

ODONTOGENIC FASCIAL SPACE INFECTIONS IN PREGNANCY - A STUDY

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ABSTRACT

Odontogenic infections are the most prevalent disease worldwide. These infections presenting initially as, localized periapical and periodontal abscess then perforate the cortical bone and spread causing facial cellulitis. Odontogenic infections spread along tissue planes involving initially primary and then secondary facial spaces depending upon the tooth involved and muscle attachments. Infections are common in pregnancy due to hormonal changes and altered immunological activity aggravating response to plaque accumulation and caries resulting in serious life threatening condition, like Ludwig's angina. The present study carried out on 28 pregnant patients with severe odontogenic infections reporting to oral and maxillofacial unit of Khyber College of Dentistry, Peshawar, Khyber Pakhtunkhwa province of Pakistan. The age range was from 17 to 40 years and mean age of 24.78 SD±5.043. Odontogenic infections were most common in the last trimester (50%) followed by late second trimester (28.5%). The most common tooth involved is mandibular wisdom tooth (53.5%) and submandibular space (28%) being the most frequently involved. Patients presented with trismus, facial swelling and dysphagia on examination. Most patients were treated with incision and drainage under local or general anaesthesia depending upon the fitness of the patient and extraction of the offending tooth and intravenous antibiotic coverage.

Key Words: *Pregnancy, pregnant female, odontogenic facial space infections.*

INTRODUCTION

Spreading odontogenic infections are one of the most common type of serious orofacial infections encountered by oral and maxillofacial surgeons ranging from simple dental caries to life threatening Ludwig's angina and mediastinitis. These infections presents initially as a localized dentoalveolar infection, usually a peri-radicular abscess which progresses and spreads rapidly through the tissue planes, with increased inci-

dence of mortality.¹ Infection from the original focus can spread along the tissue spaces and lead to facial cellulitis involving deeper facial spaces. These spaces are bounded by muscles, bones and actual facial layers. These spaces communicate with one another and therefore, allow the spread of infection beyond single space.²

Pregnancy is associated with many physiological and hormonal changes, providing the oral and maxillofacial surgeon with many challenges. If proper precautions are not taken, these alterations can lead to serious complications.³ Treatment of pregnant patients involve dealing the lives of two individuals (the mother and unborn fetus), certain principles have been developed which must be considered by an oral and maxillofacial surgeon while handling such patients. Management plan should be such that it should maximize benefit to the mother and minimizing the risk to the developing fetus.⁴ It is necessary for an oral

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and maxillofacial surgeon to consult the patients obstetrician or medical specialist in a clinical situation providing a framework for the surgeon in making medical decision for the pregnant patient⁵. In pregnancy there are changes in the respiratory physiology due to increased oxygen demands of the maternal-fetal system. There is an increase in tidal volume and minute ventilation rate caused by superior displacement of the diaphragm (upto 3-4 cm) resulting in dyspnea.^{6,7} Up to 50% of patients exhibit this clinical sign by the middle of the second trimester, and up to 75% exhibit it by the middle of the third trimester⁸. Hyperventilation is also a common finding in the pregnant patient and is present in approximately 40% of patients late in pregnancy.^{6,9} Life threatening odontogenic infections as Ludwig's angina can aggravate these respiratory changes occurring in pregnancy, as it is associated with severe airway compromise. Therefore early incision and drainage of odontogenic infections are indicated, as is appropriate use of antibiotics with primary concern should be given to airway security.^{10,11}

The objective of this study is to determine the offending tooth leading to facial space infection, the facial space involved and the trimester of pregnancy at the time of presentation.

METHODOLOGY

The present study was carried out on twenty eight pregnant women with odontogenic infection reporting at unit of Oral and Maxillofacial Surgery, Khyber College of Dentistry, Peshawar from January 2010 to 2013. Patients with gestational diabetes or known diabetic pregnant patients were excluded from the study. The purpose of this study was to determine the causative tooth, the facial space involved and trimester of pregnancy with increased frequency of odontogenic infections at the time of presentation. For this purpose a special performa regarding the variables of the study i.e culprit tooth, space involved and trimester at the time of presentation was designed. A detailed history was taken followed general physical examination. Complete intraoral and extraoral examination was done. Intra oral examination was carried out using dental mirror. The culprit tooth and the associated space involved were identified. The standard radiograph taken was orthopantomograms (OPGs), using lead shields. Diagnosis was made on the basis of history, clinical examination and radiographic assessment.

Patients with extreme limitation of mouth opening, fever of above 102°F and dysphagia were hospitalized and managed under local/ general anesthesia depending upon the condition of the patient, by incision and drainage with extraction of the causative tooth. Incision was carried out using blade no 15 and pus drained facilitated by corrugated rubber drain. The rubber drain was removed till stoppage of the pus drainage. Patients were given intravenous antibiotics and fluids during their stay at the hospital.

RESULTS

A total of twenty eight pregnant female patients were recruited in the study. The age range was from 17 to 30 years, mean age of 24.78 years SD ±5.043 (Table 1). Fourteen (50%) females presented with odontogenic infections in their last trimester and eight out of 28 (28.5%) were in their late second trimester. The remaining six (21.4%) with were in their first trimester of pregnancy (Fig 1). The most commonly involved tooth was mandibular last molar (53.5%) followed by equal number of mandibular first molar (25%) and second molar involvement (25%) (Table 2). The most frequently space involved was submandibular space (28%) and a combination of submandibular and submental space (14.2%), with nine out of twenty eight patients (32.1%) reporting with Ludwig's angina. One patient had maxillary canine space (3.5%), one with submental space (3.5%) and two patients each with masseteric space (7.1%) and buccal space involved (7.1%) (Table 3). All of these patients presented clinically with limited mouth opening with fascial swelling and dysphagia. Tenderness and warmth was observed on palpation extraorally, and pus discharge on aspiration of the involved space. All patients had systemic signs of infection including fever, dehydration and lethargy. On laboratory investigations a complete blood count revealed increased leukocyte count.

TABLE 1: AGE DISTRIBUTION IN PREGNANT PATIENTS WITH ODONTOGENIC INFECTION

Age group of patients	Number of patients	Percentage
17-20 years	7	25%
21-30 years	20	71.4%
31-40 years	1	3.5%
Total patients	28	100%

TABLE 2: TOOTH INVOLVEMENT

Tooth involved	Number of patients with involved tooth	Percentage
Maxillary canine	1	3.5%
Maxillary first molars	3	10.7%
Mandibular central and lateral incisors	1	3.5%
Mandibular first molars	7	25%
Mandibular second molars	7	25%
Mandibular last molars	15	53.5%
Total	34	100%

TABLE 3: SPACE INVOLVEMENT

Space involved	Number of patients with involved tooth space	Percentage
Submandibular space	8	28%
Bilateral submental, sublingual and submandibular space	10	32.1%
Submandibular and submental space in combination	4	14.2%
Buccal space	2	7.1%
Masseteric space	2	7.1%
Submental	1	3.5%
Maxillary canine space	1	3.5%



Fig. 2: Severe submandibular facial space infection



Fig 3: Orthopantomogram of the same patient showing carious third molar

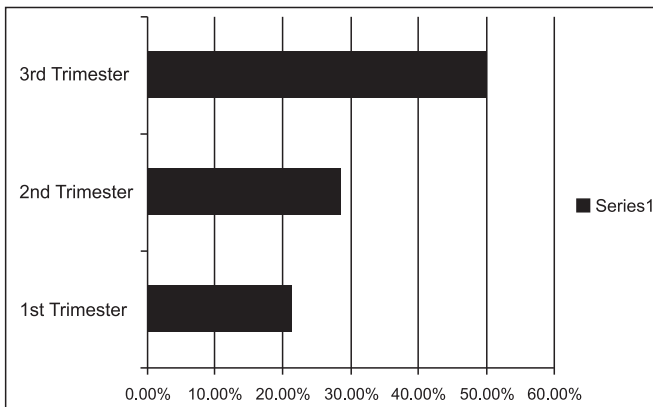


Fig 1: Trimester involved in pregnant patients with odontogenic infection

DISCUSSION

Odontogenic infection is the most prevalent disease worldwide and is the main reason for seeking dental care. The commonest odontogenic infections are periapical abscess, pericoronitis and periodontal abscess¹². Facial spaces are potential spaces divided into primary and secondary on the basis of direct and indirect involvement from the original focus. The primary spaces associated with the maxilla are canine, buccal and infratemporal while those with the mandible are submental, sublingual, submandibular and buccal.⁵

The roots of mandibular second and third molar teeth lie below the attachment of the mylohyoid muscle to the mandible and infection from these teeth spread

to the submandibular space. The roots of anterior teeth lie above the mylohyoid muscle and infection from these teeth spreads to the sublingual space.¹³ In the present study the most commonly involved tooth was mandibular last molar (53.5%) followed by equal number of first (25%) and second (25%) mandibular molar involvement. In patients with infections of odontogenic origin more than a single fascial space involvement is seen. This may be due to delay on behalf of the patient to seek dental care. The periapical infections do not remain localized within the jaw bones. They perforate the cortical bone and spread to the surrounding oral structures and present in the form of swelling and pus discharge. Common complaints associated with these infections are swelling, pain, pus discharge, limitation of mouth opening, dysphagia and fever.¹⁴

The prevalence of odontogenic infection involving primary fascial spaces in descending order is submandibular (28.2%), submental (14.8%), buccal (12%) and sublingual (11.3%).¹⁵ In the present study the also most commonly involved space is submandibular (28%), bilateral submandibular sublingual and submental in combination (32.1%), submandibular and submental in combination (14.2%), buccal (7.1%), masseteric (7.1%) and isolated submental space (3.5%).

Odontogenic infections can lead to serious complications if early treatment is not provided, including upper airway obstruction, descending mediastinitis, jugular vein thrombosis, septic shock, acute renal failure, disseminated intravascular coagulation, carotid artery pseudo aneurysm and pericardial effusion.¹⁶

Each year it is estimated that about 50,000 women undergo anesthesia and a surgical intervention at some time during gestation for indications unrelated to the pregnancy.¹⁷ Pregnancy is accompanied by many physiological changes which place the mother at a higher risk of infection or having grave consequences once infected. First, the immune response is greatly diminished during pregnancy, thus resulting in potential faster progression of an infection. In addition, there is decreased neutrophil chemotaxis, cell mediated immunity, and natural killer cell activity and also there is decrease in oxygen reserve of gravid patient.^{18,19} Pregnancy related hormonal changes affects the human body it also has some affect on the oral cavity affecting the gingival tissues. They become

much more sensitive and susceptible to irritation from soft plaque. The plaque accumulates, becomes hard calculus deposits on the teeth, and harbors bacteria in large numbers resulting in a constant, low-grade intraoral infection. An exaggerated local inflammatory response can then begin and may result in erythematous and edematous swelling of the gingiva between the teeth, also known as pregnancy gingivitis. Approximately 70% of pregnant women have this condition, even with routine oral care.³ These changes are aggravated during the last trimester and second trimester of pregnancy. As in the present study patients with increased number of odontogenic infections were in their last trimester (50%), second trimester (28.5%) and (21.4%) in their first trimester. Maternal infections are caused especially by gram negative anaerobic bacteria, such as those leading to Ludwig's angina, have been demonstrated to cause physiologic imbalance through inflammatory cytokine production, sometimes resulting in preterm labour, preterm premature rupture membranes, and low birth weight.^{20,21} During pregnancy, women tend to maintain frequent meals and snacks, which cause further plaque accumulation, as well as an increase in decay or rapid progression of previously present decay. Because a pregnant patient has increased demands on her organs, there is increased potential for poor oxygenation. On the other hand, poor oxygenation is compromising to the fetus. An infection in itself can at times infect the placenta, uterus, and possibly the fetus, causing fetal septicemia. Treatments such as prolonged intubation and certain intravenous medications can also harm the fetus.²² 25% of pregnant patients develop moderate hypoxemia and some develop an abnormal alveolar-arterial oxygen gradient when placed in the supine position.^{3,23} Ventilation patterns and patient position must be adjusted for the pregnant patient so as to avoid hypoxemia.^{3,24}

Regular routine dental visits should be planned for pregnant patients during early stages of pregnancy in order to identify the problem as early as possible and avoid serious complications. The most, appropriate time for dental treatment is second trimester, which is considered as the safe period³. Antibiotics that are acceptable include penicillin, amoxicillin, and clindamycin. Tetracycline should be avoided since it tends to cause permanent discoloration of primary and temporary dentition of the unborn child.¹⁹

In general management of a pregnant patient should include referral to the patients obstetrician

before providing treatment⁴. Due to the increased abdominopelvic mass in pregnancy, there is compression of the inferior vena cava when the patient is placed in supine position resulting in supine hypotension syndrome. To prevent or alleviate supine hypotension, the pregnant patient should be rolled to the left side by 5° to 15° (a position in which the right hip is elevated 10–12 cm) which can be accomplished by inserting a wedge or pillow under the right hip.²⁵ Ventilation patterns and patient position must be adjusted for the pregnant patient so as to avoid hypoxemia^{3, 26}. For the pregnant patient with frequent or excessive vomiting, morning appointments should not be scheduled⁶. Given the increased frequency of urination normally seen in the pregnant patient, patients should be asked to void before starting treatment. Asymptomatic bacteriuria in the pregnant patient can progress to urinary tract infection and eventually pyelonephritis if untreated.^{27, 28}

Management of mild infections should be managed via incision/drainage under local anesthetic with subsequent antibiotic coverage. It is essential to aggressively treat the gravid patient to minimize the risk of infection spreading to the facial spaces. Facial space infection should be handled in a standard fashion: airway assessment (if any doubt, intubate), imaging (computed tomography scan), and to the operating room for adequate incision and drainage. Postoperatively, if the patient is unable to maintain oral intake, parenteral nutritional support must be instituted. Until the results of the culture/sensitivity are returned, empirical penicillin therapy is appropriate. More severe infections should be managed in the operating room under general anesthesia with intravenous antibiotics and incision and drainage. Other issues with the gravid patient who is hospitalized for an extended period of time include avoiding bladder catheterization to minimize the risk of urinary tract infections and the use of subcutaneous heparin.³

Odontogenic infections can lead to serious consequences in pregnancy, as due to socioeconomic status and cultural issues in this part of the world, people have reservations in taking pregnant females to dentists. As pregnant patients are a challenge to treat because we are dealing two lives the mother and the fetus, management plan should be such that it provides maximum benefit to the mother and minimize risks to the fetus. Dental problems should be recognized earlier before it leads to grave outcomes.

CONCLUSIONS AND RECOMMENDATIONS

Mandibular last molars are the most commonly involved tooth in odontogenic infections in last trimester of pregnancy. We conclude that as mandibular last molar has the most unusual pattern of eruption and many patients had experienced pericoronitis earlier, have an aggravated response to local inflammation in pregnancy resulting in fascial space infections. Infections are common in pregnancy due to hormonal changes and altered immunological activity aggravating response to plaque accumulation and caries resulting in serious life threatening condition, like Ludwig's Angina.

The following are the recommendations from the present study,

Regular dental visits should be planned for pregnant patients as a part of their routine prenatal care.

Dental treatments should be planned during the second trimester, as it is regarded as the safe period.

Pregnancy gingivitis, as a common manifestation of pregnancy should be diagnosed at the earliest and patient should be provided adequate treatment including oral hygiene instructions.

Dental caries resulting in peri-apical abscess should be diagnosed in time before it progresses to and invades the surrounding bone.

Pregnant patients should be educated regarding the safe use of antibiotics. As many patients avoid using antibiotics in pregnancy and localized abscess can progress into facial cellulitis.

Consideration for prophylactic removal of the wisdom teeth to avoid pericoronitis leading to severe odontogenic fascial space infections.

Pregnant patients reporting with dyspnea, dysphagia, limited mouth opening i.e., less than 20 mm, swelling extending beyond alveolar process and fever of above 101 F should be referred at the earliest to an oral and

maxillofacial surgeon in order to avoid life threatening complications in these patients.

A close liaison between Gynaecologist and Oral and Maxillofacial surgeon is of paramount importance for the successful management of fascial space infections in pregnancy.

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REFERENCES

- 1 Riggio MP, Aga H, Murray CA, Jackson MS, Lennon A, Hammersley N, et al. Identification of bacteria associated with spreading odontogenic infection by 16s rRNA gene sequencing. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2007; 103: 610-7.
- 2 Smyth AG. Management of orofacial infections. In: Booth PW, Schendel SA, Hausamen JE. *Maxillofacial Surgery*. 2nd ed. Philadelphia: Elsevier publishers 2007; 1550-71.
- 3 Turner M, Aziz SR. Management of the Pregnant Oral and Maxillofacial Surgery Patient. *J Oral Maxillofac Surg*. 2002; 60: 1479-88.
- 4 Flynn RT, Susarla SM. Oral and maxillofacial surgery for pregnant patients. *J Oral Maxillofac Surg*. 2007; 19: 207-21.
- 5 Flynn TR. Complex odontogenic infections. In: Hupp JR, 111 EE, Tucker MR. *Contemporary Oral and Maxillofacial Surgery*. 5th ed. India: Elsevier publishers 2009; 317-36.
- 6 Suresh L, Radfar L. Pregnancy and lactation. *J Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004; 97(6): 672-82.
- 7 McAuliffe F, Kametas N, Costello J, et al. Respiratory function in singleton and twin pregnancy. *BJOG* 2002; 109: 765-9.
- 8 Garcia-Rio F, Pino JM, Gomez L, et al. Regulation of breathing and perception of dyspnea in healthy pregnant women. *Chest* 1996; 110: 446-53.
- 9 Skatrud JB, Dempsey JA, Kaiser DG. Ventilatory response to medroxyprogesterone acetate in normal subjects. *J Appl Physiol Respir Environ Exerc Physiol* 1978; 44: 393-44.
- 10 Flynn TR, Shanti RM, Levy M, et al. Severe odontogenic infections: I. Prospective report. *J Oral Maxillofac Surg* 2006; 64: 1093-103.
- 11 Lawrenz D, Whitley B, Helfrick J. Considerations in the management of maxillofacial infections in the pregnant patient. *J Oral Maxillofac Surg* 1996; 54: 474-85.
- 12 Piriz RL, Angulair L, Gimenez MJ. Management of odontogenic infection of pulpal and periodontal origin. *Med Oral Patol Oral Cir Bucal* 2007; 12: 154-9.
- 13 Vieira F, Allen SM, Stocks RMS, Thompson JW. Deep neck infection. *Otolaryngol Clin N Am* 2008; 41: 459-83.
- 14 Rahman ZA, Hamimah H, Bunyarit SS. Clinical patterns of orofacial infections. *Ann Dent Univ Malaya* 2005; 12: 18-23.
- 15 Rega AJ, Aziz SR, Ziccardi VB. Microbiology and antibiotic sensitivity of head and neck space Infections of odontogenic origin. *J Oral Maxillofac Surg* 2006; 64: 1377-80.
- 16 Lee JK, Kim HD, Lim SC. Predisposing factors of complicated deep neck infection: An analysis of 158 cases. *Yonsei Med J* 2007; 48: 55-62.
- 17 Aroesty JH, Lanza JT, Lucente FE. Otolaryngology and pregnancy difficult management decisions. *J Otolaryngol - Head and Neck Surg* 1993; 109(6): 1061-9.
- 18 Silver RM, Peltier MR, Branch DW. The immunology of pregnancy. In: Creasy RK, Resnik R, eds. *Maternal-Fetal Medicine: Principles and Practice*. Philadelphia, Pa: W. B. Saunders; 2004: 89-109.
- 19 Lawrenz DR, Whitley BD, Helfrick JF. Considerations in the management of maxillofacial infections in the pregnant patient. *J Oral and Maxillofac Surg*. 1996; 54(4): 474-485.
- 20 Scannapieco FA, Bush RB, Paju S. Periodontal disease as a risk factor for adverse pregnancy outcomes. A systematic review. *Annals of Periodontology*. 2003; 8: 70-78.
- 21 Goepfert AR, Jeffcoat MK, Andrews WW, et al. Periodontal disease and upper genital tract inflammation in early spontaneous preterm birth. *Obstetrics and Gynecology*. 2004; 104(4): 777-83.
- 22 Moore PA. Selecting drugs for the pregnant dental patient. *Journal of the American Dental Association*. 1998; 129(9): 1281-6.
- 23 Awe RJ, Nicotra MB, Newsom TD. Arterial oxygenation and alveolar-arterial gradients in term pregnancy. *Obstet Gynecol* 1979; 53: 182.
- 24 Barron WM. Medical evaluation of the pregnant patient requiring nonobstetric surgery. *Clin Perinatol* 1985; 12: 481-96.
- 25 Duvokot JJ, Peeters LL. Maternal cardiovascular hemodynamic adaptation to pregnancy. *Obstet Gynecol Surv* 1994; 49(Suppl): S1-14.
- 26 Barron WM. Medical evaluation of the pregnant patient requiring nonobstetric surgery. *Clin Perinatol* 1985; 12: 481-96.
- 27 Diokno AC, Compton A, Seski J. Urologic evaluation of urinary tract infection in pregnancy. *J Reprod Med* 1986; 31: 23-6.
- 28 Mikhail MS, Anyaegbunam A. Lower urinary tract dysfunction in pregnancy: a review. *Obstet Gynecol Surv* 1995; 50: 675-83.