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**A highly competent Medical Administrator to face the challenges in the
21st century.**

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Editor

Dr Priyantha L Athapattu

Editorial Board

Dr SAP Gnanissara

Dr Sanath Goonesekara

Dr Sarath Samarage

Dr Neelamani Rajapaksa Hewageegana

Secretariat

Office of the College of Medical Administrators of Sri Lanka

Directorate of Health Care Quality and Safety

Castle Street Hospital for Women

Castle Street, Colombo 08.

Email: cmals2011@gmail.com

Web Site: www.cmals.lk

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Our Objectives

- To guide the health development in Sri Lanka.
- To assist in the implementation of national health policy.
- To promote postgraduate studies in the field of medical administration.
- To undertake health system research in the field of Medical administration.
- To promote and foster professional advancement of Medical Administrators.
- To regularly review the status of Medical Administration in the country and analyze problems in the field.
- To guide the Ministry of Health and private sector on human resources development and resources mobilization in the field.
- To foster fellowship among the professionals engaged in the field of Medical Administration.
- To publish a journal of professional Medical Administration.

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WALKING THE TALK

Reimagining Primary Health Care after COVID-19

Athapattu P, Editor, College of Medical Administrators of Sri Lanka

With the COVID-19 pandemic, policy makers, health professionals and ordinary citizens in most countries understood that business as usual in health care is no longer an option. Health systems need transformation on the scale of the crisis itself. COVID-19 has created a once-in-a-generation opportunity for sweeping systemic change backed by bold public investment and supported by broad social demand. The health care model that can drive this change is fit-for-purpose primary health care. This model is anchored in the values and lessons of the historical PHC movement. And it is reimagined for a world in which the pandemic has challenged much of what we thought we knew.

Nearly half a century after the Alma Ata Conference, hasn't the world talked enough about PHC? Clearly not, because PHC's proven benefits have still not reached hundreds of millions of people who urgently need them. And because, when COVID struck, PHC's power to protect communities in health emergencies was not used. We need to keep talking about PHC. But above all we need to walk the talk fast. The distinctive strengths of PHC are vital to "build back better" in health after the pandemic. Countries that choose the path of ambitious PHC reform will reap powerful rewards: through lower health care costs, more resilient systems, stronger human capital, increased health literacy, higher economic productivity, and above all, longer, healthier and more satisfying lives for people.

There are well functioning primary care services in the preventive care system in Sri Lanka. However, it is not seen in the curative sector to the same extent. Therefore, the Government of Sri Lanka has initiated to implement operational frame work introduced by the World Health organization on 'Primary health care: transforming vision to action' which includes fourteen levers identified as necessary for translating the commitments made in the Astana Declaration into actions and would in turn support towards the progress of strengthening primary health care. Among the core strategic levers, political commitment and leadership, governance and policy frameworks play a major role for strengthening primary health care. The 'Policy on healthcare delivery for universal health coverage' in Sri Lanka was approved by the Cabinet of Ministers in 2018, and stands as the foundation for strengthening primary care in Sri Lanka. The 'Essential Services Package' has been launched in 2019, introducing the services to be provided at each

level of care. Funding and allocation of resources is another core strategic lever, where Sri Lanka is funded by the World Bank and Asian Development Bank through "Primary health care System Strengthening Project" and the "Health System Enhancement Project" respectively to improve primary care in the country, complementing the allocations of the Government of Sri Lanka. The fourth core strategic lever, 'engagement of communities and other stakeholders', is of utmost importance, and empowers the communities to work towards their own health. 'Friends of services committees' have been established in primary care hospitals in Sri Lanka with the representation of community and religious leaders in the community and grievance redress mechanisms have also been introduced.

Improving trust on the services provided is one of the major contribution to increase utilization of frontline primary health care services. Improving the quality of services provided by Primary Medical Care Institutions in turn would improve the continuity of services with improved follow up and referral systems. This would reduce the overcrowding at secondary and tertiary level health care institutions, enabling them to focus better on specialized care. The lesson learnt from COVID 19 pandemic is an eye-opener for healthcare managers to pay attention on patient centered comprehensive primary care at the community level.

Even though, Sri Lanka as a developing country, has been taking many important initiatives to re-orient its primary care system, the driving force seems to be inadequate yet. Therefore, as Medical Managers in the Sri Lanka's health system, it is our joint responsibility to facilitate implementation of reforms in the primary health care system in order to deliver a high quality health care with improved responsiveness. Let us join our hands to walk the talk to put our Vision in to action.

In this backdrop, the College of Medical Administrators of Sri Lanka is publishing the Volume 22 September 2021, of the Journal of Medical Administration consisting of research articles mainly focusing on describing the effects of the COVID 19 pandemic on Sri Lanka's health system in various angles which will be undoubtedly useful for healthcare managers to further strengthen the health care services in an evidence based manner.

PRESIDENTIAL ADDRESS

A highly competent Medical Administrator to face the challenges in the 21st century.

Rathnayake RMSK

Healthcare is one of today's most dynamic and growing fields, with a wide range of opportunities and challenges. Medical Administrators have been at the helm of the Health Care Delivery System in Sri Lanka since the inception of the Department of Health Services in 1856. Due to the untiring efforts of the Medical Administrators for well over a century, Sri Lanka has achieved an enviable health status. The present health indices provide ample testimony to this fact. Furthermore, our health care delivery system serves as a model to other developing countries.

The establishment of the Civil Medical Department of Sri Lanka in 1856, led to the development of a network of health care facilities. Establishment of Provincial councils following the 13th amendment to the constitution in 1987 was a major reform as it led to the devolution of the provisions of healthcare to the Provincial Council.

A significant event in Medical Administration was the formation of the Association of Medical Administrators in 1974 mainly to look after the interests of government medical administrators. This Association paved the way for the establishment of the College of Medical Administrators of Sri Lanka (CMASL) in 1992 by a group of 43 Medical Administrators who were members of the Association. The first Council of the College was headed by Dr. George Fernando as President, and Dr. Shanthi Dalpatadu who served as the first secretary. The Board of Study in Medical Administration was established in 1994.

Health in 21st century

In the second decade of the 21st century, the healthcare services, healthcare facilities, health seeking behaviors, attitudes and expectations of the people have undergone a dramatic change. Use of Information and Communication Technology, evidence-based medicine, cutting age technologies, novel management sciences, multi-disciplinary approaches for problem solving, Research based culture have changed the face of Healthcare in the world where the change is inevitable. On top of everything, last year we experienced the "COVID 19 pandemic" a novel experience to the world which transformed the world to a 'new normal world'. Impact of the COVID yet again reminded the whole world regarding the challenges in Health and importance of Health for sustainable development.

Like Lord Buddha said "Change is the only unchanged thing in the world".

We need to develop the medical administrators to lead this transformational era of healthcare service. As Warren Bennis (who is widely regarded as a pioneer of the contemporary field of Leadership studies) said "Leadership is the capacity to translate vision into reality". Therefore, as leaders of the Healthcare Service of our country we have the utmost responsibility to make the National Health vision a reality. Thus, we need to empower our Medical Administrators with most updated knowledge, practice, skills and attitude to fulfil this task.

Developing a highly competent Medical Administrator to face the challenges in 21st century

Developing a highly competent Medical Administrator to face the challenges in 21st century is not an easy task. But as the torch bearers in the field of Medical Administration, it is our responsibility to work at our fullest capacity to fulfil the task.

The pathway to develop a highly competent Medical Administrator is based on four pillars, namely, Professional Development, Soft Skills Development, Financial Independence and Social Welfare & Safeguard of Dignity.

Professional Development can be considered as the backbone to develop a competent Medical Administrator. In that, their academic development is of utmost importance in acquiring the knowledge, attitudes and skills relevant to Medical Administration. Another very vital dimension in a career in Medical Administration, is the development of their soft skills. A successful Medical Administrator must possess good skills in communication, oration negotiation, team building and public relations. These necessary skills are instrumental in developing a true leader with a great charisma. Financial stability and financial independence are also important aspects of a career in Medical Administration which will help uplift the self-esteem and dignity of the Medical Administrator. These areas have to be addressed properly as they perform one of the most stressful duties in the entire health sector with greater challenges and least leisure time.

I propose to introduce a "Post graduate Diploma" in Medical Administration and encourage MOICs in primary care health institutions to obtain it empowering them with skills, knowledge and attitude and developing them professionally to run primary care institutions productively. The pyramid of Medical administrative structure of Sri Lanka, consists of DMOs of Primary care Hospitals, Divisional Hospitals, Base Hospitals and MOHs as the base of pyramid. They are the foundation of our system. When we get the base of our Medical Administration pyramid strengthened with the academically sound, skilled, knowledgeable diploma holders, our Pyramid will be stronger and sustainable than the 'Great Pyramid of Giza'.

We as medical Administrators are entrusted to develop the leaders for secondary and tertiary care hospitals to lead the teams consisting of MD Medical Administration qualified consultants with local and foreign training. No doubt, that our academically sound MD qualified medical administrators will lead those institutions with dignity and vision. With 3 years mandatory post intern experience, 2 years MSc course, another 1 year post MSc training, about 3 years pre MD and finally 2 years post MD training, it takes minimum of 11 years to develop a MD qualified Consultant in Medical Administration after completion of internship. But almost all other major specialties develop MD qualified consultants in almost 6-7 years after completion of internship. With this process we have produced about 40 MD qualified Medical Administrators since 2018.

With the significant improvement of MD training, we need to look into the possibility of improving our mission further. The Board of studies in Medical Administration has restructured the MSc in Medical Administration course for the Level 10 of the Sri Lanka Qualifications Framework since 2019. Considering the fact that it is the stepping stone to the MD in Medical Administration, I believe if we could directly enroll the PG trainees who complete the new MSc, to the MD course in Medical Administration nearly 1.5 years of valuable time could be saved. With this direct intake, we could take the MSc examination as the MD part 1 exam and for the indirect intake we could follow the routine pre MD part 1 program and select the eligible. This will also withstand the equity of the failed.

Other main concern is that, we need to address to develop full time assistant director posts for our Registrars and Senior Registrars to function with dignity and authority under their supervisors to become a part of the workflow with responsibility and to train with first

hand experiences. This will definitely improve the skills, knowledge, decision taking ability and attitudes of our Post Graduate trainees and make them ready to function as leaders when situation demands.

The 21st century has made greater emphasis on quality of care. The world has been moving to develop highly specialized doctors, opening the doors to develop sub specialties and special interests. This has improved the quality of care, health status of the nation as well as the quality of the main specialty. We as the caretakers of the specialty of Medical Administration suggest that it is the correct time to introduce the selected sub specialties and special interested specialties to the field of Medical Administration. Adding one more year (foreign or local) to the Senior Registrar period, will allow adequate time frame to develop highly specialized consultants in subspecialty fields such as Healthcare Policy Development and Planning, Health Economics, Medical Procurement, Human Resource Management, Public Health and Applied Epidemiology, Health Information, Research and Biostatistics , Disaster Management as well as Hospital Designing and Architecture. This will not only improve the quality of our service to Sri Lanka but will also open new adventures in internationally recognized avenues such as WHO, UN, Donor Agencies etc. as highly specialized consultants.

Short-term part-time diploma courses for currently serving Medical Administrators will provide significant short-term as well as long term benefits to our profession. Well-structured diploma courses endorsed by the Sri Lankan College of Medical Administrators developed to fulfill the needs of our health sector will be an asset to all our members. Diplomas in special areas as noted above will significantly improve our skills, knowledge, attitudes thus developing our professionalism. With highly competent, professional medical administrators, we will be able to win the challenges in the 21st century with flying colors.

Our scientific sessions are the platform to share our research activities, novel innovations and to share our successful experiences. Thus, with the ever-energetic academic subcommittee we have introduced an online weekly professional development program. Annual scientific sessions will also be held in an international level standard, this year and I am looking forward to see all of your contribution, to make it a success.

Establishment of Sri Lanka Medical Administrative Service

All medical officers in the Ministry of health belong to the Sri Lanka Medical Service and has three service

categories, grade medical officers, specialist and medical administrators.

Medical Administrators competent technically and managerially are in charge of the overall administration of the Health Services in Sri Lanka. Therefore, their service requirements, services as they offer as well the problems they encounter are different to other medical offers in the Sri Lanka Medical Service. For the professional development of the Medical Administrators a separate service under the name of ‘‘ Sri Lanka Medical Administrative Service ‘‘ is required. Medical Administrative Service in Sri Lanka needs to have 3 grades.

1. Primary Medical Administration Grade.
2. Senior Medical Administration Grade.
3. Deputy Director General Grade.

It is a long process and will need to amend the service minutes, public administrative circulars and need cabinet approvals. But this will settle lots of current administrative and professional problems regarding the Medical Administrators. (The perfect example for co-existence of this structure is shown in Education sector with 3 services, Sri Lanka Teacher Service, Sri Lanka Principal Service and Sri Lanka Education Administrative Service)

With new ‘‘ Medical Administrative Service’’, new performance appraisal system can be introduced based on performances, new salary structure , new allowances structure can be introduced.

Soft skills Development

Soft skills development is the icing on the cake for a competent and professional medical administrator. Successful Medical Administrators need to have good communication skills, oratory skills, negotiation skills, team building skills and Personal Relationship skills. From the way of dress to the way of conducting the self is observed as soft skills which are instrumental to develop a true professional and a great charismatic leader. It improves the competency of the Medical Administrator. All our structured academic programs have neglected the ‘‘Soft skills development’’ of medical administrators. To overcome this, we as the Sri Lankan College of Medical Administrators have initiated a program named ‘Medical Leadership’ with the cooperation of ‘AESULAP Academy ‘‘ unfortunately, the COVID pandemic has affected the continuation of the program. But with time the program will be widened and continued for the betterment of all Medical Administrators.

Financial Independence

Financial stability and financial independence have been the long-lasting problem for the Medical Administrators in Sri Lanka. Based on the current law, medical administrators cannot perform private practice causing a severe financial burden compared to the ordinary medical officer. Medical Administration is not a day job or an on-call basis duty. Medical Administrator is required to be on service round the clock every day. Consequently, there is a significant mismatch among the service requirement and the financial revenue. This financial instability has made Medical Administration a less attractive specialty.

There is no argument that medical Administrators required a better attractive salary structure and allowance structure to lower the financial instability. Financial stability will attract the young energetic new set of doctors in future who will further develop the field of Medical Administration. This will also reduce the brain drain and improve the integrity of medical administrators. This requirement needs to be well thought of, with the implementation of ‘‘Sri Lanka Medical Administrative Service ‘‘.

Social Welfare

It is a well-known factor that, Medical Administration is the most stressful duty in the entire health sector. It is a fulltime duty with full of challenges, complete commitment with least leisure time. With all these adversities, we have witnessed most of our medical administrators develop health problems and some unfortunately leaving us untimely. Therefore, a special Health Insurance facility has become a mandatory requirement for the members of Sri Lankan College of Medical Administrators. A tailor-made Health Insurance system covering national and international healthcare expenditure for critical illnesses with a proper death cover for untimely deaths is required to be designed and special emphasis required to be taken to implement that.

Securing the dignity of the Medical Administrators

Medical Administrator being the leader of the institute, need to have an exemplary life with dignity and respect. It is our duty to advance the infrastructure to uplift the dignity of the Medical Administrator.

With my own experience since 1995 as the DMO of Chilaw Hospital, RDHS Chilaw, PDHS of North Western Province, Director of National Hospital Kandy, DDG of Ministry of Health and Secretary of the Sate Ministry, I have witnessed the great difficulties and challenges faced by my budding medical administrators.

Most of the medical administrators in all categories do not have proper official quarters to live in. Most are living in substandard places and some have rented houses through their own pockets. Most of the "Offices" they have in hospitals are not up to the standard. Most don't even have basic facilities required to function as an administrative center. Therefore, there is an urgent requirement to develop suitable quarters and to develop office spaces, to the medical administrators to function with dignity and respect.

Another problem is the lack of transportation facilities to the officers in deputy medical administrative grade. As the newly appointed medical administrators they are working in faraway places without eligibility to obtain transport facilities. They have no other option but to use their personal transport or public transport for official duties. Providing transport facilities to the officers in deputy medical administrative grade is very much essential, for them to function with dignity, respect and with good job satisfaction.

Our contribution to the National Development

Good Health is the backbone of the development of the country. As we have very clearly witnessed that during the recent COVID Pandemic, every government spends a significant portion of the National Budget to the Health sector to enhance the prosperity of the Nation as it depends on the Health of the Nation.

We, the Medical Administrators are the leaders, administrators as well as the managers of the entire Health system in Sri Lanka. From policy development to implementation, leading, guiding and by administration we maintain the status core of the Health sector. With our competent medical administrators we can achieve a healthier nation but without it development of the country is a dream. Thus, we are the main driving force of the development of this Nation.

Containing the COVID pandemic with timely decisions and leading the whole health sector to achieve one goal has shown everybody the importance of developing competent medical administrators to maintain the sustainable development of the country.

Development of a highly competent Medical Administrator to face the challenges in 21st century is the key to achieve the Sustainable Development Goals and to achieve the overall development as a country. Our success is the success of the country.

Let us rally under the flag of Sri Lankan College of Medical Administrators to develop the highly competent Medical Administrator. Let us overcome the challenges in 21st century. Let us make a healthier nation. Let us create a Developed, glorified Nation for the future generation.

Exposure of health staff to COVID-19 infection: causes and recommendations for reduction of exposure

Wickramasinghe SC, Perera VUE, Wickramasinghe A, Rajasinghe SV, Prabha Kumari AMU, Fernando N.

Abstract

Introduction: The coronavirus (SARS-CoV-2) spreads predominantly between people who are in close contact with an infected person. Hence, the frontline health staff members are more vulnerable for exposure due to rising number of cases.

Objectives: To describe the possible causes for exposure of health staff in Sri Lanka for COVID-19 infection and to review suggestions made by health staff for minimizing such exposure.

Methods: A descriptive cross-sectional study was conducted from October 2020 to December 2020. A self administered questionnaire was given to health staff when they were admitted to a quarantine center and collected on discharge or transfer. Data was analyzed using descriptive statistics.

Results and discussion: There were 80 participants with a response rate of 100%. Majority (n=79, 98.8%) were exposed to a confirmed/suspected case within their health institution and most (60%; n=48) were exposed within the ward they work.

Source of exposure was mostly a patient (55%; n=44) or a staff member (33.7%; n=27). At the time of exposure, majority wore only a facemask (n=43, 53.8%).

Shortage of Personal Protective Equipment (PPE), inadequate training on infection control, Incorrect contact history provided by patients were stated as the main causes (75%) of exposure. 38% of health staff members share meals with their colleagues at workplace. Conclusions and Recommendations: All staff categories should be provided with necessary PPE. Regular training programs on infection control need to be conducted covering all staff categories. A suitable arrangement to take meals individually must be developed.

Keywords: Health staff, COVID-19 exposure

Introduction

The SARS-CoV-2 virus spreads primarily between people who are in close contact (6 feet) with an infected person through respiratory pathways, although it can also be transmitted through contact with contaminated surfaces or objects [1]. Currently, the COVID-19 infection is being declared as a pandemic by the World Health Organization [2].

COVID-19 has exposed health workers to exceptional level of risk as they are at front line of the COVID-19 prevention, control, and management. In fact, data from many countries across WHO regions show that COVID-19 infection rate among health workers is much higher than those in the general population [2]. Among the factors leading to increased infection rate, shortage of Personal Protective Equipment, high workload, lack of knowledge and training related to prevention of COVID-19 infection are of importance [4].

The current outbreak of COVID-19, places healthcare workers at greater risk of infection as they are in close contact with patients. Ministry of Health has obtained the service of two hotels to place staff under quarantine. This has provided an opportunity to study the possible causes of exposure of health workers for COVID-19 infection.

General Objective: To describe the possible causes of exposure of health staff in Sri Lanka for COVID-19 infection and to review suggestions made by health staff for minimizing such exposure.

Specific Objectives:

1. To describe the socio demographic characteristics of the sample;
2. To describe the source of possible infection;
3. To assess the awareness and practice on use of personal protective equipment;
4. To describe the recommendations for staff under quarantine to prevent future staff exposure.

Methodology

Study Design

A descriptive cross-sectional study was conducted among health staff who were staying at quarantine centers.

Study period

October 2020 to December 2020.

Selection Criteria

All health staff with a history of exposure to a suspected or confirmed case of COVID-19 quarantine during October 2020 and December 2020 in centers organized by the ministry of health was included.

Sample size

All staff quarantined from October 2020 to December 2020 was included in the study.

Study Instrument

Data were obtained through a self-administered questionnaire which collected data on socio demographic characteristics, history of exposure to a patient with COVID-19 and facilities available for personal protection at workplace. The questionnaire was pretested among staff working in curative and preventive sector of Colombo district. The health staff of Sri Lanka army who managed the two centers were trained on the questionnaire and acted as coordinators of the data collection process.

Data collection

The questionnaire was distributed to the health staff when they were already staying in a quarantine center. They were requested to fill the questionnaire and hand them over on discharge or transfer from the center. It was advised to contact the army health officers if they have any problems in understanding a question when they make daily rounds to measure the temperature.

Results

Basic information

A total of 80 participants representing 11 health institutions were included in the analysis with the response rate of 100%. Majority were females (n=46, 57.5%) and the mean age of the study sample was 37.7 years (SD=8.7). Most (n=34, 42.5%) were nursing officers followed by health assistants (n=25, 31.3%) and medical officers (n=9, 11.3%).

Details related to the exposure of confirmed/suspected case of COVID-19

Majority (n=79, 98.8%) were exposed to confirmed/suspected cases of COVID-19 within their health institution and 60% (n=48) were exposed within the

hospital ward they work, followed by hospital kitchen (n=8, 10%), ICU (n=6, 7.5%) and Operating Theatre (n=6, 7.5%).

Availability of PPE and distancing

Source of exposure was a client/patient among 55% (n=44), or a staff member among 33.7% (n=27). At the time of exposure, majority wore only a facemask (n=43, 53.8%) and about 45% (n=36) wore both facemasks and gloves. However, only 5 (6.3%) wore facemasks, gloves and overall at the time of exposure.

With regard to the type of facemask, a great majority (n=73, 91.3%) wore a surgical mask, while 6.3%(n=5) and 2.4%(n=2) wore a N-95 mask and a cloth mask respectively.

Unavailability of overalls (n=33, 41.3%), gloves (n=8, 10%), sanitizer (n=5, 6.3%), and soap (n=3, 3.8%) was reported by the sample.

Among the sample, only 75% (n=60) were able to maintain one meter gap between each other while working. The reasons for inability to maintain one-meter gap were nature of the job (n=71, 32.9%), inadequate space (n=25, 32.9%) and poor attention of staff members (n=6, 7.9%).

Of the total sample, 76.2% (n=61) have a common place to have their meals. Moreover, a considerable proportion (n=30, 37.5%) have the practice of sharing meals with their colleagues.

Awareness of COVID-19 preventive measures

Sources of awareness related to prevention of COVID-19 were circulars (n=30, 37.5%), electronic media (n=29, 36.3%), workplace training (n=25, 31.3%), printed media (n=17, 31.3%) and online training (n=5, 6.3%). Table 1 shows the mode of receiving information related to prevention of COVID-19 according to the staff category.

Table 1: Mode of receiving Information on COVID prevention according to the staff category

Staff category	Mode of awareness						
	Workplace training	Online training	Circulars	Electronic media	Printed media	Social media	No training
Medical officers	1 (11.1%)	2 (22.2%)	6 (66.7%)	4 (44.4%)	1 (11.1%)	4 (44.4%)	2 (22.2%)
Nursing officers	13 (38.2%)	3 (8.8%)	18 (52.9%)	17 (50%)	11 (32.4%)	14 (41.2%)	4 (11.8%)
PHII	0 (0%)	0 (0%)	1 (20%)	0 (0%)	0 (0%)	0 (0%)	4 (80%)
Minor Staff	11 (23.9)	0 (0%)	5 (10.8%)	8 (17.4%)	5 (10.8%)	7 (15.2%)	10 (21.9%)

Forty nine percent (n=39) were satisfied about the training/information they received while 11.3% (n=9) were not satisfied. However, 40% (n=32) did not respond to that question.

Majority (n=51, 63.8%) of the participants requested training on prevention of COVID-19 for health staff but 26.2% (n=21) did not give any answer. Table 2 shows the results.

Table 2: The need for training according to the staff category

Staff category	Need for future training			Total
	Yes	No	No answer	
Medical Officers	6 (66.7%)	0 (0%)	3 (33.3%)	9 (100%)
Nursing officers	22 (64.7%)	6 (17.6%)	6 (17.6%)	34 (100%)
PHII /Food Inspectors	3 (60%)	0 (0%)	2 (40%)	5 (100%)
Minor Staff Categories	20 (62.5%)	2 (6.2%)	10 (31.3%)	32 (100%)
Total	51 (63.8%)	8 (10.0%)	21 (26.2%)	80 (100%)

Among the reasons of exposing health staff for COVID-19, wrong information given by patients (n=60, 75%), more workshifts (n=53, 66.3%), ignorance of health staff (n=40, 50%), lack of PPE (n=32, 40%) and poor knowledge on safety methods (n=29, 36.3%) were stated by participants.

With regard to measures to be taken to prevent the exposure of health staff, suggestions made by participants are shown in Table 3.

Table 3: Measures to be taken to prevent the exposure of health staff

Suggested measures	Details
<ul style="list-style-type: none"> Provision of adequate facilities for health staff/other staff 	<ul style="list-style-type: none"> Provide PPE, transport and accommodation Pay special attention on nutritional status of health workers Proper sanitization of common places such as toilets, rest rooms, meal rooms etc. Provide PPE for all cleaning service staff members
<ul style="list-style-type: none"> Necessary administrative decisions by higher authorities 	<ul style="list-style-type: none"> Reduce excessive number of duty shifts per person Minimize duty shifts for pregnant and other workers who have chronic diseases Ensure adequate rest between two duty shifts Reduce the duration of a single work shift Divide whole staff into groups and allocate duty on shift basis Restrict hospitalization of patients as far as possible Limit visitors to the hospitals Proper triage of patients according to the risk for COVID-19 Minimize the number of ward rounds per day Need to have separate COVID ward for each specialty Perform random PCR among staff members Perform PCR on suspected patients
<ul style="list-style-type: none"> Training/education for health staff 	<ul style="list-style-type: none"> Conduct special training program for health workers on COVID-19 and Its prevention Make the staff aware about aerosol generation procedures and preventive measures Display a poster on how to wear and remove full PPEs

Discussion

The aim of this study was to explore the causes for exposure of health staff for COVID-19 infection and to review the suggestions made for health staff for minimizing the exposure of COVID-19 infection among health staff. Nursing officers were the predominant healthcare workers among the frontline health workers exposed to COVID-19 infection as found in other studies [6]. Further, this study demonstrated that most of the exposure of health staff members to COVID-19 takes place within the hospital premises mainly in the wards through patients. Similar findings were observed in a rapid review conducted among health workers to assess COVID-19 risk factors [7]. In this study, shortage of PPE and other healthcare facilities were seen in some institutions and this issue was highlighted in many other studies [8-10] elsewhere.

As Wang, Zhou and Liu [6] pointed out, inadequate training on infection prevention and control for frontline healthcare workers is also evident in the present study. This may be due to the reason that they have not had sufficient time for regular training and practice. Even though the lack of professional supervision in infection control is also highlighted in other studies [6, 11], it was not revealed in the present study.

The main reason for exposing health staff for COVID-19 in present study was the wrong information given by patients related to contact history of COVID-19. Similar finding was noted by Das [12] as stigma discourage people to report the disease and take therapeutic action, hence deferring revealing, management and control of the disease.

This study revealed that even during the pandemic period, considerable proportion of health staff members used to share the meals with their colleagues at workplace. Further, in some places, maintaining an adequate distance between two people was not possible due to lack of space and the nature of their job. Therefore, such practices and factors lead to spread of infection among staff members [13].

Conclusions and recommendations

1. Exposure of majority of the staff members to COVID-19 takes place within the hospital premises mainly in the wards through patients. Therefore, special precautions should be taken to prevent spread within the hospital/workplace.
2. Inadequacy of PPE and other healthcare facilities was reported. Thus, it is recommended to provide adequate PPE for personal protection for all staff categories.

3. With regard to receiving information/training related to prevention of COVID-19, there was substantial disparity among all staff categories even within the same institution. Hence, systematic training needs to be conducted for all staff categories in a uniform manner.
4. Majority of staff had a common place to have meals in their workplaces and some had the practice of sharing their meals with others. Therefore, measures should be taken to educate health staff and to prevent such practices in order to minimize spread of COVID-19 among health staff members.

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Strategic framework for strengthening Health system response to Covid -19 pandemic

Ayanthi S. Jayawardena DB, Dharmaratne IP, Hewawasam Renuka, De Silva YNP,
Perera KW, Kaldera Dushani

Abstract

The novel Covid-19 pandemic has emerged a new sequel of distributing scarce resources according to a critical triage system and has put the healthcare management into a greater difficulty in allocating resources. Different countries have addressed these issues in different manners but highlighted on having a good response framework. The Covid operation cell was established during the first wave of Covid-19 in Base Hospital Horana and it was consisted of all relevant stakeholders. It was expanded during the second wave and the functions were done according to the strategic response framework. Decisions were made through several subcommittees. The framework outlined the objective of addressing issues on resources management in health care services at the Base Hospital Horana and to propose strategic actions to strengthen health care services during the Covid-19 pandemic. The strategic response framework included institutional policies, continuation of patient care, human resource management, logistic management, caring and emotional support for Health Care Workers (HCWs) and environment cleanliness. Most of the developments within the hospital were done to continue healthcare services to the patients while safeguarding the staff. The outcome of the response framework was to give the maximum service for patients without any intra-cross infections among HCWs.

Key words: Covid-19, Response, Risk Assessment, Resource allocation

Introduction

The Covid-19 pandemic has put an enormous strain on Health systems all over the world. Countries need to expand healthcare delivery system to the public, expand hospitals and increase critical care [1]. Health systems in these countries have limited resources. Therefore, allocation of scarce resources was the major difficulty faced by the health authorities during this pandemic [1, 2, 3]. An expert panel has highlighted the importance of a critical care triage system to allocate scarce resources [1, 3, 4, 5]. Managing a hospital in a critically changing environment is a challenge [6, 7, 8, 10, 11, 12] and it is important to focus on maintaining essential health care services while technically sound use of scarce resources for the Covid-19 response [9, 13].

Justification

It is a need of healthcare system to design and develop a contingency strategic action plan or a framework [5] which is applicable to Sri Lanka to combat future occurrence of pandemics.

Objective

To describe the issues on resources management in health care services at the Base Hospital Horana and to propose a strategic response framework to strengthen healthcare services during the Covid-19 pandemic.

Methodology

A descriptive cross sectional study was conducted with both qualitative and quantitative components based on data collected at the infection control unit, by desk reviews, Focus Group Discussions (FGD) and Key Informant Interviews (KII). The Covid operation cell was established and initiated the strategic response framework including institutional policies, continuation of patient care, human resource management, logistic management, caring and emotional support for Health Care Workers (HCWs) and environment cleanliness.

Results

Horana is a type A Base Hospital with 518 beds before Covid-19 but it was increased by 10 beds after establishment of Covid isolation ward. The total number of health staff was 758 (21 specialists, 119 medical officers, 301 nursing officers, 227 orderly staff, etc.).

Institutional policies

The Covid operational cell was established on the second week of March 2020 and it was more strengthened during the second wave of Covid-19 with subcommittees of Action team, Data collection and Risk analysis team, Logistic management team, Health education and training team, Infection control team, Grievances handling team and a focal point to communicate with external health authorities and all the activities were under the supervision of the Medical Superintendent. The institution adhered to all the guidelines and circulars issued by the Ministry of Health regarding Covid-19 preparedness. The most striking issue was to develop isolation units as a novel requirement of healthcare services with already under cadre healthcare staff.

Continuation of patient care

Fever was checked at hospital entrance points. A triage unit was expanded to 24 hours functioning with Medical Officers (MOs) and nurses (NOs). A fever corner was established with an isolation room to separate the patients with fever or respiratory symptoms. A fully equipped ten bedded isolation ward was established with a High Dependency Unit (HDU), glass partitions with fullest security to the staff and microphone system to communicate with patients. The health education team has published posters/banners/leaflets/daily announcements/television videos regarding Covid-19 infection and preventive measures and advised on properly wearing a face mask and hand washing. Only one visitor per patient was allowed and restricted visiting time to minimize overcrowding. An isolation emergency room was established with separate donning and doffing area at the Preliminary Care Unit (PCU). Three huts were established in an open space to maintain social distancing. One meter distance lines were marked at waiting areas at the Out Patient Department (OPD), pharmacy lobby. Drugs were distributed for two months for patients. Delivery system was arranged to deliver medicines for the clinic patients to their doorstep. Outreached medical clinics for elders were continued. Public Health Nurse has continued giving home based palliative care services throughout the period. After converting Homagama, Pimbura and Ingiriya as Covid hospitals our drainage area for seeking antenatal care and haemodialysis were increased. Isolation beds were established in labour room and dialysis unit.

Human resource management

Staff members were advised to wear face masks and face shields as well and not to gather in staff rooms while having their meals. Nurses and orderlies were mobilized to fever corner and isolation ward according to a common roster. They were allocated for shorter duty hours.

Logistic management

Initially availability of Personal Protective Equipment (PPEs) were unsatisfactory due to various delays of supplies in spite of almost doubling the requirement. Table 1 describes the increased use of PPEs during the Covid-19 period.

Table 1: Details of the number of PPEs used at the BH Horana during the 1st wave and the 2nd wave of Covid-19 with comparison use in 2019

PPEs used	From April 2019 to January 2020		From April 2020 to January 2021	
	Apr.- Aug.	Sep. – Jan.	Apr.- Aug.	Sep. – Jan.
Face masks	38550	44000	78850	89530
Examination gloves	135300	137650	218050	221850
Goggles	00	00	40	49
Face shields	00	00	567	1896
N-95 masks	00	00	92	1780
Coveralls	00	00	168	1230
Head covers	00	00	26	285
Original PPEs	00	00	54	1141
Isolation gowns	00	00	05	353

Therefore, the supply committee has designed an exposure risk assessment tool to prioritize the risk level of exposure to Covid-19 before allocating PPEs. Staff were promoted to prepare face masks, coveralls, head covers, pyjamas, and other PPEs once the materials were supplied by the hospital management.

Caring and emotional support for HCWs

The grievance subcommittee was established consisting of the Psychiatrist, MO/Mithuru piyasa and a senior MO to address psychological distress, fatigue, occupational burnout, stigma and fear of cross infection and real need of Polymerase Chain Reaction (PCR) sampling and PPEs.

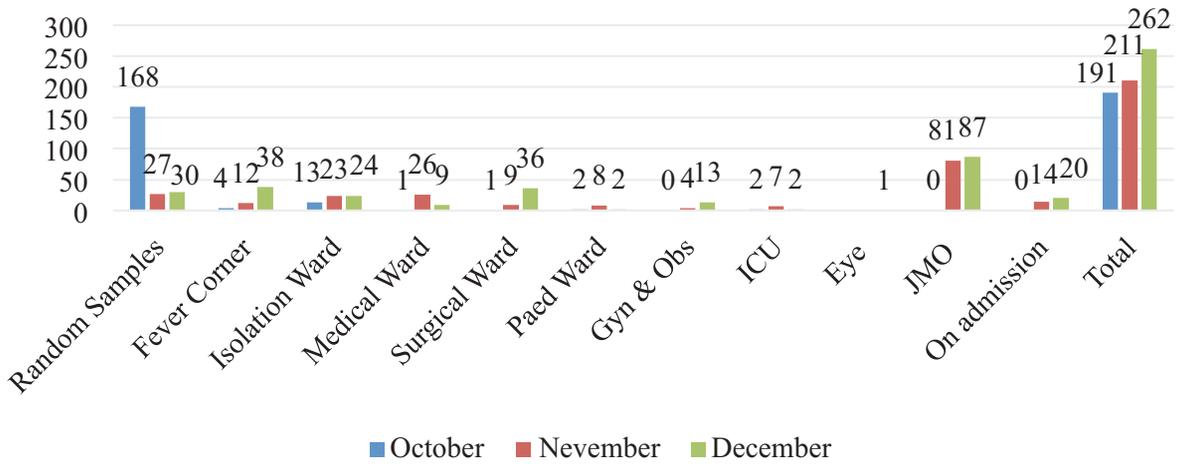
Environmental cleanliness

Environmental continuous cleaning was ensured with Tropical Chloride of Lime (TCL) spraying, mobbing walls, floors, windows according to a time table and appointed a responsible person to monitor it. Elbow taps, peddled washbasins, peddled waste bins and adequate soap were provided at the entrances to each and every unit and the process of hand washing was continuously supervised by the infection control team.

Outcome of the response framework

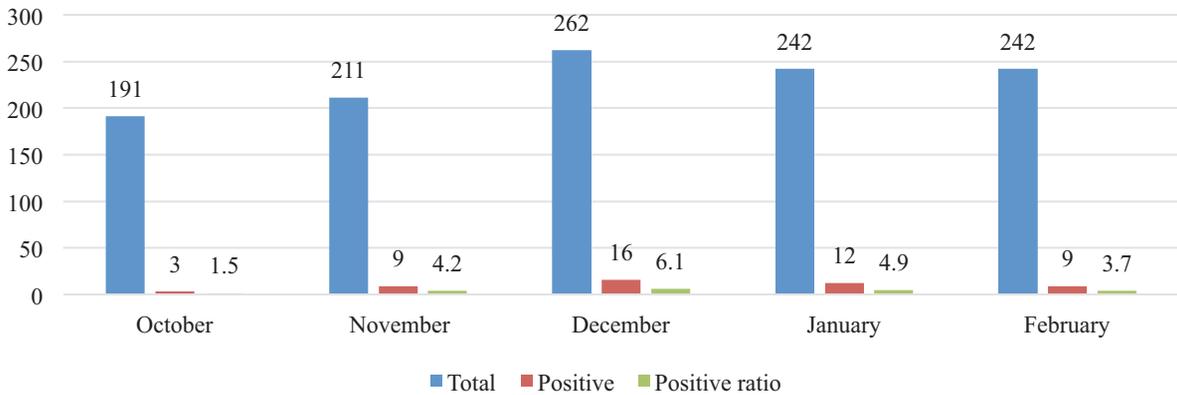
The number of PCR samples done at different units during the second wave of Covid-19 are described in figure 1.

Figure 1: The number of PCR samples done at different units from October to December 2020



The number of PCR samples done, the number of positives and the positivity ratio in the second wave of Covid -19 are described in figure 2.

Figure 2: The total number of PCRs done, number of positives and positivity ratio from October 2020 to February 2021



There were only twelve PCR positive cases identified with risk of cross contamination to the staff. These 12 cases are described in table 2.

Table 2: Details of cross contamination to the staff reported during the 2nd wave of Covid 19

No	Date	Place	Incidence in brief	Risk forms collect (No)	Covid Operation cell decisions after performing risk assessment	PCR done (No)	+ve/-ve
1	06/10/20	Ward (WD) 5	Nursing officer's husband +ve (working at Brandex)	163	1st line- 40 2nd line 108	148	-ve
2	02/11/20	WD 1, 5, 10	5 Close contacts with Bodyline garment	Not nec.	Quarantined at home	00	00
3	07/11/20	WD 9 +ve,	NO's husband at Bodyline	40	All contacts exposed were on relevant PPEs during working hours but had taken meals together in the night.	21	-ve
4	23/11/20	WD 14	Covid +ve patient has come to ward. Contact period 8-10min. MO/PBU- visited for 15 min.	None	Contact was not significant MO - home quarantined	00 00	01 -ve
5	28/11/20	WD 2	Husband and child +ve of a mother admitted for Caesarean Section.	32	Decided to do PCR if Mother becomes +ve but mother's PCR was -ve and Delivered safely	00	00
6	02/12/20	PCU, WD 7, ENT, EYE Radio. Dental Theater (OT)	Patient after Road Traffic Accident (RTA) had several lacerations on face/oral cavity became +ve	41	PCU, EYE, ENT, Dental – Minimum risk. WD 07, OT and Radiology b/c very close contact with pt.'s face, 12 home Quar.	12	-ve
7	06/12/20	OT	HCW's Husband +ve	Not nec.	Home quarantined. No sig. contacts.	00	00
08	06/12/20	WD 5	HCW's Son's close contact +ve	Not nec.	Home quarantined. Son's PCR became -ve	00	00
09	20/12/20	LSO	Lady Security Officer +ve. - one night shift during contact period and had dinner with a staff member	12	11 Security officers & one HCW -had meal with Pt. 4days back	12	-ve
10	02/01/21	OT	Family of Seamstress +ve 9 days passed when identified as +ve	04	Op. cell decided to do Rapid Antigen Tests but PCR done on Anesthetist request.	04	-ve
11	06/01/21	OPD	NO's husband working in Police dept. got +ve. NO got +ve done by MOH	Not nec.	NO has not reported to duty during the contact period	00	00
12	13/01/21	WD 4	PCR +ve of a patient waiting for surgery	31	PCRs were done on patients who were in close contact with +ve patient	20	-ve

None of them were identified as Covid-19 positive and there was no cross infection among HCWs.

Discussion

It was agreeable that outbreak preparedness was a major challenge in a scarce resource setup in our setup and in other countries as well [4, 6, 7, 9, 10, 11]. Hospitals in other countries had a similar experience to combat Covid-19 concurrently safeguarding the staff and their families using a rapid response structure which were similar to strategic response framework used in this hospital [5, 6]. Achievements were also the same that there were no intra-hospital infections reported [5]. Most of the literature touched on right strategies in the right time to control the disease [8, 12, 13] but this paper highlighted the importance of having a right strategic framework at the right time to continue patient care with zero intra-hospital infections.

Conclusion

Managing a hospital during the Covid-19 pandemic is a challenging task with scarcity of resources. Combating Covid-19 without any restrictions in services was the main challenge for all HCWs. Implementation of the strategic response framework was the key success in this hospital to give the maximum service for patients without any cross infections among HCWs. Neither they took the Covid-19 to their families from the hospital nor spread the disease to their co-workers from outside.

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“Buddy the saviour”: Selected managerial strategies deployed to facilitate Infection Control in a hospital during the COVID-19 pandemic: Experience from the National Referral Centre of Sri Lanka

Attanayake H, Wijewickrama A, Idampitiya D, Athukorala S, Sooriarchchi C, Udugamakorala G, Peramuna C, Karunartne M.

Abstract

Introduction: National Institute of Infectious Diseases (NIID) is the apex referral centre for clinical management of COVID-19 in Sri Lanka. It has remained resilient through twelve months from the onset of the pandemic. Infection Control was one of the prime concerns of its management.

Objective: The objective was to describe managerial strategies adopted by NIID to facilitate infection control during the COVID-19 pandemic.

Methods: This was a descriptive case study. Data was gathered through Key Informant Interviews and by examining hospital records.

Results: Training and improving awareness on infection control, ensuring good hand hygiene practices, management of Personal Protective Equipment (PPE), developing institutional capacities to ensure good infection control, effective cleaning and disinfection and prompt and proper management of staff outbreaks were the managerial strategies deployed by NIID to facilitate infection control.

Conclusions: Training and improving awareness on infection control, ensuring good hand hygiene practices, management of Personal Protective Equipment (PPE), developing institutional capacities to ensure good infection control, effective cleaning and disinfection and prompt and proper management of staff outbreaks are effective managerial strategies in facilitating infection control in a hospital setting.

Keywords: COVID-19, Infection Control, NIID

Introduction

National Institute of Infectious Diseases (NIID) is the National Focal Point for the clinical management of Infectious Diseases in Sri Lanka. It has managed patients with pandemic diseases such as Severe Acute Respiratory Syndrome (SARS), Avian Influenza and COVID-19 as of late.

Presently it serves as the Apex Referral Centre for clinical management of COVID-19 in Sri Lanka giving the clinical leadership to more than ninety (90) COVID-19 treatment centres island wide. As at 28.02.2021 NIID has treated 2703 COVID-19 positive patients, 1716 patients who were suspected of COVID-19; including 155 patients requiring critical care in the intensive care unit (ICU).

NIID has a bed strength of 150 for COVID-19 treatment (Resident Patient Care). It is comprised of two (2) units for single isolation, seven (7) units for cohort isolation and two ICUs.

NIID deploys 650 staff members as its workforce. This includes doctors, nurses, paramedics, health assistants, clerical staff and employees in the contractual services such as janitorial, laundry and security services.

As COVID-19 is a highly transmissible disease spread via droplet transmission mode (WHO, 2020) Infection Control was a challenge from the very beginning and was one of the top managerial concerns during the pandemic. The Infection Control of the hospital was monitored by the Infection Control Unit, The Infection Control Team (ICT) too played a vital role in trouble shooting and streamlining processes.

Objective:

To describe the managerial strategies adopted by NIID to facilitate infection control during the COVID-19 pandemic.

Methods

This was a descriptive case study. The period under the study was from 26.01.2020 up to 28.02.2021. Data was collected mainly through Key Informant Interviews (KII) and by examining Hospital Records. Data was entered both manually and electronically by the Principal Investigator (PI).

PI interviewed the four (4) Senior Consultant Physicians, two (2) Consultant Microbiologists, a Special Grade Nursing Officer (1), Infection Control Nursing Officer (1) and fifteen (15) in charge sisters/senior nurses in-charge of different units in KII. A semi structured interview schedule was used to collect data. The interview

schedule covered core areas in infection control such as Hand hygiene, Personal Protective Equipment (PPE) & management of staff outbreaks. Subsequently three successive workshops were organized to synthesize, analyze and stabilize data gathered through KII. This improved the accuracy, validity and reliability of the gathered data.

Results

The following managerial strategies were deployed by NIID to facilitate infection control during the COVID-19 pandemic.

1. Training and improving awareness on infection control
2. Ensuring good hand hygiene practices
3. Management of Personal Protective Equipment (PPE)
4. Developing institutional capacities to ensure good infection control
5. Effective cleaning and disinfection
6. Prompt and proper management of staff outbreaks

Training and improving awareness on infection control Although the COVID-19 outbreak erupted in Sri Lanka in January 2020, the preparations for a possible pandemic disease were made following the announcement of Ebola as a public health emergency of international concern by the World Health Organization (WHO) in July 2019. A preparedness assessment was conducted and several recommendations were made in a view of improving institutional capacity. Training was one of the main concerns.

Doctors, nurses, paramedics and health assistants were scheduled for simulation drills conducted by the Planning Unit with the objective of improving knowledge and practices in core areas such as the use of personal protective equipment (PPE), standard precautions and occupational hazards. These simulations were videoed and reviewed by a panel of consultants. Gaps and mistakes were identified and communicated to the respective participants following the review. The final disaster management preparedness drill conducted in 05.09.2019 was evaluated by an external panel of experts. Following their comments certain protocols were revised. This enabled the staff to develop capacities and confidence even before the pandemic.

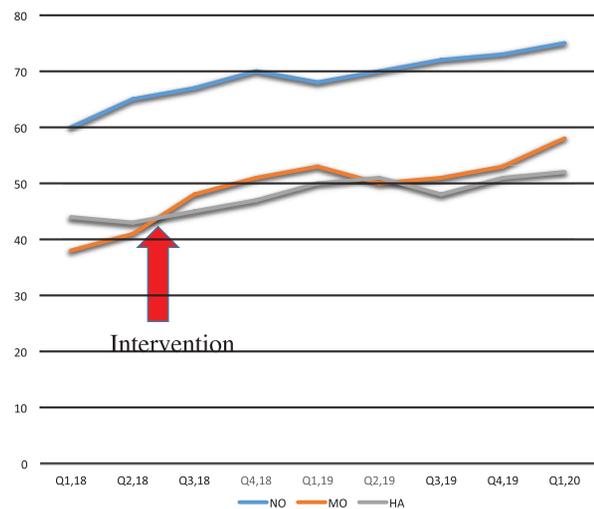
Ensuring good hand hygiene practices

Facilities for hand washing were improved for both staff and patients. Hand washing areas were established at the main entrance, entrance to clinic and OPD areas and

in certain selected areas at the entrance to wards/units. Decanters with hand rub were placed by the side of the corridors with instructions to use in all three languages.

Hand hygiene is not only about facilities but also about practices. This aspect has been highlighted even before the dawn of the outbreak where a quality improvement project was launched in 2018 in a view of improving hand hygiene compliance (HHC) of the ICU.

Figure 01 below shows the hand hygiene compliance among doctors, nurses and health assistants in the ICU in each quarter from 2018 through 2020.



According to figure 01, the HHC has been progressively improving in each staff category over the years following the intervention (quality improvement programme). This favoured the ICU to remain resilient having optimum infection control while treating large volumes of patients (n=155) with COVID-19.

Management of Personal Protective Equipment (PPE)

Management of PPE is also of great importance in infection control. It has following aspects.

I. adequacy

There were at least nine (09) PPE items that were required to ensure protection against COVID-19.

They were

- a. overall/coverall/isolation gown
- b. polythene apron
- c. hair cap
- d. mask/respirator
- e. goggles or face shield
- f. head cover
- g. shoe covers
- h. boots
- i. gloves

All PPE items (9) required per one health worker per one visit to the ward, were arranged as a “set”. The requirement of these PPE sets varied according to the number of patients, criticality of patient illnesses, unit functions and deployed number of health workers to the respective unit. For the four (4) bedded ICU, 10-15 PPE sets were required per patient per day, which was the highest requirement. Should all resident patient care units be fully operational (including the two ICUs) the average requirement of PPE sets was one (1) per patient per day.

A dedicated team comprised of a Medical Officer, Matron and two Pharmacists were deployed to assess and monitor the use of PPE and forecast the fresh requirement according to the user pattern on a daily basis. This ensured the adequacy of PPE.

When there were disturbances to the supply chains, shortages were observed in many occasions. In such instances alternatives or donated items were used.

NIID maintained a stock of 200 PPE sets as a buffer to mitigate risk of shortages in surges.

II. Quality assurance and quality control

The specifications for PPE were prepared by a panel of consultants after studying both local and international guidelines. Comments and complaints made by end users were also considered in the formulation of specifications. As with donated items, several sample checks were done by a team comprised of the Consultant Microbiologist, Consultant Physician, Matron, Infection Control Nursing Officer and Pharmacist.

Filtration efficacy of the donated respirators were checked at Sri Lanka Institute of Nano Technology (SLINTEC).

III. Storing

Storing of PPE was also an important aspect in PPE Management. Once available stores were exhausted, insulated and air conditioned containers (n=5) were used to store PPE. All PPE items were stored below 250 C.

IV. Continuous training and simulations

Training given to the staff at the preparatory phase was an investment as it prevented possible misuse/overuse of expensive PPE items and thereby reduced wasting. But it was observed that certain staff members have got accustomed to their own techniques in donning and doffing PPE and have even developed “confidence” in doing so. As such clinical teams were invited for simulations in small groups. A volunteer from the group was requested to simulate donning/doffing and team along with an expert criticized the technique constructively. This enabled the staff members to realize the consequences by getting used to wrong/substandard techniques.

V. Close surveillance of donning and doffing of PPE

Irrespective of the training any health worker may perform poor when it comes to donning and doffing due to anxiety, or mental/emotional stress. This was given thought from the very beginning. A “buddy” (a member from the same clinical team) was appointed to inspect the donning and doffing of PPE of a fellow team member and comment on his fine movements when performing duties.

Buddy was expected to be the helpful shadow of the health worker giving patient care, who escorted him up to the red zone (patient area). Buddy observed the movements of his counterpart being in the yellow zone (staff area) with adequate and appropriate PPE.



Figure 2: The Buddy inspecting the donning of a health worker.

Figure 2 above is a photograph of the Buddy inspecting the donning of a health worker before he enters the isolation room.

Developing institutional capacities to ensure good infection control

A new unit of 16 rooms was put up strengthening the single isolation capacity. This enabled separation of positive patients from suspects.

The Mechanical Ventilation and Air Conditioning system (MVAC) of the Intensive Care Unit was renovated establishing the required negative pressure gradient. This enabled effective suction of the contaminated air in the isolation cubicle. High Efficiency Particulate Air (HEPA) filters were inserted to the air conducting system.

Additional air conditioners and air curtains were inserted to improve staff comfort as wearing nine items (9) of PPE for long hours itself was exhausting.

Transparent physical barriers were inserted in triage and reception areas separating patient from the care giver. Intercom facilities were provided where appropriate to communicate with the patient.

Effective cleaning and disinfection

Based on the recommendation by the Infection Control Committee, cleaning of the clinical units was removed from the out-sourced janitorial service and handed over to the Health Assistants under the supervision of the nursing staff. As this was done proactively before the pandemic which enabled effective cleaning during the pandemic.

Cleaning and disinfection was carried out as per national guidelines.

As few undesired effects of hypochlorite were observed when it was used as a disinfectant, a hydrogen peroxide vapourizer was used as an alternative especially in ICUs, isolation rooms and ambulances.

Management of staff outbreaks

Table 01 below shows the total number of staff members who became positive for COVID-19 in each quarter (an accumulative figure) during the period 26.01.2020-28.02.2021 and the corresponding number of co-workers who were quarantined (an accumulative figure) as a result of staff member becoming positive.

Table 01: Number of staff members positive and quarantined in 2020-21

	Number of staff members who got positive for COVID-19 (n=650)	Number of staff members who were quarantined by Risk assessment committee	Ratio of number of positive staff members : number of staff members who were quarantined
1st Quarter 2020	01	12	1:12
2nd Quarter 2020	00	00	-
3rd Quarter 2020	00	00	-
4th Quarter 2020	07	43	1:6
1st Quarter 2021 (up to 28. 02.2021)	17	40	1:2
Total	25	95	1:4

According to table 01, a total of 25 staff members has been positive for COVID-19 and 95 of them have been quarantined as a result in the said period. It is worth noting that the number of coworkers that required to be quarantined per one positive staff member was evidently becoming low even at such times the positive numbers were relatively high. This was probably due to the prompt and proper actions taken up by the management in such situations. Some of them are denoted below.

- I. Performing both Rapid Antigen Test (RAT) and PCR in all exposed health care workers as early as possible separating the non-infected from infected to curtail the spread
 - II. Decontaminating all staff areas of the unit
 - III. Re-emphasizing the importance of wearing masks, face shields, keeping distance, avoiding having meals/tea together and hand hygiene
 - IV. Providing adequate separate spaces for the staff to rest in rest hours
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Discussion

Usually, the health worker is relatively safe at the point of the care delivery. But not in a pandemic. Nobody gets spared in a pandemic- neither the health worker nor the patient nor the visitor. As such Infection Control is one of the prime managerial concerns in a hospital during a pandemic. The top management has to come up with effective strategies innovatively to facilitate infection control. Strategies that are meant to educate, train, monitor, mentor and most of all supervise the infection control at the work front.

“The buddy” concept is a classic example of inserting intense supervision to a clinical unit in a more worker friendly approach. Buddy is not necessarily be a superior; nor a stranger, but a team member who observes the coworker in a view of preventing a possible exposure. Buddy is interchangeable and can even be the unit in charge when deploying a new comer.

The infection control team (ICT) cannot singly handle everything on its own during a pandemic. The management should liaise clinical units with the ICT to facilitate its functions.

Conclusions

Training and improving awareness on infection control, ensuring good hand hygiene practices, management of Personal Protective Equipment (PPE), developing institutional capacities to ensure good infection control, effective cleaning and disinfection and prompt and proper management of staff outbreaks are effective managerial strategies in facilitating infection control in a hospital setting during COVID-19 pandemic.

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Knowledge, attitudes and practices among grade medical officers of District General Hospital Matara on circulars issued by Ministry of Health, Sri Lanka.

Perera KYD, Amadoru SDS, Dileka WSC, Karunaratne HMAH, Dissanayake Y.

Abstract

Introduction: Circulars help official communications from higher authority to operational level. Government circulars issued by the Ministry of Health (MOH) and other institutions affect the Medical Officers (MOs) in numerous ways and serve multiple purposes.

Objective: To assess the knowledge, attitude and practices (KAP) among MOs of District General Hospital (DGH), Matara on circulars issued by MOH.

Methodology: This descriptive cross-sectional study was carried out at DGH, Matara by interviewing 216 MOs using a self-administered questionnaire. Data were analyzed with regards to proportions. Associations were checked using chi square test.

Results and Discussion: Among 185 respondents, most were grade II MOs (n=102, 55%) and only 18% (n=33) had administrative experience. All knew that circulars are issued by MOH. 95% knew about the circular on Disturbance, Availability and Transport (DAT) allowance of MOs but only 35%-62% knew about other circulars. Majority accepted that circulars are important for better administration (85%) and medical practice (88%). Only 55% (n=102) identified the importance of referring circulars frequently. Reasons for referring circulars were mainly related to personal interest. Main perceived barriers for referring circulars were difficulty in accessing 75% (n=138), lack of interest 61% (n=113) and difficulty of understanding technical language 44% (n=81).

Administrative post experience had a statistically significant association with the level of knowledge (p=0.035), good attitudes (p=0.048) and good practices (p=0.042) while Grade seniority affected positively on KAP of circulars.

Conclusions and Recommendations: Most were aware about the circulars issued by the MOH and majority accessed circulars for personal interest. Good KAP were shown by doctors with administrative experience. Sensitize newly-appointed MOs on use of circulars and increase accessibility is recommended.

Introduction

Despite of being categorized as a middle income country, the level of achievement in quality of life indices such as Physical Quality of Life Indices (PQLI), Human Development Index (HDI) and International Human Suffering Index (IHSI) of Sri Lanka is far better compared to other South East Asian regional countries with similar per capita income(1).

Currently SL has 1085 government sector curative health care institutions (3) and 338 preventive / community health care institutions under the Medical Officer of Health. The total employees of 123855 in the MOH are distributed as 66993 in the line ministry and 56852 in the provincial ministry level(2). Among them 17,615 are Medical Officers (MOs) who are deployed in as an all island basis(3)

There should be an efficient way of transferring information on recent changes in morbidity and mortality patterns, recent improvements in screening, diagnosing, and managing patients, changes in organizational structure and improvements and changes in administrative matters taken by the top-level management of MOH to the Grade MOs(5). Circulars are the most convenient, reliable, legal, cost effective and efficient method of transferring information to the staff to perform their duties at grass root level (5).

Circulars are issued by Ministry of public administration, Treasury, or by Ministry of Health and they can be Administrative or Clinical circulars (Public Health / Curative Health)(5) and disseminating through web-based systems, sending the hard copies to hospital administrators and displaying on the common/ward notice board etc.

Grade medical officers who work in curative and public health sectors must update their knowledge to be in par with global health development. However, in SL, most health professionals lack Continuous professional development process other than those who involved in post graduate training programmes(8). There are numerous occasions where medical officers were taken to task for violating rules and regulations defined by the administrative circulars mostly due to their lack of knowledge about the contents. Further, being the government servants who engaged in public service, and engaged in private practice who treat different ages and different conditions they are legally bound to be aware about the new changes within the system(2).

However, no research has been done in Sri Lanka so far about the knowledge, attitude and practices on circulars among the MOs despite the number of circulars issued. Moreover, it is timely to understand the perceived gap in knowledge, attitude and practices owing to various incidents reported in the country to medical administrators. Thus, identifying the existing gap is very important for better service delivery.

Objective

To evaluate the knowledge, attitudes and practices among grade medical officers of DGH Matara with regard to the circulars issued by MOH.

Methodology

Descriptive cross-sectional study, carried out in District General Hospital, Matara (DGH Matara) among 216 Grade medical officers selected through systematic sampling belonging to grade I and grade II, and who have completed a minimum 2 years of experience after completing the internship, conducted from February 2018 to August 2018. The Circulars used for this study was issued only by MOH and were administration related circulars based on their significance to the grade medical officers, issued between 1st of January 2013 and 1st of August 2017.

Self-administered questionnaire was distributed after obtaining informed written consent. Data analysis was done using SPSS 21 version software and analyzed using descriptive and analytical techniques.

Results

Out of 216 MOs who were eligible only 185 participated for the study. The response rate was 86%.

4.1 Socio demographic characteristics of the Medical Officers in DGH Matara

Table 4.1 - Distribution of the sample according to the socio demographic characteristics of the sample

Characteristic	No.	Percentage (%)
Gender		
Male	102	55.1
Female	83	44.9
Age		
<35 years	35	18.9
35-45years	95	51.3
>45 years	55	29.8
Post Graduate Qualifications		
Yes	40	21.6
No	145	78.4
Civil Status		
Single	25	13.5
Married	148	80.0
Separated	12	6.5
Total	185	100.0

Table 4.2 - Distribution of the sample according to the employment related characteristics of the Sample

Characteristics	No.	Percentage (%)
Working experience at DGH Matara		
=<5 years	102	55.1
6-10 years	49	26.5
11-15 years	34	18.4
Working experience as a Medical Officer		
=<5 years	35	18.9
6-10 years	95	51.4
11-15 years	55	29.7
Grade Seniority		
Grade 11 MOs	102	55.1
Grade 1 MOs	83	44.9
Working experience in curative sector posts		
=<5 years	48	25.9
6-10 years	92	49.7
11-15 years	45	24.4
Private practice engagement		
Yes	120	64.8
No	65	35.2

Characteristics	No.	Percentage (%)
Administrative post experience		
Yes	18	9.7
No	167	90.3
Total	185	100.0
Working experience in administrative posts		
=<5 years	13	72.2
6-10 years	04	22.2
11-15 years	01	5.6
Total	18	100.0

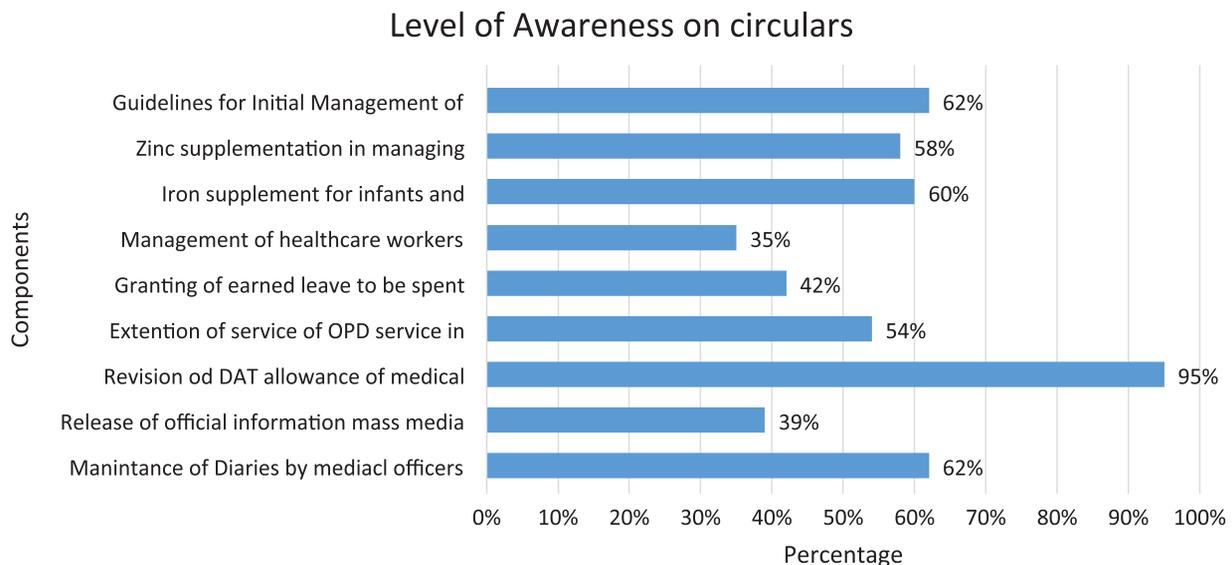
(No.= Number)

As shown in table 4.2, majority of MOs (n=95, 51.4%) were having 6-10 years of working experience, while 9.7% (n=18) were having administrative experience. Majority (n=102, 55.1%) were grade two (II) MOs.

4.2 Knowledge on circulars issued by MOH among the medical officers in DGH Matara.

Almost all of participants knew that circulars are been issued by Ministry of Health and 165 (89%) were aware about the ways of accessing circulars. However, 11 % (n=20) were unaware about other relevant agencies except MOH, who are issuing circulars relevant to Medical Officers. A statistically significant, better level of awareness was shown by the grade 1 MOs (50/63), p=0.004 and MOs with administrative experience (13/18), p= 0.003. MOs practiced more than 6 years showed better level of awareness (99/150) than junior colleagues (10/35) (p=0.08)

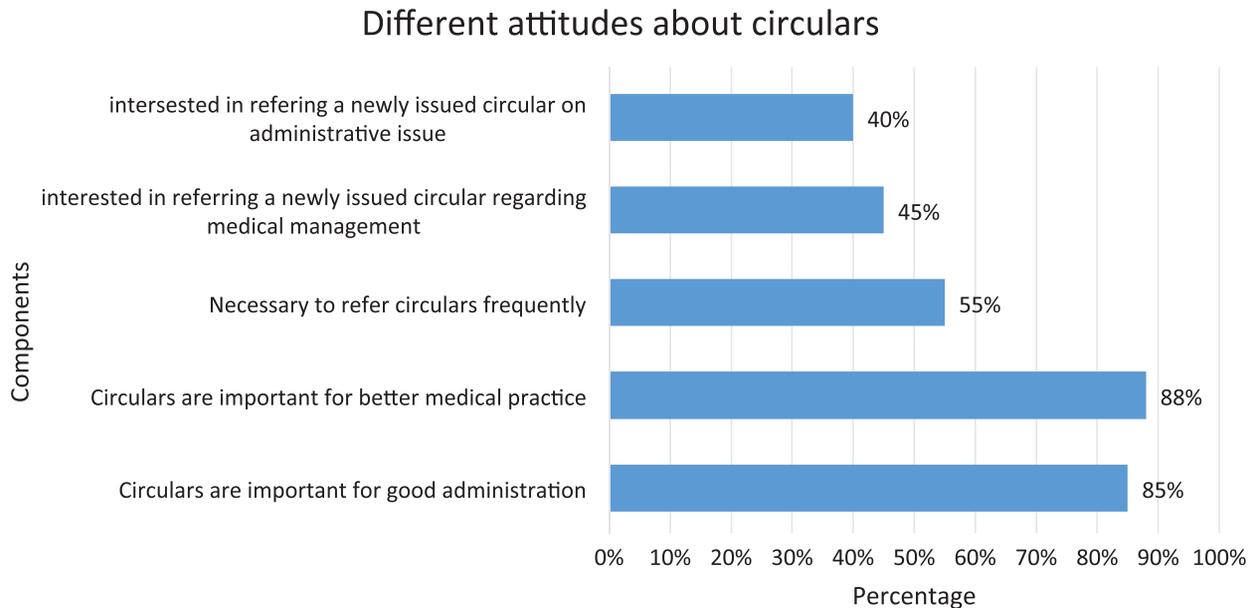
Figure 4.1: Distribution of the sample according to awareness about selected circulars



Ninety five percent (n=176) were aware about the circular on Disturbance, Availability and Transport allowance (DAT) of MOs but only 35%-62% knew about other circulars. The senior MOs (>6 years) showed awareness (148/150) than junior doctors (p=0.002). All the doctors with administrative experience and grade 1 knew about DAT circular.

4.3 Describing the attitude on using circulars issued by MOH among the medical officers in DGH Matara.

Figure 4.2: Distribution of the sample according to the different attitudes about circulars



Most held the opinion that circulars are important for better administration (n=157, 85%) and better medical practice (n=163, 88%). The medical officers with working experience of more than 11 years (p=0.004) and the MOs with experience in an administrative post (p=0.02) showed a statistically significant better level of attitudes than others. Working experience or work place did not show a statistically significant difference in better attitudes (p>0.05). Only 5 % (n=102) identified the importance of referring circulars frequently (p=0.003).

4.4 Describing the practices on using the circulars issued by MOH among the medical officers in DGH Matara.

Among the 185 respondents one hundred and fifteen (62%) referred circulars within past one year of duration. MOs with administrative exposure(p=0.04), MOs with working experience more than 6 years(p=0.02), and grade 1 MOs(p=0.003) had referred the circulars in last year more than the others. Majority (138) accessed electronic copies of the circular while eighty-four (45.4%) participants accessed both hard copies/notice board and electronic copies to refer the circulars.

For 60%, the main reason for referring circulars were mainly personal interest (eg: salary/allowances). Majority (n=97, 52.9%) were interested in referring the circulars addressing administrative and clinical management. But, 8(4.4%) were not interested in any type of circular. Among, the 185 respondents, 84(45.4%) were actively looking for new circulars.

4.5 Describing the perceived barriers for referring circulars issued by MOH among the medical officers in DGH Matara.

Main perceived barriers for referring circular were identified as difficulty in accessing 75 %(n=138) (no computer with internet facility to unit and busy schedule prevents from referring circulars), lack of interest 61%(n=113) and difficulty of understanding technical language used 44%(n=81).

4.6 Assessing the factors affecting knowledge, attitudes and practice for referring circulars, by Medical Officers in DGH Matara

A statistically significant better level of awareness was shown by The grade 1 MOs(50/63), p=0.004 and MOs with administrative experience(13/18),(p= 0.003). The medical officers with working experience more than 11 years(p=0.004) and the MOs with experience in an administrative post(p=0.02) showed a statistically significant better level of attitudes than others. Working experience or place did not show a statistically significant difference in better attitudes (p>0.05). Referring circulars frequently was identified as important by 55%(n=102) of MOs with more than 11 years working experience than the MOs with less experience(p=0.003). Busy schedule had a statistically significant association with engagement of private practice (85/120), p =0.002.

Discussion

A self-administered questionnaire was developed instead of other study instruments to assess the knowledge among the participants, in order to ensure not to lose any important information regarding the knowledge and to avoid interviewer bias. During the development of the questionnaire its contents were discussed with a Senior Medical administrator and a Consultant Community Physician to ensure content validity and face validity of the questionnaire. Questions were structured paying special attention for the simplicity and to reduce the time required to fill and increase the responsiveness.

Almost all participants knew that circulars were issued by Ministry of Health, among them 165 (89%) aware about the ways of accessing circulars. However, 11%(n=20) were unaware about other relevant agencies except MOH, who are issuing circulars relevant to MOs. Only 70% can correctly identify a circular issued by MOH from a normal letter issued by MOH. 95% (n=176) were aware about the circular on Disturbance, Availability and Transport allowance of MOs, but only 35%-62% knew about other circulars.

Most thought that circulars are important for better administration (n=157, 85%) and medical practice(n=163, 88%) while, 55%(n=102) identified the importance of referring circulars frequently. Among the 185 respondents 115(62%) referred circulars within past one year. Among them, majority (n=95, 51.4%) referred the circular issued on Concessions for Motor Vehicle importing. Majority (138) accessed electronic copies of the circular and it was the most favorable method of access. As 60% of participants responded that their main reason for referring circulars was mainly for personal interest(salary/allowances) while majority (n=97, 52.9%) were interested on administrative and clinical management circulars.

The main barriers were, 75% found it difficult to accessing circulars (no computer with internet facility to unit and busy schedule) 61%(n=113) showed lack of interest and 44%(n=81) difficulty of understanding technical language.

Grade seniority, and having administrative experience were shown to have significantly affecting the knowledge and attitudes on circulars. DAT circular was a circular showing one of the best level of awareness. Highest awareness was among the senior MOs (>6 years) grade 1 MOs and MOs with administrative background. However, Gender, working experience, place of work did not show significant relationship.

Only 55%(n=102) identified the importance of referring circulars frequently and majority with more work experience. Among the 185 respondents, 84(45.4%) were actively looking for new circulars. This was particularly seen among the medical officers with administrative post than others. Overall, It was shown that the MOs with administrative post experience and senior MOs have good knowledge, attitudes and practices with regards to circular use. Increased use of electronic based circulars was evident.

Conclusions and recommendations

Majority of MOs working in DGH Matara were aware of accessing the circulars. Knowledge on circulars, was different depending on its relevance and impact to them personally, while the knowledge on circulars issued for public health concerns were poor, despite knowing the importance. Majority were aware on the necessity of circulars for better administration and medical practice. Accessing electronic copies was the most favorable method. Referring to of institution notice board was also popular among few specially senior MOs. Overall Good KAP were shown by doctors with administrative experience. Majority were not actively accessing the circulars and main perceived barriers were identified as institutional constraints, personal constraints and system constraints.

Sensitize newly-appointed MOs on the use of circulars and increase accessibility while communicating the major concerns in the administrative and clinical related circulars at the monthly institutional meeting are the method that can be used to increase the MOs awareness on it. Clearly detailed and updated e- versions of the circulars should be available to every Medical Officer. Further studies with MOs in other areas of the country must be carried out to assess the awareness, attitude and practice about the circulars.

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Challenges and Issues in relation to COVID-19

Contact Tracing Strategy in Mahara MOH area, Gampaha District

Dharmaratne GSK, Seralathan S, Paul Roshan G, Thennakoon TMCLB, Nishanthini N, Seralathan T.

Abstract

Introduction: COVID-19 was declared as public health emergency of international concern (PHEIC) by World Health Organization (WHO) on 30th of January 2020 as it was spreading all over the world. There was a rise in the number of cases of COVID-19 during the second wave in Sri Lanka. The epicenter was in Gampaha district. Ministry of Health embarked several strategies in preventive sector. Contact tracing is one of such strategy.

Objective: To identify the challenges and issues of contact tracing in Mahara Medical Officer of Health (MOH) area in Gampaha district.

Methodology: This descriptive cross-sectional study was carried out in Mahara MOH area using qualitative and quantitative methods.

Results: The study revealed that a total number of 1532 cases were identified as contacts and they were subjected to Polymerase Chain Reaction (PCR) testing. The total number of positive cases was 575 out of 1532 contacts (37.5%). Mahara MOH region had a relatively higher incidence rate during the study period compared to district and national figures.

Discussion: Public health staff faced many challenges during contact tracing. As contact tracing is a subjective procedure, when an index case is identified, the public health staff had to engage in various contact tracing processes during which, they faced difficulties in tracking the contacts. For example, some of them were not willing to reveal true primary contact details due to stigma and experienced that, giving false addresses added further burden to this challenging task. Recall bias had also affected contact tracing to a certain extent.

Conclusion & Recommendation: Increasing public awareness through continuous public education would reduce the stigma of the disease and further strengthen the contact tracing.

Keywords: COVID-19, Sri Lanka, Challenges, Contact tracing, Preventive strategies

Introduction

Sri Lanka provides free health care to its citizens through well-demarcated preventive and curative sector arms (1). Preventive healthcare is provided through well-established Medical Officer of Health Units (MOHU) since 1925 (2), currently with 353 MOHU (3) which are scattered all over 26 health districts of Sri Lanka (4). The Public Health Inspectors (PHII) in each MOH area working under MOH are trained to do contact tracing in the community.

Based on the circular of the Director General of Health Services (DGHS) issued on 04th December 2020 process of contact tracing has been changed (5). The individuals who were in contact with the index case are identified by contact tracing and quarantined at home setting rather than sending to quarantine centres (5)(6)(7), and PCR testing is done based on the date of exposure and exposure level.

Objectives

1. To describe the process of contact tracing in Mahara MOH area
2. To determine the number of contacts traced during this period and the incidence of positive cases in MOH Mahara.
3. To identify the issues and challenges encountered during contact tracing process.

Methodology

This descriptive cross-sectional study was conducted during the period of 6th December 2020 to 31st January 2021 at Mahara MOHU.

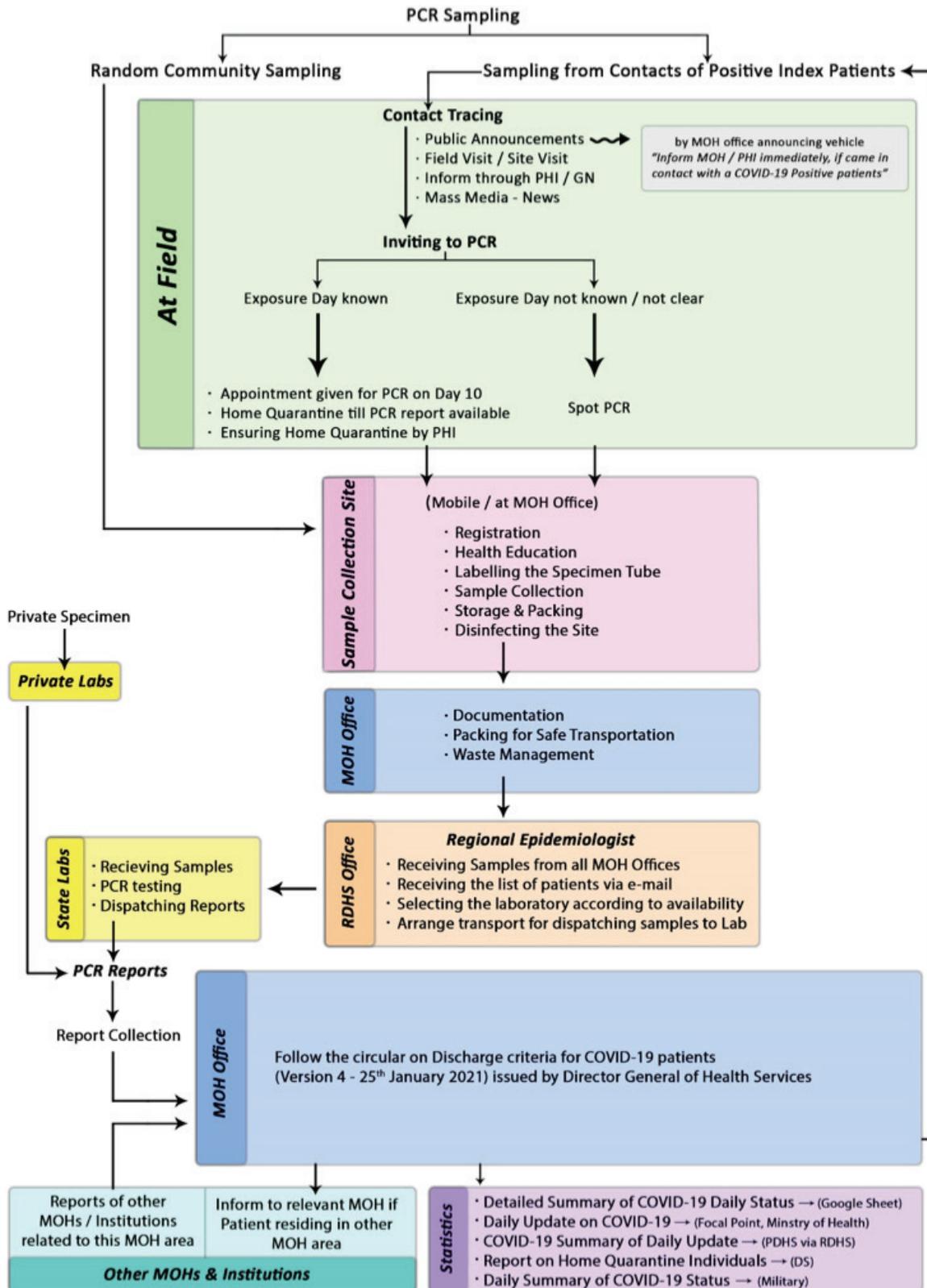
In this study quantitative data was extracted from the registers maintained at Mahara MOHU and the qualitative data was gathered through means of field visits, direct observation, Key informant interviews and focus group discussions with the public health staff by a structured questionnaire. Administrative permission for the study was obtained from Regional Director of Health Services (RDHS) of Gampaha district.

Results

Following the focus group discussions with relevant stakeholders, the process map of management of COVID-19 in the preventive sector was formulated (figure 1). With the contemporary updates and research findings, the health authorities updated the process map, accordingly.

Process mapping was formulated based on the process followed at Mahara MOH unit. It may vary from other MOH units in the district due to factors such as organizational structure, human resource capacity, geographical variation and trend of disease spread, etc. Formulation of contact tracing process map was done by focus group discussion with relevant staff.

Figure 1: Process map of Management of COVID-19 at MOHU Mahara



Along with the advancement in medical diagnosis, nucleic acid detection-based approaches have become a rapid and reliable technology for viral detection. Among nucleic acid tests, the PCR method is considered as the ‘gold standard’ for the detection of some viruses and is characterized by rapid detection, high sensitivity, and specificity (8).

As such, based on national level protocol, Mahara MOHU also used PCR tests to identify the infected cases. In order to do PCR, samples are collected from random community and from contacts of positive patients. The extracted data on PCR performance, positive cases detected among them along with the number of contacts and deaths is shown in table 1.

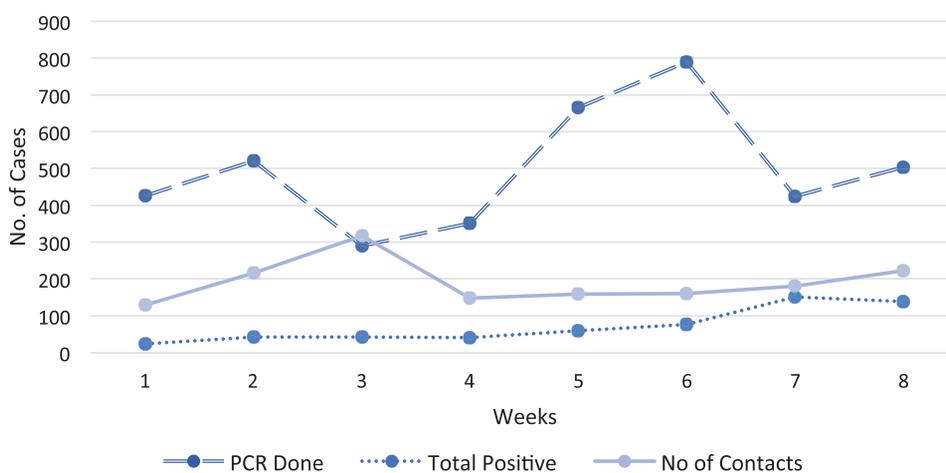
Table 1: Weekly distribution of No. of PCR tests done, No. of positive cases, No. of contacts traced and deaths at Mahara MOHU

Weeks	Date	No. of PCR Tests	Total Positive	No. of Contacts	Deaths
Week 1	(06/12/2020 – 12/12/2020)	426	23	129	1
Week 2	(13/12/2020 – 19/12/2020)	521	43	216	0
Week 3	(20/12/2020 – 26/12/2020)	290	42	317	2
Week 4	(27/12/2020 – 02/01/2021)	352	41	148	0
Week 5	(03/01/2021 – 09/01/2021)	666	60	159	0
Week 6	(10/01/2021 – 16/01/2021)	790	77	160	1
Week 7	(17/01/2021 – 23/01/2021)	424	151	181	1
Week 8	(24/01/2021 – 31/01/2021)	503	138	222	0
Total		3972	575	1532	5

The table reveals that, during the study period 1532 cases were identified as contacts and they were subjected to PCR tests. A total number of 575 positive cases identified among 1532 traced contacts.

For comparison purposes, the PCR performance along with the number of positive cases and the number of contacts are graphically presented in figure 2.

Figure 2: PCR performance and Contact tracing



Summative values of above figures are calculated to determine the data on monthly basis (Table 2).

Table 2: Monthly distribution of No. of PCR tests done, No. of positive cases, No. of contacts traced and deaths

Month	No. of PCR tests	Total Positive	No. of Contacts	Deaths
December 2020	1589	138	782	3
January 2021	2383	437	750	2
Total	3972	575	1532	5

From this data, incidence rate is calculated for each month of the study period and it is tabulated as shown in table 3 for comparison with district and national rates.

Table 3: Comparison of COVID-19 Incidence Rates of Mahara MOH with Gampaha district and national level

	Incidence Rate* of Mahara MOH area	Incidence Rate* of Gampaha District	Incidence Rate* of Sri Lanka
December 2020	6.1	8	8.7
January 2021	19	8.7	9

* per 10,000 population

This reveals that, in comparison to district and national incidence rates (9) (10), the Mahara MOH area had a relatively higher incidence rate in January 2021. The Mahara MOH team has used the incidence rate to update the strategies and the process map accordingly.

Qualitative studies revealed the challenges encountered by grass root level staff during contact tracing. Understanding that, contact tracing is a subjective procedure staff faced many challenges to identify and to locate the contacts on time. During the Key informant interviews, PHIs revealed that the hardest challenge they faced is to trace primary and secondary contacts due to the social stigma and poor understanding of the disease by people. Hence, people tend to withhold information and given fabricated names and addresses which made the task a further burden.

Further, the following problems caused difficulties in locating the contacts

- 1) the lack of updated data on resident.
- 2) population migration due to employment and education needs.
- 3) Non availability of standard updated contact tracing protocols in the Ministry of Health. (This led the PHII to use their own checklists and criteria on risk assessment which contributed to the loss of uniformity in the contact tracing process)

Further, the study group came across the grievances shared by health staff due to severe distress. In this sense, health care workers are at a high risk of experiencing severe distress, burnout, and both mental and physical illness. In turn, this could affect outcomes, such as the quality of care provided by such institutions (11),(12),(13).

The main challenge in modelling contact tracing is the individual-based character of the process (14). Health workforce had to solely rely on the information provided by individuals. Reliability of the history provided is most of the time questionable.

Discussion

WHO emphasized the following strategies; testing, contact tracing, isolation, supported quarantine and quality care. Contact tracing, followed by treatment or isolation, is a key control measure in the battle against infectious diseases (15). As such, PCR testing and contact tracing are performed at the same time to augment the effect of COVID-19 management strategy. However, it was understood that the process might be changed depending on the circulars issued by DGHS, Ministry of Health from time to time.

Stigma of the disease has been a burden for both the public and health care providers. When a disease is novel and leads to severe symptoms or death, fear, anxiety and limited knowledge about the disease may lead to stereotyping, discrimination, and labelling toward persons with the disease (16). For example, contact tracing by public announcement system has stigmatized the public of Mahara area and then the health authorities had to drop that plan with concern of confidentiality of patients.

Public health inspectors and their team had to solely rely on the information provided by index cases. Non-willingness to reveal data and not understanding the importance of data has made the health staff to face further challenges in accurately tracing the contacts. Recall errors and exposures in public settings further impede contact identification (17).

Johannes Müller (14) describes the level of contact tracing in three levels:

- Individual level: Infected persons are diagnosed early, are isolated and receive medical attention.
- Population level: Transmission chains can be detected and stopped, which reduces the effective reproduction number.
- Medical/scientific level: By studying infector-infectee pairs, one can learn about who infected whom in the outbreak.

As such, Mahara MOH incorporated all three levels of contact tracing to make the process more efficient. Intensified control measures, thoroughly training the workforce through in-service training, building their capacity, scaled up surveillance system, treatment modalities are some of the ingredients of success stories of preventive health arm of Sri Lanka. However, health authorities have faced difficulties in training the workforce regarding COVID-19 due to time constraints.

Limitations

This study has few limitations, such as a limited study setting and time constraints. So, the study could not be conducted in other MOHUs in the district. Also, abnormal field condition due to pandemic and lockdown has led difficulties for onsite field observations.

Conclusion

Key informant interviews and focus group discussions revealed that field-level staff faced challenges due to stigma of the disease and the subjective nature of the contact tracing process. Also, recall errors and non-willingness of public to provide accurate data such

as name and address has further added burden to this challenging task.

Increasing public awareness through continuous public education would reduce the stigma of the disease. Further to this, the introduction of mobile applications and data gathering at digital devices would reduce the recall errors and facilitates easy retrieval of accurate data.

However, extending similar studies in other MOHU or even other districts would help to identify challenges in different settings.

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Assessment of readiness for the implementation of the hospital health information system under primary health care reorganization in selected hospitals in Kalutara District

Rajapaksha DMP, Wickramasinghe SC.

Abstract

Introduction: Organizational resources and technical structures such as hardware and software are very essential requirements in the redesign of electronic projects. (Ajam, 2011) Before implementation of Hospital Health Information System (HHIS) in primary health care institutions it is essential to conduct an assessment of readiness of institutions.

Objective: To assess the readiness for the implementation of Hospital Health Information System under primary health care reorganization in selected Hospitals in Kalutara District.

Methodology: Cross-sectional study was carried out in Divisional Hospitals Bandaragama, Gonaduwa and Haltota. A readiness assessment tool was used to study readiness in Technology and Infrastructure, Human Resources, and Workflow.

Technology and infrastructure readiness and workflow readiness were assessed by interviewing medical officers in charge (MOICs) of relevant three hospitals and by direct observation. For assessment of human resource readiness, a validated and pretested self-administered questionnaire was used for all staff supposed to be involved in the operational process of proposed HHIS in selected hospitals.

Results and discussion: Although all three Hospitals show a total readiness of more than 50%, technology, infrastructure readiness and workflow readiness of Divisional Hospital Gonaduwa and Haltota are less than 50%. Higher level of Human resource readiness has increased the total readiness of these two hospitals more than 50%. However, divisional hospital Bandaragama shows more than 50% readiness of all three types.

Conclusions and recommendations: It is important to have more than 50% of readiness for all three major sections of the tool individually.

Key words: Readiness assessment, primary Care, Information System

Introduction

Sri Lankan health sector is heavily dependent on documentation, and it imposes a heavy workload on

health care staff as is documentation at present is based almost entirely on handwritten paper records. There is additional work in filling and retrieving information, in copying and summarizing it and transmitting it from one section to another. One of the weaknesses of the health care system is difficulty in tracing records.

Health management information system can reduce the burden of documentation. In addition to reducing documentation an information system can cut down the long queues and provide more time for doctor patient interaction.

Hospital Health Information System (HHIS) is an open-source medical database software planned to be used in primary care settings. It stores clinical details of patients treated and is designed for use mainly by clinical staff. Clinical details are recorded on the system as they examine the patient. The system enables hospital staff to

- Change from more complex paper-based patient management system to more efficient Electronic Health Record System.
- Access patient's medical record anywhere in the country and to share that information among different levels of health care such as primary, secondary and tertiary.
- Conduct disease surveillance and notification easily as patient management system, hospital management system and the disease surveillance and notification systems are integrated with each other.
- Refer previous clinical records when a patient comes for treatment at clinics
- Update and maintain patient's clinical data in each visit.
- Coordinate with laboratory management information system to expand the patient care service by getting investigations done which are not available in primary care institutions but available in secondary and tertiary care hospitals.
- Manage issuing of drugs and monitor the drug stock balance.

The software will thus significantly reduce the need for maintaining paper-based records and enable an improved and efficient service to the patient.

Although making health records electronically in computer systems has many advantages, establishment of an e-Health information system can also be complicated. The reasons may be unavailability of technology, funding, and lack of personnel with technical and computer skills. Moreover, resistance and opposition to changes from manual systems to electronic systems by some health service providers may create problems.

E-health (Electronic health) readiness assessment, as a part of the assessment prior to implementation aims to evaluate preparedness of each organization component. This process can lead to the correct decision making based on existing realities and constraints of the organization.

General Objective

To assess the readiness for the implementation of Hospital Health Information System under primary health care reorganization in selected Hospitals in Kalutara District.

Specific Objectives

1. To assess the following type of readiness for the Hospital Health Information System under primary health care reorganization in selected hospitals in Kalutara District
 - a. Technology and infrastructure
 - b. Human Resources
 - c. Workflow
2. To assess the total / overall readiness for the implementation of Hospital Health Information System under primary health care reorganization in selected hospitals in Kalutara District.

Methodology

This is a descriptive cross-sectional study conducted in Divisional Hospitals Bandaragama (DHB), Gonaduwa (DHG) and Haltota (DHH).

Figure 1 summarizes the methodology used for the assessment of different types of readiness in the selected Hospitals.

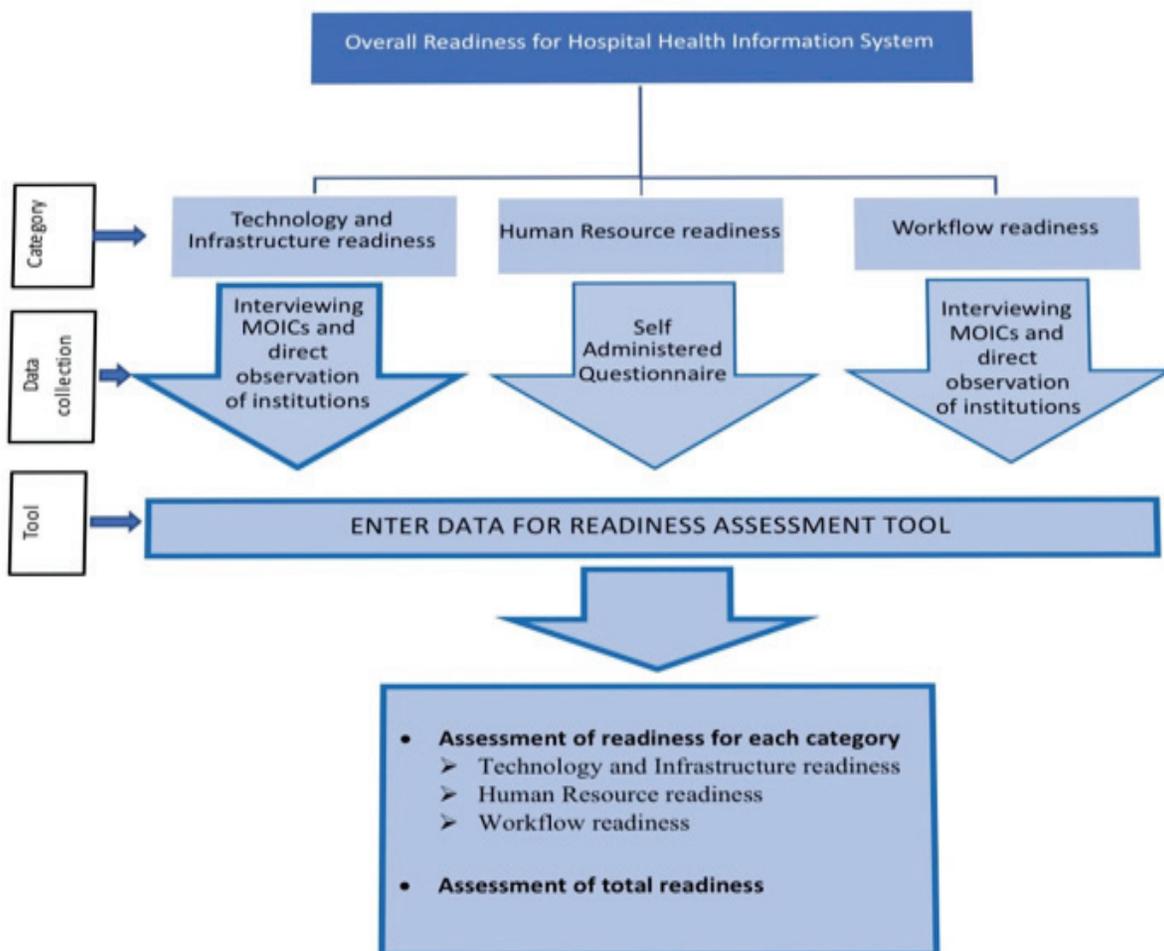


Figure 1: Process of Readiness Assessment in each Hospital

Readiness assessment tool was constructed for the assessment of readiness for implementation of HHIS in the hospitals. Principal Investigator worked with an expert in Information Communication Technology in developing the Readiness assessment tool. This tool has three major components.

1. Technology and Infrastructure readiness
2. Human Resource readiness
3. Workflow readiness

This tool was constructed in English and translated to Sinhala and Tamil languages. Technology and infrastructure readiness is the readiness of the software, hardware, network resources, and services necessary for the implementation, operation, management, and existence of HHIS. Human Resource readiness is the availability of employee skills, talent, and know-how to perform the internal processes critical to the implementation, operation, management, and existence of HHIS. Data was collected through a self-administered Questionnaire (SAQ HS) to complete this category. Workflow readiness is the readiness of the series of activities through which HHIS function from initiation to completion when it is implemented in a healthcare institution.

Out of three sections of the tool, technology and infrastructure readiness and workflow readiness were assessed by interviewing MOICs of relevant three hospitals and by direct observation.

For assessment of Human Resource Readiness, a validated and pretested self-administered questionnaire was administered to all staff supposed to be involved in the operational process of proposed HHIS in selected hospitals.

Principal Investigator (PI) visited all three institutions after obtaining relevant administrative and ethical clearance and himself collected data for the research.

Results

Assessment of the readiness for the implementation of the New Information System planned for Primary Care Reorganization was done using the tool developed. Table 1 shows the readiness score of selected three hospitals.

Table 1: Readiness Score of Selected Three Hospitals

	Divisional Hospital Bandaragama	Divisional Hospital Gonaduwa	Divisional Hospital Hultota
Technology and Infrastructure Readiness	57.4%	42.6%	40.7%
Human resource Readiness	82.7%	80.4%	82.7%
Workflow Readiness	54.4%	43.8%	43.8%
Total Readiness*	63.47%	54.2%	54.89%

* Total readiness was calculated after weighting the three components. Technology and infrastructure readiness:50%, Human resources readiness: 30% and workflow readiness:20%

There is no visible difference among the percentages of Human resource Readiness of three Hospitals and it shows a satisfactory level (Table 1). All three hospitals show a Human Resource Readiness of more than 80%. There is no visible difference of any type of assessed readiness between DHG and DHH. But Technology and Infrastructure readiness and Workflow readiness of DHG and DH Haltota were low.

Table 2 shows readiness score of selected three hospitals after weightage given according to the importance. Weightage was given to each type of readiness as Technology and infrastructure readiness:50%, Human resources readiness: 30% and workflow readiness:20%.

Table 2: Comparison of each readiness of selected three hospitals after weighting according to the importance.

Section	DHB	DHG	DHH
Technology and Infrastructure Readiness (out of 50)	27.78	21.30	21.30
Human resource Readiness (out of 30)	24.82	24.13	24.82
Workflow Readiness (out of 20)	10.87	8.77	8.77
Total	63.47%	54.20%	54.89%

DHB has a higher level of total readiness than other two. This is because Technology, Infrastructure and Workflow Readiness were better in DHB. Although the total readiness for all three Hospitals shows more than 50%, Readiness score for Technology, Infrastructure and Workflow of DHG and DHH is less than 50%. Higher level of Human resource readiness has increased the total readiness percentage of these two hospitals more than 50%.

Discussion

Lack of readiness weakens the organization to undergo transformation during the implementation of Electronic Health Record Systems. (Ajami, 2011) Sufficient preparedness in an organization enables to custom the system and ensure minimal workflow disruptions and irregularities during and after the implementation of such systems. (Ajami, 2011)

Ajami (2011) explains the requirements associated with electronic readiness and infrastructure readiness. In all three hospitals internet connections were not satisfactory. The download speed was between 4-8 Mbps and connections were shared and limited. Although this is adequate at the moment it needs to be improved before proper establishment of the system. The coverage was limited to some of the essential areas in all three Hospitals. DHB was having both wi-fi and wired internet connections but other two hospitals had only wi-fi connections at the time of the data collection for the study. All three hospitals are having good power backups such as UPS and generators which will activate automatically in any power failure.

Based on the validated assessment tool (Figure 1), majority in the hospital feel that the current paper-based systems in their institutions should be changed with new technology and make it easy for them to work. (DHB-88.6%, DHG-90.0%, DHH-100%)

Computer literacy is important in operating Health Information Systems. 42.9% of relevant staff in DHB is having good computer literacy while another 25.7% are having adequate knowledge just to manage. In DHB those figures are 20% and 60% respectively while in DHH 54.5% and 27.3% respectively.

Staff involvement and responsibility held in planning process of Health Information System is not satisfactory. Staff involvement in planning process is important in every organization as the staff are directly involved in the implementation. (Wairimu, 2014)

Majority of the staff accept that the proposed technology is appropriate according to the condition within the Hospital (DHB -85.7%, DHG -77.8%, DHH -90.9%).

Training is definitely the most critical element of the successful implementation and adoption of any technology. Even the best. Electronic Health record is useless unless the staff is trained and comfortable with its capabilities (AFIA, 2019). 71.4% of Medical Officers in DHB have received proper training for the Hospital Health Information System while it is 50% in DHG and none of medical officers has received any training for the Health Information System in DH Haltota.

Assessment of the workflow needed for hospital health information system has not been done yet in DHG and DHH. But it has been started in DHB.

Conclusions

1. Technology and Infrastructure readiness was low in all three selected Hospitals. Only DHB shows Technology and Infrastructure readiness more than 50% whereas in other two hospitals it was even less than 50%
2. Level of Human resource readiness was satisfactory in all three Hospitals, and it was more than 80% according to the assessment.
3. Workflow readiness was low in all three Hospitals compared to Human resource readiness. The level of it was more than 50% only in DHB. In other two Hospitals it was less than 50%.
4. All three Hospitals show a level of total readiness more than 50%. DHB shows a higher value compared to other two Hospitals. Having more than 50% does not indicate that the institution is ready for the implementation of the HHIS. All three categories should be assessed individually. So,

according to this study only DHB is ready for the implementation of HHIS.

Recommendations

1. Readiness assessment should be done in every healthcare institution before the implementation of HHIS to reduce the wastage of resources. The areas with poor level of readiness should be identified and necessary steps should be taken to correct them.
2. Following measures should be taken to improve the Technology and infrastructure readiness.
 - I. All three Hospitals should be provided with internet connections with a better speed specially with the advancement of the system.
 - II. Wi-Fi coverage should be expanded to all areas in the hospital before the system proceeds to its next stages.
 - III. There should be a good trouble shooting system in all three hospitals. Ideally it should be present internally in the institution both for software and hardware.
 - IV. There should be an external service support with the ability of attending 2 hours.
 - V. All Hospitals should have a local server to store the data.
3. Awareness programs and training programs should be conducted to improve the Human Resource Readiness.
4. Following measures should be taken to improve the workflow readiness.
 - I. Assessment of workflow needed for HHIS prior to implementation and redesign should be done when necessary.
 - II. Protocols should be available in every institution.
 - III. Identification of barriers should be done and measures must be taken to overcome them
 - IV. Monitoring and evaluation of all processes should be done.

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Cost of managing COVID 19 patients in a tertiary care hospital in Sri Lanka

Ranga SDUM, Dilrukshi DARK, Abeysekara CM, Obeysekara S.

Abstract

Introduction: COVID-19 is caused by Severe Acute Respiratory Syndrome coronavirus 2 and it spread throughout the world and turned into a severe global pandemic in 2020. The severity of the COVID-19 is wide, ranging from asymptomatic to severe illness that requires mechanical ventilation. Although the curative sector response of Sri Lanka was somewhat different from other countries, it was remarkably effective in preventing community spread.

Objective: To assess the average cost of treating Covid 19 patients at Covid Treatment Centre (CTC) in District General Hospital (DGH) Hambantota.

Methodology: This retrospective costing study was conducted in CTC at DGH, Hambantota in December 2020. The step-down costing method was used in this study. Key informant interviews with the accountant, deputy director, and staff of CTC, reviewing expenditure records of the accountant's office, visiting and taking measurements of the floor area, reviewing relevant literature were used to gather data in this costing study.

Results: The average cost of treating a Covid 19 patient per day at CTC, DGH Hambantota was Rs 2317.60.

The total cost of treating a Covid 19 Patient at DGH Hambantota for 10 days was Rs 23176.00. The cost of treating Covid patients at CTC, DGH was exceptionally low when compared to other countries.

Discussion and conclusion: Treating Covid 19 patients is an economic burden to any health system. Treatment cost was extremely low at DGH, Hambantota and only about 23000 rupees was spent for one patient for 10 days. Drug cost was comparatively low and transport cost was relatively high.

Keywords: Cost, Covid 19, Drug expenditure

Introduction

COVID-19 is caused by Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) is a public health threat worldwide [1]. The 1st case of COVID 19 was reported in Sri Lanka on 27 January 2020, a 44-year-old female Chinese national was admitted to the National

Institute of Infectious Diseases. Since then, there were no cases until her recovery. The first confirmed locally acquired case of COVID 19 in Sri Lanka was reported on 11 March 2020 and the individual was a tour guide for travelers from Italy (2). Thereafter, several cases were reported from Sri Lanka.

As of 30 January 2021, a total of 65000 human COVID-19 cases had been reported in Sri Lanka. The severity of the COVID-19 is wide, ranging from asymptomatic to severe illness that requires mechanical ventilation [3]. Most infected people with COVID-19 are asymptomatic or causing mild-to-moderate disease, whereas the mortality rate is high in patients affected by the severe disease [4]. Covid 19 patients with critical illness, need application of unaffordable respiratory supporting devices which carries a high-cost burden for patients and governments (5).

Although the curative sector response of Sri Lanka was somewhat different from those of other countries, it was remarkably effective in preventing community spread. Admitting all COVID 19 positive patient, without considering the severity of disease to COVID 19 treatment hospitals, admitting COVID 19 suspected patients only to designated hospitals, and preventing admission of COVID 19 patients into private sector hospitals were highly successful measures. Currently, there are 72 Covid treatment and intermediate care centers in Sri Lanka.

The economic impact of the COVID-19 pandemic is extremely high in middle-income countries including Sri Lanka due to the disruption of main incomes like tourism, garment industry, and salaries of foreign employees. However, there are a few studies aimed at quantifying the direct medical costs incurred by COVID19 patients.

To address this public health problem, this retrospective study conducted a cost analysis to determine the medical costs of treating COVID-19 patients in Sri Lanka. This cost analysis study was conducted at Covid treatment center (CTC) at DGH, Hambantota which is one of the nine tertiary care treatment centers in the country. There are 270 beds and 7 ICU beds available at CTC in DGH, Hambantota.

Objective

To assess the average cost of treating Covid 19 patients at CTC in DGH, Hambantota.

Methodology

This retrospective costing study was conducted in CTC at DGH, Hambantota in December 2020. This study setting was selected by using convenient sampling methods. CTC was filled with patients during last November, December, and January and the total numbers were similar during those three months. Therefore, the middle month, December was considered for the study.

The step-down costing method was used in this case study. This method contains the following steps;

1. Identification of final cost centres (i.e. the accounting objects to be costed).
2. Identification of intermediate cost centres (i.e. cost pools which are not relevant in themselves directly but serve as a step for allocating costs to final cost centres).
3. Identification of the relationships between intermediate and final cost centres, and allocate the intermediate costs to final cost centres.

Key informant interviews with the accountant, deputy director, and staff of CTC, reviewing expenditure records of the accountant's office of the DGH, Hambantota, taking measurements of the floor area of Covid treatment centre, reviewing relevant literature were used to gather data in this costing study.

The average cost was calculated in this costing study by considering final, intermediate, and overhead costs. However, the capital costs like land value, building value and equipment cost were not considered.

Estimation of the costs involved.

Expenditure for drugs and PPE, expenditure for PCR and other investigations, expenditure for meals of the patients were considered as the final costs involved in treating the Covid 19 patients.

Staff salaries, expenditure on utilities – water, electricity, cleaning services and security service, expenditure for transport and miscellaneous costs were considered as intermediate and overhead costs.

The CTC is situated in the old hospital premises at DGH, Hambantota. It obtains water and electricity from

a separately metered sources. Janitorial services and security services to the CTC and DGHH were provided by same providers and expenses are in common bill. Therefore, expenses for janitorial services and security services were apportioned according to the floor area of CTC. Total inpatient days during December 2020 was 7164. This was used to calculate the unit cost.

The cost for the drugs, PPE and surgical consumables was calculated by using respective consumption records at wards and using the medical supply information management system (MSIMS). Cost for the PCR and other investigation was calculated by using market value, since calculating a real value for investigation is difficult in the government sector. Expenditure for patient meals was calculated by using the cost for raw materials purchase, gas consumption and other consumables.

A deputy director, 2 consultants, 5 medical officers, 20 nursing officers and 15 health care assistants are working in the CTC. Cost for their salaries was obtained from payroll. Electricity, water, telephone, janitorial and security service costs are overheads involved. Cost for electricity, water and telephone was obtained directly from respective bills. Security service and cleaning service costs are apportioned according to the floor area.

The floor area of CTC = $\frac{4}{10}$ of the total wards floor area of the hospital
= 0.4%

The number of kilometers run by Covid ambulances was calculated by using the DRCs of the drivers. Since the Ministry of Health charges 50 rupees per kilometer for private ambulance usage, total transport cost was obtained by multiplying that value by 50.

Number of Km run by Covid ambulance = Y
Total transport cost = Y x 50

Miscellaneous expenses of CTC were calculated by using the records of the account branch.

As described and calculated in the sections, total costs and the per-patient cost were considered.

Results

Cost calculation for treating Covid 19 patients was given in following tables.

Table 1: Cost for drugs, PPE and other surgical consumables in December 2020

Item	Cost (SLR)
Drugs	235,764
PPE and other surgical consumables	248,163
Total	483,927

Table 2: Cost for the PCR and other investigations

Test	Cost (SLR)
PCR	429,000
Haematological investigations	
Biochemical investigations	
Microbiological investigations	219,750
X-rays	10,400
CT	18,000
ECG	5,950
Total	683,100

Table 03: Expenditure for COVID patient meals

Item	Cost (SLR)
Raw provisions for meals	2,494,214
LP Gas	85,561
Other consumables	234,480
Total	2,814,255

Table 4: Cost for staff salaries at CTC

Staff category	Number	Cost for salary (SLR)
Deputy director	01	4,979,135
Consultants	02	
Medical officers	04	
Nursing officers	19	
Cooks	02	
Overseer	02	
Health care assistants	20	

Table 5: Expenditure for electricity, water and telephone of the CTC

Overheads	December 2020 (SLR)
Electricity	636,822
Water	129,588
Telephone	16,035

Table 06: Janitorial service and security service cost of CTC

Overhead	Total expenditure of hospital for December 2020	Percentage of floor area of CTC	Cost apportions to CTC
Janitorial	977,048	0.4	390,819
Security service	1,019,848	0.4	407,939
Total			798,758

Cost of transport

Number of Km run by Covid ambulances	=	119,014
Total transport cost (Cost for km = Rs 50)	=	119,014 x 50
	=	Rs 5,950,700

Miscellaneous expenses

Miscellaneous expenses of CTC were	=	Rs 111,287
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Cost calculations

Table 7: Total Cost calculation

Cost Item	Total cost for CTC (SLR)
Drugs	483,927
PCR and other investigations	683,100
Meals	2,813,955
Staff salaries	4,979,135
Overheads	
Electricity	636,822
Water	129,588
Telephone	16,035
Janitorial	390,819
Security	407,939
Transport cost	5,950,700
Miscellaneous expenses	111,287
Total	16,603,307

Total number of inpatient days	=	7,164
Cost per inpatient day	=	16,603,307/ 7164
	=	Rs 2317.60

Average cost for treating Covid 19 patient per day at CTC, DGH Hambantota	=	Rs 2317.60
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Total cost for treating Covid 19 patient at DGH Hambantota for 10 days	=	2317.60 x 10
		Rs 23176.00

Table 8: Percentage of expenditure for each cost item

Item	Cost (SLR)	Percentage (%)
Medication, PPE, and surgical consumables	483,927	2.9
Investigations	683,100	4.1
Patient meals	2,814,255	16.9
Staff salaries	4,979,135	29.9
Overheads	1,593,163	9.6
Transport	5,950,700	35.8
miscellaneous	111,287	0.67
	16,603,307	

Discussion

The cost of treating Covid patients at CTC, DGHH was exceptionally low (Rs 23176) when compared to other countries. In Philippines, it is around Rs 172000 (6). This low cost may be due to treating both asymptomatic and symptomatic patients, functioning under minimal staff with maximum efficiency at CTC, DGHH.

The cost of drugs is the major contributor to the direct medical cost (7). Hospitals in the United States spent 207100 rupees per COVID-19 patient on medication, although CTC DGHH only spent 675.40 rupees (8). This difference may be due to treating both symptomatic and asymptomatic patients at CTC, DGHH, which significantly reduced the drug cost.

Transport cost accounted for 35.8% of the total cost. This may be relatively high when compared to other cost items. Transporting Covid patients from all parts of the country to CTC, DGHH and sending them home by using ambulances was the reason for this high cost.

However, cost per inpatient day and total cost for the patient at CTC, DGHH was exceptionally low when compared to other countries and even private sector of Sri Lanka.

Conclusion

Treating Covid 19 patient is an economic burden to any health system. Although, its economic impact is high, there were very few researches to assess it. Therefore, this retrospective Costing study was conducted to assess the cost incurred in managing Covid 19 patients at Covid treatment centre in DGH, Hambantota. Treatment cost was extremely low at DGH, Hambantota and only 23000 rupees were spent for one patient. The cost for drugs, PPE and surgical consumables was comparatively low while transport cost was relatively high.

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Cost effective management of COVID patient transport from treatment centers to their homes: A report related to second wave

Fernando GHS, Sridaran S.

Brief introduction on COVID

On 31st December 2019, the World Health Organization (WHO) Country Office for China was informed about cases of pneumonia of unknown cause in Wuhan, China. Authorities identified a new type of Coronavirus, subsequently named COVID-19 on 30th January 2020 (1). WHO Director-General declared the outbreak of COVID-19 a Public Health Emergency of International Concern (PHEIC), and on 11th March 2020, COVID-19 was characterized as a pandemic (2). The first case of the virus was confirmed in Sri Lanka on 27th January 2020, after a 44-year-old Chinese woman from Hubei Province in China was admitted to the National Institute of Infection Diseases (3). Following that, the first local case was reported on 11th March 2020(4). Since then, the number of COVID cases increased gradually but slowly in the first wave and the spread was rapid in the second wave. According to the recommendation of the COVID-19 expert committee all the COVID-19 positive cases were quarantined at the quarantine centers established by the Ministry of Health.

Discharge criteria and guidelines

According to the expert opinion and research findings the quarantine period was changed on three occasions. Initially, the positive cases were quarantined for 14 days at the institution and another 14 days at home (5). Then, with the new findings the quarantine period was limited to 14 days at the institution after which they were released to move to the community (6). Now, the expert committee has decided to reduce institutional quarantine period for 10 days followed by 4 days of home quarantine (7).

Treatment centers

Currently 80 quarantine centers are managed by the Ministry of Health to manage COVID-19 positive

cases. They are run by the Ministry staff centrally. These quarantine centers include 47 treatment centers, 26 intermediate treatment centers, two police treatment centers and 4 hotel intermediate treatment centers for health staff (8).

Existing system of transport of patients for home quarantine

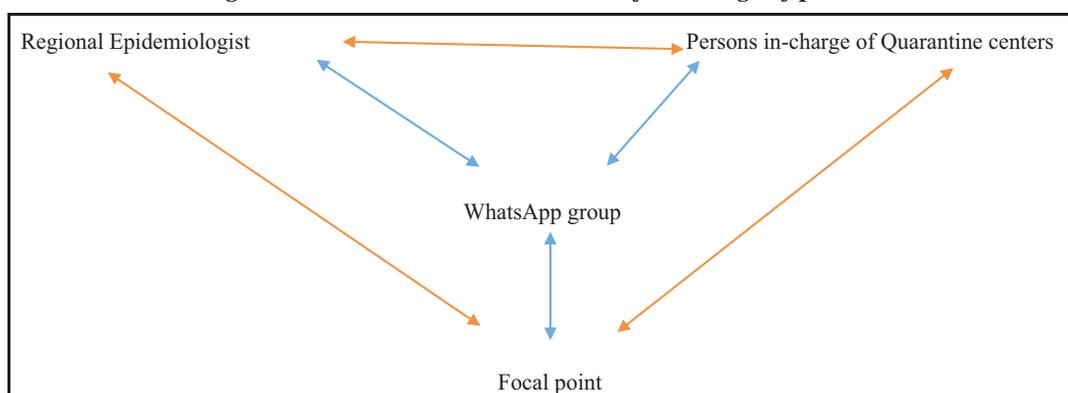
All quarantine centers are coordinated centrally by the Ministry of Health. Positive cases are allocated to relevant quarantine centers by the Ministry and it is the responsibility of the Regional Epidemiologist (RE) to send them to quarantine centers. Sri Lanka Army provided transport facilities to send them to the centers especially in the Western province. Other provinces use their own ambulances and Suwasariya ambulances to send cases to quarantine centers.

However, it is the sole responsibility of the RE to send discharged patients to their resident places. Even though patients are sent from one center they are from different parts of the country and the government had to incur high cost for arranging transport for the discharged patients. Since the existing ambulances are used amidst the normal hospital routine work, discharged patients had to wait more days in the hospital after discharge. Ambulances were sent to far away places to get down even a single patient (Galle to Jaffna, Rathnapura to Jaffna etc.) which cost more than Rs. 20000.00 per journey. Therefore, the existing system incurred a heavy cost to the government and was inefficient.

Adapted method to improve transport system

A focal point was established at the COVID operation room for management of transport of COVID patients and one Senior Registrar was appointed to handle the discharge of patients in all districts.

Figure 1: Inter-district coordination of discharge of patients



The main objective of the focal point was to use the government vehicles cost effectively and send the patients home on the same day of discharge.

Strategies adapted to develop the transport system

1. Creation of WhatsApp group connecting all persons in-charge of quarantine centers and the RE (figure1).
2. Allocation of buses of the Nursing Training Schools (NTS) to treatment centers and Ministry disaster unit.
3. Establishment of transit point in the Western province.

The lists of discharged patients from each center were uploaded to WhatsApp group by each treatment center on the previous day. Since most of the patients were from the Western province discharges were also higher in Western province. Few patients in each center were from different districts and they had to be sent to their relevant districts. NTS buses were used to get down patients from peripheral centers to Western province. Some buses collected patients on the way from other centers. All patients were dropped at the transit points established in Maligawatta, Gampaha UC ground and Kalutara and from there sent to their homes using district ambulances. Few ambulances were mobilized from distant districts to the transit points and all patients were dropped on the way at the relevant district. In most of the occasions those ambulances were used for both up and down trips to reduce unit cost. This coordinated transport system reduced sending of ambulances to distant places and it also reduced the movement of many ambulances around the country. Buses were sent every day all around the country according to the demand to take patients from the treatment centers. They were used efficiently and cost effectively every day without rest. One ambulance was allocated to the disaster management unit and was used to transport patients within the Western province during this period enabling transport of all discharges within the same day. During the three months period (16/12/2020 to 16/02/2021), 1547 patients had been transported by that single ambulance. Almost all REs, persons in-charge of quarantine centers and drivers have rendered their fullest support in managing patient transport within the same day even when patients are from faraway places.

Issues related to transport

- Unavailability of a circular for sending patients by ambulance to their homes. Some heads of the institutions were reluctant to release their ambulance.

- Some heads of institutions did not allow sending their ambulances outside their districts.
- Unavailability of extra ambulances within the district.

Conclusions

With the help of all the relevant authorities, patients were transported to their homes as early as possible, efficiently and cost effectively.

Recommendations

- Issuing a special circular regarding release of ambulance for COVID-19 patient transport.
- Allocation of few vehicles to the focal point of the Ministry of Health for COVID-19 purposes.
- Allocation of one bus in each district to transport patients from nearest NTS or government institution.

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Establishment of a national focal point to monitor the Performance of PCR Centres in Sri Lanka

Athapattu P, Wijenayake PH, Weediawatta PKGP.

Abstract

Introduction: The number of confirmed cases of COVID -19 informs us about the development and magnitude of the global pandemic. Confirmation of COVID-19 infection is mainly by testing with PCR. The necessity of evaluating the performance of PCR laboratories was identified to understand how the pandemic was progressing, how to respond appropriately to the threat; either as individuals or as a society, to learn where countermeasures against the pandemic worked and for planning. Reliable data on testing was therefore necessary to assess spread of the pandemic.

Objective: To establish a national focal point to collect quality, accurate, timely data of PCR test performance for planning and to make decision.

Methods: Defining of data elements for collection and monitoring of the performance of PCR laboratories was done as the first step. Digital solution was identified after assessing the requirement. Agile development method was used to develop the digital solution, which consists of five modules. Entered data on PCR performance of laboratories were analyzed by the officer in charge of the focal point and disseminated timely, accurate, complete and compile data to the relevant officials on daily basis for further planning and implementation.

Results: Performance of individual laboratories was identified on daily basis. Private sector performance was higher than public sector. Peaks showed the local clusters.

Conclusion: A quality, accurate and real-time data and information helped for remarkable improvement in every step of planning and decision making to overcome the global challenge of COVID-19.

Limitations: Computer literacy, close monitoring and duplication of data affected for accuracy.

Key Words: COVID-19, PCR Test, Performance of laboratories

1. Introduction

COVID 19- infection has spread as pandemic form throughout the world. Sri Lanka too is significantly affected by this pandemic. The World Health Organization (WHO) declared the COVID-19 infection as a Public Health Emergency of International Concern (1).

The establishment of the presidential task force and enacting several regulations under the Quarantine and Prevention of Diseases Ordinance (1897) were initial COVID-19 mitigation measures of Sri Lanka (2). The index case of Sri Lanka, a Chinese tourist was detected on the 27th of January. The first indigenous patient was diagnosed on the 11th of March. The government took immediate measures, and the country has been kept in lockdown mode to prevent the spread of the disease in Sri Lanka (3).

WHO declared the RT-PCR test as the confirmatory laboratory test (Gold standard test), which Sri Lanka adopted initially (4–7). With the gradual increase of cases, the need for accurate, reliable and real-time data on laboratories' performance was identified. That information was used to understand the pandemic, determine which outcomes should be prioritized, plan resource allocation, decide intervention of health care delivery, and compare meaningfully with other countries (8). Because of the rapidly changing and uncertain context of the pandemic, it was essential to build up feedback loops and frequent pause points to revisit how things are happening in the field. The data collection, storage, processing, and dissemination via online systems would be more beneficial as access to the laboratories was limited during the pandemic (9).

The Director General of Health Services (DGHS), the competent authority, ordered to establish a National Focal Point to gather daily performance of PCR test at the laboratories. The Directorate of Primary Care services, Ministry of Health (MOH) was assigned this task to collect quality, accurate, real-time data on the performance of PCR laboratories and compile, analysis and dissemination of information efficiently and effectively since the end of March 2020.

2) Objectives

2.1 General Objective

To establish a national focal point to monitor the performance of PCR test Centers in Sri Lanka.

2.2 Specific objectives

- To design a user friendly, comprehensive, online operational data base
- To identify and trained focal point from each functioning lab
- To maintain timelines, accuracy and completeness of data
- To compile and disseminate a daily report for decision makers and planners

2. Methodology

Ten data elements were defined (Table 1) to monitor the performance of PCR laboratories by obtaining inputs from relevant stakeholders.

Table 1: Data elements and definitions

No Data Element	Definition
1 Name of the Laboratory	The laboratory where the sample was tested
2 Sample Received From	The place from where the sample was sent to the lab
3 Number of Samples Received - First Time Patients	Sample received from a patient who was suspected to having COVID-19.
4 Number of Samples Received - Repeat (Patients)	Sample received from a patient who was already diagnosed and having treatment for COVID-19
5 Number of Samples Tested - First Time Patients	Number of samples tested out of “Samples Received - First Time Patients”
6 Number of Samples Tested - Repeat (Patients)	Number of samples tested out of “Samples Received - Repeat (Patients)”
7 Number of Positive Samples - First Time	Number of positive samples out of “Samples Tested - First Time Patients”
8 Number of Positive Samples – Repeat Patient	Number of positive samples out of “Samples Tested - Repeat Patients”
9 Inconclusive Samples	No of samples tested and unable to give result
10 Invalid Samples	Contaminated samples due to various reasons from the time of sample collection to sample testing

Requirements for digital solution were identified via key stakeholder interviews. Rapid literature review and market analysis were conducted to find a suitable product (10–15). The agile development method was used to develop the digital solution. It consists of an online data entry module for collecting aggregated data, a central database, a real-time data visualization module, a data analytic module and a report module. Initial development and deployment completed within 2 days with zero development cost. Online user training was given to the end-users (pre-identified officer at the laboratory), and an electronic comprehensive user manual was provided. Also, round the clock user support was given to improve data quality and to maintain the sustainability of the digital solution.

Process

The prescribed time for data entry of daily performance was before 10.00 pm daily, but data entered up to midnight was considered for the final report. SMS reminders were sent to the laboratories to enter data by 10.00 pm that ensured completeness. The compiled daily performance report was disseminated to the heads of the laboratory and institutions daily at 7.00 am of the following day to get feedback and cross-check the accuracy.

PCR laboratories initiated entering the data since 24th March 2020 into the system. The paper based data collected from 2020.02.18 were entered by the National Focal Point. Initially there were 6 labs by late March which increased up to 25 laboratories by the end of September 2020 and 36 laboratories identified by the end of 28th February 2021.

3. Results

Compilation and data analysis was carried out at the national focal point, and the chief controlling officer sent an interim report to Intelligence Services (SIS) and the National Operation Centre for Prevention of COVID - 19 Outbreak every day at 10 pm. The final report was prepared before 7.00 am of the following day and sent to SIS, National Operational Centre, Ministry Officials, all consultants in charge of laboratories and heads of the institutions to assess their own performances and for data validation with their feedback.

Table 2 indicates the samples tested during the reporting period (2020.02.18 – 2021.02.28)

Table 2: Summary of PCR performance.

Duration	Sample Tested			Positive number		First time
	First time	Repeat	Total	First time	Repeat	Positivity rate
2020.02.18 – 2020.09.30 (Phase 1)	276,357	15,798	292,155	3,377	4,463	1.22%
2020.10.01 – 2021.02.28 (Phase 2)	1,821,972	10,383	1,832,355	85057	4,700	4.66%
2020.02.18 – 2021.02.28 (Reporting Period)	2,098,329	26,181	2,124,510	88,434	9,163	4.21%

Note 1: Percentage First-time positivity rate = (First-time positive/Sample tested in first-time*100)

During phase 1, the total number of samples tested was 292,155 and out of them 276,357 (94.59%) were suspected (First time) patients and 15,798 (5.41%) tests were conducted on diagnosed (Repeat) patients who were at treatment centres. The positivity rate of first time was 1.22% (3,377/276,357).

During phase 2, Total number of samples tested was 1,832,355 and out of them 1,821,972(99.43%) samples were tested in first time patients, 10,383 (0.57%) tested on diagnosed patients who were at treatment centres. The positivity rate of first time was 4.66% (85057/1,832,355).

Total number of samples tested during the reporting period was 2,124,510 and out of them 2,098,329 (98.76%), samples were tested in suspected patients and 26,181 (1.24%) tests conducted in diagnosed patients. The positivity rate of reporting period was 4.21% (88,434/2,098,329).

Daily and cumulative report when required was issued as per the details in table 3. Also daily average, district wise community samples tested, and private sector performance report also issued as a routine.

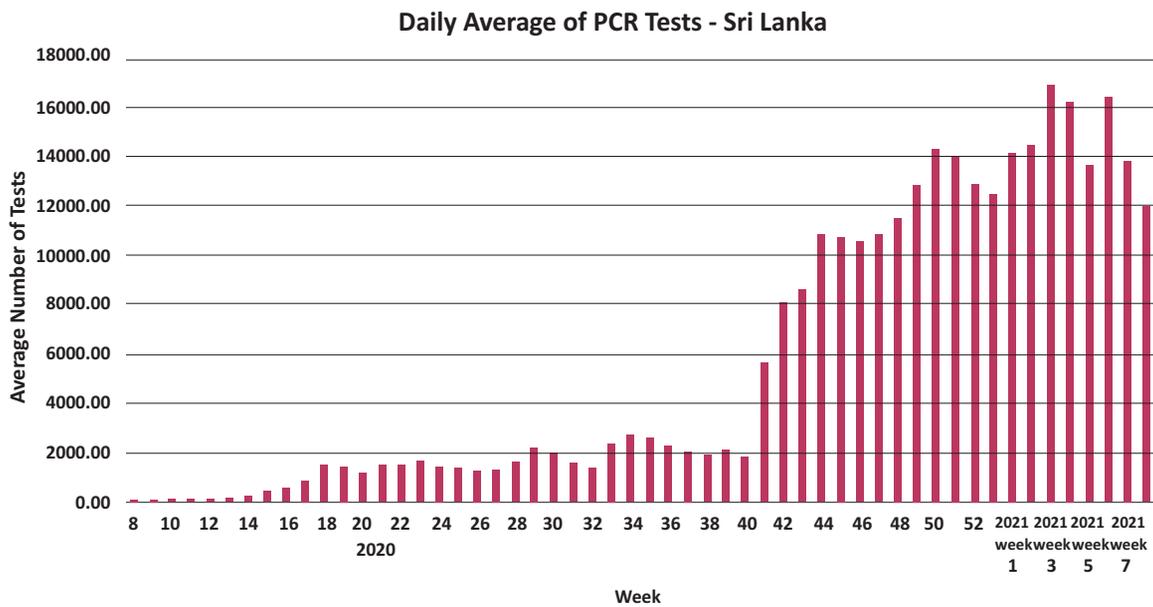
The performance of individual laboratories are described in table 3.

Table 3: Performance of Individual Laboratories

Laboratory Name	Samples		Positive Samples		Samples Inconclusive
	Received	Tested	First Time	Repeat	
Medical Research Institute (MRI)	236579	227990	10432	752	1616
BIA – Katunayake	205897	205693	10396	128	2562
TH - Karapitiya	135341	135483	4430	1027	784
BH-Colombo East (Mulleriyawa)	115538	112339	8535	18	3397
National Hospital - Kandy	102253	102325	4797	637	1900
NIID Angoda	101604	101001	5866	3813	2375
TH - Anuradhapura	86204	86064	2071	1243	1748
TH – Jaffna	59203	59208	825	38	1212
TH – Batticaloa	55134	54675	1952	287	313
PGH – Badulla	41273	40859	1482	70	268
Apeksha Hospital - Maharagama	35699	35934	1418	157	1234
CNTH- (Ragama)	33577	33636	1560	114	1062
TH - Sri Jayawardhanapura	26134	26432	997	0	415
DGH - Nuwara Eliya	25985	25923	1246	2	349
TH – Rathnapura	25484	25314	2130	93	813
TH – Kurunegala	9060	9031	532	9	48
CSTH - Kalubowila	4011	3872	479	0	56
National Hospital - Sri Lanka	4887	4887	197	0	192
DGH – Kegalle	1175	975	91	0	2
Sri Lanka Army Hospital	32174	32224	2168	147	251
Private Laboratories					
Nawaloka Hospital (pvt) Ltd	293662	293588	6660	1	20
Asiri Genetic Lab	107240	106449	2911	2	40
Durdans Hospital	96315	96330	1204	9	0
Lanka Hospital (pvt) Ltd	92492	91038	2067	5	6
Genelabs Medical (pvt) Ltd	33445	33437	915	5	29
Credence Genomics (Pvt) Ltd	4767	4751	281	4	2
Melsta Laboratories	3498	3498	140	0	0
Hemas Hospitals	1518	1518	35	0	0
Forte Diagnostics (pvt) Ltd	1069	1068	71	2	17
University Laboratories					
KDU	30451	30372	1085	309	884
Faculty of Medicine - Japura	109907	109818	10258	231	981
Faculty of Medicine - Jaffna	15905	15711	324	1	19
Faculty of Medicine - Colombo	6103	6032	265	3	87
Faculty of Medicine - Peradeniya	3973	4000	442	10	98
University of Peradeniya	1814	1800	153	0	7
Faculty of Medicine - Karapitiya	1356	1235	19	46	33
Total	2140727	2124510	88434	9163	22820

- TH-Teaching Hospital, PGH-Provincial general Hospital, DGH-District General Hospital, BH-Base Hospital, BIA- Bandaranayake International Airport, NIID-National Institute of Infectious Disease, NIHS-National Institute of Health Science, KDU-Kothalawala Defense University, CSTH- Colombo South Teaching Hospital, CNTH- Colombo North Teaching Hospital

Figure 1: Daily Average number of PCR Tests - Sri Lanka



There were 21 government sector laboratories, 6 university laboratories and 9 private sector laboratories. The maximum number of tests were done by Nawaloka Hospital (n=293588). The MRI and BIA tested more than 200,000 samples during the referring period out of the state sector institutions.

The average number of PCR tests conducted by the labs was calculated weekly (defined according to ISO standard). In Phase 1 (8 to 40 weeks of 2020), the maximum number was 2723, which was on the 34th week of 2020. In phase 2, the maximum daily average of 16921 was achieved in the 3rd week of 2021.

The total community samples tested in reported period were 1005763 (47.3%) and out of that 51923 were positive, with a rate of 5.16%. During phase 1, 81376 (27.85%) samples were tested, and 424 (0.52%) were positive. In phase 2, 924387 (50.73%) community samples were tested, and 51499 (5.57%) were positive. In both phases, Colombo, Kaluthara and Gampaha RDHS areas reported the highest numbers for community samples.

Four private laboratories (Asiri Genetic lab, Durdans hospitals, Lanka Hospitals and Nawaloka hospitals) conducted the PCR tests in phase 1. Though it was expanded up to 10 laboratories in phase 2, only 9 laboratories entered data during the reporting period. Overall, private sector contribution was 29.73% (n=631677). The majority were performed by the Nawaloka hospital during both phases.

4. Discussion

As the pandemic progressed over time, large-scale testing and contact tracing were the central efforts to understand the spread and respond appropriately. Based on the evidence, patient management criteria were advanced, testing of discharged patients was decided with reference to initial viral load; thus, conducting two consecutive negative samples was omitted. Therefore, the number of tests performed on diagnosed patients were reduced [Table: 02].

With increased demand, accredited private sector labs were recruited to conduct PCR tests. Nawaloka hospital performance was higher than even the MRI, the reference lab that initiated in January 2020. Convenience, to maintain privacy and as positivity attached stigma [Table:03] may be the causes. Increasing testing capacity reduced the unnecessary self-isolation, depletion of workforce especially for essential services and the missing potentiality of individual cases that minimize the risk of transmission.

Introducing mass testing for the community on both symptomatic and asymptomatic cases reduced the risk of nosocomial transmission. Another key epidemiological parameter that could inform the intensity and range of social distancing strategies to combat COVID-19 is the asymptomatic proportion. Indeed, the asymptomatic proportion is a useful quantity to gauge the true burden of the disease and better interpret estimates of the transmission potential (16). The remarkable improvement was achieved in this aspect in phase two than in phase one.

Regular feedback sessions were made for updating knowledge and technical modifications. Issues and opposing events were discussed at review meetings, technical advisory meetings and lab meetings to strengthen the process. Frequent feedbacks and daily performance reports helped to manage the continuous logistic supply. Cumulative reports were issued at different milestones. This daily performance report was validated with the comments of expert officials. Accordingly, the ministry expanded the services.

There was a difference noted between the sample tested, and the sample received in some labs. Reasons behind were the number of receiving samples was not compatible with the number of actual samples in the container, single samples tested several times in the same laboratory (duplicate sample), invalid samples and data entry errors (duplicate values).

A discrepancy was noted between figures of this system and the epidemiology unit because, the system reported number of positive samples while the epidemiology unit reported positive patients during reported period. Duplicate samples, several samples of one individual were sent to several labs, receiving multiple samples of one individual to the laboratory especially in postmortem samples were other reasons for the discrepancy.

Also, data disseminated to the Health Promotion Bureau for the national dashboard, which used for country comparison.

5. Limitations

Computer literacy of the data entry operator, supervision of the head of the institutions and national focal point affected the accuracy of the data. Although the system is compatible with mobile data entry, poor network connections still affect the data entry. The available data has limited value on epidemiological or demographic analysis. Strict discipline, responsibility should be maintained as individual users can enter the data for multiple laboratories.

6. Conclusion

Established focal point under the direction of DGHS provided remarkable improvement for accurate, effective data dissemination, maintaining appropriate logistic supply for labs to increase PCR testing capacity, project disease trend, improve patient care facilities, and identify the disease burden and for evidence-based distribution of samples among labs that reduced the overburden. Even today, this is a valuable source of information for policy planners and decision makers.

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“The impact of health informatics on public health emergency response during the COVID-19 pandemic in developing countries – systematic review”

Hewagama SP.

Abstract

Introduction: The world grapples with the unprecedented challenges of the Covid-19 pandemic with devastating economic and social impacts. The healthcare systems across developed and developing countries are laid a huge responsibility with immense pressure to combat this contemporary global crisis. With modern technological improvements health informatics (HI) plays a vital role in the public health emergency response (PHER). However, there is little empirical evidence to show the impact of HI in developing countries during this pandemic.

Objective: To determine how HI impacted the PHER during Covid-19 pandemic in developing countries.

Methodology: This study deployed a systemic review of published quality academic journals that emphasize and evaluate the HI role and impact during PHER in developing countries.

Results: The synthesized evidence in developed countries found that the technological advances in telemedicine, e-health and mobile devices have proven to possess huge potentials in controlling the pandemic spread with enormous rapid transformations of service delivery patterns, with high patient satisfaction. HI impact on developing countries reported a high positivity towards PHER during Covid-19 pandemic. The adoption rates were low in developing countries with the key determinants; digital technology, efficient health governance, partnership, collaboration in national & international, infrastructure, stakeholder skills and acceptance.

The empirical research findings clearly showed the fundamental need to establish suitable HI initiative framework in developing countries in align with the countries national policies with medium to long-term plans and collaborative international partnerships. The level of maturity of HI needed to be deployed within health systems at pace and scale ready enough to save the world in most needed.

1. Introduction

1.1. Background

Today the world grapples with the challenges of the COVID-19 pandemic affecting more than 80 million worldwide, lading huge responsibilities towards the public health systems globally. Healthcare systems across developed and developing nations are being put under tremendous pressure with this novel coronavirus (Nagesh & Chakraborty 2020). In particular, impact on developing countries at a higher rate, with imminent threats (CHP HKSARG 2020).

Health informatics (HI) is the application of information technology (IT) in the field of healthcare - clinical informatics, clinical research informatics, consumer HI(mobile devices, telemedicine), public HI (population & community). Health informatics is mainly powered by various forms of information technologies, telecommunication infrastructures, systems and their practices (Mosa, Yoo and Sheets, 2012).

The arena of HI combined with healthcare data, and modern business concepts have gained an enormous improvement in healthcare industry (Kabakus et al, 2016). Several HI applications are used to fasten the surveillance processes with high accuracy in public health. Eg; WHO web-based surveillance network.

IT based tools can support institutions effectively in pandemic response by facilitating the faster widespread distribution of information with real time tracking, creating virtual platform for discussions and operations, offering telemedicine for distant. (Langabeer et al, 2016). The health informatics tools are essential to be leveraged to the full potential (Reeves et al, 2020).

The establishment of integrated healthcare system will also provide positive reference for designing future intelligent healthcare platforms. Though, there are some financial limitations in developing nations, this contemporary health crisis warrants effective implementation of HI. Therefore, it is of utmost important to come up with the findings on the HI impact on pandemic response in developing countries.

1.2. Aim & objectives

Aim of this research is to critically evaluate the impact of Health Informatics on the COVID-19 Pandemic response in developing countries.

Objectives

1. To assess the key determinants of HI use in PHER in developing countries.
2. To describe the key initiatives on HI in Covid-19 pandemic response in developing countries.
3. To critically evaluate how HI impact on the public health emergency response during Covid-19 in developed countries.
4. To establish suitable HI initiatives to enhance pandemic response in future pandemics in developing countries.

2. Method of Analysis

2.1. Systematic review

This research deploys a systemic review of credible quality academic journals aiming to evaluate the impact of health informatics on public health emergency response during Covid-19 response in developing countries. As per Saunders, Lewis and Thornhill (2012), systematic review is a process of reviewing the literature using pre-planned criteria in order to filter the most appropriate and current literature. The range of the articles was based upon the pre-determined principles laid around the scope of selected review. The articles published after 2010 were used in this review to identify the latest analyses on the topic. Hence, all the selected articles on the topic were shortlisted and filtered based on the relevance to the topic and importance. Finally, attempts to come for conclusions with evidence.

The key scope of this review is to get a reliable and objective overview of the currently available evidence on the research questions and to synthesize them. Thus, the main objective of this systematic review is to evaluate the impact of HI on Covid-19 pandemic response in developing countries. The evidence-based evaluation will be able to evaluate the core aim of the study with the filtered sources which is cited to support the reasoning. The entire process follows theory to data approach which is deductive (Saunders, Lewis and Thornhill, 2012), supported by Denscombe (2017), pointing out the use of deductive approach to underpin theory to data. Furthermore, he stated the importance of using quantitative data while conducting a qualitative research.

2.1. Search criteria

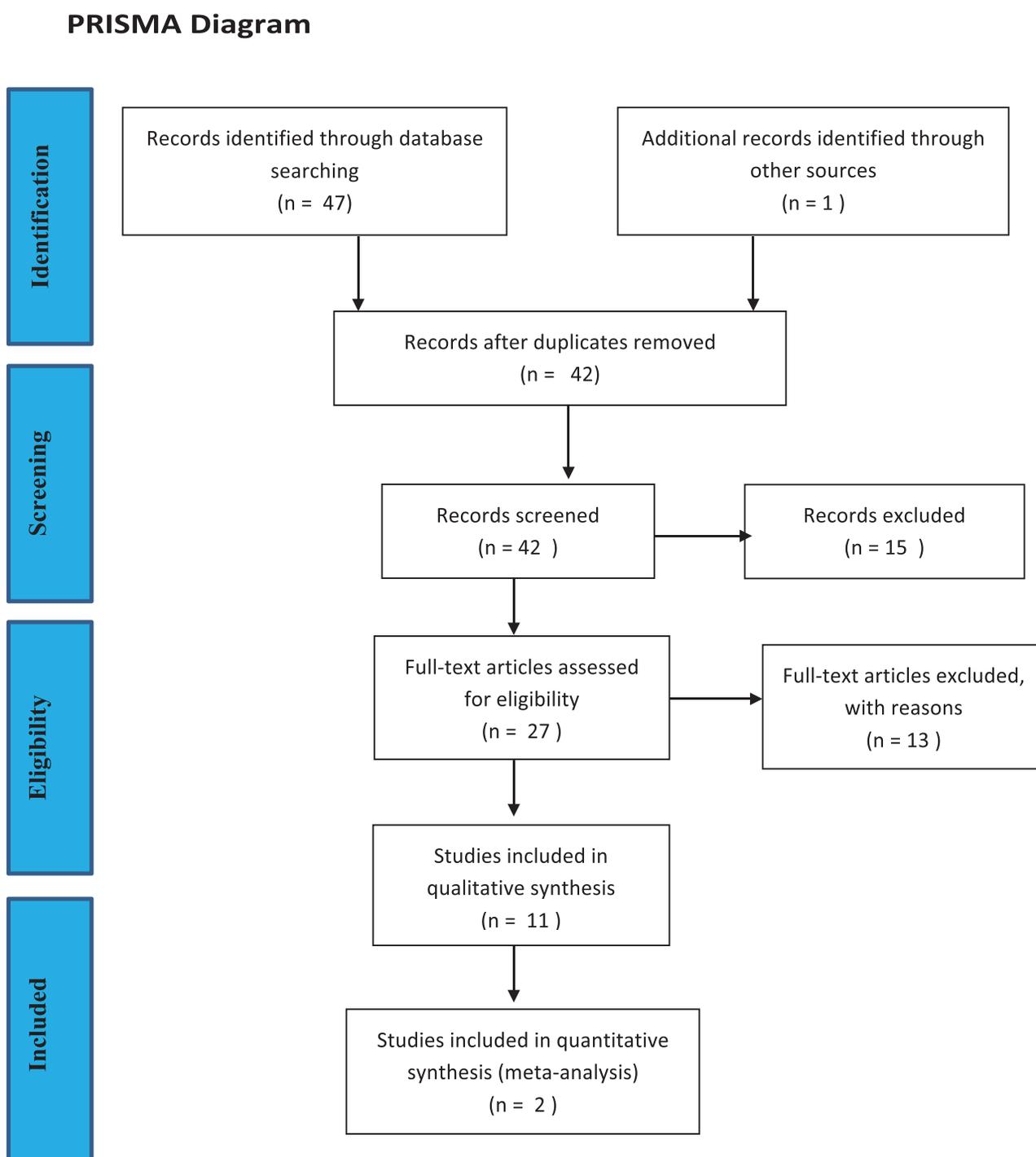
For this systematic review, studies were selected from Emerald insight, Elsevier, Pubmed, Scimago, Google scholar research databases focusing the areas of public health emergency response, health informatics, key determinants of HI in Covid-19 PHER in developing & developed countries including recent research relevant to HI and PHER in developing countries and related themes.

3.3. Inclusion & exclusion process

The peer-reviewed quality academic journals published after 2010 were considered by the author to evaluate the findings related to the research topic. Several key words were used to find most relevant articles.

The filtering was done as per the PRISMA model. Relevant and important academic journal articles were filtered considering priority, duplication, elimination to extract the most appropriate which can find out the answers and accomplishing the aim and objectives of the research.

Figure 5: Flow diagram of research selection as per PRISMA checklist



2.3. Thematic analysis

As per Saunders, et al., (2016) thematic analysis is one of the major tools and foundational method that support the analysis of qualitative data. Thus, it assists researchers on breaking down the qualitative data into thematic manner in order to create the codes. These coding methods finally identify the themes. Under this guidance the author used codifications and the qualitative data was tabulated as per the themes. Initial themes identified from literature review are structured under three key themes.

1. Key determinants of HI & health sector response in developing countries
2. The role & key initiative of HI in the public health emergency response in developed countries
3. Initiatives to enhance the future pandemic response in developing countries

3. Conclusions & Recommendations

This systematic review was aimed to critically analyze the best available data on the impact of Health Informatics (HI) on the COVID-19 pandemic response in developing countries and subsequently to establish an appropriate framework with suitable HI initiatives for developing countries. Fundamental need to establish suitable HI initiative in the developing nations was that, the systematic review revealed the high positivity related to HI use in PHER with the Covid-19 pandemic experience.

With that motivation it is then set to process of establishing most suitable initiative framework for developing countries incorporating the related key factors and performance measures. The key determinants were identified fulfilling the first objective by synthesizing all the articles. It should be appreciated that the key determining factors are common to both developed and developing regions except the factor of funding which is critical for the developing countries.

The light of the researchers revealed low adoption rates in developing countries compared to the developed world and the key determinants; the digital technology, efficient health governance, and civil partnership. Further, ICT infrastructure, internet penetration, user perceptions, collaboration specially the national & international were also identified as influencing factors. Finally, synthesizing the evidence of systematic review on key determinants it could be summarized as the infrastructure, stakeholder skills and acceptance.

Telemedicine and mobile devices were identified in most studies as initiatives in developing countries in combating Covid-19 with live video conferencing, wireless remote monitoring, distant multi-disciplinary care, health education, collecting health information, transforming and evaluation. As the COVID-19 pandemic scales exponentially across the countries, calls for extended use of telehealth and other innovative solutions, validates the concept of having well integrated virtual health platforms for developing countries with enormous rapid transformations of service delivery patterns. In addition, several prediction models were developed for diagnosis and prognosis of covid-19 globally.

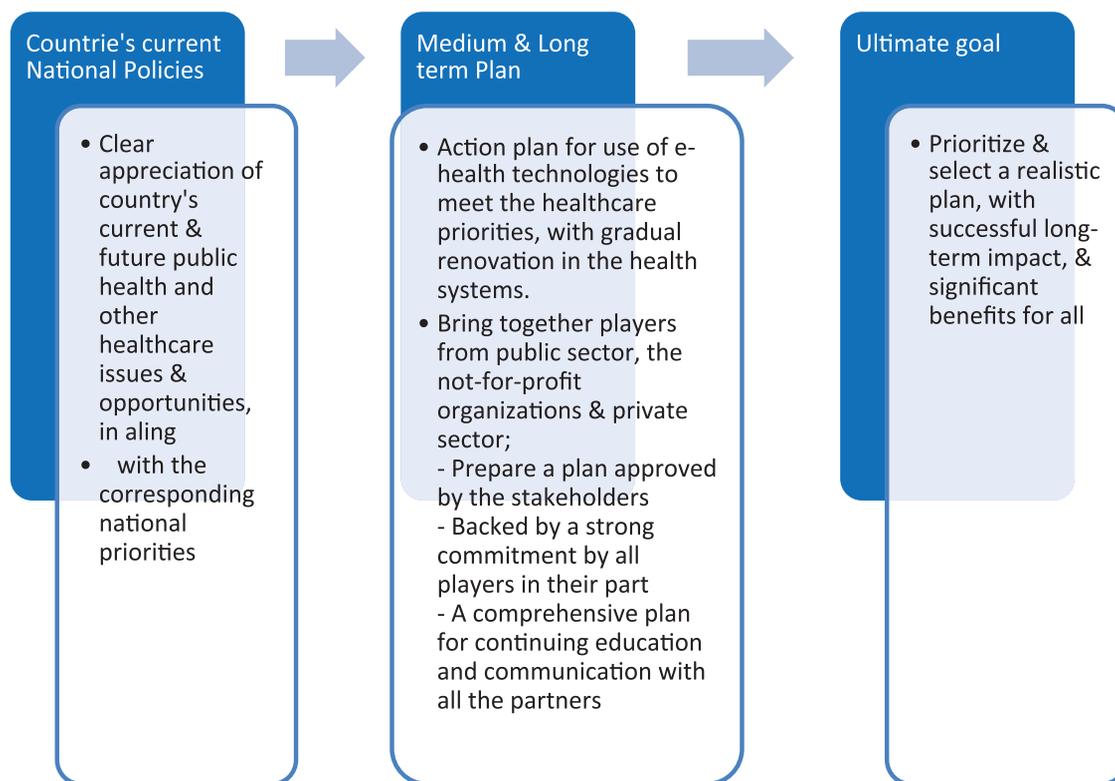
The synthesized evidence in developed countries found that the technological advances in telemedicine have proven to possess huge potentials in controlling the pandemic spread with enormous rapid transformations of service delivery patterns. The experience suggested the level of maturity needed to be deployed within health systems at pace and scale addressing the fact that the available HI technologies are not ready enough to save the world in most needed. Also the evidence reported high patient satisfaction with HI practices in developed countries. French telemedicine system provides an example for a well-established HI system.

Overall, the evidence depicts the possible roles of health informatics played in moving forward the technology that supports healthcare both in developed and developing countries. The experience from developed countries during Covid-19 pandemic response can guide the way of developing world to combat public health emergencies. The emerging technologies like telemedicine, and artificial intelligence, cloud computing, 4G mobile communications are becoming indispensable in emergency response.

As user engagement revealed as a vital factor it is important to improve the skills among stakeholders. Finally, it is essential to have stringent measures in developing countries to ensure the data security and integrity. Also the prediction models carry a high risk of bias and are still at primary stages. It is vital to have national and international partnerships for successful future health IT solutions in developing countries. Drawing on experience and the lessons learned from developed world, and considering progress in technology during this contemporary crisis, it is imperative to incorporate suitable HI initiatives for PHER in the healthcare systems of developing countries. With the most available knowledge derived from the review, the author proposes a framework exploiting new avenues for future research.

As depicted in the figure the author proposes a framework.

Figure 1: Framework for developing countries HI initiatives.



Findings from this study depict e-health and telemedicine's transformative impact on PHER and the rapid shift in the virtual platform adoption in healthcare. Although, HI cannot completely solve the issues caused by COVID-19 in health, it can help to flatten infection curve of COVID-19. The implications of this research will guide the way of future researches on suitable, effective and sustainable HI initiatives for developing countries to combat more efficiently.

Since this study is a systematic review, it carries some own limitations. Some limitations occurred for this study due to issues in language, accessibility and skipped attention. The factors discussed in this paper essential to be generalized with caution and can be varied within different countries. Therefore the proposed framework by the author needed to be validated through further survey or case study by using primary data and mixed method.

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Barriers and Strategies to Implement e-procurement in the State Pharmaceuticals Corporation (SPC) of Sri Lanka

Koggalage PD.

Abstract

Introduction: Public procurement not only delivers goods and services to public, but also ensures value for money. An efficient system is vital to accomplish core principles of public procurement: transparency; fairness; competitiveness; value for money; efficiency, etc. The State Pharmaceuticals Corporation of Sri Lanka (SPC) procures pharmaceuticals for state health sector through traditional procurement which has inefficiencies affecting patient care services. Therefore, introduction of e-procurement in SPC is pivotal.

Objective: To obtain the perspectives of staff of the SPC about barriers and strategies to implement e-procurement for pharmaceuticals.

Methods: A descriptive cross-sectional study was designed to obtain perspectives of staff in selected sections of SPC about barriers and strategies to implement e-procurement for pharmaceuticals. Data was collected by a survey using a self-administered questionnaire which mainly contained five-point Likert scale questions and analysed using SPSS software.

Results & conclusion: The majority was dissatisfied with the existing system which is less efficient, costly and less user-friendly. The majority agreed that lack of political and top level commitment, lack of knowledge and skills of the staff, lack of IT experts and necessary infrastructure facilities as barriers for implementation of e-procurement. Political advocacy, training of top level managers and staff members, development of necessary infrastructure facilities and Public-Private Partnership initiatives were perceived as viable strategies.

Research implications: The study obtained perspectives of staff about barriers and strategies for e-procurement initiatives, which will support successful implementation as they are the implementers and the end-users.

Keywords: electronic procurement; barriers and strategies to implement e-procurement; State Pharmaceuticals Corporation of Sri Lanka.

1. Introduction

1.1. Overview of Procurement

Obtaining of goods, services or works by procuring entities by the most appropriate means, with public funds or funds from any other source whether local or foreign received by way of loans, grants, gifts, donations, contributions and similar receipts is known as 'Public Procurement' (1). Public procurement has core principles such as transparency, equity, fairness, competitiveness, accountability, value for money, economy and efficiency, integrity and non-discrimination (2).

A traditional public procurement process is characterised by manual events. Therefore, it is more time consuming, expensive and prone to errors. Also, there needs to be large number of human resources to manage the process (3). Moreover, a traditional system has too much attention on procedural compliance rather than on its performance. Hence, it sometimes acts as a bottleneck to efficient service delivery, with unnecessary delays (2). Therefore, traditional processes can be enhanced by the application of Information and Communication Technology (ICT) which is known as electronic government procurement (e-GP) (4). It can streamline all aspects of the procurement system by simplifying processes (5). Also, e-GP will provide access to a larger marketplace, minimize the opportunity for manipulations and corruption (2).

1.2. The State Pharmaceuticals Corporation of Sri Lanka

The State Pharmaceuticals Corporation of Sri Lanka (SPC) has been established with the objective of supplying pharmaceuticals and other medical consumables to all health institutions under the Ministry of Health, Sri Lanka (6). It acts as the central procurement arm for pharmaceuticals for the Ministry of Health. Its existing traditional, paper-based procurement process faces many challenges in fulfilling escalating demands of the country. Introduction of e-procurement methods will be a good solution to ensure the efficiency, effectiveness and transparency of processes. Therefore, it was vital to obtain perspectives of the staff engaging in procurement activities in SPC about barriers and strategies for implementation of e-procurement methods as they will be the implementers and end users of the system.

1.3. Objective

To describe the perspectives of the staff engaging in procurement activities in the SPC on barriers and strategies to implement e-procurement system for pharmaceuticals.

2. Methods

2.1. Study design and setting

This descriptive cross-sectional study was conducted in the selected sections of the SPC during the five-month period from October 2018 to February 2019. The selected sections were Pharmaceutical, Surgical-Annual, Surgical-Special, Laboratory and Technical Divisions considering their level of involvement in the procurement process and the feasibility.

2.2. Study population

All the staff members who had at least six (6) months of service in the selected divisions of the SPC, engaging in the procurement process at different stages were purposively selected as the study population. The total number was 70.

2.3. Collection of data

Collection of data was done by the Principal Investigator (PI) using a structured pre-tested, self-administered questionnaire prepared in English medium. The study analysed selected socio-demographic characteristics of respondents, their perspectives on the existing procurement process and also, the barriers and strategies for implementation of e-procurement for pharmaceuticals. Variables were identified under each specific aspect and operationalized by including relevant questions in the questionnaire. The responses for majority of questions were in the 'Five Point Likert Scale'.

- eg. 1. Very Satisfied
2. Satisfied
3. "N" (Neither Satisfied nor Dissatisfied)
4. Dissatisfied
5. Very Dissatisfied.

An 'Information Sheet' and a 'Consent Form' were provided with the questionnaire.

2.4. Analysis of data

The analysis of data was carried out by the PI using the Statistical Package in Social Sciences (SPSS), Version 21.0 software. Results have been presented using frequency distributions.

2.5. Administrative and ethical requirements

Permission to conduct the study was obtained from the General Manager of the SPC.

Participation in this study was completely voluntary. Purpose and issues related to the study were explained to every participant using the Information Sheet and informed consent was obtained. Information gathered was kept confidential. Only the aggregated data was presented and published.

3. Results

Out of all the staff members under consideration (n=70), 60 responded to the questionnaire with a response rate of 85.7%.

3.1. Socio-demographic characteristics of the respondents

As depicted in Table I below, among the respondents, 41.7% and 38.3% were in age groups 19-30 and 31-40 years respectively. The majority was females (70%). The large majority, 73.3% included Management Assistants at the operational level.

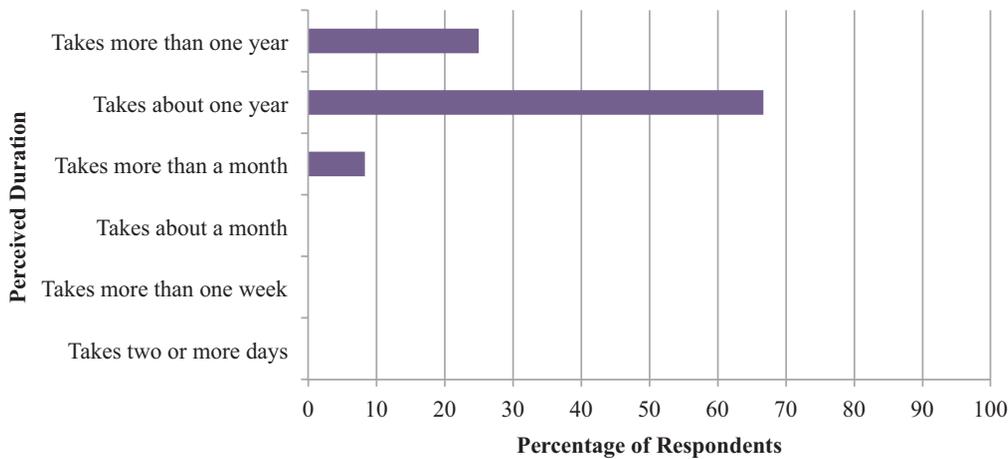
Table I - Frequency distribution of respondents by selected socio-demographic characteristics

Characteristic	Frequency (n=60)	Percentage
Age groups/ Years		
19 – 30	25	41.7
31 – 40	23	38.3
41 – 60	12	20.0
Sex		
Male	18	30.0
Female	42	70.0
Designation		
Deputy General Manager	03	5.0
Supervisor	05	8.3
Procurement Officer	08	13.4
Management Assistant	44	73.3

3.2. Perspectives of respondents on the existing procurement system at SPC

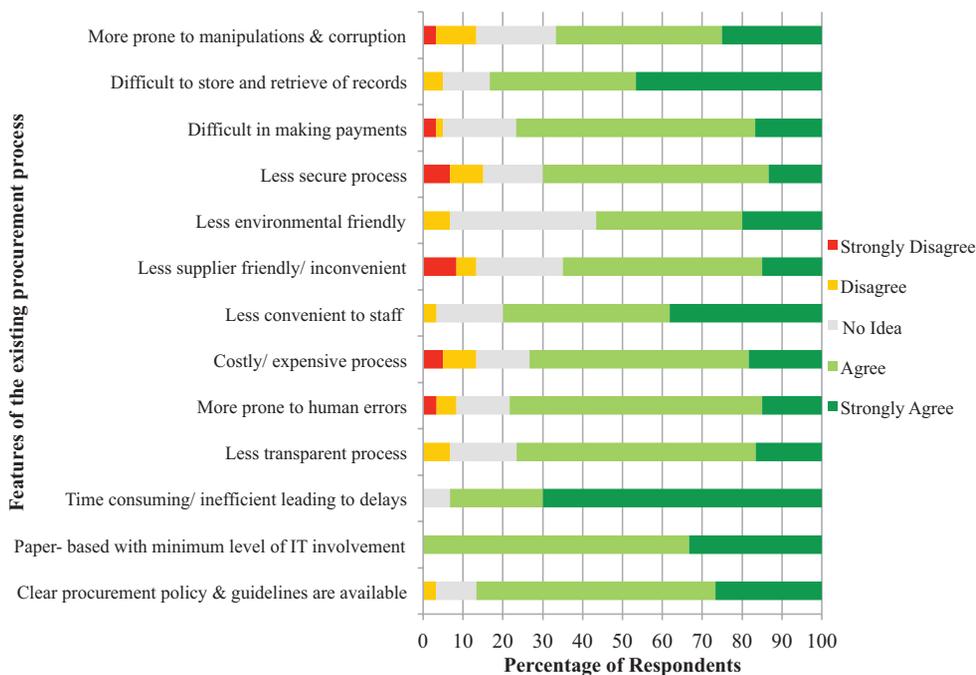
The perception of respondents about the average lead time is shown in Figure I below.

Figure I - Perception of respondents about average time taken to receive goods from order date (lead time)



The large majority, 66.7% was of the view that the average time taken to receive goods (lead time) is about one year. The level of agreement of respondents with the existing procurement process is shown in Figure II.

Figure II - The level of agreement of respondents with the following features of the existing procurement process in SPC



The majority, 60% agreed that clear procurement policies and guidelines are available at present while another 26.7% strongly agreed with that. The large majority either agreed (66.7%) or strongly agreed (33.3%) that the existing system is paper-based with minimal IT support. Seventy percent strongly agreed that the existing system is more time consuming and inefficient while 60% agreed that this is a less transparent and 63.3% agreed that it is more prone to human errors. The majority either agreed (41.7%) or strongly agreed (25%) that the existing procurement system is more prone to manipulations and corruptions.

Table II shows respondents' overall level of satisfaction about the existing process of procurement at SPC.

Table II - Overall level of satisfaction of respondents about the existing procurement process in SPC

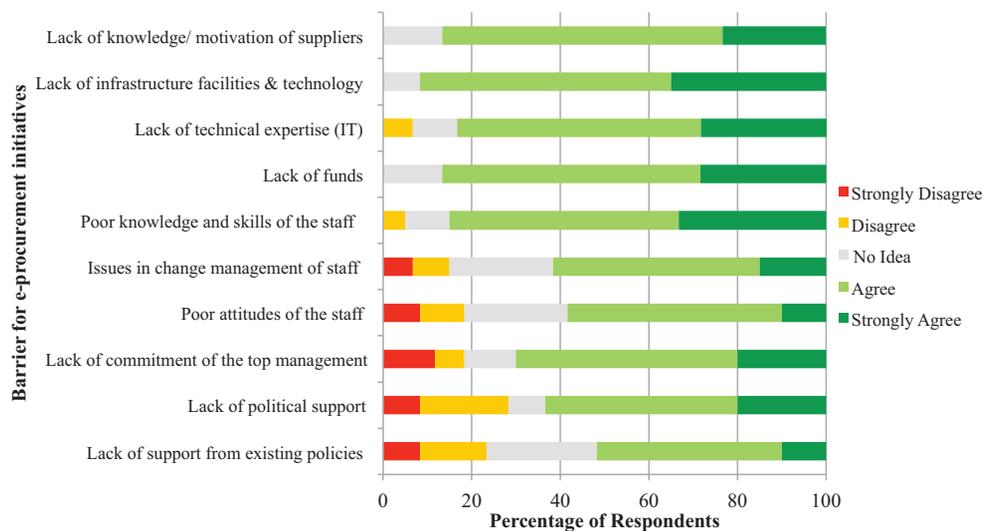
Level of satisfaction												
Satisfaction	Very Dissatisfied		Dissatisfied		No Idea		Satisfied		Very Satisfied		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
	Overall level of satisfaction	08	13.3	32	53.4	12	20.0	08	13.3	00	0.0	60

It was evident that the majority of participants were either dissatisfied (53.4%) or very dissatisfied (13.3%) with the existing procurement process at the SPC.

3.3. Perspectives of respondents on barriers to implement e-procurement in SPC

Their level of agreement with the perceived barriers for implementing an e-procurement system in SPC is shown in Figure III.

Figure III - The level of agreement of respondents with the perceived barriers for implementing e-procurement in SPC

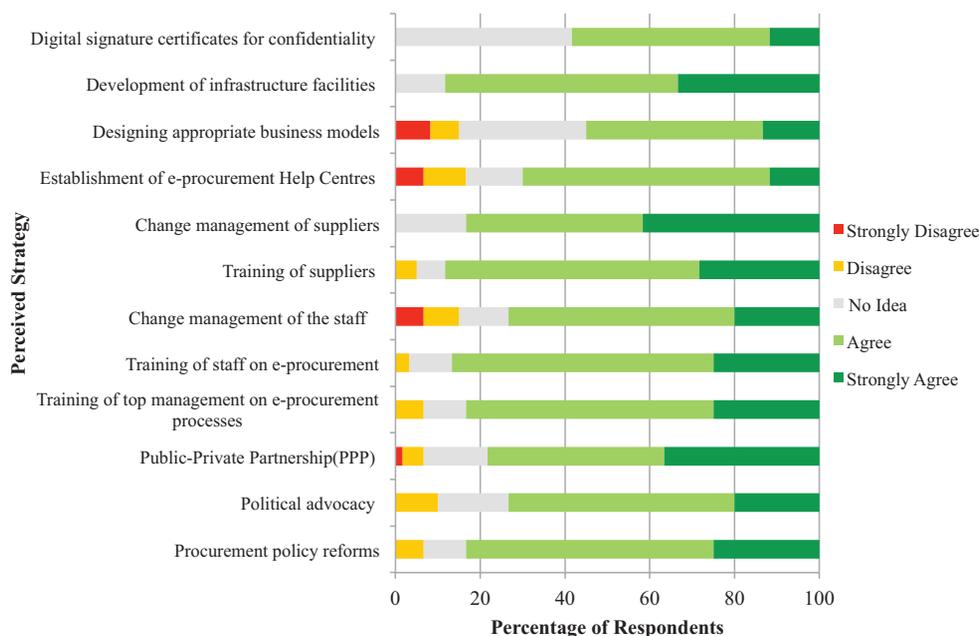


Most of the participants either agreed (41.7%) or strongly agreed (10%) that the existing policies and guidelines act as barriers in implementing e-procurement systems. About 61% either agreed or strongly agreed that there is lack of political support while 70% either agreed or strongly agreed that there is lack of commitment from the top management. The majority either agreed (51.7%) or strongly agreed (33.3%) that lack of knowledge and skills of the staff acts as a barrier. The majority, 56.7% and 35% agreed and strongly agreed respectively that lack of infrastructure facilities and technology in the institution as a barrier.

3.4. Perspectives of respondents on strategies to implement e-procurement in SPC

Their level of agreement with the following strategies to implement an effective e-procurement system in SPC is shown in Figure IV.

Figure IV – The level of agreement of respondents with the following strategies to implement an e-procurement system in SPC



The majority either agreed (58.3%) or strongly agreed (25%) that there should be policy reforms in order to implement e-procurement systems. About 73% either agreed or strongly agreed that political advocacy is an important strategy. A large majority (78.3%) either agreed or strongly agreed that PPP can be a viable strategy in this regard. About 83% either agreed or strongly agreed that the top management should be trained while it was 86% for training of the staff. About 88% either agreed or strongly agreed with the strategy to develop infrastructure facilities for e-procurement.

4. Discussion

Traditional public procurement gives too much attention to compliance on procedures rather than on its performance. Therefore, procurement has often become a barrier to efficient service delivery (2). In many countries, traditional procurement processes have considerable inefficiencies which adversely affect the achievement of value for money in the procurement of goods and services (7). Similarly, in Sri Lanka also, the supply of pharmaceuticals has been adversely affected due to delays in traditional procurement procedures. Hence, it is high-time to automate procurement process of the SPC. This study was designed aiming at describing the perspectives of the staff of the SPC about perceived barriers and strategies for implementation of e-procurement. Out of 70 relevant staff members, 60 responded (response rate=85.7%) to the self-administered questionnaire with five-point Likert scale questions.

About the existing procurement system, the majority (66.7%) mentioned that the average lead time is about one year while another 25% said it's more than one year. Mawenya (2008) has also identified this delay as one of the challenges (7). However, it is not only delays in the procurement process that leads to this considerable lead time, but also other reasons which need further analysis.

The large majority either agreed (66.7%) or strongly agreed (33.3%) that the existing system is a paper-based one with minimal IT support. As Claritum (2009) discussed, this type of traditional procurement process will consume more time mainly for managing the approvals, invoices and bills on paper which is more prone to errors and loss of paperwork (3). The majority of the present study strongly agreed that the existing system is more time consuming, inefficient, costly, more prone to errors and less transparent. Therefore, the majority was either dissatisfied (53.4%) or very dissatisfied (13.3%) with the existing procurement process at the SPC. All these findings are consistent with discussions of both Claritum (2019) and Komakech (2016) (2,3).

The majority agreed that the existing policies and guidelines, lack of political support, lack of commitment from the top level management, lack of IT experts, lack of necessary infrastructure facilities and technology and lack of knowledge and skills of the staff on e-procurement act as barriers. A similar study conducted in Kenya also revealed that the employees' poor level of e-procurement skills had affected implementation of e-procurement (8).

The majority in this study either agreed or strongly agreed that there should be policy reforms, political advocacy and the commitment of top level management in order to implement e procurement successfully. Similarly, Clifford McCue (2012) also recommended that all the relevant stakeholders; policymakers, system designers, and procurement professionals must be involved at all stages of e-procurement implementation (9). Training the management and the staff, development of necessary infrastructure facilities and PPP initiatives were other important strategies for which the majority agreed.

4.1. Limitations

The study was limited to purposively selected Divisions of the SPC due to time constraints. Analysis was limited to calculation of percentages due to limited time.

5. Conclusion and Recommendations

This descriptive cross-sectional study was designed to describe the perception of staff members of the SPC towards implementation of an e-procurement system for pharmaceuticals.

The majority was dissatisfied with the existing traditional procurement process of the SPC and agreed that lack of political advocacy and top level commitment, poor knowledge and skills of staff and lack of necessary infrastructure facilities and expertise as barriers for implementation of e-procurement. Hence, political advocacy, top level commitment, training of staff and PPP initiatives were possible strategies agreed upon by respondents.

Therefore, the study recommended the following.

- Advocate political leaders and top level managers on the importance of implementing e-procurement in SPC.
- Establish PPP initiatives for funding for infrastructure developments, technology and also for expertise.
- Conduct in-service training programmes on e-procurement methods for staff.

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Use of GIS mapping in the COVID 19 outbreak management

Sampath Indika Kumara MK, Pathiraja PMRBI, Ranasinghe RASU, Vipula Shantha NAR.

Abstract

COVID 19 pandemic has exposed gaps in outbreak management in different parts of the world. Evidence based decisions are compelled by health authorities. Even though Geographical Information System (GIS) has been identified as a technology to support different avenues of public health management, it has been rarely utilized at regional level outbreak management. COVID-19 case maps for high-risk Medical Officer of Health (MOH) areas at Grama Niladari Division (GND) level were compiled using freely available GIS software. These maps were used in different scenarios of regional level outbreak management and also helped other non-health stakeholders involved in COVID 19 prevention activities.

Key word: COVID-19, GIS, Case Mapping.

Introduction

Geographic Information Systems (GIS) and spatial mapping act as new tools to fight complex pandemics. The use of GIS mapping in an outbreak yields several important results for prevention of further spread, identification of hot spots, resource allocation, future trend projections. The challenges caused by COVID 19 prompted health officials to use GIS mapping. The use of maps can be at many levels. It has been initially used for spatial identification of the spread of the disease and forecasting future outbreaks(1). Several developing countries have practiced GIS based analysis in the COVID 19 outbreak situation in terms of understanding the real scenario. In Australia GPS mapping was used to describe the geographic distribution variability of COVID 19 in reference to health care services availability(2). In South Africa mapping was used to outline the COVID 19 risk zones (3). Maps have been found to be effective in identifying and communicating risk(4). But use of GIS mapping in the field is still in infancy stages in Developing countries like Sri Lanka due to inadequacy GIS professionals and the resources. COVID 19 has become a global pandemic in the recent years with the first few cases reporting in 31/12/2019(5). Since then up to this date, there has been 121,817,583 COVID 19 cases and 2692699 deaths due to COVID 19 worldwide(6).

First case of COVID 19 in Sri Lanka was reported on 10/03/2020(7). First COVID 19 case in Kurunegala was reported in 13/03/2020. Since then 4,556 COVID

patients and 66 deaths due to COVID 19 have been reported in North Western Province (NWP)(8). Our objective in this study was to utilize GIS mapping in the COVID 19 outbreak management in local setting.

Design and Methods

Map is a visual output generated from various data sources for the decision on geographically bounded instances. By nature of the Map, it is easy to understand the real situation in terms of geographical means rather than other classical analysis tools.

In the situation of COVID 19 pandemic, it is most important to obtain the real locational information and recent movement of COVID 19 positive cases to reduce the spread of disease, identify the potentially risk population exposed and creating measures for other strategic interventions such as welfare programmes or giving assistance or subsidies to really affected and high priority families.

Demarcating the vulnerable population or COVID 19 clusters to some geographical extent is a challenge. Grama Niladhari Division (GND) is the smallest administrative boundary of Sri Lanka and demarcation is clearly defined and digitized the maps for GIS purposes by the Department of Survey General. These GND information is used to demarcate the COVID 19 risk area supported with other COVID 19 related epidemiological risk parameters.

Criteria to categorise High Risk GND

- 1) There are the positive cases reported beyond particular family cluster
- 2) There are positive secondary contacts
- 3) There are positive cases without epidemiological link (Unknown Index Case)
- 4) There are unknown contacts in the area
- 5) Positive cases reported after participation to an event (Religious, Wedding or Party)
- 6) PCR positivity rate

Freely available GND information (Digital Data, shape files) from Department of Survey General is used as based maps. MOH Area Map layers and District Map layers were created using same GND data source in same resolution. QGIS version 3.16, MS Excel and Google Sheet were used as computer software.

Each and every COVID 19 positive case reported at high risk MOH areas was entered to the Google Sheet and updated all relevant epidemiological information. Geographical coordinates were captured for each and every case and was updated using centroid coordinates of relevant GND. This information was used later with QGIS software to create Risk and Other COVID 19 Map production. Random spotting of cases by GND was the major algorithm used to maintain privacy and confidentiality of the patients.

Results and Discussion

Use of GIS in Management of COVID 19 in PDHS, NWP

GIS mapping was broadly used by the Provincial Department of Health Services, North Western Province (PDHS NWP) for management of COVID 19 in two situations;

- i. For clear demarcation of lock down areas until contact tracing
- ii. Socio economic stratification of lock down areas for resource allocation.

Clear demarcation of lock down areas until contact tracing

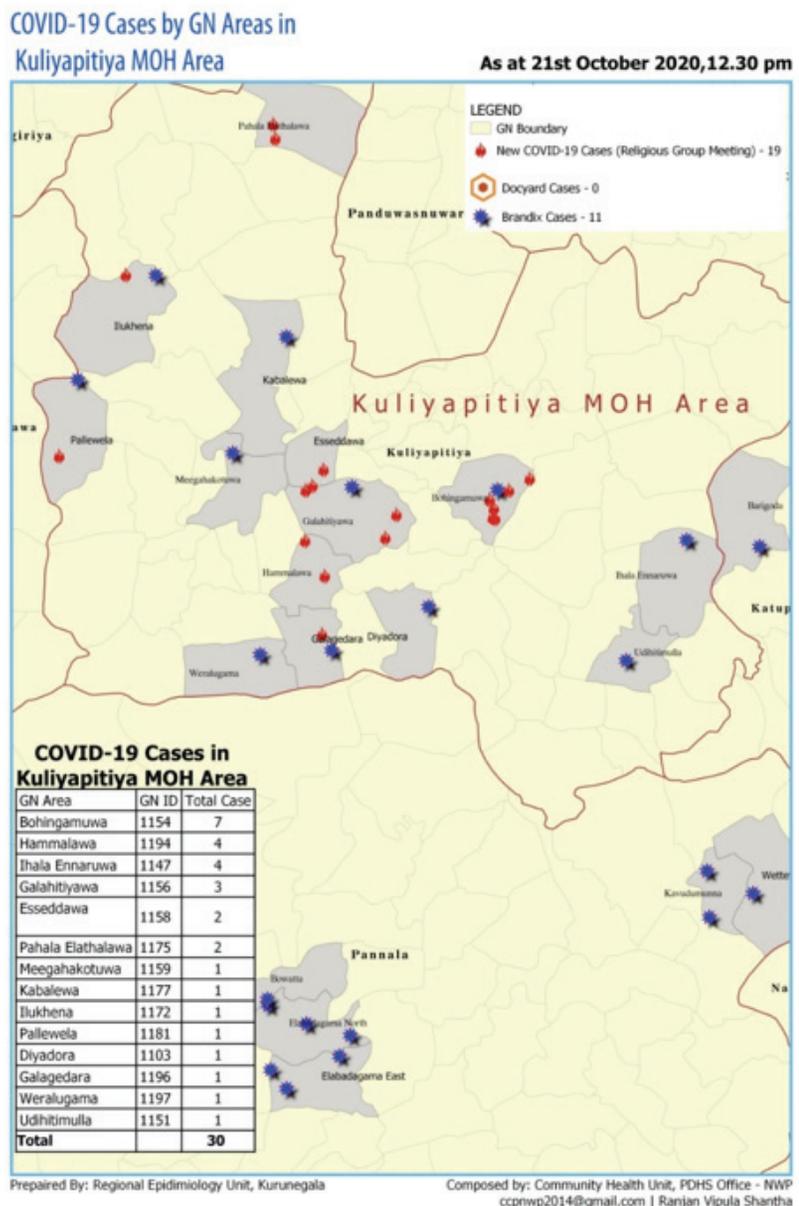
The contact tracing of COVID 19 patients remains a priority in controlling spurious spread (9, 10). However the contact tracing in the developing countries is somewhat hard due to lack of systematic location tracing methods(11).

On 12/10/2020, a COVID 19 patient was detected by the passive surveillance system established at the Teaching Hospital Kuliyaipitiya. This was a random PCR testing conducted for febrile patients presenting to outpatient department. A complex situation developed while tracing her contacts. She has participated to a wedding and a mass at the church. All her workplace colleagues were tested negative. On 15/10/2020, two of the participants at the wedding were tested positive. On 16/10/2020, a patient who was admitted for heart failure was tested positive for COVID 19, exposing

53 members of the hospital mass. This incident and the untraceable numerous contacts lead to a situation out of control from the health officials.

Locking down the whole region was going to affect the country as most of the egg and other dairy product needs are supplied from this area. All the cases and known contacts of this incident that has been found were mapped using GIS mapping. Four Grama Niladhari Divisions were found to be red spots. GIS map was used to prioritise the PCR testing of the contacts and community. As all the cases were mapped separately, it was easy to identify the affected GN divisions of this immediate incident, separately. Curfew was imposed in these GN areas without affecting the other areas of the MOH.

Figure 1- COVID 19 cases distribution in Kuliyaipitiya MOH area



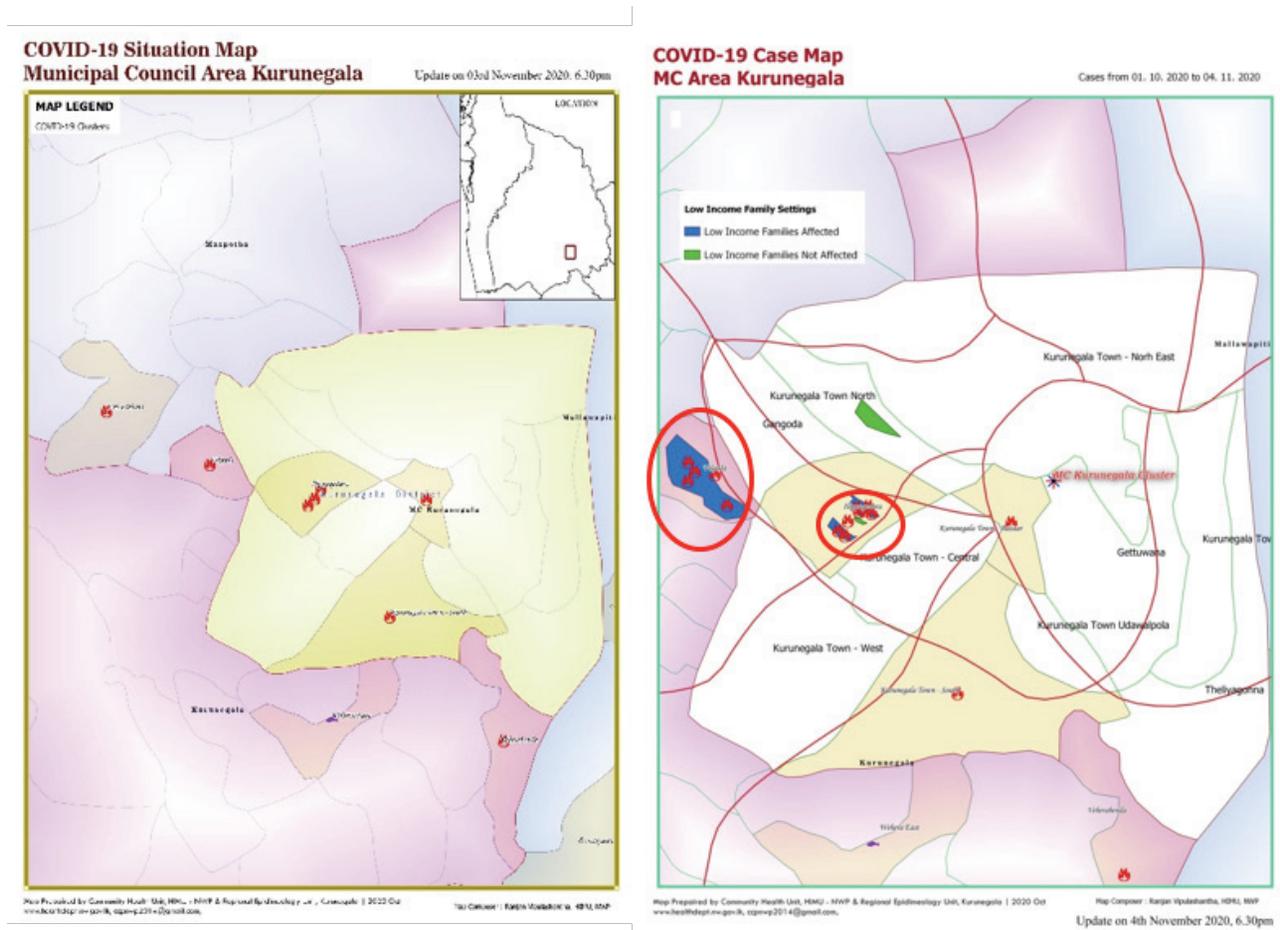
As shown in the figure 1, the cases marked by fire flame were the cases related to the incident mentioned above. The areas demarcated with these were locked down immediately and an urgent contact tracing was conducted. This map enabled as to lockdown targeted areas with high disease burden.

Socio economic stratification of lock down areas for resource allocation

Lockdown was a strategy used in COVID 19 outbreak in many countries (12, 13). This is necessary in contact tracing and preventing further spread of disease. But some of the residents in these areas are daily wagers with low income levels. Lock down will push them below poverty line more and requiring provision of daily needs (14). Therefore, government has decided to provide basic needs and some monetary allowances for people in these areas. For a developing country, such decision should be initiated among most needy people as of the

poor economic strength in the country. Therefore, socio economic data should be apparent for such distribution. This has been conducted in USA with use of mapping of socio economic status and COVID 19 cases for the purpose of disease exploration (15). At PDHS NWP this method was crudely used in outbreaks at Kurunegala municipal council areas. Some areas in Municipal council area were locked down with identification of several sub clusters. After mapping, it was found that these sub clusters were spread throughout the city limits. A local government decision was taken to provide basic needs and monetary allowance for the people. In there the prioritisation had to be done using the socio economic stratification. GIS mapping was conducted stratifying areas according to Socio economic data available. This was further furnished with COVID 19 case distribution mapping. The clusters in lowest socio economic levels were identified and prioritised in aid distribution.

Figure 2 COVID 19 Local Level Sub Cluster for Essential Lockdown



Conclusion

GIS can be incorporated in COVID-19 outbreak management process in different scenarios at regional level. Intersectoral information sharing could be achieved by utilizing GIS Maps in a user friendly way. Further high risk geographic areas can be visualized and demarcated at GND level as well as below GND levels. Decision of restriction of people movements or lock down can be taken cautiously by exploring GIS maps. In addition it improves transparency of data and case reporting. Ultimately it will facilitate evidence based sociological and epidemiological outbreak management decisions.

Further development

This GIS mapping can be incorporated in to a data base developed on COVID 19 patients. Thus automatically all the maps can be generated. It will facilitate automatic new cluster identification and contributions in COVID 19 distribution analysis.

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Does Sri Lanka's Drug and Laboratory Supply related Regulatory Mechanism address the current concerns at tertiary level hospital care?

Gunasekera V.

Abstract

Although medicinal products and drugs may have similar characteristics as any other commodity, consumers would need specific knowledge to make decisions with regard to their usage, benefits, harms and potential risks. Poor regulatory capacity could lead to monopolies, breach of market principles, market failure, trade ethics and large scale corruption. If unregulated, money spent for procuring and providing poor quality medicinal products, which are unsafe and ineffective may go down the drain.

However, institutional level Health Technology Assessment (HTA) has been given little importance in the current day practice specifically in Tertiary level hospitals. Due to lack of capacity at institutional level for evidence based decision making, tertiary level institutions may not be able to make right choices to produce desired clinical outcomes.

Therefore, regulatory needs of large institutions such as tertiary level care institutions and specialized hospitals need to be addressed with special emphasis on their uniqueness and specific needs. Country's drug and medicines regulatory mechanism is paramount in fulfilling fundamental public health objectives.

Introduction

Unlike for any other commodity medicinal products and drugs, consumers would need specific knowledge to make decisions with regard to their usage, benefits, harms and potential risks. Therefore, professional advice is needed to make this consumer decision from a prescriber or the dispenser in order to make the right choice.

Why regulation is important

There may be many consequences resulting from using poor quality and harmful drugs such as treatment failure and worsening disease conditions, drug resistance especially in the case of antibiotics and even death. Use of poor quality drugs may also demonstrate a bad impression on the health care delivery system and create frustration among professionals, practitioners, and all other industry stake holders. Furthermore, poor regulatory capacity could lead to monopolies, breach of market principles, market failure, trade ethics and large scale corruption. Resources used for procuring and providing poor quality medicinal products, which are unsafe and ineffective may go down the drain.

Therefore, it is the government's responsibility to protect its citizens/patients in this specific field where they would not have adequate knowledge, skills to make right consumption decision. In order to safeguard the public from such ruinous situations, government need to establish a strong mechanism for drug and medicinal product regulation institutionalizing a body of strong National Medicinal and Drug Regulatory Authority (NMRA). In broader perspective, the body should be able to regulate, promote and protect all public health aspects of drugs and medicinal products in the country. Hence the mechanism will need strong technical capacity in terms of knowledge, skills and capacity to make scientific evidence base decisions on these products within a well-structured legal frame.

Minimum regulatory functions for a National Regulatory Authority (NRA)

As an absolute minimum NRAs should:

- ensure that all medicines manufacturing, importation, exportation, wholesale and distribution establishments are licensed. Activities and premises must comply with Good Manufacturing Practices (GMP) and Good Distribution Practice requirements.
- before medicines are marketed, assess their safety, efficacy and quality.
- monitor the quality and safety of medicines on the market to prevent harmful, substandard and counterfeit medicines from reaching the public.
- regularly inspect and control the informal market, including e-commerce, to prevent illegal trade of medicines.
- monitor advertising and promotion of medicines, and provide independent information on their rational use to the public and professionals.
- participate in sub-regional and regional regulatory networks and international meetings of drug regulatory authorities to discuss issues of mutual interest and concern, facilitate timely exchange of information and promote collaboration.
- monitor and evaluate performance to assess if perceived regulatory objectives have been met, to identify weaknesses and take corrective action.

Source: WHO Policy Perspectives on Medicines no 7, 2003.

Resources for Drug Regulation.

Tertiary level care hospitals are institutions that have special needs which should be addressed. Therefore, tertiary level hospitals need to be equipped with mini Health Technology Assessment (HTA) hubs that would liaise with country's main regulatory body in the case of Sri Lanka it's the NMRA, where this interaction would address some information gaps and capacity issues.

Drugs and medicinal regulatory affairs need a strong capacity in terms of expertise, infrastructure, laboratory capabilities and strong information technology backbone. Sri Lanka is currently facing severe shortages of qualified experts to evaluate drugs and medical devices. However, it is the situation in many low resource settings and therefore way out would be to develop resilient networks with other agencies such as US Food & Drug Administration (US FDA), UK National Institute for Clinical Care Excellence (UK NICE), and European Medicines Agency (European Commission, Regulation, 2004). Constant exchange of information and developing higher level analytical skills to utilize existing knowledge would save our time and more importantly prevent duplication.

Current capacity of the drug testing laboratory and inefficiencies due to various routine processes have to be rectified urgently as laboratory capabilities and capacity is paramount in drug regulatory activities. Sri Lanka is currently facing serious drawbacks in this area leading to delays in testing new chemical entities or new products entering the market, inefficient testing of failed and withdrawn products and ineffective post marketing surveillance.

NMRA needs a robust information support which should be founded on a well-organized information management system. This may streamline all activities related to NMRA and the system will be more industry friendly, transparent and efficient.

Scientific, evidence based decision making is needed at tertiary level care.

Health Technology Assessment (HTA) is a key strategy to bring in evidence to make informed decisions. However, institutional level HTA assessment has been given little importance in the current day practice specifically in tertiary level care hospitals. Strong regulatory networks within and outside the region would be important to share knowledge. Developing HTA capacity in the country will certainly be important not for carrying out in depth analysis and appraisals each time, but to interpret and make information adaptable to local situations.

More investments should direct towards such capacity enhancement and more attention should be paid in developing capacity such as Good Manufacturing Practices (GMP) and Good Clinical Practices (GCP), how to assess generic medicines, equivalence, safety monitoring and pharmacovigilance, quality assurance and quality control.

Should regulation only cover drugs and devices?

Although drugs and medical devices have gained more attention and falls under a strict regulatory framework, much attention is needed to regulate blood and blood products and cosmetics in Sri Lanka. Very little has been done on these aforesaid areas and as a result Sri Lanka has not been able to appropriately regulate blood related products which is considered as a pharmaceutical product in many other countries and cosmetics and related products which can cause serious harmful effects to citizens.

Way forward

Building capacity and enhancing professional expertise would be a major priority area in future expansion of drug regulation in Sri Lanka. Globally there seems to be a severe dearth of human resource in this area and therefore, strong collaborations, harmonization and effective sharing of information would optimize overall regulatory performance of the country. Furthermore, institutional level appraisal of drugs and laboratory technologies would be the way forward in dealing with tertiary level care related decision making.

Use of a state-of-the-art information technology platform for all processes related to regulatory cycle will be a challenge in the current context as there will be lot of resistance to change arising within the system. (Goroshenko,1996) However, working towards establishing such a systematic process-oriented work flow and bringing in industry ethics within a sound legal frame would certainly benefit overall regulatory environment in the country.

Upgrades and improvements are essentially needed for the drug testing laboratory and taking the technology to the next level is a mandatory requirement to enhance laboratory capacity that will cater to the current demand and regulatory needs.

Strong legal framework should be established in order to promote best practices in the industry. Hence, the current legal framework governing medical products for human use, should include all related products such as blood and blood products (Klein. R, 1995).

Another area of challenge includes new technologies and emerging treatment modalities. Fast developing technologies of Pharmacogenetics, biological medicinal products and nanotechnologies are few examples for such development. A “complete rethink” may be necessary in terms of regulation to deal with these new trends.

It is the ultimate responsibility of the government to ensure quality, safety and efficacy of all medicinal products and provide cost effective options which would be affordable to both public and to the health care delivery system. Regulatory needs of large institutions such as tertiary level care institutions and specialized hospitals need to address with special emphasis on their uniqueness and specific needs. Country’s drug and medicines regulatory mechanism is fundamental in achieving this core public health obligation.

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Costing of Haemodialysis and Continuous Ambulatory Peritoneal Dialysis procedures performed at National Institute of Nephrology, Dialysis & Transplantation, Sri Lanka

Malalasekara LI, De Silva Dileep.

Abstract

Introduction: Chronic Kidney Disease (CKD) is a rising epidemic. It is estimated that annually 1000 patients of End Stage Renal Failure are newly diagnosed. They require dialysis therapy, until kidney transplantation.

Haemodialysis (HD) is the widely practiced dialysis method used today. The Continuous Ambulatory Peritoneal Dialysis (CAPD) is the other dialysis option. There are studies done on costing of HD, no such studies are available for CAPD in Sri Lanka.

Objective: To compare the provider cost of HD and CAPD, performed at National Institute of Nephrology, Dialysis and Transplantation (NINDT) during the month of February 2016.

Methodology: A descriptive cross sectional retrospective study, conducted among patients who underwent HD and CAPD for one month. Step down approach was used to calculate the costs.

Results: Study reveals that the cost for a patient who undergoes HD for one month is Rs. 102,420. Cost for CAPD procedure for a patient during the 1st month was Rs 87,485 including the five day training. From the second month home based CAPD cost per month is Rs. 77,520.

Most Asian countries adopt 'CAPD first policy' for Renal Replacement Therapy (RRT). With the increasing number of ESRF patients in Sri Lanka a need of rationalizing RRT exists.

According to the study the annual cost for a HD patient is Rs1,229,040 and the same for CAPD patient is Rs 940,205.

Conclusion: CAPD is 25% less costly than HD.

Recommendation: Increase the facilities available for CAPD at more hospitals.

Key Words: Haemodialysis, Continuous Ambulatory Peritoneal Dialysis, Provider Cost

Introduction

Chronic Kidney Disease (CKD) is rising and becoming an epidemic in Sri Lanka. Diabetes Mellitus, Hypertension, Snake bites, use of pesticides are among the causes that can lead to End Stage Renal Failure (ESRF).

People diagnosed with CKD can be categorized in to five stages, by referring to Glomerular Filtration Rate values (GFR) as given below.

Table 1 CKD Stage based on Glomerular Filtration Rates

CKD Stage	Kidney Function	GFR (mL/min/1.73 m ²)	value
One	Kidney damage with normal kidney function	90 or above	
Two	Mild loss of kidney function	60-89	
Three	Mild to moderate loss	30-59	
Four	Severe loss	15-29	
Five	Kidney failure	Less than 15 (Dialysis)	

Source: National Kidney Foundation
<http://www.kidney.org/atoz/content>.

Justification

The purpose of this study is to summarize the evidence surrounding CKD patients wellbeing according to dialysis modality HD and CAPD to estimate and compare the provider cost involvement for the choice. The HD which is commonly used in Sri Lanka has limitations due to requirement of equipment and trained manpower.

The other dialysis method CAPD is used successfully in many countries. Both methods of dialysis have advantages and disadvantages. The main advantage of haemodialysis is that it is being carried out by trained health professionals who can identify unexpected outcomes. The patient will also experience the emotional support from other patients undergoing haemodialysis. The main disadvantages of haemodialysis are, it can cause circulatory problems and changes in blood pressure.

The main advantages of CAPD are, the patient will have more freedom as it is home based and does not need needles for the process. The disadvantages of CAPD include, the difficulty for some patients to conduct the procedure and it may increase the risk of peritonitis.

Problem Statement

Sri Lanka is faced with a fast spreading epidemic of kidney diseases. Nearly 1000 patients reach ESRF annually and require regular dialysis.

Facilities available for haemodialysis are limited. State sector is unable to fulfill the HD needs of the patients. Therefore, other available optimal methods of dialysis need to be considered. CAPD is one such method. It is appropriate to estimate and compare the costs involved for these two methods.

General Objective

To compare the provider cost of HD and CAPD performed at NINDT during the month of February 2016.

Specific Objectives

1. To estimate the provider cost of
 - a. Haemodialysis
 - b. Continuous Ambulatory Peritoneal Dialysis
2. To compare provider costs of haemodialysis and continuous ambulatory peritoneal dialysis.

Literature Review

Chronic Kidney Disease(CKD) and End Stage Renal Failure (ESRF)

Despite having new treatment methods to stop or slow down the progression of Chronic Kidney Disease, it has now become a worldwide health crisis (Levey et al., 2007).

The incidence of ESRF in Sri Lanka is rising with the figure of 232 persons per million population. The most common reasons for rising incidence of CKD are Diabetes and Hypertension (Jha, 2009). In North Central parts of the country, CKD due to unknown etiology (CKD-u) too is being reported. It has mostly affected the farmers of age between 30 to 60 years. They belong to the most productive working years. Unfortunately, since the symptoms appear late or not diagnosed at the beginning, patients end up with the need of renal replacement therapy or kidney transplant. By the end of year 2023 it is estimated that the number of CKD-u patients will be over 25000 (Alwis, 2013). Morbidity in this young group has affected the production.

Methodology

This study on CKD was planned to determine the costs involved for various dialysis methods and compare them. In this study both haemodialysis and CAPD units of the institute were taken as direct cost centers and unit cost is calculated separately for the two therapies.

Study design

Descriptive cross sectional study design is used. The main components included provider cost estimation of both methods and cost comparison between them.

Study setting & Study population

All patients who underwent HD and CAPD at NINDT.

Study period

The study was conducted from 1st of February 2016 to 29th February 2016

Study Instrument

Check list was developed.

Data collection:

The required data was collected by examining relevant documents and interviews with appropriate officers.

Identification of cost centres

Three cost centers identified were: overhead (Administrative office, water, electricity, etc..), intermediate (laundry, surgical stores, etc..) and final (Haemodialysis and CAPD units).

Data Analysis and Results

Table 2 below summarizes the cost incurred when providing HD and CAPD services for the patients undergoing dialysis for the study month.

Table 2: Cost calculations for HD Unit and CAPD Unit for a month

	HD Unit Rs.	CAPD Unit Rs.
Total recurrent cost per month	5,431,854	1,311,515
Total Capital consumption cost per month	1,007,144	15,891
Total cost per month	6,438,998	1,327,406

Total monthly cost for HD unit is Rs. 6,438,998 which includes recurrent cost of Rs. 5,431,854 and the capital consumption cost of Rs. 1,007,144. The total cost per month for CAPD unit is Rs. 1,327,406 which includes Rs. 1,311,515 as recurrent cost and Rs. 15,891 as capital consumption cost.

A special feature that can be noticed here is that capital consumption cost of CAPD is only Rs. 15,891 and same for HD is as high as Rs.1,007,144.

Total monthly cost for haemodialysis unit	=	Rs. 6,438,998
Number of haemodialysis sessions per month	=	943
Cost per each hemodialysis session	=	Rs. 6,828
Total cost for one patient who is undergoing every other day dialysis per month Rs. 6,828 X 15		
(Average cost per month per patient for HD)	=	Rs. 102,420
Total monthly cost for CAPD unit	=	Rs.1,327,406
Total cost of CAPD for the first month inclusive of five day training per patient	=	Rs. 87,485
Total cost for home based CAPD per month per person including the surgical consumables provided by the NINDT from the second month Rs. 2584 x 30 days	=	Rs. 77,520
Total cost for CAPD for one year	=	Rs. 940,205
Rs. 87,485+ 852,720 (77,520 x 11 months)		
Average cost per month per patient for CAPD	=	Rs. 78,350
Rs. 940,205/12		

Table 3 below summarizes the provider cost for CAPD and HD processes.

Table 3: Comparison of average monthly and annual treatment cost between CAPD and HD

Period of Tx		Total cost for a patient for daily CAPD Rs.	Total cost for a patient for every other day HD Rs.
First month	CAPD: Training cost for 1st five days Rs. 22,885 (Rs.4,577 x 5days)	87,485	102,420 (6,828 x 15 sessions)
	CAPD :Cost for continuation at home with provided chemicals Rs.64,600 (Rs. 2,584 x 25days)		
Second to Twelfth month (for eleven months)	852,720 (Rs. 2,584 x 30days x 11 months)	852,720	1,126,620 (6,828 x 15 sessionsx 11months)
Total cost for one year Per patient		940,205	1,229,040
Average cost per month per patient		78,350 (87,485+852,720/12 months)	102,420 (1,29,040 /12 months)

Note

Irrespective of the dialysis method most patients receive anti-anemic drugs such as Erythropoietin or Mircera. These drug costs are not included in the above cost calculations.

Discussion

The purpose of this study was to estimate and compare the provider cost of two major RRT methods used at NINDT.

Study used the stepdown approach to calculate the provider costs of both processes. The final result of the study is summarized below.

Haemodialysis (HD)

Cost of one four- hour cycle of HD (unit cost) is Rs.6828
For a patient undergoing every other day HD for one month, the cost will be Rs. 102,420 (Rs.6828 x 15)

Cost for one year duration for HD per patient isRs. 1,229,040 (Rs.102,420 x 12)

Continuous Ambulatory Peritoneal Dialysis (CAPD)

For this process the patient will have to undergo initial five day training at the cost of Rs.4577 per day. Then the patient will have to conduct the CAPD process at home using the chemicals provided by the NINDT costing Rs. 2,584 per day.

The cost of five day training is Rs. 22,855 (Rs. 4577 x 5)
Cost for home based CAPD for the balance 25 days of the 1st month is Rs. 64,600 (2,584x 25)

Total cost to conduct the process for the 1st month is Rs.87,485 (Rs 22,855 + 64,600)

Cost for the next eleven months for the home based CAPD is.853,720 (Rs.2884 x 30days x 11months)

Therefore, the total cost for CAPD for one year per patient is Rs. 940,205

Hence the difference of provider cost between the two processes is Rs.288,835 per year in favor of CAPD.

Conclusion

The study shows a difference of Rs.288,835 in favor of CAPD over HD.

The main reason for this is due to HD being a completely a hospital based, machine dependent procedure and CAPD is mainly a homebased procedure after five day training in the hospital.

The annual cost for HD being Rs. 1,229,040 and CAPD being Rs, 940,205 per patient are costly procedures beyond the capability of the average Sri Lankan individual to pay. The government should continue to finance and support both therapies through the national health system.

Final conclusion of the study is that when provider cost is considered CAPD is more cost effective renal replacement therapy for end stage renal failure patients than the HD.

Recommendation

Since each HD session per person cost is Rs. 6,828 and CAPD cost per dialysis after initial five day training is Rs. 2584, it is more economical for Sri Lankan authorities to provide facilities for CAPD in a widespread manner for most of the RRT therapy requirements.

To achieve this, it is necessary to conduct:

Advocacy programmes for policy makers and decision makers of the Health Ministry, nephrology consultants and other appropriate officials.

Awareness and educational programmes are needed to update the knowledge, skills, abilities and benefits to the medical officers , nurses , etc.

Facilities should be upgraded in dialysis centers to carry out CAPD process.

Government should intervene effectively to promote CAPD by reducing or removing completely the import duty charge on CAPD materials

Health education programmes should be conducted to convince kidney patients that CAPD is also an efficient method of dialysis.

Further research should be promoted to determine the real cost benefits of CAPD, including the provider cost as well as the economic cost and benefits for patients and it should compare the relevant costs for both CAPD and HD.

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Mediator effect of Brand Image on the relationship between Service Quality and Patient Loyalty in the Out Patients Department of the Lady Ridgeway Hospital for Children, Colombo.

Wickremasinghe WK, Chandrika GHTNK.

Abstract

Introduction: The utilization pattern of public hospitals in Sri Lanka is different, some are underutilized and some are over utilized. The Lady Ridgeway Hospital for Children gets its clients from all corners of the country. As it is known in the competitive health care industry, the impact of perceived quality of care on the attitudes and behavior of visit and re-visit intention of the customers towards hospitals is becoming an important issue.

Objective: To examine the relationship between perceived quality of care and client loyalty, to ascertain whether there is a Brand Equity towards the Lady Ridgeway Hospital among its customers and how the Brand Equity affects the association of perceived quality towards patients loyalty.

Methodology: For the purpose of the study data was collected from 371 respondents who sought outpatient care from the Lady Ridgeway Hospital for Children Colombo.

Results: The study revealed that customers from all social layers seek care at the Lady Ridgeway Hospital. Results also revealed that perceive quality of care has positive effect on the patient loyalty towards hospital and hospital has a good Brand Image and it plays a mediating role in this association. Patient Loyalty mainly depends on the qualitative aspects of the services provided and not on the socio-economic factors of the patients. Results imply that perceived quality of care received by the patients lead to build up of Brand Equity towards the hospital which in turn leads to patient loyalty towards Lady Ridgeway Hospital for Children, Colombo.

1. Introduction

Lady Ridgeway Hospital (LRH) for Children is the premier Tertiary Care Teaching Hospital for children in Sri Lanka, situated in Colombo, Sri Lanka, was established in 1896. LRH with 973 beds renders its services for children less than 14 years of age. It provides inward services for almost all clinical specialties. The Out Patient Department (OPD) serves to an average of 1500 to 2000 patients daily. LRH OPD gets patients from all over the country who come by their own will, without any kind of referral. At a glance one can see overcrowding of the OPD, especially during epidemics

such as Dengue. This led researchers to think LRH has its own brand name that has augmenting effects towards patients to seek care in the hospital and service quality of the hospital which makes patients loyal towards the hospital.

2. Objective

To examine the relationship between perceived quality of care and client loyalty, to ascertain whether there is a Brand Equity towards the Lady Ridgeway Hospital among its customers and how the Brand Equity affects the association of perceived quality towards patient loyalty.

3. Methodology

Study was carried out as a prospective descriptive study at the Out Patients Department of the Lady Ridgeway Hospital for Children, Colombo from June 2018 to September 2018 and, at the end 371 respondents out of planned 384 were interviewed.

Patients seeking care at the OPD of the LRH randomly selected were included in the study. Due to the nature of patients being children their mother, father or guardian who accompanied the child, was interviewed. The study was conducted using an interviewer administered questionnaire, which consisted of two main parts. The first part of the questionnaire was on Socio-Demographic data, and the second included questions to secure data on independent (service quality), dependent (loyalty) and mediator variables (brand image). Measurement on each question was done using 1-5 scale where 5 was given to 'strongly agree' response and 1 point was allocated to 'strongly disagree' response. The second part of the questionnaire was developed on the basis of SERVQUAL: multiple-item scale for measuring consumer perception of service quality, modified to suit the needs of the research.

4. Results

According to the study findings mean age of customers was 31.67 years, 43.9 % of the respondents belong to the 31-40 age range and 29.1% were in 21-30 years age group. Ninety percent were females, accompanying their sick children. Of them 64.2% were Sinhalese, 18.3% were Tamils and 16.7% were Muslims. Fifty eight and half percent of the respondents were Buddhists, 12.9% were Christians, 17.5% were Muslims and 11.1% were

Hindus. The distribution of the sample population however was not reflecting the national proportions for ethnicity and religion. Sixty-four-point seven percent had O/L or A/L education and 24.5 % of the population had an education below 11th grade. Only 3% of the population had higher educational qualifications. In keeping with the education level of the general population, a great majority of the respondents had adequate education that in return may have had higher expectations. Details of average monthly income of the respondents showed that client of the hospital belong to all social levels of the society. Only one person had indicated that their monthly income is less than 10,000 rupees. About 9% of those had 10,000 to 20,000 monthly income while about 32% had indicated that their monthly income was ranging from 20,000 to 30,000, while 29.4% had indicated that their monthly income was more than 45,000 rupees.

4.1 Descriptive statistics

Perceived quality was the independent variable of the study. Assessment of perceived quality domain was done by the five operationalized variables, namely tangibility, reliability responsiveness, assurance and empathy. The overall mean value for perceived quality of healthcare domain was equal to 3.81 which means majority of customers agreed that quality of care provided by the hospital is good. Customer loyalty, the dependent variable in the study was assessed by five separate items. The great majority agreed that they selected this institution as their first choice, that they visit this institution generally for treatment and they also recommend this institution to friends and relatives. The overall mean value of 4.11 shows that loyalty to Lady Ridgeway Hospital is high among its customers. *Brand equity*, the mediator variable was assessed in sub domains such as brand awareness, brand attitude, brand prestige, brand trust & brand commitment. The overall mean value for brand equity being 4.82, once again confirms the high brand equity towards the hospital among its clients.

4.2 Reliability Test

A well-known approach to measure reliability is to use the Cronbach alpha. The value of Cronbach alpha with the range of greater than 0.70 is considered acceptable and good (Cavana et al., 2001). Results from the Table 1 show that Cronbach alpha for the seven constructs were well above 0.70 out of 10. Based on the finding, Cronbach alpha for the construct ranged from lowest of 0.57(Responsiveness) to 0.96 (brand attitude). In conclusion, the outcome concluded that the measurement scales of the constructs were stable and consistent in measuring the constructs.

Table 1: Reliability of the Constructs

Constructs	Composite Reliability			
	Alpha	Items	Alpha	Items
Perceived quality			0.28	5
Tangibles	-	0.67	7	
Reliability	-	0.76	3	
Responsiveness	-	0.57	5	
Assurance	-	0.70	3	
Empathy	-	0.78	4	
Customer loyalty	-		0.34	5
Brand equity			0.81	6
Brand equity	-	0.93	2	
Brand awareness	-	0.61	5	
Brand attitude	-	0.96	2	
Brand prestige	-	-	1	
Brand trust	-	0.93	4	
Brand commitment	-	0.82	2	

4.3 Correlation among variables

Table 2 shows that correlation matrix contained most of correlations above 0.40 and most of the correlations are significant at $p < 0.05$ and $p < 0.01$ level. Furthermore, each of the components also well correlated (0.40 and above) with the overall measure of perceived quality.

Table 2: Correlation matrix of perceived quality, customer loyalty, and brand equity (n= 371)

	Tangibility	Reliability	Responsive	Assurance	Empathy	equity	awareness	attitude	prestige	Trust	commitment	Perceive quality	Brand equity	Custom loyalty
Tangibility	1													
Reliability	.478**	1												
Responsive	.098	-.038	1											
Assurance	.375**	.496**	-.037	1										
Empathy	-.130*	-.202**	.389**	-.214**	1									
equity	.357**	.340**	-.036	.338**	-.152**	1								
awareness	.349**	.270**	.018	.292**	-.043	.519**	1							
attitude	.354**	.343**	-.057	.386**	-.187**	.616**	.477**	1						
prestige	.349**	.307**	-.047	.467**	-.190**	.587**	.463**	.840**	1					
Trust	.380**	.388**	-.032	.395**	-.149**	.626**	.475**	.810**	.764**	1				
commitment	.231**	.130*	.031	.087	.022	.261**	.435**	.302**	.316**	.319**	1			
Perceive quality	.469**	.368**	.682**	.270**	.662**	.152**	.213**	.129*	.133*	.185**	.151**	1		
Brand equity	.427**	.360**	-.017	.390**	-.128*	.738**	.731**	.820**	.812**	.809**	.685**	.211**	1	
Custom loyalty	.391**	.383**	-.092	.398**	-.192**	.619**	.545**	.715**	.707**	.705**	.456**	.135**	.795**	1

*. Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed)

4.4 Results of multivariate analysis

4.4.1 Service quality positively influences brand equity – Hypothesis 1(H1)

Table 3: Summary of regression results (n = 371)

Dependent var.	Independent var.	R (R2)	β - Beta	T-value	T-sig.	F-value, sig.
Brand equity	Perceived quality	0.21(0.05)	0.231	4.15	<0.001	17.21, <0.001
	Tangibles		0.204	5.538	0.000	
	Reliability		0.083	1.887	0.060	
	Responsiveness	0.50(0.25)	-0.016	-0.603	0.547	24.70, <0.001
	Assurance		0.300	4.202	0.000	
	Empathy		-0.003	-0.174	0.862	

To examine the effect of service quality on brand equity, regression analysis has been conducted. The hypothesis-1 (H1) tests as shown in Table 3, the H1: hypothesized relationship is supported in the estimated structural model. As shown in table, Perceived quality has significant positive effects on brand equity ($\beta = 0.231$, t-value = 4.149). Hence, H1 is supported.

4.4.2 Brand equity positively influences patient loyalty - Hypothesis 2 (H2)

Testing of hypothesis 2(H 2) is shown in Table 4. Hypothesized relationship is significant in the estimated structural model. As shown in table, brand equity has significant positive effects on patient loyalty ($\beta = 0.903$, t-value = 25.203). Hence, H2 is supported.

Table 4: Summary of regression results (n = 371)

Dependent var.	Independent var.	R (R2)	β - Beta	t-value	T-sig.	F-value, sig.
Patient loyalty	Brand equity	0.795(0.633)	0.903	25.20	<0.001	635,20, <0.001
	Equity		0.158	3.856	<0.000	
	Awareness		0.098	2.721	0.007	
	Attitude	0.808(0.653)	0.188	2.791	0.006	114.12, <0.001
	Prestige		0.194	3.464	0.001	
	Trust		0.212	3.270	0.001	
	Commitment		0.095	5.368	<0.000	

4.4.3 Relationships among Brand equity, perceived quality and customer loyalty Hypothesis 3(H3)

Table 5: Summary of regression results (n = 371)

Independent Variable	Brand equity (Mediator)		Patient loyalty (Dependent Variable)	
	Model 1	Model 2	Model 2	Model 3
Perceived quality	0.2307*	0.1682**	0.0421 (NS)	0.0421 (NS)
Brand equity	1st equation	2nd equation	3rd equation	3rd equation
			0.9114*	0.9114*

* $p < 0.00$, ** $p = 0.009$, NS=Not Significant ($p = 0.2396$, $p > 0.05$)

According to the finding from Table above, perceived quality as an independent variable significantly affects the brand equity as a mediator in equation; perceived quality as an independent variable significantly affects the patient loyalty as a dependent variable in equation two; both perceived quality as an independent variable and brand equity as a mediator considerably impacted the patient loyalty as a dependent variable. Hypothesis 3 (H3) is supported

because the beta value of perceived quality in equation three (beta=0.0421) is smaller than the beta value of perceived quality in equation two (beta=0.1682), diminishing by 0.1260 (0.1682-0.0421). In conclusion, brand equity does act as a mediator in mediating the relationship between perceived quality and customer loyalty.

A Sobel test was conducted and found full mediation in the model ($z = 4.09, p < 0.000$). It was also found that brand equity is mediated the relationship between perceived quality of care and loyalty intention to the customer.

Table 6: Conclusion of the hypotheses in the study.

Hypothesis	Relationship	Conclusion
H1	Perceived quality → brand equity	Supported
H2	Brand equity → patient loyalty	Supported
H3	Service quality → has a positive influence and, indirect effect on patient loyalty mediated by brand equity.	Supported

5. Discussion

The study was conducted to investigate the effect of perceived quality of care on customer loyalty at OPD, LRH and also whether there is effect of brand equity which mediates customer loyalty towards Lady Ridgeway Hospital. Extensive literature search did not reveal any published similar studies done in Sri Lanka. Therefore, most of the literature support and explanations were based on the studies conducted in other parts of the world.

Perceived quality of care is well known standard attribute used all over the world to assess the quality of care given to the customers at the healthcare institutions. In overall perceived quality of care in the Lady Ridgeway Hospital found to be good since majority with mean value of 3.81 agreed to it.

Customer loyalty is the result of consistently positive emotional experience, physical attribute-based satisfaction and perceived value of an experience, which includes the product or services. Overall mean value close to 4 is the confirmation of the loyalty of customers towards Lady Ridgeway Hospital.

Brand equity refers to the value of a brand. A strong brand name works as a credible signal of product quality for imperfectly informed customers. When customers are satisfied by getting desired values from organizations, customers may in return provide value to organizations. Brand equity in healthcare is built through the continuous accumulation of thoughts, feelings, opinions, and behaviors regarding a hospital or health system based on the experience it provides the customer. The overall mean value of 4.82 confirms it towards LRH.

The outcome of reliability test concluded that the measurement scales of the constructs were stable and consistent in measuring the constructs. Most of the correlations are significant and each of the components also well correlated with the overall measure of perceived quality. The results of multivariate analysis concluded that all three hypotheses are well supported.

6. Conclusions

The study revealed that perceived quality as an independent variable significantly affect the brand equity as a mediator and perceived quality as an independent variable significantly affect the customer loyalty as a dependent variable. And both perceived quality as an independent variable and brand equity as a mediator considerably impacted the customer loyalty as a dependent variable. Therefore, study concluded that brand equity does act as a positive mediator between perceived quality and customer loyalty that patient's loyalty greatly influenced by the perceived quality of care by the patients and brand equity play significant positive effect on patient's loyalty towards Lady Ridgeway Hospital, Colombo.

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