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Factors Affecting Classroom Concentration among Students at the School of Health, Zabol University of Medical Sciences: A Cross-Sectional Study

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A B S T R A C T

Introduction: Concentration in classroom plays a vital role in students' academic success and effective learning. Understanding factors that affect concentration can help educators enhance teaching methods and classroom environments. This study aimed to identify and analyze factors affecting student concentration in classrooms of the School of Health, Zabol University of Medical Sciences.

Materials and Methods: A descriptive-analytical cross-sectional design was employed, involving 170 students selected through convenience sampling (response rate: 100%). Data collection was performed from January to March 2023 using a validated 25-item questionnaire (three dimensions: instructor-related [11 items], student-related [11 items], and environmental factors [3 items]), rated on a 5-point Likert scale (0–4). The questionnaire showed excellent internal consistency (Cronbach's $\alpha = 0.90$). Data were analyzed using descriptive statistics, independent t-test, one-way ANOVA, and Pearson correlation in SPSS 26.

Results: Most participants were female (74.1%), single (78.8%), and non-native (80%), with a mean age of 21.38 years. The highest total score was related to instructor-related factors (45.78 ± 5.65), while environmental factors had the lowest total score (11.1 ± 2.06); however, mean-per-item scores were 4.16, 3.52, and 3.70, respectively, indicating that environmental factors were also perceived as relatively important. Significant gender differences were found, with female students reporting higher scores in all three domains ($p < 0.05$). Native and married students had higher scores in student-related factors ($p < 0.05$). Environmental factors significantly differed by field of study, with Nutrition students reporting the highest levels ($p < 0.05$). Students reported greater concentration in front rows (34.1%) and during 10:00–12:00 time slot (38.8%). Reviewing notes or references before class (88.2%) and participation in note-taking groups (84.1%) were the most frequently reported factors associated with perceived improvement in concentration. No significant relationship was found between age and other factors, while strong positive correlations existed among the three dimensions ($p < 0.01$).

Conclusion: Enhancing student concentration requires a multifaceted approach focusing primarily on improving teaching quality and addressing student behaviors, as well as optimizing environmental conditions. Policymakers, educators, and university administrators should consider these associative findings when developing targeted interventions to promote concentration and improve learning outcomes.

Keywords: Concentration, Students, Teaching Methods, Learning Environment, Student Engagement, Medical Education

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Introduction

Concentration, the ability to sustain attention on a specific task or stimulus, is a fundamental cognitive skill that underpins effective learning and academic achievement (1, 2). In educational

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settings, sustained attention enables students to process information deeply, retain knowledge, and perform well in assessments (3). However, maintaining concentration in classroom has become increasingly challenging, particularly in digital age, where smartphones, tablets, and other electronic devices constantly compete for students' attention (4). This challenge is especially pronounced in health professions education, where students face heavy cognitive loads, rigorous curricula, and high-stakes examinations that demand prolonged focus (5).

Factors affecting classroom concentration are generally classified into three broad categories, including instructor-related, student-related, and environmental. Instructor-related factors include teaching style, clarity of presentation, use of interactive methods, and respectful communication. Student-related factors encompass personal motivation, interest in subject, prior preparation, and psychological states such as stress or fatigue. Environmental factors refer to physical conditions such as lighting, temperature, noise levels, and seating arrangements (6).

Numerous studies have examined these dimensions in various educational contexts. Internationally, Wallace et al. (2021) found that students taught with active-learning strategies outperformed those in traditional lectures, highlighting the importance of pedagogical approach (7). Similarly, Cardenal et al. (2023) reported that participative teaching styles strengthened teacher-student relationships and increased student engagement (8). Environmental studies have shown that lighting, temperature, and noise significantly affect concentration, though their impact is often secondary to instructional quality (9, 10).

In Iran, several studies have investigated concentration among medical and health sciences students. Mehralizadeh et al. (2013) conducted a foundational study at Semnan University of Medical Sciences and identified instructor-related factors as the primary determinants of student focus (6). Zangiband et al. (2023) confirmed these findings among medical students in Kurdistan, reporting that appropriate instructor behavior had the strongest influence on concentration (11). Hamidian et al. (2026) at Zabol University of Medical Sciences also found the instructor domain to have the highest concentration scores (12). Despite these contributions, most previous Iranian studies have been limited to single-domain analyses or have not systematically examined the interrelationships among the three dimensions. Moreover, data from health sciences students in southeastern Iran remain sparse, and the role of demographic variables such as native status, marital status, and field of study has not been fully explored.

This study addresses these gaps by simultaneously assessing all three dimensions and their correlations, while also examining differences across demographic subgroups in a sample of health sciences students at Zabol University of Medical Sciences. Specifically, the study aimed to (1) rank the perceived effect of instructor-, student-, and environmental factors on concentration, (2) compare these perceptions across gender, marital status, native status, field of study, and academic semester, and (3) explore the inter-correlations among the three domains. The findings are expected to provide evidence-based insights for improving teaching quality, student support, and classroom design in health professions education.

Materials and Methods

Study Design and Setting

This descriptive-analytical cross-sectional study was conducted from January to March 2023 at the School of Health, Zabol University of Medical Sciences. The target population comprised all undergraduate students enrolled during the 2022-2023 academic semester (total eligible students: N = 350).

Participants and Sampling

Inclusion criteria were: (a) completion of at least two academic semesters, and (b) active class attendance for at least one semester during the

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study period. Exclusion criteria included unwillingness to participate and guest (transfer or temporary) students.

A convenience sampling method was employed due to practical constraints, including time limitations and accessibility of participants. All eligible students were approached during class sessions; 170 students agreed to participate and completed the questionnaire (response rate: 100%). The sample size was justified using the rule-of-thumb for factor analysis and regression analyses, which recommends 5–10 participants per questionnaire item. With 25 items (excluding demographics), the required minimum was 125–250 participants; the achieved sample of 170 met this criterion and provided adequate statistical power for the planned analyses.

Data Collection Instrument

Data were collected using a validated questionnaire originally developed by Mehralizadeh et al. (2013) (6) and used without modification. The instrument comprised two sections:

Section 1: Demographic information including gender, age, semester, marital status, field of study, and grade point average (GPA).

Section 2: 25 items assessing factors affecting concentration, divided into three dimensions: instructor-related (11 items), student-related (11 items), and environmental factors (3 items). Each item was rated on a 5-point Likert scale from 0 (no effect) to 4 (very high effect). Total scores for each dimension were calculated by summing item responses, with possible ranges of 0–44, 0–44, and 0–12 for the three dimensions, respectively. To enable valid cross-dimensional comparisons despite unequal item numbers, mean-per-item scores were computed for each dimension.

Validity and Reliability

Face and content validity had been established in the original study through expert review (6). For the current population, face validity **was** re-confirmed through cognitive interviews with 5 students and content validity with 5 faculty experts, who confirmed the relevance and clarity of all items. Reliability was assessed in a pilot test with 20 randomly selected students, yielding a Cronbach's alpha of 0.90 for the total scale. Subscale alphas were: instructor-related = 0.89, student-related = 0.87, and environmental = 0.78, indicating good to excellent internal consistency.

Data Analysis

Data were analyzed using SPSS version 26. Descriptive statistics (frequencies, means, standard deviations) were calculated for all variables. Prior to inferential analysis, normality of data distribution was assessed using Kolmogorov-Smirnov test for each dimension. The study results confirmed normal distribution ($p > 0.05$ for all). Homogeneity of variances was verified using Levene's test.

- Independent t-tests were used to compare mean scores between two groups (gender, marital status, native status) for each dimension.
- One-way ANOVA was used to compare mean scores across multiple groups (field of study, academic semester); post-hoc Tukey HSD tests were conducted for significant ANOVA results.
- Pearson correlation coefficients were computed to examine relationships among age, instructor, student, and environmental factor scores. Statistical significance was set at $p < 0.05$.

Result

Demographic Characteristics of Participants

As shown in Table 1, the majority of participants were female (74.1%), single (78.8%), non-native (80%), and studying Public Health (27.1%). Most of them were in their second semester (31.2%). The mean age was 21.38 ± 1.51 years, and mean GPA was 16.42 ± 1.35 (range 12–19).

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Table 1. Demographic information of the study population

Variable		Frequency	Percentage
Gender	Male	44	25.9%
	Female	126	74.1%
Marital Status	Single	134	78.8%
	Married	36	21.2%
Native Status	Native	34	20%
	Non-native	136	80%
Field of Study	Public Health	46	27.1%
	Occupational Health	23	13.5%
	Environmental Health	39	22.9%
	Nutrition Sciences	33	19.4%
	Health Services Management	29	17.1%
Academic Semester	2	53	31.2%
	4	40	23.5%
	6	45	26.5%
	8	32	18.8%

Descriptive Statistics of Factors Affecting Concentration

The highest total mean score was observed for instructor-related factors (45.78 ± 5.65), followed by student-related factors (38.7 ± 4.33), while environmental factors had the lowest total score (11.1 ± 2.06). However, mean-per-item scores were: instructor = 4.16, student = 3.52, and environment = 3.70, indicating that when standardized, environmental factors were perceived as relatively important (Table 2).

Table 2. Mean and standard deviation of age and factors related to professor, student, and environment

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	21.38	1.51	18	26
Professor-related factors	45.78	5.65	19	53
Student-related factors	38.7	4.33	24	45
Environmental factors	11.1	2.06	6	15

Inferential Statistics

Normality was confirmed for all dimensions (Kolmogorov-Smirnov $p > 0.05$). Independent t-tests revealed significant gender differences in all three dimensions ($p < 0.05$), with female students reporting higher mean scores than males (Table 3). Significant differences were also found in student-related factors by native status (native students higher, $p = 0.026$) and marital status (married students higher, $p = 0.009$). One-way ANOVA showed significant differences in environmental factor scores by field of study ($p = 0.048$). Tukey post-hoc comparisons indicated that Nutrition students scored significantly higher than Occupational Health (mean difference = 1.27, 95% CI: 0.15–2.39, $p = 0.022$) and Environmental Health (mean difference = 0.95, 95% CI: 0.04–1.86, $p = 0.038$) students, but not significantly different from Public Health or Health Services Management groups. No significant differences were found for academic semester or age ($p > 0.05$).

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Table 3. Comparison of mean scores by demographic variables

Variable	Group	N	Instructor-Related (Mean ± SD)	Student-Related (Mean ± SD)	Environmental (Mean ± SD)
Gender	Male	44	44.20 ± 7.03	37.54 ± 4.84	10.40 ± 2.09
	Female	126	46.34 ± 5.00	39.11 ± 4.08	11.52 ± 2.02
	p-value		**0.031**	**0.039**	**0.038**
Native Status	Native	34	46.14 ± 6.80	39.85 ± 5.05	11.55 ± 2.13
	Non-native	136	45.69 ± 5.36	37.66 ± 4.16	10.98 ± 2.04
	p-value		**0.681**	**0.026**	**0.148**
Marital Status	Single	134	45.74 ± 5.37	37.52 ± 4.37	11.07 ± 1.97
	Married	36	45.94 ± 6.69	39.36 ± 4.18	11.19 ± 2.38
	p-value		**0.853**	**0.009**	**0.758**
Field of Study	Public Health	46	46.93 ± 4.27	39.54 ± 3.48	11.56 ± 1.77
	Occupational Health	23	45.52 ± 6.57	38.73 ± 4.66	10.39 ± 2.79
	Environmental Health	39	45.48 ± 5.11	38.71 ± 3.66	10.71 ± 1.48
	Nutrition Sciences	33	45.09 ± 4.88	38.69 ± 3.83	11.66 ± 2.07
	Health Services Management	29	44.44 ± 7.93	38.17 ± 4.92	10.79 ± 2.28
	p-value		**0.453**	**0.497**	**0.048**
Academic Semester	2nd	53	46.11 ± 4.50	39.58 ± 3.60	11.24 ± 1.74
	4th	40	45.67 ± 4.65	37.55 ± 3.50	10.55 ± 1.67
	6th	45	45.77 ± 6.40	38.73 ± 5.22	11.37 ± 2.42
	8th	32	45.40 ± 7.39	38.65 ± 4.85	11.15 ± 2.39
	p-value		**0.954**	**0.170**	**0.270**

Note: P-values are from independent t-test (gender, native status, marital status) or one-way ANOVA (field of study, academic semester). Bold p-values indicate statistical significance at $p < 0.05$.

Concentration Levels by Classroom Conditions

As presented in Table 4, the highest concentration was reported when sitting in front rows (34.1%) and during the 10:00–12:00 time slot (38.8%).

Table 4. Concentration levels according to classroom conditions

Variable	Frequency	Percentage
In which part of the classroom does your concentration increase?		
Front rows	58	34.1%
Back rows	18	10.6%
Middle rows	54	31.8%
No effect	40	23.5%
During which time interval do you have the highest concentration in class?		
8:00 – 10:00	42	24.7%
10:00 – 12:00	66	38.8%
14:00 – 16:00	2	1.2%
16:00 – 18:00	26	15.3%
No effect	34	20.0%

Factors Affecting Concentration

Table 5 shows that reviewing notes before class (88.2%) and relying on note-taking groups (84.1%) were the most frequently reported factors associated with perceived increased concentration. Regarding the presence of students of different genders, the majority (61.2%) reported no effect, while 24.1% reported an increase and 14.7% reported a decrease. Gender difference between instructor and students had no effect for 77.6% of respondents.

The nature and extent of these perceived effects on concentration are visually summarized in Figure 1

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Table 5. Frequency distribution of the effective factors on the concentration of students in the School of Health

Variable	Effect on Concentration	Frequency	Percentage (%)
Relying on note-taking groups	Increase in concentration	143	84.1
	Decrease in concentration	15	8.8
	No effect	12	7.1
Presence of students of different genders in class	Increase in concentration	41	24.1
	Decrease in concentration	25	14.7
	No effect	104	61.2
Reviewing prepared notes or reference books before class	Increase in concentration	150	88.2
	Decrease in concentration	10	5.9
	No effect	10	5.9
Gender difference between instructor and students	Increase in concentration	27	15.9
	Decrease in concentration	11	6.5
	No effect	132	77.6

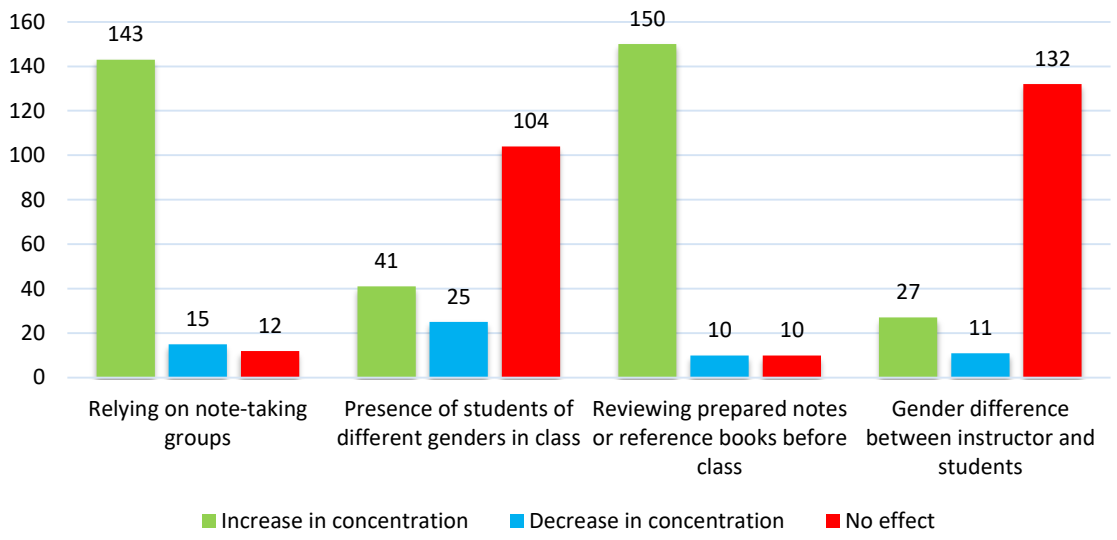

Figure 1. The Nature and Extent of the Impact of the Following Factors on the Concentration of Students in the School of Health

Correlation Analysis

Pearson correlation analysis (Table 6) revealed strong positive correlations among instructor-, student-, and environmental factors (r = 0.823, 0.578, and 0.602, respectively; $p < 0.01$ for all). No significant correlation was found between age and any of the three dimensions ($p > 0.05$).

Table 6. Pearson correlation matrix among age and concentration dimensions

Variable	1	2	3	4
1. Age	1			
2. Instructor-Related Factors	-0.119 (p = 0.124)	1		
3. Student-Related Factors	-0.112 (p = 0.146)	0.823 (p < 0.001)	1	
4. Environmental Factors	-0.046 (p = 0.550)	0.578 (p < 0.001)	0.602 (p < 0.001)	1

Values are Pearson correlation coefficients (r). P-values are shown in parentheses below each coefficient.
*** p < 0.01*

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Discusion

This study examined the perceived factors affecting classroom concentration among health sciences students at Zabol University of Medical Sciences and explored their associations with demographic variables. The findings indicated that instructor-related factors had the highest perceived influence, followed by student-related factors, while environmental factors had the lowest total score. However, mean-per-item analysis revealed that environmental factors were perceived as relatively comparable to student-related factors, suggesting that physical conditions are not negligible when standardized. This pattern is broadly consistent with previous Iranian studies (6, 11, 12) and international research (7, 8), collectively underscoring the central role of teaching quality in sustaining student focus.

The prominence of instructor-related factors can be interpreted through self-determination theory (SDT), which posits that students are more engaged when their needs for autonomy, competence, and relatedness are satisfied (13). Instructors who employ interactive teaching methods, provide clear explanations, and create a respectful classroom atmosphere, are likely to fulfill these psychological needs, thereby enhancing concentration. In the Iranian higher education context, where lecture-based teaching remains prevalent, students may particularly value instructors who deviate from passive delivery and actively involve them in learning. This contextual factor may explain why instructor-related factors consistently emerge as the most influential dimension across studies conducted at different Iranian universities (6, 11, 12).

Although environmental factors had the lowest total score, their mean-per-item score was close to that of student-related factors. This nuance is practically important, since environmental modifications, such as improving lighting, controlling temperature, and reducing noise, are often more feasible and cost-effective than large-scale pedagogical reforms. Previous research has shown that even simple interventions like adjusting classroom layout or ventilation can yield measurable benefits in concentration and academic performance (9, 10). Therefore, while instructor factors may be paramount, environmental factors should not be overlooked in efforts to optimize learning conditions.

Female students reported significantly higher scores across all three dimensions compared to males. This may indicate that female students are more perceptive or more responsive to instructional quality, personal study habits, and environmental conditions. Alternatively, it could reflect gender-based differences in self-reporting styles, with female students being more attentive to classroom dynamics or more willing to acknowledge the effect of external factors. Some studies suggest that gender differences in academic engagement are linked to behavioral styles rather than cognitive ability (14). Regardless of the underlying mechanism, this finding highlights the need for gender-sensitive approaches in educational interventions and suggests that male students might benefit from additional strategies to enhance their awareness and utilization of concentration-promoting factors.

Native and married students had higher student-related factor scores compared to their non-native and single counterparts. This may reflect stronger social support networks, a greater sense of belonging, or more stable life circumstances that enhance academic focus. Duran et al. (2020) similarly found that perceived social support positively predicted academic engagement (15). For non-native students, the stress of adapting to a new environment and the lack of familiar social networks may hinder their ability to maintain concentration. Married students may benefit from emotional and practical support provided by their spouses, as well as greater life stability. These findings suggest that universities should consider providing additional mentoring, counseling, or peer support programs for non-native and single students to foster a sense of community and enhance their academic concentration.

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Field-of-study differences in environmental factor scores, with Nutrition students reporting the highest scores, are noteworthy. Tukey post-hoc comparisons confirmed that Nutrition students scored significantly higher than Occupational Health and Environmental Health students. Nutrition students often spend considerable time in laboratory settings where environmental precision, such as temperature, lighting, and hygiene, is critical. This experience may heighten their sensitivity to physical conditions in classroom settings as well. Zhang et al. (2022) found that STEM students, who engage in hands-on activities, are more affected by classroom lighting and ventilation (16). The study finding extends this observation to nutrition education, suggesting that curriculum content and practical training may shape students' awareness and expectations of their physical learning environment. Therefore, universities should consider the specific needs of different disciplines when designing and maintaining learning spaces.

The study also identified practical factors associated with perceived improvement in concentration: front-row seating, mid-morning class times, preparatory behaviors (reviewing notes before class), and collaborative note-taking groups. Front-row seating reduces visual and auditory distractions and increases instructor interaction (17), while the 10:00–12:00 time slot aligns with circadian peaks in cognitive performance (18). These observations reinforce the importance of classroom seating arrangements and scheduling in educational planning. Preparatory behaviors and collaborative learning strategies align with active learning principles, which foster deeper understanding and sustained attention (19, 20). Regarding the presence of mixed-gender students, the majority of respondents reported no effect, suggesting that gender composition per se may be less influential than the overall classroom climate and teaching quality.

The strong positive correlations observed among instructor-, student-, and environmental factors suggest that these dimensions are interconnected. Instructor-related factors were strongly correlated with student-related factors and environmental factors, and student-related factors were correlated with environmental factors. This pattern is consistent with Kember and Leung (2006), who emphasized that student engagement is significantly shaped by teaching approaches that foster autonomy and critical thinking (21). However, since the study design was cross-sectional, these relationships should be interpreted as associations rather than causal pathways. It cannot be concluded that improving one domain will necessarily enhance another. The our findings indicated that they co-vary and may represent a mutually reinforcing system. Future longitudinal studies are required to test directional hypotheses and establish causal mechanisms.

This study has several limitations that should be acknowledged. First, the cross-sectional design precludes causal inferences. Second, self-reported data are subject to recall bias and social desirability bias. Third, convenience sampling and the single-university setting limit the generalizability of findings. Fourth, the study did not assess mental health status, sleep quality, or digital distraction variables that may moderate concentration. Despite these limitations, the study provided valuable insights into the perceived determinants of concentration among health sciences students in southeastern Iran, an understudied population. Future research using longitudinal designs and multi-institutional samples is recommended to build on these findings and explore the dynamic interplay of concentration-related factors in more depth.

Conclusion

The findings of this study indicate that instructor-related factors had the highest perceived influence on classroom concentration among health sciences students, followed by student-related factors. Environmental factors, despite having the lowest total score, demonstrated relatively high mean-per-item scores, suggesting that physical classroom conditions remain relevant

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and should not be overlooked.

Demographic variables were significantly associated with concentration perceptions: female, native, and married students reported higher scores in certain domains. Field of study affected environmental factor scores, with Nutrition students rating them the highest. Preparatory behaviors (reviewing notes before class) and collaborative note-taking were the most frequently reported factors associated with perceived improvement in concentration. Strong positive correlations among the three dimensions suggest they are interrelated; however, given the cross-sectional design, these should be interpreted as associations rather than causal relationships.

Based on these associative findings, the following practical suggestions are offered:

- **For policymakers:** Consider enhancing faculty development programs with a focus on interactive and student-centered teaching methods.
- **For administrators:** Evaluate classroom environmental conditions (lighting, temperature, acoustics) and consider scheduling cognitively demanding courses during mid-morning hours (10:00–12:00).
- **For instructors:** Employ active learning strategies, encourage students to review materials before class, and create a supportive classroom atmosphere.
- **For students:** Engage in collaborative note-taking, prepare before class, and choose seating positions that minimize distractions.

Future longitudinal and interventional studies are recommended to test the effectiveness of these strategies and establish causal pathways. This study contributes novel insights into the interconnected nature of concentration determinants in a previously understudied population of health sciences students in southeastern Iran.

Availability of data and material

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Conflict of interests

The authors declare that they have no competing interests.

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Authors' contributions

MS and PI participated in the design of the study. PI, SD, and MS undertook the literature review process. All authors drafted the manuscript. All authors read and approved the final manuscript.

Ethical considerations

Ethical approval was obtained from the Research Vice Presidency of Zabol University of Medical Sciences (IR.ZBMU.REC.1402.133). All participants provided written informed consent prior to participation. Confidentiality was strictly maintained, and all data were anonymized for analysis.

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