ORIGINAL ARTICLE

Association between oral health and need for hospitalization of women in a highly complex hospital unit

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ABSTRACT

Maintaining oral health is important for hospitalized patients. There is a bidirectional causality between some diseases of the oral cavity and systemic morbidities. **Objective**: To analyze the association between oral condition and hospitalization needs. **Methods**: Cross-sectional observational research with secondary data referring to the moment of the first dental appointment after hospital admission, from July 2017 to July 2019. To analyze the associations between the categorical variables, the Chi-square Partition test was applied, with 5% significance level. **Results**: 1683 patients were analyzed, and only 1.12% (N=19) did not need dental treatment. There was a higher frequency of oral alterations in patients hospitalized for cardiological, neurological and endocrine reasons. **Conclusions:** Some oral alterations are more common in hospitalized patients according to medical specialty; therefore, the oral condition can have a significant impact on the patient's general health.

Keywords: Hospitalization, Women's health, Oral health, Inpatients

INTRODUCTION

The mouth hosts many microorganisms, with different species living in the teeth, gums, cheeks, gingival sulcus, or palate, all interacting with their human host in health and in disease[1]. The passage of bacteria from the mouth into the bloodstream through interruptions of tissue integrity secondary to inflammation can cause systemic infections, as in the case of periodontitis or resulting from dental procedures[2].

A patient has an altered routine through the hospitalization process, which sometimes causes anxiety and stress due to the imminence of pain and discomfort, in addition to a certain fragility due to the pathological process and the hospital environment itself, which can interfere in the practice of oral hygiene[3].

The composition of dental biofilm is influenced by salivary flow, oral hygiene, and diet. A change in these factors can negatively affect the composition and amount of biofilm. Disease and medications can also alter oral flora. A deficient oral condition has been associated with difficulties in swallowing, deficient nutritional intake, impact on speech clarity, and increased infections[4,5].

Pathogenic microorganisms in dental biofilm have been associated with infectious and inflammatory processes that compromise the function of organs and systems, favoring increased morbidity and mortality. A precarious oral condition has been associated with cardiovascular and cerebrovascular diseases, as patients with coronary artery disease (CAD) have a higher prevalence of periodontal disease (PD), and patients with PD may be at in-

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creased risk of CAD, myocardial infarction, and stroke[6-8].

A deficient oral condition can increase the risk of local abscesses, aspiration pneumonia, and sepsis[9]. Pre-existing oral pathologies of hospitalized patients may worsen or new comorbidities may manifest themselves[3].

According to the Sistema Único de Saúde (SUS, the Brazilian national healthcare system), procedures involving state-of-the-art equipment and high costs are classified as highly complex (e.g., dialysis procedures, cardiovascular surgery, and endovascular procedures) [10].

Antimicrobial prophylaxis is recommended for certain groups of patients before a dental procedure[2], as well as a reduction in IL-6 after 90 days of non-surgical periodontal therapy[11]. Meanwhile, other research studies associate PD with certain systemic diseases such as diabetes[12], CAD[7,13], premature birth[14], and salivary markers in patients with kidney disease[15].

Due to the importance of the integrality of the individual's health, ranging from primary care to high complexity, the present study was conducted with the aim of analyzing the possible association between oral health and hospitalization needs in women.

MATERIAL AND METHODS:

Study design

This study was a cross-sectional observational study developed at the Presidente Dutra unit at the University Hospital of the Federal University of Maranhão, located in the city of São Luís do Maranhão. The unit offers medium and high complexity care to a mixed population of medical and surgical patients. The wards consist of 94 beds in the medical clinic and 84 beds in the surgical clinic and are covered by multidisciplinary teams.

Sample and data collection

In this study, only female patients aged 18 years or over from the Clinical Medical Inpatient and Surgical Clinic Units and attended to by the Dentistry service were selected. Those who were using mechanical ventilation and systemically decompensated in order to make dental consultation impossible and those with incomplete data in their medical records were excluded.

Secondary data were collected regarding the first dental appointment after hospital admission from July 2017 to July 2019. The variables investigated were age, pathological processes in the oral cavity, use of dental prostheses, and the reason for hospitalization, which was characterized by medical specialty according to the Federal Council of Medicine.

Regarding changes in the oral cavity, an oral lesion, a tongue coating, tooth mobility, dental calculus, caries, residual root, teeth with indicated extraction, tooth absence, edentulism, and prosthesis use in a dichotomized manner were investigated.

Statistical analysis:

The data were organized in Microsoft Excel for Windows 2016 (Microsoft; Redmond, WA) and were not analyzed in BioEstat version 5.0 and Epi Info version 7. Descriptive analysis was performed, and defined and absolute frequencies of technical variables and means and standard de-

viations of quantitative variables were obtained. To analyze the variations between strategic variables, the chi-square test was used, with a significance level of 5%.

This research was approved by the Ethics and Research Committee of the University Hospital of the Federal University of Maranhão, São Luís / MA under opinion number 2,848,777

RESULTS

The sample consisted of 1683 patients from 14 medical specialties: Vascular Surgery, General Surgery, Thoracic Surgery, Neurology, Cardiology, Orthopedics, Otorhinolaryngology, Plastic Surgery, Nephrology, Rheumatology, Hematology, Endocrinology, Gastroenterology, Gynecology, Infectology and Coloproctology. The average age of the patients evaluated was 48.73 (± 16.27) years, with a median of 48 years and ranging between 18 and 90 years, with a greater age range in Cardiology.

Regarding the participants' reason for hospitalization, General Surgery was responsible for 31.85% of hospitalizations, followed by Cardiology (16.93%) and Rheumatology (8.56%), as shown in Table 1.

Table 1 – Distribution of patients by medical specialties

Need for hospitalization	n	%
Vascular Surgery	51	3.03%
General Surgery	536	31.85%
Thoracic Surgery	125	7.43%
Neurology	98	5.82%
Cardiology	285	16.93%
Orthopedics	60	3.57%
Otorhinolaryngology	46	2.73%
Plastic Surgery	70	4.16%
Nephrology	66	3.92%
Rheumatology	144	8.56%
Hematology	26	1.54%
Endocrinology	63	3.74%
Gastroenterology	87	5.17%
Others	26	1.54%
Total	1683	100.00%

There was a statistical difference in the distribution of patients admitted to the wards of the Medical Clinic and Surgical Clinic according to the reason for hospitalization and the presence or absence of lesions in the oral mucosa and the tongue coating. These differences were evident in the General Surgery ($\chi 2=6.0824$; n=20) and Cardiology (χ 2=12,899; n=29) specialties which had a greater presence of lesions in the oral mucosa; Endocrinology was almost significant p = 0.059 ($\chi 2=3,5626$; n=7), as shown in Table 2.

Table 2 - Distribution of patients according to the reason for hospitalization and the presence or absence of oral changes in the oral mucosa.

Need for hospitalization	Oral mucosa									
	Lesion in the oral mucosa					Tongue Coating				
	No		Yes		P	No		Yes		P
	n	%	n	%		n	%	n	%	
Vascular Surgery	48	94.12	3	5.8		41	80.39	10	19.61	
General Surgery	516	96.27	20	3.73		391	72.95	145	27.05	
Thoracic Surgery	121	96.80	4	3.20		90	72	35	28	
Neurology	92	93.88	6	6.12		54	55.10	44	44.90	
Cardiology	256	89.82	29	10.18		195	68.42	90	31.58	
Orthopedics	57	95	3	5		41	68.33	19	31.67	
Otorhinolaryngology	45	97.83	1	2.17	0.002	35	76.09	11	23.91	0.001
Plastic Surgery	68	97.14	2	2.86		47	67.14	23	32.86	
Nephrology	62	93.94	4	6.06		38	57.58	28	42.42	
Rheumatology	140	97.22	4	2.78		91	63.19	53	36.81	
Hematology	23	88.46	3	11.54		13	50	13	50	
Endocrinology	56	88.89	7	11.11		43	68.25	20	31.75	
Gastroenterology	78	89.66	9	10.34		44	50.57	43	49.43	
Others	22	84.62	4	15.38		14	53.85	12	46.15	

The presence of a tongue coating was associated with hospitalizations due to General Surgery (*p*=0.0422; χ^2=4.1282; n=145), Neurology (*p*=0.0008; χ^2=11.2431; n=44), Nephrology (p=0,0423; χ^2=0,0423; n=28), Hematology (p=0,0469; χ^2=3,9486; n=13), and Vascular Surgery (p=0,0468; χ^2=0,0468; n=10).

Table 3 presents the results found in relation to dental condition. No significant differences were seen in terms of tooth mobility (p = 0.1592). In this group, Orthopedics had the highest number of cases (n=6).

Regarding the presence of stones (n=510), the p value found corresponded to 0.0027. There was a difference in General Surgery (p=0.0010; χ^2=12.7779; n=148), Orthopedics (p=0.0178; χ^2=5.6166; n=9), Gastroenterology (p= 0.0139; χ^2= 6.0483; n=36) and once again, Endocrinology presenting a borderline value of 0.0580 (χ^2=3.5946; n=25).

When studying the presence of caries (n=292), p<0.0001 was found. In relation to this variable, the difference occurred in the specialties Neurology (p=0.0196; χ^2=5.4510; n=23), Plastic Surgery (p=0.0057; χ^2=7.6536; n=12), Nephrology (p=0.0573; χ^2=0.0573; n=16), Rheumatology (p<0.0001; χ2=21.9721; n=45) and Endocrinology (p=0.0003; χ^2=12, 9250; n=22).

Table 3 - Distribution of patients according to the reason for hospitalization and dental condition

Need for hospitalization	Dental Condition														
	Mobility					Caries					Calculus				
	No		Yes		P	No		Yes		P	No		Yes		P
	n	%	n	%		n	%	n	%		n	%	n	%	
Vascular Surgery	50	98.04	1	1.96		41	80.39	10	19.61	< 0.0001	38	74.51	13	25.49	0.0012
General Surgery	531	99.07	5	0.93		464	86.57	72	13.43		388	72.39	148	27.61	
Thoracic Surgery	120	96	5	4		109	87.20	72	13.43		90	72	35	28	
Neurology	94	95.92	4	4.08		75	76.23	23	23.47		66	67.35	32	32.65	
Cardiology	275	96.49	10	3.51		251	88.07	34	11.93		201	70.53	84	29.47	
Orthopedics	59	98.33	1	1.67		51	85	9	15		51	85	9	15	
Otorhinolaryngology	45	97.83	1	2.17		39	94.78	7	15.22		36	78.26	10	21.74	
Plastic Surgery	70	100	0	0	0.1592	58	82.86	12	17.14		53	75.71	17	24.29	
Nephrology	62	93.94	4	6.06		50	75.76	16	24.24		41	62.12	25	37.88	
Rheumatology	138	95.83	6	4.17		99	68.75	45	31.25		91	63.19	53	36.81	
Hematology	25	96.15	1	3.85		19	73.06	7	26.92		18	69.23	8	30.77	
Endocrinology	61	96.83	2	3.17		41	65.08	22	34.92		38	60.32	25	39.68	
Gastroenterology	84	96.55	3	3.45		75	86.21	12	13.79		51	58.62	36	41.38	
Others	24	92.31	2	7.69		19	73.08	7	26.92		11	42.31	15	57.69)	

When analyzing the presence of residual root (N=300), General Surgery was the specialty with the highest frequency (n=95), followed by Cardiology (n=45) and Rheumatology (n=37). In this variable, there was no statistical difference, with p=0.2361, as shown in Table 4.

The group that corresponds to the presence of teeth requiring extraction had a p value of 0.0075 (n=359). In this case, the difference occurred in Rheumatology (p=0.0008; χ^2=11.2300; N=46) and Endocrinology (p=0.0075; χ^2=5.3124; n=21).

Table 4 - Distribution of patients according to pathological changes with greater impairment

Need for hospitalization	Pathological changes with greater dental involvement									
	Residual Root					Teeth With Indication Of Extractions				
	No		Yes		P	No		Yes		P
	n	%	n	%		n	%	n	%	
Vascular Surgery	41	80.39	10	19.61		39	76.47	12	23.53	
General Surgery	441	82.28	95	17.72		432	80.60	104	19.40	
Thoracic Surgery	104	83.20	21	16.80		102	81.60	23	18.40	
Neurology	80	81.63	18	18.37		74	75.51	24	24.49	
Cardiology	240	84.21	45	15.79		229	80.35	56	19.65	
Orthopedics	49	81.67	11	18.33		45	75	15	25	
Otorhinolaryngology	42	91.30	4	8.70	0,2361	41	89.13	5	10.87	0.0075
Plastic Surgery	59	84.29	11	15.71		58	82.86	12	17.14	
Nephrology	59	89.39	7	10.61		53	80.30	13	19.70	
Rheumatology	107	74.31	37	25.69		98	68.06	46	31.94	
Hematology	20	76.92	6	23.08		19	73.08	7	26.92	
Endocrinology	47	74.60	16	25.40		42	66.67	21	33.33	
Gastroenterology	74	85.06	13	14.94		75	86.21	12	13.79	
Others	20	76.92	6	23.08		17	65.38	9	34.62	

Table 5 shows the variables related to the use of prosthesis. It was found that when evaluating the absence of a tooth in the oral cavity, the presence (n=901) of such a variable was greater than its absence (n=782). With emphasis on General Surgery (n=296), followed by Cardiology (n=157) and Rheumatology (n=75). There was no statistically significant difference (p=0.5713). Similar behavior was observed when analyzing the presence of some type of edentulism (p<0.0001; n=1218;), where the difference occurred in the Cardiology specialties (p<0.0001; $\chi 2$=15.6330; n= 175), Otorhinolaryngology (p=0.0002; $\chi 2$=13.8520; n=44), Plastic Surgery (p=0.0103; $\chi 2$=6.5835; n=60), Rheumatology (p=0.03290; $\chi 2$=4.5524; n=116) and Gastroenterology (p=0.0030; $\chi 2$=8.8379; n=51).

Finally, regarding the use of some type of prosthesis, a p value of 0.0076 was obtained. Here the difference occurred in Otorhinolaryngology (p=0.0232; $\chi 2$=5.1548; n=9), Plastic Surgery (p=0.0095; $\chi 2$=6.7197; n=14), Rheumatology (p=0. 0271; $\chi 2$=4.8847; n=36) and Hematology (p=0.0556; $\chi 2$=3.6654; n=04).

Table 5 - Distribution of patients according to oral condition associated with the prosthesis

Need for hospitalization	Oral Condition														
	Absence of a tooth					Edentulism					Use of prosthesis				
	No		Yes		P	No		Yes		P	No		Yes		P
	n	%	n	%		n	%	n	%		n	%	n	%	
Vascular Surgery	24	47.06	27	52.92		16	31.37	35	68.63		30	58.82	21	41.28	
General Surgery	240	44.78	296	55.22		142	26.49	394	73.51		346	64.55	190	35.45	
Thoracic Surgery	57	45.60	68	54.40		35	28	90	72		81	64.80	44	35.20	
Neurology	42	42.86	56	57.14		20	20. 41	78	79.59		71	72.45	27	27.55	
Cardiology	128	44.91	157	55.09		110	38.60	175	61.40		173	60.70	112	39.30	
Orthopedics	33	55	27	45		15	25	45	75		39	65	21	35	
Otorhinolaryngology	26	56.52	20	43.48	0.5713	2	4.35	44	95.65	< 0.0001	37	80.43	9	19.57	0.0076
Plastic Surgery	41	58.57	29	41.43		10	14.29	60	85.71		56	80	14	20	
Nephrology	31	46.97	35	53.03		21	31.82	45	68.18		44	66.67	22	33.33	
Rheumatology	69	47.92	75	52.08		28	19.44	116	80.56		108	75	36	25	
Hematology	11	42.31	15	57.69		4	15.38	22	84.62		22	84.62	4	15.38	
Endocrinology	28	44.44	35	55.56		16	25.40	47	74.60		45	71.43	18	28.57	
Gastroenterology	37	42.53	50	57.47		36	41.38	51	58.62		53	60.92	34	39.08	
Others	15	57.69	11	42.31		10	38.46	16	61.54		17	65.38	9	34.62	

DISCUSSION

This study brings as a difference to the scientific literature the evaluation of patients hospitalized in wards and not in ICUs. It was found that General Surgery and Cardiology were the medical specialties that led to more women being admitted to wards. Determining the reason for hospitalization and the oral condition of these patients are relevant due to the influence that these health states exert on each other, interfering with the recovery of the health of the hospitalized individual, and hospitalized women must have the chance to obtain relevant information about oral health in hospitals[16].

Even though in the hospital where the present study was carried out, there are dentistry professionals working for more than five years, it was detected that only 1.12% of the patients evaluated did not need dental treatment. While there is a study showing a more favorable reality, where 17.5% of hospitalized patients did not need invasive dental treatment [17], there is also a record that dental exams in hospitalized pregnant patients revealed that only 15.2% did not need dental treatment[16].

In this research, a significant association was found between the presence of oral lesions and patients hospitalized in Cardiology, a sector where there is a protocol established by the hospital's Dentistry team, which may have contributed to these findings as the detection of lesions has become more frequent. changes since all patients who will undergo cardiological surgery must undergo prior dental care to be able to undergo treatment. Another relevant result that corroborates this hypothesis lies in the low rates of changes in hard tissues found in that group, proving the greater dental care provided to these patients. It is noteworthy that cardiovascular diseases (CVD) are part of a set of diseases of the vascular system and heart that affect many individuals worldwide, such as infective endocarditis, hypertension, ischemic heart disease and dysrhythmias [18]. Consequently, they are patients who require attention and differentiated assistance provided by the Hospital Dentistry team.

The medical condition most repeatedly reported as a reason for referring patients to dentists in the hospital setting is cardiovascular disease. It is noteworthy that periodontal disease, a high number of cavities and large tooth loss are associated with future adverse cardiovascular events, while frequent brushing and regular visits to the dentist to carry out professional cleaning procedures were associated with a lower cardiovascular risk[19]. Therefore, it is essential to create a comprehensive treatment plan for this group of individuals, considering all the pros and cons related to the patient's medical condition [8,18].

In relation to the presence of oral lesions, Endocrinology also presented significant values, with a high frequency of dental calculus, residual roots and extractions indicated. It is worth highlighting the fact that diabetic patients are part of this group, and diabetes has been associated with different oral diseases, such as salivary and taste dysfunction, bacterial and fungal infections, and lesions of the oral mucosa such as stomatitis, geographic tongue, traumatic ulcer, lichen planus [20,21]. Furthermore, delayed healing is also observed in individuals with Type I diabetes, compared to the control population [22].

When analyzing the relationship between residual root and teeth with recommended extraction, a higher frequency was observed in patients admitted due to the Rheumatology and Endocrinology specialties, with the average age found being 40 years for Rheumatology and 45 years for Endocrinology. Corroborating that in adults, periodontal disease and caries are the main causes of tooth loss[5]. A recent study demonstrated the correlation between advanced age and worse oral health status, in addition to more serious systemic conditions, due to the increased life expectancy of population[17].

The presence of caries disease was found in 17.35% of the patients evaluated, and in this group, Neurology, Plastic Surgery, Nephrology and Rheumatology showed a positive association with the presence of caries. Although patients belonging to Nephrology have continuous dental follow-up at the hospital where the research was carried out, it is believed that this result is due to the patient's systemic condition, which often does not allow dental care, leading to the postponement of their realization. It is noteworthy that there are multiple mechanisms by which kidney disease can impair oral health status, including impaired mineralization, malnutrition, drug excretion, inflammation and impaired immunity due to the condition itself, as

well as direct immunosuppressive therapy in some individuals [9].

As for Neurology, it is known that patients may experience limited movement and even difficulty opening their mouths as sequelae, which results in a significant obstacle in performing simple oral hygiene. Regarding Rheumatology patients, it should be known that many were carriers of Lupus, and that patients affected by this disease may present significant changes in salivary flow, buffer capacity, leading to changes in the oral microbiota, factors directly related to caries disease [23]. In relation to the Plastic Surgery group, it should be noted that in this case these are reconstructive surgeries and not simply for aesthetic purposes, being composed of patients with an average age range of 42 years, often coming from another medical specialty.

The study carried out had limitations as it was a convenience sample and based on secondary data from medical records. However, the sample size and robust selection criteria made the results consistent. Thus, it is reiterated that oral condition is linked to general health, systemic diseases, and mortality, so it is necessary for the hospital environment to encourage good oral hygiene practices. Furthermore, oral health is also linked to the patient's nutrition and recovery since poor oral health has been associated with nutritional status and unsatisfactory nutritional intake methods in hospitalized patients[24]. This situation becomes relevant for recovery and hospital discharge, which will reflect on the period of hospitalization, as when the patient's discharge is postponed, there is a decrease in hospital bed turnover, consequently leading to longer care times for hospitalized patients.

CONCLUSION

In this study, it was observed that most patients evaluated presented with oral alterations, and some of these are described as risk factors for the worsening of systemic health. The oral condition has a significant impact on a patient's systemic condition.

Studies such as the present one is expected to increase awareness of the need for dentists as permanent members of multidisciplinary teams as a way of providing comprehensive care.

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Contribution of each author to the article

The authors of this publication contributed in the following main aspects:

HLAL: completed his Master's Thesis, which was the basis for the article. Supported research planning and field data collection, as well as data analysis, as well as writing the article.

FFL: supervisor of the work, supported the planning of the study, guided the collection and analysis of data and writing of the article.

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