RESEARCH ARTICLE

BUSINESS CONTINUITY (RECOVERY) PLAN DURING AND AFTER COVID-19 PANDEMIC AT KING ABDULLAH MEDICAL CITY IN MAKKAH

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ABSTRACT

Objective: Recovery refers to a plan that gives the community sense of healing and turning back to the previous pattern of providing services as much as possible the recovery plan is very important especially for the healthcare sector since the services involve and affect the quality of human life. **Methodology:** Cohort Retrospective study using four years data, starting from May 2019 to August 2022, this study collected data from health information system (HIS). All patients attending OPD clinic with suspected or positive COVID-19 will be included. Also, patients admitted to inpatient wards or visit emergency or having OPD appointments. **Results:** The pandemic starts on March 2020 in Saudi Arabia; this is the reason why the number of cases suddenly increased. Results shows that the mortality total number is insignificantly correlated with either suspected or positive. Unlike emergency the statistical shows highly negatively affected rate during pandemic. Moreover, admission and procedures are highly significant and correlated because of the nature of services delivering. KAMC staff placed as second in the rank of most infected groups. And old age group of patients was highly infected versus other groups. **Conclusion:** Lessons learned from the pandemic are summed that the good infrastructure always helps the medical team to continuously deliver services remotely. Earlier diagnosis is significantly affects if services access were blocked. Applying restrictions to limit the infection and provide the services is better than stop delivering them. Surgical procedures need to be addressed intensively as they were the most negatively affected services during the pandemic.

INTRODUCTION

Recovery refers to a plan that gives the community sense of healing and turning back to the previous pattern of providing services as much as possible(1). The field of recovery, whether financial or non-financial, does not matter. It has been set as an important technique during the pandemic. As mentioned earlier, the recovery plan is very important especially for the healthcare sector since the services involve and affect the quality of human life. This study will address the pattern of the pandemic with healthcare number of services delivered to patients and it will categorize the most effected group, which is staff or vulnerable group as well as geriatric patients (2)or pediatric. The pattern is also affected by the type of services provided whether are outpatient or emergency (3). Studies reveal that approximately 80% was middle age group (4) affected by Corona virus and most of them were healthcare workers (5), (6), (7), (8) this

means that infection transmitted within hospitals or family members. This zoonotic illness classifies as acute respiratory syndrome spread all over the world(9), (10), (11), (12)as well as the Middle East Respiratory syndrome or SARS "COVID-2"(10)all of them have cough and fever(13)lead to lower respiratory tract infection especially in older people and psychologically burden healthcare workers (14). Other patients were diagnosed as COVID patients but their status was asymptotic (11).Those might be with suspected cases infected and have negative result with mild Symptoms should be identified and isolated as well to limit the rate of infection. One diagnostic tool is chest image that means the number of x-ray, CT and lung ultrasound examination (14)will be high during the pandemic, and lab tests such as nasopharyngeal swab (7)will help physicians to confirm the result. Treatment was concentrated on quarantine or social distancing(4)and patients should isolate themselves to limit the infection and reduce mortality rate in order to cope with pandemic (7).

The critical cases require ventilators as the infection classification is airborne infection and spreads via contact droplet or in the air with difficult type of clinical management were always physical burden healthcare system (14), (15) and increases the rate of morbidity and mortality among the society (16) due to supplies shortage (11)not meet the demand (17). As stated in the previous literatures that outpatient services were not affected, especially in the hospitals with good infrastructure to support delivering this type of service remotely whether as consultation after surgeries or as routine follow-up (18), (14), (12).Also before surgical admission to determine clearance and necessity for medical intervention plus reducing healthcare cost(11), (17). Unlike services required actual attending to healthcare facilities with interaction or direct communication such as admissions, surgeries and so on lead to shortage in bed services but there are some other factors affect their pattern of services deliver so current study will explain it. This study aims to address the correlation between suspected and volume of services or positive cases. The pandemic affected based on the period, and it's classified as during and after pandemic also by positive rate. There are many factors work to improve the pandemic situation also rate of services delivered study will use all this information to document learned lessons from the pandemic.

RESEARCH OBJECTIVES: The current study evaluates the correlation or relation between suspected and positive number of cases versus the number of services provided per services type to determine the most effected type of services and explain how the healthcare team manages the situation. In addition, current study will evaluate and manage factors, which affected healthcare services outcome such as age or patients' categories. Assess any significant difference in result in order to accept or reject the null hypothesis and document the evidence related to study result. On the other hand, this study will compare outcome between the diagnostic services (2)such as radiology examination, address if there is a relation between mortality rate and services provided or a relation between number of suspected cases and services type, evaluate the relation between group of age (19) and suspected positive cases, and determine the most affected group and which group is at risk of infection.

METHODOLOGY

King Abdulla medical city (KAMC) is specialized healthcare institution deliver non-profit medical services located at Makkah in western Region, Saudi Arabia. KAMC has many centers of excellence like Cardiac Center, Neurosciences Center, and Oncology Center. It also has other Specialized Surgery as {Urology oncology, Orthopedic, Digestive & liver Center, Head& Nick Center and so on}. The Cohort Retrospective study for four years, starting from May 2019 to August 2022, and it collected data from health information system (HIS). Data was for all population utilized King Abdullah Medical City's services during May-2019 until August 2022 attending OPD clinic with suspected or positive COVID-19 will be included. Also, patients admitted to inpatient wards or visit emergency or having OPD appointments during and after the COVID-19 pandemic.

Exclusion criteria:

- Cancelled or postponed OPD visits.
- Cancelled, postponed operations or procedure.
- Discontinued, unverified Radiology examination.
- Patients dead outside hospital.
- All services records for patients visits to OPD, admitted to wards or having surgeries / procedures during the period of current study and they have radiology examinations or medications.
- Classify the services per type and examinations per group.
- Include all age group and found the positive suspected cases on them.

Research table created on Qlik sense as data collection tool for the following variables: Total number of services, Positive cases, and suspected cases. A period of 40 months will be included in data collection.

Research outcomes will assess the pattern of mortality during the period of the study versus the suspected and positive cases. Address the main diagnosis for mortality patients (16)and classifies them into three groups oncology, cardiology, and other diseases. Analyze the risk rate in the study period and address the pattern of services provided. Evaluate the most affected patients' group during the pandemic as well as their age group. Address the most affected services during the period of study. List the managing techniques for recovery and ways to improve the services continuity. Data will be collected from HIS electronic/files "on to excel datasheet" using Qlik sense as data analysis program for descriptive statistic. The 'collection forms' not showing any nominative information. Volume of services will be included only without any identification document. Research records will be linked to patient's name and MRN as total number in log sheet, which will be kept in a safe locked place. Data will be transferred to statistical database directly which is SPSS program package 21 version and will be used for inferential analysis purposes to address study hypothesis. The total number of services records will be included except the cancelled appointment and discontinued examination. Plus, the total number of patients will be included across all sites. SPSS software, version 21 will be used for all statistical analyses.

- Show the categorical variables, percentages.
- Check the normality of data as mean± SD, or median and range according to the type of distribution of each variable.
- Analyze the pattern of mortality versus positive& suspected on the same period via person correlation to assess the severity of pandemic because the data is not normally disrupted.
- Current study will analyze the pattern of positive cases versus services provided on the same period via spearman correlation to adders the relation between two variables.
- Address the relation between two causes of death which are (Oncology – Cardiology) Diseases versus number of morbidity (Positive – Suspected) COVID.
- Comparisons between different age groups affected by the virus and different categories.
- Address the comparisons between radiology examination group and determine the most affected services via spearman correlation test.
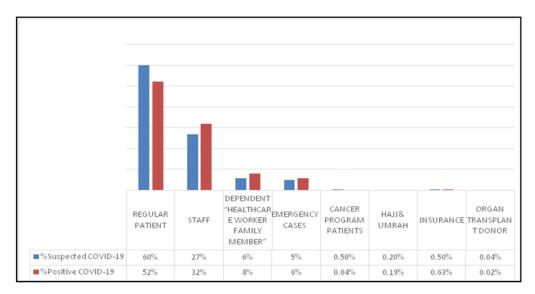- Assess the pattern of medication dispensing during the pandemic.

Ethical part& confidentiality: No informed consent is requested because it's a retrospective review study. Ethical approval granted from KAMC Institutional Review Board. IRB approval number is (22-979) issue date is September 12, 2022. No patient will be included in the study, only total number of services records without identification.
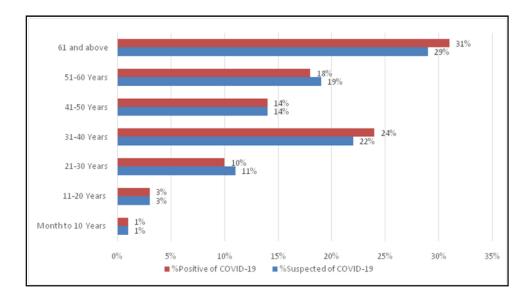
RESULTS

The study examines collected data to check normality, and descriptive statistic showed that the data not normally distributed around the mean because the values of mean, mode and median are not on the same range. The normality urges us to use nonparametric test type such as spearman to address the correlation between variables instead of person correlation. Table-1 highlights that the COVID-19 pandemic starts on March 2020 in Saudi Arabia, which is the reason why the number of cases suddenly increased, and this reflected on suspected and positive columns. After that, statistic shows number of main service types delivered and their effect during and after pandemic such as emergency, which is decreased from 2700 to 2000 on March, April, May, Jun and July and reached less than two thousand. This might relate to curfew applied by Saudi government to stop the spreading of infection. On the same period, admission volume decreased but the effect of pandemic was slightly on outpatient visits because the hospital activated virtual clinics that relatively decreased the effect and kept the continuity of services. From April until August 2020 operations were highly effected due to equipment shortage in addition to infection spreading.

Table 1. Exhibits the Total Number of Suspected and Positive COVID-19 during Pandemic versus the Mortality with five healthcare services

Month-Year	SUSPECTED	POSITIVE	Mortality	Emergency	Admission	Outpatients	OR	Procedures
May-19	0	0	265	2052	1382	9064	257	214
Jun-19	0	0	182	2926	1316	15491	363	306
Jul-19	0	0	189	2799	1584	23566	518	361
Aug-19	0	0	225	2732	1699	14106	340	743
Sep-19	0	0	183	2839	1583	23023	480	331
Oct-19	0	0	199	2879	1823	27864	602	345
Nov-19	0	0	198	2858	1780	21557	521	297
Dec-19	0	0	225	3030	2001	25823	629	362
Jan-20	2	0	216	2883	1881	23039	544	456
Feb-20	2	0	191	2742	1815	23181	597	357
Mar-20	480	13	164	2085	1446	19183	412	274
Apr-20	1685	324	128	1414	665	15991	117	71
May-20	1596	351	159	1520	654	7362	97	80
Jun-20	1192	203	174	1712	926	17856	143	136
Jul-20	1444	392	175	1995	936	15304	148	171
Aug-20	1410	385	173	2290	1089	16858	196	221
Sep-20	1431	333	169	2252	1256	20641	289	222
Oct-20	1499	205	194	2201	1548	21913	456	227
Nov-20	1596	178	182	2128	1618	24091	478	255
Dec-20	1384	59	212	2275	1843	25773	574	283
Jan-21	1468	90	208	2390	1703	24185	592	245
Feb-21	1432	64	190	2055	1809	24260	643	259
Mar-21	1327	72	214	2473	1996	28492	682	302
Apr-21	1162	195	196	2271	1502	19274	372	259
May-21	1324	242	188	2479	1219	15283	172	240
Jun-21	1358	266	223	2527	1701	26201	363	216
Jul-21	907	130	175	2208	1305	14343	297	216
Aug-21	1065	78	184	2418	1851	25637	566	257
Sep-21	786	20	160	2365	1670	23297	388	258
Oct-21	819	4	153	2511	1924	23787	600	295
Nov-21	832	8	142	2495	1883	24514	657	284
Dec-21	1002	112	148	2632	1822	25123	643	259
Jan-22	2344	929	157	2700	1581	23413	376	215
Feb-22	1127	173	143	2319	1638	20464	474	260
Mar-22	618	48	148	2610	2059	27208	672	331
Apr-22	516	75	110	2479	1279	11655	376	270
May-22	893	195	115	3030	1663	20747	450	284
Jun-22	689	190	99	2683	1852	24153	580	258
Jul-22	570	143	107	2663	1773	14987	485	434
Aug-22	433	51	87	2539	1772	23424	547	274

SUSPECTED			Mortality	Emergency	Admission	Outpatients	OR	Procedures
Correlation Coefficient			-.156	-.655**	-.338*	.017	-.276	1.000
Sig. (2-tailed)			.336	.000	.033	.916	.085	.000

POSITIVE			Mortality	Emergency	Admission	Outpatients	OR	Procedures
Correlation Coefficient			-.208	-.531**	-.525**	-.230	-.515**	-.767**
Sig. (2-tailed)			.198	.000	.000	.154	.001	.000

	REGULAR PATIENT	STAFF	DEPENDENT "HEALTHCARE WORKER FAMILY MEMBER"	EMERGENCY CASES	CANCER PROGRAM PATIENTS	HAJJ & UMRAH	INSURANCE	ORGAN TRANSPLANT DONOR
■ %Suspected COVID-19	60%	27%	6%	5%	0.50%	0.20%	0.50%	0.04%
■ %Positive COVID-19	52%	32%	8%	6%	0.04%	0.19%	0.63%	0.02%

Figures 1. Shows the percentage of suspected & positive cases among different patients' Categories

Figures 2. Shows the percentage of suspected positive cases among different age groups

Table 2. Exhibits the Total Number of Mortality patients in Oncology and Heart Diseases with Suspected and Positive COVID-19

Month-Year	SUSPECTED	POSITIVE	Mortality	Oncology Mortality	%	Heart Disease Mortality	%
May-19	0	0	265	88	33%	40	15%
Jun-19	0	0	182	58	32%	31	17%
Jul-19	0	0	189	63	33%	46	24%
Aug-19	0	0	225	73	32%	75	33%
Sep-19	0	0	183	68	37%	41	22%
Oct-19	0	0	199	78	39%	34	17%
Nov-19	0	0	198	59	30%	44	22%
Dec-19	0	0	225	85	38%	44	20%
Jan-20	2	0	216	76	35%	51	24%
Feb-20	2	0	191	65	34%	47	25%
Mar-20	480	13	164	52	32%	33	20%
Apr-20	1685	324	128	45	35%	22	17%
May-20	1596	351	159	73	46%	26	16%
Jun-20	1192	203	174	69	40%	39	22%
Jul-20	1444	392	175	73	42%	34	19%
Aug-20	1410	385	173	61	35%	31	18%
Sep-20	1431	333	169	69	41%	40	24%
Oct-20	1499	205	194	85	44%	36	19%
Nov-20	1596	178	182	69	38%	36	20%
Dec-20	1384	59	212	64	30%	49	23%
Jan-21	1468	90	208	80	38%	49	24%
Feb-21	1432	64	190	81	43%	35	18%
Mar-21	1327	72	214	92	43%	44	21%
Apr-21	1162	195	196	64	33%	36	18%
May-21	1324	242	188	72	38%	33	18%
Jun-21	1358	266	223	90	40%	41	18%
Jul-21	907	130	175	69	39%	29	17%
Aug-21	1065	78	184	77	42%	21	11%
Sep-21	786	20	160	69	43%	25	16%
Oct-21	819	4	153	57	37%	23	15%
Nov-21	832	8	142	48	34%	22	15%
Dec-21	1002	112	148	53	36%	20	14%
Jan-22	2344	929	157	58	37%	25	16%
Feb-22	1127	173	143	43	30%	29	20%
Mar-22	618	48	148	64	43%	30	20%
Apr-22	516	75	110	47	43%	21	19%
May-22	893	195	115	47	41%	15	13%
Jun-22	689	190	99	39	39%	12	12%
Jul-22	570	143	107	42	39%	22	21%
Aug-22	433	51	87	30	34%	13	15%

SUSPECTED		Mortality (7020)	Oncology Mortality (2617)	37%	Heart Disease Mortality (1365)	17%
Correlation Coefficient		-.156	.068		-.257	
Sig. (2-tailed)		.366	.677		.109	

POSITIVE		Mortality (7020)	Oncology Mortality (2617)	37%	Heart Disease Mortality (1365)	17%
Correlation Coefficient		.208	-.072		-.253	
Sig. (2-tailed)		.198	.659		.155	

Moreover, all of these procedures were affected from April to July then started to recover after implementation of the plan set by hospital administration to manage the pandemic effect throughout a set of steps such as getting the swab result before and after procedures to ensure the patients were not infected and keeping the continuity of services during the pandemic although decrease the level of spreading the infection between patients and staff and delivering appropriate services in appropriate time. Under inferential statistic, current study addresses the correlation between suspected and positive cases with mortality and other services. Results state that the mortality total number is insignificantly correlated with either suspected or positive because the P value is more than 0.05.This means level of morbidity increased during the pandemic not level of mortality and therefore leads to reject the hypothesis link to mortality volume accept the null. Unlike emergency the statistical test shows P value level is less than 0.05 and correlation coefficient above .5 it will be highly affected negatively during pandemic. Patients tend to visit emergency as it is the first line of services, but curfew hindered them unless there are life threatening cases that can't be treated at home. Correspondingly, admission and procedures are highly significant and correlated with both suspected and positive cases because if the cases increased admission and decreased procedures due to the nature of delivering the services that need patient to be present in the hospital and be in close contact with healthcare providers. Others, such as OR, is significant with positive and insignificant with suspected number of cases because if the patients infected the healthcare team can't treat them due to consequences of that action. Otherwise, OPD is insignificant in both types because the good infrastructure helps the hospital to recover earlier and the natural of OPD visits do not require direct contact with patients.

Figure -1 illustrates that King Abdullah Medical City staff placed as second in the rank of most infected groups and their family in third level. They have high percentage of susceptible to COVID-19 versus other categories as they deliver medical care to infected people and they work in contaminated area. The percentage was low due to restrictions that allowed healthcare workers to stay away from their homes during the pandemic as the Saudi Government offers them free accommodations near to their work place in an attempt to protect their family members from being infected. This might affect their physiological health negatively, but at least their families were safe. Also, Hajj& Umrah patients have less exposure because the Saudi Government stopped accepting more pilgrims from outside Saudi Arabia. Also, they banned other travel trips as well as foreigner countries to limit the rate of spreading of the infection. This translated into low percentage of pilgrim's cases during the pandemic and the regulations set by the Ministry of Health regarding passengers after reactivating the air traffic help to limit infection. These regulations are playing an important role to decrease the level of infection in the society because most of the countries required clear swab result before traveling in order to ensure the infection was managed.

Figure-2 illustrates what was mentioned in the literature that the old age group of patients was highly infected versus other groups of patients during pandemic(13).This result confirms that geriatric patients were more vulnerable to acquire the infection during pandemic and their ability to fighting the virus was weak. The old age infected patients have less ability to recover because their immune system can't heal easily. Unlike the young ones as the figure shows lower percentage of positive suspected cases among children. Table-2 Displays that the rate of mortality in Oncology and Cardiology was about 50% from total number of all mortality per month. This study highlights these two specialties because at King Abdullah Medical City there are two specialized centers with more than 200 beds out of 500 to deliver specialized medical care services. Some literature mentioned that the rate of mortality was increased during pandemic for oncology patients (20). The literature result does not match with the current study (13), possibly due to virtual clinic operation and other applications like TAWAKKALNA to enhance access for medical services and protect patients' life during curfew applied by Saudi Government. Results of the activated E-services reduced the percentage of mortality before and during pandemic even for sub-specialty such as Oncology and Cardiology. The total number of morbidity and mortality per specialty, were insignificant because P values was less than 0.05 and that's the main reason of death not related to COVID-19 pandemic. Study accepts null hypothesis related to cause of death. Table-3shows the number of examinations applied and continuity of services in Radiology department during after pandemic. The hospital tries to stop outpatients' examinations and concentrate on the inpatients, that's why level of services does not appear to be affected as the other services. Also, unlike what is mentioned or stated in other literatures, the statistical test displays the correlation between suspected and positive COVID with radiology examinations during study period and rejects hypothesis accept null because P values for all examination groups were more than 0.05. Unlike other studies, which indicate that there is a relation between some radiology examinations due to increases in the number of morbidities during pandemic. All P values were more than 0.05 which means there is no correlation between type of examination and increased number of suspected positives COVID-19 cases. Only from Mar-2020 until Aug 2020 descriptive statistic shows that numbers are a little decreased due to curfew / quarantine activation. Table-4addresses the correlation between suspected and positive patients with medication and prescriptions. The result shows that emergency and inpatients medication are highly significant correlated negatively with level of spreading the infection morbidity during pandemic due to supply shortage and especially the prescription because the pattern of dispensing was changed. Unlike OPD medication because the pattern is fixed, and hospital administration supports the services with new program which is "medication delivery "its voluntary program allowed patients to receive their medication at home during curfew. The data above accepts null hypothesis for OPD medication and emergency and rejects null for inpatients prescription /medications plus emergency prescription(21).

DISCUSSION

Current study documents the services affected or not affected during the pandemic and lists the reasons link to study results to enhance services delivered in the future if any pandemic arose. Some concerns were raised in UK for Cancer patients, they assume that Covid-19 increases the mortality rates (13)for cancer patients since that patient stopped visiting OPD for any related complain that could delay disease diagnosis (2)till they reach fatal progression of the disease. However, these assumptions were for the 5 coming years thus could be taken into consideration for future research since that we are a specialized hospital for cancer patients (Maringe et al., 2020). Current study shows different results due to different situations and this urge the heath care community to enhance medical technology and continue delivering the health services in different circumstances. After pandemic, people trust the remote/virtual services were changed and the rate of using these services also enhanced (3)this led to ease the workload and manage the waiting time for services. Current study proves that the technology always helps health institutions to recovery earlier and limit the consequences related to stop delivering the services as well as mortality rate (12). Although a reduction on ER visits during the 4 months lockdown in comparison to before and after locking down visits this reduction was observed in the United States of America as well when they compare it to ER visits between the periods before and after pandemics with 42% reduction of ER visits. They refer this reduction to the CDC recommendations to rely on virtual visits and triage to contaminate the spread of Covid-19(3). And this could be the same reason in KAMC since those major restrictions were taken for ER visits also patients tend to avoid ER visits and to stay at home unless it was a really series health issue(22).Admission affected significantly negative because it shares the pattern of services with emergency that led to force patients and medical team to meet each other physically to deliver the services. The healthcare leader limits the period of admission by activating same day admission and allow patients to get results for ancillary services such as laboratory and radiology before admission then get invasive non-invasive procedures or surgeries during admission and discharge them with less hospitalization length of stays.

Table 3. Exhibits the Total Number of Suspected and Positive COVID-19 during Pandemic versus the Radiology Examination Groups

Month	CT	Interventional Radiology	Mammography	MRI	Nuclear Medicine	Ultrasonography	X-Ray
May-19	737	309	48	117	95	256	3176
Jun-19	1300	433	67	200	170	366	4709
Jul-19	1986	488	248	459	307	539	5302
Aug-19	1830	728	154	460	177	620	6179
Sep-19	2058	572	283	526	286	661	5823
Oct-19	2338	667	329	589	314	703	6301
Nov-19	1875	514	155	479	272	611	5996
Dec-19	2425	838	395	670	381	681	6423
Jan-20	2227	643	326	506	359	719	5908
Feb-20	2234	606	350	630	316	723	6297
Mar-20	2038	547	175	433	292	687	5208
Apr-20	943	322	76	152	35	187	2802
May-20	1036	309	37	171	31	261	3137
Jun-20	1779	413	187	379	136	381	4408
Jul-20	1967	533	214	415	179	423	4610
Aug-20	1889	575	191	448	168	492	5381
Sep-20	2829	662	272	678	330	644	5635
Oct-20	2880	711	375	821	372	703	5751
Nov-20	2947	607	410	800	371	720	6087
Dec-20	3241	717	438	889	529	888	6717
Jan-21	3070	653	351	791	517	832	6417
Feb-21	2824	714	357	741	401	828	5922
Mar-21	3120	766	337	1060	572	945	6948
Apr-21	2782	639	368	691	474	735	5738
May-21	2516	526	240	679	263	645	5705
Jun-21	3733	729	506	949	581	957	6611
Jul-21	2543	578	244	654	354	747	5440
Aug-21	3472	707	397	1130	599	1041	6260
Sep-21	3369	809	406	1201	566	889	5847
Oct-21	3227	694	501	1160	505	884	6343
Nov-21	3456	718	540	1126	712	908	6624
Dec-21	3494	754	540	1210	630	995	6759
Jan-22	3060	661	418	860	600	880	6564
Feb-22	3112	734	447	930	526	912	6416
Mar-22	3631	809	540	1065	673	943	6892
Apr-22	1985	541	263	521	311	664	5508
May-22	3196	670	424	869	443	963	6499
Jun-22	3593	861	477	1032	593	934	6322
Jul-22	2752	740	281	776	368	842	6456
Aug-22	3861	785	549	1069	593	982	6570
SUSPECTED	CT	Interventional Radiology	Mammography	MRI	Nuclear Medicine	Ultrasonography	X-Ray
Correlation Coefficient	.194	-.047	.121	.163	.136	.083	-.030
Sig. (2-tailed)	.231	.776	.458	.316	.404	.612	.856
POSITIVE	CT	Interventional Radiology	Mammography	MRI	Nuclear Medicine	Ultrasonography	X-Ray
Correlation Coefficient	.120	-.080	.032	.060	.022	.023	-.135
Sig. (2-tailed)	.462	.623	.844	.714	.891	.889	.406

Same day project helps the patient receives the services with less risk of being infected. Also, hospital team will limit spreading infection among their staff as restrictions were taken to protect health workers from infected patients by getting swab results before admission as well as after. Another reason may be highlighted according to the nature of sub specialized services provided in KAMC and to protect patients' lives, the management tends to transfer patients who have COVID-19 after delivering sub-specialized healthcare services to them. This act limited the infection and kept delivering high services with less risk. The Ministry of Health dedicated a hospital in each city all over the kingdom for patients infected with COVID-19 virus. This policy helped healthcare workers to continue delivering sub-specialized services with high quality and low risk. As the result states, healthcare workers are more likely to be infected due to their nature of work. The government tends to call their attention for new protocols to contain the infection and treat infected people as well through many channels (5), (6), (7), (8). E-learning technology was one of the methods the Ministry of Health utilized to limit infection and protect the workers and patients as well. Also, the Ministry of health kept circulating new pathways from time to time to apply the

most updated techniques during pandemic, because the infection was new all over the world and they attempted to contain it. Moreover, the hospital created an internal policy to ensure that new guidelines were not only read, but also applied by all staff as well. Regardless of the curfew, healthcare workers have been one of the groups that were granted full access to streets during pandemic due to their nature of work. Geriatric patients were the most effected group during the pandemic (2). This might lead to increasing the need for intensive care services and workload as well. The only solution might apply to improve the situation is to encourage people towards having a healthy lifestyle and therefore, a good health condition to prevent being weak when infected. Also, not to burden healthcare system as they need intensive services due to high-risk situation and disease progressions after acquiring the infection. Unlike what was mentioned in result, literatures show unique results in regards to the utilization of Radiology services, which was insignificant in relation to the occurrence of the pandemic(23), (24), (25). Radiology services might be insignificant due to short length of stay, which means patients no longer needed radiology examination unless they were COVID-19 patients.

Table 4. Exhibits the Total Number of Suspected and Positive COVID-19 during Pandemic versus the Medications Dispensing

Month	ED-Prescription	ED-Medication	IP-Prescription	IP-Medication	OPD-Prescription	OPD-Medication
May-19	0	0	0	0	0	0
Jun-19	2592	10822	6577	30778	7467	28256
Jul-19	2605	11587	7944	39173	11674	40727
Aug-19	2462	11749	8305	46810	7009	24421
Sep-19	2618	12853	7831	39670	10457	36763
Oct-19	2675	12269	8154	41999	12043	41338
Nov-19	2690	13661	8035	41195	9307	32134
Dec-19	2809	14153	8282	43686	11386	39749
Jan-20	2,692	13,261	8,004	42,961	10,534	37,750
Feb-20	2569	12936	7862	41685	10254	35828
Mar-20	1937	9862	6723	36491	8891	33457
Apr-20	1334	6346	4083	18899	7050	33933
May-20	1375	6608	4785	21974	3064	15623
Jun-20	1601	7803	5750	26863	8747	44394
Jul-20	1901	9279	6095	28908	7254	32848
Aug-20	2180	11192	6184	30006	8261	39665
Sep-20	2129	10919	6463	32523	9582	44815
Oct-20	2019	10101	7065	34318	9836	45207
Nov-20	1956	9967	6987	36406	10515	47905
Dec-20	2025	10760	7718	41345	11079	51188
Jan-21	2,197	11,874	7,712	40,222	10,260	47,552
Feb-21	1907	10149	7170	41019	10726	49322
Mar-21	2204	12383	8169	45489	12407	55453
Apr-21	2183	11909	6826	36776	8136	35945
May-21	2370	12787	6581	34075	6906	32800
Jun-21	2305	13616	7569	39874	11582	53920
Jul-21	2150	11586	6847	36369	6689	30891
Aug-21	2257	12191	7469	39865	11643	53351
Sep-21	2219	11589	7069	35698	10543	47499
Oct-21	2375	12289	7795	41295	10433	49955
Nov-21	2367	12890	7786	42789	10674	49401
Dec-21	2492	13578	8106	43046	10984	50270
Jan-22	2,463	14,918	7,339	37,777	10,593	46,582
Feb-22	2133	12639	7276	38382	9161	41967
Mar-22	2376	13884	8473	45765	12615	58559
Apr-22	2393	13119	7043	36679	5575	24407
May-22	2821	16480	7555	39912	10637	47108
Jun-22	2604	14301	7734	41117	11840	50657
Jul-22	2531	14312	7531	44044	7048	27717
Aug-22	2399	12997	7659	39988	10760	41349
SUSPECTED	ED Prescription	ED Medication	IP Prescription	IP Medication	OPD Prescription	OPD Medication
Correlation Coefficient	-.647**	-.328*	-.480**	-.388*	-.082	.329*
Sig. (2-tailed)	.000	.039	.002	.013	.614	.038
POSITIVE	ED Prescription	ED Medication	IP Prescription	IP Medication	OPD Prescription	OPD Medication
Correlation Coefficient	-.489**	-.143	-.586**	-.497**	-.226	.120
Sig. (2-tailed)	.001	.378	.000	.001	.160	.459

Medical supplies to the patients were continuous and did not stop because the Ministry of Heath created new programs to deliver the medications for the patients at home. Otherwise, the lack of supplies affected the quantity of drugs patients usually receive (21)due to the interruption of air traffic between drug-producing and drug-consuming countries(26). Saudi Government addressed the issue and suggested enhancing drug industries sector in order to cover the need in the future and maintain the services continuity.

Study Limitation: Results related to infection spreading among children might not be representative of the group. That is related to the hospital's scope of services as King Abdullah Medical City provides sub-specialized health are services limited to adults and staff and their family members, who can use general services such as preventive and family medicine.

Recommendations and Conclusion

Lessons learned from the pandemic are summed in the following points. First, good infrastructure always helps the medical team to continuously deliver services remotely. Second, earlier diagnosis, especially for cancer patients, significantly affects if services access were blocked.

Third, applying restrictions to limit the infection and provide the services is better than stop delivering them. Fourth, emergency services should always deliver medical services for high-risk people to maintain resources and healthcare team effort. Fifth, other surgical procedures need to be addressed intensively as they were the most negatively affected services during the pandemic. Finally, medications and supplies should be available and planned to delivery and must activate from time to time in order to maintain the services sustainability.

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