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Prevalence and Risk Factors of Text Neck Syndrome Among Palestinian Medical Students: A Multicenter Cross-Sectional Study

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Prevalence and Risk Factors of Text Neck Syndrome Among Palestinian Medical Students: A Multicenter Cross-Sectional Study

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Abstract

Introduction: The use of smart devices has increased substantially in recent years, contributing to the emergence of musculoskeletal disorders associated with prolonged and improper posture. Medical students are some of the most affected groups due to reliance on such devices due to academic demands. Text neck syndrome is caused by prolonged and repetitive flexion of the neck while using smart devices. TNS has been associated with neck pain, functional disability, reduced mobility, and overall quality of life. Despite the increasing reliance on digital devices and the burdens associated with them, evidence regarding the prevalence and risk factors remains limited. The aim of this study was to assess the prevalence of TNS among medical students in West Bank universities and to identify factors associated with TNS. **Methods**: In this cross-sectional study, an online, self-administered questionnaire was used to collect data regarding the use of smart devices, ergonomic practices, sociodemographic characteristics, TNS symptoms, and neck disability using the Neck Disability Index (NDI). **Results:** Among the 358 medical students included in this study, the prevalence of TNS was 46.6%, significant associations included university, year of study, female gender, shorter break time from using devices, degree of neck tilting, tablet holder non-use, height, time on devices, time spent sitting, NDI score, and category. Multivariable regression analysis also showed independent associations with academic year, gender, time spent on digital devices, degree of neck tilting, and non-use of tablet holders. Statistical significance was set at $p < 0.05$, with a 95% confidence interval. NDI showed that 42.7% had no disability, 45.5% had mild disability, 11.2% moderate disability, and 0.6% had severe disability; no cases of complete disability were reported. **Conclusion**: TNS was prevalent among medical students and had significant associations with sociodemographic, ergonomic, academic, and device use factors, highlighting the need for preventative measures and further research.

Keywords: text neck syndrome; musculoskeletal disorders; smartphone use; medical students; posture; neck pain; digital health; cross-sectional study; Palestine; risk factors

1. Introduction

Neck pain is the second most prevalent musculoskeletal disorder after back pain, and the fourth most prevalent cause of disability worldwide [1]. It represents a significant burden to patients as it is associated with disability and reduced quality of life [2]. Because of the technological advancements of the 21st century, lifestyles have become more sedentary owing to the reliance on smart devices for work, entertainment, communication, as well as academic activities, most of which are usually done

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with suboptimal posturing, thus giving rise to new musculoskeletal pathologies that have emerged as major public health concerns [3].

Text Neck Syndrome (TNS) is an overuse syndrome defined as "prolonged, repetitive, and frequent maintenance of a flexed head and neck position while using mobile devices such as smartphones or tablets, often characterized by typing below eye level, leading to strain, injuries, and stiffness in the cervical spine". Biomechanically, flexion of the cervical spine causes increased mechanical stress on the neck up to five times the load experienced in the neutral position [4], leading to a change in the normal alignment of the cervical spine. This results in muscle fatigue, ligament strain, postural imbalance, and chronic neck pain.[5] TNS commonly manifests neck pain, upper back pain, shoulder pain, headaches, tingling sensations, and sleep disturbances [6]. If prolonged and unaddressed, these biomechanical stresses may increase cervical disc loading, potentially leading to disc compression, disc herniation, cervical radiculopathy, and, in severe cases, irreversible nerve or muscle injury [4]. The Neck Disability Index (NDI) was used to evaluate neck-related functional disability, as it is a validated and reliable tool that allows standardized assessment of the impact of neck pathology on quality of life. Young adults are the most affected group by such conditions, with medical students being some of the most vulnerable subgroups to this condition, as their intense academic demands require prolonged studying and screen time along with sustained static neck posture, which predisposes individuals to prolonged cervical flexion, which is a well-documented associated factor of TNS [6].

Available literature indicates that posture-related neck disorders associated with smart device use affect a significant proportion of the global population, with students being among the most vulnerable groups due to their heavy reliance on digital devices for academic activities. Several studies conducted specifically among medical students have reported high prevalence rates of TNS. In Jordan, a study among medical students reported a prevalence of TNS of 31.7% [7], while similar studies among medical students in Pakistan, Iraq, and Saudi Arabia reported prevalences of 43.6% [8], 64.5% [9], and 68.1% [10], respectively. Studies conducted among general university student populations have also demonstrated a substantial burden of TNS, including a prevalence of approximately 46% in Benin and 34% in South Korea [11]. Some associated factors have also been identified, which include weight, BMI, female gender, duration of device use, purpose of device use, and degree of neck flexion.

Although TNS has been studied internationally, evidence regarding its associated factors remains limited in certain regions. To the best of our knowledge, no previous study has investigated the prevalence of TNS among medical students in Palestine (West Bank). Therefore, this present study was aimed at assessing the prevalence of TNS, evaluating its impact on neck dysfunction, and examining its association with sociodemographic, ergonomic practices, and smart device usage patterns among medical students in the West Bank.

2. Methods

2.1. Study Design and Settings

This study is a cross-sectional observational study conducted using a structured online self-administered questionnaire. The cross-sectional design was chosen in order to assess the prevalence of TNS as well as to identify associated factors among medical students enrolled in universities across the West Bank. Data collection took place from November 2025 until February 2026.

2.2. Study Population, Inclusion and Exclusion Criteria

The population of this study consisted of medical students in universities across the West Bank, Palestine. To ensure methodological clarity and reproducibility, those with previous traumatic injury to the neck, surgical history of the neck, congenital deformities, or cervical disc herniation were excluded.

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2.3. Sample Size and Sampling Techniques

The minimum required sample size was calculated for a cross-sectional prevalence study using the single-proportion formula:

$$n_0 = \frac{Z^2\, p(1-p)}{d^2}$$

where Z = 1.96 for a 95% confidence level, p was estimated from previous literature, and d = 0.05. Based on these parameters, the initial calculated sample size was 333 participants. Considering the finite population of medical students in West Bank universities (N ≈ 7200), finite population correction was applied:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

The adjusted minimum required sample size was 319 participants. To compensate for potential non-response, a higher number of participants was targeted. Participants were recruited using a non-probability convenience sampling method through online distribution. A total of 358 students were ultimately included in the final analysis, exceeding the minimum required sample size

2.4. Variable Definitions

Sociodemographic data collected included the participant's age, gender, year of study, height, and weight. While ergonomic data was collected about the participant's posture, degree of neck tilting, break-time duration, the use of tablet holders, armrests and backrests, TNS was defined according to previously published criteria, which were at least 4 h of screen time daily along with three of the six characteristic symptoms being neck pain, upper back pain, headache, hand numbness, tingling, insomnia, and shoulder pain [12,13]. Neck disability was assessed using NDI, which is a validated self-administered questionnaire consisting of 10 items: pain intensity, personal care, lifting, reading, headaches, concentration, work, driving, sleeping, and recreation. each item giving a score of 0–5, which totals 50 points[14]. However, when the driving item was not applicable, it was omitted, and the total NDI score was calculated as a percentage of the maximum obtainable score (either 50 or 45 points), consistent with previous reporting of this approach in the literature [15].

2.5. Study Tools, Validity, and Reliability

Information was obtained through a structured, self-administered questionnaire that incorporated established and previously validated tools, including the Neck Disability Index (NDI), in addition to published criteria for defining Text Neck Syndrome. This questionnaire is a previously published and validated questionnaire assessing Text Neck Syndrome and associated factors was used in this study, with permission from the original authors [7]. The content of the questionnaire was reviewed by experts to ensure its appropriateness and clarity. Furthermore, the use of well-recognized instruments supported the validity and reliability of the collected data based on their documented psychometric properties. The internal consistency of the NDI in the present study was acceptable (Cronbach's α = 0.787), indicating reliable measurement of neck-related disability among the participants.

2.6. Statistical Analysis

Data analysis was done through the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics were used to analyze the data, including frequencies, percentages, means, and standard deviation. TNS was calculated using percentages. Associations between variables were done using the chi-square test, Fisher's exact test, T test, and Mann-Whitney U. Continuous variables were analyzed using appropriate statistical tests based on data distribution. Multivariable logistic regression analysis was applied to variables with a p-value of <0.2 to identify independent associated factors. Statistical significance was set to a p-value of <0.05.

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2.7. Ethical Approval

Ethical approval was granted by the Institutional Review Board (IRB) of the Arab American University of Palestine (AAUP). Participation was anonymous and voluntary; no personal identifiers were included in the questionnaire. Only the team working on the research had access to the data. Participants were informed of their right not to participate in this study. All methods were carried out in accordance with relevant guidelines and regulations and in accordance with the principles of the Declaration of Helsinki.

3. Results

A total of 358 medical students were included in the analysis; the median age of participants was 22 years. Females represented the majority of the participants in this study, with a total of 223 females and 135 males. All medical schools of the West Bank, and all years of study were represented, with senior students being the most represented. Substantial screen exposure was reported by participants, with a median of 6 h of exposure daily, and a median of 7 h of daily sitting duration. Most students used multiple digital devices. Moderate neck tilting was commonly reported, and 46.6% of students met the criteria for TNS diagnosis. Characteristics of participants were further described in **Tables 1–3.**

The analysis showed that TNS had significant associations with multiple sociodemographic, academic, and ergonomic factors. The prevalence of TNS was higher among females (62.3%). TNS also had a higher incidence among shorter participants. Academic factors that demonstrated significant associations included academic year and university affiliation, suggesting a cumulative effect of higher workload and learning environment. As for ergonomic factors, longer daily time on devices, increased daily sitting duration, shorter break time from digital devices, greater degrees of neck tilting, as well as tablet holder non-use all had significant associations with TNS prevalence.

The p-values of these significant associations were (< 0.001), (p =0.036), (p = 0.01), (p = 0.01), (p < 0.001), (p = 0.005), (p = 0.026), (p < 0.001), (p < 0.001) respectively. All can be found in **Tables 4 and 5.**

In multivariable logistic regression analysis, female gender, higher academic year (years 3-5), longer daily screen time, severe neck tilting, and non-use of smartphone/tablet holders remained independently associated with TNS. In contrast, height, sitting duration, break time, BMI, and number of digital devices did not retain statistical significance after adjustment, suggesting that ergonomics posture and screen exposure are stronger independent predictors than general anthropometric or lifestyle factors.

P values were (0.022), (0.046), (0.038), (0.012), (0.010), (0.002), (0.003), (0.002) as is shown in **Table 6.**

Table 1. participant characteristics (N=358).

Variable	n (%)
Sex	
Male	135 (37.7)
Female	223 (62.3)
University	
Arab American University	126 (35.2)
An-Najah National University	70 (19.6)
Al-Quds University	72 (20.1)
Palestine Polytechnic University	43 (12.0)
Hebron University	47 (13.1)
Academic year	
1st year	50 (14.0)
2nd year	50 (14.0)
3rd year	51 (14.2)

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4th year	50 (14.0)
5th year	60 (16.8)
6th year	97 (27.1)
GPA category	
Excellent	76 (21.2)
Very good	179 (50.0)
Good	94 (26.3)
Satisfactory	9 (2.5)
Physical activity level	
Low	207 (57.8)
Moderate	122 (34.1)
High	22 (6.1)
Vigorous	7 (2.0)
Current smoking status	
Yes	66 (18.4)
No	292 (81.6)
Number of digital devices used	
1	17 (4.7)
2	225 (62.8)
3	107 (29.9)
4	7 (2.0)
5 or more	2 (0.6)
Break time during digital device use	
< 2 h	205 (57.3)
≥ 2 h	153 (42.7)
Degree of neck tilting during device use	
No tilting (0°)	21 (5.9)
Moderate tilting (15–25°)	234 (65.4)
Severe tilting (≥30°)	103 (28.8)
Chair with armrest	
Yes	177 (49.4)
No	181 (50.6)
Chair with backrest	
Yes	262 (73.2)
No	96 (26.8)
Smartphone/tablet holder use	
Yes	73 (20.4)
No	285 (79.6)
Dominant hand	
Right-handed	332 (92.7)
Left-handed	26 (7.3)
Preferred hand used to hold/type smartphone	
Dominant hand	236 (65.9)
Non-dominant hand	13 (3.6)
Both	109 (30.4)
Clinical symptoms	
Neck pain	176 (49.2)
Upper back pain	163 (45.5)
Shoulder pain	172 (48.0)
Headache	210 (58.7)
Insomnia	129 (36.0)

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Tingling or numbness in hands	104 (29.1)
Text Neck Syndrome (TNS)	
Yes	167 (46.6)
No	191 (53.4)

Table 2. medians and interquartile ranges.

Variable	Median (IQR)
Age (years)	**22 (21–24)**
Height (m)	**1.70 (1.65–1.76)**
Daily time spent using digital devices (hours/day)	**6 (4–8)**
Time spent sitting per day (hours/day)	**7 (5–9)**

Table 3. mean & standard deviation.

Variable	Mean ± SD
Weight (kg)	68.4 ± 12.6
Body mass index (kg/m²)	23.6 ± 4.1

Table 4. Significant associations between TNS diagnosis and participant characteristics.

Variable	Category / Statistic	TNS No (n = 191)	TNS Yes (n = 167)	p-value
Gender	Male	90 (66.7)	45 (33.3)	**< 0.001**
	Female	101 (45.3)	122 (54.7)	
Height (m)*	Median (IQR)	1.72 (1.67–1.78)	1.68 (1.63–1.74)	**0.036+**
Academic year	1st year	32 (64.0)	18 (36.0)	**0.010**
	2nd year	29 (58.0)	21 (42.0)	
	3rd year	22 (43.1)	29 (56.9)	
	4th year	21 (42.0)	29 (58.0)	
	5th year	25 (41.7)	35 (58.3)	
	6th year	62 (63.9)	35 (36.1)	
University	Arab American University	64 (50.8)	62 (49.2)	**0.020**
	An-Najah National University	35 (50.0)	35 (50.0)	
	Al-Quds University	49 (68.1)	23 (31.9)	
	Palestine Polytechnic University	16 (37.2)	27 (62.8)	
	Hebron University	27 (57.4)	20 (42.6)	
Daily time spent on digital devices (hours)*	Median (IQR)	5 (3–7)	7 (5–9)	**< 0.001+**
Daily sitting duration (hours)*	Median (IQR)	6 (5–8)	8 (6–10)	**0.005+**
Break time during device use	< 2 h	99 (48.3)	106 (51.7)	**0.026**
	≥ 2 h	92 (60.1)	61 (39.9)	
Degree of neck tilting during device use	No tilting (0°)	16 (76.2)	5 (23.8)	**< 0.001**
	Moderate (15–25°)	136 (58.1)	98 (41.9)	
	Severe (≥ 30°)	39 (37.9)	64 (62.1)	
Use of smartphone/tablet holder	Yes	53 (72.6)	20 (27.4)	**< 0.001**

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	No	138 (48.4)	147 (51.6)

+ Mann–Whitney U test was used for non-normally distributed continuous variables. * non-normally distributed variables.

Table 5. non-significant associations with TNS.

Variable	Category / Statistic	TNS No (n = 191)	TNS Yes (n = 167)	p-value
GPA	Excellent (3.67–4.00)	41 (53.9%)	35 (46.1%)	
	Very good (3.00–3.66)	97 (54.2%)	82 (45.8%)	
	Good (2.33–2.99)	48 (51.1%)	46 (48.9%)	
	Satisfactory (2.00–2.33)	5 (55.6%)	4 (44.4%)	**0.984**
Handedness (dominant hand)	Right-handed	178 (53.6%)	154 (46.4%)	
	Left-handed	13 (50.0%)	13 (50.0%)	**0.722**
Preferred hand used for smartphone	Dominant hand	133 (56.4%)	103 (43.6%)	
	Non-dominant hand	7 (53.8%)	6 (46.2%)	
	Both	51 (46.8%)	58 (53.2%)	**0.254**
Smoking status	Non-smoker	159 (54.5%)	133 (45.5%)	
	Smoker	32 (48.5%)	34 (51.5%)	**0.380**
Number of cigarettes/day	1	11 (40.7%)	16 (59.3%)	
	2	8 (66.7%)	4 (33.3%)	
	3	10 (52.6%)	9 (47.4%)	
	4	6 (54.5%)	5 (45.5%)	**0.496**
Physical activity level	Low	100 (48.3%)	107 (51.7%)	
	Moderate	75 (61.5%)	47 (38.5%)	
	High	13 (59.1%)	9 (40.9%)	
	Vigorous	3 (42.9%)	4 (57.1%)	**0.114**
Age (years)*	Median (IQR)	—	—	**0.535**
Smoking duration (years)*	Median (IQR)	—	—	**0.306**

Table 6. Multivariable logistic regression.

Variable	Adjusted OR (95% CI)	p-value
Academic year		
Year 3	2.48 (1.05–5.84)	0.038
Year 4	2.79 (1.26–6.19)	0.012
Year 5	2.79 (1.28–6.05)	0.010
Sex (Female)	2.80 (1.16–6.76)	0.022
Daily time spent using digital devices (hours/day)	1.16 (1.06–1.28)	0.002
Degree of neck tilting during device use		
Moderate tilting vs Severe tilting (≥30°)	0.43 (0.25–0.75)	0.003
Non-use of smartphone/tablet holder	2.82 (1.47–5.40)	0.002

4. Discussion

The prevalence of TNS was found to be 46.6% which is consistent with the literature, as the prevalence ranged from around 40% to 70% [8–11,16], with studies done on general student population having a lower prevalence [11], highlighting the growing magnitude of TNS among medical students, the high prevalence may be due to the high academic demand placed on medical students leading to prolonged screen exposure, and sustained posture.

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Female gender was associated with TNS prevalence, which is consistent with the literature, showing females had a significantly higher TNS prevalence than that of males [7]. The analysis showed that females had higher time spent on digital devices than males, which could help explain this finding.

Height was inversely associated with TNS; however, this finding has not been widely reported in previous literature. However, this association did not remain significant after multivariable adjustment, suggesting possible confounding by other factors such as gender.

The academic year had a significant association with the prevalence of TNS up until the 6th year, which is consistent with the literature, suggesting a cumulative effect of academic workload with prolonged device use and static posture over time, as higher year medical students showed higher prevalence of TNS. The lack of significance with 6th year medical students may be explained by the change in academic structure, as the 6th year is more about clinical exposure than 4th and 5th years, making this group of participants less prone to high amounts of screen exposure.

A significant association between TNS prevalence and university affiliation was found in the analysis, however, There were significant discrepancies between universities pertaining to TNS prevalence, with the (Palestine Polytechnic University) having the highest prevalence of TNS, which may be attributed to differences in academic requirements, as well as study environments, as environments with higher screen time and suboptimal ergonomics are more likely to cause neck pain [10,17,18].

Daily time spent on digital devices had a significant association with TNS prevalence, as participants with higher screen time showed a higher prevalence of TNS, as forward head posture increases the burden on neck muscles, thus increasing the burden on the ligaments and muscles of the neck [6,19,20]. Longer device use has also been linked to neck pain [10,17,18].

Higher daily sitting duration was also associated with TNS prevalence, as it typically involves a static posture of the neck. Prolonged sitting duration has been associated with neck pain in numerous studies [20–23].

Degree of neck tilting was significantly associated with TNS prevalence, with greater amounts of neck tilting amounting to higher TNS prevalence, which could be attributed to biomechanics, as greater neck tilting causes extreme loading on the cervical spine and may, over time, disrupt the normal alignment of the cervical spine. It has been associated with neck pain and musculoskeletal dysfunction [20].

Tablet holder non-use has been associated with a higher prevalence of TNS, as participants who did not use smartphone/tablet holders showed a higher prevalence of TNS than the participants who used them, highlighting the significance of posture while using digital devices, as forward head posture and neck tilting have been associated with neck pain [6,19,20].

Factors like body weight, BMI, sitting duration, and physical activity level were not linked to increasing the likelihood of developing TNS, indicating that posture-related behaviors play a larger role than general lifestyle characteristics.

The combined findings of this study, along with the accumulating scientific data, suggest that TNS constitutes a widespread and multifactorial musculoskeletal pathology that causes significant morbidity to medical students, evidenced by a high prevalence rate and a biologically plausible association with prolonged screen time and increased amounts of neck flexion. Beyond transient inconvenience, TNS represents a significant cause of disability and decreased quality of life, positioning it as an emerging occupational health challenge that must be addressed.

Limitations and Strengths of This Study

Several limitations of this study should be acknowledged. First, the cross-sectional design prevents establishing causal relationships between the variables and TNS. Second is the use of a questionnaire as the source of data, which may be subject to recall bias and reporting inaccuracy, especially in variables such as device use and physical activity level. Third, even though multiple

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confounders were included in the multivariable analysis, some residual confounders may still be present from unmeasured sources, such as detailed workstation ergonomic characteristics.

Strengths of this study include taking a large sample of medical students, who were drawn from multiple universities and academic years across the West Bank, which enhances the generalizability of the study findings.

The study used a structured questionnaire, which allowed for assessment of a wide range of sociodemographic, academic, lifestyle, and ergonomic factors, thus providing a more holistic view of TNS and the factors associated with it.

The focus on modifiable ergonomic behaviors offers practical implications for prevention strategies and targeted interventions in academic settings.

The results of this study have important clinical and educational implications for medical students and academic institutions, most important of which is the high prevalence of TNS among medical students in West Bank universities and its association with modifiable ergonomic factors, highlighting the need for early identification and prevention strategies to reduce the burden.

These strategies may include incorporating ergonomic education into medical curricula, thus promoting healthier posture and screen positioning, as well as employing adequate break time.

Another strategy may be for institutions to promote ergonomically supportive learning environments and encourage healthy studying behaviors, which may contribute to improving musculoskeletal health and overall well-being among medical students.

5. Conclusions and Recommendations

In this cross-sectional observational study, the prevalence and associated factors of TNS were evaluated among a population of medical students in universities across the West Bank, Palestine. Analysis revealed that TNS was highly prevalent within this population. Several factors were significantly associated with TNS, ranging from ergonomic, sociodemographic, and academic performance to device use habits. These results draw attention to daily habits such as prolonged smart device use and sustained neck flexion.

Per the cross-sectional design, causal relationships cannot be determined.

Based on these findings, the implementation of targeted educational programs aimed at raising awareness of TNS and its risk factors and potential health consequences is strongly recommended. Universities should promote proper ergonomic practices, including optimal screen positioning, supportive seating, and the use of device holders. Integrating ergonomic education into medical curricula may contribute to the development of long-term healthy study habits among future healthcare professionals.

Further studies are recommended to use interventional or longitudinal designs to better establish causal relationships and to evaluate the effectiveness of preventative measures. Understanding the incidence and risk factors of TNS among the general population, or other student populations, is also crucial.

Authors' Contributions: The concept behind this study originates from Ahmed Abdelrahman; the study design was selected by Mahmoud Alhalayqa. A previously published and validated questionnaire assessing Text Neck Syndrome and associated factors was used in this study, with permission from the original authors [7] and edited by Ahmad Salmoodi. Data collection was done by all students, and data entry was done by Mouyad A. Abuobaid. Statistical analysis was done by all authors. All the authors interpreted the results. Writing the manuscript was done by all authors so was the literature review. Dr. Sundus Shalabi & Dr. Mahdi aljamal supervised the whole process and revised the final version of the manuscript.

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Ethics approval and consent to participate: Ethical approval was obtained from the Institutional Review Board (IRB) of the Arab American University of Palestine (Approval number: R-2025/A/86/N). All participants provided informed consent before completing the questionnaire. Participation was voluntary and anonymous,

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and no personal identifiers were collected. All methods were carried out in accordance with relevant guidelines and regulations and in accordance with the principles of the Declaration of Helsinki.

Availability of data and materials: The de-identified data supporting the findings of this study are available from the corresponding author upon request. they also are attached in the file of mini data file.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

Clinical trial number: Not applicable.

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