

Impact of COVID-19 pandemic on the medical activities of the Directorate of Health and Hygiene, Vatican City State

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Objectives. To report the changes in volume and characteristics of medical activities in the Vatican City State during COVID-19 pandemic.

Methods. Data for general medical service, specialty consultations, radiology examinations and

diagnostic procedures delivered by the Directorate of Health and Hygiene of the State were retrospectively analysed. Analysis focused on year 2020 and on the lockdown period 9 March – 18 May.

Results. In 2020, 73.932 procedures were performed compared to 95.218 in 2019 (–22.4%). During lockdown, general/emergency activities decreased by 61.1%, specialty consultations by 85.3%, radiology examinations by 95.8%, and diagnostic procedures by 96.5%. A decrease was found for nearly all specialties; the most affected were occupational medicine and dermatology, whilst an increase was found for legal medicine, psychiatry and angiology.

Conclusion. Medical activities of the Vatican City State have been severely impacted, especially during the first months of the pandemic. However, organizational efforts allowed rapid restoration to near-normal volumes.

Keywords: COVID-19, healthcare system, SARS-CoV-2, Vatican City State.

Introduction

The ongoing coronavirus disease 2019 (COVID-19) pandemic caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has led to an unprecedented health crisis with dramatic consequences on individual and public health and represented a considerable challenge for the

management and stability of national healthcare systems [1, 2].

The rapid increase of cases, the initial unavailability of personal protection equipment (PPE) for healthcare workers, and the inadequacy and unpreparedness of many public structures, in addition to the absence of data regarding diagnostic criteria, disease management, and treatment options, required an immediate redesign of public healthcare systems with significant investments and unexpected workload [3–5]. In some cases,

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especially for developing countries, the pandemic caused the collapse of healthcare systems with dramatic consequences on public health [6].

Amongst measures taken to support public healthcare systems and avoid contagion between patients and healthcare workers [7, 8], most countries converted units and hospitals into facilities dedicated to the treatment of COVID-positive patients, whilst the majority of elective outpatient clinical and surgical procedures were delayed, allowing the confluence of available resources towards emergency and infectious diseases departments and intensive care units [9, 10].

The healthcare system of the Vatican City State, an independent State located as an enclave within the city of Rome, Italy, provides medical assistance to nearly 12 000 residents, workers, retirees and their families, both priests and lay persons. The healthcare system of the State is composed of the Directorate of Health and Hygiene that offers general and specialty medical consultations, emergency assistance, radiology examinations and diagnostic procedures in buildings inside the Vatican City State, and the Healthcare Assistance Fund (Fondo Assistenza Sanitaria – FAS) that offers surgical procedures and hospitalization in affiliated hospitals in the Italian territory [11].

Similar to other countries, the healthcare system of the Vatican City State underwent a profound reorganization of daily clinical activities to prevent virus diffusion amongst patients and healthcare workers and to focus on prevention measures [12]. Between 9 March and 18 May 2020, the medical activities of the Directorate of Health and Hygiene were limited to emergency cases guaranteed by a non-stop medical service, whilst non-urgent and specialty consultations, when permitted by the clinical condition of the patient, were rescheduled in accordance with international recommendations. Afterwards, all clinical activities were restored with new protocols and safety regulations.

The aim of this study is to report and discuss the changes occurred in the volume and characteristics of the healthcare activities of the Directorate of Health and Hygiene of the Governorate of the Vatican City State during 2020, with special attention to the first months of the pandemic and to the strategies adopted to return to routine activity.

Materials and methods

Data from the clinical records of the Directorate of Healthcare and Hygiene of the Vatican City State were retrospectively analysed.

Data analysis focused on different time ranges. The first was 1 January – 31 December 2020, and the second was 9 March – 18 May 2020. Data were then compared with the same date ranges in 2019 (1 January – 31 December 2019; 9 March – 18 May 2019). The first allowed an overall comparison of consultations and examinations executed during the year characterized by SARS-CoV-2 pandemic with that of a regular year; the second focused on the period most impacted by the pandemic in which extensive lockdown measures were imposed in Italy and in the Vatican City State.

Data referred to general medical service activities, specialty consultations, radiology examinations and instrumental diagnostic procedures. General medical service activities included internal medicine consultations and emergency procedures; specialty consultations included diagnostic and therapeutic activities in 21 different medical and surgical specialties; radiology examinations included x-ray and ultrasound evaluations; and instrumental diagnostic procedures included diagnostics in angiology, cardiology, ophthalmology and pneumology. Data for laboratory examinations and ambulance rescues were not included in this study. Details on medical procedures included in the analysis are listed in Table S1, Appendix S1.

All information was managed using anonymous numerical codes, and data were handled in compliance with the Declaration of Helsinki. Data analysis was performed using Prism GraphPad Software version 9 (GraphPad Software LLC).

Results

Figure 1 shows the total number of medical procedures performed by the Directorate of Healthcare and Hygiene of the Governorate of the Vatican City State in 2020 and during the previous year. General/emergency procedures were 40.312 in 2020 compared to 52.993 in 2019 (–23.9%); specialty procedures were 24.822 in 2020 compared to 30.184 in 2019 (–17.8%); radiology examinations were 4469 in 2020 compared to 7314 in 2019 (–38.9%); and diagnostic procedures were 4329 in 2020 compared to 4727 in 2019 (–8.4%). General /

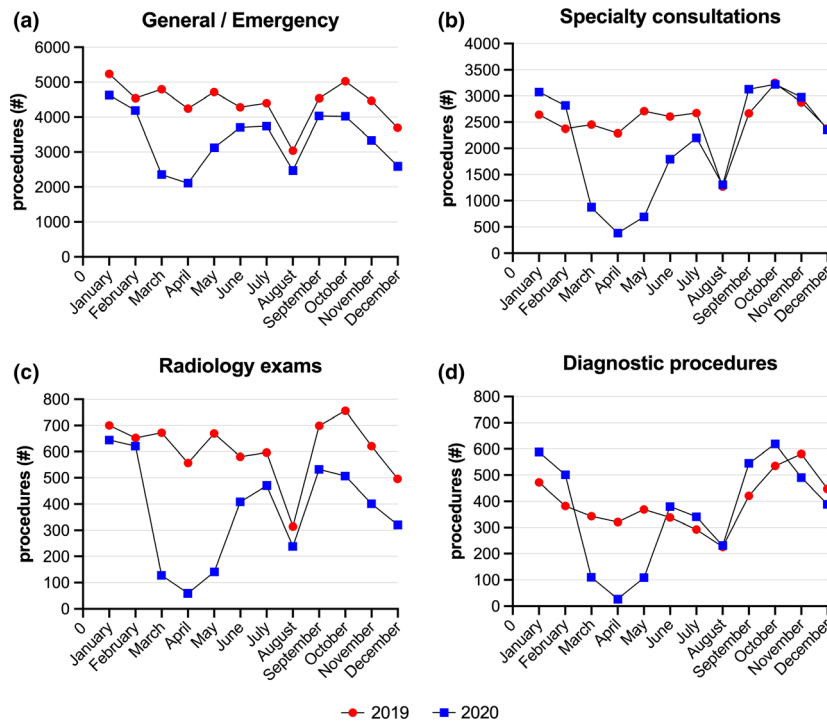


Fig. 1 Total number of medical procedures performed by the Directorate of Healthcare and Hygiene of the Governorate of the Vatican City State sorted by type (a) general / emergency activities; (b) specialty consultations; (c) radiology examinations; and (d) diagnostic procedures. The most impacted months were March, April and May 2020, in which consultations and examinations were limited to emergency cases and to undelayable general and specialty procedures, whilst non-urgent activities were temporarily suspended to minimize the risk of contagion amongst patients and healthcare workers.

emergency and radiology procedures in 2020 were constantly lower than 2019, whilst specialty consultations and diagnostic examinations, even if were drastically reduced during March, April and May, matched or surpassed 2019 volumes during the second half of the year. General and emergency procedures were less affected by the lockdown measures of the first months of the pandemic compared to other activities.

Figure 2 shows details on the overall number of specialty consultations performed by the Directorate of Healthcare and Hygiene in 2020 compared to 2019, sorted by specialty. A marked decrease was found for nearly all disciplines, except for legal medicine, psychiatry and angiology. The most impacted were occupational medicine (−789 visits), followed by dermatology (−733), general surgery (−704), ophthalmology (−693), nutritional medicine (−638) and paediatrics (−591). A slight increase was found for angiology

(+20 visits) and psychiatry (+7), whilst a significant increase was found for legal medicine (+1628 procedures).

When the volume and type of medical activities of the Directorate of Healthcare and Hygiene provided during the lockdown period (9 March – 18 May 2020) were compared with the same period of 2019, even larger differences were found. Figure 3 (upper panel) shows details on volume change for each type of procedure: general/emergency activities decreased from 10,275 in 2019 to 3999 in 2020 (−61.1%), specialty consultations decreased from 5551 in 2019 to 814 in 2020 (−85.3%), radiology examinations decreased from 1,406 to 59 (−95.8%), and diagnostic procedures decreased from 771 in 2019 to 27 in 2020 (−96.5%). Figure 3 (lower panel) shows the same changes using a 10x10 plot: in 2019, general / specialty / radiology / diagnostic procedures were 57%, 30.8%, 7.8% and 4.3%, respectively; during lockdown, the

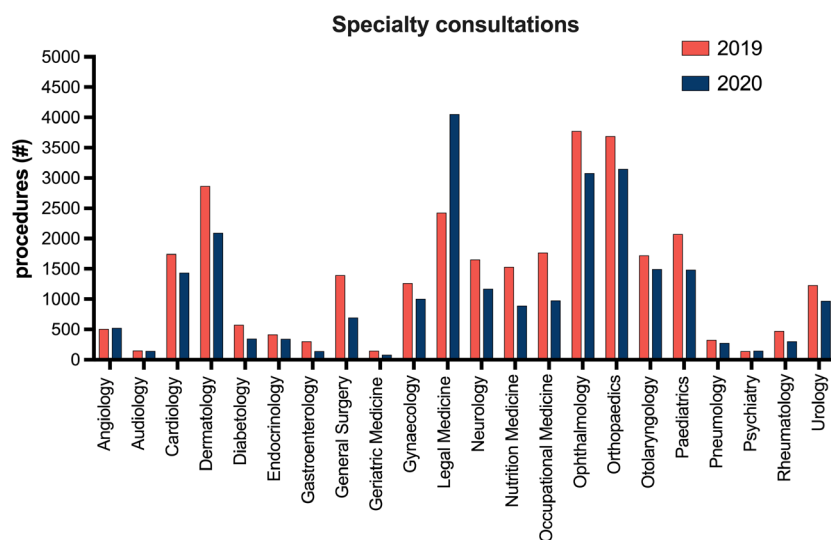


Fig. 2 Details on the overall number of specialty consultations performed by the Directorate of Healthcare and Hygiene in 2020 compared to 2019. A marked decrease was found for nearly all disciplines, except for legal medicine, psychiatry and angiology.

percentages changed to 81.6%, 16.6%, 1.2% and 0.5%. The preponderance of general/emergency procedures is evident in 2020 when compared to 2019.

Discussion

COVID-19 impacted the healthcare systems of most countries worldwide, with different patterns of change in activity depending on prevalence, stage of the pandemic and local policies [2-5]. Similar to other countries [13-15], during the first months of the pandemic the Directorate of Healthcare and Hygiene of the Vatican City State limited its healthcare activities to emergency and undelayable procedures, such as urgent calls, trauma, general and specialty emergencies and evaluation and follow-up of patients with undelayable necessities (e.g. oncology patients) [12]. Rescheduling non-urgent procedures contributed to reducing the possibilities of virus spread within the State, where 42 cases were tracked as of 7 January 2020, by limiting the number of patients presenting to the internal facilities, and at the same time preserved medical resources, such as healthcare personnel and PPE, to treat critical patients and concentrate on prevention. Nevertheless, many organizational efforts have been taken to regain postponed consultations afterwards, thus limiting consequences on patients' health, especially for those affected by chronic diseases.

Based on the results of our retrospective analysis, the impact of rescheduling non-urgent

consultations and examinations was limited to the first three months of the pandemic and the considerable decrease in the number of procedures occurred during this period was compensated in the following months thanks to virtuous reorganizational efforts, also favoured by the relatively low number of patients assisted by the healthcare system of the State. Starting from June 2020, the Directorate of Health and Hygiene returned near to average pre-COVID-19 volumes for medical procedures even if the pandemic condition imposed a new agenda with increased the time between appointments to allow disinfection procedures. When comparing with other countries, our results look promising; in fact, recent studies have shown that, after the lockdown of the initial period, a stable decrease in medical procedures could be found due to delays in restoring pre-COVID schedules and to patients' fear of contracting the infection at the hospital [16-18].

According to our analysis of the volume of specialty consultations, the number of visits performed during 2020 in the Directorate of Healthcare and Hygiene decreased for nearly all specialties compared to 2019. The most affected specialty was occupational medicine; the decrease may be explained by the temporary suspension of hiring procedures in 2020 in the Vatican City State in addition to the rescheduling of most employees' annual health checkups. Occupational medicine was followed by dermatology, general surgery and ophthalmology, for which in-office appointments were mostly rescheduled. These findings are in line

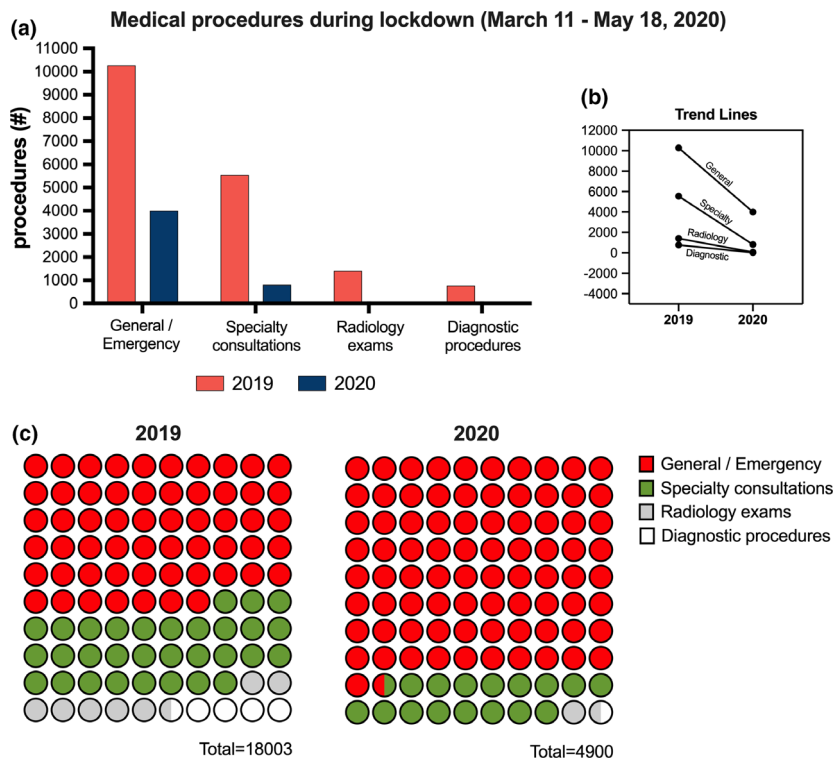


Fig. 3 Numeric with trend lines (upper panel) and visual (lower panel) volume change for each type of medical procedures performed by the Directorate of Healthcare and Hygiene during the lockdown period (9 March – 18 May 2020) and during the same period of 2019 (9 March – 18 May 2019): general/emergency activities decreased by 61.1%, specialty consultations by 85.3%, radiology examinations by 95.8%, and diagnostic procedures by 96.5%.

with reports from healthcare systems of other countries, where COVID-19 pandemic seriously impacted specialty consultations, leading to concerns regarding the impact of these changes on non-COVID chronic or acute conditions and screening procedures with potential consequences on patients' life [16-19]. Diversely, the number of legal medicine, angiology and psychiatry consultations increased in 2020. Legal medicine, the specialty that deals with the application of medical knowledge to legal proceedings, in the Vatican City State is also in charge of authorizing and verifying employees' absences. This branch showed a growth of 1628 procedures compared to the previous year; the increase can be explained by the high number of employees reporting symptoms or close contacts with positive cases that prevented them from going to work and required legal medicine evaluation to authorize their absence and their return to work. The increase in psychiatric consultations – although potentially influenced by the limited number of total consultations – may reflect the

impact of the pandemic on mental health and well-being of patients, including impacts on people already living with mental health condition and new onset triggered by restrictions and uncertain future, leading to increased demand for psychological support, as also reported in the literature [20].

This is the first study to publish data on the volume and type of medical activities of the Directorate of Healthcare and Hygiene of the Governorate of the Vatican City State during the pandemic and provides a first step in assessing the indirect impact of COVID-19 on the State's healthcare services. Future studies to assess healthcare outcomes related to foregone care, such as an increase in rates of chronic disease, are necessary to evaluate the long-term effects of the adopted measures.

This study has some limitations: the first is that it relies on administrative data, which only provide quantitative information whilst are unable to

capture in detail the treatments provided to patients and the severity of disease. Secondly, it only focused on medical activities offered within the Vatican City State (mainly consultations and in-office procedures), without taking into consideration surgical procedures and hospitalization that are offered in affiliated hospitals in the Italian territory that are managed by the FAS. Third, patients served by the healthcare system of the Vatican City State are, in most cases, also assisted by the Italian public healthcare system; in this study, we could not investigate the role of the latter in the assistance of our patients.

Conclusions

The Directorate of Health and Hygiene of the Governorate of the Vatican City State underwent a profound reorganization of its medical activities to prevent virus diffusion amongst patients and healthcare workers and focus on prevention measures, still guaranteeing continuous assistance for emergency and undelayable procedures. Similar to other countries, the most severe impact on medical activities has been recorded during the first wave of the pandemic, and especially during the lockdown occurred in the first months of 2020. However, the organizational efforts of the Directorate of Health and Hygiene allowed a rapid restoration of medical activities to near-normal volumes, with increased prevention and control measures to guarantee safety amongst patients and healthcare workers.

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Author contribution

Massimo Ralli: Conceptualization (equal); Data curation (equal); Investigation (equal); Writing-original draft (equal). **Andrea Arcangeli:** Conceptualization (equal); Supervision (equal); Writing-original draft (equal); Writing-review & editing (equal). **Paolo Maurizio Soave:** Formal

analysis (equal); Investigation (equal). **Luigi Carbone:** Data curation (equal); Methodology (equal). **Lucia Ercoli:** Conceptualization (equal); Supervision (equal); Visualization (equal). **Fabio De-Giorgio:** Conceptualization (equal); Supervision (equal); Writing-review & editing (equal).

Conflict of interest

The authors have no conflicts of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Table S1 Details on medical procedures performed by the Directorate of Healthcare and Hygiene of the Vatican City State included in the retrospective analysis. ■