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Research Paper

Pattern, Distribution, and Determinant of Outcomes of Pregnant Women with Orofacial Infections in a Tertiary Health Facility in Lagos Nigeria.

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Abstract
Adequate knowledge of associated physiological changes in pregnancy with decreased immune functions that affect almost every system of the bodyis important in improving outcomes. Severe odontogenic infections in pregnancy are rarely considered in most studies and the literature, despite the myriad of oral changes that occur in pregnant women in the perinatal period. Neglected dental care during pregnancy could result in life-threatening odontogenic infections. Orofacial infections can be preceded at times by dental caries with a toothache, periodontal tissue disease secondary to poor oral hygiene,and pericoronitis
Methods
Twenty-eight confirmed orofacial pregnant women were retrospectively recruited into the study using the case files. Information retrieved includes age, gender; duration of the infection at presentation, fascial spaces involved, and whether admitted or not. The trimester period as of the time presented, nature of surgical procedures done such as extraction of teeth involved, incision and drainage, and tracheostomy as was required Data were analyzed using IBM SPSS version 21.0.
Results
The mean age of the participants was 28.96 with a range of 17 to 42 years. 30-39 years old have the highest population 13(46.4%). Both primary and secondary level of education has near equal distributions of 10(35.7%) and 13(46.4%) respectively. 11 (39.3%) of the patients were in their first trimester of pregnancy and most of them 13(46.3%) had fair oral hygiene (1.3-3.0). Most cases seen were admitted 22(78.6%),with

significant differences observed for oral hygiene (p=0.003), duration of infection at presentation (p=0.005), and systemic disease (p=0.005).

Conclusion

The overall well-being of the pregnant woman and the fetus posesa serious challenge to the oral and maxillofacial surgeon for effective surgical management. Elective procedures can be delayed to the postpartum period, but emergency conditions should be promptly treated.

Keywords:*pregnant woman, orofacial or space infection, incision, and drainage*

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I. Introduction

The lack of international clinical guidelines for the management of common oral conditions in pregnancy compounded the problem of having a concise approach to the standard care of oral infections in pregnant mothers[1]. Only one-half of pregnant womenwere documented to attend to their oral problems[23].Adequate knowledge of associated physiological changes in pregnancy with decreased immune functions that affect almost every system of the bodyis important in improving outcomes and reducing morbidity or mortality during orofacial infection management[4].Severe odontogenic infections in pregnancy are rarely considered in most studies and the literature[5]

In the perinatal period, Oral changes do occur in pregnant women,30 -70% of pregnant females present with gingivitis, periodontal diseases, bleeding gingivae, hyperplastic gingivae, and pregnancy epulis[6,7]. Neglected dental care during pregnancy could result in life-threatening odontogenic infections[8]. Pregnant women have a high tendency to develop tooth decay due to the oral cavity's acidic environment, increased consumption of a sugary diet, and poor attention toward good oral hygiene[7]. Nausea and vomiting prevent most from observing proper oral toiletingpractice[3]. Frequent vomiting episodes during pregnancy do result in an oral acidic environment that can causedemineralization of teeth making them prone to caries[1,9]. Several females also develop frequent esophageal gastric reflux due to relaxation of lower oesophageal sphincter tone and increased gastric pressure which also make the oral cavity acidic[10]

Orofacial infections can be preceded at times by dental caries witha toothache, periodontal tissue disease secondary to poor oral hygiene, and pericoronitis[119].Thesefurther can be associated with fever,dysphagia, odynophagia, reduced mouth opening, and progressive facial swellings. This may lead to death from acute airway obstruction or multi-organ failure.

The introductionof antibiotic therapy has led to improvements in the outcome of management of such severe infections[4,8].However, early diagnosis is crucial for effective therapy in pregnancy oral infections.Therapy for fascial space infections is always challenging, and it's even more crucial during pregnancy because of the possible life-threatening condition for both the mother and the fetus.Complicated odontogenic infections can result in airways compromise requiring emergency tracheostomy[12]. Further complications canoccur like mothers with preterm delivery, low birth weight of babies, fetal growth restriction, the development of preeclampsia, as well as the death of the mother and/or the fetus[3,13]. Doumbia-Singare et al[14]. and Osunde et al[11,15]. reported an incidence of the maternal death rate of 25% in their studies. How maternal death occurs during this infection is not too clear however, they have been thought to be associated with increased inflammatory mediators[3,16]. Maternal periodontitis represents one potential source of microorganisms that are known to routinely enter the circulation to influence the health of the mother and the unborn baby[6].The immune system does becomesuppressedinresponseto pregnancy, therefore decrease in cell-mediated immunity and naturalkillercellactivityis observed.Pregnancy fascial space infections thus have the potential tobecome fast-spreadingdeep space infections and compromise the airway.Therefore, this study aims to assess the pattern, facial space distribution, and teeth associated with pregnant women presenting with orofacial infections in a tertiary health facility In Lagos Nigeria. It is also to determine factors associated with the outcome of the infections.

II. Methods

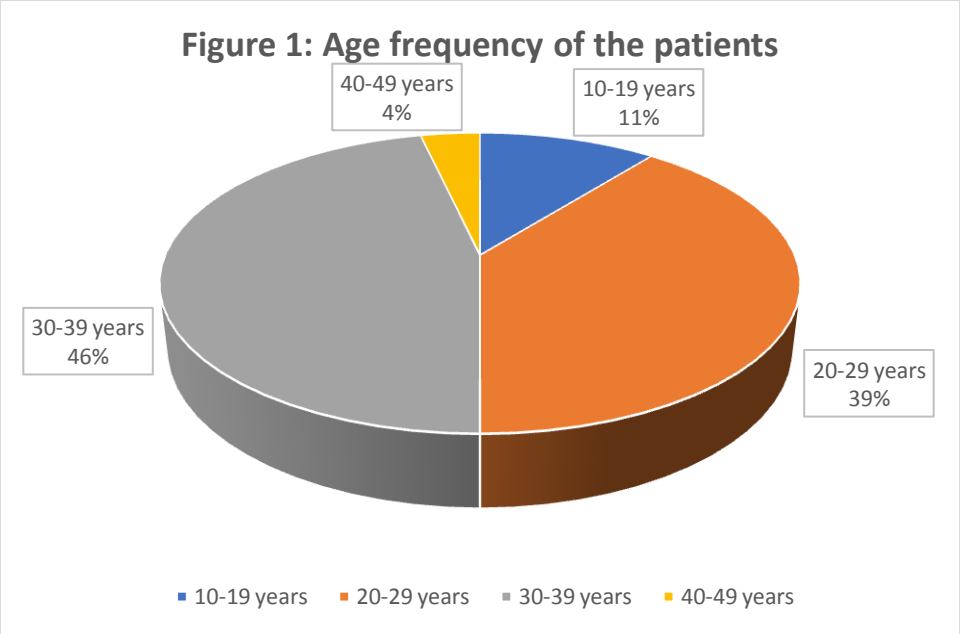
Twenty-eight confirmed orofacial pregnant women were retrospectively recruited into the study using the case files. Pertinent patient information retrieved includes sociodemographic data such as age, gender; duration of the infection at presentation, fascial spaces involved,and whether admitted or not. The trimester period as of the time presented, nature of surgical procedures done such as extraction of teeth involved, incision and drainage, and tracheostomyas was required. All patientsinvolved are co-managed with obstetrics and gynecologist and anesthesiologist as necessitated in the management.

Protocols for management
Infection assessment- (extent of diffuse swelling-spaces involved, presence of trismus)
*Airway assessment- patient in distress, tending towards distress or not distressed
*Maternal and fetal review/monitoring (O&G)
*Need for admission or not (all admitted cases strictly under OMFS)
*Request for urgent investigations (such as microscopic and sensitivity tests, Full blood count, electrolyte, urea, and creatinine, periapical radiographs, and essential radiographs)
*Commencing of intravenous antibiotics(IV Augmentin, flaggy, and paracetamol)
*Surgical management- (informed consent obtained)
Extraction- under local anesthesia
Incision and drainage- (placement of drains, all under local anesthesia)
Administration of nutritional and supportive therapy
Daily wound dressing
Re-assessment by managing teams
Discharge with weekly reviews

Analysis
Descriptive statistics were used to characterize demographic variables such as age and sex, for descriptive continuous variables, the mean, median, minimum and maximum values were determined. Pearson's chi-square was used to test for the association of the different variables and the outcome of the treatmentwith a p-value set at <0.05.Data wereanalysed using IBM-SPSS statistics for windows, Version21.0. M Corp.

III. Results

A total of twenty-eight pregnant women confirmed with single or multiple fascial spaces were analyzed. The mean age of the participants was 28.96 with a range of 17 to 42 years. 30-39 years old have the highest population 13(46.4%) while the 40-49 years old has the least 1(3.6%) (Figure 1). Concerning space involvement (Figure 2), submandibular space was the commonest as single and multi-space infection (14.3% & 35.7% respectively). Most of the patients 10(35.7%) waited for 3 to 4 weeks before presenting at the hospital for treatment (Figure 3). 3(10.7%) have a positive history of regular alcohol consumption, and two of the patients 2(7.1%) were known as diabetic.



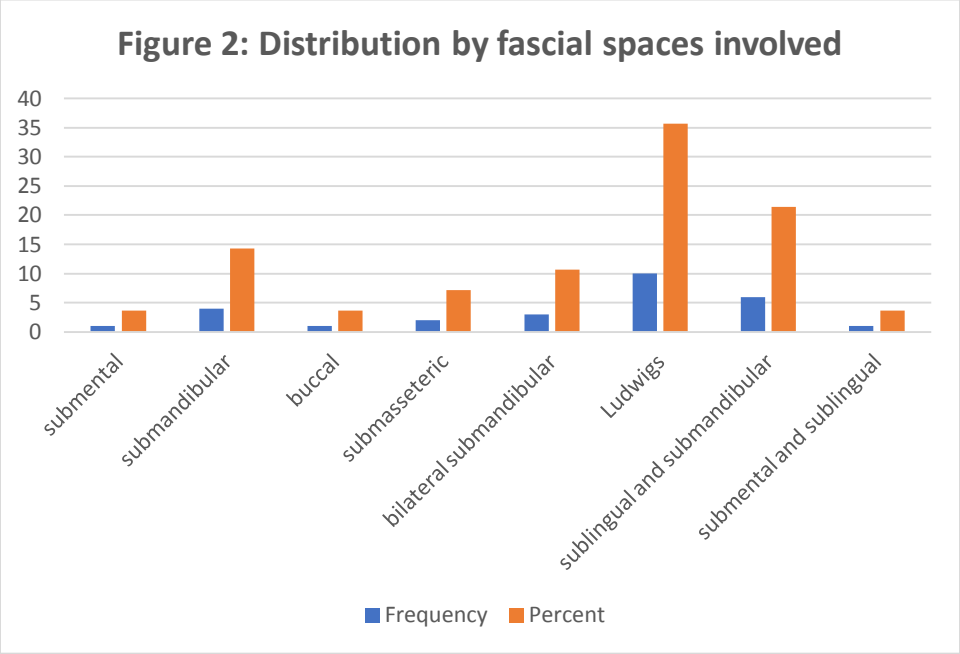


Table 1: Description of the variables.

Variable		Frequency	Percentage
Occupation	Housewife	8	28.6
	Trading/business	12	42.9
	Civil servant	4	14.3
	Students	4	14.3
Educational level	Primary	10	35.7
	Secondary	13	46.4
	Tertiary	5	17.9
Trimester	First	11	39.3
	Second	9	32.1
	Third	8	28.6
Oral hygiene	Good (0-1.3)	7	25.0
	Fair (1.3-3.0)	13	46.4
	Poor (3.1-6.0)	8	28.6
Teeth involved	13-23	2	7.1
	34-38	11	39.3
	44-48	15	53.6
Tracheostomy use	No	25	89.3
	Yes	3	10.7
Treatment	Medications only	6	21.4
	Extraction + Incision and drainage	22	78.6
Admission	Yes	22	78.6
	No	6	21.4
Outcome	Discharged	26	92.9
	Dead	2	7.1

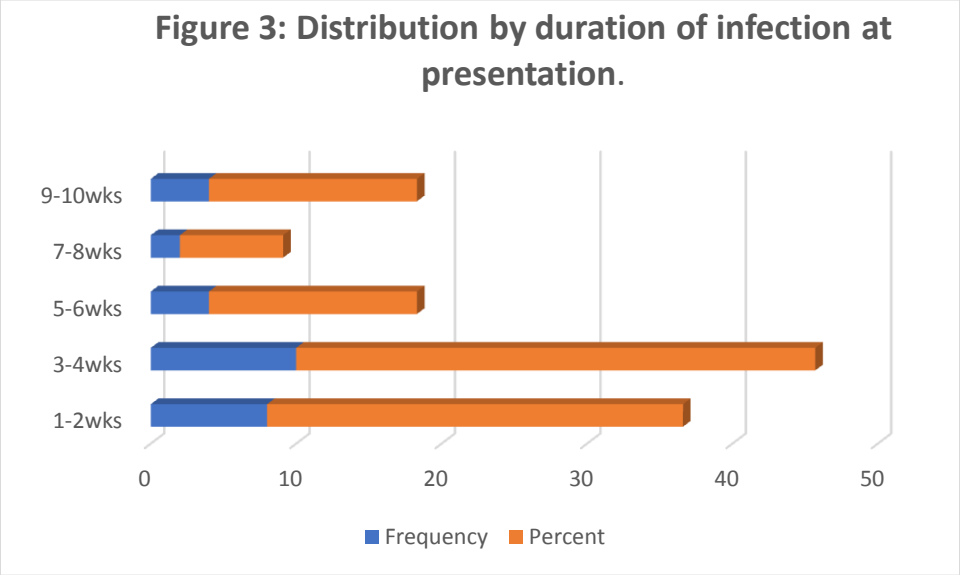


Table 2: Association between the variables and admission/outcome

Variable		Admission			Outcome		
		Yes	No	P-value	Discharged	Dead	P-value
Age range (years)	10-19	1	2	0.18	3	0	0.26
	20-29	10	1		11	0	
	30-39	10	3		11	2	
	40-49	1	0		1	0	
Occupation	Housewife	6	2	0.23	8	0	0.39
	Trading/business	11	3		11	1	
	Civil servant	3	1		3	1	
	Students	2	2		4	0	
Educational level	Primary	8	2	0.60	9	1	0.46
	Secondary	10	3		12	1	
	Tertiary	4	1		5	0	
Trimester	First	10	1	0.26	11	0	0.27
	Second	6	3		8	1	
	Third	6	2		7	1	
Oral hygiene	Good (0-1.3)	8	0	0.34	7	0	0.003*
	Fair (1.3-3.0)	11	2		12	1	
	Poor (3.1-6.0)	3	4		2	1	
Teeth involved	13-23	2	0	0.60	2	0	0.14
	34-38	8	3		9	2	
	44-48	12	3		15	0	
Tracheostomy use	No	19	6	0.06	24	1	0.22
	Yes	3	0		2	1	
Duration of infection at presentation	1-2 weeks	7	1	0.29	7	1	0.005*
	3-4 weeks	10	0		9	1	
	5-6 weeks	3	1		4	0	
	7-8 weeks	1	1		2	0	
	9-10 weeks	1	3		4	0	
Fascial spaces involved	Submental	1	0	0.007*	1	0	0.49
	Submandibular	1	3		9	0	
	Buccal	0	1		1	0	
	Submasseteric	1	1		2	0	
	Bilateral submandibular	3	0		3	0	
	Ludwigs angina	10	0		8	2	
	Sublingual+submandibular	5	1		6	0	
	Submental+submandibular	1	0		1	0	
Systemic disease	None	19	6	0.36	24	1	0.005*
	Diabetes mellitus	2	0		1	1	
	Others	1	0		1	0	

Both primary and secondary level of education has near equal distributions of 10(35.7%) and 13(46.4%) respectively, several of the women are involved in trading/business 12(42.9%) while civil servants and students have equal distributions of 4(14.3%) (Table 1). 11(39.3%) of the patients were in their first trimester of pregnancy and most of them 13(46.3%) had fair oral hygiene (1.3-3.0) (Table 1).
The mandibular (44-48) teeth were the commonest origin of infection spread 15(53.6%) followed by the mandibular (34-38) teeth 11(39.3%) (Table 1). Extraction of the focus teeth followed by incision and drainage was the commonest form of treatment employed 22(78.6%), and conservative management with medications ranked the least 6(21.3%) (Table 1).
Most cases seen were admitted 22(78.6%), and 6(21.4%) were managed without being admitted. Three of the patients also had surgical tracheostomy under local anesthesia (10.7%), 26(92.9%) were discharged home after certified assessment from the managing teams, and two mortality was recorded in the study.

Association of variables with admission and outcome

Associations of the independent variables with the dependent variables (admission and outcome) (Table 2) using the student t-test revealed no statistical significance was observed with age, occupation, education, trimester, teeth involved, and the fascial spaces for the outcome (discharged/dead). There is however significant difference observed for oral hygiene (p=0.003), duration of infection at presentation (p=0.005), and systemic disease (p=0.005). Only thefascial spaces demonstrated a significant difference inthe admission of the patients (p=0.007).

IV. Discussion

Maxillofacial infections are fairly common and can affect any age group, sex, and the pregnant individual[10,17]. The management of the pregnant patientsrequires special considerations in maintaining the maternal-fetal unit and assuring a normal pregnancy[18]. In the early stage of the infection, patients' symptoms are easily overlooked, andfrequently, patients are worried about the effects of drugs on their unborn child, which often leads to delays in diagnosis and treatment.[13]A higher incidence of orofacial infections and mortality rate has been reported in developing countries and this has been attributed to malnutrition, late presentation, and poor health services[11]While there is little evidence to support that the maternal immune system is globally suppressed during pregnancy, increased risks for certain types of infections indicate important qualitative immunological changes[19].

A woman's peak reproductive years are between the late teens and late 20s. By age 30, fertility (the ability to get pregnant) starts to decline[20]. No study has related age with immunity during pregnancy, however, studies have documented pregnancy reducesthe immunity of the mother[21,22]. Several women involved in the study are within the stated fertile age period, however physiological anemia/leukopeniadue to increased plasma volumedoes occur in a pregnant state.[23]In addition, there could also be increased monocytes and regulatory T cells witha corresponding decreasein the $CD4^{+}$,$CD8^{+}$ T cells, and B cells during this period irrespective of age[23]. This therefore can result in adecreased ability to fight infections which may further progress to an increased risk of severity in pregnant mothers[23].

The socioeconomic status of an individual especially the level of education and occupation influences the pattern of attitude observed inmaintaininggood oral health. Lower-income and fewer years of education are said to increase the risk for oral disease. This study concurred with the previous studies that education is a risk factor for poor oral hygiene[2425,26].Both the education and occupation status of the pregnant patients in the study hasno statistical influence on the admission duration or the outcome.Studies have discovered that poor oral hygiene, more consumption of sugary foods,and no visit to the dentist for a check-upare very much prevalent among patients with no education or lower education status[27].Paganini-Hill et al[28] and Hayasaka et al[29] reported that people with poor oral health care habits or hygiene had a higher risk of mortality[30]. In agreement with the stated reasons, several of the patients with poor (3.1-6.0) or fair (1.3- 3.0) oral hygiene in this study belong to the group with the basic education (primary and secondary level) and the two recorded death in the study are also within the same group. Other reasons that may be responsible for this poor oral hygiene are poor oral health awareness anderroneous beliefs about good oral health practices among the people. Konstantinos et al[2]however, did notfind arelationshipbetween socioeconomic status or educationallevel and the likelihood of the effect on oral health.

The trimesterdoes not seem to have any associationwith the severity, admission and outcome recorded. A regular visit to the hospital for proper monitoringand review is very pertinent to a good outcome.The secondtrimester isreportedto be the safest period for procedures, the uterus is said to beat a lower level thantheumbilicusallowingforcomfortduring dentaltreatment[17,18]. Furthermore, it's important to note that organogenesis during the periodhasbeen completed and the threat of abortionis reduced.[11]It should be noted that during the third trimester there couldbe compression of the inferior vena cava if the patient is supine and this

may lead to hypotension, nausea, and vomiting. Considering this during surgical procedures is essential for positioning the patient on the dental chair or operating table[11]

Early presentation for treatment is very pertinent to a good result. The average period of infection at presentation was five weeks. Thisperiod likely gives room forfurther spread and prevention of timely intervention to reduce severity and mortality. Duration of infection at the time of presentation was significantly related to the discharge period and the mortality observed. This is made worse in a third world nation where this study was carried out, as delay in presentation is often associated with the inability to finance the cost of care and limited attention to oral health by most pregnant women, thus several presents late for management[3,31,32]. The National Health Insurance Scheme though available is poorly implemented in Nigeria and may also be difficult to access where available, thus a large number of patients pay out of pocket.[31] Konstantinos et al[2] described in their study that knowledge of free dental treatment during pregnancy was independently associated with visiting a dentist, implying that financial reasons largely determine the attendance of dental treatment.

. The submandibular space is the most common location of odontogenic abscesses,[23,]and is the most involved region for both single-space and multi-space infections in this study. Several studies have reported submandibular space infection; the proximity of the root of the mandibular posterior teeth often leads to its involvementwhen affected[12,33,34]. Several factors may be responsible for the rapid progression of infection in these fascial planes, factors such as delayed presentation, an ineffective therapeutic approach,and poor attitude to proper health management[12]. The most frequent teeth and quadrant affected is(44-48) and (34-38). This is in agreement with some other studies,[1233,34]Both maxillary and mandibular molarocclusal surfaces are often subjected to heavy masticatory stress, they are also highly susceptible to caries, greater tendency to have stagnation of food debris on occlusal fissures, and reduced accessibility to thorough hygiene. [35]All these contribute to the tendency of being fractured or infected by caries which can result in space infection.

The standard means of management of spreading odontogenic infections need to be followed[18]. Elective dental treatment is best delayed till after delivery however, emergency dental treatment can be provided in any trimester[17,21], dental treatment is less of a risk compared witha progressing facial infection[23]. Careful detailed assessment and work-up of all the patients were done, and radiographic evaluation was done using rectangular collimated beams, lead apron, and thyroid collar to reduce exposure. There is no contraindication to the sparing use of dental radiology. It has been shown that doses of less than 5-10 centigrams (cGy) have no association withincreased development of congenital defects or intra-uterine growth retardation.[17,21]Dental radiography during pregnancy produces negligible radiation exposure to the fetus in utero, around 1/50000 of the direct exposure to the head.[21]Patients in this study under intravenous Augmentin and Paracetamol cover had an extraction of the focus teeth. The local anesthetic agent was administered in the form oflidocainecontaining adrenaline 1:100,000 epinephrine.Local anesthesia of this kind had been documented also safe for use in pregnant patients[18,21]with minimal stress and the right patient/chair positioning the procedure was carried out. Emergency tracheostomy was done successfully in three cases presenting with airway compromise[12].Studies have reported fiber optic intubation method or tracheostomy using local anesthetics to secure the airway is difficult intubation, with the pregnant woman's right hip elevated 10-12 cm or rolled to the left side to lift the uterus off the inferior vena cava in other to prevent a supine hypotensive syndrome in the dental chairs[12,21]

V. Conclusion

There is a need for dentists working in conjunction with obstetrics &gynecologist to correct the myths and misconceptions many women have about oral health during pregnancy.A pregnant woman and the fetus pose a serious challenge to the oral and maxillofacial surgeon for effective surgical management. Elective procedures can be delayed to the postpartum period, but emergency conditions should be promptly treated.

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Conflict of interest
The authors declare no conflict of interest.

Image of a pregnantmother undergoing Surgical decompression with draining tubes in place

Fascial space infection

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