of the increased risk of exposure during the lockdown, females showed higher odds to test positive. Furthermore, despite the racial underrepresentation as most of those eligible for treatment in our institution are Saudi, the odds a non-Saudi test positive was higher. However, most of the tested non-Saudi were symptomatic dependents of HCWs. On the other hand, regarding the underrepresentation of HCWs, the odds of a HCW test positive did not vary significantly from other categories. In fact, most of our staff are treated in staff dedicated FC, especially the symptomatic ones for rapid identification and controlling them as a source of infection. These are more or less consistent with the findings from other studies.<sup>[38-46]</sup> Actually, none of these characteristics is given weight in our triage checklist.

The risk of contracting COVID-19 would possibly increase with the presence of an infected household, and the prevalence of asymptomatic positive cases is important as it would provide essential information on hidden viral circulation. Our findings regarding the lower odds of household transmission among asymptomatic individuals are consistent with findings of other studies.<sup>[46-49]</sup> However, SARs among these groups may have been underestimated due to lower testing rates as asymptomatic contact were less likely to be tested. Further, our data about households were retrieved from our hospital system, therefore

**Table 5: Multivariate Analysis: Triage Items, Symptoms, and Comorbidity Associated with Testing Positive for COVID-19 Among Suspected Cases in Primary Care Setting**

Variables	B	P	Adjusted OR (95% C.I.)
<b>Model1: Triage Items</b>			
Age in Years	0.009	0.152	1.01 (1.00, 1.02)
Male	-0.272	0.156	0.76 (0.52, 1.11)
Saudi	-0.942	0.077	0.39 (0.14, 1.11)
History of Contact	0.367	0.086	1.44 (0.95, 2.20)
Symptomatic	1.478	<0.001	4.38 (2.77, 6.94)
Has Comorbidity	0.728	0.001	2.07 (1.34, 3.20)
Number of Households	0.026	0.438	1.03 (0.96, 1.09)
Number of Tested Households	-0.105	0.153	0.90 (0.78, 1.04)
Number of positive households	0.516	<0.001	1.68 (1.37, 2.06)
<b>Model2: Symptoms</b>			
Fever	0.684	<0.000	1.98 (1.37, 2.87)
Cough	0.979	<0.000	2.66 (1.82, 3.89)
Sob	-0.252	0.299	0.78 (0.48, 1.25)
Sore Throat	0.144	0.511	1.15 (0.75, 1.77)
Runny Nose	0.111	0.755	1.12 (0.56, 2.25)
Loss of Taste and Smell	1.490	0.009	4.44 (1.45, 13.58)
Vomiting	-0.473	0.463	0.62 (0.18, 2.20)
Diarrhea	-0.166	0.567	0.85 (0.48, 1.50)
Myalgia	0.879	<0.001	2.41 (1.47, 3.95)
Headache	-0.221	0.429	0.80 (0.46, 1.39)
<b>Model3: Comorbidities</b>			
Bronchial Asthma	0.457	0.086	1.58 (0.94, 2.66)
Hypertension	0.151	0.668	1.16 (0.58, 2.32)
Diabetes Mellitus	0.787	0.011	2.20 (1.20, 4.04)
<b>Other Comorbidities</b>			
Cardiac	-0.004	0.995	1.00 (0.35, 2.87)
Immunocompromised	-0.109	0.840	0.90 (0.31, 2.59)
Others	0.453	0.131	1.57 (0.87, 2.83)

exposures among households could not be assured. Furthermore, classifying the households as a contact or as a source was not accurate as some of them tested positive on the same day, before, or after our recruited participants test positive. Moreover, most of the suspected cases have been isolated or quarantined for 14 days, and positive cases were isolated in dedicated facilities including hospitals before the adoption of home isolation or quarantine. These practices might have affected the pattern of transmissions and exposures among households.

Symptoms and history of contacts were self-reported, and overreporting may have existed as some people were worried and look for reassurance by being tested for COVID-19. In our study, symptomatic contacts were 4.1 times more likely to test positive for COVID-19 compared to asymptomatic ones. This was much less compared to a Canadian study, however, unlike our study, the latter included asymptomatic noncontact as well.<sup>[50]</sup> Consistent with the revised visual triaging checklist, symptomatic patients, especially those having fever and cough were more likely to test positive for COVID-19.<sup>[49]</sup> However, we may need to reduce the weight given to the SOB on the visual triaging scale. Runny nose,

headache, and GIT symptoms seem to deserve the low weight given in the visual triage tool.

Two other results from this study merit comment. First, in the absence of fever and cough, the patients who presented with loss of taste and smell, and myalgia, but not sore throat were more likely to test positive for COVID-19. Accordingly, loss of taste and smell, and myalgia may need to go into our triaging tool besides fever and cough. Correct triaging is very important to protect both patients and HCW. For instance, patients presented with SOB may be missed, especially if it was related to cardiac or other pulmonary conditions which require prompt intervention. Further, wrong triaging of patients depending on symptoms would deplete FC resources and would make it more crowded increasing the chance of exposing noninfected patients to COVID-19. The second finding that merits comment is that, whereas only DM, BA, and HTN from studied comorbidities were found to be related to testing positive for COVID-19 on univariate analysis, on further analysis, only DM was found associated with testing positive for COVID-19. Wrong triaging of such vulnerable patients exposes them to COVID-19 through their presence in the wrong place. In addition, they are at more risk of deterioration of their condition and the development of severe complications.

## Conclusion

At the time of outbreak and pandemic, people get worried and need to be reassured. Therefore, people who have contact with confirmed cases or those who have related symptoms would then seek testing. However, in such a situation, resources need to be used wisely, and unnecessary testing needs to be avoided. In our study, only 36.8% of the tested suspected cases were found to be positive for COVID-19. Taken together, our findings indicate the need to adopt an evidence-based updated COVID-19 testing policy, and currently used triaging criteria may need to be refined. However, the modified triaging tool should also consider the importance of early identification of the potential sources of the infection to facilitate the control of spreading of the infection. Changes based on these findings should make the visual triaging process more efficient and specific rather than sensitive. This is expected to reduce the load on the FC, reduce transmission, avoid delaying or cancellation of appointments in the general clinic, allow giving the best care for the patients without being occupied with COVID-19, and make wise use of available resources including swabbing kits.

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## Conflicts of interest

There are no conflicts of interest.

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