COVID-19 TESTING: ESSENTIAL FOR TRACKING INFECTION AND HELPING AUTHORITY TO OVERCOME THE CHALLENGES OF SPREAD

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ABSTRACT

COVID-19 is mainly transmitted through droplet infection and spread very fast compared to SARS-CoV and MERS-CoV. For the countries, it is important to know at what stage the COVID-19 epidemic is? So, as to take appropriate steps to contain the epidemic. This will only be known by testing the suspects and contacts of confirmed cases. If there is poor testing, then most of the infected people may remain undetected, however they could spread the virus to hundreds of other people and potential contacts, which could not be known and quarantined in time continuing the spread. If there is quality assured, highly sensitive and specific testing along with adequate isolation and quarantine, then the spread will be limited. There are two types of tests available for COVID-19: the tests directly detecting the viral ribonucleic acid (RNA) collected in nasopharyngeal or throat swabs, and tests detecting antibodies from the blood sample. At this point in time, the polymerase chain reaction (PCR) tests are used for confirmation of the disease while antibodies tests may provide information regarding the prevalence of infection. World Health Organization advises the countries to increase the testing and get to know the level of epidemic and act accordingly for containment of infection.

INTRODUCTION

As of June 07, 2020 (05.12 GMT), COVID-19 has already affected 213 countries and territories and 2 international conveyances around the world; around 7 million new cases and more than 0.4 million deaths have been reported. COVID-19 is caused by a novel Coronavirus SARS-CoV-2, an outbreak of viral pneumonia centered on Wuhan, Hubei, China reported in January 2020.¹ There were two other outbreaks due to Coronavirus in recent past; one is Middle East Respiratory Syndrome (MERS) and another Severe Acute Respiratory Syndrome (SARS). MERS caused by MERS-CoV is a viral respiratory illness first reported in Saudi Arabia in 2012. SARS caused by SARS-CoV, a severe viral respiratory illness reported first in Asia in February 2003.²

All these three diseases are transmitted from close person to person contact.³ Human-to-human transmission of SARS-CoV-2 (COVID-19) have been occurring till date mainly between family members and also to relatives, coworkers or healthcare staff who intimately contacted with symptomatic patient or asymptomatic cases or carriers during the incubation period. However, the transmission of SARS-CoV and MERS-CoV is reported to have occurred mainly through nosocomial transmission.⁴ COVID-19 spreads much faster than MERS and SARS. For first 1000 people to get infected with MERS took 903 days, SARS 130 days and COVID-19 took only 48 days (in China).⁵ So far, there has been no effective vaccine available for prevention, no efficacious drugs to treat and no drugs for prophylaxis purpose for the COVID-19.⁶

COVID-19 Testing: essential for tracking infection

In an epidemic or pandemic of infectious diseases like COVID-19, testing is essential as to see who, what, where, when, why and how many people are infected by one COVID-19 patient. If there is poor testing, then most of the infected people remain undetected and can spread the virus to hundreds of the people in contact, so, the infected people could not be isolated and contacts could not be traced and quarantined. Hence, the transmission will not be limited and the cycle of transmission continues. If there is quality assured diagnostic testing along with adequate isolation/quarantine, then the spread could be limited. There are two types of tests available for COVID-19:
test directly detecting viral ribonucleic acid (RNA) from swabs of nose and throat, and tests for detection of antibodies from blood sample (Table 1). Test performance is also tied to disease prevalence.9

Table 1: Comparison of lab tests for detection of (SARS-CoV-2, COVID-19)1–12

| Test Version | Tests for antibodies# | Tests directly detecting viral ribonucleic acid RNA | RT-PCR* | NAAT** |
|--------------|------------------------|---------------------------------------------------|---------|--------|
| Sample       | Blood                  | Swabs                                             |         |        |
| Time         | Rapid: 20 minutes (Rapid Antibody Test-RDT)       | 6 hours                                          |         |        |
| Cost         | Low cost               | Costly                                            | Moderate cost |    
| Detection    | After six to seven days of infection10           | After infection with virus                       | After infection with virus |
| Approval     | FDA*** Recently approved | Currently being used                             | FDA*** Recently approved |
| Lab & Staff  | Staff just need orientation                           | Trained staff and approved lab required         | Staff need orientation |
| Report accuracy | False negative report in early stages of infection, with high infectivity. Good for later stage. | Highly specific. 99% specificity and sensitivity vary between 71-98%. 6, 9 | Comparably specific as RT-PCR and sensitivity around 80%9 |

*RT-PCR: Reverse transcriptase polymerase chain reaction, **NAAT: Nucleic acid amplification testing
***FDA: Federal Drug Agency (USA), # other countries have developed this type of test.

If antibody detection tests are used, then antibodies will be detected in patient’s serum after 6-7 days of infection10; by that time, patient might have already infected so many other people. The minimum incubation period of COVID-19 is 3 days while median 5-6 days.1 Patient remains asymptomatic during that period and keeps on infecting people.1 Antibody tests are commonly used to test for exposure to the viruses. These tests could help disclose people who have been exposed to the virus.11-12 They may also provide information regarding prevalence of infection.11-12 IgM antibodies are detected after six-seven days of infection indicating recent infection; these antibodies are short-lived. While IgG remains in the serum but for how long and other details about its protective effect is yet to be known.14

The World Health Organization (WHO) has recommended a policy of widespread testing. But the policies about lab testing for diagnosis around the world vary and there seem to be opinions in support of the different approaches- largely due to: supply-shortages and priorities, stage of epidemic, financial constraints, etc.15

Currently RT-PCR is recommended for diagnosis of COVID-19 and antibody testing is generally recommended for public health surveillance purpose.16, 17

National Testing Guidelines for COVID-19 approved by Ministry of Health and Population Welfare, Government of Nepal on June 2, 2020 recommends RT-PCR will be used for diagnostic purpose while all serology tests including the Rapid tests can be used for surveillance and/or research purpose and for screening purpose during discharge from the quarantine.18

Weinstein et al have put forward four perspectives with regard to understanding of SARS-CoV-2 antibodies; 1) presence of antibodies in infected population is known, 2) performance of serologic testing to detect presence of antibodies is also known, 3) whether and how antibodies confer immunity yet to be proven and 4) false positive and false negative test result phenomenon is also known. They suggested delicate balance to be struck during decision making for antibody testing.19 WHO and other international and national health agencies are waiting for other evidences to unfold.

Testing with RT-PCR is essential in all COVID-19 suspects, if tested and found positive, people can either be isolated in an identified facility or put on strict home isolation ensuring that they are aware of having disease and willing to adhere to protocol instructions. In case of limited resources and if healthcare system is overloaded, limit the visit of non-sick people to health care facilities, so as to minimize the risk of contagion but have a focused strategy for containment.15

Data on COVID-19 testing report updated on May 27, 2020 reveals that if testing increases, then it will be known to policy makers and healthcare professionals where the epidemic is? and what next step likely to be taken to contain the pandemic globally or epidemic/outbreak in particular country or particular region, province, city or village of the country20 (Figure 1).

Total COVID-19 tests per 1,000 people

Figure 1: Total COVID-19 tests per thousand people (Jan 21- May 27, 2020)
Data of USA, South Korea, India, Pakistan, Bangladesh and Nepal is compared as an example with regard to the population, test done and new cases detected (Table 2). South Korea is selected because it slows down the curve while USA have been reporting highest number of cases globally. South Korea has succeeded in flattening the curve with rapid increase in testing. After testing South Korea isolated detected cases and traced contacts and quarantined them in time. The process is continued.

**Table 2: Comparison of COVID-19 laboratory test (RT-PCR) data of some countries April 6-May27, 2020**

| Country          | Population | 6-Apr-20 | 27-May-20 |
|------------------|------------|----------|-----------|
|                  |            | Tests/1000 population | New Cases Reported | Tests/1000 population | New Cases Reported |
| USA              | 331 million | 5.87     | 375,348   | 45.9               | 1,745,803         |
| *South Korea*    | 51 million  | 9.11     | 10,284    | 16.64              | 11,265            |
| India            | 1380 million | 0.07     | 4,478     | 2.35               | 158,086           |
| Pakistan         | 220 million | 0.18     | 3,766     | 2.26               | 59,151            |
| Bangladesh       | 164 million | 0.02     | 123       | 1.62               | 38,292            |
| Nepal            | 29 million  | 0.07     | 9         | 2                  | 82                |

*Curve flattens in South Korea*

Data in table 2 clearly shows “with increasing number of RT-PCR tests per 1000 population, the greater number of new cases are detected. This provides input to policy maker to relook into their strategy for containment.

**CONCLUSION**

In conclusion, countries need to increase the testing for COVID-19. Without widespread testing, it is difficult to know how the pandemic is spreading and how appropriate are our responses and whether to escalate the responses or continue the same strategy or scale down the ongoing interventions. The tests directly detecting viral RNA like RT-PCR are essential to diagnose the COVID-19 patients and for their subsequent management as to declare the patient recovered and trace the contacts, test and then isolate/quarantine as to prevent further spread of infection. Antibody tests may give detail about the prevalence of a disease in a population at a particular point in time by ascertaining the persons who have developed antibodies against the virus. These tests are useful for surveillance purposes.

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