



Protocol for management of pregnant patients requiring emergency minor oral surgical procedures: a prospective study in 52 patients

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Abstract (J Korean Assoc Oral Maxillofac Surg 2023;49:21-29)

Objectives: Dental or maxillofacial emergencies are uncommon during pregnancy, but if they occur, they are challenging to treat due to potential risks. The mother should not be denied necessary medical or dental care because of pregnancy. The aim of the study is to observe outcomes of pregnancy in patients requiring emergency minor oral surgical procedures during gestation and to determine the safety of the pregnant woman undergoing the procedure and the fetus.

Materials and Methods: The study was conducted on 52 pregnant women requiring emergency oral surgical procedures. A standard treatment protocol for treatment of specific entities was followed. Close monitoring and observation were the primary goal of treatment. All patients were followed postoperatively until complete recovery from the surgical procedures and then until birth of the baby. A control group of 52 healthy pregnant patients who did not require oral surgical procedures was considered for statistical analysis. The measurements to calculate observation were fetal loss (spontaneous abortion), preterm birth, low-birth weight, or incidence of any congenital anomalies in the baby and its association with surgical procedures.

Results: No fetal loss occurred in any of the cases. However, four patients experienced preterm birth and seven neonates exhibited low birth weights. No congenital abnormalities were discovered. In one instance, a patient who underwent surgery for a mandibular symphysis fracture under general anesthesia in the 31st week of pregnancy experienced labor pain on the fourth postoperative day, requiring an emergency Caesarean section.

Conclusion: The results of our study demonstrate that, compared to the control group, minor emergency surgeries performed during pregnancy have no discernible negative effects on the fetus. These procedures can safely be performed by adhering to our described protocols.

Key words: Pregnancy, Minor oral surgical procedure, Emergency, Pregnancy outcome

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I. Introduction

One of the most significant and deeply emotional experiences in a woman's life is becoming a mother. The physiology of the human body changes and demands special attention during pregnancy. Pregnancy causes significant changes to the normal physiology that maintains homeostasis, including

changes to the cardiovascular, respiratory, hematologic, gastrointestinal, renal, and endocrine systems as well as changes in the oral cavity that increase the risk of oral infections. Although these maternal organ adaptations are normal, a surgeon should closely monitor them because they may necessitate change in patient treatment¹.

Even though dental and maxillofacial emergencies are uncommon, they can be difficult to treat because there is a possibility that they could endanger the lives of two individuals (the mother and fetus). Just because the mother is pregnant, she should not be denied necessary medical or dental care. Mothers have a right to receive the best medical care possible because they are distinct individuals with their own rights and obligations. Danger exists to the mother and fetus from the possibility of a negative pregnancy result². However, modern surgical and anesthetic techniques appear to reduce the likeli-

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hood of maternal death according to research by Cohen-Kerem et al.³ of pregnancy outcomes after non-obstetric surgical intervention (general surgery procedures). When necessary, surgery should be performed in the second trimester to decrease the risk of serious birth abnormalities³.

Typically, any dental surgical operation is postponed until after delivery. However, there are several circumstances where surgery on pregnant patients is necessary. The benefit to the mother and risk to the fetus must be carefully weighed before determining whether to perform the procedure under general or local anesthesia. The primary goal of treating any pregnant patient is to decrease the likelihood of unintended risks to the mother or developing fetus.

The purpose of this study was to assess the effectiveness of the protocol for pregnant patients as well as to monitor the outcome of pregnancy in patients who underwent emergency oral surgical procedures.

II. Materials and Methods

This observational study was performed on pregnant women who presented to the Department of Dentistry at the JIIU's Indian Institute of Medical Science and Research in Jalna, Maharashtra, India, from January 2021 to July 2022. The study focused on patients who required urgent minor oral surgery, such as multiple tooth extraction, surgical removal of an impacted tooth, incision and drainage, treatment of a fractured jaw, infected dentigerous cyst enucleation, and periapical cyst enucleation.

1. Patient selection

Of 104 pregnant patients enrolled in the study, 52 prospectively underwent minor emergency oral surgery. All the data were documented and preserved, and there were no dropouts in the study. Two patients who left the city of the study center were followed by telephone communication.

A control group consisting of 52 healthy pregnant women who did not undergo any non-obstetric surgical procedures was recruited. The data of the control group were obtained from the Obstetrics and Gynecology Department of JIIU's Indian Institute of Medical Science and Research (Jalna, India) from a similar study duration. To match the control group (1:1), the criteria of age (20-32 years) was applied since age is a main factor in pregnancy.

• Inclusion criteria:

- (1) Patients who are naturally pregnant, in good health, and

have no existing medical conditions.

- (2) Patients who are willing to provide informed consent.

• Exclusion criteria:

- (1) In order to prevent bias about low birth weight, pregnant women who were underweight and women with hemoglobin level below 10 g/dL were excluded from the study.

- (2) Patients with children or history of previous miscarriage were excluded.

2. Methods

A potential protocol for treating pregnant individuals has been hypothesized based on previous studies and experience. The protocol consists of multiple levels and is described as follows. All patients were treated by strictly adhering to the pregnancy protocol.

- 1) Protocol for management of pregnant patients requiring minor oral surgical procedures

- (1) Preoperative assessment

① In general, it is advisable to avoid surgical procedures during the first trimester if possible. The same treatment should be avoided in the late third trimester and deferred until after delivery. Only urgent surgical procedures that are drug-resistant and whose benefits outweigh the risk to the fetus should be performed.

② Categorization of the patients into first, second, and third trimesters demands specific considerations.

③ Obtaining an obstetrician's advice on fitness. Typically, tests include clinical examination; fetal ultrasound sonography or anomaly scans; assessments of risks to the growing fetus and placenta; certain investigations like complete blood count, HIV, and hepatitis B surface antigens tests; and medications are provided to reduce uterine contractility (tocolytics). A clinical examination and blood tests to detect gestational diabetes mellitus (which often develops after 20 weeks of pregnancy) and pre-eclampsia are typically performed. These include periodically measuring blood pressure and assessing the protein urea content of urine. A glucose tolerance test is used to identify gestational diabetes. These conditions must be handled by the proper specialty consultant.

④ Obtaining the patient's informed, verbal, and written consent after thoroughly explaining the surgical treatment to be performed, its results, and any potential risks to the mother and fetus.

- (2) Intraoperative safety measures

- ① To reduce nausea and possible aspiration during the pro-

cedure (especially in the first trimester), appointments should be arranged during the afternoon or evening. Pregnancy-related gastrointestinal problems frequently occur in the morning and cause nausea and vomiting. One hour prior to surgery, the administration of antiemetics such as ondansetron should be considered. In addition, a high-power suction device must be ready in case vomiting occurs during the procedure.

② To prevent pressure from an enlarged uterus on the inferior vena cava, it is advisable to assume a left lateral posture with the right hip elevated 10°-15°. This can be performed by tucking a pillow beneath the right hip.

③ Careful monitoring of vital signs like oxygen saturation, pulse rate, respiratory rate, and blood pressure while performing the procedure. Observing for any possible fainting or loss of consciousness must also be carried out.

④ Pain management: Careful pain management is desired since discomfort during the procedure may cause uterine contractions or labor pain. To obtain the necessary anesthesia, lignocaine with adrenaline (1:180,000 or 1: 200,000) is a safe medication.

⑤ The length of the procedure must not exceed 30 minutes due to the patient's somewhat unusual and challenging operating position.

(3) Postoperative safety measures

① Monitoring of the patient's vitals during recovery.

② During recovery, the patient must be left in the left lateral position to prevent aspiration and syncope due to compression of the inferior vena cava. If necessary, 100% oxygen can be administered.

③ Provide the patient and her accompanying caretaker the appropriate postoperative instructions.

④ Consider category A and B medications for pain management and infection control that have been approved by the U.S. Food and Drug Administration. We used standard medications to achieve this goal.(Table 1)

⑤ The patient has been informed to notify her physician if she experiences abdominal pain or spotting (mild vaginal bleeding brought on by placental detachment). The patient is also urged to keep an eye out for changes in fetal mobility and should consult her obstetrician if there is any suspicion of fetal mobility being altered.

All patients were monitored postoperatively until they fully recovered from their surgery, and further monitoring was performed until the baby was born. This was conducted to observe fetal loss (spontaneous abortion), preterm birth, low birth weight, or any congenital defect in the newborn and its association to the surgery.

The analysis was performed using IBM SPSS Statistics software (ver. 22.0; IBM, Armonk, NY, USA). Difference between groups were considered significant at $P < 0.05$.

III. Results

After minor oral surgical procedures, all information related to fetal loss, labor and delivery timing, baby weight, and presence or absence of congenital anomalies was obtained from the patient's obstetrician following the procedure and postpartum. The study revealed the following results.

- Preoperative ultrasonography and anomaly scans in both the study and control groups detected no congenital abnormalities.

A study group of 52 patients ranging in age from 24 to 36 years who underwent various minor oral surgical procedures were included.(Table 2) No fetal loss occurred in any of the instances. However, 4 patients (7.7%) experienced preterm birth and 9 neonates (17.3%) exhibited low birth weight. In any event, no congenital abnormalities were discovered. In one instance, a patient who underwent surgery for a mandibular symphysis fracture under general anesthesia in the 31st week of pregnancy experienced labor pain on the fourth postoperative day, necessitating an emergency Caesarean section. Interestingly, none of the patients experienced syncope, decrease in blood pressure (BP), or an episode of vomiting during surgery except for severe gagging in one patient.

- Three patients of 52 experienced gestational diabetes, while 2 patients (3.8%) were diagnosed with pre-eclampsia. The patients were being treated with medications suggested by their physicians and were properly controlled. During the procedures, we encountered no issues.

- The data of the control group were collected from the obstetrics department and statistically analyzed. In the control group of 52 patients ranging in age from 20 to 32 years, none of the cases experienced fetal death, 4 patients (7.7%) had preterm births, 6 babies (11.5%) exhibited low birth weights, and no instances of congenital anomalies were observed. (Table 3)

- To determine the significance of the difference between the two groups in terms of fetal loss, preterm birth, birth weight, and the existence of congenital anomalies in newborns, the Z test and chi square test were applied. No significant differences were observed between the two groups with respect to birth weight ($P=0.113$), preterm birth delivery ($P=0.629$), and induction of labor pain ($P=0.927$).

We discovered no significant difference between the two

Table 1. List of standard drugs used during minor oral surgical procedures of pregnant patients in the current study

Drugs	FDA category	Safety during pregnancy	Safety in lactation	Potential teratogenic effects
Antibiotics				
Amoxicillin, amoxicillin with clavulanic acid - injectable and oral	B	No proven risk in humans	Not recommended	
Ceftriaxone - injectable	B	No proven risk	Drug excreted in the milk in small quantities - acceptable with caution	Not determined
Cefixime	B	No proven risk	Safety not proven	
Cefuroxime	B	No proven risk even in the first trimester	Not recommended	
Metronidazole - oral - injectable	B	No proven risk	Drug secreted in the milk at similar concentrations as that of plasma - discontinue breastfeeding temporarily	Metronidazole had carcinogenic effects after prolonged and high-dose consumption
Ciprofloxacin	C	Can be used even in the first trimester	Secreted in the milk but considered to be usually compatible with breastfeeding	Unlikely
Clindamycin	B	No proven birth defects in the second and third trimesters. Safety of the drug in the first trimester data not known	Drug secreted in the milk at one-tenth of the concentration in plasma. Monitoring of the child required for diarrhea and candidiasis. If symptoms appear, stop breast feeding temporarily.	Undetermined
Analgesics/NSAID				
Paracetamol	Category - not assigned	Traditionally supposed to be safe in pregnancy	Secreted in the milk at low concentrations. Compatible with breastfeeding.	Unlikely
Aceclofenac/aceclofenac +seratiopeptidase	Not recommended		Not recommended	
Tramadol	C	Allowed in low dosages for short durations	Not recommended	Better to avoid the last trimester, baby may show withdrawal symptoms of the drug
Diclofenac	C - prior to 30 weeks of gestation D - after 30 weeks of gestation	May be used with great caution before 30 weeks of gestation. Contraindicated in the 3rd trimester	Not recommended	Premature closure of the ductus arteriosus, fetal renal impairment, delay in labor
Local anesthetics				
Lignocain hydrochloride	B	Safest local anesthetic		Found to be non-teratogenic
Antacids/antiemetics				
Doxylamine succinate	A	Safest antiemetic	May decrease the amount of breast milk, as the drug is secreted in milk and may cause drowsiness in the baby - not recommended	Non teratogenic
Pantoprazole, pantoprazole +domperidone	C	Recommended	Drug excreted in milk with very little concentration, does not affect the baby	
Ondansetron	B	Recommended	Not proven to have effects on the baby	

(FDA: U.S. Food and Drug Administration, NSAID: nonsteroidal anti-inflammatory drug)

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groups in any of the measurements. This indicates that there is no significant association between minor oral surgery during pregnancy and the outcome of pregnancy.(Table 3) In addition, there were no significant medical or obstetric emergencies while operating on the pregnant patients under proper care.

IV. Discussion

Pregnancy begins at the moment of conception, and the female carries the fetus in her uterus until delivery. Typically, this period ranges from 37 to 40 weeks after her last period. Each of the three trimesters of pregnancy lasts for approximately three months. The first trimester is the most crucial because organogenesis occurs from the second to the eighth week, followed by morphogenesis.

Table 2. Explaining the categorization of patients in trimesters and the timing of different surgical procedures performed

Surgical procedure performed	First trimester	Second trimester	Third trimester	Total
Multiple tooth extractions due to recurrent swelling and pain	0	5 (22.7)	0	5 (9.6)
Third molar surgery	4 (28.6)	6 (27.3)	5 (31.3)	15 (28.8)
Incision and drainage	4 (28.6)	5 (22.7)	5 (31.3)	14 (26.9)
Mandible fracture	0	0	1 (6.3)	1 (1.9)
Enucleation of infected dentigerous cyst	2 (14.3)	3 (13.6)	3 (18.8)	8 (15.4)
Enucleation of infected periapical cyst	4 (28.6)	3 (13.6)	2 (12.5)	9 (17.3)
Total	14 (26.9)	22 (42.3)	16 (30.8)	52

Values are presented as number (%).

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Table 3. Comparison of different parameters between patients in the study and control groups

	Study group	Control group	P-value
Birth weight (g)	2,822.11±384.49	2,717.50±218.37	0.113 (NS)
2,000-2,500	9 (17.3)	-	
2,500-3,000	27 (51.9)	-	
>3,000	16 (30.8)	15 (28.8)	
Preterm birth	5 (9.6)	4 (7.7)	0.629 (NS)
Fetal loss	0	0	NA
Induction of labor pain perioperatively	1	0	0.927 (NS)
Pre-term birth (time of preterm birth in weeks)	4 (7.7)	4 (7.7)	0.918 (NS)
Congenital anomaly at birth	0	0	NA

(NS: not significant, NA: not applicable)

Values are presented as mean±standard deviation, number (%), or number only.

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Different systems are involved in the many physiological changes that occur during pregnancy. They are described in detail in the literature along with their considerations during surgery.

1. Cardiovascular system

Significant increases in blood volume and cardiac output occur during pregnancy. By 32 weeks of gestation, increases in plasma volume and secondary anemia in pregnancy are reflected by an up to 50% increase in blood volume⁴. The increase in cardiac output during the third trimester (gestational weeks 25-33) is largely owed to an increase in stroke volume and secondarily because of an increase in heart rate. Clinically, 90% of pregnant patients have a functioning S3 systolic murmur⁵. Despite having a higher cardiac output at the beginning of pregnancy, the blood pressure drops and returns to normal at the conclusion of the second trimester. Since prostaglandins, nitric oxide, and progesterone produce vasodilation and venodilation, this drop is predominantly brought about by a decrease in systemic vascular resistance^{6,7}.

Considerations for treatment: Due to the potential for inferior vena cava compression when the patient is in the supine position, supine hypotension syndrome, which is clinically

characterized by hypotension, syncope, and bradycardia, may manifest. Even if the patient does not exhibit these symptoms, the uteroplacental flow may be disrupted. To avoid this issue, the patient is rolled to the left side with the right hip elevated by a pillow or wedge by 10-15 cm (5° to 15°). If this is insufficient, the patient may be positioned fully to the left^{2,8}. This position only allows a brief surgery to 20-30 minutes or until the patient can no longer tolerate the uncomfortable position. As a result, surgeons must learn how to operate quickly and efficiently on patients².

2. Respiratory apparatus

The maternal-fetal system's increased oxygen requirement and superior displacement of the diaphragm (up to 3-4 cm) brought on by continued fetal growth contribute to alterations in respiration during pregnancy. As a result, the intrathoracic pressure rises, increasing the chest's anteroposterior diameter and circumference during inspiration^{9,10}. Increasing tidal volume and minute ventilation rate cause hyperventilation. Since this puts the mother and fetus at risk for hypoxia, concurrent decline in oxygen reserve may be considerable. Although dyspnea is a very frequent occurrence, hypercapnia is not a typical physiologic alteration. In the middle of the second

trimester, approximately 50% of pregnant women experience at least one episode of dyspnea; 75% of pregnant women experience this in the middle of the third trimester¹¹.

The mucosa of the upper airway, including the oral cavity, undergoes major changes in addition to alterations in respiratory physiology. The mucosa has a propensity to become edematous and friable as a result of the pregnancy's elevated serum estrogen level. This increases the risk of oral infection, pregnancy tumor, and pregnancy gingivitis. In the event of oral or dental abscess, prompt intervention is needed. Up to one-third of pregnant individuals experience upper respiratory tract infections, bouts of epistaxis, and frequent recurrent rhinitis¹².

Considerations for treatment: According to the research, there is a 25% probability of mild hypoxia in pregnant patients when they are lying supine, with some of them possibly developing an aberrant alveolar-arterial oxygen gradient¹³. To prevent hypoxemia, ventilation patterns and patient position must be modified^{2,14}.

3. Gastro-intestinal system

The three most significant gastrointestinal changes are pyrosis, vomiting, and nausea (heartburn). By the conclusion of the first trimester, almost two-thirds of patients report a peak in their nausea and vomiting. Only 1% of women exhibit frequent vomiting^{2,15}. Approximately 70% of pregnant women exhibit pyrosis, which is thought to be caused by increased intragastric pressure due to the growing fetus. Concurrently, there is a decrease in smooth muscle tone of the lower esophageal sphincter, which is considered to be brought on by high level of progesterone inhibiting the generation of motilin. These factors work in concert to slow stomach emptying^{16,17}.

Total protein and albumin levels are decreased, while levels of alkaline phosphatase, cholesterol, bilirubin, triglycerides, and aminotransferase are elevated in the serum. In 3% of pregnant women, abnormal liver function tests have been documented¹⁸.

Considerations for treatment: Early appointments are not advised because pregnant individuals frequently vomit and feel sick in the morning. The patient is also recommended to avoid foods that cause nausea and vomiting, particularly oily and fatty ones. Excessive vomiting can occasionally cause dehydration and electrolyte problems. In such circumstances, the patient is recommended to drink plenty of water and electrolyte powder¹⁹. Since there is a chance that gastric contents will be aspirated and possibly result in aspiration

pneumonia or death, increased episodes of gastric reflux and regurgitation warrant special attention. Although the severity of aspiration pneumonia is directly correlated with the acidity of the gastric juices, there is no evidence to support the use of antacids or antihistamines to lessen aspiration-related mortality^{2,20}. This issue can be resolved with frequent oral suctioning and left lateral posturing.

4. Hematologic changes

The erythrocyte count, erythrocyte sedimentation rate, leukocytosis, and the majority of clotting factors increase in a pregnant patient, increasing coagulability. Physiologic anemia is brought on by an increase in plasma volume. Leukocytosis during pregnancy is known to be caused by elevated levels of circulating catecholamines and cortisol^{21,22}.

Considerations for treatment: Pregnant women are five times more likely to experience thromboembolic events than non-pregnant women due to their hypercoagulable status. This danger is related to a hypercoagulable state and venous stasis in the lower extremities brought on by the growing fetus in the womb compressing the inferior vena cava^{3,23}. For pregnant women with a history of thromboembolic disease, anticoagulant prophylaxis in the form of low molecular weight heparin is advised to prevent this issue. In order to prevent excessive bleeding during surgery, the surgeon must be familiar with these patients' condition²⁴. Low molecular weight heparin can be terminated one day before surgery and re-initiated the following day, or it can be delayed as recommended by the obstetrician.

5. Excretory system

Pregnancy-related renal changes include increased renal plasma flow and glomerular filtration rate, which are principally brought on by an increase in blood volume which peaks at 60% to 80% during the second trimester and then gradually declines. The first trimester is when the glomerular filtration rate increases by 30% to 50% above normal peaks and remains at that level until the baby is born^{25,26}. Increased filtration clearance of creatinine causes increase in urea and uric acid, which cause a decrease in serum creatinine and blood urea nitrogen. Additionally, women who are pregnant urinate more often and are more likely to get frequent urinary tract infections^{2,8}.

Considerations for treatment: Since pregnant patients urinate more frequently, they should be asked to void their blad-

ders before receiving treatment. A patient with asymptomatic bacteriuria is more likely to develop a urinary tract infection, which could lead to pyelonephritis. To prevent asymptomatic bacteriuria, the patient must undergo careful evaluation if urinary catheterization is necessary. Increased glomerular filtration necessitates dose adjustment of drugs that are eliminated by the kidney^{2,27}.

6. Pregnancy oral alterations

The mucosa of the oral cavity is significantly impacted by pregnancy's elevated levels of progesterone (10 times higher) and estrogen (30 times higher). These hormones promote gingival crevicular fluid flow and vascular permeability while changing how the body reacts²⁸. Since estrogen receptors are present in the fibroblasts of the periosteum and the periodontal ligaments, they directly affect the periodontal health of women²⁹. Mouth mucosa becomes friable and edematous, as previously mentioned, along with upper respiratory tract mucosa, increasing the risk of oral infection and gingivitis.

Gingivitis, pyogenic granuloma, aphthous ulcer, tooth mobility, temporomandibular joint dysfunction, and facial hyperpigmentation are all significantly more common in pregnant than non-pregnant patients. These symptoms are transient and may improve following delivery. However, patients require preconceptional counselling, preventative scaling, and continuous monitoring throughout pregnancy to allow early diagnosis and treatment if necessary. These elements must be taken into account when performing oral surgery³⁰.

Not much information is available on pregnant patients who undergo oral and maxillofacial surgery. There was no difference in the rate of miscarriages, gestational age at delivery, or birth weight when 210 pregnant patients underwent various dental treatments including extraction in 31 patients according to research by Hagai et al.³¹. They concluded that use of dental local anesthetics and undergoing dental work while pregnant did not significantly cause teratogenic defects³¹.

On the other hand, there is an abundance of literature about pregnant patients who undergo nonobstetric general surgery. Cohen-Kerem et al.³ reviewed 54 papers with 12,452 pregnant patients undergoing various surgical operations. Maternal mortality was reported at 0.006% with a miscarriage rate of 5.8%. However, because matched controls were unavailable, it was difficult to interpret this figure. In their study, 1.3% of pregnancies were terminated voluntarily after non-obstetric surgery, 3.5% of non-obstetric surgical operations resulted in

premature labor, particularly after appendectomy as opposed to other types of interventions ($P=0.001$). Fetal loss occurred in 2.5% of pregnancies overall. The rate of prematurity was 8.2% with 3.9% of women who underwent non-obstetric surgical intervention in the first trimester experiencing serious birth abnormalities. A sub-analysis of articles discussing appendectomy during pregnancy found a significant rate (4.6%) of labor induction due to surgery. Fetal loss related to appendectomies was 2.6%. However, when peritonitis was present, this rate increased to 10.9%³.

In our study, among the 52 patients who underwent minor oral surgical procedures, 1 experienced induced labor pain following surgery, 4 had preterm labor, and 7 had low birth weight babies. None of the patients displayed congenital abnormalities, fetal loss, or maternal death.

V. Conclusion

Emergency oral surgery procedures must only be performed during pregnancy if the risks to the mother and fetus outweigh the benefits of the procedure. However, as it is a patient's right to undergo treatment, a pregnant patient should never be denied care. We conclude that, compared to the control group, minor emergency surgery performed during pregnancy has no discernible negative effects on the fetus if the "Protocol for management of pregnant patients requiring minor oral surgical procedures" is followed strictly. Given that the patients' primary physicians are obstetricians, a multidisciplinary approach is necessary. Interestingly, none of the patients in this study experienced syncope, decrease in BP, or episodes of vomiting during surgery.

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Authors' Contributions

A.N.J. was the principal investigator, designed the study protocol, and was involved in data acquisition and manuscript preparation. S.G. contributed to the clinical study and literature collection. U.H.S. contributed to the coordination of investigators and clinical study. M.S. contributed to the clinical study, definition of intellectual content, manuscript preparation, and editing. Y.I.S. contributed to the clinical study, data acquisition, data analysis, manuscript preparation, and review. P.R.T. contributed to manuscript preparation, editing, review, and drafting of the manuscript. All authors read and approved the final manuscript.

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Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Institutional Ethical Committee of JIIU's Indian Institute of Medical Science and Research (IEC No. IIMSR/IEC/F/2022/01), and the informed consent was obtained from all patients.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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