Responses to the Pandemic COVID-19 in Primary Health Care in Oman: Muscat Experience

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ABSTRACT

Background: As coronavirus disease (COVID-19) was pervading different parts of the world, little has been published regarding responses undertaken within primary health care facilities in the Arabian Gulf countries. This paper describes such responses from January to mid-April 2020 in primary health care including public health measures in Muscat governorate.

Methods: This is a descriptive study showing the trends of the confirmed positive cases of COVID-19 and the undertaken responses to the evolving epidemiological scenario. These responses were described utilising the World Health Organisations' building blocks for health care system: Leadership and governance, Health workforce, Service delivery, Medical products and technologies, and health information management.

Results: In mid-April 2020, cases of COVID-19 increased to 685 (particularly amongst the non-nationals). As the cases were surging up, the primary health care responded by executing all guidelines and policies from the national medical and public health response committees and integrating innovative approaches. These included adapting comprehensive and multi-sectoral strategies, partnering with private establishments, and strengthening the use of technology (in tracking, testing, managing the cases and data management).

Conclusions: Facilities in Muscat governorate, with the support from the national teams, seemed to continuously scale-up their preparedness and responses to meet the epidemiological expectations in the management of COVID-19.

Keywords: COVID-19; Oman; Muscat; Building Blocks; Responses.

INTRODUCTION

Responding to the global alert by the World Health Organisation (WHO) on the Coronavirus disease 2019 (COVID-19) pandemic on 20 Jan 2020, most countries under took immediate actions to contain the spread of this disease. Nevertheless, the number of people infected by COVID-19 has increased exponentially since January 2020 as a result of traveling and contact with COVID-19 infected individuals. To curb the proliferation of COVID-19, various measures have been contemplated in various parts of the world. Despite such undertaking, as of April 15th, 2020 more than 2 million cases were confirmed with 138000 reported deaths worldwide.[1]

COVID-19 emerged in Wuhan, China in December 2019 and currently most of the countries are at different stages of disease transmission.[2] Despite its similarities to the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV)and the Middle East Respiratory Syndrome coronavirus (MERS-CoV),[3] COVID-19is distinct in terms of community spread and severity. Specifically, the nature of COVID-19 and its behaviour across populations is still under research. In this regard, the experience from public health preparedness and response for COVID-19 is building up and these experiences must be described and reported for peer review of public health experts and utilisation by various stakeholders.

The WHO has defined four transmission scenarios/phases for COVID-19 worldwide: 1) countries with no cases (No cases); 2) countries with one or more cases, imported or locally detected (sporadic cases); 3) countries experiencing cases clusters in time, geographic location and/or common exposure (clusters of cases); and 4) countries experiencing larger outbreaks of local transmission (community transmission.[1,2] Evidence from China reported the positive impact of quarantine, social distancing, and isolation of infected populations to contain the epidemic in China has encouraged many other countries to do the same.[4]These measures have saved lives and allowed many countries to increase readiness for the appearance of COVID-19.

On 10 March 2020, His Majesty the Sultan of Oman, Sultan Haitham bin Tariq al-Said, gave orders to initiate a supreme committee to implement the necessary measures at the appropriate scale to reduce

COVID-19 transmission and any anticipated public and socio-economic impacts. The committee was chaired by the Minister of Interior Affairs with the membership of different governmental sectors including the Ministry of Health (MoH).The preparedness and response initiated by MoH for COVID-19 were thus scaled up, aimed at strengthening the health emergency response systems; increase capacity to screen/detect and manage patients; ensure availability of adequate medical supplies, and necessary personnel; and develop life-saving medical interventions.

Primary Health Care (PHC) is the gate to health care and captures the vast majority of the population, making it an ideal setting for COVID-19 first line of defence.[5] Ideally, the PHC provides curative, preventive, health-promoting, and rehabilitative services. Delivery of PHC services in Oman is carried out by trained physicians, nurses, allied professions such as health educators, and dietitians.

The national population estimates at the beginning of 2018 was 4,660,153 with ~45% non-Omani indicating significant growth (or immigration). About 32% of the total population live in Muscat.[6] In Muscat, the capital of Oman, there is 30 primary health care centres (PHCs), three poly clinics and two hospital all under the direct administration of the Directorate General of Health Services (DGHS) in Muscat governorate. The health centres are scattered across six willayats/areas in Muscat: Alseeb (n=9), Bousher (n=6), Muttrah (n=5), Muscat (n=3), Al amirat (n=4) and Quryat (n=3).

The purpose of this paper is to summarise the trend of COVID-19 positive cases in Muscat governorate from 1st January to mid-April and describe the related responses to COVID-19 in PHC setting. The frameworks for the descriptive analysis are the epidemiology of case scenarios in Oman[7]and the six WHO building blocks of health care system framework.[8,9] The stepped case scenarios include: phase one: preparedness, phase two: high-risk of imported cases, phase three: imported cases, phase four: clusters of secondary local transmission, and phase five: clusters of community transmission.[7]

METHODS

This is a descriptive cross-sectional study aim at describing the trends of the laboratory confirmed positive COVID-19 cases in Muscat governorate and the responses against the disease utilising the health system building blocks including:1) health care leadership and governance, 2) health workforce, 3) service delivery, 4) medical products and technologies, 5) health information systems and 6) health system financing.

Data were extracted from the health information system within the department of diseases surveillance and control in the Muscat governorate. Information on the scaled-up organisational response was derived from the regional alert reports prepared fortnightly by the department of disease surveillance

and control. Responses were categorised to fit the definitions of WHO health system building blocks. The categorization was cross-checked independently by three researchers (LA, HA and FA). The final categorization was revised by an expert researcher (KP) as a further measure of inter-rater reliability. Continuity of reporting responses was ensured by one researcher (TA), responsible for the data management and analysis. Written responses were re-visited whenever conflicting interpretations occurred.

Ethics

Ethical approval was obtained from the regional research review and ethical approval committee (see supplementary file 1).

Statistical analysis

Continuous variables were expressed as whole numbers to show/describe trends over time. Due to the descriptive nature of this study, there were no inferential statistics performed.

RESULTS

Trends of the confirmed cases

The first case of COVID-19 in Muscat governorate was confirmed on the 23rd of February 2020 linked to a travel from abroad. There has been an exponential increase in the number of cases reaching 832 cases in mid-April (Figure 1).

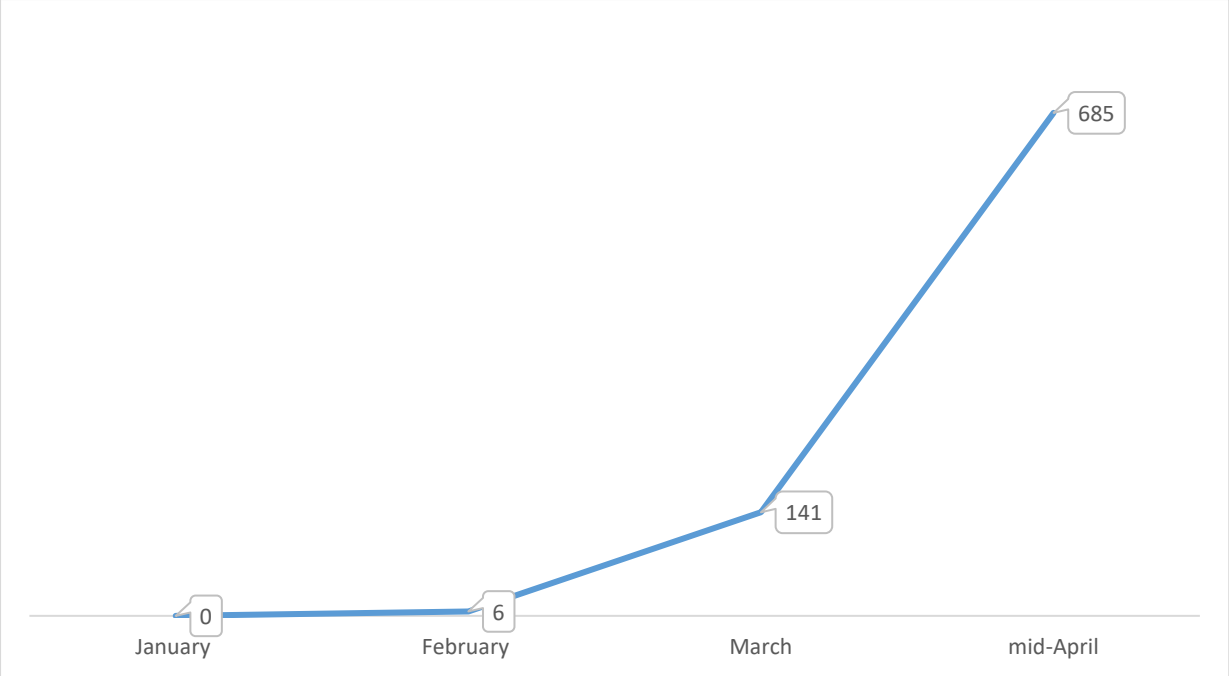

Figure 1: *Number of confirmed COVID-19 cases in Muscat governorate from January to mid-April*

The increase was prominent in community clusters within Muttrah willayat (Figure 2) especially among the expatriates/non-nationals (>70%).

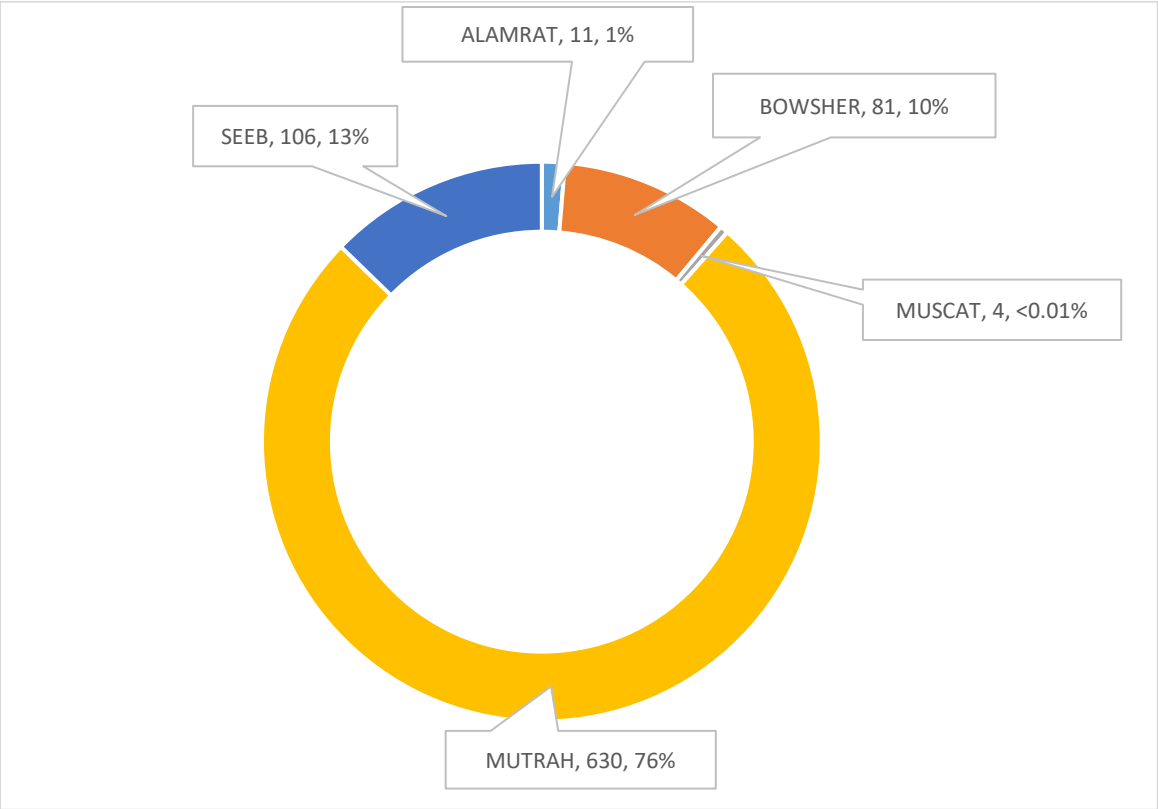

Figure 2: *Distribution of COVID-19 confirmed cases across the willayats/regions of Muscat governorate*

Organisational responses at the primary health care level across the WHO building blocks for health care system (Table 1)

Building block one: Leadership and governance

With the first alert from China about the COVID-19 in January 2020, the national and regional public health emergency task force groups in MoH were activated. The regional operation centre (ROC) composed of 12 teams all under the direct command of the director general of health services. These teams coordinated with one another throughout the phases of the disease to adhere to daily action plans:

1- Ports of entry (POE).
2- Clinical health care (primary, secondary and hospital) and support services.
3- Infection prevention and control (IPC).
4- Disease surveillance& response.
5- Health information system.
6- Information technology.
7- Health services for isolated/quarantined individuals.
8- Pharmacy and medical supplies.
9- Private establishments.
10- Health awareness and social media.
11- Administration and finance.
12- Studies and research.

In phase one of the epidemiological scenario, the focus was preparedness and risk assessments in all ports of entries namely Muscat international airport and Al Fahal and Sultan Qaboos sea ports (Table 1). With the increase in the number of positive cases among travellers coming from the affected areas, the supreme committee in March 2020 provided a mechanism for coordination between all national sectors. The supreme committee requested a complete closure of air, sea, and land ports and the shutdown of Muttrah willayat where multiple clusters were initially identified followed by the closure of the whole of Muscat governorate on 8th March 2020. These measures were accompanied by a range of social distancing measures, including the closure of schools, universities, prayers in mosques, and sports activities, cinemas, parks, and even restricting all movement in some of the most affected areas (Muttrah and Muscat willayats).

Building block two: Health workforce

Several measures were put in place as the epidemiological case scenarios were progressing. Initially, staff numbers and duties were revised. Then exposure risk assessment and classification were

enhanced throughout the phases. In phase three and four, outreach teams and public-private partnerships were established. Volunteers from the community and non-governmental organisations were actively involved from phase three onwards. They were all trained on infection prevention and control measures by the concerned team in ROC.

Building block three: Service delivery

Adaptations across primary, secondary and tertiary care services included strengthening of the: emergency response mechanisms, risk communication and public engagement, public health measures, IPC, case management and drills with simulation exercises.

Despite reductions in the OPD visits from 115324 in January to 109719 in March, essential health services were ensured in all health centres primarily for the vulnerable groups, women and children.

A COVID-19 model health centre was established in phase two to provide coordinated support with all the teams in ROC. With the situation escalating in Muttrah willayat, health centres in Muttrah were opened for 24 hours to ensure that testing and isolation procedures were in place.

Care services were restructured to implement COVID-19 triaging, screening and quarantine/isolation algorithms as indicated. All staff underwent several trainings and exercises on protocols, communication, multi-sectoral coordination, and operational capabilities, swab taking, referrals and management of symptomatic/asymptomatic patients.

Phone consultations and virtual communications were utilised to respond to public queries. Moreover, public health awareness campaigns, especially on the importance of social distancing and hand hygiene, were carried out. Importantly, the nursing cadre took the responsibility of setting up isolation facilities for suspected cases (arrivals from abroad) and positive cases and thus 22 hotels were arranged for this purpose. Additionally, mass isolation facilities for positive mild positive cases in phases three and four were arranged (e.g. the Oman National Engineering and Investment_ONEIC).

Building block four: Medical products and technologies

Overall, shortages of supplies have been reported on personal protective equipment (PPE) and face masks and it has been a concern in all regions leading to strict measures of use.

Every effort was made to reduce the influx of patients to health centres via scaling up pharmacy stock from regular consumption and implementing WhatsApp and home delivery services to transport regular drugs to patients.

Furthermore, two central stores for PPE (Muttrah and Seeb) were opened in phase three and four to accommodate the escalating demand. Also, the pharmacy and medical supply team in ROC was responsible for providing institutional isolation facilities with the required pharmaceutical supplies.

The use of technology was implemented throughout the epidemiological phases, as most health centres conducted phone consultations and video conferencing to share experiences. The geographical information system (GIS) was introduced in February 2020 to ease data management and graphical interpretations.

Building block five: Data and information management

Data sharing, specifically the number of confirmed cases, was widely considered to have been provided by authorities at all levels promptly via social media.

Building block six: Finance

Because MoH is a public health care delivery system, the management of finance was not within the scope of this this paper. However, with the economic recession, additional financial resources are warranted to support the implementation of COVID-19 interventions.

Table 1: *Responses to COVID-19 across the epidemiological case scenarios utilising the WHO health system building blocks.*

	Phase 1	**Phase 2**	**Phase 3**	**Phase 4**	**Phase 5**
Definition	No Cases (preparedness)	First case detected (imported Cases)	Clusters of secondary local transmission	Clusters of cases	Clusters of community transmission
Aim	Preparedness Planning, risk assessment, coordination and resource mobilisation	Quarantine, Stop transmission and prevent spread.	Limit extend of transmission to contain within clusters + continuing mitigation efforts		Containment measures , slow transmission, end community outbreaks
Focus	Preparedness and Risk management (using declaration forms) at ports of entry	**Screen** arrivals from affected countries **activate** quarantine facilities and emergency responses	**Social distancing** measures **Revise** industrial policies	**Early identification of hotspots and detection of cases** **Isolation** of positive cases	**Early identification of clusters** **Isolation** of Muttrah 1st April 2020 **Expand** geographical isolation of areas (Muscat governorate) and 8th April 2020 **Enhance** surveillance activities
Leadership and governance	National and regional COVID-19 task force	Supreme national committee **Suspend** flights from the affected countries	**Activation** of the National Committee of Civil Defence (NCCD) **Add** other countries in quarantine list (China, South Korea, Japan, Singapore and Iran) **Activation** of vital sectors: the national medical and public health response and rescue and sheltering **Isolation** of areas with clusters of community transmission		
Health workforce	Human Resource **deployment** and **remobilisation**	**Enhance** HCW exposure risk assessment and classification **Initiation** of outreach teams **Facilitate** public private partnership **Organise** support from volunteers			**Augment** medical services access for all at the ground level by reorienting HCW **Establish** efficient triaging mechanism for detection of high risk cases through orientation training
Service delivery					
health care services	**Revise** essential health care needs, human resources and working hours **Liaise** with hospitals	**Identify** COVID primary care centre (North Al Khuwair).	**Strengthen** referral protocols, IPC, swab taking and transfer of specimens to the central laboratories.	**Expand** services at Muttrah health centre **Preparation** of a community areas/tent to perform a community surveillance activity in Muttrah **Identify outreach** teams **Expand** isolation facilities especially for foreigners	

	Prepare plans for surge in number of cases **Use** telemedicine	**Identify doctors** on call to answer public queries. **Monitor** OPD visits	**Arrange** continuity of services for vulnerable groups and immunisation programme	**Provide** multiple testing facilities (Muttrah, Darset, Asharadi and Russail)	
Emergency response mechanisms	**Preparedness phase**	**Enhancing** patient referral pathways &coordination between tertiary hospitals, and with private institution **Arranging** ambulance services		**Activate** emergency response mechanisms **Scale up** emergency response mechanisms	
Risk communication and public engagement	**Educate** and actively **communicate** with the public through risk communication and community engagement	**Engaging** opinion leaders **Activation** of 24 hours call centre	**Activate** multi-sectoral preparedness, response and gradual recovery. **Maintain** communication with private health sector, Immigration, Airport authorities, Local airline, Aviation sector **Retrain** staff in IPC and clinical management specifically for COVID-19		
Case management and related guidelines	**Set up** screening and triage protocols at points of access to the primary care	**Setting** up facilities for isolation of suspected cases (arrivals from abroad)_*22 hotel* **Test** suspected cases according to case definition	**Scale up** surge plans for health and isolation facilities (suspected and positive cases) **Set up** COVID-19 hotlines Strengthen referral system to hospitals	**Prepare** mass isolation facilities for positive mild cases **Strengthen** outbreak control measures in Muttrah area **Enhancing** passive surveillance in other willayats **Enhancing** capacity for testing and medical services in Muttrah HC **Support** private sector participation in Muttrah HC	
Drills and simulation exercises	**Practice** regular exercises to test plans, protocols, communication, multi-sectoral coordination, and operational capabilities **Enhance** capacity building and strengthening activities				
Medical products and technologies					
Laboratory testing	**Ensure** availability of testing tools **Test** all individuals meeting the suspected case definition			**Activate** laboratory contingency plans	**Implement** prioritized testing and measures that can reduce spread

Pharmacy	**Review** daily inventories and requirements	**Scale** up stock from regular consumption **Provide** institutional isolation facilities with the required supplies	**Activate** WhatsApp services to prepare prescriptions **Create** safe windows to pick up medication in HCs **Start** home delivery services **Use** social media platforms to inform the public on collection, use and information about medication		
Surveillance activities					
Case finding, contact tracing and management	**Prepare** resources **Conduct** active case finding, contact tracing and monitoring; quarantine of contacts		**Enhance** active case finding, contact tracing, monitoring, quarantine of contacts and isolation of cases	**Intensify** case finding, contact tracing, monitoring, quarantine and isolation facilities	**Continue** active case finding, contact tracing where possible, especially in newly infected areas **Implement** COVID-19 surveillance **Start** "al tarsssud" web based notification (government and private) **Assign** focal points in all institutes for data update
Health system financing	Ministry of Health				

ROC: Regional operation centre, HCW: Health care worker, IPC: Infection prevention and control, POE: Ports of entry, GIS: Geographical information system, ARI: Acute respiratory tract infection

DISCUSSION

This is the first paper that looked at changes in primary care responses with the increase in cases of COVID-19 utilising the WHO health system building blocks in an Arabic speaking country namely Oman. Based on the experiences described in Table 1 and 'real life' scenarios, this discussion is structured to highlight approaches to strengthen the medical and public health responses to mass crisis:

A comprehensive multi-sectoral approach including public-private partnership

A comprehensive multi-sectoral approach was especially crucial as new cases of the COVID-19 continued to surge in Muscat. This approach potentially alleviated the fear of exhausting current health care resources, and shortages of competent health care personnel and essential medical supplies.[10] With the experience from Muscat governorate, It was clear that an effective pandemic response required a whole-of-government, whole-of-society approach.[11,12] This mandated the involvement and partnership with multi-sectoral capacities and resources including the private sector, non-governmental organizations and civil society.[13]

Additionally, with the disease surge among expatriates (the case in Muttrah willayat), there was a growing acknowledgment that the public and the private partnership was compulsory to solidify Universal Health Coverage (UHC) defined as equity and social justice to accessing health care.[13,14] In Oman, Sultan Haitham bin Tariq, the Sultan of Oman, declared free of charge medical services against COVID-19 to all expatriates living in Oman in April 2020.

Similar to the experience in Muscat (Muttrah willayat and ONIEC), a private network in the United Arab Emirates made staff and hospital bed capacity available to government use as needed.[15] Also, in Bahrain, licenses were provided to private healthcare providers for the management of COVID-19.[16] However, the role of private health sector could be expanded to enrol hospitals and laboratories to fill gaps in healthcare provision and coverage.[13] Other potential areas of engagement could be nursing home facilities, and social support and care to vulnerable populations.

Enhancing public health and field epidemiological skills in primary health care

Responding to the COVID-19 outbreak in Muscat governorate revealed the need for public health/field epidemiologist expertise in PHC. In crises of such an over whelming scale, using the best available evidence is essential to save lives. Public health responses to emerging pandemics works on sound principles of established infectious disease epidemiology. Hence knowledge of such principles and skills are essential in health care. Further research is required to explore effective methods to institutionalize and strengthen public health/epidemiological strategies within the health care setting.[17]

Enhancing innovation and technology use

Technologies such as the use of geographical information technologies for big data are fundamental to maximise public health responses.[18] Countries such as Taiwan, used location sharing in phones to track people inquarantine.[18] Future direction may consider accelerating the use of novel technology, such as artificial intelligence, digital tools, and machine learning to achieve better medical and public health outcomes.

Data sharing and role of research

This pandemic has demonstrated that sharing real-time information is critical and mandatory. Lack of data sharing and a transparent reporting system may weaken health systems and may open windows for "infodemic", false social media.[19,20] The efforts in Muscat Governorate in line with the national level mandates have been building a platform for data sharing and this has been affected by the surveillance platform that integrated quarantine services, patient records, laboratory data as well as follow up information of confirmed cases. This platform is a success story in the development of robust sustainable platforms for the future.

CONCLUSION

Primary health care is considered the first responders for a mass crisis namely COVID-19. It is crucial to enhance capacities and resources across the health system building blocks as the epidemiological case scenarios surge up. Building a comprehensive, multi-sectoral approach, partnership with the private sectors, use of innovative technologies and data sharing are the core for an effective medical and public health response.

Declarations

Consent for publication

Not applicable.

Availability of data and material

Data generated from this study is publicly available.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

TA is the principal investigator in charge of conceptualisation of the data. All other co-authors provided support including the: conception of idea, manuscript writing, interpretation of results, and critical reviewing. TA prepared the initial draft of the manuscript and all other authors have critically reviewed and approved the final version of the manuscript.

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