



Impact of COVID-19 on the patient referral pattern and conversion rate in the university versus private facial plastic surgery centers

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Abstract

Purpose To compare the number of referrals and conversion rate between the pandemic and pre-pandemic period.

Methods The number of referrals and conversion rate between the 10-month pandemic (March–December 2020) and pre-pandemic (March–December 2019) were evaluated in the two university (mainly non-cosmetic) and private (mainly cosmetic) facial plastic surgery centers. Demographics and monthly number and type (cosmetic and non-cosmetic) of the referrals and surgeries were recorded from the both and cosmetic facial injections (botulinum toxin and filler) and the source of referrals (web- and non-web-based) from the private center. The conversion rate was a ratio of the number of the surgeries to the number of referrals.

Results The number of referrals declined by 7.7% in the private center which was significantly higher for the non-cosmetic (26%) than the cosmetic (0.5%) referrals. It was 32% in the university center. The

private center conversion rate significantly ($P < 0.001$) decreased for both the cosmetic (60%) and non-cosmetic (82%) procedures. It was not significantly different between the cosmetic (65%) and non-cosmetic (58%) procedures in the university center. However, the number of cosmetic facial injections (11%) and the web-based referral source (4%) increased. The recovery was better for the number of referrals (better in the private center) than the conversion rate.

Conclusion The fall in the conversion rate was statistically significant in the private center. While the number of referrals recovered to almost the pre-pandemic level, the conversion rates, despite recovery, remained at a lower level at the end.

Keywords COVID-19 · Pandemic · Coronavirus · Cosmetic · Plastic surgery · Conversion rate · Facial plastic surgery

Introduction

Two important steps towards the success of any business including plastic surgery practice are increasing the number of potential customers (referred patients) through different referral sources (patients, medical professionals, TV, radio, printed media, and web-based media) and convincing the potential customers (referrals) to funding the procedure privately (undergoing plastic procedures) [1, 2]. Conversion rate is a ratio of the number of private patients (patients

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undergoing procedures) to the number of potential customers (referrals) [1]. Most of the patients with non-cosmetic demands are referred to the university-based facial plastic surgery center due to the insurance coverage and consequently a lower cost [1, 2]. However, since insurance companies do not cover the cosmetic costs, most of the cosmetic patients are referred to the private center [1, 2].

The coronavirus 2019 (COVID-19) has caused a global pandemic with a massive social, economic, and practice impact since the first quadrant of the year 2020 [3]. Consequently, different plastic [4, 5] including facial plastic [6, 7] surgery societies released a statement urging the suspension of elective procedures at different times during the pandemic.

A few studies on the impact of the pandemic on the plastic surgery practices are limited to the first few (2–5) months in the beginning [8–12]. A 74% reduction in the number of procedures (especially cosmetic) in the first three-months of the pandemic was observed in a tertiary center in Brazil [8]. The cosmetic proportion of the surgeries decreased from 20 to 5% [6]. Likewise, assessment of one-month data in two Italian hospitals (COVID and non-COVID) showed a reduction of 80–90% in the outpatient and 50–60% in the in-patient surgeries [9]. The reduction was for all types of the plastic surgeries except for post-trauma and skin cancer procedures [9]. The same model was reported from Turkey [10] for the first two months after the pandemic and Mexico city [11] for the first 4-month. However, it is unclear if the same results would have been found for a longer period of time after the pandemic. Therefore, the aims of this study were to compare the 10-month pre-pandemic (March–December 2019) with the same time period during the pandemic (March–December 2020) regarding to the number of referrals and the conversion rate in the senior author's (MBK) university and private facial plastic surgery centers.

Methods

This is a retrospective comparative study in which data were extracted from the university (mainly non-cosmetic referrals) and private (mainly cosmetic referrals) centers between the first of March and 30 of December 2019 (pre-pandemic) and the same time period in the year 2020 (pandemic). Institutional review board

approved the study (IUMS.REC.1400.011). This study adhered to the tenets of the Declaration of Helsinki.

Recorded data were the age, gender, and the number and type of the referrals and the surgeries on the both centers. Type of the referrals were either cosmetic or non-cosmetic (anophthalmic socket, lacrimal drainage system, orbit, and ocular adnexa). The referral source data were only available in the private center. The web-based sources were web site and Instagram. The non-web-based sources included other patients (word-of-mouth), medical professionals, and others (TV, radio, and printed media). The cosmetic facial injections (botulinum toxin A and filler) are performed in the private center from which the monthly number of the patients with injections was recorded. Incomplete charts were excluded. The conversion rate was defined as a ratio of the number of the facial surgeries to the total number of the referrals.

Primary outcome measure was to compare the number of referrals and surgeries as well as the conversion rate between the pandemic and pre-pandemic 10-month time frame in the university and private centers. Secondary outcome was to assess the monthly pattern of the recovery.

Statistical analysis

Data were entered with the SPSS for Windows software version 22.0 (SPSS Inc., Chicago IL, USA). Comparison between the groups were performed using Chi-Square test. *P*-value of less than 0.05 was considered statistically significant. The comparative analysis of baseline characteristics (Table 1) was performed on a random sample instead of the whole population in order to eliminate the effect of large population size on the *P* values. The calculated sample size was 368 for the total, 358 for the private and 348 for the university center by considering the $\alpha=0.05$ (confidence level=95%), the margin of error=5%, the sample proportion=50% (due to absence of previous study), and the population size=8692 (total), 5055 (private center) and 3637 (university center).

Table 1 Baseline characteristics of the patients in the private and university facial plastic surgery centers before (March–December 2019) and during (March–December 2020) the COVID-19 pandemic

Variable	Total						Private center			University center			
	Pre-Pandemic		Pandemic		<i>p</i> -value ^a	<i>p</i> -value ^a	Pre-Pandemic		Pandemic		<i>p</i> -value ^a		
	Number	%	Number	%	Number		%	Number	%	Number	%		
Referrals	4793		3899		–	2629		2426		2164		1473	
Cosmetic	40.2% (1925/4793)	48.5% (1890/3899)	0.01	71.9% (1889/2629)	77.5% (1879/2426)	0.02	28.1% (740/2629)	22.5% (547/2426)	98.3% (2128/2164)	1.7% (36/2164)	0.7% (11/1473)	0.7% (1462/1473)	0.5
Non-cosmetic	59.8% (2868/4793)	51.5% (2009/3899)		28.1% (740/2629)	22.5% (547/2426)		28.1% (740/2629)	22.5% (547/2426)	98.3% (2128/2164)	1.7% (36/2164)	0.7% (11/1473)	99.3% (1462/1473)	1.0
Conversion rate	13.2% (634/4793)	6.0% (232/3899)	0.1	14.2% (374/2629)	5.2% (125/2426)	<0.001	9.9% (259/2629)	4.3% (104/2426)	0.9% (20/2164)	11.1% (240/2164)	6.8% (100/1473)	15.5% (228/1473)	0.02
Cosmetic	5.8% (279/4793)	2.8% (111/3899)	0.1	9.9% (259/2629)	4.3% (104/2426)	<0.001	4.4% (115/2629)	0.9% (21/2426)	11.1% (240/2164)	20.3% (440/2164)	52.3% (770/1473)	32.2% (475/1473)	
Non-cosmetic	7.4% (355/4793)	3.1% (121/3899)	0.1	4.4% (115/2629)	0.9% (21/2426)	0.1	9.6% (253/2629)	7.9% (191/2426)	46.4% (1004/2164)	33.3% (720/2164)	50.4% (743/1473)	49.6% (730/1473)	
Age groups	14.5% (693/4793)	10.7% (419/3899)	0.5	64.1% (1685/2629)	72.2% (1751/2426)	0.1	64.1% (1685/2629)	72.2% (1751/2426)	46.4% (1004/2164)	33.3% (720/2164)	50.4% (743/1473)	49.6% (730/1473)	
≤20	56.1% (2690/4793)	64.6% (2520/3899)		26.3% (691/2629)	20% (484/2426)		26.3% (691/2629)	20% (484/2426)	33.3% (720/2164)	50.8% (1099/2164)	50.4% (743/1473)	50.4% (743/1473)	0.7
21–50	29.4% (1410/4793)	24.6% (960/3899)		82.8% (2178/2629)	83.1% (2016/2426)	0.2	82.8% (2178/2629)	83.1% (2016/2426)	50.8% (1099/2164)	49.2% (1065/2164)	49.6% (730/1473)	49.6% (730/1473)	
50 ≤	68.4% (3277/4793)	70.8% (2759/3899)		17.2% (451/2629)	16.9% (410/2426)		17.2% (451/2629)	16.9% (410/2426)	50.8% (1099/2164)	49.2% (1065/2164)	49.6% (730/1473)	49.6% (730/1473)	
Sex	31.6% (1516/4793)	29.2% (1140/3899)		36.7% (965/2629)	40.9% (992/2426)	0.3	36.7% (965/2629)	40.9% (992/2426)	NA	NA	NA	NA	
Female	NA	NA	–	63.3% (1664/2629)	59.1% (1434/2426)		63.3% (1664/2629)	59.1% (1434/2426)	NA	NA	NA	NA	
Male	NA	NA	–	25.6% (674/2629)	21.6% (523/2426)	0.1	25.6% (674/2629)	21.6% (523/2426)	NA	NA	NA	NA	
Referral sources	NA	NA	–	11.1% (291/2629)	19.3% (469/2426)		11.1% (291/2629)	19.3% (469/2426)	NA	NA	NA	NA	
Web-based	NA	NA	–	32.1% (843/2629)	25.7% (623/2426)		32.1% (843/2629)	25.7% (623/2426)	NA	NA	NA	NA	
Non-we-based	NA	NA	–	31.0% (816/2629)	33.1% (803/2426)		31.0% (816/2629)	33.1% (803/2426)	NA	NA	NA	NA	
Specific Referral sources	NA	NA	–	0.2% (5/2629)	0.3% (8/2426)		0.2% (5/2629)	0.3% (8/2426)	NA	NA	NA	NA	
Website	NA	NA	–	NA	NA		NA	NA	NA	NA	NA	NA	
Instagram	NA	NA	–	NA	NA		NA	NA	NA	NA	NA	NA	
Medical professionals	NA	NA	–	NA	NA		NA	NA	NA	NA	NA	NA	
Other patients	NA	NA	–	NA	NA		NA	NA	NA	NA	NA	NA	
Others	NA	NA	–	NA	NA		NA	NA	NA	NA	NA	NA	

^a Chi-square test *p*-values are for the sample population. NA Not assessed due to no data

Results

Both centers in total

Demographics were the same between the two time frames (Table 1). Total number of pre-pandemic referrals (4793) decreased by 19% (894/4793) during the pandemic (3899). Since the reduction was 1.8% (35/1925) for the cosmetic and 29.9% (859/2868) for the non-cosmetic referrals, the proportion of cosmetic referrals became significantly higher during the pandemic (Table 1). The fall in the number of surgeries during the pandemic was 63% (402/634) in total, 60% (168/279) in the cosmetic, and 66% (234/355) in the non-cosmetic procedures. A higher reduction of the number of surgeries than referrals led to a fall in the conversion rate (Table 1). Such a reduction during the pandemic was not statistically significant for either the total, the cosmetic, or the non-cosmetic conversion rate (Table 1).

Private center

The pandemic time showed a reduction of 7.7% (203/2629) in the number of referrals which was significantly higher in the non-cosmetic (26%, 193/740) than the cosmetic (0.5%, 10/1889) referrals. In fact, despite a drop in the number of referrals, the proportion of cosmetic to non-cosmetic referrals significantly ($P=0.02$) increased during the pandemic (Table 1). The fall in the number of surgeries was 67% (249/374) in the total, 60% (155/259) in the cosmetic, and 82% (94/115) in the non-cosmetic procedures. Consequently, the conversion rate significantly ($P<0.001$) decreased during the pandemic in the total (14% vs. 5.2%), cosmetic (9.9% vs. 4.3%) and non-cosmetic (4.4% vs. 0.9%) procedures (Table 1).

On the contrary, the number of cosmetic facial injections increased from 509 in the pre-pandemic to 565 during the pandemic which showed a rise of 11% (56/509) (see table, supplement digital content 1, which shows the number of monthly facial injections).

The age, sex, and referral sources were not significantly different between the two time frames (Table 1). Although the web-based referral sources increased from 37% in the pre-pandemic to 41% during the pandemic, the rise was not statistically significant ($P=0.3$).

University center

The pandemic time showed a reduction of 32% (691/2164) in the number of referrals. Such a fall, on the contrary to the private center, was observed insignificantly more in the cosmetic 69% (25/36) than non-cosmetic 31% (666/2128) referrals (Table 1). A significant fall in the number of young (≤ 20 years) referrals was observed during the pandemic. However, no gender difference was observed between the two time frames (Table 1). The fall in the number of surgeries was 59% (153/260) in the total, 65% (13/20) in the cosmetic, and 58% (140/240) in the non-cosmetic procedures. Reduction of the conversion rate was not significantly different between the cosmetic (0.9% vs. 0.5%) and non-cosmetic (11% vs. 6.8%) procedures (Table 1).

Monthly recovery during the pandemic

While the number of referrals (Fig. 1) and the surgeries (Fig. 2) were at their lowest (both centers) in the beginning of the pandemic, they gradually rose with a couple of fluctuations during the 10-month pandemic. Recovery in the number of referrals was better for the private (mainly cosmetic) than the university center (mainly non-cosmetic) during all the 10 months of the pandemic (Fig. 1 and see table, supplement digital content 2, which shows the monthly change during the pandemic). The number of referrals reached to almost the pre-pandemic level at the end of the study period (Fig. 1 and see table, supplement digital content 2, which shows the monthly change during the pandemic).

While the recovery in the number of surgeries was better for the private center during the first few months (March–August), it became a bit worse than the university center for the rest of the year (Fig. 2 and see table, supplement digital content 2, which shows the monthly change during the pandemic). Generally, the monthly recovery was better for the number of referrals than the surgeries (Fig. 3). Therefore, the recovery of conversion rate was much slower remaining at a lower than the pre-pandemic level at the end of the year 2020 (Fig. 4 and see table, supplement digital content 2, which shows the monthly change during the pandemic).

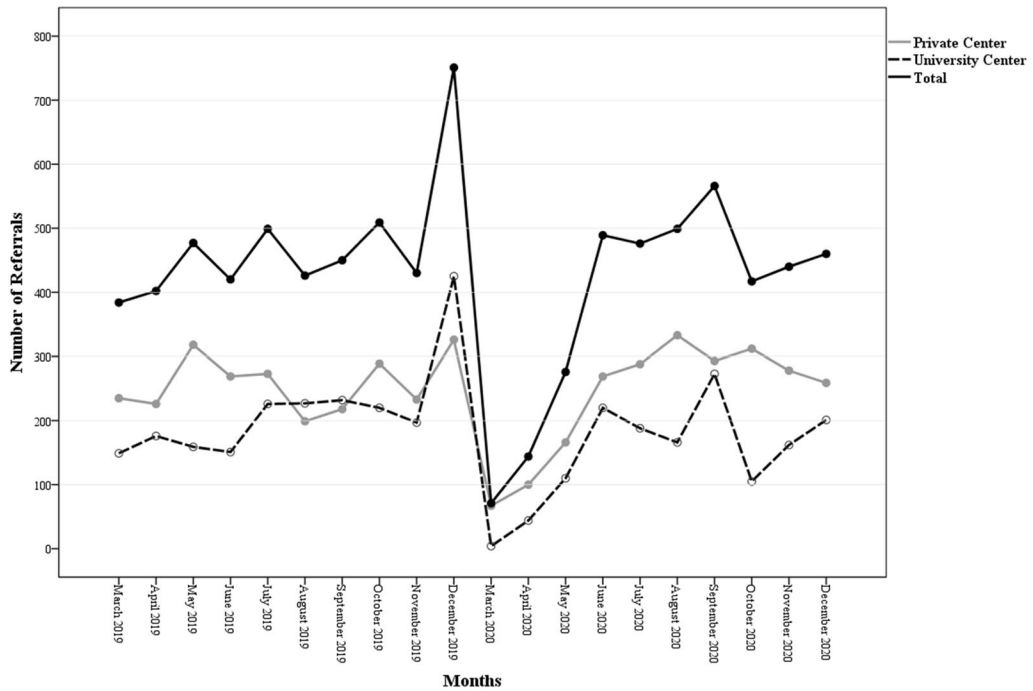


Fig. 1 Monthly number of the referrals in total, private, and university centers during the pre-pandemic (March 2019 to December 2019) and the pandemic (March 2020 to December 2020)

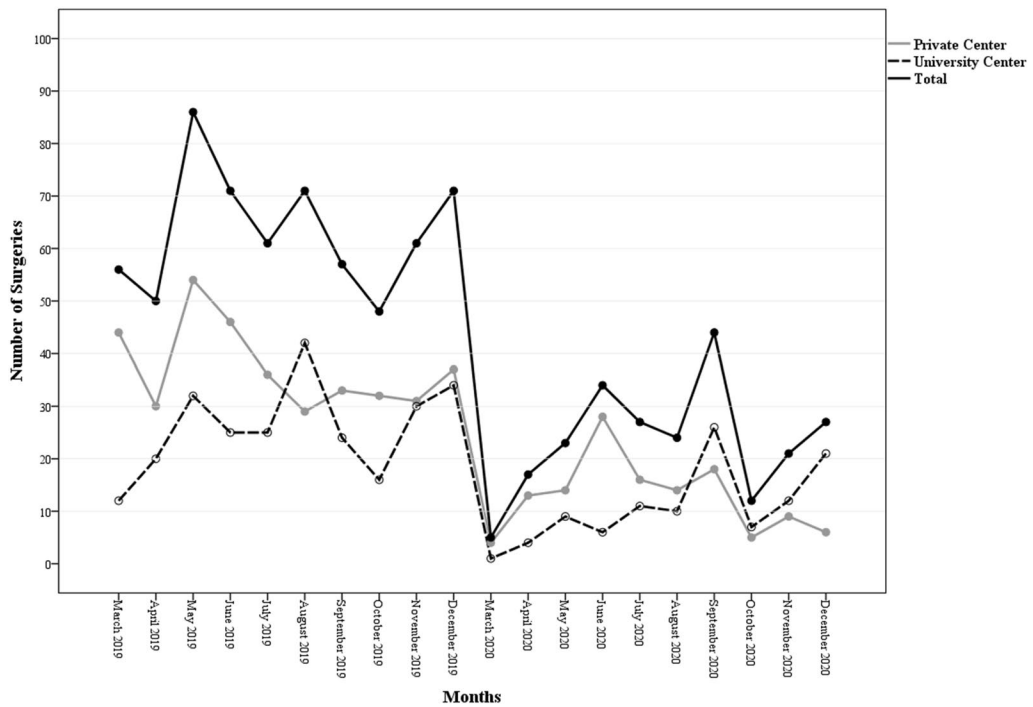


Fig. 2 Monthly number of the surgeries in total, private, and university centers during the pre-pandemic (March 2019 to December 2019) and the pandemic (March 2020 to December 2020)

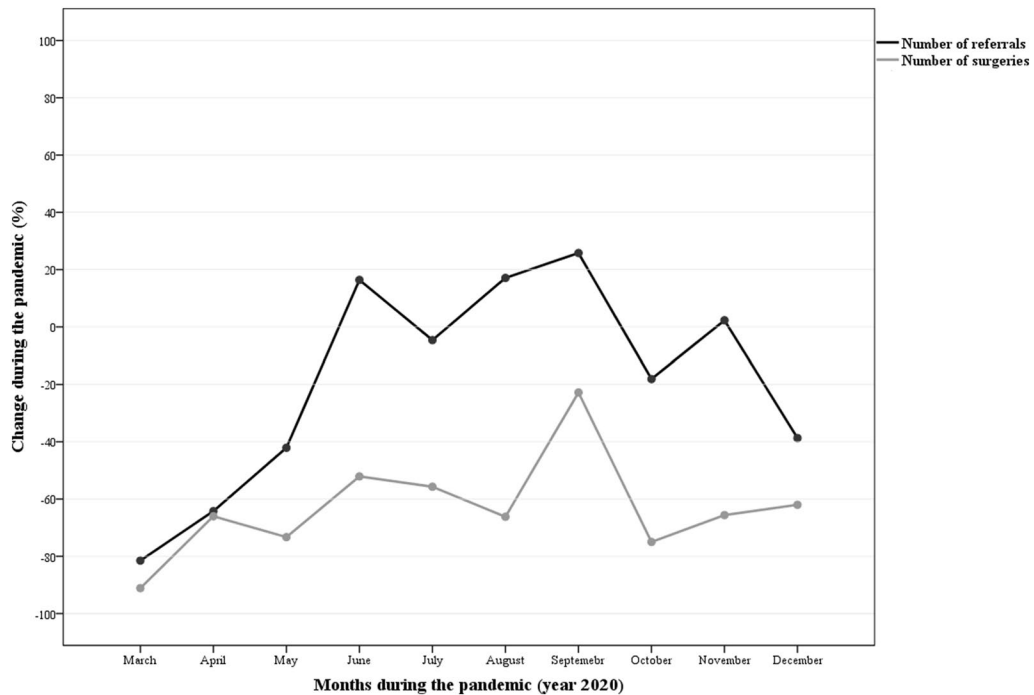


Fig. 3 Monthly percentage changes in the referrals and surgeries during the 10-month pandemic as compared to the 10-month pre-pandemic

Discussion

The COVID-19 pandemic has caused a major disruption to the elective plastic surgeries in the beginning (February–March 2020) [8–12]. The speed of slow recovery, however, has varied in different countries and regions [13]. A few studies discussed the reduction of the plastic surgery referrals and procedures in the first few months after the pandemic [8–12]. However, none has assessed the pandemic impact and recovery pattern during the total year of 2020. This study, to the best of our knowledge, is the first to objectively quantify the impact of the pandemic in both the university and the private facial plastic surgery centers during the 2020 (March–December).

Our results showed a reduction of 7.7% and 32% in the number of referrals in the private and university centers, respectively. The university center is a general hospital in which most of the resources have been re-directed to the COVID-19 patients care. This could be a reason why a bigger drop and a slower recovery (Fig. 1) were observed in the university rather than the private center. Another reason might be the patients'

negative attitude towards the COVID-19 hospital (university center) which could have driven them to the non-COVID centers. However, such a difference was not observed by Grippaudo et al. [9] who reported a similar drop in the COVID and non-COVID hospitals during the first month after the pandemic.

Chandawarkar et al. [14] evaluated the public interest on the cosmetic procedures during the pandemic period by assessing the web search volume. Although the search volume significantly declined in the beginning of the pandemic, there was a recovery which, interestingly, the web-search for cosmetic procedures reached to even a higher level than the pre-pandemic years [14]. Our private center referral pattern showed an insignificant rise in the number of referrals through the web-based rather than non-web-based sources during the pandemic (Table 1). We have previously shown that the web-based referral sources were on the rise before the pandemic [2], even though this trend did not result in a significant increase in the conversion rate [1].

Although both centers showed a gradually rising trend in the number of referrals during the pandemic,

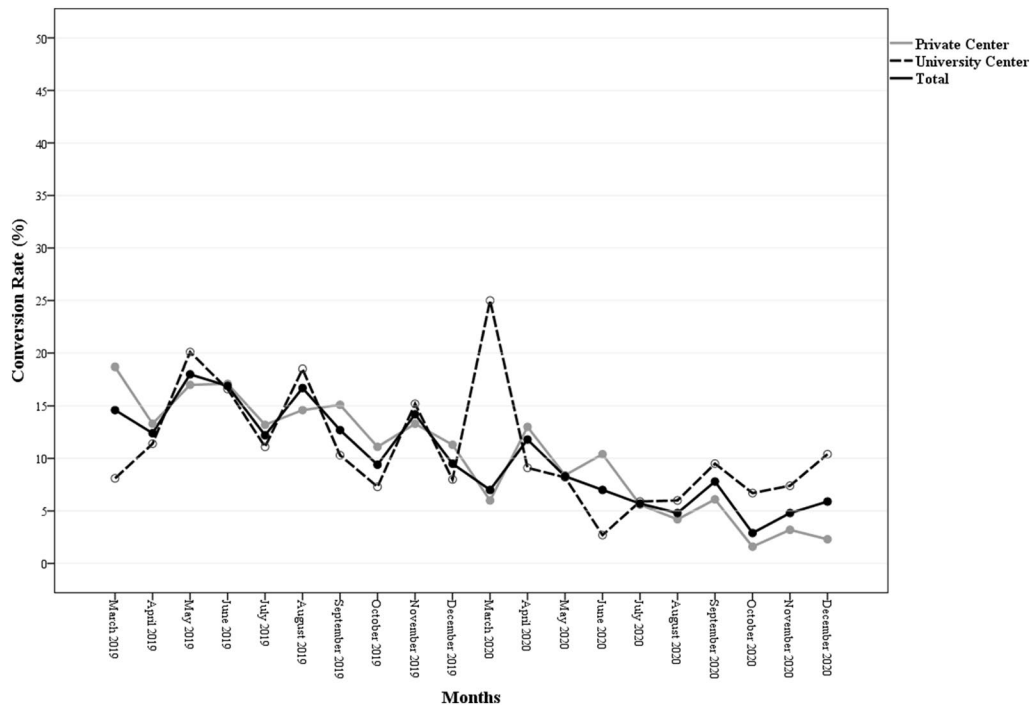


Fig. 4 Monthly conversion rate in total, private, and university centers during the pre-pandemic (March 2019 to December 2019) and the pandemic (March 2020 to December 2020)

it was steeper in the private center in which majority of referrals were cosmetic (Fig. 1, 3). Whereas, the number of surgeries (Fig. 2, 3) and consequently the conversion rate (Fig. 4) did not show a similar rising trend. Current study showed that the total conversion rate declined from 13 to 6% in the both centers. Such a decline was expected, since majority of the facial plastic surgeries are elective or semi-elective [15]. Such a reduction was statistically significant in the private rather than the university center (Table 1). This could be attributed to the higher percentage of the cosmetic surgeries in the private and non-cosmetic urgent surgeries in the university center. There was a higher proportion of the trauma, oncology, and reconstructive procedures during the pandemic than the same pre-pandemic time [6, 8–10]. This implies a drop in the elective/cosmetic rather than a rise in the urgent and non-elective surgeries [9, 10].

Age, gender, time spent on social media, public figures, personality, relationship, and economy are influencing the public interest in the cosmetic procedures [16–20]. Number of cosmetic procedures positively correlates with the economic status [20–22].

Financial constraint due to the COVID-19 related recession could be a reason for a significant fall in the cosmetic conversion rate. A gradual recovery in the number of referrals, surgeries, and conversion rates could imply that the businesses have been resuming the normal operations.

There are opposite reports on the effect of social distancing and self-quarantine on the attitudes toward the plastic surgeries [14, 23]. While 30% of people lost their interest in the personal appearance, inter-personal relationships, and consequently the cosmetic procedures; 20% showed a more interest in at least one of the cosmetic interventions during the pandemic [23]. Staying home and spending more time on the social media, paying attention to the facial appearance on the video conferencing, and seeking for a better look after the pandemic could be the most probable reasons for the rise in interest in the cosmetic procedures. The greatest interests were on the non-invasive facial aesthetic procedures and the skincare which could be performed in the office with a lesser risk of contracting the virus [23, 24]. Similarly, our study showed an 11% rise

in the number of cosmetic facial injections during the pandemic (see table, supplement digital content 1, which shows the number of monthly facial injections).

Current study showed that the facial plastic surgery centers have been recovering with a slower speed for the number of surgeries (especially the cosmetic surgeries) than the referrals. Therefore, the conversion rates remained lower than pre-pandemic during the pandemic. No previous study has assessed the recovery pattern of plastic surgery to be compared to.

The university center did not record the referral sources which could be a limitation in this study. While this study is showing the 10-month impact of pandemic on the facial plastic surgery referrals and procedures in two centers (university and private), the results might not be necessarily the same in the other centers around the world.

In conclusion, the number of referrals declined by 7.7% in the private and 32% in the university center during the 10-months pandemic. The fall was significantly higher for the non-cosmetic in the private and cosmetic (insignificant) in the university center. The number of referrals gradually recovered in both and especially the private center (mainly cosmetic) to almost their pre-pandemic level. The number of surgeries fell by 67% in the private and 59% in the university center. Consequently, the conversion rate declined in both centers which was only statistically significant in the private center. Its recovery, however, was slow (especially in the private center) which led to a lower than pre-pandemic level at the end of the study (30 December 2020). Despite a fall in the number of surgeries, the number of cosmetic facial injections increased by 11% during the pandemic.

Authors' contributions Conceptualization: MBK, SA; Methodology: MBK, SJ, SA; Formal analysis and investigation: PA, SJ, SR, SA; Writing—original draft preparation: PA, SR, SG; Writing—review and editing: PA, MBK, SJ, SG, SA; Funding acquisition: MBK; Resources: MBK; Supervision: MBK; All authors read and approved the final manuscript.

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Declarations

Conflicts of interests The authors declare that they have no conflict of interest.

Ethical approval Approval was obtained from the ethics committee of Iran University of Medical Sciences approved the study (IUMS.REC.1400.011). The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

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