



Original Research

Impact of irregular appointment interval on Orthodontic treatment amid COVID-19 Pandemic- A Cross-Sectional Observational Study

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ABSTRACT

Introduction: The COVID-19 pandemic situation has affected all professions including orthodontics. The present study proposed determination of impact of irregular appointments on Orthodontic treatment amid COVID-19 pandemic.

Materials and Methods: The cross-sectional observational study design enrolled 134 patients over period of 2 weeks were recorded such as treatment start date, total number of appointments scheduled and frequency of missed appointments after 24 March 2020, Stage of Orthodontic treatment on or before 24 March 2020 i.e., Alignment & levelling b) Space closure c) Finishing and Detailing d) Retention.

Results: The distribution of malocclusion based on Angle Molar criteria showed prevalence of 53.73 % Class I, 37.32 % Class II and 8.95% Class III. The malocclusions were treated predominantly by extraction in 57.46 % and non-extraction in 42.44 % patients. The total treatment duration revealed that more than 51 % patients' treatment lasted beyond 24 months but finished before 36 months. Similarly, 35.82 % patients' treatment duration was less than 12 months. It was found that more than 47 % were in Stage I, 28.36 % were in stage II, 18.66 % in stage III and lastly 5.97 % were in stage IV.

Conclusion: Orthodontic emergencies and un-schedule appointments had prevalence of Class I, followed by Class II and Class III with extraction treatment therapy. Majority patients treated with fixed mechanotherapy followed by Clear aligners and Retainers. More than half of the patients had increased treatment duration due to irregular follow up.

Keywords: COVID-19, Corona Virus Disease, Orthodontic Appointment, Orthodontic Appliances.

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INTRODUCTION

It has been almost three years since the COVID-19 Pandemic emerged as a global threat affecting every aspect of human beings from physical health to social well-being as well as psychological perspectives.^[1] The disease has shown various phases of lockdowns and restrictions due to Quarantine protocols which have affected every profession including Orthodontics. This situation has changed the lifestyle of many around the globe.^[2] Constant unabated fear of the new Coronavirus and anxiety fuelled by the introduction of new strains and the quarantine protocols to contain/control the contagion have severely impacted the mental health and quality of life of everyone including orthodontic profession and patients.^[3,4]

As dental practices are considered focal points for cross infection, it has led all dental governing authorities across worldwide to minimise or cancel or postpone routine/elective dental care. the services were limited to only acute emergency situations and relying on telecommunication, pharmaceutical options, the use of high-volume saliva ejectors, and minimizing the use of aerosol-generating procedures or any procedure that can induce coughing. Furthermore, during this pandemic, guidelines had been published to emphasize on the maximal utilization of personal protective equipment (PPE) and infection prevention and control measures.^[5] However, there were other problems that arose, in addition to acute orthodontic emergencies, which led to different types of harm, with respect to treatment outcomes. Such problems were pertaining to the stage of treatment, whether in active or passive phases of orthodontic treatment, and required urgent attention to prepare and manage similar kind of unparalleled situation. The overall effect of the anxiety of orthodontic patients resulting/stemming from the missed appointments, iatrogenic implications of un-supervised orthodontic treatment, prolonged treatment, could exacerbate the overall result of on-going orthodontic treatment.^[6] Therefore, study was proposed to evaluate impact of irregular appointments on Orthodontic treatment amid COVID-19 pandemic. Study assessed type of the appliance failure, over-correction, periodontal condition and relapse.

Null Hypothesis

There is no impact of irregular appointments on Orthodontic treatment amid COVID-19 pandemic.

AIM AND OBJECTIVES:

AIM:

The present study proposed determination of impact of irregular appointments on Orthodontic treatment amid COVID-19 pandemic.

OBJECTIVES:

To Determine the frequency and pattern of orthodontic malocclusion, different type of orthodontic appliance reported with orthodontic emergencies and the impact of orthodontic emergencies on un-schedule appointments during and after Pandemic along with determination of frequency and pattern of impact caused due to pandemic on different stages of treatment.

MATERIALS AND METHODS:

Present study was conducted as cross-sectional observational study between 15 Aug 2022 to 15 Oct 2022 in department of orthodontics of reputed Autonomous Dental Institution with approval from Institutional Biomedical Ethical committee approval number BEC335072022. The study proposal was accepted vide ICMR STS Project No REFERENCE ID: 2022-07984. The study is being reported in accordance with STROBE guidelines for cross-sectional studies.^[7]

Study Design:

Type of study: Cross sectional observational study.

Study design: Observational Study

Study population: Patients undergoing orthodontic treatment.

Sample size: Sample size was calculated taking into consideration, 95% confidence level and 5% level of precision with 80% power. A total of 134 patients were recruited for the study.

Written informed consent from the adult patients along with verbal assent from children aged 7-12 years and written assent from children aged 13-15 years was obtained after explaining the detailed procedure to the children and parents in their native language

Participants Sample Size (N): 134

Selection Criteria

Inclusion criteria:

1. Orthodontic patients willing to participate.
2. Minimum two appointment missed with more than two-week interruption.
3. Treatment started before onset of pandemic and ongoing till inception of study.
4. Patients with all essential Orthodontic diagnostic records such as study model, intra extra oral photograph, OPG and Lateral Cephalogram and Treatment book.

Exclusion criteria:

1. Patient not willing to provide consent.

Assessment Variables:

134 patients were enrolled after OPD screening over period of 2 weeks from the Department of Orthodontics based on appointment cum treatment book details. The following variables were recorded.

- i. Treatment start date.
- ii. Total number of appointments scheduled since 24 March 2020 i.e. After national lockdown was announced.
- iii. Frequency of missed appointments after 24 March 2020.
- iv. Stage of Orthodontic treatment on or before 24 March 2020 i.e., Alignment & levelling b) Space closure c) Finishing and Detailing d) Retention
- v. Stage of Orthodontic treatment on day of data recording.
- vi. History of unscheduled Orthodontic appointments after 24 March 2020 for emergencies i.e., dislodged bracket/band/tube/mini-implant, dislodged arch wire, in-situ broken arch wire, missing ligature/modules, missing/dislodged retraction module such as e-chain, coil spring, active tie backs, elastics, broken retainers.

The data was recorded by the principal investigator of the project under the guidance of the project mentor. The written consent from parents/legal authorized guardian was taken in case of children along with informed assent as well as written assent. The information pertaining to project was explained to the patients in the language best understandable language.

Statistical Analysis

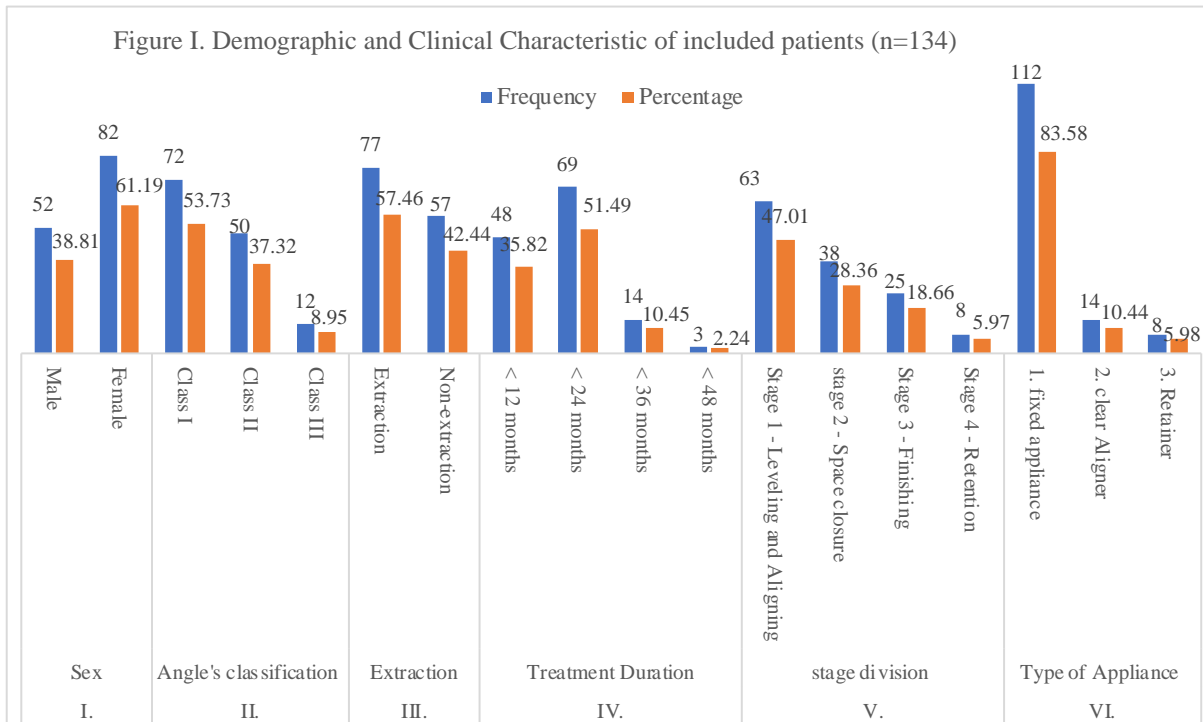
The data was prepared using Microsoft Excel sheet for all the variables. The descriptive statistical analysis was conducted to determine the frequency and percentages of each variable such as based on angle malocclusion, type of orthodontic appliance, Type of orthodontic emergency, stage of orthodontic treatment and number of missed and un-schedule appointments. The SPSS Version 21 (IBM, USA) was used for calculation of statistical analysis.

RESULTS:

The present study assessed the impact of irregular appointments on Orthodontic treatment amid COVID-19 pandemic. Total 134 patients (M-52, F-82) were evaluated based on their appointment schedule and response.

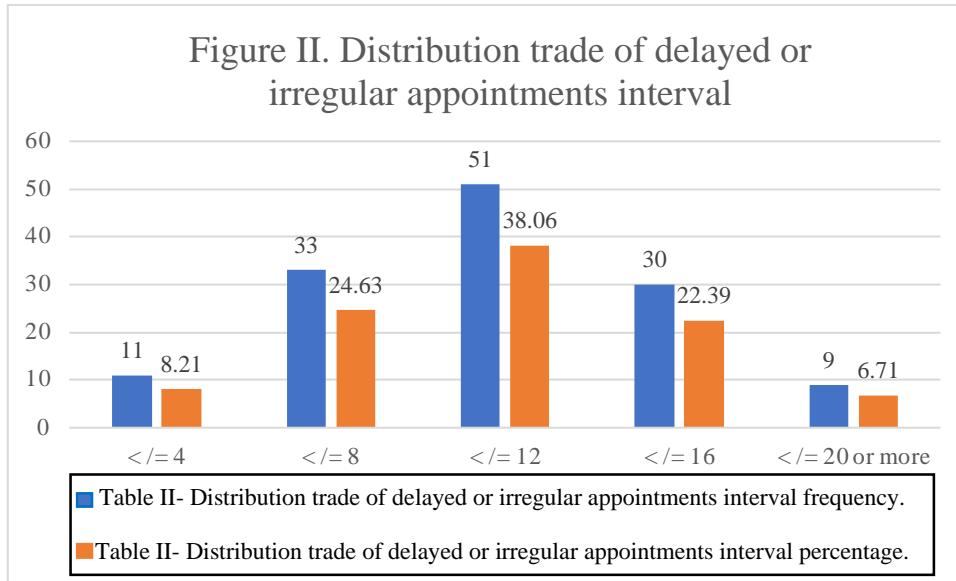
The descriptive statistics revealed 61.19 % Female and 38.81 % Male patients. The distribution of malocclusion based on Angle Molar criteria showed prevalence of 53.73 % Class I, 37.32 % Class II and 8.95% Class III. The malocclusions were treated predominantly by extraction in 57.46 % and non-extraction in 42.44 % patients. The total treatment duration revealed that more than 51 % patients’ treatment lasted beyond 24 months but finished before 36 months. Similarly, 35.82 % patients’ treatment duration was less than 12 months. While considering the stage of the orthodontic treatment, it was found that more than 47 % were in Stage I, 28.36 % were in stage II, 18.66 % in stage III and lastly 5.97 % were in stage IV. The type of the mechanotherapy revealed majority of the patients were treated with fixed mechanotherapy (83.58 %) followed by Clear aligners (10.44 %) and Retainers (5.98 %). (Table I) (Figure I).

Sr. No.	Variables	Category	Frequency	Percentage
I.	Sex	Male	52	38.81
		Female	82	61.19
II.	Angle's classification	Class I	72	53.73
		Class II	50	37.32
		Class III	12	8.95
III.	Extraction	Extraction	77	57.46
		Non-extraction	57	42.44
IV.	Treatment Duration	< 12 months	48	35.82
		< 24 months	69	51.49
		< 36 months	14	10.45
		< 48 months	3	2.24
V.	Stage division	Stage 1 - Levelling and Aligning	63	47.01
		stage 2 - Space closure	38	28.36
		Stage 3 - Finishing	25	18.66
		Stage 4 - Retention	8	5.97
VI.	Type of Appliance	1. fixed appliance	112	83.58
		2. clear Aligner	14	10.44
		3. Retainer	8	5.98



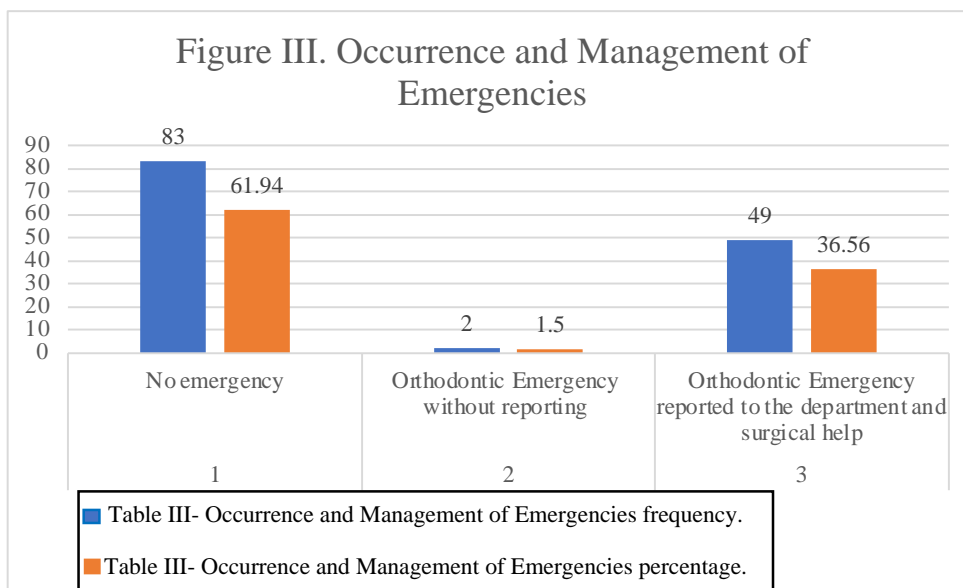
The delay in appointments statistically found more than 38 % patients had a delay of less than 12 but more than 8 appointments scheduled every four months, followed by 24.63 % missed appointments more than 4 but less than 8 times (Table II) (Figure II).

Delayed or irregular appointments interval in weeks	Frequency	Percentage
< / = 4	11	8.21
< / = 8	33	24.63
< / = 12	51	38.06
< / = 16	30	22.39
< / = 20 or more	9	6.71



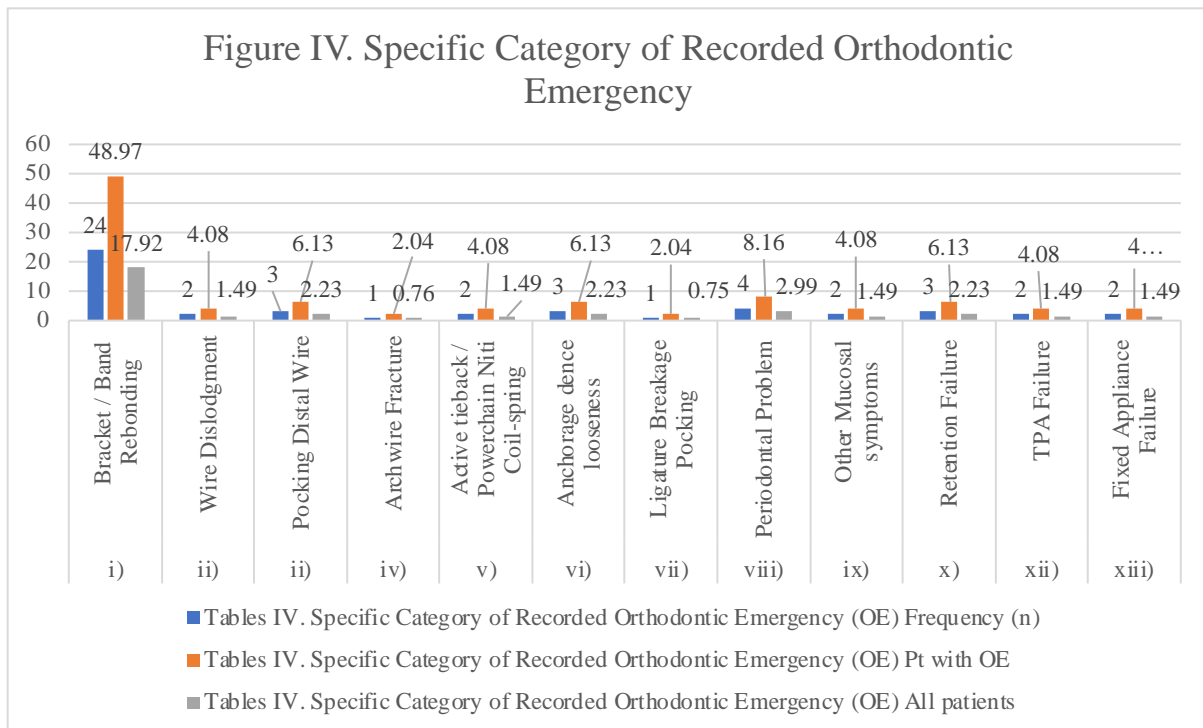
The orthodontic emergencies evaluation revealed that more than 61.94 % patients did not suffer any orthodontic emergency however 36.56 % patients did suffer and had to be report to orthodontic center for intervention (Table III) (Figure III).

Table III. Occurrence and Management of Emergencies			
Sr. No.	Orthodontic emergency	Frequency	Percentage
1	No emergency	83	61.94
2	Orthodontic Emergency without reporting	2	1.5
3	Orthodontic Emergency reported to the department	49	36.56



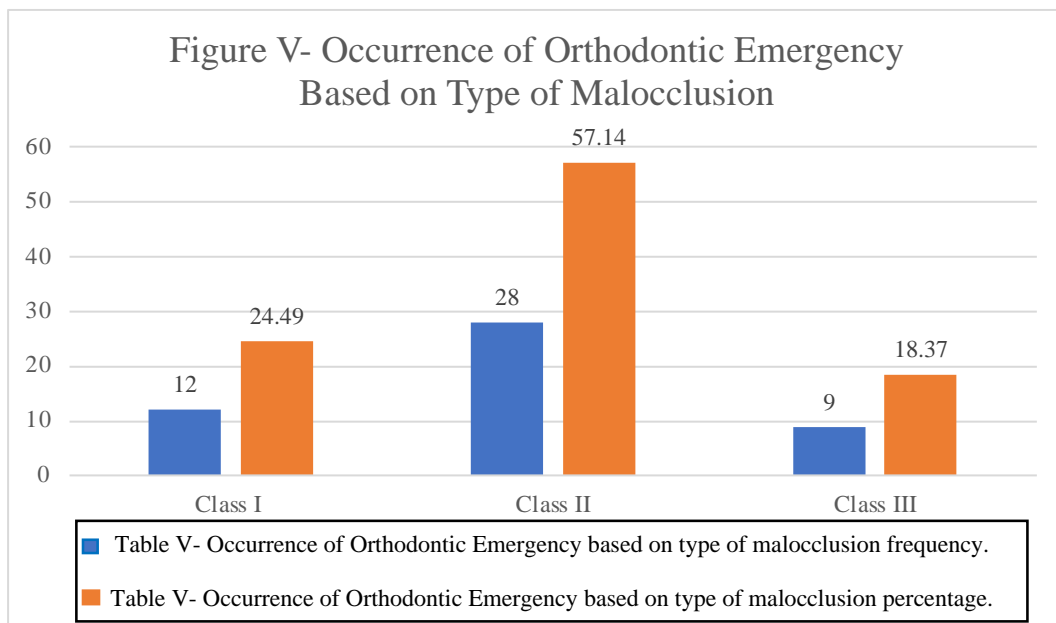
Among the emergencies, 17.92 % patients reported with debonding of brackets and bands, followed by more than 2 % patients reported with different problems of poking distal arch wire, anchorage and retention failure, each (Table IV) (Figure IV).

S. No.	Orthodontic and Emergency	Frequency (n)	Percentage	All patients
i)	Bracket / Band Debonding	24	48.97	17.92
ii)	Wire Dislodgment	2	4.08	1.49
ii)	Poking Distal Wire	3	6.13	2.23
iv)	Archwire Fracture	1	2.04	0.76
v)	Active tieback / Power chain Niti Coil-spring	2	4.08	1.49
vi)	TAD looseness	3	6.13	2.23
vii)	Ligature Breakage/Pocking	1	2.04	0.75
viii)	Periodontal Problem	4	8.16	2.99
ix)	Other Mucosal symptoms	2	4.08	1.49
x)	Retention Failure	3	6.13	2.23
xii)	TPA Failure	2	4.08	1.49
xiii)	Fixed Appliance Failure	2	4.08	1.49



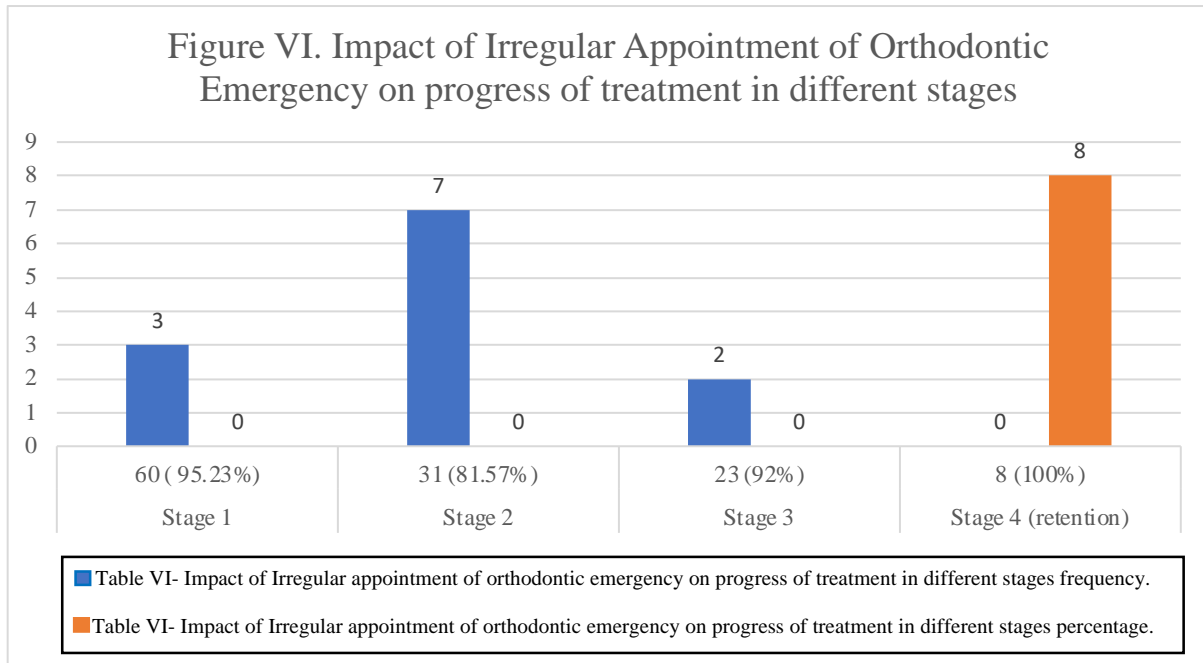
It was also found that mainly class II malocclusion patients reported with orthodontic emergencies seeking orthodontic intervention (57.14 %) followed by class I and Class III (Table V) (Figure V).

Type of Malocclusion	Frequency	Percentage
Class I	12	24.49
Class II	28	57.14
Class III	9	18.37



Results also showed that there was a definite impact of irregular or delayed appointment with orthodontic emergency on progress of orthodontic treatment. In stage 1 treatment progress to stage 2 was highest (95.23%) while stage 2 to stage 3 progress was low as compared to stage 1 and Stage 3 (92%). Retention phase showed no need for any re-treatment. (Table VI) (Figure VI).

Stage Division	Category of Treatment Progress		
	Progress	Retreatment	Maintenance
Stage 1	60 (95.23%)	3	0
Stage 2	31 (81.57%)	7	0
Stage 3	23 (92%)	2	0
Stage 4	8 (100%)	0	8



DISCUSSION:

The COVID – 19 pandemics resulted in lockdown and travel restriction and brought huge limitation in dental care and especially to orthodontic treatment delivery, which required regular follow up visits to orthodontist for timely completion of orthodontic treatment. Due to various restrictions during this COVID – 19 pandemics, patients were at greater risk of delaying or missing the appointments.

During initial years of orthodontics, wires were made of precious metals and their working range was relatively small compared to stainless steel and NiTi wires, so appointment interval was less and often two weeks. Over the period of time with improvement in wires and alloy, the working range increased resulting in increased appointment interval up to 6 to 8 weeks. In present scenario we generally follow appointment interval at 4 weeks which is suitable and helps in timely completion of cases. Alger ^[8] in his study reported that extraction cases were best scheduled at 4 weeks interval, however patient undergoing rapid maxillary expansion needed to be scheduled every one to two weeks for assessment of the expansion. He also emphasized that patients who had poor oral hygiene or were undergoing compliance-dependent treatment (such as headgear or elastics) might need to be seen more frequently to foster psychological reinforcement and encouragement.

Sheridan ^[9] noted that the treatment stage generally dictated the appointment interval: patients undergoing initial levelling and alignment could easily go six to eight weeks between visits, but the demands of finishing required a shorter interval of four to five weeks. Cases involving maxillary expansion, impacted teeth, or periodontal complications also needed more frequent appointments

Cotrin et al ^[10] reported anxiety and fear concern related to pandemic in delaying and unwillingness to attend orthodontic appointments probably due to lockdown and restrictions in travelling. Present study also found the irregular and delayed appointment interval resulting in overall increased duration of orthodontic treatment with more than 91.79% of the patient’s appointment delayed by 8 weeks and more than 20 weeks delay also seen (6.71%). Major factor influencing the missed or irregular appointment was prolongation of overall treatment

duration, which was longer than the routine orthodontic appointment interval. This delay was attributed to lockdown and travel restriction during COVID – 19 pandemics, resulting in closure of dental hospitals and clinics other than emergency treatment. It was accepted and well understood that dental and orthodontic treatment were at an extremely high risk of infection due to potential aerosol generating environment of dental hospitals.^[11,12]

Beckwith et al ^[6] reported 1.09 months duration increased for each missed return-visit. Other than treatment duration, orthodontic treatment outcomes should also be taken into consideration if a long-term appointment delay occurred. It was found in our clinical examination that the extraction space of some few patients reduced after a long-term delay in attending appointment that resulted from COVID-19, which had a negative impact on the retraction of anterior teeth. Furthermore, Saltaji and Sharaf ^[13] also reported that certain patients could not be left unattended for over 10-12 weeks, such as patients with a reverse curve nickel-titanium wire. However, the influence on therapeutic outcomes still needs further investigation in the long run.

Although tele orthodontics ^[14] was reported to be a feasible solution to balance the regular monitoring and the security of patients during the pandemic lockdown. Perhaps orthodontists could only make plans and monitor on the basis of their situation to reduce the treatment delay as far as possible.

Previous investigation by authors have proved the pain and discomfort from orthodontic emergencies such as poking distal wire, bracket debonding and injury from ligature breakage, due to which overall treatment duration increases.^[15] These adverse events resulting in orthodontic emergencies and were likely to be increased during COVID- 19 pandemics and due to lockdown and restrictions timely interventions were not accessible increasing

Jie Xiang ^[16] reported that a total of 32.3% of the patients experienced various OEs during the prolonged appointment interval that resulted from the COVID-19 shutdown. By comparison, only 16.0% of the patients were found to be bothered with OEs during an appointment interval of normal times. The author, however, did not report any correlation between OE occurrence and sex, age, Angle's classification, extraction protocol, treatment duration, and stage division was detected by logistic regression, indicating that OE was a common trouble for all patients. Present study also reported with similar finding with increased prevalence of Angle Class II malocclusion for orthodontic emergencies. The most common orthodontic emergency was found to be dislodged bands and brackets.

LIMITATIONS

The present study was conducted at the single tertiary care autonomous teaching institution, hence the data can be considered localised in demographic and geographical respect. The finding of the present study needs to be validated by conducting similar kind of study preferably at multi-centric level to assess the true impact of COVID-19 pandemic on orthodontic treatment.

CONCLUSION:

The present study found definite impact of COVID 19 pandemic on orthodontic treatment. The salient findings enumerated as below.

- The distribution of malocclusion based on Angle Molar criteria showed patients reported with orthodontic emergencies and un-scheduled appointments had prevalence of Class I, followed by Class II and Class III with predominantly managed with extraction treatment therapy.
- The pattern of appliance revealed majority of the patients were treated with fixed mechanotherapy followed by Clear aligners and Retainers.
- Majority of patients suffered with debonding of brackets and bands, followed by other problems of poking distal arch wire, anchorage and retention failure.
- Patients with levelling and alignment were affected most with pandemics followed by space closure and finishing stage.
- More than half of the patients had increased treatment duration due to irregular follow up.

SOURCE OF FUNDING

STS 2022 reference ID: 2022-07984

CONFLICT OF INTEREST

The authors have no conflict of interest to declare.

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