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Abstract

Background

The first COVID-19 cases in Qatar were reported on 29th of February 2020. As the epidemic progresses, essential epidemiological information is needed to facilitate monitoring of COVID-19 in the population and plan pandemic response in Qatar.

Aim

The primary aim of this cross-sectional study is to estimate the point prevalence of COVID-19 in Qatar's primary care registered population.

Design and Settings

A cross sectional study design will be utilized. One publicly funded health centre from each of three geographical regions in Qatar will be identified as a study location and set up to facilitate a drive through for the study.

Methods

PHCC is publicly funded and the largest primary care provider in Qatar. The study will include randomly selected individuals from the full list of Primary Health Care Corporation's (PHCC)registered population on its electronic medical records system. The sample selection will be done using a proportional to size sampling technique stratified by age, gender and nationality representative of the overall PHCC registered population. Considering the total population registered in PHCC a sample of 2080 is proposed. A questionnaire will be administered to collect sociodemographic information and a nasal and throat swab sample will be taken. Data will be analysed to report overall symptomatic and asymptomatic point prevalence of COVID-19.

Conclusion

This study, with the help of a randomly selected representative sample from Qatar's primary care registered population, will provide results which can be applied to the entire population. This study design will closely represent a real-world scenario of the outbreak and is likely to provide important data to guide COVID-19 pandemic planning and response in Qatar.

Keywords: COVID-19, Epidemiology, Primary Care, SARS-CoV2

How this fits in

Primary care is the cornerstone of any health system. It plays a crucial role in managing SARS-CoV2 pandemic. This study protocol highlights how primary care can contribute to generating robust epidemiological information of the SARS-COV2 in a timely manner to support monitoring using minimal resources.

Introduction

According to the World Health Organization (WHO) situation report, on 31st December 2019, Chinese national authorities reported an outbreak of pneumonia with unknown etiology (1). On the 12th of January 2020, National Health Commission in China associated the outbreak to a seafood market in Wuhan (China) and shared the genetic sequence of the novel causative agent - a novel coronavirus (1).

Coronaviruses are enveloped non-segmented, single-stranded, positive-sense RNA viruses named after their corona- or crown-like surface projections seen on electron microscopy that correspond to large surface spike proteins (2). Coronaviruses in the recent past have come to attention as pathogens of emerging respiratory disease outbreaks such as Severe Acute Respiratory Syndrome (SARS) in 2002-3 and Middle East Respiratory Syndrome (MERS) in 2012-14. The newly identified coronavirus with its epicenter in Wuhan was labelled Severe Acute Respiratory Coronavirus 2 (SARS-CoV2) and is also known as 2019 novel coronavirus (2019-nCoV) and coronavirus disease 2019 (COVID-2019) (3).

SARS-CoV2 very quickly spread to other parts of China and the world. First imported cases were reported in Japan, Thailand and Republic of Korea between the 13th – 20th January (1). The first 1000 cases were infected within 48 days a significantly rate compared to SARS and MERS which took 4 months and 2 and a half years respectively (4). With 18 countries affected and as the outbreak continued to spread globally, the WHO declared it a Public Health Emergency of International Concern (PHEIC) on the 30th January 2020 (5). With 118,000 cases in 114 countries, and 4,291 deaths, the WHO declared the SARS-CoV2 outbreak a pandemic on the 11th of March 2020 (6).

Primary care is the cornerstone of any health system. A strong primary care is often seen as a solution for the challenges that health care systems face (7,8). During pandemics, primary care is the frontline against emerging infectious diseases in communities. It provides infrastructure and plays a variety of key roles such as disease surveillance, diagnosis and treatment, prevention, patient education etc. (9). During the peak week of a pandemic, it is estimated there could be a surge in primary care visits (10). These present challenges and opportunities in primary care.

The first COVID-19 cases in Qatar were reported on 29th of February 2020. As the SARS-CoV2 continues to spread in the country, there is an urgent need to understand its epidemiology in primary care to plan resources and manage a response. Reverse transcriptase polymerase chain reaction (RT-PCR) is routinely used to confirm diagnosis of COVID-19 [12]. While RT-PCR diagnostic

testing is being conducted extensively across Qatar, similar to most other countries, it is undertaken to test individuals based on specific criteria (symptoms, profession, risk status etc.) or close contacts of individuals who have tested positive [13,14,15] on an ad hoc basis. In general, testing strategies of countries are passive [16,17]. Furthermore, majority of RT-PCR surveillance studies conducted to date include convenience samples, specific population groups, geographical regions etc [18,19,20.] Such approaches do not provide an accurate picture of disease spread in the general population. More robust approaches are required to support key stakeholders and decision makers in order to implement tailored public health interventions.

The proposed study protocol is designed to provide a snapshot of the COVID-19 infections in Qatar's primary care registered population. The study will be repeated based on passive surveillance findings and key stakeholders and decision makers requirements. It will generate essential epidemiological information that will facilitate monitoring of COVID-19 in the population and plan pandemic response in Qatar. The primary aim of this study is to estimate the point prevalence of COVID-19 in Qatar's primary care registered population.

Methods

Setting

Qatar is a peninsular Arab country with one of the highest gross domestic product (GDP) per capita in the world [21]. It is known for extensive development over recent years and its ultra-modern lifestyle, attracting expatriates from all over the world. Qatar operates a universal publicly funded health care system accessible to Qatari national and expatriates who hold a valid health card [22]. A health card can be obtained at a cost of 100 Qatari riyals (Approximately 28 US dollars).

Primary healthcare service in Qatar are delivered by the Primary Health Care Corporation (PHCC). PHCC is the largest primary care provider in the country with 27 health centres (all accredited by Accreditation Canada International and distributed across three geographical regions – North, Central and South) serving approximate 70 % of the total population. All individuals who hold a valid health card are registered to a specific PHCC health centre.

Study locations

One PHCC health centre from each of three geographical regions in Qatar will be identified as a study location. Each health centre will be set up to facilitate a drive through for the study.

Sample selection

The study will include randomly selected individuals from a full list of eligible (10 years and above) PHCC registered population (N= 1,063,243 as of July 2020) that will be extracted from electronic medical records. The sample selection will be done using a non-proportional to size sampling technique stratified by age, gender and nationality representative of the overall PHCC registered population (Table 1).

Sample size calculation

Target fixed size strata will be used to achieve adequate representation of each strata. A total of 130 individuals will be randomly selected for each stratum. To adjust for non-response, 50 % extra participants will be added (n=65). The final strata sample size will be 195 and the resulting total sample size will be 3120 (Table 2).

Weighting of each strata will be done at the analysis stage to represent the primary health care population. This approach is chosen to enable having a variable sample size in each strata after completing the survey without affecting the representativeness of the overall positivity rate estimate as population weights will be applied in the analysis stage.

The sample size formula with an anticipated proportion of positive RT-PCR test ranging between 0.5 to 5 % will be used. The targeted total sample size of 2080 is expected to estimate the PHCC population rt- PCR positivity rate (after weighting for population strata proportions) with 95 % confidence and a margin of error (as a percentage of the expected estimate) ranging between 19% for the highest anticipated estimate of 5% estimate to 60% error for the lowest anticipated estimate of 0.5 % for positivity rate.

Participant recruitment

Participants will also be sent an SMS invitation message 2 days in advance of a 2-day window during which the drive through testing facilities at the three identified health centres will open. The SMS message will include information about the study and a link to a questionnaire survey to accept or decline the invitation. Participants will be invited to attend a study location in the same region as the health centre they are originally registered. A national campaign to publicise the study will also be initiated 2 days prior its launch using television, newspapers and social media to increase awareness and response rate.

Data collection

Data collection at study locations will be undertaken as a drive through. Participants will be seated in their cars and queue to be attended by a data collector. Data collection will be undertaken as a 3-step process.

- Step 1: Confirm participant is invited by SMS and verify details.
- Step 2: Administer a questionnaire to collect information on sociodemographic factors (age, gender, nationality, residential address, education level, employment status, occupation, accommodation type, number of rooms and individuals living in household), lifestyle (physical activity, smoking status, fruit and vegetable consumption), history of chronic conditions), history of contact with a COVID-19 positive individual in the past two weeks and presence of COVID-19 symptoms in the past two weeks (see Table 3).
- Step 3: Collect a nasal and throat swab sample.

Laboratory test and notification of test results

The nasal and throat swabs collected with be analysed using RT-PCR. Participants with negative RT-PCR test results will be notified by SMS. Participants with positive RT-PCR test results will be

contacted by the health centres where they are registered, and their health will be monitored and care provided as required.

Analytical plan and anticipated results

All data will be collated at the end of study and subjected to quality assurance. For the purposes of the study, point prevalence will be defined as the number of active COVID-19 infections (identified by RT-PCR) over the total sample size and reported as proportions. All statistical analyses will be done using survey commands in SSPS (version 23).

The primary analysis will be undertaken to establish the overall point prevalence of COVID-19 in PHCC primary care registered population. Secondary analysis will be undertaken to establish:

- point prevalence of COVID-19 by age, gender, residential area, nationality, educational level, occupation, contact with a suspected or confirmed COVID-19 case and presence of COVID-19 symptoms in PHCC registered population.

point prevalence by symptoms COVID-19 cases from all COVID-19 cases in PHCC registered population.

The sensitivity and specificity of RT-PCR has been reported as 70 % and 95 % respectively [23]. These figures will be taken into account when reporting findings of the study.

The results of this study will provide information required to identify the extend of COVID-19 by sociodemographic factors which will help identify social network and geographic areas with ongoing transmission. This information will help identify social networks and neighborhoods, associated with increased levels of transmission that could benefit from targeted interventions.

Discussion

rt- PCR is a diagnostic tool for COVID-19 and can contribute to understanding the spread of the disease in Qatar's primary care registered population at a specific point in time. This study, with the help of a randomly selected representative sample, will provide results which can be applied to the entire population. This study design will closely represent a real-world scenario of the outbreak and is likely to provide important data to guide COVID-19 pandemic planning and response in Qatar.

The design of the study is its key strength. Identifying a representative sample of PHCC registered population along with collection of sociodemographic data in combination with COVID-19 specific data will enable translation of findings to the overall PHCC registered population. Furthermore, the design allows for rapid data collection, analysis, interpretation and reporting of results to key stakeholders and decision makers. Once set up, it can be undertaken at required intervals to provide long term, high quality data representative of the population.

There may be some limitations in this study. While efforts will be made to represent a real-world scenario, if the overall or strata response rate is low, it may not be possible to translate the study results. Also, while there is data collected, it will not be practical to collect significantly detailed information (such as behavioral and health status data) that may provide more in-depth insight of the outbreak as the study is planned as a drive through. Finally, positive RT-PCR diagnoses are

being used as a proxy for COVID-19 incidence in the population. This may not accurately reflect incidence due to limitations of the test itself (sensitivity, specificity etc.).

This study will provide important information on the on-going transmission of COVID-19 that represents real-world scenario of the outbreak amongst PHCC registered population in Qatar. The study design will allow key stake holders and decision makers to develop and implement tailored interventions for specific populations. In addition, it will provide important information on overall COVID-19 rates that will facilitate monitoring of COVID-19 in the population and plan pandemic response in Qatar. The design of the study can be adapted for use across other health care settings in Qatar as well as in other countries experiencing difficulties in understanding the epidemiology of the COVID-19 outbreak.

Funding

None

Ethics approval and consent to participate

The study was reviewed and approved by PHCC's Independent Review Board (PHCCDCR202005051). It presents a minimal risk of harm to its subjects. Written Informed assent will be obtained from participants aged 10 – 18 years and informed consent will be obtained from participants aged 18 or over. Overall, the study will be conducted with integrity according to generally accepted ethical principles.

Competing interests

The authors declare that they have no competing interests

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Table 1: Population sample selection

Sociodemographic variable	Category
Age group (years)	60+
	40-59
	18-39
	10-17
Gender	Female
	Male
Nationality	Non- Qatari
	Qatari

Table 2: Sample size per population strata

	Per strata	Total sample
Targeted sample size	130	2080
extra 50% to compensate for non-response rate	65	1040
Required sample size	195	3120

Table 3

COVID-19 symptoms in past two weeks
• Fever 38 degrees Celsius or higher
• Chills
• Fatigue
• Muscle Ache
• Sore throat
• Cough
• Runny nose
• Shortness of breath
• Wheezing
• Chest pain
• Other respiratory symptoms
• Headache
• Nausea/Vomiting
• Abdominal Pain
• Diarrhoea
• Loss of sense of smell
• Loss of sense of taste

Source: WHO. Population-based age-stratified seroepidemiological investigation protocol for COVID-19 virus infection. Available at https://apps.who.int/iris/bitstream/handle/10665/331656/WHO-2019-nCoV-Seroepidemiology-2020.1-eng.pdf?sequence=1&isAllowed=y [Accessed on 10 November 2020]