GRADUATION PROJECT

Degree in Dentistry

HOW DOES OUR DAILY STRESSFUL LIFESTYLE AFFECT OUR DENTAL HEALTH HABITS?

Madrid, academic year 2024/2025

Identification number: 188

ABSTRACT

Introduction: A daily stressful lifestyle is known to impact general health, however its specific effect on dental health habits remains less explored. University environments, in particular, expose individuals to frequent stress that may influence routines such as oral hygiene, dietary choices, or parafunctional behaviours; **Objectives**: To determine and evaluate how a daily stressful lifestyle affects dental health habits during high stress periods compared to non-stressful periods; **Methods**: A cross-sectional, observational study was carried out using a self-reported survey distributed to students and professors at the European University of Madrid. Responses were collected on oral hygiene, parafunctional behaviours, diet, and perceived stress. Statistical analysis was performed using Python, applying paired t-tests, Wilcoxon signed-rank, binomial, and Chi-square tests; **Results**: After applying inclusion and exclusion criteria, 111 responses were analysed. During high stress periods, participants reported increased sugar consumption and parafunctional behaviours such as bruxism, alongside reduced use of floss and mouthwash. Brushing frequency remained stable. Self-rated dental care declined during stress, although most participants did not subjectively perceive a worsening of their oral health; **Conclusions**: A daily stressful lifestyle appears to influence several dental health habits, particularly diet and parafunctions. These findings support including stress-related questions and behavioural advice in preventive dental care—especially for high stress populations such as students.

KEYWORDS

Dentistry; stress; oral health habits; bruxism; preventive care.

RESUMEN

Introducción: Se sabe que un estilo de vida estresante a diario repercute en la salud general, pero su efecto específico en los hábitos de salud dental sigue estando menos explorado. Los entornos universitarios, en particular, exponen a los individuos a un estrés frecuente que puede influir en rutinas como la higiene bucal, las elecciones dietéticas o las conductas parafuncionales; **Objetivos**: Determinar y evaluar cómo un estilo de vida estresante diario afecta a los hábitos de salud dental durante periodos de alto estrés en comparación con periodos no estresantes; **Métodos**: Se realizó un estudio observacional transversal mediante una encuesta autoinformada distribuida a estudiantes y profesores de la Universidad Europea de Madrid. Se recogieron respuestas sobre higiene oral, conductas parafuncionales, dieta y estrés percibido. El análisis estadístico se realizó con Python, aplicando pruebas t pareadas, Wilcoxon signed-rank, binomial, y Chi-cuadrado; **Resultados**: Tras aplicar criterios de inclusión y exclusión, se analizaron 111 respuestas. Durante los periodos de estrés elevado, los participantes informaron de un aumento del consumo de azúcar y de comportamientos parafuncionales como el bruxismo, junto con una reducción del uso de hilo dental y enjuague bucal. La frecuencia de cepillado se mantuvo estable. El cuidado dental autoevaluado disminuyó durante el estrés, aunque la mayoría de los participantes no percibieron subjetivamente un empeoramiento de su salud bucodental. **Conclusiones**; Un estilo de vida estresante diario parece influir en varios hábitos de salud dental, en particular la dieta y las parafunciones. Estos hallazgos respaldan la inclusión de preguntas y comportamientos relacionados con el estrés en las encuestas.

PALABRAS CLAVE

Odontología; estrés; hábitos de salud bucodental; bruxismo; cuidados preventivos.

CONTENTS

1. INTRODUCTION

1.1 Prevalence of stress

Stress is an ever-present part of modern life, with many studies underlining the link it holds with one's general and oral health (1,2). Both acute and chronic stress impact health directly and indirectly through behavioural changes and physiological alterations. When one is unable to effectively cope with repeated daily stressors, a shift from acute to chronic stress can occur, resulting in long-term physiological and behavioural consequences (3, pp. 367-368). These changes enhance the risk of developing dental diseases such as caries and periodontal disease (4,5). Daily stressors and their influence on dental health habits are especially relevant in university populations, facing elevated stress from academic, social, and personal pressures (6).

1.2 Definition of stress

Stress is defined as the non-specific physiological response of the body to change. It can be stimulated by physical changes such as exercise, psychological changes such as future uncertainties, and social changes such as relationship conflicts (1). Within daily life, frequent but minor pressures - known as daily stressors - hold a considerable presence. Unlike chronic stress, which arises from ongoing, major life events such as long-term illness or unemployment, daily stressors are brief and temporary. These include small events like examinations, minor work conflicts, or short-lived inconveniences (4). Despite their seemingly trivial nature, these stressors can cumulatively impact resilience and motivation, influencing health behaviours such as diet, sleep, and dental health habits - especially when they build up over time without proper coping (4,7,8).

Notably, stress is not always uniquely linked to negative experiences, known as distress. Positive stress, or eustress, arises from favourable occurrences such as achievements (2). Regardless of its classification, the non-specific physiological responses to stress, such as joint pain, gastrointestinal issues, and cephalalgias, demonstrate its undeniable impact on the body (1).

1.3 Behavioural changes due to stress

Stress plays a decisive role in one's lifestyle choices, with a tendency to habits that negatively impact dental health. Dental health habits, particularly, encompass behaviours such as regular brushing, flossing, and the use of mouthwash, which are key for maintaining oral health and preventing dental diseases (5). Evidence suggests that elevated stress can result in neglection of these oral hygiene routines due to exhaustion, cognitive strain, or lack of motivation (9).

The Biopsychosocial Model suggests that disease is multifactorial; Influenced by biological, psychological, and social factors (10, p. 2). Notably, two psychosocial elements of the model, elevated stress and low social support, correlate with deteriorated diet quality and reduced exercise (11). These non-health-promoting behaviours indirectly impact oral health by cultivating conditions that favour disease progression. Psychologically, stress reduces participation in positive dental health habits like regular tooth-brushing and flossing (10, p. 2). From a behavioural economics perspective, stress and cognitive overload may lead individuals to favour low-effort routines over long-term health behaviours like flossing or using mouthwash (12).

Lifestyle coping behaviours such as alcohol consumption, tobacco use, and recreational drug use are observed in those experiencing stress and have been shown to significantly harm oral health. These mechanisms not only decrease compliance with dental health habits but also promote the progression of oral diseases (13,14). One example is smoking, a common stress-related coping mechanism, which weakens the immune response, decreases salivary flow, and increases susceptibility to periodontal disease and caries (15, pp. 2-4; 16, pp. 11703-11706).

Another frequent coping mechanism is alcohol ingestion. Literature suggests that its dehydrating nature leads to decreased salivary flow and diminished salivary molecules such as immune cells and protective proteins, as well as disruption of the oral microbiota equilibrium (17, p. 6). Alcohol is also frequently consumed with sweet mixers, provoking caries and dental erosion (18).

Stress has also been shown to alter eating habits, often increasing the intake of fermentable carbohydrates and sugary foods (19). These changes, particularly frequent snacking between meals, create a cariogenic environment that significantly raises the risk of dental caries (20). Furthermore, some psychological theories, such as the comfort food hypothesis, suggest that individuals under stress may seek out high-calorie, palatable foods to help reduce physiological and emotional strain (3, p. 368; 21, p. 706).

Additionally, psychological disorders such as anxiety or depression are associated with increased stress levels, making individuals more susceptible to poor dental health habits (22,23). Evidence suggests that individuals with these conditions commonly display inconsistent brushing, poor nutritional choices, and reduced likelihood of attending dental appointments (24). These individuals are more prone to smoking, which heightens dental health issues by diminishing

salivary buffer capacity and encouraging the proliferation of cariogenic bacteria such as *Streptococcus mutans* (25).

1.4 Physiological responses due to stress

In addition to behavioural changes, stress affects oral health by inducing physiological responses. One of the primary responses is the release of glucocorticoids such as cortisol. Although this occurs in both acute and chronic stress, repeated or prolonged exposure can lead to dysregulation of immune and inflammatory responses. Over time, this may suppress immune function, increasing the vulnerability of the oral cavity to infections such as caries and periodontal disease (1, pp. 103-104; 2).

Xerostomia and reduced salivary flow are particularly associated with chronic stress, which can build up from daily stress in a cumulative manner (4,25). Saliva is crucial in neutralizing acids, washing away food particles, and providing anti-caries molecules. These protective functions are compromised with xerostomia, increasing the risk of caries and periodontal disease (25). In the physiological context of the Biopsychosocial Model, stress-induced salivary hormonal markers such as elevated glucocorticoid levels alter immune response, making the oral cavity more vulnerable to disease (10).

The Life-Course Perspective further clarifies how physiological responses to stress develop over time. Research suggests that adverse experiences at any age can impact one's coping strategies and health behaviours significantly, over-activating the hypothalamic–pituitary–adrenal (HPA) axis, increasing systemic inflammation, and reducing volume in brain areas related to regulation and decision-making (26,27). This may result in difficulty upholding oral hygiene habits, particularly when stressed (27).

Acute, minor stressors especially can accumulate to become chronic stress, weakening the body's immune defences and one's dental health habit maintenance, as highlighted in the Cumulative Stress Effect. This concept suggests that the more an individual experiences chronic stress, the greater they are negatively impacted by the same daily stressors that they could otherwise manage (7). Over time, one's capacity to effectively withstand stressors with resilience is reduced as the repeated minor inconveniences accumulate (4,7). These reactions to chronic stress, such as xerostomia and increased inflammatory markers, therefore, are also linked to minor, daily stressors.

Moreover, a cross-sectional study analysing reactive markers found that a greater degree of inflammatory markers was noted in those experiencing chronic stress. These inflammatory markers have been linked to periodontal disease progression, highlighting the physiological impact stress holds (8).

The combination of behavioural and physiological responses to both daily and chronic stressors outline an undeniable link to stress that greatly shapes oral health. Thus, it is fundamental to understand these links to form effective measures against stress-induced dental health issues.

1.5 Justification

Understanding the connection between daily stressors and oral health habits is key in modern dentistry, which tends towards prevention. Today's high-productivity culture creates daily stress through work, academics, relationships, and personal issues. Studying how stress affects behaviours and their frequencies - such as brushing, flossing, diet, chewing gum, bruxism, and substance use – helps identify patterns linked to dental disease and Temporomandibular Joint (TMJ) damage. Identifying the potential causes of dental diseases is the starting block to reducing their prevalence.

The outcomes of this investigation may highlight implications for a more holistic view of dentistry in the future, wherein the oral cavity is not the sole focus, but the main route through which problems affecting the whole body and mind can be identified. If daily stressors show significant impact on dental health habits, dental practitioners can be encouraged to include questions about stress as part of the medical history and holistically address the habits it may produce. Moreover, public health programmes to educate and aid in management of stress could be implemented. The rising prevalence of stress in daily life makes insight into stress mechanisms fundamental for updating dental practices and encouraging long-term oral well-being.

1.6 Research question

Amongst university students and professors, how does a daily stressful lifestyle affect oral health habits as compared to a non-daily stressful lifestyle?

1.7 Hypotheses

Alternative hypothesis (H1): University students and professors with a daily stressful lifestyle have poorer oral health habits compared to those with less daily stressful lifestyles.

Null hypothesis (H0): There is no significant difference in oral health habits between university students and professors who have a daily stressful lifestyle and those who have less daily stressful lifestyles.

2. OBJECTIVE

To determine and evaluate how a daily stressful lifestyle impacts dental health habits during high stress periods, compared to non-stressful periods.

3. MATERIAL AND METHODS

3.1 Study type and design

This observational, cross-sectional study collected subjective data from European University of Madrid (UEM) students and professors at a single point in time. The survey (Annex 9.1), distributed via Microsoft Forms through social media, asked participants to reflect on their dental habits and daily stress levels across academic periods (28). As defined in the survey, "*high*", "*intermediate*", and "*low*" stress periods correspond to exam, lecture, and holiday periods, respectively, and are referred to hereafter as HSP (High Stress Period), ISP (Intermediate Stress Period), and LSP (Low Stress Period).

3.2 Scope of study

An online sample size calculator was used to determine the required sample size to obtain reliable and representative data for a population of 10,000 (estimated number of UEM students and professors) (29). A sample of 370 was calculated using a 95% confidence level and 5% margin of error. Recruitment followed convenience sampling, applying inclusion and exclusion criteria. Informed consent was obtained, guaranteeing anonymity. Literature was reviewed through PubMed and ResearchGate.

3.3 Inclusion and exclusion criteria

Inclusion criteria:

1. Individuals aged 18–65 years.
2. Active UEM students or professors.
3. Individuals who provide informed consent to participate.

Exclusion criteria:

1. Participants with diagnosed mental health conditions affecting stress perception (e.g., anxiety, Post-Traumatic Stress Disorder).
2. History of systemic diseases affecting the oral cavity, such as Sjögren's syndrome or diabetes, as these may independently influence oral health outcomes.
3. Participants with removable dentures, or edentulous cases that would complicate assessments of routine oral health maintenance.
4. Individuals who do not consent to participate.

3.4 Intervention

As this was an observational study, no active interventions were used. Participants completed a self-reported survey via Microsoft Forms, which queried lifestyle habits, subjective stress levels,

and dental health habits, including Temporomandibular Joint (TMJ)-related behaviours (28). It evaluated how university-specific daily stressors like exam periods influenced dental health habits, compared to lecture and holiday periods, based on participant self-reflection across different academic contexts.

3.5 Method of data collection

Data was collected electronically via a self-reported survey (January 31 - March 3, 2025). Informed consent was obtained, and participants were assured of anonymity. The Biomedical Sciences Department and Ethics Committee granted approval. The survey (Annex 9.1) included:

1. Demographics: Age, sex, university role, study field, health conditions.
2. Dental health habits: Brushing, cleaning tools, bruxism.
3. Caries risk: Sugar consumption, snacking, smoking.
4. Stress: Primary stressors, perceived stress during LSP vs HSP (via multiple choice and Likert scale, rating stress during HSP and LSP on a scale from 0-5, wherein 0 represented "never stressed," and 5 represented "very frequently stressed.")

3.6 Statistical analysis

Statistical analysis was performed using Python (version 3.11). The scipy.stats library was used to apply significance tests. A paired t-test was used for continuous, normally distributed data (e.g., sugar consumption), and the Wilcoxon signed-rank test was used for ordinal responses such as self-rated dental care and bruxism frequency. The Shapiro-Wilk test was used to assess normality. For categorical variables like brushing or mouthwash changes, the Chi-square test was applied. However, due to small sample sizes in one category, the Chi-square test for flossing frequency was replaced by a binomial test, grouping "no change" and "more frequent" as one category. A worked example of the binomial test is included in Annex 9.2.1 to illustrate the statistical method applied manually. A full summary of all statistical tests used in the analysis is presented in Table 16 (Annex). Statistical significance was set at $p < 0.05$.

3.7 Ethical issues

The study protocol was approved by the Biomedical Sciences department at UEM. Participants received informed consent regarding the study's purpose, confidentiality of data, and voluntary response.

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4. RESULTS

4.1 Participants

The survey was widely distributed to 171 students and professors at UEM, via Microsoft Forms through social media (28). The survey completion rate was 64.9% according to the exclusion criteria (Figure 1).

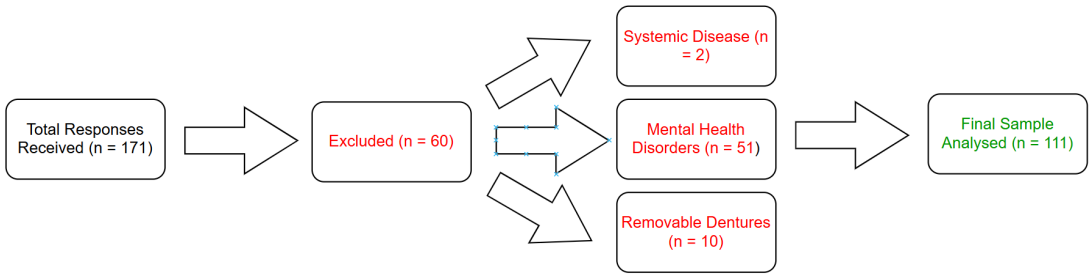


Figure 1. Flowchart of participant selection and exclusion criteria

4.2 General information

4.2.1 Participant characteristics and general health

The survey included participants aged 18 to 55+ years old (Figure 2), with 73 females (67.0%), 33 males (30.0%), and 3 "Other/Prefer not to say" (3.0%) (Figure 3). 96 (86.5%) were from Health Science degrees, and 15 (13.5%) from Non-Health Science degrees.

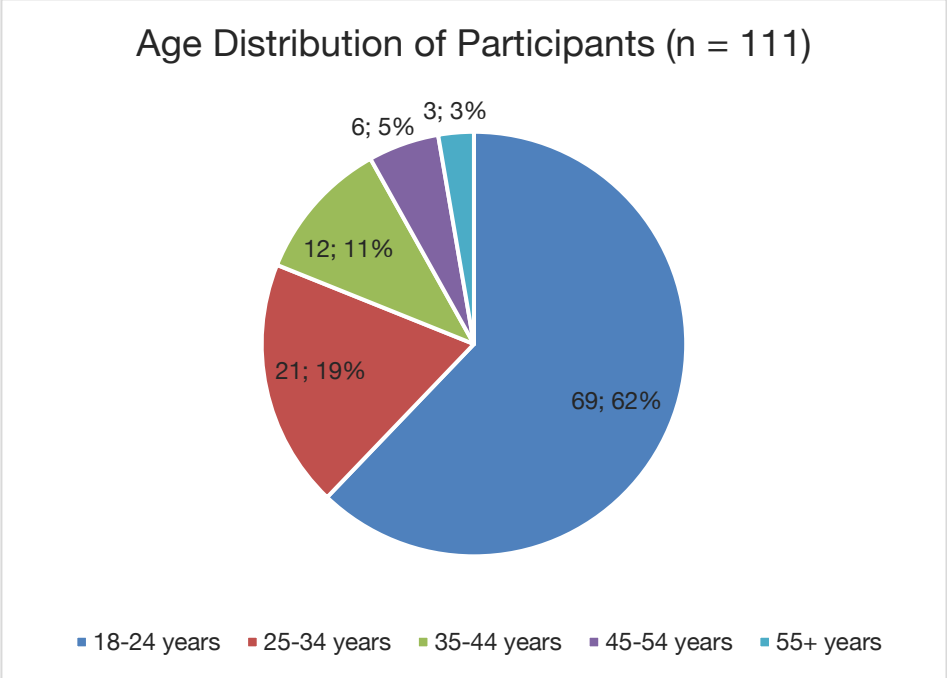


Figure 2. Age distribution of participants

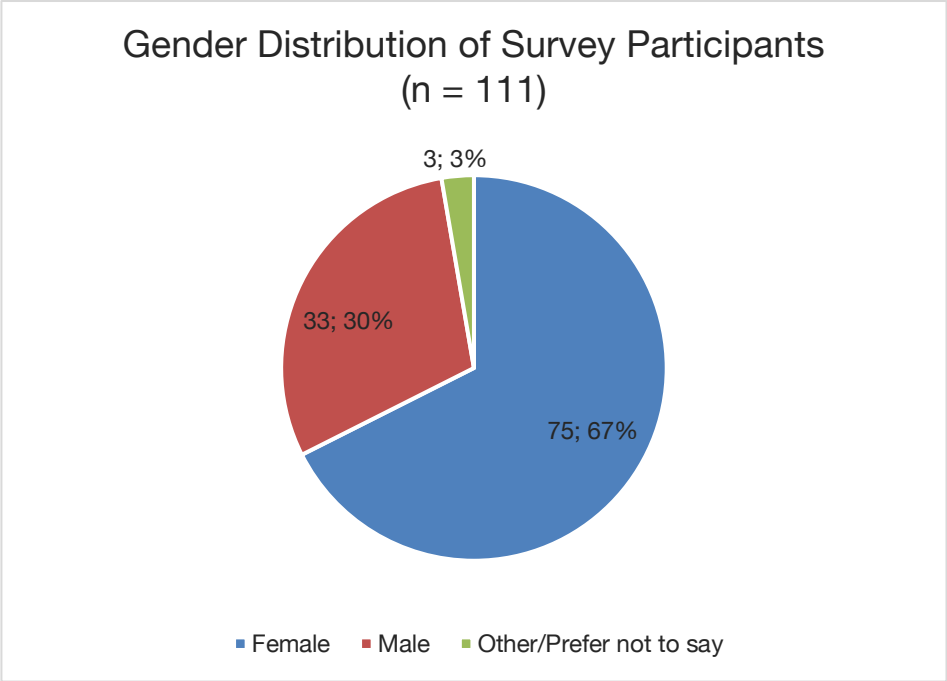


Figure 3. Gender distribution of survey participants

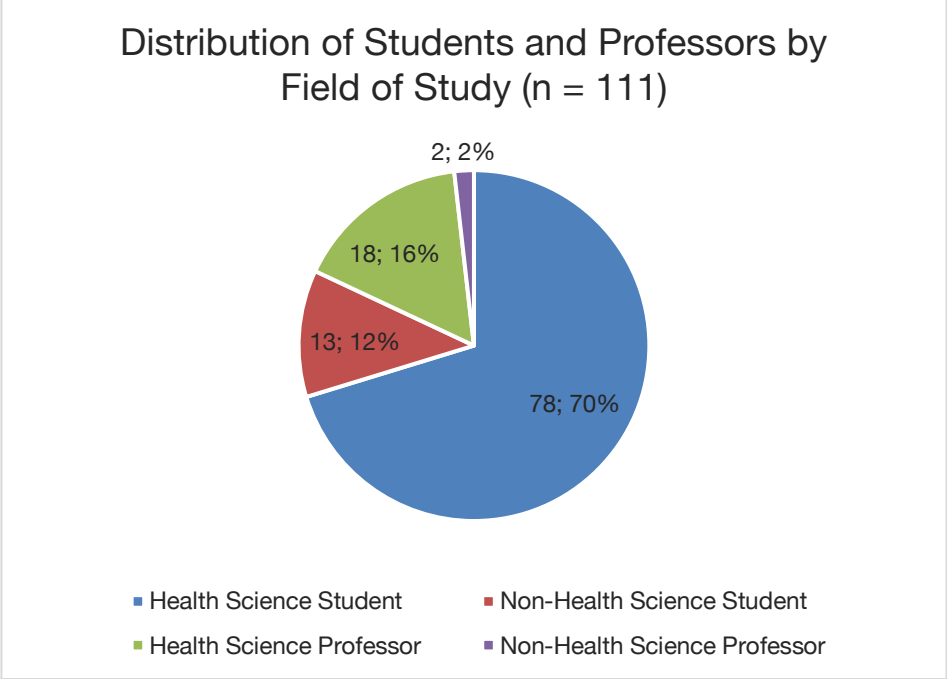


Figure 4. Distribution of students and professors by field of study

Table 1. Self-Reported Overall Health Condition of Participants (n = 111)

Health Condition	Count (n)	Percentage (%)
Very Poor	0	0.0
Poor	0	0.0
Fair	16	14.4
Good	56	50.5
Very Good	39	35.1

4.2.2 Stress levels and sources

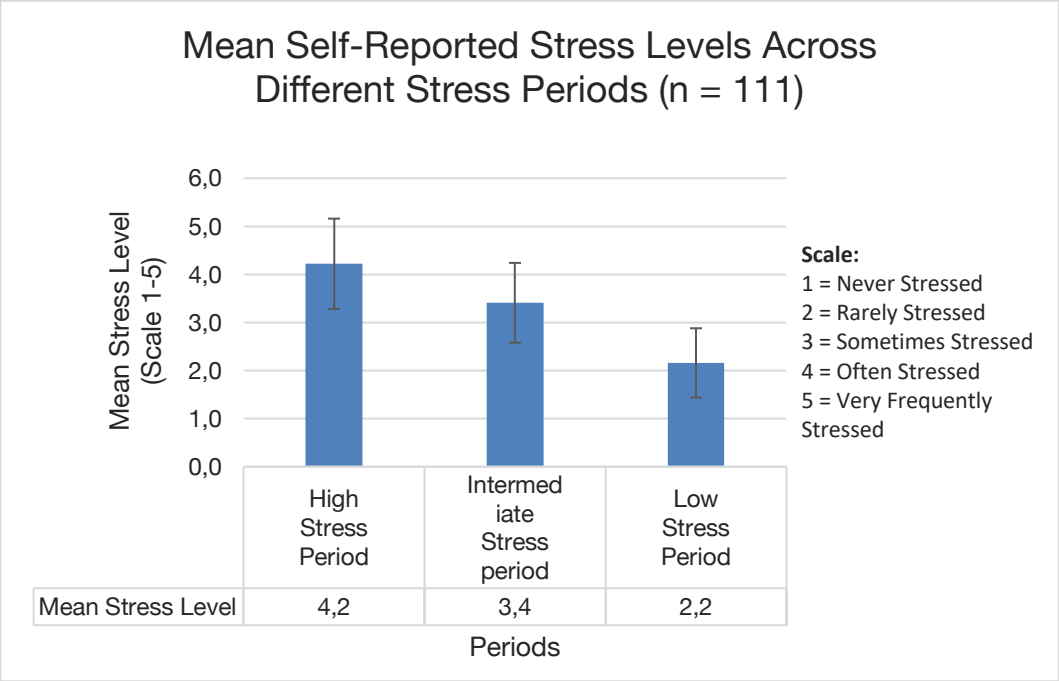


Figure 5. Self-reported stress levels across different stress periods (Standard Deviation (SD) and Sample Variance (s^2) of Mean (M) stress levels: HSP: SD = 0.94, s^2 = 0.88; ISP: SD = 0.83, s^2 = 0.69; LSP: SD = 0.72, s^2 = 0.52)

Table 2. Primary Stressor Selected as Most Impactful (n = 111)

Stressor (First Chosen)	Count (n)	Percentage (%)
Academic pressures/work	47	42.3
Other	25	22.5
Personal life (relationships)	20	18.0
Finances	10	9.0
Health	9	8.1

4.2.3 Health habits and perceived oral health issues

Table 3. Distribution of Habit Selections Among Participants (Multiple Responses Allowed; n = 151; Total selections from 111 participants)

Habit	Count (n)	Percentage (%)
Smoking, drinking alcohol, recreational drugs	39	25.8
Lack of sleep	57	37.7
Unhealthy diet	26	17.2
None of the above	29	19.2

Table 4. Frequency of Smoking, Alcohol Consumption, or Recreational Drug Use Among Participants Who Engage in These Habits (n = 25)

Frequency of Smoking, Drinking Alcohol, or Recreational Drug Use	Count (n)	Percentage (%)
Daily	6	24.0
A few times a week	4	16.0
Weekly	6	24.0
Monthly	7	28.0
Rarely	2	8.0

Table 5. Prevalence of Oral Health Issues Among Participants (Multiple Responses Allowed; n = 152; Total selections from 111 participants)

Oral Health Issues Experienced	Count (n)	Percentage (%)
Bruxism/Tooth Grinding	49	32.2
Gingivitis/Periodontitis (Bleeding or Painful Gums)	20	13.1
Dry Mouth	21	13.8
Mouth Sores or Other Issues	20	13.1
No, I Have Not Experienced Any of These Issues	42	27.6

4.3 Temporomandibular Joint (TMJ) symptoms

4.3.1 Bruxism

Table 6. Frequency of Bruxism Among Participants (n = 111)

Response	Count (n)	Percentage (%)
Yes	35	31.5
No	58	52.2
Maybe	18	16.2

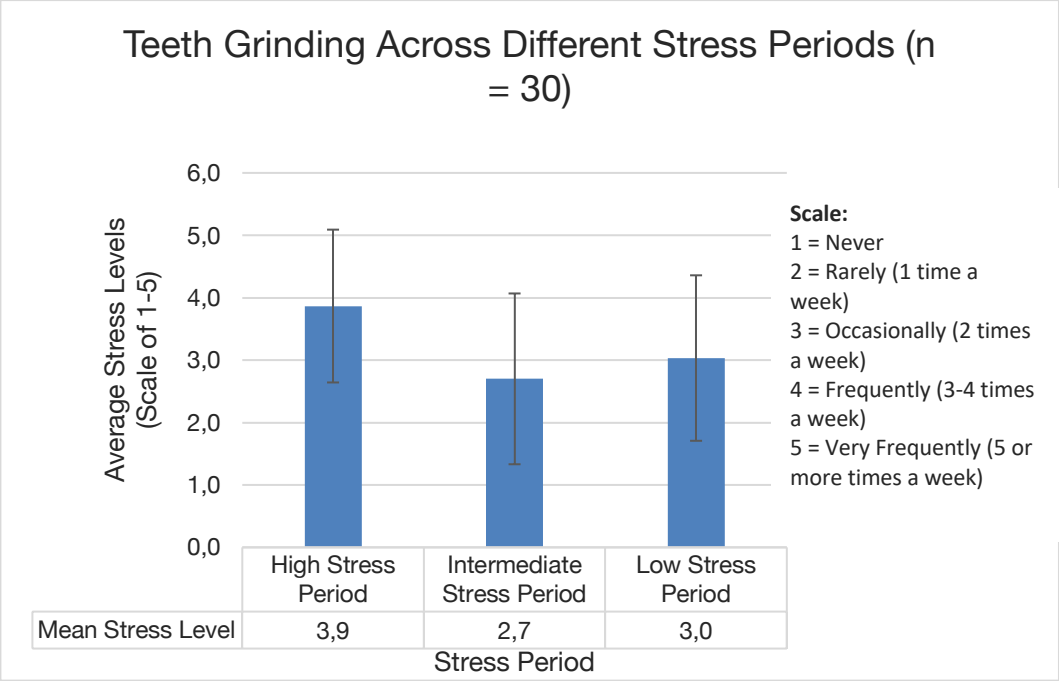


Figure 6. Teeth grinding across different stress periods (SD and s^2 of Mean Stress Levels: HSP: SD = 1.22, s^2 = 1.5; ISP: SD = 3.03, s^2 = 1.76; LSP: SD = 1.37, s^2 = 1.87)

4.3.2 Nail biting, pen biting, and gum chewing

Table 7. Nail Biting, Pen Biting, and Gum Chewing Habits Among Participants (n = 111)

Response	Count (n)	Percentage (%)
Yes	49	44.1
Sometimes	16	14.4
No	46	41.4

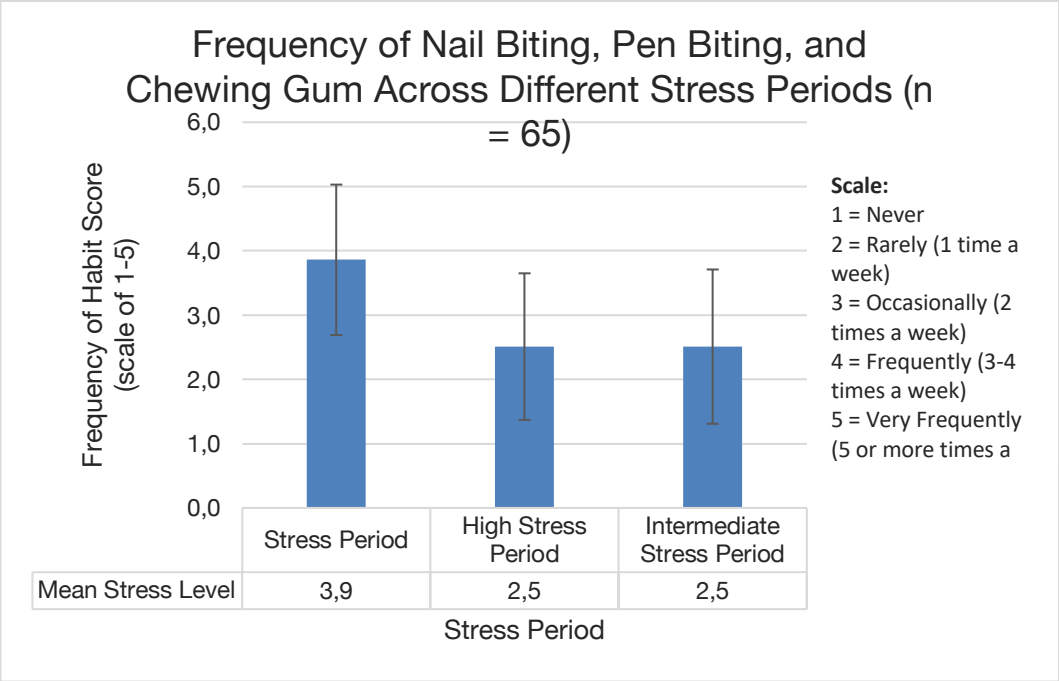


Figure 7. Frequency of nail biting, pen biting, and gum chewing across different stress periods (Frequency SD: HSP = 1.17; ISP = 1.14; LSP = 1.20)
Significantly more frequent during HSP ($t(64) = 7.05$, $p < 0.001$).

Table 8. Use of Occlusal Splint at Night Among Participants (n = 111)

Response	Count (n)	Percentage (%)
Yes	23	20.7
No	88	79.2

Table 9. Response to Increased Frequency or Intensity of Headaches During HSP (n = 111)

Response	Count (n)	Percentage (%)
Yes	58	52.2
No	53	47.7

4.4 Nutrition and Habits

4.4.1 Number of main meals consumed daily

Table 10. Number of Main Meals Eaten Per Day (n = 111)

Number of Meals	Count (n)	Percentage (%)
One	6	5.4
Two	43	38.7
Three	52	46.8
More than three	10	8.9

4.4.2 Stress-related changes in sugar intake

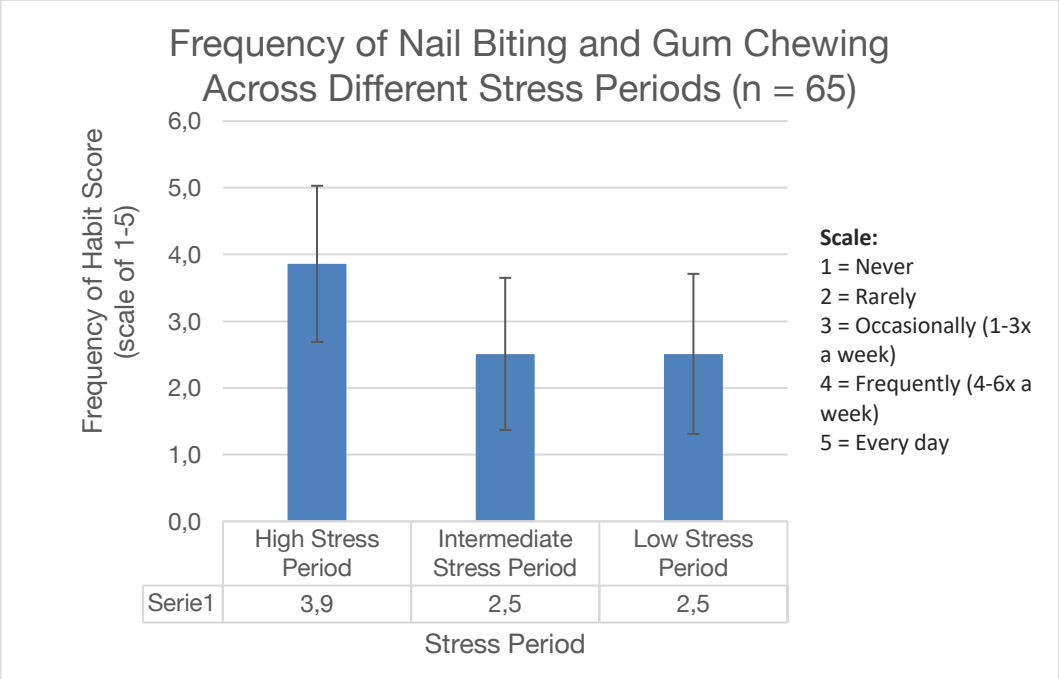


Figure 8. Comparison of sugar consumption frequency between HPS and LSP (SD in HSP: SD = 1.11; LSP: SD = 0.84).
Significant difference between HSP and LSP ($t(110) = 8.74$, $p < 0.001$).

4.4.3 Habits during stress

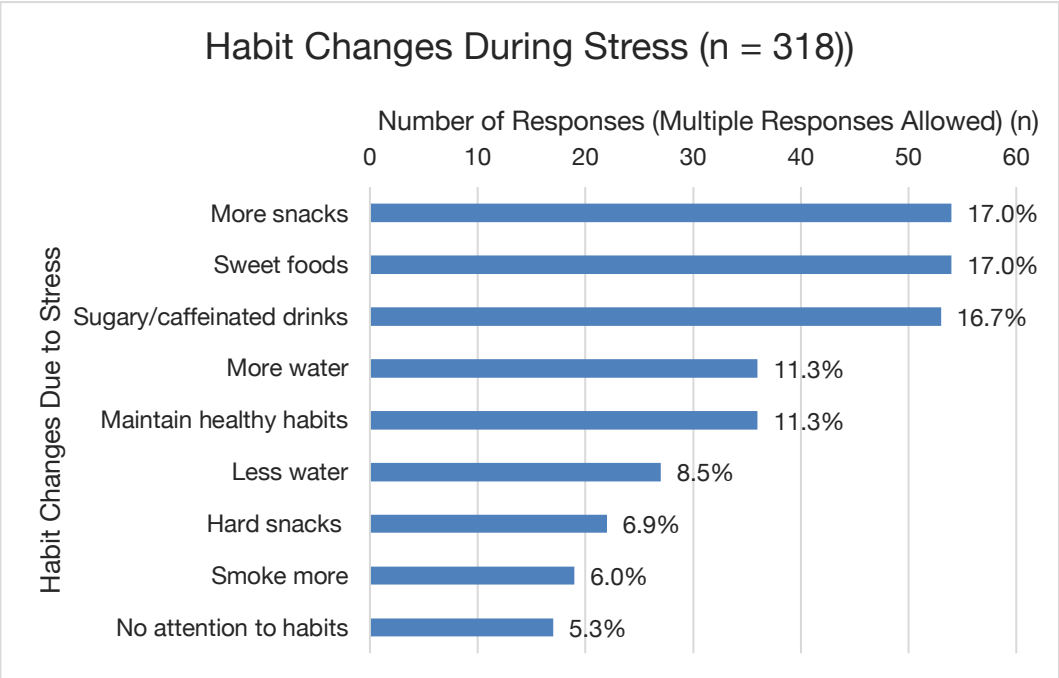


Figure 9. Nutritional habit changes during HSP (Multiple responses allowed; n = 318; Total selections from 111 participants)

4.5 Hygiene

4.5.1 General dental hygiene habits

Table 11. Toothbrush Type Utilised (n = 111)

Toothbrush Type	Count (n)	Percentage (%)
Manual	68	61.2
Electric	43	38.7

Table 12. Daily Toothbrushing Frequency Among Participants (n = 111)

Duration of Toothbrushing Among Participants	Count (n)	Percentage (%)
0 times a day	0	0.0
1 time a day	5	4.5
2 times a day	62	55.8
3 times a day	40	36.0
More than 3 times a day	4	3.6

Table 13. Duration of Toothbrushing Among Participants (n = 111)

Brushing Duration	Count (n)	Percentage (%)
0-1 minute	7	6.3
1-2 minutes	52	46.8
2+ minutes	52	46.8

Table 14. Use of Fluoridated Toothpaste Among Participants (n = 111)

Response	Count (n)	Percentage (%)
Yes	103	92.8
No	7	6.3
Does not use toothpaste	1	0.9

Table 15. Use of Additional Dental Hygiene Tools (Multiple Responses Allowed; n = 201; Total selections from 111 participants)

Oral Hygiene Tool Used	Count (n)	Percentage (%)
Floss	72	41.9
Mouthwash	46	26.7
Interdental brushes	29	16.9
Tongue Scraper	22	12.8
None of the listed tools	20	11.6
Water-flosser	7	4.1
Threader Floss (Superfloss)	5	2.9

4.5.2 Hygiene habits change under stress

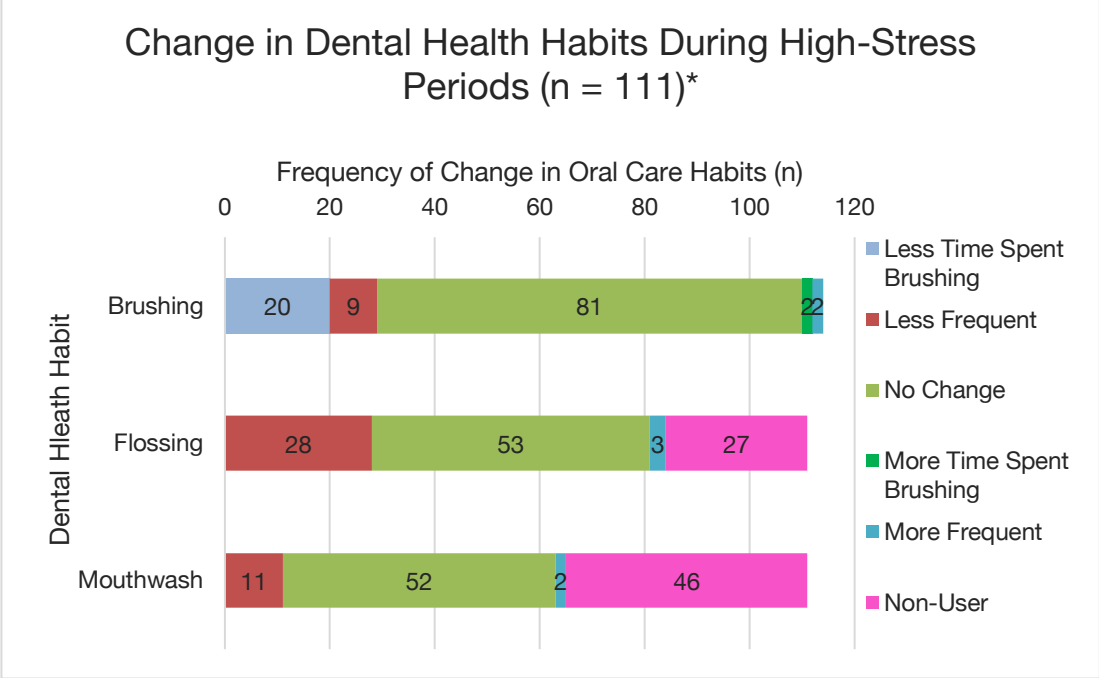


Figure 10. Change in dental health habits during HSP
*(n = 114 for brushing as multiple responses allowed)
Brushing behaviour showed no significant change (p = 1.0; Chi-square test). Flossing frequency decreased significantly during HSP (p = 0.016, binomial test).

4.5.3 Changes in *Candida* infections under HSP

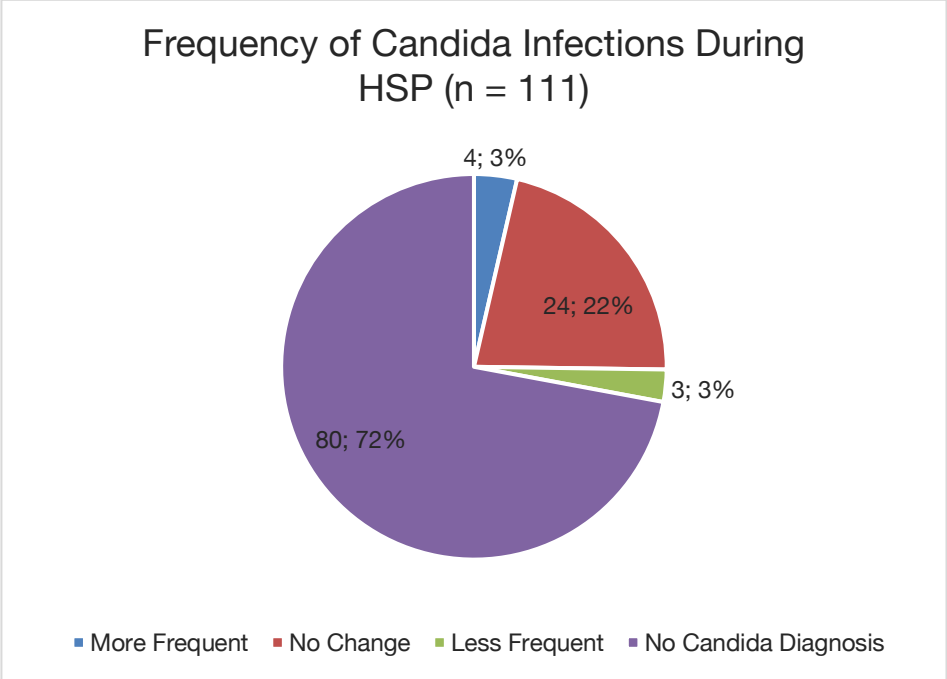
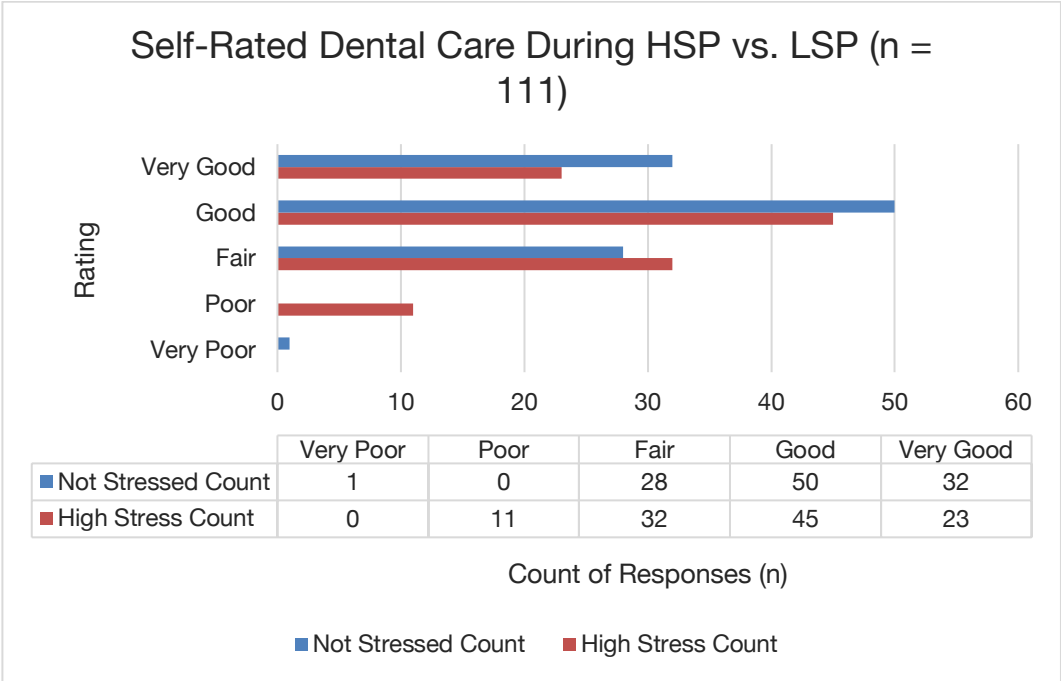


Figure 11. Frequency of *Candida* infections during HSP

4.6 Self rated dental care and stress



	Very Poor	Poor	Fair	Good	Very Good
Not Stressed Count	1	0	28	50	32
High Stress Count	0	11	32	45	23

Figure 12. Self-rated dental care during HSP vs. LSP
Rated significantly lower during HSP ($W = 66.5$, $p < 0.001$; Wilcoxon test).

4.7 Increase in dental problems during HSP

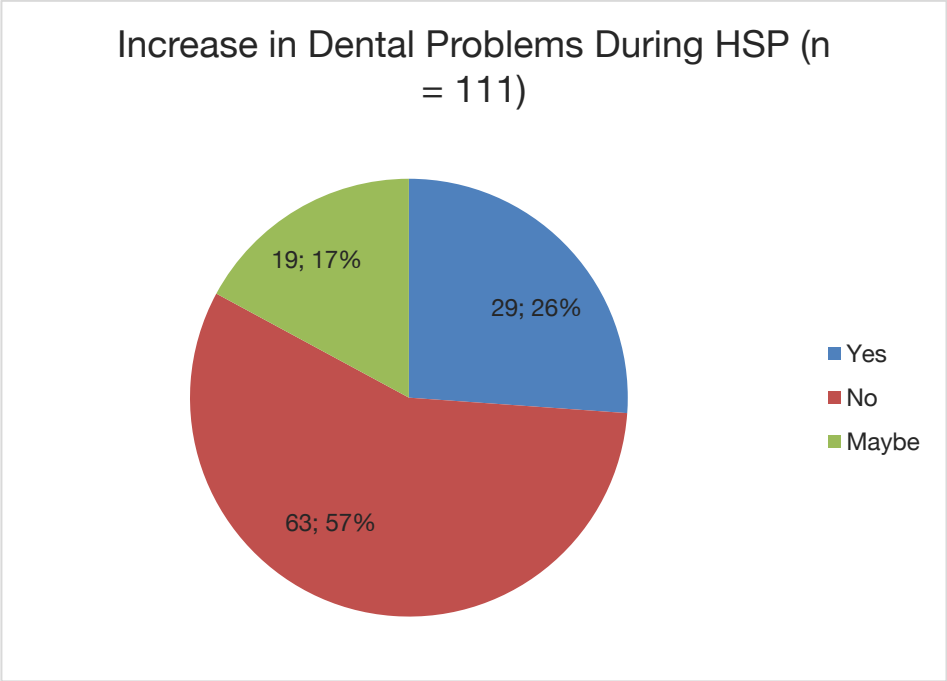


Figure 13. Increase in dental problems during HSP

4.8 Coping strategies for stress management

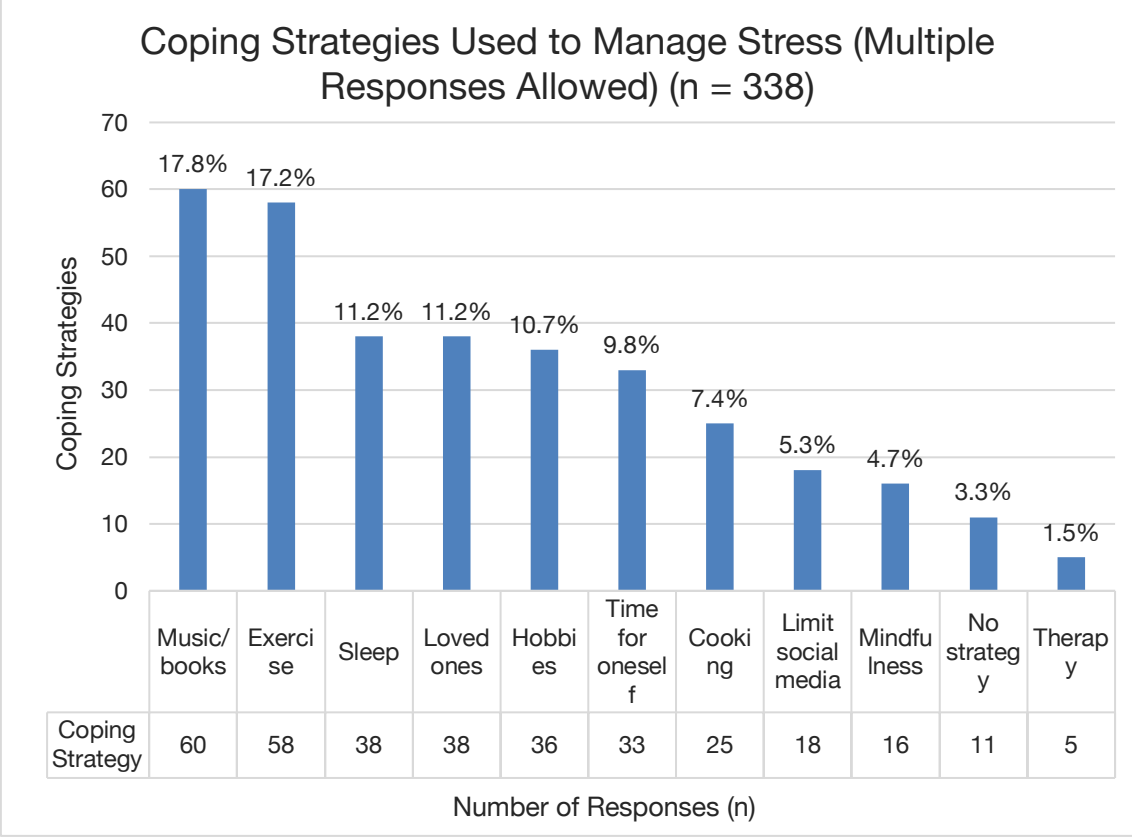


Figure 14. Coping strategies used to manage stress (Multiple responses allowed; n = 338; Total selections from 111 participants)

4.9 Impact of stress management on dental habits

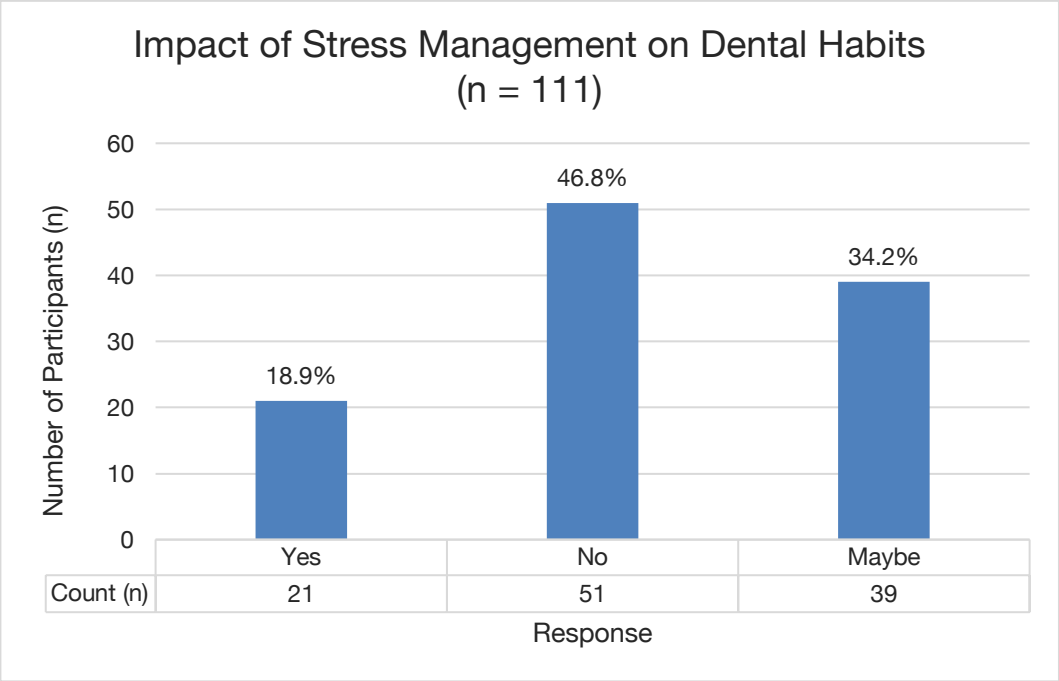


Figure 15. Impact of stress management on dental habits
Significant distribution across "Yes / Maybe / No" responses ($\chi^2(2) = 12.32$, $p = 0.0021$).

5. DISCUSSION

5.1 Overview

5.1.1 Overview of findings

This section reviews key findings and compares them to those of other populations to better understand how daily stress impacts dental health.

While some behaviours, like brushing frequency, remained unchanged, others showed clear changes under stress. Participants reported increased bruxism (Table 6; Figure 6), higher sugar consumption (Figure 8), reduced use of floss and mouthwash (Figure 10), and lower self-rated dental care (Figure 12). These changes were observed alongside a significant rise in self-reported stress during exam periods (Figure 5), highlighting the behavioural impact of daily stress on oral health.

5.1.2 General stress patterns across periods

Perceived stress levels varied across the academic calendar, peaking during High Stress Periods (HSP, M = 4.22), remaining moderate during Intermediate Stress Periods (ISP, M = 3.41), and dropping during Low Stress Periods (LSP, M = 2.16) (Figure 5). Notably, stress levels during ISP showed the highest variability (SD = 3.03), suggesting more individual differences in perceived stress during academic periods (Figure 6).

These shifts suggest academic pressure influences stress levels and may explain behavioural changes like increased sugar intake or reduced flossing during HSP. Stress levels during HSP reflect patterns reported in previous studies of academic pressure (30).

5.2 Oral hygiene practices

Although stress is often linked to neglect of hygiene routines, most participants in this study reported no change in brushing during HSP. Statistical analysis supported this, though some brushed for less time. In contrast, flossing frequency significantly dropped ($p = 0.016$, binomial test), after merging “no change” and “more frequent” responses. Mouthwash use also declined - likely because flossing and mouthwash are seen as less essential (Figure 10). This suggests stress more strongly affects less ingrained habits, while brushing remains stable, likely due to its automatic nature or the high proportion of health students (86.5%). The pattern aligns with behavioural economics, where stress leads to prioritising ease over long-term health, supported by evidence that exam stress worsens outcomes like plaque and gingivitis (12,31).

5.3 Parafunctional habits: Nail biting, pen biting, and gum chewing

As mentioned in Section 1.3, stress can also influence less conscious behaviours like nail biting, pen biting, and gum chewing. These stress-triggered habits are parafunctional and may impact dental structures (32).

In this study, 58.5% of participants reported engaging in these behaviours either occasionally or frequently (Table 7), with significantly higher frequency during HSP ($M = 3.86$, $SD = 1.17$), than during ISP ($M = 2.51$, $SD = 1.14$) or LSP ($M = 2.51$, $SD = 1.20$), $p < 0.001$ (Figure 7). Similarly, a 2021 study found gum chewing and nail biting to be significantly associated with painful Temporomandibular Joint (TMJ) clicking, suggesting these behaviours may contribute to Temporomandibular Disorders (TMD) (32). These findings suggest that daily stress can trigger and intensify parafunctional habits, often going unnoticed, yet contributing to occlusal wear and reinforcing the need for clinical screening - especially in patients with jaw discomfort.

5.4 Nutrition and dietary habits

Responses indicated that stress significantly influenced nutrition habits with participants consuming more sugary foods during HSP ($t(110) = 8.74$, $p < 0.001$; Figure 8). This aligns with a preference for carbohydrate-rich diets under stress (22), possibly as a coping strategy suggested by the comfort food hypothesis. A 2023 study linked higher sugar intake with reduced salivary cortisol reactivity after acute stress, implying a stress-alleviating effect (33). However, these foods, though momentarily comforting, carry clear implications for oral health - particularly their cariogenic potential (34).

5.5 Self-rated dental care

Participants rated their dental care significantly lower during HSP ($W = 66.5$, $p < 0.001$; Figure 12). While objective behaviours like brushing frequency may remain stable, perceived dental care quality often declines under pressure. However, less than half reported this decline, suggesting a disconnect between behaviour and self-assessment. This may reflect a limited perception of health, where individuals equate well-being with physical status, overlooking the effects of daily psychological stress. Asking about recent stress during appointments could help contextualise changes in perceived care, especially when no behavioural shift is observed.

5.6 Coping strategies

Although many participants reported using coping strategies like music, exercise, or socialising (Figure 14), few believed these improved their dental habits (Figure 15). Most responded "No" or "Maybe" when asked if managing stress improved their dental care, with a significant skew toward "No" ($\chi^2(2) = 12.32$, $p = 0.0021$). These findings suggest that while such strategies may be helpful emotionally, they are not reliably effective in improving oral health behaviours under stress, highlighting the need for more targeted, dental health-focused interventions.

5.7 TMJ symptoms, headaches, and stress-related pain

Bruxism, a common parafunctional behaviour, was clearly influenced by stress in this study. Amongst participants who identified as bruxists, grinding frequency was significantly higher during HSP ($M = 3.9$) compared to LSP ($M = 2.7$), $W = 0.0$, $p < 0.001$ (Table 6, Figure 6). Even those unsure about grinding still reported symptoms, suggesting subconscious occurrence. Figure 13 supports this trend, with more participants reporting oral health deterioration - including pain, bruxism, and stress-related discomfort - during HSP. These findings align with prior studies linking stress to bruxism (35,36).

Increased grinding during HSP was accompanied by a rise in physiological symptoms: jaw soreness, facial pain, and tension headaches. Over half reported more frequent headaches during HSP (52.2%; Table 9), a common symptom of TMD and parafunctional strain (37). A 2023 study similarly found that nearly half of dental students under stress experienced TMD symptoms, reinforcing the clinical relevance of daily psychological stress in academic settings (38).

This aligns with the biopsychosocial model, linking emotional strain to physical tension and inflammation (10). In dentistry, this may manifest as myofascial pain, TMJ dysfunction, or bruxism. These findings highlight the need for clinicians to consider stress when assessing unexplained orofacial symptoms.

5.8 Overall perceived deterioration of oral health under stress

Although stress was associated with behavioural changes, such as reduced hygiene quality (Figure 12), increased sugar intake (Figure 8; Figure 9), and more frequent parafunctional habits (Figure 6), most participants did not perceive a direct worsening of their dental health during HSP. As shown in Figure 13, the majority did not report an increase in caries, myalgia, or oral pain. No significant changes were found in reported *Candida* infections (Figure 11), likely due to the short timeframe, as *Candida* overgrowth typically results from prolonged immune

suppression or poor hygiene (39). This reflects a disconnect between actual behaviour and subjective awareness, reflected by findings where students rated their oral health positively despite needing treatment (40). These results highlight the importance of educating patients how stress may subtly affect oral health, even without noticeable symptoms.

5.9 The life-course perspective

The Life-Course Perspective builds on previous evidence by emphasising how stress exposure across life stages influences dental health habits. While acute stress may offer short-term benefits, repeated daily stressors accumulate into chronic stress, gradually weakening coping capacity and disrupting routines like oral hygiene (7,26).

Long-term patterns in oral behaviour may also reflect earlier adaptations to stress. For instance, individuals with a history of early adversity may develop more reactive stress responses, making them more vulnerable to neglecting hygiene under pressure (27). Understanding these life-span effects reinforces the need for early, targeted interventions and helps explain variability in stress responses across individuals.

5.10 Clinical and preventive implications

This study reinforces the need for a preventive approach that recognises how daily stress can influence oral health behaviours. Participants showed clear changes under HSP: increased sugar intake (Figure 8), more frequent parafunctions (Figure 6; Table 6), and reduced flossing (Figure 10). Brushing habits remained stable, suggesting that stress selectively affects behaviours.

Biologically, chronic stress elevates inflammatory markers, associated with periodontal disease progression (8). Dentists may incorporate basic stress-related questions during visits, especially for those in high-pressure environments, identifying individuals at risk of neglecting hygiene or developing TMJ-related symptoms. Education remains key, as many are unaware of stress-related oral effects. Practical advice, like jaw relaxation techniques, splints, or snack substitutions can support meaningful change.

These findings, consistent with stress-focused studies like Garg et al., reinforce the importance of stress screening in education and clinical settings (38).

5.11 Limitations

This study has several limitations. While 35 participants identified as bruxists and 18 were unsure (Table 6), only 30 completed follow-up questions (Figure 6), limiting subgroup analysis. The sample was mainly health students and predominantly female (Figure 3), reducing generalisability. Several responses were excluded due to systemic or mental health conditions, or denture use (Figure 1), reducing overall sample size.

Since the data was collected at a single time point, it wasn't possible to observe longer-term patterns or understand how stress might influence dental habits over time. Finally, self-reported data introduced potential bias - especially in hygiene and stress reporting.

Future research should include more diverse populations, objective measures such as salivary tests, and a longitudinal approach to track stress-related changes over time.

6. CONCLUSIONS

This study aimed to evaluate how a daily stressful lifestyle affects dental health habits during HSP compared to LSP. Results showed that stress significantly influenced several behaviours: sugar consumption and parafunctional habits such as bruxism increased during HSP, while flossing and mouthwash use declined. In contrast, brushing remained stable, possibly due to the high proportion of Health Science students, or its ingrained nature. This suggests selectively stress affects some behaviours more than others and supports promoting resilient hygiene routines through education.

Although many participants did not perceive a decline in oral health, the data revealed behavioural changes with potential long-term consequences if repeated. These findings support the alternative hypothesis (H1), confirming that daily stress is a relevant behavioural factor in oral health and should be considered in preventive strategies.

Including questions about stress and routine habits during dental revisions, especially for high-risk groups like students or healthcare professionals, may aid in early intervention. While meaningful, the findings must be interpreted alongside limitations such as sample size, population type, and reliance on self-reported data.

7. SUSTAINABILITY

This study supports the social sustainability of healthcare by showing how daily stress affects dental health habits. Changes such as increased sugar intake, reduced flossing, and bruxism during HSP indicate a need for early intervention and prevention. Addressing these patterns early on could help avoid future complications and reduce treatment costs.

The findings align with the United Nations Sustainable Development Goals, especially Goal 3 (Good Health and Well-being) and Goal 4 (Quality Education). Educating patients and training dental professionals to consider how stress can impact one's dental health habits encourages a more preventive, patient-centered, realistic approach to care.

Asking simple, brief questions about stress during check-ups, especially for students or other high-stress populations, could help with early risk detection. Supporting better coping strategies and encouraging small, manageable, yet practical changes in routines and behaviours can promote long-term oral health, reinforcing public health strategies and ethical responsibility in sustainable healthcare practice.

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9. ANNEXES

9.1 Full Microsoft forms survey used in the study, including informed consent

How does stress affect your dental habits? ¿Cómo afecta el estrés a sus hábitos dentales?

Thank you for your interest in our study!

We're interested in understanding how stress affects dental habits. Your insights will help us improve awareness and support for better oral health. Our research focuses on university students and professors. If you do not fit this profile, we greatly appreciate your interest, but kindly ask you to skip the survey. If you are a university student or professor, please continue – your participation is highly valuable, and we truly appreciate your contribution!

This survey should take about 4 minutes to complete, and your responses will remain confidential.

Thank you!

¡Gracias por su interés en nuestro estudio!

Nos interesa saber cómo afecta el estrés a los hábitos dentales. Su opinión nos ayudará a mejorar la concienciación y el apoyo a una mejor salud bucodental. Nuestra investigación se centra en estudiantes y profesores universitarios. Si no se ajusta a este perfil, le agradecemos enormemente su interés, pero le rogamos que se salte la encuesta. Si es estudiante universitario o profesor, continúe: su participación es muy valiosa y apreciamos sinceramente su contribución. La encuesta le llevará unos 4 minutos y sus respuestas serán confidenciales.

¡Gracias!

Informed Consent:

This questionnaire is part of the Final Degree Project in Dentistry of the European University of Madrid entitled "How does our daily stressful lifestyle affect our dental health habits?" and directed by Professor Cristina Albarrán Nogales. The purpose of the present work is to determine the influence of daily stress on our dental care habits. The study will be carried out on both students and related university faculty and the information will be collected through a brief survey. Your participation in this study is free and voluntary, and you may request to be excluded from the study, without prior justification or prejudice to you. The information collected will be confidential and will not be used for any other purpose outside this research and derived from the research disclosure. The data collected will be completely anonymous. No personally identifiable information will be requested. The data collected in the survey will

be treated in accordance with the provisions of the Organic Law 3/2018, of December 5, on the Protection of Personal Data and guarantee of digital rights. For the purpose of the provisions of the regulations of the Organic Law 3/2018, of December 5, on the Protection of Personal Data and guarantee of digital rights, is informed and expressly consents to the use of the data provided in the survey, for the purposes indicated above. This consent is granted without prejudice to all the rights you have in relation to the above mentioned regulations, with the possibility of accessing the information provided, rectification, cancellation and opposition at any time you wish. To do so, please write to the tutor Prof. Cristina Albarrán Nogales cristina.albarran@universidadeuropea.es. Do you give your consent to participate in the survey as a volunteer so that the results of the survey can be used in the Final Degree Project "How does our daily stressful lifestyle affect our dental health habits?"

Consentimiento informado

El presente cuestionario forma parte del Trabajo de Fin de Grado en Odontología de la Universidad Europea de Madrid titulado How does our daily stressful lifestyle affect our dental health habits? y dirigido por el Profesor/a Cristina Albarrán Nogales. El propósito del presente trabajo es determinar la influencia del estrés diario en nuestros hábitos de cuidado dental. El estudio se realizará tanto en estudiantes como en el profesorado universitario relacionada. y la información será recogida a través de una breve encuesta. Su participación en este estudio es de carácter libre y voluntario, pudiendo solicitar ser excluido del mismo, sin justificación previa ni perjuicio para usted. La información recogida será confidencial y no se usará para ningún otro propósito fuera de esta investigación y derivados de la divulgación investigativa. Los datos recogidos serán completamente anónimos. No se solicitarán datos personales identificativos. Los datos que se recojan en la encuesta se tratarán de acuerdo con lo establecido en la Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales. A los efectos de lo dispuesto en el reglamento de la Ley Orgánica3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales, queda informado y es expresamente consiente de la utilización de los datos proporcionados en la encuesta, con los fines anteriormente indicados. El presente consentimiento se otorga sin perjuicio de todos los derechos que le asisten en relación con normativa anteriormente citada, existiendo la posibilidad de acceder a la información proporcionada, rectificación, cancelación y oposición en cualquier momento que lo desee. Para ello debe dirigirse por escrito al tutor Prof. Cristina Albarrán Nogales cristina.albarran@universidadeuropea.es. ¿Da su consentimiento de participación en la encuesta como voluntario/a para que los resultados en la encuesta se

utilicen en el Trabajo Fin de Grado How does our daily stressful lifestyle affect our dental health habits?

General data Datos generales

1. Do you consent to participate in this survey? ¿Consiente participar en esta encuesta?
   - Yes Sí
   - No No

2. How old are you? ¿Cuántos años tiene? *
   - Under 18
   - 18-24
   - 25-34
   - 35-44
   - 45-54
   - 55+

3. How do you identify? ¿Cómo se identifica? *
   - Male Masculino
   - Female Femenino
   - Other/Prefer not to say Otra/Prefiero no decirlo

4. Are you a university student or a professor? ¿Es estudiante universitario o profesor? *
   - Health science university student Estudiante universitario de ciencias de la salud
   - Non-health science university student Estudiante universitario de otras áreas
   - Health science university professor Profesor universitario de ciencias de la salud
   - Non-health science university profesor Profesor universitario de otras áreas

5. How is your overall health condition? ¿Cómo calificaría su estado general de salud? *
   - Very poor Muy malo
   - Poor Deficiente
   - Fair Regular
   - Good Bueno

- Very good Muy bueno

6. How would you rate your current stress level (daily university life)? ¿Cómo calificaría su nivel actual de estrés (vida universitaria diaria)? *

- Never stressed Nunca estresado
- Rarely stressed Raramente estresado
- Sometimes stressed A veces estresado
- Often stressed A menudo estresado
- Very frequently stressed Muy frecuentamente estresado

7.How would you rate your stress levels during the exam period? ¿Cómo calificaría su nivel de estrés durante el período de exámenes? *

- Never stressed Nunca estresado
- Rarely stressed Raramente estresado
- Sometimes stressed A veces estresado
- Often stressed A menudo estresado
- Very frequently stressed Muy frecuentamente estresado

8. How would you rate your stress level during relaxation periods (summer holidays, periods after exams)? ¿Cómo calificaría su nivel de estrés durante los periodos de relajación (vacaciones de verano, periodos después de los exámenes)? *

- Never stressed Nunca estresado
- Rarely stressed Raramente estresado
- Sometimes stressed A veces estresado
- Often stressed A menudo estresado
- Very frequently stressed Muy frecuentamente estresado

9. Please rank the following factors in order of how much they typically cause you stress, with 1 being the least stressful and 5 being the most stressful: Por favor, ordene los siguientes factores en función del grado de estrés que le producen, siendo 1 el menos estresante y 5 el mas estresante: *

- Health Salud
- Finances Finanzas

- Academic pressures/work Presiones académicas/trabajo
- Other Otros
- Personal life (relationships) Vida personal (relaciones)

10. Do you engage in any of the following habits? ¿Tiene alguno de los siguientes hábitos? *

- Smoking, drinking alcohol, recreational drugs Fumar, consumir alcohol o drogas recreativas
- Lack of sleep Falta de sueño
- Unhealthy diet Dieta poco saludable
- None of the above Ninguno de los anteriores

11. If you selected the first option, how often do you smoke, drink alcohol, or use drugs recreationally? Si ha seleccionado la primera opción, ¿con qué frecuencia fuma, bebe alcohol o consume drogas de forma recreativa?

- Daily Diario
- A few times a week Varias veces a la semana
- Weekly Semanalmente
- Monthly Mensualmente
- Rarely Rara vez

12. Have you ever been formally diagnosed with one or more of the following? ¿Le han diagnosticado formalmente alguna de las siguientes enfermedades? *

- Anxiety Ansiedad
- Depression Depresión
- Post Traumatic Stress Disorder Trastorno de Estrés Postraumático
- Obsessive Compulsive Disorder Trastorno Obsesivo-Compulsivo
- Bipolar Disorder Trastorno Bipolar
- No, but I am currently under evaluation No, pero estoy en evaluación actualmente
- Never Nunca

13. Have you experienced one or more of the following phenomena? ¿Ha experimentado uno o más de los siguientes fenómenos? *

- Bruxism/Tooth grinding Bruxismo (rechinar de dientes)

- Gingivitis or periodontitis (bleeding or painful gums) Gingivitis o periodontitis (encías sangrantes o dolorosas)
- Dry mouth Sequedad bucal
- Mouth sores or other issues Llagas en la boca u otros problemas
- No, I have not No, no he experimentado ninguno

14. Do you have any of the following? ¿Tiene alguno de los siguientes?
    - Use a removable denture (dental prosthesis) Uso de dentadura removible (prótesis dental)
    - Systemic disease (Schrogen's syndrome, diabetes, etc.) Enfermedad sistémica (síndrome de Sjögren, diabetes,etc.)

TMJ

What is TMJ?

TMJ is the TemporoMandibular Joint, that connects your jaw to your skull. Disorders of this joint can cause pain, clicking sounds, or trouble moving your jaw, often associated to stress or grinding.¿Qué es la ATM (articulación temporomandibular)?

La ATM es la Articulación Temporomandibular, que conecta su mandíbula con el cráneo. Los trastornos de esta articulación pueden causar dolor, ruidos de clics o dificultad para mover la mandíbula, a menudo asociados con el estrés o el rechinamiento de dientes.

15. Do you grind your teeth? ¿Rechina sus dientes? *
    - Yes Sí
    - No No
    - Maybe Tal vez

Teeth grinding patterns Patrones de rechinar de dientes

Since you indicated that you grind your teeth, we'd like to understand more about when and how often this occurs. Please answer the following questions about your teeth-grinding habits during different periods of time.Dado que indicaste que rechinas tus dientes, nos gustaría

comprender mejor cuándo y con qué frecuencia ocurre esto. Por favor, responde las siguientes preguntas sobre tus hábitos de rechinar de dientes durante diferentes períodos de tiempo.

16. How often do you grind your teeth during your highest period of stress: the exam period? ¿Con qué frecuencia rechina sus dientes durante su período de mayor estrés: el período de exámenes? *

- Never Nunca
- Rarely (1x a week) Rara vez (1 vez a la semana)
- Occasionally (2x a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4x a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5x + a week) Muy frecuentemente (5 veces o más a la semana)

17. How often do you grind your teeth when not stressed: during the holiday period? ¿Con qué frecuencia rechina sus dientes cuando no esta estresado: durante el período de vacaciones? *

- Never Nunca
- Rarely (1x a week) Rara vez (1 vez a la semana)
- Occasionally (2x a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4x a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5x + a week) Muy frecuentemente (5 veces o más a la semana)

18.How often do you grind your teeth when not stressed: during the academic period (university)? ¿Con qué frecuencia rechina sus dientes cuando no esta estresado: durante el período académico (universidad)? *

- Never Nunca
- Rarely (1 time a week) Rara vez (1 vez a la semana)
- Occasionally (2 times a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4 times a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5 or more times a week) Muy frecuentemente (5 veces o más a la semana

19.Do you bite your nails, bite a pen, or chew gum? ¿Muerde tus uñas, muerde un bolígrafo o mastica chicle? *

- Yes Sí
- No No
- Sometimes A veces

Chewing gum or nails Masticar chicle o morderse las uñas

Since you indicated that you chew gum or nails, we'd like to understand more about when and how often this occurs. Please answer the following questions about your chewing habits during different periods of time. Dado que ha indicado que mastica chicle o uñas, nos gustaría saber más sobre cuándo y con qué frecuencia lo hace. Por favor, responda a las siguientes preguntas sobre sus hábitos de masticación durante diferentes periodos de tiempo.

20. How often do you bite your nails or chewing gum during your highest period of stress: the exam period? ¿Con qué frecuencia se muerde las uñas o mastica chicle durante su período de mayor estrés: el período de exámenes? *

- Never Nunca
- Rarely (1 time a week) Raramente (1 vez a la semana)
- Occasionally (2 times a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4 times a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5 or more times a week) Muy frecuentemente (5 veces o más a la semana)

21. How often do you bite your nails or chewing gum when not stressed: during the holiday period?¿Con qué frecuencia se muerde las uñas o mastica chicle cuando no está estresado: durante el período de vacaciones? *

- Never Nunca
- Rarely (1 time a week) Raramente (1 vez a la semana)
- Occasionally (2 times a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4 times a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5 or more times a week) Muy frecuentemente (5 veces o más a la semana)

22.How often do you bite your nails or chewing gum when not stressed: during the academic period (without exams)? ¿Con qué frecuencia se muerde las uñas o mastica chicle cuando no está estresado: durante el período académico (sin exámenes)? *

- Never Nunca
- Rarely (1 time a week) Rara vez (1 vez a la semana)
- Occasionally (2 times a week) Ocasionalmente (2 veces a la semana)
- Frequently (3-4 times a week) Frecuentemente (3-4 veces a la semana)
- Very frequently (5 or more times a week) Muy frecuentemente (5 veces o más a la semana)

23. Do you wear an occlusal splint at night? ¿Usa una férula de descarga por la noche? *

- Yes Sí
- No No

24. Do you find that you suffer from more frequent or intense headaches during your highest period of stress? ¿Encuentra usted que sufre de dolores de cabeza más frecuentes o intensos durante su período de mayor estrés? *

- Yes Sí
- No No

Nutrition and habits Nutrición y hábitos

25. How many main meals do you eat per day? ¿Cuántas comidas principales realiza al día? *

- One Una
- Two Dos
- Three Tres
- More than three Más de tres

26.During your highest period of stress, do you: (select all that apply) Durante su periodo de mayor estrés, ¿usted: (seleccione todo lo que corresponda) *

- Consume more snacks Consume más snacks
- Consume hard snacks such as nuts Consume aperitivos duros como frutos secos
- Consume more sweet foods Consume más alimentos dulces
- Drink more water Bebe más agua

- Drink less water Bebe menos agua
- Drink sugary or caffeinated beverages (e.g., soda, coffee, energy drinks) Bebe bebidas azucaradas o concafeína (p. ej., refrescos, café, bebidas energéticas)
- Smoke more Fuma más
- I try to maintain healthy habits Intento mantener hábitos saludables
- I don't pay much attention to my habits No presto mucha atención a mis hábitos

27. How often do you consume food/drink high in sugar during your highest period of stress? ¿Con qué frecuencia consume alimentos/bebidas con alto contenido en azúcar durante su periodo de mayor estrés? *

- Never Nunca
- Rarely Raramente
- Occasionally (1-3x a week) Ocasionalmente (1-3 veces por semana)
- Frequently (4-6x a week) Frecuentemente (4-6 veces por semana)
- Every day Todos los días

28. How often do you consume food/drink high in sugar when not stressed? ¿Con qué frecuencia consume alimentos/bebidas con alto contenido en azúcar cuando no está estresado? *

- Never Nunca
- Rarely Raramente
- Occasionally (1-3x a week) Ocasionalmente (1-3 veces por semana)
- Frequently (4-6x a week) Frecuentemente (4-6 veces por semana)
- Every day Todos los días

Hygiene Higiene

29. Do you use any of the following dental tools? (Select all that apply) ¿Utiliza alguna de las siguientes herramientas dentales? (Seleccione todas las que procedan) *

- Floss Hilo dental
- Mouthwash Enjuague bucal
- Interdental brushes Cepillos interdentales
- Waterpik (Water flosser) Waterpik (Irrigador bucal)

- Tongue scraper Raspador lingual
- Superfloss (for braces and appliances) Superfloss (para brackets y aparatos)
- None of the above Ninguno de los anteriores

30. Do you use a manual or electric toothbrush? ¿Utiliza cepillo manual o eléctrico? *

- Manual Manual
- Electric Eléctrico

31. How often do you brush your teeth a day? ¿Con qué frecuencia se cepilla los dientes al día? *

- 0 times a day 0 veces al día
- 1 time a day 1 vez al día
- 2 times a day 2 veces al día
- 3 times a day 3 veces al día
- More than 3 times a day Más de 3 veces al día

32. How long do you brush your teeth for? ¿Cuánto tiempo se cepilla los dientes? *

- 0-1 minute 0-1 minuto
- 1-2 minutes 1-2 minutos
- 2+ minutes 2+ minutos

33.How does your brushing change during your highest period of stress? ¿Cómo cambia su cepillado durante su periodo de mayor estrés? *

- Less frequent during the day Menos frecuente durante el día
- Less time spent brushing Menos tiempo de cepillado
- No change Sin cambios
- More frequent during the day Más frecuente durante el día
- More time spent brushing Más tiempo de cepillado

34. How does your flossing frequency change during your highest period of stress? ¿Cómo cambia la frecuencia de uso del hilo dental durante el periodo de mayor estrés? *

- Less frequent Menos frecuente
- No change No cambia

- More frequent Más frecuente
- I do not use floss No uso hilo dental

35. How does your mouthwash use change during your highest period of stress? ¿Cómo cambia el uso del enjuague bucal durante su periodo de mayor estrés? *

- Less frequent Menos frecuente
- No change No cambia
- More frequent Más frecuente
- I do not use mouthwash No uso colutorio

36. Do you use toothpaste with fluoride? (Colgate, OralB, Sensodyne etc.) ¿Utiliza dentífrico con flúor? (Colgate, OralB, Sensodyne etc.) *

- Yes Sí
- No No
- I do not use toothpaste No uso dentífrico

37. Do you suffer from more frequent Candida sp. infections (white tongue) during your highest period of stress? ¿Sufre con más frecuencia infecciones por Candida sp.(lengua blanca) durante su periodo de mayor estrés? *

- Yes, they are more frequent Sí, son más frecuentes
- No difference No hay diferencia
- No, they are less frequent No, son menos frecuentes
- I do not suffer from candidiasis No padezco candidiasis

Final thoughts Reflexiones finales

38. How would you rate your dental care during your highest period of stress? ¿Cómo calificaría su atención dental durante su periodo de mayor estrés? *

- Poor Deficiente
- Fair Regular
- Good Bueno
- Very good Muybuena
- Very poor Muy mala

39. How would you rate your dental care when not stressed? ¿Cómo calificaría su atención dental cuando no está estresado? *

- Very poor Muymala
- Poor Deficiente
- Fair Regular
- Good Bueno
- Very good Muy buena

40. Have you experienced an increase in dental problems during your highest period of stress? (cavities, local pain, bruxism or grinding teeth, myalgia) ¿Ha experimentado un aumento de problemas dentales durante su periodo de mayor estrés? (caries, dolor local, bruxismo o rechinar de dientes, mialgia) *

- Yes Sí
- No No
- Maybe Tal vez

41. What coping strategies do you use to combat stress? ¿Qué estrategias de afrontamiento utiliza para combatir el estrés? *

- Spending time with loved ones Pasar tiempo con los seres queridos
- Participating in hobbies Participar en aficiones
- Exercising Hacer ejercicio
- Listening to music/reading or journalling Escuchar música/leer o escribir un diario
- Mindfulness (meditation/yoga) Atención plena (meditación/yoga)
- Support from a therapist Apoyo de un terapeuta
- Limiting social media Limitar las redes sociales
- Cooking Cocinar
- Prioritising more sleep Dar prioridad a dormir más
- Making time for myself Dedicarme tiempo a mí mismo
- I do not use any strategy to manage my stress No utilizo ninguna estrategia para controlar mi estrés

42. Have you found that managing your stress has improved your dental habits? ¿Ha notado que el control del estrés ha mejorado sus hábitos dentales? *

- Yes Sí
- No No
- Maybe Tal vez

9.2 Statistical analyses

9.2.1 Worked example: binomial test for flossing frequency

For flossing behaviour (n = 84), 28 participants reported flossing less frequently during HSP. Under the null hypothesis (p = 0.5), the expected distribution would be equal (42 vs. 42). Using a binomial test:

$$P (X \leq 28 \mid n = 84, p = 0.5) = 0.003$$

This indicates a statistically significant deviation from the expected distribution (two-sided test).

9.2.2 Summary of statistical tests applied to survey data

Table 16. Summary of statistical tests applied to survey data

Test Type	Variable Compared	Count (n)	Result	Related Figure
Paired t-test	Sugar consumption: HSP vs LSP	111	$t(110) = 8.74$, $p < 0.001$	Figure 8
Paired t-test	Nail/pen biting or gum chewing: HSP vs LSP	65	$t(64) = 7.05$, $p < 0.001$	Figure 7
Wilcoxon	Self-rated dental care: HSP vs LSP	111	$W = 66.5$, $p < 0.001$	Figure 12
Wilcoxon	Bruxism frequency: HSP vs LSP	30	$W = 0.0$, $p < 0.001$	Figure 6
Binomial test[1]	Flossing behaviour: Less frequent vs No change/More frequent	84	p = 0.00149	Figure 10
Chi-square	Brushing behaviour: Less frequent / No change / More frequent	111	$\chi^2(2) = 0.0$, $p = 1.0$	Figure 10
Chi-square (GoF)[2]	Coping strategy impact: Yes / Maybe / No	111	$\chi^2(2) = 12.32$, $p = 0.0021$	Figure 15

1. Categories “No change” and “More frequent” were merged to meet assumptions of the test.
2. GoF = Goodness-of-Fit Chi-square test, used to check whether the distribution of responses in a single categorical variable (Yes / Maybe / No) differs from what would be expected by chance.)

9.3 List of abbreviations

Table 17. Abbreviations used throughout the study

Abbreviation	Full Term
PTSD	Post-Traumatic Stress Disorder
HSP	High Stress Period
ISP	Intermediate Stress Period
LSP	Low Stress Period
TMJ	Temporomandibular Joint
TMD	Temporomandibular Disorder
M	Mean
SD	Standard Deviation
s^2	Variance