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Impact of COVID-19 on Elective Cleft Surgery in Low- and Middle-income Countries

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Background: The COVID-19 pandemic disrupted health systems worldwide, including in low- and middle-income countries (LMICs). Many countries limited the delivery of elective surgery. To date, COVID-19's impact on elective surgery in LMICs has been unquantified. We use operative data from a large international non-government cleft organization to compare case volume for 2019 and 2020 to quantify the impact of COVID-19.

Methods: Smile Train supports a partner network of over 1100 partners globally to deliver treatment to children with cleft lip and cleft palate (CLP). Treatment data is documented into a proprietary digital platform, Smile Train Express. We compared monthly treatment data for 2019 to 2020, by country, and by World Bank Income group to describe the effect that the COVID-19 pandemic has had on CLP surgery in LMICs.

Results: Our analysis shows 25,444 (31.4%) fewer primary operations performed between January and December 2020 than in the same period in 2019 with the most significant decline in procedures observed in April 2020. Many countries resumed elective surgery for CLP procedures from May onward and volume approximated that of pre-pandemic baseline by November of 2020.

Conclusions: The emergence of the COVID-19 pandemic had a large impact on health systems and service delivery across the world. We find that this is evident in the delivery of CLP surgery in LMICs. The impact is characterized by a dramatic decrease in surgery rates in April of 2020 with a recovery of surgical volume from July 2020 onwards. The rate of surgical rate recovery is consistent across World Bank Income groups. *(Plast Reconstr Surg Glob Open 2021;9:e3656; doi: 10.1097/GOX.0000000000003656; Published online 22 June 2021.)*

INTRODUCTION

On March 11, 2020, the World Health Organization declared the novel coronavirus (COVID-19) outbreak a global pandemic.[1] As of November 5, 2020, the Johns Hopkins Coronavirus Resource Center noted a total of 48,252,129 global cases, with 1,227,544 deaths, in 190 countries and regions.[2]

In the initial preparedness and response, countries focused on developing testing, ensuring adequate supply chains of personal protective equipment and ventilators, and implementing lockdown measures to prevent disease spread. At this time, many countries mandated cancellation of all but emergency and cancer surgeries with the objectives of preserving the health of health care workers, alleviating the strain on personal protective equipment procurement, freeing up operating room space to be used as "surge" intensive care units, and preventing transmission to surgical patients.[3]

In most LMICs, elective surgery was halted because of countrywide lockdown aimed at stopping the spread of infection. Hospital services and travel came to standstill and the restriction in movement of patients made it difficult to access hospitals.

The actual effect of these measures on elective surgery in LMICs has been estimated but not specifically

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quantified using actual operative data. In this article, we compare monthly operative data for 67 countries conducting cleft surgery in partnership with Smile Train for 2019 and 2020, in order to understand the impact of COVID-19 on rates of elective surgery in LMICs.

For context, in some countries (eg, India), the government mandated stopping elective surgery in COVID-19 designated hospitals, which were mostly public sector institutes, whereas in other countries (eg, Nigeria), the decision was mainly made on an individual hospital and regional basis. Although some private sector centers were ready to perform cleft surgeries, the fear of contracting a COVID-19 infection and fear of surgical and postsurgical complications in COVID-19 infected patients delayed restoration of elective surgery.

In India, the decision to halt elective surgeries for a few months gave the wrong impression in the minds of some of the hospital managers that these surgeries may not be required. Hence, elective surgery was renamed as "medically important, time sensitive" surgery. These surgeries are definitely required; however, they could be delayed without compromising the overall outcome.

Ghana's experience with COVID-19 is similar to that of India. Elective surgeries except for cancer surgery were put on hold in all the public hospitals during the period from March to July. Unlike India, however, the majority of cleft surgeries in Ghana are carried out in well-equipped public hospitals; so this period of restrictions saw a low volume of cleft surgeries being performed.

This article is structured to present current literature and author experiences in the Introduction and Literature Review sections. Subsequently the data and approach to analysis are described in the Methods section. The Results and Discussion section present the findings of the analysis and describe their context and relevance. Finally, a Conclusion section summarizes the articles necessity, approach, and findings. Analysis of actual patient data to quantify the impact of COVID-19 on elective surgery in LMICs will provide valuable insights to patient groups, providers, and policy-makers in designing a strategic plan to handle the resultant increased backlog of patients waiting for surgery.

LITERATURE REVIEW

The Lancet Commission on Global Surgery utilized surgical volume, described as annual rate of surgery per 100,000 population, as an indicator of surgical system performance[4] and provides a useful metric in evaluating COVID-19 impact on surgical performance. The general effect of the cancellation of elective surgeries has been described as having multiple levels of impact.[5,6] At the patient family level, deferred surgery for cleft lip and palate prolonged the psychological, nutritional, and speech challenges experienced by those affected. In a recent publication, a consensus of providers suggested that cleft lip surgery could be postponed for up to 3 months without adverse effects on the patient.[7,8] With the duration of the pandemic now well into 12+ months, deferred surgery may be falling outside this prescribed window. Effects on families have also been described in literature as decreasing confidence in hospitals to provide care and fear of the risk of contracting COVID-19 when seeking routine hospital care as altering health seeking behavior for surgery. In making the decision to conduct craniofacial surgery versus postponing the surgery (including primary and secondary cleft surgery), "surgeons are advised to balance the risks of postponing surgery with the risks of exposure to the child and healthcare staff and risk of developmental delay against delaying the procedure during the COVID-19 outbreak."[9]

The effects of cancelled elective surgery have also been felt by health care workers. Trainees have had limited access to usual surgical volume required for clinical exposure and training, and in many cases may have been deployed to aid in the facility COVID-19 response in a non-surgical capacity (eg, screening patients in COVID-19 clinics, providing critical care for COVID-19 patients).

At the facility level, it is expected that already scarce budgets allocated to support surgical care have been "repurposed" to support facility level COVID-19 response, leading to a depletion of resources required for providing surgery (eg, operating room personal protective equipment being used in the care of COVID-19 patients, oxygen usually used for general anesthesia used for supporting ventilation of COVID-19 patients). A survey of American Council of Academic Plastic Surgeons identified the most common reason for determining which procedures were currently offered was due to changes in hospital policy.[10]

The COVID-19 pandemic has led to discussion and description of innovation in therapies[11] (eg, convalescent plasma) developed during previous coronavirus outbreaks (MERS, SARS), treatment plans,[12] innovations in the management of testing in resource constrained environments,[13] and management of health services,[14] within scientific literature.

PURPOSE

The purpose of this article is to describe the effect of the COVID-19 global pandemic on elective cleft surgery in resource constrained surgical systems across the world.

METHOD

Smile Train supports a partner network of over 1100 providers and hospitals in more than 70 countries around the world. As part of routine record keeping, program partners enter medical record information for patients treated and supported by Smile Train into a digital platform, STX.

A deidentified export of STX treatment records for patients having surgery for primary repair of cleft lip, cleft lip and palate, and cleft palate was provided from January 1, 2019 to December 31, 2020(Fig. 1). Patients undergoing secondary surgeries were not included in this analysis. Records were organized by country and by month. A month-over-month comparison was conducted, and the cumulative difference between cases performed in 2019 and 2020 was calculated.

To allow comparison between countries, the number of procedures was converted to a rate of procedures per

100,000 population using current World Bank population data.[15] Surgical rate data were then stratified by World Bank Income group for comparison.

RESULTS

The comparison of January through December 2019 to the same period in 2020 show that there was a 31% reduction (n = 25,444) in the total number of procedures. The monthly number of cases declined from January 2020 through April 2020, before increasing month over month from May 2020 to December 2020 (Table 1, Fig. 2).

The median procedure rate for all 67 countries for January through December 2020 was 0.068 (IQR 0.05–0.075) per 100,000 population. After a monthly low of a median of 0.00 cases per 100,000 of population in April and May 2020, case rates had rebounded to a median of 0.057 (IQR 0.042–0.07) per 100,000 population for the period July through December 2020 (Fig. 3). Of the 67 countries analyzed, 47 reported no surgical activity in April 2020, and 43 reported no surgical activity in May 2020 (Fig. 4).

When the median of the country case rates is calculated by World Bank Income Group, it is noted that pre-COVID-19 the most active groups were: lower middle–income countries (LMICs) (n = 30) (Fig. 5). All groups experienced a marked decline in case rates during March–May 2020. Generally, all income groups recovered to January 2020 surgical rates during the September–December 2020 period. Decrease in case rates in December 2020 amongst high-income countries is likely due to the seasonality of annual holidays (this phenomenon is also noted to a lesser extent in upper middle–income countries, LMICs, and low-income countries.

DISCUSSION

From our analysis the decrease in elective surgeries in LMICs as a response to COVID-19 has led to an estimated 25,444 fewer procedures for primary cleft lip and cleft palate performed in the period from January through December 2020 than in the previous year. These patients, predominately children, join the estimated backlog of over 600,000 people with untreated cleft lip and cleft palate.[16] Although "elective"[17] in nature, this definition during the current global pandemic requires further discussion as there is a relationship to the timing of cleft surgery and long-term treatment outcome.[18,19] Though it has been suggested that a short delay in the timing of primary cleft lip surgery[7] may be appropriate during a global pandemic our data shows that the effect of the COVID-19 pandemic on decreased surgical rates continues and may become an "intermediate term" rather than "acute" problem.

Table 1. Total Number of Cases by Month in 2019 and 2020 with Cumulative Difference

Month	Year 2019	Year 2020	Cumulative Monthly Surplus/ Deficit in Cases
January	5488	5129	–359
February	6086	5797	–648
March	7306	4435	–3519
April	6492	937	–9074
May	5616	1470	–13220
June	6357	3323	–16254
July	6686	4249	–18691
August	5660	4151	–20200
September	6108	5259	–21049
October	8604	7474	–22179
November	8538	6558	–24159
December	7979	6694	–25444

Managing the increased backlog of postponed cleft lip and cleft palate cases, along with all other postponed elective surgery would require increasing surgery rates beyond pre-pandemic levels to clear the accrued backlog. This may be hard to achieve, especially in LMICs. However, proposals for how to manage the increased need for elective surgery are not represented in the literature.[20] Given the slow resumption of cleft lip and palate surgery we observed in LMICs, it can be assumed that the challenges of increasing surgery rates to address an accrued backlog will be more complicated in these environments.

Many organizations have published recommendations and guidelines for safely restarting surgical care.[21,22] These recommendations largely describe using a segregated clean hospital area for non-COVID-19 patients, using pre-surgical COVID-19 testing to clear patients for admission, limiting the number of patient accompaniers for admissions, and limiting the length of hospital stay.[23,24]

This research has the potential to be used to estimate the effect of COVID-19 on other elective surgeries of known prevalence, or more generally to model the disruption of the overall surgical capacity in LMICs. The findings of this research are relevant to patient groups, providers, and policy-makers involved in addressing the backlog for elective surgery that has likely developed during the global pandemic.

Although the authors provided specific examples and context of their experiences in India, Nigeria, and in Ghana, more research is required to specifically describe the types of factors impacting surgical care delivery during a global pandemic and how to quantify their relative effect. Future research in this area will be essential in planning for resilient surgical systems that may be impacted by future disruptions (eg, future pandemics, natural disasters, war, and conflict).

Limitations

There are limitations that exist with the approach to this study. Although the data analyzed represent Smile Train partners across numerous LMICs, the operative data only represent surgeries reported to Smile Train. It is possible that some of the usually expected surgeries were still conducted without reporting to Smile Train for unknown reasons.

The data included in this article provide little insight into the actual factors leading to the decrease in surgery beyond the anecdotal reports from the authors and the limited available literature available. It is possible that the reduction in surgery may be due to the secondary effects of the COVID-19 pandemic (eg, economic downturn

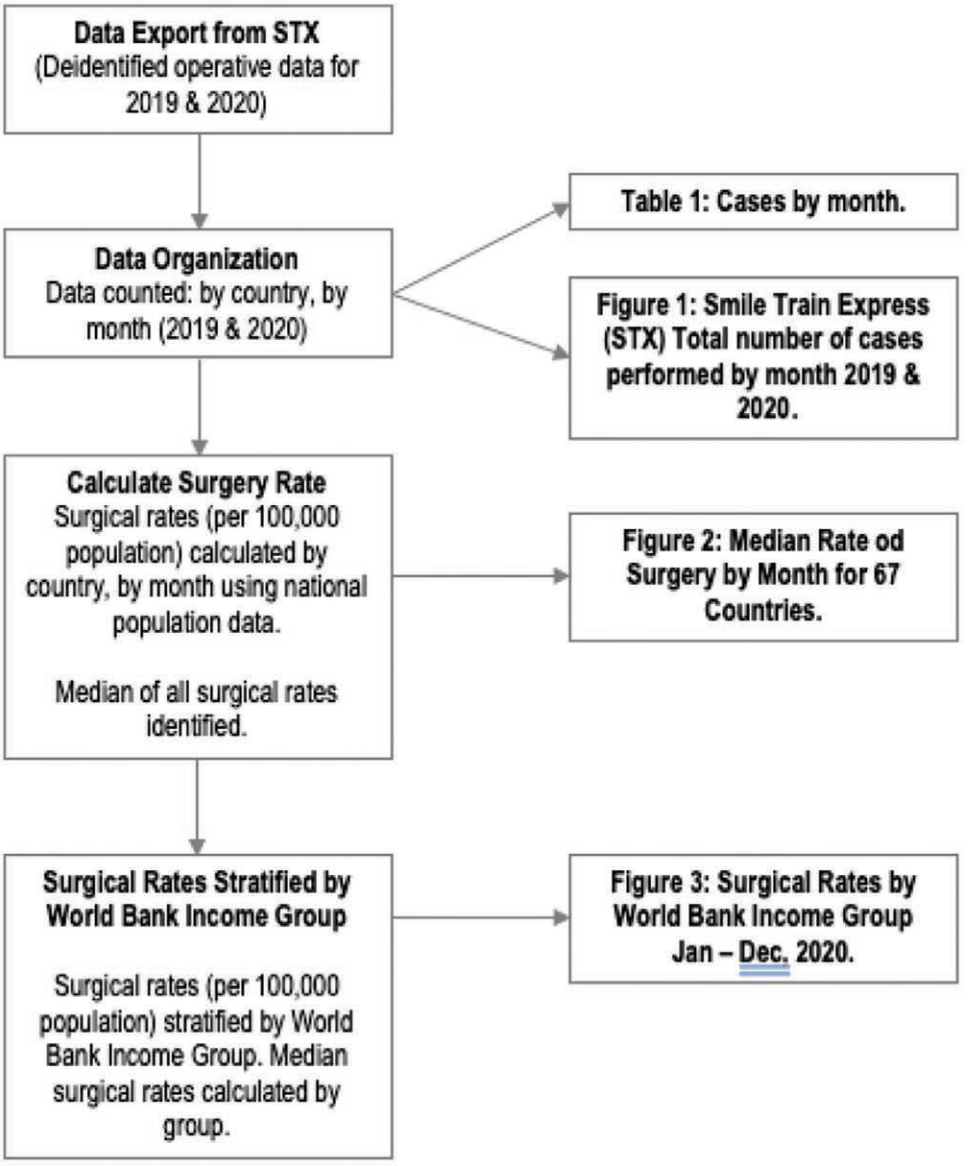

Fig. 1. Methodology of data analysis.

within a community), rather than the primary effect of health service availability. These factors are unable to be considered using the available data.

It is assumed that the need for surgery in the reviewed countries would be consistent across the years compared. Without widely available birth defect registries from which to establish birth incidence of cleft lip and cleft palate, this assumption is yet to be validated.

CONCLUSIONS

This study represents a large, international, pediatric cohort, representing LMICs for which the impact of COVID-19 has been analyzed. The data analyzed show a marked reduction in surgery during the COVID-19 pandemic, with a peak reduction in surgical rates in April and May of 2020. Our data suggest a significant effect on surgery rates and metrics required to quantify the effect and inform restoration of services that would need to be developed beyond looking at the specific number of surgeries, which is currently the best available data point.

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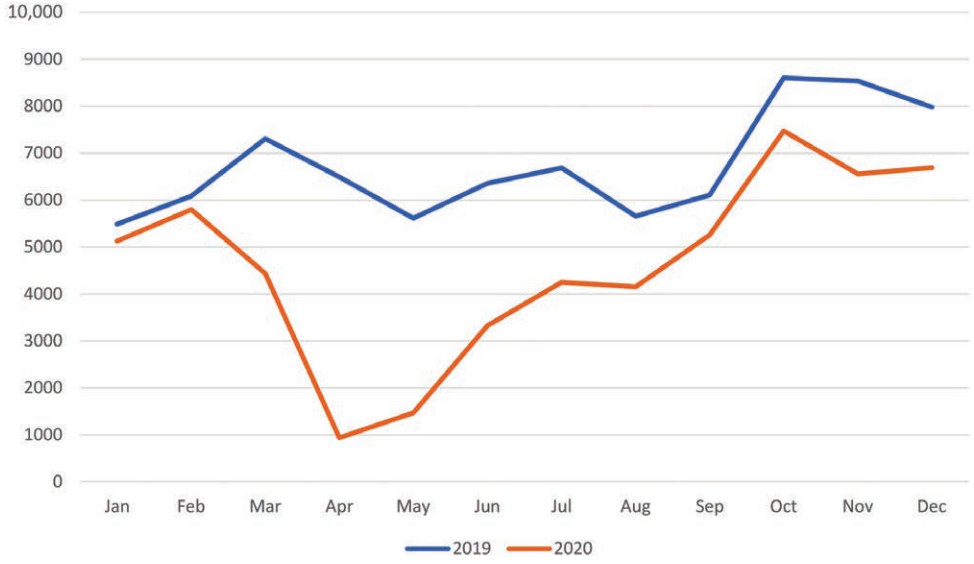

Fig. 2. STX total number of cases performed by month for 2019 and 2020.

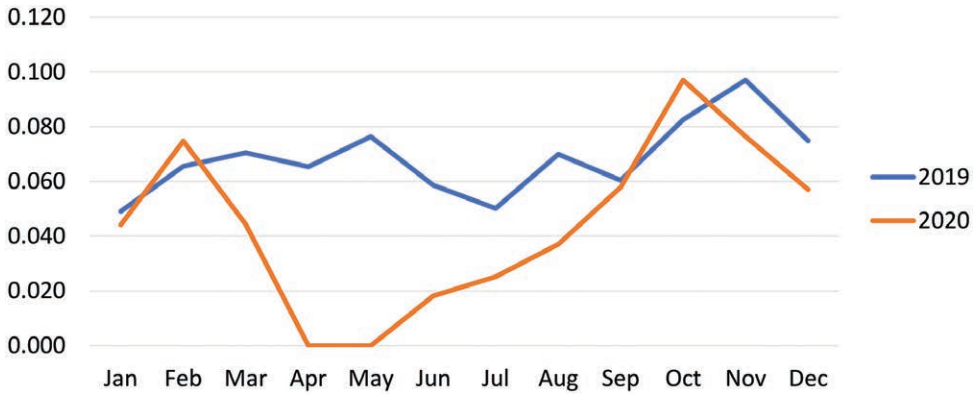

Fig. 3. Median rate of surgery by month for 67 countries.

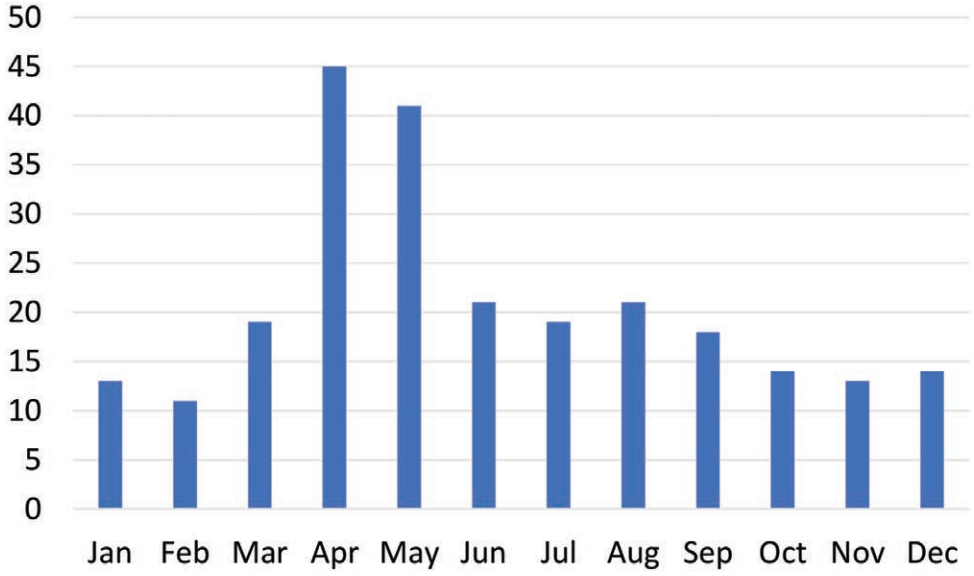

Fig. 4. Number of countries reporting no surgical activity by month for 2020.

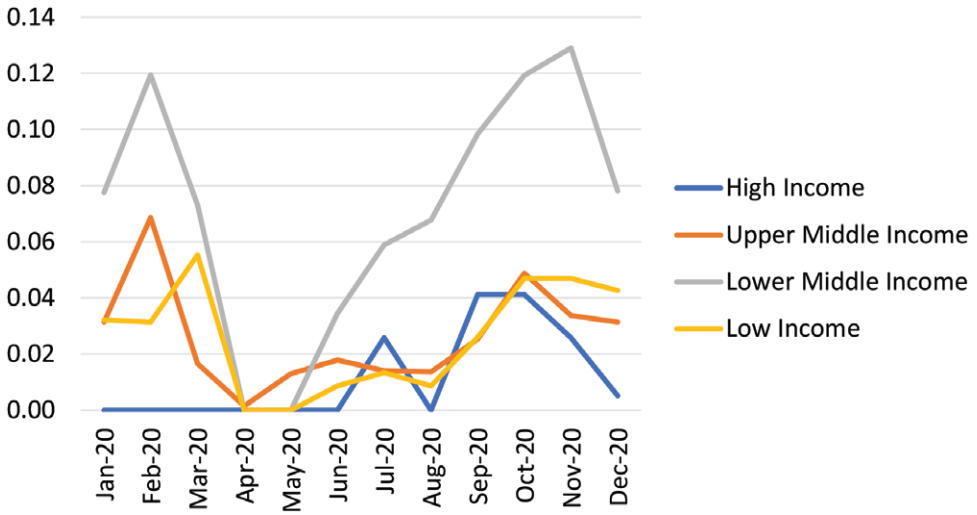

Fig. 5. Surgical Rates by World Bank Income Group. January 2020–December 2020.

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