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## Pattern of Oral and Maxillofacial New Referrals During COVID-19 Lockdown

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### ABSTRACT

The study aimed to quantify the impact of lockdown during the COVID-19 pandemic on new case referrals to the Oral and Maxillofacial Surgery (OMS) service. The researchers retrospectively reviewed all new referrals received during a government-imposed 47-day lockdown period and a similar period pre-lockdown as a control group. The main outcome was the differences in the number of new case referrals between the two periods. The contributing clinical and demographic factors were also explored. Appropriate bivariate statistics were computed and the level of significance was set at 0.05 for all tests. A total of 309 referrals were received during the study period. There was a reduction of new referrals due to the lockdown from five to two cases per day. There was a statistically significant reduction of cases referred from outpatient and emergency departments. There was also a statistically significant difference with regard to home address distance to the centre. Medically compromised and orofacial infection referrals were not affected by lockdown. The lockdown imposed due to the pandemic has significantly impacted the pattern of new OMS referrals. Referrals for orofacial infections, the medically compromised and inpatients were minimally affected by lockdown.

**Keywords:** COVID-19; lockdown; oral and maxillofacial surgery; referral

### INTRODUCTION

The emergence of COVID-19 has changed the way we live. COVID-19 spreads from an infected person directly via respiratory droplets containing the virus or indirectly from contaminated inanimate objects (Centers for Disease Control and Prevention, 2020). The ease of transmission contributed to an initial uncontrollable spread causing what is now a worldwide pandemic (World

Health Organization, 2020). The difficulties in controlling the spread are compounded with the possibility of asymptomatic carriers (Rothe *et al.*, 2020). To reduce the basic reproduction number ( $R_0$ ) of the disease, governments worldwide were forced to take countermeasures to halt the rapid spread of this disease. Malaysia, as with most countries, took measures to impose lockdowns, which lasted for 47 days (Shah *et al.*, 2020). During the lockdown period,

the measures taken included prohibition of mass movements and gatherings, closures of all kindergartens, schools and higher education institutions and closure of nonessential government and business premises. Citizens were instructed to stay at home with only a single person within a household allowed to perform essential tasks (Malaysian National Security Council, 2020).

The changing patterns in the delivery of oral and maxillofacial surgery (OMS) clinical services during the pandemic have been reported (Maffia *et al.*, 2020). Working mostly in the oral and facial region, OMS personnel are directly exposed to respiratory droplets and aerosols. Because of the elevated risk, early guidelines recommended elective OMS nonemergent cases to be postponed (Grant *et al.*, 2020; Panesar *et al.*, 2020). Focus of the OMS services were given to time-dependent diseases such as trauma and oncology contributed to the changing patterns seen (Allevi *et al.*, 2020). The change in resources during the initial phase of the pandemic, with either OMS personnel or facilities redistribution to manage COVID-19 also contributed to the changes in the OMS services that were delivered. It was found that during the peak period of the pandemic in Italy, 17% of OMS personnel were reallocated to COVID-19-related services (Allevi *et al.*, 2020). Moreover, the enforcement of lockdowns, besides causing limited movement also indirectly instils fear and anxiety within the community (Jayakumar *et al.*, 2020; Murphy *et al.*, 2020). This can lead to postponement requests from the patients themselves. There have been few reports on the pattern of OMS treatment delivery in severe COVID-19-affected areas. The outpatient visits were reduced by more than 87% (Allevi *et al.*, 2020). The number of inpatient surgeries was also found to have overall reduced activity, with trauma and oncological surgery the least affected (Allevi *et al.*, 2020; Maffia *et al.*, 2020).

While previous reports have explored the change in the delivery of OMS services during the COVID-19 lockdowns, the pattern of new referrals during this period, to the best of our knowledge, has never been explored. The purpose of a referral system is to link primary care providers to specialised tertiary services, such as OMS. Such a system allows other healthcare providers to refer cases to these OMS units. Exploration of this aspect will enable an understanding of the demand for OMS clinical services from the perspective external to the specialty itself. It will also provide insight into the critical clinical services expected of the OMS speciality. This study aimed to explore the changes in the referral patterns following COVID-19 lockdowns.

## MATERIALS AND METHODS

All new referrals to the OMS Department of the Universiti Kebangsaan Malaysia Medical Centre (UKMMC) and University Malaya Medical Centre (UMMC) during the study period were identified from the departmental clinical census. Both centres are tertiary hospitals situated in Kuala Lumpur, Malaysia. Neither of the centres are fully dedicated COVID-19 centres but still they accepted and treated a limited number of COVID-19 cases during the lockdown period. Ethical approval from both centres has been obtained from the respective ethical committees: The UKMCC (Ref. no. UKM PPI/111/8/JEP-2017-005) and UMMC (Ref. no. DF OS2031/0111[L]), prior to initiating the retrospective data collections. The data collected were all inpatient, outpatient and emergency department new referrals to the OMS speciality from 31 January until 3 May 2020. Demographic data included the age of patient, gender, race and home address. Clinical data consist of the source of referral, clinical presentations, diagnosis and treatment rendered.

The data were then divided into two groups with a 47-day period each, namely for referral before the lockdown (31 January to 17 March 2020) and during the lockdown (18 March to 3 May 2020). Based on the home addresses, distance to the centre they were referred to was calculated using Google Maps and these data were recorded. From the clinical data, cases were categorised into type of cases based on nine main clinical services in OMS (see Table 1). Data collection was recorded in a standardised proforma and later transferred to IBM SPSS Statistics version 25 (Armonk, NY: IBM Corporation) for descriptive analyses.

## RESULTS

In total, the OMS departments in the two medical centres received 309 new referrals during the study period. UKMMC received 172 while UMMC had 137 new referrals. There were more male (58%) than female (42%) referrals received (see Table 2). The mean age was 39.6 years old, which is not surprising as the age group of 20 to 39 was the highest contributor with 36%. Referral for cases over 60 years old was also substantial at 26%. The age groups of under 19 years old and 40 to 59 years

old both formed 19% of the study sample. Ethnicity wise, Malay (56%) formed the majority of the new referral cases received, followed by Chinese (27%) and Indian (12%). Most of the referrals accepted were from the emergency department (44%). Outpatient and inpatient referrals made up 34% and 22% respectively of the total referrals received. On average, patients' home addresses were 65 km from the centres they were referred to. Most of them (61%) lived less than 15 km away. Only 11% of the patients' addresses were more than 50 km from the medical centres. Trauma formed the major contributor for the new cases seen by OMS services, with 38%. This is followed by new cases of patients who were medically compromised (27%). Orofacial infection also formed a substantial portion of new cases (11%), while the other type of cases formed less than 10% of the new referral seen.

When comparison was made between the two groups, there was an obvious reduction in the number of new referrals received, from 217 cases to 92 cases (Table 2). The average referrals received dropped from five to two cases per day due to the lockdown. The reduction was more substantial in UKMMC. However, the reduction of cases did not affect the proportion of cases with

**Table 1** Categorisation of cases based on diagnosis

Type of cases categories
1. Oral pathology – oral soft tissue lesion; benign odontogenic jaw tumours; benign orofacial swellings; oral ulcers; Stevens-Johnson Syndrome
2. Head and neck oncology – squamous cell carcinoma; malignant salivary gland tumours
3. Cleft and craniofacial anomalies – cleft lip and palate; craniofacial syndromic cases
4. Temporomandibular disorder and orofacial pain – TMJ pain dysfunction syndrome; TMJ dislocations; internal joint derangements; trigeminal neuralgia; atypical facial pain
5. Trauma – facial bone fractures; facial soft tissue injuries; dentoalveolar injuries
6. Dentoalveolar surgery and dental implants – wisdom tooth; impacted tooth; dental implants; post-extraction bleeding
7. Orthognathic surgery – dentofacial deformities; post-orthognathic complications (bleeding, infection etc.)
8. Medically compromised – patient on antiplatelet/coagulant needing extraction; pre/post radiation dental extraction; bisphosphonate/antiangiogenic-related dental extraction; odontogenic pain in a medically compromised patient
9. Orofacial infection – odontogenic-related orofacial cellulitis or abscess involving facial spaces

Note: TMJ = temporomandibular joint

regard to gender. The average age is slightly higher during the lockdown, with a mean of 42 versus 39 years old. This change in the mean age was contributed mainly by the increase in the proportion of the above 60 years age group and the reduction in the 20 to 39 years age group. Looking at the ethnicity, while Malay still formed the majority of the cases in both groups, there was a 5% reduction during lockdown, with a similar percentage increase in the Chinese ethnicity. The most obvious change was seen in the source of referrals, with a substantial reduction of outpatient new cases from 89

cases (41%) to only 17 cases (19%). The absolute number of inpatient cases received actually did not differ much but formed a bigger proportion of referrals received during lockdown because of the reduction in total referrals received (see Table 2). On the other hand, emergency department referral numbers actually reduced by more than half but maintained their percentage in the total referrals received. Another major change is the reduction in the mean distance from 81 km to 27 km. The reduction in mean is due to the fact that only 5% of patients lived more than 50 km during the lockdown

**Table 2** Demographic and clinical features of cases received

Variable		Group N (%)		Total	p
		Lockdown	No lockdown		
		92 (29.8)	217 (70.2)	309 (100.0)	
		2.0 cases/day	4.6 cases/day	3.3 cases/day	
Centre	UKMMC	42 (45.7)	130 (59.9)	172 (55.7)	0.210 <sup>a</sup>
	UMMC	50 (54.3)	87 (40.1)	137 (44.3)	
Gender	Female	39 (42.4)	91 (41.9)	130 (42.1)	0.941 <sup>a</sup>
	Male	53 (57.6)	126 (58.1)	179 (57.9)	
Age	Mean (±SD)	41.6 (±25.0)	38.8 (±22.5)	39.6 (±23.3)	0.655 <sup>a</sup>
	0–19 years	17 (18.4)	41 (18.9)	58 (18.8)	
	20–39 years	29 (31.5)	82 (37.8)	111 (35.9)	
	40–59 years	18 (19.6)	41 (18.9)	59 (19.1)	
	≥ 60 years	28 (30.4)	53 (24.4)	81 (26.2)	
Ethnic	Malay	49 (53.3)	126 (58.1)	175 (56.6)	0.757 <sup>a</sup>
	Chinese	28 (30.4)	54 (24.9)	82 (26.5)	
	Indian	11 (12.0)	29 (13.2)	40 (12.9)	
	Others	4 (4.3)	8 (3.7)	12 (3.9)	
Source	Inpatient referral	33 (35.9)	34 (15.7)	67 (21.7)	* < 0.001 <sup>a</sup>
	Outpatient referral	17 (18.5)	89 (41.0)	106 (34.3)	
	ED referral	42 (45.7)	94 (43.3)	136 (44.0)	
Distance	Mean (±SD)	26.9 (±57.8)	81.3 (±342.2)	64.9 (±288.8)	*0.027 <sup>β</sup>
	≤ 15 km	53 (57.6)	135 (62.2)	188 (60.8)	
	16–50 km	34 (37.0)	51 (23.5)	85 (27.5)	
	≥ 51 km	5 (5.4)	28 (12.9)	33 (10.7)	
	No information	0 (0.0)	3 (1.4)	3 (1.0)	

Notes: α = chi-squared test, β = Fisher's exact test.

compared to 13% before that. The changing pattern seen in the sources of referral and distance from their home to the medical centre was statistically significant.

Regarding the types of cases seen, trauma maintained its proportion during both periods (37% versus 38%), albeit with a reduced number of cases (34 cases versus 83 cases). However, most of the referrals received during the lockdown were for medically compromised patients with an increase to 40% from 21% prior lockdown (see Table 3). Orofacial infection was also a significant contributor of new referrals seen in both periods. It is not surprising to see no new cases in the categories of “orthognathic surgery” and “dentoalveolar surgery and implants” during the lockdown, but it is also notable that no new “head and neck oncology” and “oral pathology” cases were

received. Looking in more detail at the types of cases seen, medically compromised cases were the main contributor of new inpatient referrals received pre- and during lockdown (see Table 3). Comparing both periods, the types of cases for inpatient referrals received were similar, with only the proportion of each categories altered. The common referrals for inpatients were “medically compromised,” “orofacial infection,” “cleft and craniofacial anomalies” and “trauma.” Similarly, medically compromised referrals were the main bulk of outpatient referrals for both periods. However, the number of outpatient referrals for medically compromised patients during lockdown were reduced to half from the usual number received pre-lockdown. Adding this to the total absence of any referrals from other categories except orofacial infection, the number of outpatient referrals received was one quarter of the

**Table 3** Source of referral for the different types of cases

	Type of cases	Inpatient	Outpatient	Emergency	Total
Lockdown	Oral pathology	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Head and neck oncology	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Cleft and craniofacial anomalies	3 (9.1)	0 (0.0)	0 (0.0)	3 (3.3)
	TMJ disorder and orofacial pain	0 (0.0)	0 (0.0)	1 (2.4)	1 (1.1)
	Trauma	2 (6.1)	0 (0.0)	32 (76.2)	34 (37.0)
	Dentoalveolar surgery and dental implants	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Orthognathic surgery	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Medically compromised	21 (63.6)	14 (82.4)	2 (4.8)	37 (40.2)
	Orofacial infection	7 (21.2)	3 (17.6)	7 (16.7)	17 (18.5)
	<b>Total</b>	<b>33 (100.0)</b>	<b>17 (100.0)</b>	<b>42 (100.0)</b>	<b>92 (100.0)</b>
No lockdown	Oral pathology	1 (2.9)	13 (14.6)	2 (2.1)	16 (7.4)
	Head and neck oncology	0 (0.0)	5 (5.6)	0 (0.0)	5 (2.3)
	Cleft and craniofacial anomalies	8 (23.5)	5 (5.6)	1 (1.1)	14 (6.5)
	TMJ disorder and orofacial pain	0 (0.0)	8 (9.0)	1 (1.1)	9 (4.1)
	Trauma	4 (11.8)	1 (1.1)	78 (83.0)	83 (38.2)
	Dentoalveolar surgery and dental implants	0 (0.0)	18 (20.2)	2 (2.1)	20 (9.2)
	Orthognathic surgery	0 (0.0)	6 (6.7)	1 (1.1)	7 (3.2)
	Medically compromised	15 (44.1)	29 (32.6)	1 (1.1)	45 (20.7)
	Orofacial infection	6 (17.7)	4 (4.5)	8 (8.5)	18 (8.3)
	<b>Total</b>	<b>34 (100.0)</b>	<b>89 (100.0)</b>	<b>94 (100.0)</b>	<b>217 (100.0)</b>

pre-lockdown numbers. Trauma, meanwhile, forms the majority of referrals received from the emergency unit during both periods. After trauma, orofacial infection is the next most common case received by the emergency unit. The number of trauma referrals halved during the lockdowns, but orofacial infection numbers remained static.

## DISCUSSION

Lockdown measures' main aim is to slow down the rapid spread of disease transmission. By flattening the curve, it was hoped that the time bought by this measure would prevent the health service from being overwhelmed and eventually reduce overall mortality. It has shown to be effective in reducing the  $R_0$  of the disease (Flaxman *et al.*, 2020). Similarly, we saw a reduction of cases in Malaysia following strict lockdown measures (Tang, 2020). However, these measures are not without ramifications. They have caused a widespread social and economic impact (Nicola *et al.*, 2020). More pertinently is the impact on the healthcare delivery system and specifically on the delivery of OMS services. Previous surveys have reported the changes in the delivery patterns of OMS services during lockdowns (Allewi *et al.*, 2020; Maffia *et al.*, 2020). This study adds further understanding in this regard by assessing the demands of OMS services during these COVID-19 lockdowns from its starting point, which is new case referrals.

Several recommendations have been made regarding prioritising cases during the COVID-19 pandemic (Chigurupati *et al.*, 2020; Grant *et al.*, 2020; Panesar *et al.*, 2020; Zimmermann & Nkenke, 2020). These guidelines generally suggest postponement of all elective nonemergency cases. In OMS, it is accepted that oncology, trauma and severe orofacial infection constitute cases that should continue (Panesar *et al.*, 2020; Zimmermann & Nkenke, 2020). Because surgical scheduling is within the autonomy of the OMS unit itself, these

recommendations can be adhered to. Prioritising surgery will come with the later consequences of increasing case load and burden of disease (Brindle *et al.*, 2020). The approach in handling new referrals is much less discussed. Referrals come from sources external to the OMS units, thus coordinating them is less straightforward. This study found that there was a substantial drop in the new case referrals during the lockdown. Previous studies in other surgical disciplines assessing the referral pattern, similarly, found a significant drop in the number of new cases (Jayakumar *et al.*, 2020; Murphy *et al.*, 2020). However, the reduction of new cases should not be assumed to be equal to a reduction of the incidence of new disease but instead it might indicate that patients with symptoms were avoiding treatment during this period (Jayakumar *et al.*, 2020). Thus, similarly, to delaying elective surgery, this will only cause a further backlog that might overwhelm the OMS services later on.

Even with the reduction of new referrals received during lockdowns, the gender representation did not change. There was, however, a slight increase in the mean age of patients. This is likely to be due to a reduction in trauma cases during the lockdown, which are known to be more common in younger age groups (Hussaini *et al.*, 2007). Studies have shown that the positive side of lockdowns is that they reduce the incidence of trauma-related injuries, mainly due to a reduction in road traffic (Jayakumar *et al.*, 2020; Murphy *et al.*, 2020). This study also found a reduction in the proportion of Malay ethnicity during the lockdown. This trend is probably due to similar reasons with the changes seen relating to age, as previous studies in Malaysia have shown that trauma-related injuries are more prevalent among Malays (Hussaini *et al.*, 2007).

The centres included in this study are tertiary referral hospitals located in Kuala Lumpur and accept referrals from across the nation. The distance a patient needs to travel to a hospital depends on local factors, including

the location of the healthcare facilities, the healthcare delivery system, geographical accessibility and transport infrastructure, among others. A previous study in the UK stated 89% of patients needed to travel less than 6 miles (9.7 km) to the referred OMS centre (Coulthard *et al.*, 2000a). In comparison, the distance the patients in this study expected to travel appear to be higher, probably due to the local factors stated above. Taking this into consideration, the exact distances of travel in this study may not be applicable to other localities. However, the statistically significant finding regarding the reduction of distance during lockdown is relevant regardless of locality. What this suggests is that restrictions during lockdown reduced the accessibility of patients living further away from accessing OMS services. A previous study has shown that household wealth is inversely related with traveling time to the city (Weiss *et al.*, 2018). Therefore, the lockdown increased the socioeconomic inequality gap specifically in accessing OMS services. The use of technology, such as telemedicine, should be considered as a solution to alleviate issues relating to the movement restrictions (Coulthard *et al.*, 2000a; Chigurupati *et al.*, 2020).

The scope of work for each OMS unit may differ slightly, depending on the facility and subspecialisation expertise of their personnel. These factors may affect the type of cases seen in a particular OMS unit. This study reduces that variability by including two centres. The core area of expertise of OMS, however, should be the same anywhere that includes traumatology, dentoalveolar surgery, dental implants and oral/jaw pathologies (Laskin, 2008). Being a tertiary referral hospital, both centres also accept complex surgical cases such as orthognathic surgery, oncology, cleft and craniofacial surgery. This study found that there in reduced numbers of new case referral in all type of cases except for orofacial infection. Our findings are in agreement with a recent study that similarly found no difference in the percentage of OMS consultation for orofacial infection during the peak of COVID-19 pandemic

in the US (Johnson *et al.*, 2020). As most orofacial infections present acutely and are associated with pain, it is unlikely that patients delay seeking treatment. Another important finding is that trauma cases halved during lockdown due to reduced traffic, as discussed earlier (Jayakumar *et al.*, 2020; Murphy *et al.*, 2020). Of grave concern, however, is the absence of any new head and neck oncology referrals during the lockdown. A similar reduction was seen in neuro-oncological referrals (Jayakumar *et al.*, 2020). It is possible there was an avoidance by the patients to present themselves during this period (Jayakumar *et al.*, 2020). The absence of symptoms, such as in the early stages of oral cancer, may possibly contribute to the delay in seeking treatment during the lockdown period. The ramification of this finding is serious since late presentation of oncological cases will affect prognosis. The definitive evidence of this scenario can only be ascertained by assessing the staging of oncological cases presented following lockdown, which is out of the scope of this study.

Referral of a case can come from various sources. Outpatient new cases would usually come from the general dental practitioner needing specialist management for their patients. Meanwhile, inpatient referrals would come from medical colleagues of other specialties needing OMS input for patients under their care. Emergency department referrals would commonly indicate urgent need of care from the patients themselves, with emergency physicians being mediators to convey their needs via referrals. As found from this study, the reduction in the number of referrals to OMS during lockdown was substantial. Interestingly, the reduction in new referrals was only attributed to the reduction of outpatient and emergency cases. Inpatient referrals were consistent throughout both periods. More than 85% of inpatient referrals received during both periods were from the “medically compromised,” “orofacial infection” and “cleft and craniofacial anomalies” categories. This study highlights an aspect of OMS

service that is often overlooked. Being a hospital-based specialty with training in dentistry creates an expectation of services from other specialities that are not affected by the lockdown. This shows that OMS services are recognised as an integral interdisciplinary member in the management of patients with complex diseases. Outpatient referrals saw a significant drop in the number of referrals. It was previously reported that the most common reasons for outpatient referral were the anticipated difficulty of surgery and patients who were medically compromised (Coulthard *et al.*, 2000b). Dental practitioners' understanding of the cases that should be delayed is reflected in the changing pattern of outpatient referrals seen. The absence of all categories except for "medically compromised" and "orofacial infection" in outpatient referrals during lockdown further reaffirms the critical demand of these categories of cases. The reduction in referrals from the emergency departments meanwhile can be explained by the reduction in trauma cases during lockdown, which is the main contributor of OMS referrals from the emergency units.

There are a few limitations of this study. To increase applicability of these findings, we included two different centres in a hope to reduce centre-to-centre variability. However, because it is still based on a single-country situation, the variability of cases seen might be different when compared to other nations. Still, most of the changing trend seen here can be extrapolated to a certain degree. Secondly, in interpreting the results of this study, consideration should be made on the differences in the strictness of the lockdowns imposed by different governments. The lockdown imposed for 47 days in Malaysia was stringent and contributed to the findings seen.

## CONCLUSION

The lockdown imposed due to the pandemic has significantly impacted the patterns of new OMS referrals. The reduction in the number

of new referrals was not only contributed to by the reduction in the incidence of trauma, but also to the reduction of almost all types of new referrals, including for malignant conditions. The demand for the management of orofacial infection and medically compromised patients are the only conditions unaffected by lockdown. Similarly, inpatient referrals were unaffected. It is highly likely that the pandemic and lockdown causes treatment-seeking delay. Future studies should investigate the consequences of lockdowns on the number of new cases and the severity of diseases post-lockdown. Results from this study provide a better understanding of what to expect in any future local or global catastrophic event that causes restriction in movement. This hopefully will allow better planning of resources in such a situation.

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