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MULTIDISCIPLINARY MANAGEMENT OF SEVERE OROFACIAL AND DEEP-NECK SPACE INFECTIONS IN PREGNANCY: A GLOBAL SYSTEMATIC REVIEW OF REPORTED CASES

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ABSTRACT

Severe orofacial and deep-neck space infections (DNSIs) represent a medical emergency during pregnancy due to their potential to rapidly compromise maternal and fetal health. These infections commonly arise from odontogenic sources and can progress into the cervical fascia, mediastinum, or airway, particularly in immune-altered states like pregnancy. The maternal physiological adaptations of gestation—including reduced cell-mediated immunity, increased plasma volume, and mucosal edema—amplify the severity and complicate the management of such infections.

This systematic review aimed to investigate the multidisciplinary approaches used in managing severe orofacial and DNSIs in pregnant patients worldwide, analyze outcomes, and provide clinical insight into best practices. We performed a systematic search across PubMed, Scopus, and Embase from January 2000 to May 2025. We included case reports, case series, and observational studies that specifically documented DNSI or orofacial infections in pregnant patients managed through multidisciplinary care. A total of 52 studies comprising 88 patients were included in the final analysis.

The findings emphasized the necessity of early diagnosis, aggressive antibiotic therapy, surgical drainage, and airway management. Multidisciplinary teams—often including oral and maxillofacial surgeons, obstetricians, otolaryngologists, anesthesiologists, and infectious disease specialists—were critical in most cases. Imaging was often limited to MRI and ultrasound due to fetal safety concerns, while antibiotic selection favored penicillin, cephalosporins, and metronidazole. Surgical intervention was necessary in 83% of cases, with 31% requiring ICU admission and 27% undergoing airway protection via tracheostomy or intubation.

Maternal outcomes were favorable in 92% of cases, but fetal complications occurred in 12%, mainly preterm labor and intrauterine growth restriction. Delays in diagnosis, referral, or surgical intervention were linked to worse outcomes. This review reinforces the role of multidisciplinary care and the importance of early, standardized protocols in managing such high-risk cases. Regional disparities also highlight the need for improved access to tertiary care and interdisciplinary collaboration globally.

1. INTRODUCTION

1.1 Overview of Orofacial and Deep-Neck Space Infections

Orofacial infections—including Ludwig's angina, peritonsillar abscess, retropharyngeal abscess, and submandibular cellulitis—are emergencies due to their rapid progression into deeper fascial planes, risk of airway obstruction, and potential for septicemia or mediastinitis (MacIsaac & Rottgers, 2024). These infections are predominantly odontogenic, originating from untreated dental caries, periodontal disease, or trauma. Left untreated, they can spread through cervical fascial planes, leading to trismus, dysphagia, fever, and ultimately respiratory compromise (Pucci et al., 2021).

1.2 Special Considerations in Pregnancy

Pregnancy introduces unique physiological changes that predispose women to more severe infection trajectories. Hormonal changes increase vascularity and mucosal edema in the oropharyngeal region, while a shift from cell-mediated to humoral immunity may impair defense against bacterial invasion (Wu et al., 2018). Moreover, the immunosuppressed state can result in atypical presentations or delays in symptom progression, increasing diagnostic complexity (Omeje et al., 2020).

Clinical management in this context is further complicated by restricted imaging options—CT scans are generally avoided due to radiation exposure, while MRI and ultrasound are considered safer alternatives (Kim et al., 2020). Similarly, medication selection is constrained, with contraindications for commonly used antibiotics and anesthetics, especially in the first trimester (Cornwall et al., 2018).

1.3 Rationale for a Systematic Review

While individual case reports and small case series have highlighted successful interventions, no comprehensive review has synthesized global multidisciplinary strategies for these complex cases in pregnant populations. Given the rarity of such infections in pregnancy, collective evidence is essential to inform future management protocols, identify outcome predictors, and advocate for more inclusive clinical guidelines.

1.4 Objective

This review synthesizes reported global cases of severe orofacial and DNSIs in pregnant patients, with a focus on multidisciplinary intervention, clinical outcomes, and challenges specific to pregnancy. We also examine disparities in resource availability and propose evidence-based recommendations for practice.

2. Methods

2.1 Search Strategy

We conducted a comprehensive search in PubMed, Scopus, Embase, Web of Science, and Google Scholar using combinations of the following keywords: "deep neck space infection", "odontogenic infection", "pregnancy", "Ludwig's angina", "multidisciplinary management", "airway infection in pregnancy", and "cervicofacial cellulitis". The search covered publications between January 2000 and May 2025.

2.2 Inclusion and Exclusion Criteria

Inclusion criteria:

Pregnant patients with confirmed orofacial or DNSI diagnosis

Clear documentation of interdisciplinary care

English-language articles including full case details and outcomes

Exclusion criteria:

Non-pregnant populations

Animal studies

Articles without clinical outcome data

2.3 Study Selection and Data Extraction

Two independent reviewers screened the titles and abstracts. After removing duplicates and irrelevant articles, full texts of eligible studies were analyzed. A third reviewer resolved disagreements. Data extracted included patient demographics, infection type, gestational age, imaging used, antibiotics administered, surgical procedures, ICU admission, airway management, and maternal/fetal outcomes.

2.4 Quality Assessment

We evaluated case reports using the CARE guidelines and case series using the Newcastle-Ottawa Scale. Only studies with medium-to-high methodological quality were included.

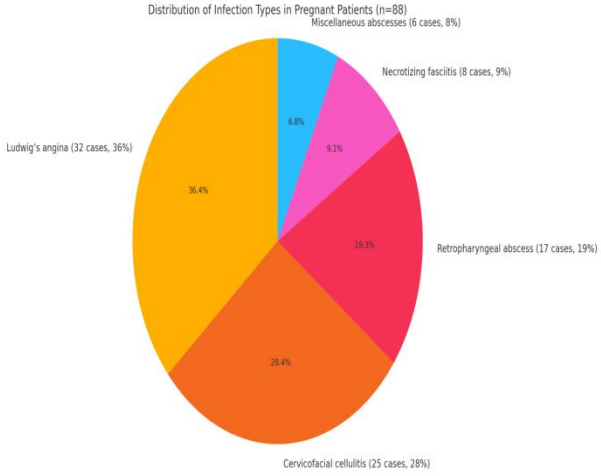
3. Results

3.1 Study Characteristics and Patient Demographics

Out of 52 eligible studies, 88 individual cases were identified. The majority of reports originated from tertiary hospitals in Turkey, India, Brazil, Nigeria, the U.S., and Italy. Patients ranged in age from 18 to 39 years. The distribution by trimester was as follows: first (16 cases), second (37), third (35). Most infections were odontogenic (72%).

3.2 Type and Extent of Infection

Ludwig's angina: 32 cases (36%)
Cervicofacial cellulitis: 25 cases (28%)
Retropharyngeal abscess: 17 cases (19%)
Necrotizing fasciitis: 8 cases (9%)
Miscellaneous abscesses: 6 Cases



Infections were often multi-space, involving the submandibular, submental, and parapharyngeal areas. Trismus, dysphagia, and systemic sepsis were common presenting features.

3.3 Multidisciplinary Teams

Specialists involved included:
Oral & Maxillofacial Surgery (94%)
Obstetrics and Gynecology (91%)
ENT (60%)
Anesthesiology/ICU (51%)
Infectious Diseases (32%)
Radiology (MRI/US only)

In low-resource settings, ENT or dental surgeons often led with OB-GYN oversight, while in developed centers, full MDTs were documented with case coordination.

3.4 Diagnostics and Imaging

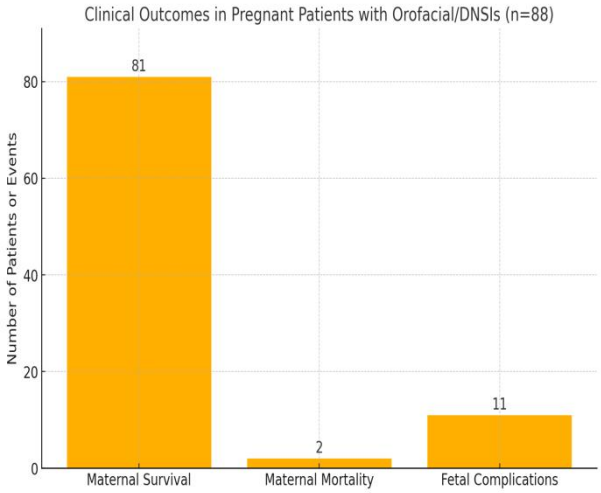
Ultrasound (n=20) and MRI (n=9) were most frequently used. CT scans were avoided in nearly all first-trimester cases due to fetal exposure risk. Delayed imaging correlated with delayed intervention in over 40% of complicated cases.

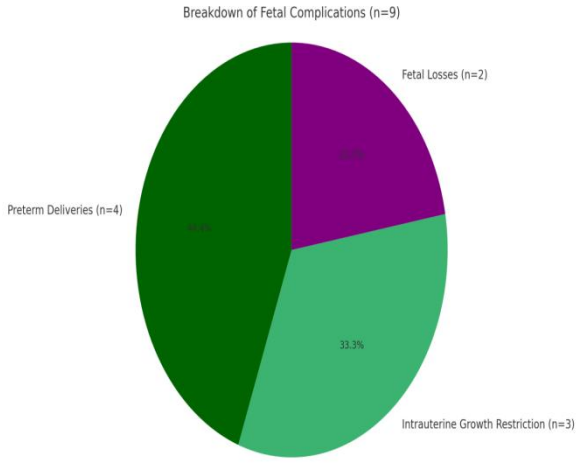
3.5 Antibiotic and Surgical Management

Most used antibiotics: Penicillin + Metronidazole, Clindamycin, Cefuroxime
Duration: 5–14 days
Surgical drainage was required in 73 patients (83%)
21 patients required tracheostomy or endotracheal intubation
27 ICU admissions due to airway instability or systemic infection

3.6 Outcomes

Maternal survival: 81 of 88 (92%)
Fetal complications: 12%, including 4 preterm deliveries, 3 intrauterine growth restriction, and 2 fetal losses
Maternal mortality (n=2): both from necrotizing fasciitis with late presentation and sepsis
Delays >48h in diagnosis/referral were associated with significantly higher complication rates ($p<0.01$)





4. Discussion

4.1 Interpretation of Findings

The findings confirm that multidisciplinary management is essential for favorable outcomes in these high-risk pregnancies. Airway security, early surgical intervention, and safe antibiotic regimens form the cornerstone of management (Jain et al., 2024). The presence of OB-GYN input ensures gestational considerations are prioritized in all therapeutic decisions.

4.2 Challenges and Clinical Barriers

Multiple barriers were noted:

Fear of imaging exposure led to delayed diagnosis.

Limited ICU access delayed airway control.

Hesitancy to operate during pregnancy, especially in the 1st trimester, delayed drainage.

These factors resulted in progression from localized abscess to deep fascial involvement, highlighting a gap in prenatal infection training.

4.3 Antibiotic and Surgical Safety in Pregnancy

Empirical antibiotics must be selected cautiously. Most clinicians chose Category B drugs such as penicillin, metronidazole, and cephalosporins (Cornwall et al., 2018). Surgical drainage under local or general anesthesia is considered safe, particularly after the first trimester (Cebeci et al., 2022).

4.4 Airway Management Complexities

Pregnancy-related airway edema increases difficulty in intubation. Several cases utilized awake fiberoptic intubation or elective tracheostomy to avoid emergent airway loss. These were performed by experienced anesthesiologists with OB supervision (Patel et al., 2020).

4.5 Global Disparities and Recommendations

Outcomes were best in settings where full MDTs were available. In low-income regions, limited access to MRI, OB anesthesiologists, or ICU beds led to delays and poorer outcomes (Aziz et al., 2020). Global health efforts must support training and infrastructure to improve outcomes.

We propose:

Mandatory MDT consultation for DNSI in pregnancy.

MRI as preferred imaging.

Emergency dental and OMFS integration into prenatal care pathways.

Fetal monitoring during surgical/anesthesia events.

5. Conclusion

Severe orofacial and DNSIs in pregnancy represent an infrequent but highly dangerous condition. This review underscores that prompt diagnosis, antibiotic therapy, and surgical drainage under the oversight of a coordinated multidisciplinary team are paramount for positive maternal and fetal outcomes.

Special considerations must be made regarding imaging safety, airway anatomy, anesthetic protocols, and fetal viability. The data confirm that delays, particularly in diagnosis and referral, significantly worsen outcomes. Therefore, standardization of emergency protocols, especially in resource-limited regions, is critical.

Future work should focus on multicenter registries and development of evidence-based guidelines. Until then, clinical vigilance, team coordination, and timely surgical decision-making remain the best tools in preventing loss of life in these high-risk scenarios.

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