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RESEARCH ARTICLE

Association of sleep deprivation and stress with oral diseases among dental undergraduate students, Jaipur, India.

Dr Nidhi Sharma[1], Dr Sudhanshu Sanadhya[2], Dr. Javed Khan[3], Dr. Rudra Pratap Singh[4], Dr. Abinash Bori[5] and Dr. Tushar Kiran Bawaskar[6]

[1]Reader, Department of Oral Medicine and Radiology, Daswani Dental College & Hospital Ranpur Industrial Area, Kota
[2]Professor, Department of Public Health Dentistry, RUHS College of Dental Sciences, Jaipur
[3]Postgraduate student Dept. of Public Health Dentistry, Vyas Dental College, Jodhpur
[4]Postgraduate student Dept. of Public Health Dentistry, Vyas Dental College, Jodhpur
[5]Postgraduate student Dept. of Public Health Dentistry, Vyas Dental College, Jodhpur
[6]Postgraduate student Dept. of Public Health Dentistry, Vyas Dental College, Jodhpur

*Corresponding Author
Dr Sudhanshu Sanadhya

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Abstract: ***Objective***: To investigate the association between sleep deprivation, stress, and self-reported oral health status and habits among final-year dental undergraduate students in Jaipur, India. ***Methods:*** A cross-sectional questionnaire-based study was conducted among 184 final-year dental students from six dental colleges in Jaipur. Data were collected using a modified Dental Environment Stress (DES) questionnaire and the Pittsburgh Sleep Quality Index (PSQI). Self-reported oral health status and habits were also recorded. Statistical analysis included descriptive statistics, Pearson's correlation, t-tests, and ANOVA. ***Results***: The majority of students (56.2%) slept 6–7 hours per night, with 8.9% sleeping less than the recommended duration. Significant stressors included academic workload (38.6% severely stressed), difficulty in learning clinical procedures (50% moderately stressed), and lack of time (60.3% slightly stressed). Poor self-reported dental health and gingival condition were associated with higher sleep disturbance scores (7.22 ± 0.92 and 7.23 ± 0.81, respectively). Significant correlations were found between stress, sleep quality, and oral health behaviors (e.g., flossing, mouth rinsing, dental visits). ***Conclusion***: Sleep disturbances and stress are prevalent among dental students and are significantly associated with poorer self-reported oral health status and less favorable oral health habits. Interventions to manage stress and improve sleep hygiene are recommended to enhance both general and oral health outcomes in this population.

Keywords: Sleep deprivation, stress, oral health, dental students, PSQI, DES, India.

INTRODUCTION

Sleep, a normal, reversible, recurrent state of reduced responsiveness to external stimulation that is accompanied by complex and predictable changes in physiology. These changes include coordinated, spontaneous, and internally generated brain activity, as well as fluctuations in hormone levels and relaxation of musculature [1]. The National Sleep Foundation (NSF) suggested that school-age children (5-10 years) need 10-11 hours of sleep daily, teens (10-17 years) need 8.5-9.5 hours, and adults need 7-9 hours [2]. From National Health Interview Survey in US, nearly 30% of adults reported an average of ≤ 6 hours of sleep per day in 2005-2007 [3]. In 2009, only 31% of high school students reported of getting at least 8 hours of sleep on an average school night [4].

Sleep deprivation causes an increase in corticotrophin releasing hormone or CRH in the body. A chain reaction follows which eventually leads to the production of hormones related to stress, such as adrenaline. These hormones in excess will generally result in a host of negative effects including anxiety, heart related problems, high blood pressure and migraines. Loss of sleep can undesirably impact on energy levels, moods, hormone levels, thus overall health and wellness. Sleep pattern is affected quantity and quality by variety of environmental, behavioral, cultural, pathophysiological, social and psychological influences. This had steered to excessive daytime sleepiness, elevated levels of fatigue and tiredness. Sleep deficiency also imparts detrimental effects with noticeable changes in immune, metabolic and endocrine pathways. Over the last few decades there has been growing evidence to suggest that too little sleep and too much sleep are associated with adverse health outcomes, including total mortality, obesity in both children and adults, poor self-rated health, cardiovascular disease, type II diabetes, hypertension and respiratory disorders [5].

Here in this excited present day society, sleep deprivation is unattractively becoming an interminable growing problem. Symptoms of sleep deprivation can include, but are not limited to aching muscles, headaches, depression, memory lapse, fibromyalgia, diabetes, hypertension, obesity and confusion. Some can adversely affect oral well being too for example obesity, hypertension and diabetes can cause circulation issues, healing complications, etc. [6].

Aspiring students opt for dentistry into affiliated dental institutions per year. Yet, these students are thoughtful, they could simply become astounded and yet stressed out due to sleep deprivation. The volume of facts that dental students, especially, final year undergraduates, have to absorb in a short span prevailing sleeping less

every night. This could distress the health of the student, affecting student's well-being, inability to concentrate properly and execute their responsibilities. This all could give rise in carelessness for themselves and eventually affecting their oral health and well-being. A study conducted by Dumitrescu *et al* (2010) concluded disturbed sleep index, impaired awakening, fatigue and vitality were associated with oral-health status and behavior [7]. Huynh *et al* (2013) reviewed about multiple interactions between oral health and sleep and underscored the need for an interdisciplinary clinical team to manage oral health-related sleep disorders that are commonly seen in dental practice [8].

In daily practice, clinicians are becoming more and more involved with patients requesting information about or needing management of oral and dental conditions with respect to sleep related disorders: bruxism, xerostomia, apnea and effect of oro facial pain on sleep quality [9]. As in Rajasthan state, Jaipur city, having more number of dental professional colleges alongwith the feasibility for the study to be conducted, thus considered. In dental undergraduate curriculum, final year dental students had more work load and peer pressure as compared to first-third dental undergraduate students. This could be predicted regarding an effect of sleep disturbance with oral health, hence this aroused the need for the study to be conducted. As still paucity of literature persists regarding oral health and sleep disturbance, to find an association between sleep deprivation and stress with self-reported oral health status and habits among dental undergraduate students of Jaipur, India.

MATERIAL AND METHODS:

The Study design and the study population

A cross-sectional self-administered questionnaire survey was conducted among final year undergraduate students of Jaipur dental institutions which were affiliated with deemed universities and government state university respectively. Jaipur was selected for study convenience. Dental Students were selected as their feasibility and approach was better than students from different professions. Six dental colleges affiliated and commended in Jaipur according to *Dental Council of India* were opted for the study [10]. Dental Undergraduates who were willing to participate in the study, irrespective of their age, sex, year of their study, work experience etc., were included. The study considered all six dental colleges situated in Jaipur for study purpose.

Ethical Considerations

The study protocol was reviewed by the Ethical Committee of each affiliated institutions and were granted ethical clearance. An official permission was obtained from the respective institutions and was well informed way prior to the day of questionnaire.

Training and Calibration

Before the commencement of the study, the two senior faculty members were examiners which were standardized and calibrated to ensure uniform interpretations, understanding and application of the codes and criteria for the variables to be observed and recorded and to ensure a consistent examination. The inter examiner reliability for DES and PSQI questionnaires were assessed by using Kappa statistics, which was found to be 95% and 93% respectively.

Pilot Survey

A pilot study was carried out among various professional population groups to determine the feasibility and practicability of the study and the time required to conduct it. It helped us in knowing and overcoming the practical difficulties which we encountered while we conducted the survey. There were many instances where ethical clearance was not obtained, official permission for was not granted, mismatch of timings for availability of students etc., all lead to emphasize only on feasible data present i.e. undergraduate dental students. It took 15 minutes to complete the questionnaire.

Assessment and Data Collection

Before the commencement of the study, a list of all dental undergraduate students were obtained from each respective institutions. As per the list provided, they had a Collective intake of total dental Undergraduate 500 students enrolled. So, study population consisted of Final year dental undergraduate students undergoing clinical training along with didactic courses. Demographic data such as age and gender were recorded. The purpose of the study was communicated well in advance to the students and student participation in the research was voluntary. Then class-room survey was conducted for 6 days, each institution per day, from 9 am to 12 pm, in the month of March 2018, in mid of their academic term for the year 2018-19. The questionnaires were distributed in a lecture hall prior to commencement of a scheduled lecture which took 15 minutes to complete. All final year undergraduate students were invited to attend, requested to fill in the written informed consent form and also to rate each item of the questionnaire choosing the most appropriate response. Students willing and consenting to participate were included in the study while students which were procuring internship, habits of smoking, oral tobacco and alcohol consumption, etc., and also affected with psychiatric illness and/or under medication for the same were excluded.

Questionnaire

Part I – Based on Modified dental environment stress (DES) questionnaire which consists of 38 questions appropriate for Indian dental education, stress will be measured [11]. On a Likert scale with response option of not stressful, slightly stressful, moderately stressful and severely stressful will be used. Testing the internal consistency of questionnaire a pilot study was

conducted by considering convenience sample of 25 from the same sample in a single institution. The internal consistency of the questionnaire was tested using Cronbach's Alpha which was found to be 0.68; significant results were obtained by a set of 20 questions out of 38, therefore outstanding questions were excluded for further analysis. Each item of the questionnaire was coded from 1-5 (Strongly disagree to strongly agree). Higher scores indicate positive appraisals and lower scores indicate negative evaluation.

Part II - The Pittsburgh Sleep Quality Index (PSQI) is self-administered questionnaire which is short, simple and well-accepted universally. It is made up of 19 items in addition to five questions for the bed companion. The 19 items analyze different factors determining sleep quality, grouped into seven components: quality, latency, duration, efficiency and sleep alterations, use of sleeping pills and daytime dysfunction [9]. In scoring, seven component scores were derived, each scored 0 (no difficulty) to 3 (severe difficulty). The component scores were summed to produce a global (total) score (range 0 to 21). Higher scores indicated worse sleep quality. Buysse proposed a cut-off of 5 (score ≥ 5) defining bad sleepers. Data on disturbed sleep were obtained using The Pittsburgh Sleep Quality Index of (PSQI) modified by Buysse. The internal consistency and reliability coefficient which was tested using Cronbach's alpha was 0.83.

Pre-testing of questionnaire:

Mean Content Validity Ratio (CVR) were calculated as 0.87 and 0.81, respectively, based on the opinions expressed by a panel of four skilled academicians for index of sleep quality and stress scales respectively. Face validity was also assessed and was observed that 96% of participants found the questionnaires to be easy.

Questionnaire

Data were collected using self-administered questionnaire survey and standardized psychological scales. A questionnaire was specifically prepared for the present study and addressed the following: (1) demographic factors (age and gender) (2) perceived oral health status (dental health, gingival condition, dental caries and gum bleeding) and (3) oral-health habits (tooth brushing frequency, flossing frequency, mouth rinse frequency and dental visit frequency) (4) index of sleep quality and stress scales.

Based on voluntary basis, participants were invited and no incentives were provided. Students who were present on the day of survey in each institution were included. Exclusion criteria was for those students who remained absent on the day of survey. Still, a phone contact was made to establish a communication with absentees, but no positive response was obtained as they have no complain regarding the sleep.

Statistical analysis:

Completed questionnaires were coded and spreadsheets were created for data entry. The data was analyzed using SPSS 17 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics were used on all variables. Bivariate associations among disturbed sleep, stress and self-rated oral-health status and health behavior variables were estimated with Pearson's correlation. Differences between groups were identified using student 't'-test and Analysis of Variance. All of the reported P values were two-tailed; moreover, those $P < 0.05$ were considered to be statistically significant.

Questions	Not stressful	Slightly stressful	Moderately stressful	Severely stressful
Amount assigned work	51 (27.7)	32 (17.4)	30 (16.3)	71 (38.6)
Full loaded day	9 (4.9)	135 (73.4)	28 (15.2)	12 (6.5)
Responsibilities for comprehensive patients care	79 (42.9)	94 (51.1)	7 (3.8)	4 (2.2)
Competition with peers for grades	61 (33.2)	111 (60.3)	8 (4.3)	4 (2.20
Difficulty in learning clinical procedures	10 (5.4)	66 (35.9)	92 (50.0)	16 (8.7)
Atmosphere created by clinical supervisors	118 (64.1)	53 (28.8)	9 (4.9)	4 (2.2)
Receiving criticism from staff for academic or clinical work	101 (54.9)	66 (35.9)	12 (6.5)	5 (2.7)
Difficulty in learning precision manipulation skills required for clinical and laboratory work	52 (28.3)	31 (16.8)	30 (16.3)	71 (38.6)
Lack of confidence to be successful dental students	80 (43.5)	68 (37)	29 (15.8)	7 (3.8)
Rules and regulations of faculty	50 (27.2)	101 (54.9)	29 (15.8)	4 (2.2)
Working on patients with dirty mouth	7 (3.8)	79 (42.9)	69 (37.5)	29 (15.8)
Completion of clinical requirements	102 (55.4)	50 (27.2)	32 (17.4)	0
Lack of confidence in clinical decision making	20 (10.9)	139 (75.5)	15 (8.2)	10 (5.4)
Fear of failing a course on year	72 (39.1)	98 (53.3)	14 (7.6)	0
Fear of unemployment after graduation	153 (83.2)	11 (6)	13 (7.1)	7 (3.8)
Financial resources	115 (62.5)	51 (27.7)	9 (4.9)	9 (4.9)

Lack of time to do assigned work	58 (31.5)	111 (60.3)	11 (6,0)	4 (2.2)
Shortage of allocated clinical time	113 (61.4)	57 (31)	14 (7.6)	0
Difference in opinion between clinical staff concerning patient treatment	140 (76.1)	25 (13.6)	13 (7.1)	6 (3.3)
Fear of being unable to catch up if getting behind with work	130 (70.7)	26 (14.1)	16 (8.7)	12 (6.5)

Table 1: Distribution of respondents according to their response to questionnaire of modified dental environment stress (DES) (N=184)

Table 2: Comparison of scores between sleeplessness and stress scales according to self-reported oral health status

Grades	***Index of disturbed sleep*** (Mean ± SD)	***Stress scale*** (Mean ± SD)
Perceived dental health		
Poor	6.75 ± 1.35	40.50 ± 3.37
Normal	7.22 ± 0.92	41.38 ± 2.38
Good	5.97 ± 1.48	41.56 ± 2.56
Excellent	4.82 ± 1.66	32.36 ± 2.85
P value	< 0.05	< 0.05
Gingival condition		
Poor	7.23 ± 0.81	41.33 ± 2.50
Normal	7.00 ± 0.91	41.60 ± 2.33
Good	6.97 ± 1.48	41.56 ± 2.56
Excellent	5.81 ± 1.66	39.35 ± 2.84
P value	p < 0.05	p < 0.05
Caries		
No	6.87 ± 1.65	40.93 ± 4.98
Yes	7.20 ± 0.89	41.36 ± 2.33
P value	NS	NS
Gum bleeding		
No	5.19 ± 1.68	37.81 ± 4.42
Yes	5.79 ± 1.99	37.17 ± 5.59
P value	NS	NS

Table 3: Comparison of score of sleeplessness and stress scales according to self-reported oral health habits

Habits	***Index of disturbed sleep*** (mean ± SD)	***Stress questionnaire*** (mean ± SD)
Tooth brushing frequency		
Once a day	7.20 ± 0.89	41.36 ± 2.33
Twice a day	5.57 ± 1.65	38.93 ± 4.98
P value	NS	NS
Flossing		
Never	6.18 ± 1.87	41.43 ± 2.41
Once a month	5.35 ± .81	34.25 ± 2.40
Once a week	3.68 ± 1.20	30.91 ± 2.24
Everyday	2.81 ± 1.83	28.36 ± 5.20
P value	NS	NS
Mouth rinse frequency		
Never	7.18 ± 0.91	41.40 ± 2.40
Once a month	5.30 ± 1.64	37.41 ± 4.18
Once a week	5.56 ± 2.01	39.73 ± 4.49
Everyday	3.74 ± 1.18	31.01 ± 2.36
P value	NS	NS
Reasons for visit		
Pain/other conditions	7.20 ± 0.89	41.36 ± 2.33
Routine check up	7.57 ± 1.65	41.93 ± 4.98
P value	p < 0.05	p < 0.05

NS – Not Significant.

Table 4: Correlations between the scores of Stress (DES) and sleep (PSQI) scales for self-reported oral health status and habits.

	Dental condition	Gingival condition	Caries	Bleeding gum	Tooth brushing frequency	Flossing	Mouthwash frequency	Reasons for visits	stress	sleep
Dental condition	1									
Gingival condition	0.93	1								
Caries	-0.89*	-0.91*	1							
Bleeding gum	-0.38	-0.37*	0.58	1						
Tooth brushing frequency	0.89	0.91	-1.0*	-0.58*	1					
Flossing	0.65	0.67	-0.53*	-0.18*	0.53	1				
Mouthwash frequency	0.07	0.76*	-0.71*	0.05	0.71	0.71	1			
Reasons for visits	0.89*	0.91*	-1.0*	-0.58*	1.0*	0.53*	0.718*	1		
Stress	-0.74*	-0.77*	-0.60*	-0.05	-0.60*	-0.72*	-0.716*	-0.60*	1	
Sleep	-0.53*	-0.55*	-0.67*	-0.15*	-0.67*	-0.41*	-0.666*	-0.67*	0.39*	1

*Correlation is significant at the 0.05 level (two-tailed)

RESULTS

From the study population, 137 (36.05%) were boys and 243 (63.94%) were girls, with the age of the study population ranged between 20 years to 24 years (mean age = 22). As mentioned in Table 1, 71 (38.6%) were severely stressful due to the amount of workload assigned, faced difficulty in learning precision manipulation skills required for clinical and laboratory work. 92 (50%) were Moderately stressed with difficulty in learning clinical procedures. 111 (60.3%) were slightly stressed due to lack of time because of assigned work, fully loaded day in competition with peers for grades, 139 (75.5%) because of lack of confidence in clinical decision making, 101 (54.9 %) with rules and regulations of faculty. 53.3% Fear of failing a course in academic year and working on patients with dirty mouth 79 (42.9%). No stress was signified for shortage of allocated clinical time 113 (61.4%), financial resources 115 (62.5%), competition of clinical requirements 102 (55.4%).

In the present study that 56.2% of students obtained 6 and 7 hours of sleep, nearly 8.9% of students slept fewer than the recommended number of hours. Almost 34.6% of students had adequate sleep which more than 7 hours. Thirty eight percent students sleep around 11 PM, 51.6% students slept at 12 PM and 10.3% at 1 AM. Almost 56% of students rate their sleep very good and 5.4% rate very bad. Fifteen percent of students woke up early in morning around 6 AM, 67.4% at 7 AM and 17.6% at 8 AM. Around 39.1% students took ≤ 15 minutes to fall asleep each night and 48.8% took 15-30 minutes while 7.6% took 30-60 minutes and 4.9% required more than 60 minutes. None of the students had any problem with driving, eating meals, or engaging in social activity and do not take any medicine for sleeping. Students had sleep disturbance just because of tension, uneasiness, uncomfortable and working load thoughts but not during past month.

Table 2 revealed index of disturbed sleep was significantly highest for perceived dental health (7.22 ± 92) and gingival condition (7.23±8) respectively. The overall highest scores in index for disturbed sleep in individuals with caries and gum bleeding were (7.20±0.89) and (5.79±1.99) respectively (p is non-significant).

Table 3 elaborated highest scores in index for disturbed sleep for tooth brushing frequency, flossing and mouth rinse frequency were once a day (7.20±.89); never (6.18±1.87); never (7.18±.91) respectively (p is non-significant). However, reasons for dental visit in index for disturb sleep was non-significant and other conditions (7.20±0.89) and routine dental check-ups (7.57±1.65).

Correlation between self-reported oral health status and habits with stress and sleep variables is been shown in table 4. Self-reported oral hygiene habits were significantly correlated with self-reported oral health status.

DISCUSSION

The present cross-sectional questionnaire study has uncovered an interesting topic in relation to sleep disturbance and stress in field of dentistry among dental undergraduate students of Jaipur. This was in disagreement with previous studies, in which items linked to clinical training tended to induce less stress in final-year students [12, 13].

Stress could be a factor wherein students can either get motivation to achieve success or reduce to ineffectiveness. Earlier reports have shown that considerable stress has levied through dental education on students [14, 15, 16]. It is difficult to eliminate all the stressful problems in a dental education programme. To become a Liable Dental Expert, students have to attain high level of knowledge and peak professional skills, as well as developing good attitude towards patient's care; all within a little duration [17]. The present study was conducted to better appreciate the factors influencing perception of students and its effects on oral health.

On one hand, every individual requires exclusive amount of rest to function optimally. Although 7 to 9 hours is the recommended amount of sleep, others may require more or less than this stipulated period [18]. Several investigators confirms these approvals; scientific studies have suggested even longer rest period [19], yet only about 30% of participated students testified sleeping within that range. In the present study, 56.2% of students obtaining 6 and 7 hours of sleep, nearly 8.9% of students sleep fewer than the recommended number of hours. Almost 34.6% of students have adequate sleep which is more than 7 hours.

Britz and Pappas [20] showed eating and sleeping patterns were the two most significant unhealthy behaviors associated with the participants in the study. According to a recent study, persons obtaining less than 7 hours of sleep per night were about three times more likely to catch a disease than persons who obtained 8 or more hours of sleep [21]. Researchers have found that human immune system is most proficient during times of rest and therefore, chronic sleep deprivation puts the body at risk for myriad medical problems [19]. This sleep deprivation, and other student behaviors that correlate with higher level of stresses, can thus have serious implications for current and long-term health.

There was strong association between insomnia and self-reported physical and mental health, with individuals who reported poor health status being more likely to report insomnia. Although it is likely that some individuals do not perceive insomniac symptoms as problematic or troublesome, or do not experience daytime consequences during the initial episode, persistent insomnia has been shown to increase the risk for major depression [22]. In line with the present findings, previous studies have shown that oral-health status and oral-health related behaviors are associated with stress or depression [23, 24, 25].

Anttila *et al* (2006) reported that subjects with high number of depressive symptoms had a lower frequency of tooth brushing and dental visits than subjects with no or only a few depressive symptoms [26]. Similar results were found in the present study in which dental health and gingival condition of subjects were affected and stating statistically significant. Ylöstalo *et al* (2003) showed that dental health behavior (frequency of dental check-ups and tooth brushing frequency) increases with strengthening life satisfaction and optimism [27]. In the present study there was no statistically significant finding in tooth brushing frequency but it was conflicting to that of the frequency of dental check-ups.

The authors' study reported higher rates of sleep disturbance on student population other than dental students [28, 29, 30]. So, it is clear that students who are in whatsoever field they might be in catch of some extend of sleep disturbance**.** The distress association with fatigue would thus more likely to be discovered in routine health check-ups programme along with sleep disturbance [31]. In daily practice, clinicians are becoming more and more involved with patient's requesting information about or needing management of oral and dental conditions with respect to sleep-related disorders. Sleep bruxism is less deleterious to health, but its consequences, including tooth structure breakdown, exacerbation of facial pain, grinding noise are the major complaints that arouses patients to visit a dental clinic. Less frequent consultations are noted for salivary flow problems, such as xerostomia and hypersalivation, and for gastroesophageal reflux [32, 33].

Further, subjective limitation should also be taken into account. Stress perception and sleep levels are variable among persons and throughout the year. Additionally, several students may not exhibit an impartial account of their own oral health condition. This variability of subjects, however, was limited by large scales provided by the survey to rank stress and sleep levels and oral health, in addition to the space provided for students to specify extenuating circumstances that could bias results. This perception could be applied to address college-related stress directly through university programs and further investigations.

Although sleep and stress correlate with many characteristics of health, this study does not establishes that both increased condition directly compromises oral health or increases unhealthy tendencies. It does, however, demonstrate correlation, which is important for the development of specific intervention programs for insomnia to decrease stress and improve oral health among college students. While it may not be possible to decrease the academic workloads of modern day students, it is important for universities to develop programs to help students deal with this stress. Actions could include the creation of adequate counseling resources and clinical advice. The development of university public health programs should be focused on how to provide the knowledge and effective training regarding the effects of insomnia and stress.

CONCLUSION

Based on the present finding, there exists an association between sleep disturbances, stress and oral health in dental students related to their course. In future, longitudinal study could also be conducted to check various kinds of stresses associated and an increased level of it from first to final year during their course. At this instant, various stress imparting factors were neglected like were the students residing in hostels or else day scholars, mode of travelling could impart, sufficient allowance being given or not, students belonging to urban or rural areas, peer pressure, habits associated such as Consumption of oral tobacco, caffeine interfering in oral health or sleep etc. could lead to bias in the current study.

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