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Research Article

Impact of Pregnancy on Dental Caries, Periodontal Diseases and Salivary pH, in Makkah Region

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Abstract

Introduction: Dental caries and periodontal diseases are affected by many factors that influences their severity or progression. There is a strong correlation between hormonal changes during pregnancy and women's health including oral health.

Aim: This study was conducted to evaluate the impact of pregnancy on dental caries prevalence, periodontal conditions and salivary pH.

Material and Method: Cross sectional study was conducted including (223) pregnant and non-pregnant women of an age 18 - 40 years attending to primary health care centers and Maternity and Children Hospital (MCH) in Makkah city. Data was collected through two ways: self-administrated questionnaire and clinical assessment to measure three oral parameters using DMFT index (Organization, 1997), Periodontal Disease Index (Ramfjord, 1967) and saliva pH.

Result: Statistically significant difference (p = 0.03) was detected between pregnant and non-pregnant women regarding the decayed components of DMFT index, with mean value (3.910 and 3.185 respectively). On the other hand, salivary pH was more alkaline among non-pregnant than pregnant women with statistically significant (p = 0.000). Regarding periodontal statues both groups showed nearly similar results with no significant difference. However, when comparing between the pregnancy trimesters we found development of deep pockets (> 6 mm) in the second and third trimesters.

Conclusion: The results show higher caries prevalence with low salivary pH among pregnant women than non-pregnant. Development of deep pockets among pregnant women specially in the last trimesters of pregnancy.

Keywords: *Pregnancy; Dental Caries; Periodontal Disease; Salivary pH; DMFT*

Abbreviations

MCH: Maternity and Children Hospital; WHO: World Health Organization; DMFT: Decay-Missing-Filled Index

Introduction

Pregnancy causes a variety of generalized changes in a woman's body due to the progressive cycle of hormonal influences. It makes women more susceptible to different oral diseases and infections such as, dental caries and periodontal diseases [1].

The high level of dental caries among pregnant women was reported by different studies; a study was conducted in Baghdad showed high significant differences in dental caries parameters (DMFS), (DS) in pregnant than non-pregnant women [2]. In addition, according

to periods of pregnancy, the third trimester and after delivery were the higher periods of dental caries prevalence [3]. On the other hand, another study showed no significant correlation between the gestational stages and DMFT scores; however, a significant association between the number of deliveries and their high DMFT scores was reported [4].

Many researchers investigated factors contributing with pregnancy that influence the incidence of dental caries; such as age, dental visit, educational level and mothers belief about dental care, which explain about 25% of the variation in the DMFT score between pregnant and non-pregnant women [5,6].

In assessing the role of saliva on dental caries development among pregnant women, a study reported an inverse relation between DMFT scores and salivary pH for both pregnant and non-pregnant women. Furthermore, the results displayed that the correlation was more significant in pregnant women. However, there was no association between salivary flow rate and DMFT index in both groups [7].

It is well known that steroid hormones increase during pregnancy, which may affect salivary pH and alternate the immune system response leading to gingival inflammation [8]. A negative correlation between salivary pH and gestational stages was also reported [3,9]. Women in their third trimester and after delivery have higher significant difference in levels of salivary pH than those in their first and second trimester. Moreover, pregnant women had significantly low salivary flow rate and pH when compared to after delivery [10].

The relation between periodontal health and pregnancy was found as there was increase in the incidence of *Porphyromonas gingivalis* and *Aggregatibacter actinomycetemcomitans*, during the first and second trimesters [11]. Recently, two studies displayed the severity of gingival and periodontal diseases as gingival response to the same amount of plaque was more severe in pregnant than non-pregnant women; however, this response is usually due to hormonal changes during pregnancy and will return to its normal condition after delivery [12,13]. Whereas, another study found that deep pocket does not return after delivery to the condition it was before pregnancy [14].

This study was conducted to assess the correlation between oral health and pregnancy by evaluation different parameters using DMFT index [15], Periodontal Disease Index [16] and saliva pH; which was held in Makkah city targeting specific group to establish database.

Materials and Methods

Study design

Cross sectional study was carried out using a self-administered questionnaire to assess oral health related factors among pregnant and non-pregnant women.

Study population

Total of (223) pregnant and non-pregnant women of age 18 - 40 years attending primary health care centers and Maternity and Children Hospital (MCH) in Makkah city were included. Participants with the following criteria will be excluded from the study: contributory medical history, smokers, history of antibiotic or drug therapy, non-pregnant women who take contraceptive pills, lactating women (at least one year), participant who received dental prophylaxis during the past 6 months before the study.

Sample size

Sample size measured by ClinCalc program (http://clincalc.com/Stats/SampleSize.aspx) the program was fed with power of 80, two-sided confidant level 95%, the incidence of known population was 65% and the expected incidence of study group was 85%. After calculation the sample size was (38) for pregnant group which will increase to (50) participants to avoid non-response. Regarding non pregnant women the calculated sample size was (170).

Sampling technique

Multi-stage random sampling technique was used. There are five regions in Makkah city: East, West, South, North and Central. One primary health care center was selected randomly from each region then all pregnant and non-pregnant women attending to these centers were included.

Data collection tools

Data was collected through two ways: Self-administrated questionnaire and clinical assessment.

Questionnaire

After signing the informed consent, a self-administrated questionnaire was answered by participant, it was made up of three sections: demographic data part including (Age, pregnancy status, month of pregnancy), and the second part inspect the oral hygiene measures including (use of tooth brush, frequency of brushing and dental visits) and the dietary screening part including (frequency of eating sugar between meals, chew regular (non-sugar-free), gum, drink milk and eat cheese).

Clinical assessment

Oral examination was conducted by five trained and calibrated examiners. One professor of periodontics and other of dental public health supervised the training and calibration process. The training procedure and data collection took one-month period.

Clinical examination was conducted for all participants in female's waiting room on comfortable chair and good source of illumination. Dental caries was measured by DMFT index following the world health organization (WHO) criteria (WHO, 1997), using disposable mouth mirrors and sharp explorers. Periodontal diseases were measured by Periodontal Disease Index (Ramfjord, 1967) using Williams periodontal probes.

Stimulated salivary samples were collected from randomly selected participants in both groups; the participants were instructed to be fasted two hours after breakfast. They instructed to rinse thoroughly using distilled water to remove any food debris. The participants were then asked to chew a piece of paraffin wax for five minutes then spit out the saliva in a cup that had been collected over 30 seconds. High quality falcon 50 ml conical tubes were used for collection, immediately stored in cold media, then it transported to Umm Al Qura University lab for calibration. Salivary pH was measured using Jenway Model 3505 pH/mV/Temperature Meter.

Validity of clinical examination and questionnaire

The five examiners were trained and examined by professors of periodontal department and professor of dental public health with criteria of clinical assessment. The inter examiner and intra examiner consistency was calculated using Kappa test it was (95 and 90% respectively).

The study was piloted on 10% of the sample size to test for feasibility, validity and reliability of the questionnaire.

Ethical consideration

Ethical approval from Institutional Reviewing Board (IRB), Ministry of Health, Makkah region, permission approval from the primary care authorities and informed consent from all participants were obtained before starting the study.

Statistical analysis

Data was collected and the tabulated then analyzed using SPSS version (21). The comparison between the group's frequencies was performed using Chi square test. Independent t test was used to compare between the means values of pregnant and non-pregnant groups. p value of equal or less than 0.05 was considered significance.

Results

A cross sectional method was conducted in the period from January 2019 till February 2019, to determine the prevalence of dental caries and periodontal health among pregnant compared with non-pregnant women at Makkah city.

The total number of pregnant women was (N = 78) which represents 35% of the sample and the number of non-pregnant women was (N = 145) with a percent 65%. The age distribution was 41% from (25 - 34 years), 27.8% from (18 - 24 years), 23.8% from (35 - 44 years), 5.8% (> 45 years) and 1.3% (< 18 years) (Figure 1).

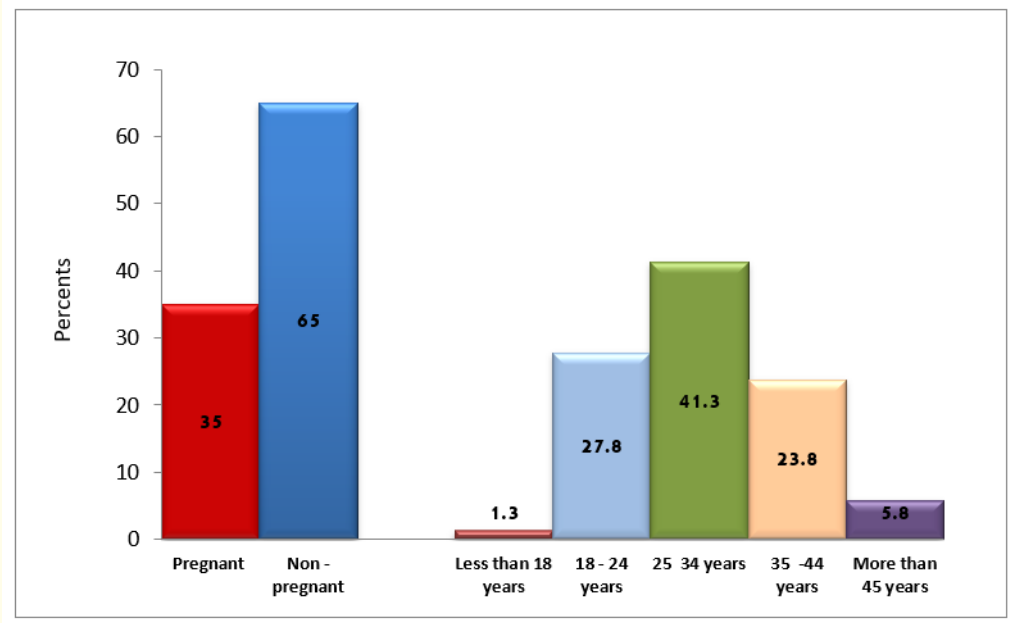

Figure 1: *The distribution of the study sample according to age and pregnancy status.*

Table 1 and figure 2 showing caries experience expressed as mean and standard deviation among pregnant and non-pregnant women, the mean value of decayed (DT) component was higher in pregnant than non-pregnant women with statistical significant difference (p = 0.03). Regarding missed (MT) and filled (FT) components higher means were found among non-pregnant group with no statistical significant difference (p = 0.126, P = 0.376 respectively). Moreover, the total mean DMFT value was higher in non-pregnant group with no statistical significant difference (p = 0.589).

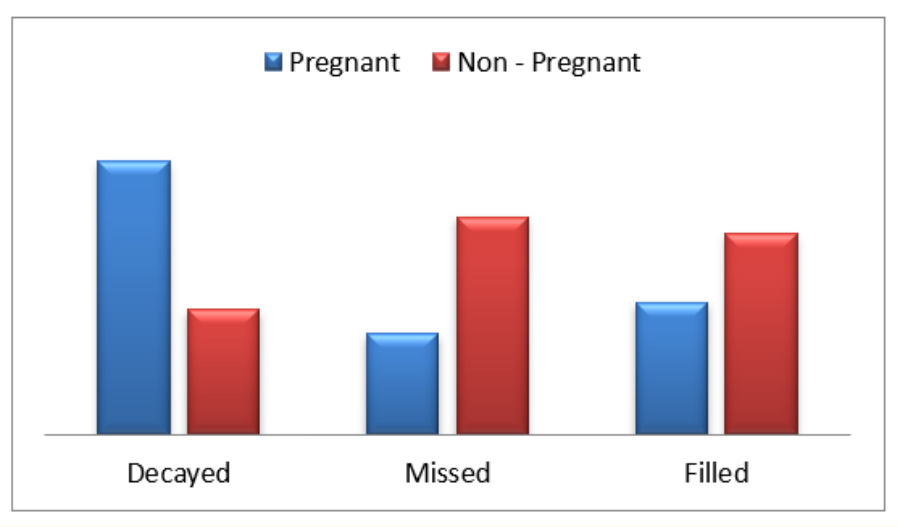

Figure 1: *The DMFT index components among pregnant and non-pregnant women.*

Variables	Pregnant	Non-Pregnant	t (p value)
	Mean (SD)	Mean (SD)	
DT	3.910 (2.919)	3.158 (2.265)	2.130 (0.03)
MT	0.948 (1.484)	1.324 (1.862)	1.536 (0.126)
FT	3.064 (3.510)	3.537 (3.947)	0.888 (0.376)
Total DMFT	8.346 (4.404)	8.731 (5.380)	0.542 (0.589)

Table 1: *Caries experience (mean ± SD) among pregnant and non-pregnant women.*
SD: Standard Deviation; t: Independent t Test; P value ≤ 0.05 Significant.

Table 2 showing the mean salivary pH and pocket depth among pregnant and non-pregnant women, the salivary pH was more alkaline in the non-pregnant (7.35) than pregnant group (6.927) with statistical significant difference (p = 0.000). The mean pocket depth showed nearly the same mean between pregnant and non-pregnant with no significant difference between them (p = 0.33).

Variables	Pregnant	Non-Pregnant	t (p value)
	Mean (SD)	Mean (SD)	
Salivary pH	6.927 (0.288)	7.350 (0.290)	5.626 (0.000)
Pocket depth	3.046 (0.77)	3.138 (0.608)	0.975 (0.330)

Table 2: *Salivary pH and pocket depth (mean ± SD) among pregnant and non-pregnant.*
SD: Standard Deviation; t: independent t Test; P value ≤ 0.05 significant.

Figure 3 representing the periodontal conditions according to the pregnancy trimester among pregnant women. It shows that sever gingivitis was found in the three trimester groups with development of deep pocket (> 6 mm) in both second and third trimester groups.

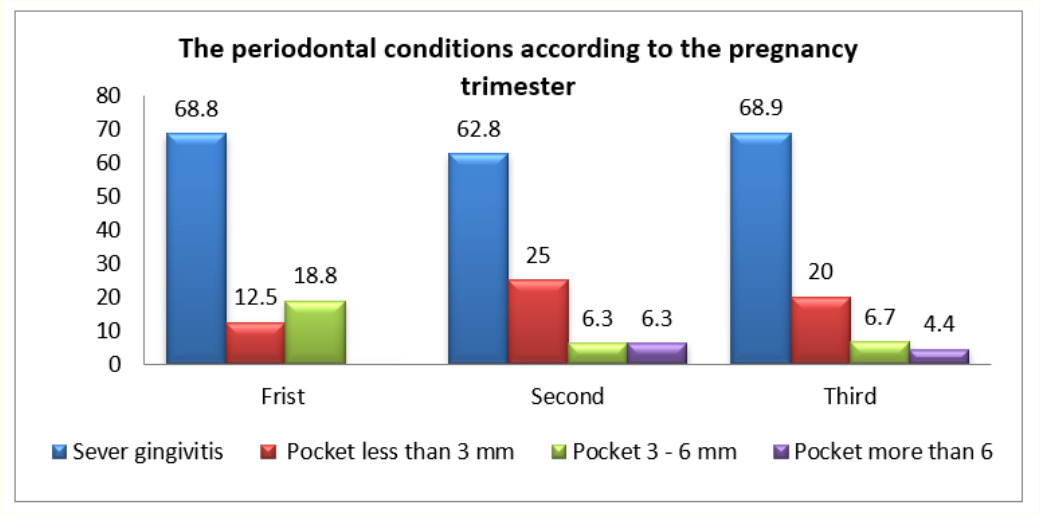

Figure 3: *The prevalence of periodontal conditions among pregnant group regarding their pregnant trimester.*

In respect to oral hygiene measures and dietary habits (Table 3) showing the most prominent measure, the use of additional fluoride product which was higher among non-pregnant (24.8%) than pregnant (12.8%) with significant difference (P = 0.03) between them. However, the prevalence of tooth brush usage with fluoridated tooth paste was (98.7%, 98.6%) which was nearly equal percentages between pregnant and non-pregnant women. The prevalence of dental floss usage was higher among pregnant group with no significant difference (p = 0.141). Regarding the dental visits prevalence, was higher in non-pregnant group (88.3%) than pregnant (85.9%) with no significant difference (p = 0.676). The regular dental visit every 3-6 months or annually was higher in pregnant group (23.1%) than non-pregnant group (17.9%), however visiting the dentist in case of pain was higher in non-pregnant group (75.2%) than pregnant (66.7%) with no significant difference (p = 0.501).

	Pregnant	**Non-pregnant**	**P value**
	%	**%**	
Use of tooth brush			0.952
Yes	98.7	98.6	
No	1.3	1.4	
Frequency of brushing			
Not use tooth brush	1.3	0.7	0.572
Once	21.8	23.4	
Twice	64.1	56.6	
Three times	12.8	19.3	
Use of fluoridated paste			
Yes	98.7	98.6	0.952
No	1.3	1.4	
Use of fluoride products			

Yes	12.8	24.8	0.03
No	87.2	75.2	
Use of dental floss			
Yes	29.5	20.7	0.141
No	70.5	79.3	
Dental visit			
Yes	85.9	88.3	0.676
No	14.1	11.7	
Frequency of dental visits			
Never	10.3	6.9	0.501
3 - 6 months	10.3	6.2	
Every 12 month	12.8	11.7	
With pain	66.7	75.2	
Frequency of eating sugar between meals			
Always	21.8	23.4	0.324
Usually	60.3	49.7	
Rarely	17.9	25.5	
Never	.0	1.4	

Table 3: *The prevalence of oral hygiene measures and different dietary habits among pregnant and non-pregnant. P value ≤ 0.05 significant.*

As regarding the Frequency of eating sugar between meals the prevalence were (21.8% and 23.4%) among pregnant and non-pregnant respectively. the frequency of always eating sugar was higher among pregnant (60.3%) compared with (49.7%) among non-pregnant, the total percentage was higher among pregnant group with no significant difference (p = 0.324).

Discussion

A cross sectional study was carried out in Makkah to determine prevalence and association between pregnancy and the three parameters of oral health as dental caries, periodontal disease and saliva pH.

The sample included a wide age range (from 18 - 40) to cover most of the pregnancy population as in Saudi population women attend to marry at young age, moreover, pregnancy in older women is not uncommon.

Regarding the periodontal condition, the present study showed non-significant difference in periodontal health between the pregnant and non-pregnant women. additionally, a study confirmed that pregnancy only affect gingival tissue and increase the inflammation and does not affect periodontal attachment levels [17]. On the other hand, a study on Japanese women have found an increase in the incidence of Porphyromonas gingivalis and Aggregatibacter actinomycetemcomitans, during pregnancy [11]. Other authors had suggested that gingival inflammation could be explained by hormonal changes during pregnancy that affect immune response to be more exaugurated to dental plaque. Although, it is a temporary effect that will return to normal level after delivery [12,13].

Many studies showed high prevalence of dental caries among pregnant women than non-pregnant [1,18]. Explained by the lower saliva pH in pregnant women than non-pregnant which significantly related to dental caries [7]. In the present study, the results showed

significant difference in the decay component between pregnant and non-pregnant women while non-significant difference in missed and filled components. Similar results were published previously with high significant differences in dental caries parameters in pregnant than non-pregnant women [2,6]. Moreover, dental caries relates with pregnancy trimesters as caries prevalence was shown to be gradually increasing throughout the three trimesters [19]. However, A study in U.S. have found no statistically significant difference in caries prevalence in pregnant and non-pregnant [20].

The increase of dental caries among pregnant women can be explained by the deterioration of oral hygiene measures and they tend to defer regular dental appointment until delivery, which reflect the high missing and filling components of non-pregnant group [21].

Regarding relation between salivary pH and pregnancy, the present study showed lower pH of saliva among pregnant women, this was confirmed by other studies that showed the same results [7,22]. Additionally, there was an inverse relation between saliva pH and pregnancy status as saliva pH decreased throughout pregnancy trimesters [9].

Conclusion

Pregnant women showed lower salivary pH with higher decayed (DT) component. Missed (MT) and filled (FT) components were found higher among non-pregnant group. The development of sever periodontitis was higher among pregnant women with development of deep pocket (> 6 mm) in both second and third trimester groups.

According to these results, it is recommend providing educational and preventive programs for pregnant women as it considered as target group with greatest risk for dental caries and periodontal disease.

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Conflict of Interest

The authors declare no conflict of interest.

Bibliography

1. Ravindran S., *et al*. "Enumeration of salivary Streptococci and Lactobacilli in children with differing caries experiences in a rural Indian population". *ISRN Plastic Surgery* (2013).

2. Mutlak Nadia Qasim and Baydaa Ahmed Yas. "Dental Caries Severity in Relation to Selected Salivary Variables among a Group of Pregnant Women in Baghdad City, Iraq". *Journal of Baghdad College of Dentistry* 325.5281 (2017): 1-7.

3. Kamate Wasim Ismail., *et al*. "Estimation of DMFT, salivary *Streptococcus mutans* count, flow rate, ph, and salivary total calcium content in pregnant and non-pregnant women: a prospective study". *Journal of Clinical and Diagnostic Research: JCDR* 11.4 (2017): ZC147.

4. Shaghaghian., *et al*. "Dental Caries Status and Its Associated Factors in Pregnant Women, Shiraz, Iran, 2014". *Journal of Oral Health and Oral Epidemiology* 6.3 (2017): 165-172.

5. Kateeb Elham and Elizabeth Momany. "Factors related to high dental caries experience in Palestinian pregnant women in the Jerusalem governorate: a cross-sectional study". *The Lancet* 391 (2018): S11.

6. Rakchanok Noochpoung., *et al.* "Dental Caries and Gingivitis among Pregnant and Non-Pregnant Women in Chiang Mai, Thailand". *Nagoya Journal of Medical Science* 72.1-2 (2010): 43-50.

7. Karnik Amruta A., *et al.* "Determination of salivary flow rate, pH, and dental caries during pregnancy: A study". *Journal of Indian Academy of Oral Medicine and Radiology* 27.3 (2015): 372.

8. Gürsoy M., *et al.* "Longitudinal study of salivary proteinases during pregnancy and postpartum". *Journal of Periodontal Research* 45.4 (2010): 496-503.

9. Jain Kanu and Harshaminder Kaur. "Prevalence of oral lesions and measurement of salivary pH in the different trimesters of pregnancy". *Singapore Medical Journal* 56.1 (2015): 53.

10. Lasisi Taye J and Rukiyat A Abdus-salam. "Pregnancy-induced periodontal inflammation: Influence of salivary cytokines and antimicrobial proteins". *The Saudi Dental Journal* 30.4 (2018): 306-311.

11. Fujiwara Natsumi., *et al*. "Significant increase of oral bacteria in the early pregnancy period in Japanese women". *Journal of Investigative and Clinical Dentistry* 8.1 (2017): 1-8.

12. Morelli EL., *et al.* "Pregnancy, parity and periodontal disease". *Australian Dental Journal* 63.3 (2018): 270-278.

13. Kashetty Meena., *et al.* "Oral hygiene status, gingival status, periodontal status, and treatment needs among pregnant and nonpregnant women: A comparative study". *Journal of Indian Society of Periodontology* 22.2 (2018): 164.

14. González-Jaranay., *et al.* "Periodontal status during pregnancy and postpartum". *PloS One* 12.5 (2017):1-9.

15. Organization W H. "Oral Health Surveys, Basic Methods". WHO (1997).

16. Ramfjord Sigurd P. "The periodontal disease index (PDI)". *Journal of Periodontology* 38.6 (1967): 602-610.

17. Tilakaratne A., *et al*. "Periodontal Disease Status During Pregnancy and 3 Months Post-Partum, in a Rural Population of Sri-Lankan Women". *Journal of Clinical Periodontology* 27.10 (2000): 787-792.

18. Laine Merja Anneli. "Effect of Pregnancy on Periodontal and Dental Health". *Acta Odontologica Scandinavica* 60.5 (2002): 257-264.

19. Kumar Santhosh., *et al.* "Factors influencing caries status and treatment needs among pregnant women attending a maternity hospital in Udaipur city, India". *Journal of Clinical and Experimental Dentistry* 5.2 (2013): e72.

20. Azofeifa Alejandro., *et al.* "Dental caries and periodontal disease among US pregnant women and nonpregnant women of reproductive age, National Health and Nutrition Examination Survey, 1999–2004". *Journal of Public Health Dentistry* 76.4 (2016): 320-329.

21. Agbelusi GA., *et al*. "Oral health status and treatment needs of pregnant women in Lagos State". *The Nigerian Postgraduate Medical Journal* 7.3 (2000): 96-100.

22. Naveen S., *et al*. "Salivary Flow rate, pH and buffering capacity in pregnant and non pregnant women-A comparative study". *JMED Research* (2014): 1-8.

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