Brazilian Dental Science

unesp
UNIVERSIDADE ESTADUAL PAULISTA
"JÚLIO DE MESQUITA FILHO"
Instituto de Ciência e Tecnologia
Campus de São José dos Campos

ORIGINAL ARTICLE

DOI: https://doi.org/10.4322/bds.2024.e4413

Association between painful temporomandibular disorders and psychosocial factors in dental students

Associação entre disfunções temporomandibulares dolorosas e fatores psicossociais em estudantes de odontologia

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How to cite: Ortiz-Culca F, Astupinaro-Capristan P, Salcedo-Moncada D, Pineda-Mejia M, Watanabe-Velasquez R. Association between painful temporomandibular disorders and psychosocial factors in dental students. Braz Dent Sci. 2024;27(4):e4413. https://doi.org/10.4322/bds.2024.e4413

ABSTRACT

Objective: To establish the association between painful Temporomandibular Disorders (TMD) and psychosocial factors in dental students, using the Diagnostic Criteria for TMD. **Material and Methods:** This cross-sectional study included dental students of the Universidad Nacional Mayor de San Marcos from the third to tenth cycle. Descriptive and inferential statistical tests were used, including the chi- square, Fisher's, and t-tests, and multivariate analysis to analyze the results. **Results:** This study was carried out on 203 students aged 17–48 years; 64.5% were female. Using the TMD pain screener, we found 14.7% and 15.76% of painful TMD in the short and long versions, respectively. Painful TMD was associated with chronic pain (odds ratio [OR: 34.506 and 9.205 for the short and long versions, respectively), moderate depression (OR: 7.545 and 6.301 for the short and long versions, respectively), severe depression (OR: 57.218 and 18.310 for the short and long versions, respectively), and oral habits (OR: 3.146 for the long version). **Conclusion:** Psychosocial variables may increase the risk for the presence of painful TMD. Moderate and severe depression and oral habits were significantly associated with TMD pain.

KEYWORDS

Chronic pain; Cross-sectional studies; Dental students; Psychology; Temporomandibular joint disorders.

RESUMO

Objetivo: Estabelecer a associação entre as Disfunções Temporomandibulares (DTM) dolorosas e os fatores psicossociais em estudantes de Odontologia, utilizando os Critérios de Diagnóstico para DTM. **Material e Métodos**: Este estudo transversal incluiu estudantes de Odontologia da Universidade Nacional Maior de São Marcos, do 3º ao 10º semestre. Para a análise dos resultados foram utilizados testes estatísticos descritivos e inferenciais, nomeadamente os testes do qui-quadrado, de Fisher e t, e análise multivariada. **Resultados**: Participaram neste estudo 203 estudantes com idades compreendidas entre os 17 e os 48 anos, sendo 64,5% do gênero feminino. Utilizando o questionário de triagem de dor para DTM, encontramos 14,7% e 15,76% de DTM dolorosa nas versões curta e longa, respetivamente. A DTM dolorosa foi associada à dor crônica (odds ratio [OR: 34,506 e 9,205 para as versões curta e longa, respetivamente), depressão moderada (OR: 7,545 e 6,301 para as versões curta e longa, respetivamente), depressão grave (OR: 57,218 e 18,310 para as versões curta e longa, respetivamente) e hábitos orais (OR: 3,146 para a versão longa). **Conclusão**: As variáveis psicossociais podem aumentar o risco para a presença de DTM dolorosa. A depressão moderada e grave e os hábitos orais foram significativamente associados à dor na DTM.

PALAVRAS-CHAVE

Dor crônica; Estudos transversais; Estudantes de Odontologia; Psicologia; Distúrbios da articulação temporomandibular.

INTRODUCTION

Temporomandibular disorders (TMD) are a group of musculoskeletal and neuromuscular conditions that compromise the temporomandibular joints, masticatory muscles, and associated tissues. The signs and symptoms may include difficulties in chewing, speech, and other functions of the masticatory system [1].

TMD is a complex chronically painful condition that occurs in both acute and chronic forms and is the most important chronic orofacial pain condition [2].

Diagnostic Criteria for TMD (DC/TMD) have been proposed to standardize the diagnostic system and classification for therapeutic purposes, including clinical (Axis I) and psychosocial aspects (Axis II) [3]; currently an official Spanish version is available [4].

The prevalence of TMD varies owing to the various diagnostic systems used and the presence of pain as a necessary condition for treatment intervention. Huhtela et al., using self-report pain questionnaires in Finnish university students, found the prevalence of TMD pain to be 20.6% [5]; Lung et al. found in Australian university students that 77.2% reported at least one TMD symptom [6]; in Peru, using the DC/TMD screener, the individuals identified with painful TMD were reported in 16.1% of dental students [7]; and using the same self-report instrument, Iodice et al. in Italy found 16.4% of individuals with painful TMD [8].

The biopsychosocial model proposed by Engel [9] included factors associated with pain perception, as well as social and cultural factors. In a study carried out in the USA with 208 risk factors, involving 2737 participants and a follow-up period of 2.8 years, it was found that in the appearance of TMD, which occurred in 260 individuals, one of the important risk factors was the location of the city [10]. Associations have been found between chronic pain and levels of education and poverty [11], social class [12], rural location, and poor general health [13,14].

The model proposed by Maixner et al. [15] presents two intermediary phenotypes, psychological distress and pain amplification, which contribute to the appearance and persistence of TMD, with social factors appearing as contributing factors.

The results of a prospective cohort study ("Orofacial Pain Prospective and Risk Assessment") evaluated the contribution of 202 variables in 2,737 men and women from the USA, and found an annual TMD incidence of 3.5% in a period of 2.8 years [16]. Variables related to the health status contributed greatly to the incidence of TMD, followed by psychological and clinical factors [17].

Some authors do not report the results of Axis II and do not consider the heterogeneity of psychosocial factors and their possible influences on various results of similar therapeutic interventions in identical diagnoses on Axis I [18].

No correlation has been found between a specific diagnosis of Axis I and the findings of Axis II; however, high levels of pain were associated with severe depression and higher somatization scores [19,20]. The prevalence of severe depression and somatization was higher in patients with TMD [21,22].

This study aimed to determine the association between painful TMD and psychosocial characteristics using standardized and validated self-report questionnaires and screener included in DC/TMD.

MATERIAL AND METHODS

A total of 281 students, enrolled in the 2022-2 semester at the dental school of the Universidad Nacional Mayor de San Marcos (UNMSM), Lima (Perú), were invited to participate in this study by filling out the surveys within the application of a web page (http://essentia-ttmperu.com/encuesta/) containing the triage instrument (Axis I) and Axis II instruments of the DC/TMD. A total of 230 students responded and authorized their participation with a digital informed consent. This research was approved by the General Directorate of Research and Technological Transparency of the UNMSM (N.º 000230-2022-DGITT-VRIP/UNMSM).

The exclusion criteria were the presence of ongoing orthodontic treatment or chronic systemic joint diseases.

To determine the study variables, the official Spanish version of the DC/TMD was used. These criteria included the assessment of TMD in two axes, Axis I, physical diagnosis, and Axis II, which

measured the psychosocial state and disability caused by pain [4].

Axis I included the TMD pain screener, which is a six-item questionnaire, with two versions, a short version of three items and a long version of six items, which has a sensitivity and specificity of 97% and 99%, respectively. The presence of a painful TMD is established when the sum of the scores obtained from their responses is greater than 2 and 3 for the short and long versions, respectively [23].

For the estimation of psychosocial factors, we used Axis II; to estimate chronic pain, the Graded Chronic Pain Scale version 2.0 was used, the long form of Jaw Functional Limitation Scale 20-item was used; for anxiety, the Generalized Anxiety Disorder Index GAD-7 was used; for depression, the Patient Health Questionnaire PHQ-9 was used; for somatization, the Patient Health Questionnaire: Physical Symptoms PHQ-15; and for waking-state oral behaviors, the Oral Behaviors Checklist was used. All of these instruments were found in the Spanish version of the DC TMD [4].

For socioeconomic level, a variation of the Peruvian Institute of Statistics and Informatics scale adapted by the Peruvian Association of Market Research Companies was used [24].

After signing the digital informed consent form and according to the semester corresponding to each participant, they were provided with an access code to an internet application that contained the DC/TMD in Spanish in the digital version (http://essentia-ttmperu.com; Peruvian National Institute for the Defense of Competition and the Protection of Intellectual Property patent Resolution No. 1271-2022/DDA-INDECOPI). The application did not allow the completion of the survey if it was not completely filled out or completed at a single time. The indications for completing the survey were provided at the time of signing the digital informed consent form.

The survey was completed during the final week of the final semester of 2022 academic year. All instruments were self-responsive and did not require examiner calibration.

Statistical analysis

All data were exported from the web application to Excel (Microsoft Corp., Redmond, WA, USA) to determine the corresponding diagnoses according to the specifications of each instrument used, thus allowing verification of the collected data.

The frequencies were obtained for each variable. The associations between variables were established using chi-square and Mann–Whitney U tests.

The univariate and multivariate analyses were used to calculate the odds ratio (OR) and the corresponding 95% confidence intervals to estimate the association between painful TMD and the various instruments used in the assessment of Axis II of DC/TMD. A multivariate analysis was performed using painful TMD as the dependent variable. Age, sex, and psychosocial variables were categorized as dichotomous (score "0" representing absence and "≥1" denoting presence), except for depression (absence, moderate, and severe) and the Jaw Functional Limitation Scale 20-item (continuous). Socioeconomic levels were grouped as low, medium, and high.

The data were analyzed using STATA (StataCorp, College Station, TX, USA), and the results were considered significant with $p < 0.05$.

RESULTS

Of the 230 students who responded, 1 was eliminated for presenting a diagnosis of rheumatoid disease and 26 were eliminated for having orthodontic treatment, thus resulting in 203 students. The age range of the participants was 17–48 years, with an average of 22.03 (± 3.47 [standard deviation]) years; 131 (64.5%) were women and 72 (35.5%) were men.

Using the TMD pain screener of the DC/TMD, 14.78% of the students identified with painful TMD using the short version (3 items), of which 16.0% were women and 12.5% were men, and using the long version (6 items) the estimate was 15.76%, of which 17.6% were women and 12.5% were men.

No statistically significant differences were found between the positive results in terms of sex using the distribution of TMD pain screener ($\chi2 = 0.459$, $p = 0.498$ for the short version and $\chi2 = 0.895$, $p = 0.344$ for the long version) (Table I).

A high socioeconomic status was found in 20 (9.85%) students, medium in 67 (33%), and low in 116 (57.14%). No significant difference

was found between socioeconomic level and positive results using the screener ($\chi 2 = 2.796$, $p = 0.247$ for the short version and $\chi 2 = 2.174$, $p = 0.337$ for the long version) (Table II).

Using the chi-square test with psychosocial factors (Axis II), it was found that with the chronic pain scale, 53.20% of the individuals (57.73% women and 48.61% men) reported the presence of chronic pain, 51.72% reported some degree of anxiety (52.67% women and 50.0% men), and 61.58% reported some degree of depression (65.65% women and 54.17% men). In these variables no significant difference was found in relation with sex. Regarding somatization, 62.07% of the individuals presented some degree of somatization (70.9% women and 45.83% men), indicating a significant relationship with sex ($p < 0.05$). Regarding the information on the presence of parafunctions among the participants, using the Oral Behaviors Checklist, it was found that 18.23% of the individuals presented a score >25 (high level); no significant difference was found in relation to sex ($p = 0.420$). All Axis II instruments were significantly associated with the presence of painful TMD in both the versions. (Table III).

The overall index of decreased mandibular mobility was significantly associated with both the versions of the TMD pain screener ($p < 0.001$), using the Mann-Whitney U test.

Multivariable logistic regression analysis showed that in both the versions of the TMD pain screener, there was a significant association with the presence of chronic pain (OR: 34.603 and 9.205 for the short and long versions, respectively), moderate depression (OR: 7.545 and 6.301 for the short and long versions, respectively), severe depression (OR: 57.218 and 18.31 for the short and long versions, respectively), and oral behavior (OR: 3.146 for the long version) (Table IV, Table V).

DISCUSSION

The results of this cross-sectional study confirmed the findings of previous research on the association between psychosocial factors and the presence of painful TMD in university students [25-27].

No statistically significant association was found between socioeconomic level and the presence of painful TMD, similar to the results of the study presented by Nogueira et al., who found a higher percentage of low socioeconomic level (48.5%) in university students from Brazil [28].

Using the TMD pain screener, we found the presence of painful TMD in 14.78% and 15.76% of the individuals in the short and long versions, respectively. The presence of painful TMD using this instrument was lower than those

Table I - Sample distribution according TMD pain screener by sex

		n	3-item version		6-item version	
			Negative	Affirmative	Negative	Affirmative
Sex	Male	72	63	9	63	9
			87.50%	12.50%	87.50%	12.50%
	Female	131	110	21	108	23
			84.00%	16.00%	82.40%	17.60%
Total		203	173	30	171	32
			85.22%	14.78%	84.24%	15.76%

Table II - Percent of cases identified by socioeconomic level using the TMD Pain screener

Socioeconomic Level	3-item version		6-item version	
	Negative	Affirmative	Negative	Affirmative
Low	96 (82.8%)	20 (17.2%)	95 (81.9%)	21 (18.1%)
Medium	61 (91.0%)	6 (9.0%)	60 (89.6%)	7 (10.4%)
High	16 (80.0%)	4 (20.0%)	16 (80.0%)	4 (20.0%)
Total	173 (85.22%)	30 (14.78%)	171 (84.24%)	32 (15.76%)

Table III - Comparison of prevalence of psychosocial factors and TMD pain

	Prevalence				3-item version		6-item version	
	n	%	male	female	p value (Chi squared)	p value (Fisher test)	p value	Fisher (pvalue)
Socioeconomic level								
High	20	9.85%	8 (11.11%)	12 (9.16%)	0.247		0.337	
Medium	67	33.00%	29 (40.28%)	38 (29.01%)				
Low	116	57.14%	35 (48.61%)	81 (61.63%)				
Chronic Pain								
No pain	95	46.80%	37 (51.39%)	58 (44.27%)	<0.001*		<0.001*	
Low intensity pain, without disability	79	38.92%	24 (33.33%)	55 (41.98%)				
High intensity, without disability	11	5.42%	6 (8.33%)	5 (3.82%)				
Moderately limiting	18	8.87%	5 (6.94%)	13 (9.92%)				
Depression								
No depression	78	38.42%	33 (45.83%)	45 (34.35%)		0.000*		0.001*
Mild	70	34.48%	25 (34.72%)	45 (34.35%)				
Moderate	27	13.30%	6 (8.33%)	21 (16.03%)				
Moderately severe	17	8.37%	5 (6.94%)	12 (9.16%)				
Severe	11	5.42%	3 (4.17%)	8 (6.11%)				
Anxiety								
No anxiety	98	48.28%	62(47.33%)	36(50%)		0.003*	0.007*	
Mild	67	33.00%	40(30.53%)	27(37.50%)				
Moderate	25	13.32%	20(15.27%)	5(6.94%)				
Severe	13	6.40%	9(6.87%)	4(5.56%)				
Somatic symptoms								
No symptoms	77	37.93%	39(54.17%)	38(19.02%)	<0.001*		0.005*	
Low intensity pain, without disability	70	34.48%	22(30.46%)	48(36.64%)				
Medium	42	20.69%	5(6.94%)	37(28.24%)				
High physical symptoms	14	6.90%	6(8.33%)	8(6.11%)				
Oral Behaviour Cheklist								
No risk	166	81.77%	61 (84.72%)	105(80.15%)	0.001*		0.001*	
Risk	37	18.23%	11(15.28%)	26(19.85%)				

* Significant difference p<0.05

Table IV- Multivariable logistic regression analysis assesing the association between psychosocial factors and TMD pain with 3-item version

Variable	Category	Presence/ Absent	version 3 (crude)			version 3 (multivariable)		
			OR	95% IC	p	OR	95% IC	p
Age	Mean	21.93/22.04	0.99	0.881-1.112	0.869	0.898	0.736-1.096	0.294
Sex	Male	9/63	1	reference		1	reference	
	Female	21/110	1.336	0.576-3.095	0.499	1.03	0.345-3.076	0.05
Socioeconomic level	Low	20/96	1	reference		1	reference	
	high/medium	10/77	0.623	0.275-1.409	0.256	0.496	0.173-1.424	0.193
Graded Chronic Pain	no pain	1/94	1	reference		1	reference	
Scale Version 2.0	pain	29/79	34.506	4.596-259.026	0.001*	34.603	4.144-288.90	0.001*
Anxiety (GAD - 7)	no symptoms	10/88	1	reference		1	reference	
	with symptoms	20/85	2.07	0.916-4.680	0.08	0.173	0.415-0.729	0.017*
Depression (PHQ-9)	no depression	4/74	1	reference		1	reference	
	Moderate	13/84	2.863	0.894-9.164	0.07	7.545	1.587-35.855	0.011*
	Severe	13/15	16.033	4.591-55.992	<0.001*	57.218	7.914-413.66	<0.001*
Somatization (PHQ-15)	No somatization	5/72	1	reference		1	reference	
	With somatization	25/101	3.564	1.302-9.753	0.013*	1.42	0.367-5.489	0.611
Jaw Functional Limitation Scale 8-item		mean value	1.56	1.164-2.089	0.003*	1.27	0.873-1.849	0.21
Oral Behaviors Checklist	no risk	18/148	1	reference		1	reference	
	Risk	12/25	3.946	1.696-9.182	0.001*	2.897	0.985-8.522	0.053

* p significative

Table V - Multivariable logistic regression analysis assesing the association between psychosocial factors and TMD pain with 6-item version

Variable	Category	Presence/ Absent	version6 (crude)			version 6 (multivariable)		
			OR	95% IC	p	OR	95% IC	p
Age	Mean	22.28/21.98	1.023	0.925-1.131	0.656	0.991	0.855-1.149	0.914
Sex	Male	9/63	1	reference				
	Female	23/108	1.49	0.649-3.421	<0.001*	1.226	0.452-3.320	0.688
Socioeconomic level	Low	21/95	1	reference		1	reference	
	high/medium	11/76	0.654	0.297-1.441	0.293	0.676	0.263-1.736	0.417
Graded Chronic Pain	no pain	3/92	1	reference		1	reference	
Scale Version 2.0	pain	29/79	11.257	3.303-38.364	<0.001*	9.205	2.447-34.62	0.001*
Anxiety (GAD - 7)	no symptoms	11/87	1	reference		1	reference	
	with symptoms	21/84	1.977	0.898-4.351	0.09	0.335	0.958-1.176	0.088
Depression (PHQ-9)	no depression	5/73	1	reference		1	reference	
	Moderate	16/81	2.883	1.006-8.264	0.049*	6.301	1.524-26.051	0.011*
	Severe	11/17	9.447	2.898-30.792	<0.001*	18.310	3.129-107.177	0.001*
Somatization (PHQ-15)	No somatization	7/70	1	reference		1	reference	
	With somatization	25/101	2.475	1.014-6.038	0.046*	0.815	0.245-2.712	0.739
Jaw Functional Limitation Scale 8-item		mean value	1.641	1.226-2.198	0.001*	1.33	0.940-1.880	0.106
Oral Behaviors Checklist	no risk	19/147	1	reference		1	reference	
	Risk	13/24	4.190	1.832-9.581	0.001*	3.146	1.172-8.443	0.023*

* p significative

reported by Khan et al. [29], who found 36.1% of adolescents with painful TMD in a Brazilian city, and Ortiz-Culca et al. [7], who found 19.4% and 16.1% of Peruvian dental students with painful TMD with the short and long versions, respectively. Iodice et al. [8] found 16.1% of adults in Italy with painful TMD using the short version, whereas Nadershah [30] found 35% of individuals in Saudi Arabia with painful TMD, using the long version of the instrument.

The DC/TMD offers a dual approach, with an officially validated Spanish translation available on the internet with a series of psychometric instruments that allow their results to be compared with publications made in other countries, owing to their high levels of standardization, validity, and reliability, and with an official translation in Spanish [4]. To the best of our knowledge, this is the first publication in Peru that uses the official translation of all instruments of Axis II.

Dental students are subjected to strong levels of stress; reported up to 100% [31]. This perception is due to the tendency of students towards perfectionism, based on the excellence that represents the norm in dentistry [32], the natural demand for training [33], and the curriculum changes developed in dentistry that increase the levels of stress in the students [34].

Benassi et al. [35] reported higher levels of anxiety in a sample of 90 dental students and found no significant association with sex, which are similar to the results of this study. Srivastava et al. [36] found a prevalence of TMD to be 36.99% and significant differences in relation to sex ($p = 0.004$), similar to the study by Ortiz-Culca ($p < 0.001$) [7].

Disability due to chronic pain has been proposed since the appearance of the Research Diagnostic Criteria for TMD (RCD/TMD) and various studies have found a significant relationship between the presence of TMD and severe depression and somatization [37].

Most investigations have evaluated the distribution of Axis II in patient populations; however, not in population samples.

The scores obtained on the chronic pain scale (GCPS) and the duration of pain, followed by psychological problems, are the main factors that can affect the quality of life of patients with TMD [38]. The psychosocial variables of Axis II of the RCD/TMD were found to be more severe in patients with TMD compared with the normal population ($p < 0.001$) [39].

According to the results of this study, a significant relationship was found between painful TMDs and the presence of moderate or

severe depression, limited mandibular function, and oral habits.

Depression, anxiety, and stress were found in 55.9%, 66.8%, and 54.7% of dental students, respectively, thus establishing a need to provide support to dental students [40]. Lövgren et al. reported that in dental students painful TMD was significantly related to the chronic pain scale (GCPS, $p = 0.001$) with respect to those who presented with non-painful TMD, and found no significant differences between the presence of TMD and the severity of depression, anxiety, or stress. However, they found significant differences with respect to the Jaw Functional Limitation Scale ($p < 0.001$) and for estimated oral parafunctions with the Oral Behaviors Checklist ($p = 0.005$) [27].

In some investigations carried out in patient populations, it was found that moderate-to-severe depression varied from 47.4% to 60.1%, whereas moderate-to-severe somatization varied from 62.8% to 76.6% [20,41], attributing these variation to ethnic factors and socioeconomic aspects that would merit future research [24].

Canales et al. [42] did not find significant relationships between the various instruments of Axis II of the RDC/TMD and TMD in patient populations; however, found significant relationships when comparing painful and non-painful TMD, and found higher levels of depression and moderate and severe somatization ($p < 0.001$).

No significant differences were found in this study in relation to oral habits with respect to sex, results that disagree with other reports that found higher in women ($p < 0.001$) [43].

In this study, significant differences were found in relation to oral habits and TMD, similar to the results of Srivastava et al. [36], and a higher level of risk was found with respect to oral habits in the female sex [44].

No significant association was found between anxiety and painful TMD on any version of the TMD pain screener. Fernandes Azevedo et al. [45], using the RDC/TMD, found 36.2% of individuals with TMD and found no significant relationship between TMD and anxiety ($p > 0.05$), which was contrary to other studies carried out on university students, where statistically significant relationships were found between anxiety and TMD [46-51].

The findings of Axis II, especially the GCPS, expressed in terms of disability caused by pain, can be established as the best predictors of treatment outcomes and the best tools for better therapeutic planning for TMD [20]. The clinical relevance of psychosocial diagnosis may be more important than physical evaluation for treatment prognosis [52]. Ethnic, socio-demographic, and cultural factors may have influenced the presence of painful TMD in more representative samples.

There are limitations on determining the painful TMD only by the use of questionary, we consider in the future to include clinical examination to classify the TMD and to establish their relationships with psychological factors in time.

The results of this cross-sectional study provide an overview of the psychosocial status of dental students, and the need for a longitudinal estimation of these variables must be established.

CONCLUSION

In this cross-sectional study, psychosocial variables were found to increase the risk of painful TMD. Moderate and severe depression, and oral habits were significantly associated with painful TMD. Longitudinal studies must be conducted to assess the probable risks of psychosocial variables in dental students with TMD.

Acknowledgements

The authors would like to thank to dental students from the Universidad Nacional Mayor de San Marcos, Lima (Peru), for their voluntary participation in the study.

Author's Contributions

FOC, RWV: Conceptualization. FOC, PAC, DSM, MPM, RWV: Methodology. FOC, PAC: Data curating. FOC: Writing – Original Draft Preparation. FOC, PAC, DSM, MPM, RWV: Writing – Review & Editing. PAC, MPM: Resources. FOC, RWV: Supervision.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Regulatory Statement

This study was conducted in accordance with the General Directorate of Research and Technological Transparency of the UNMSM (N.º 000230-2022-DGITT-VRIP/UNMSM).

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Date submitted: 2024 June 19
Accept submission: 2024 Oct 13