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The Relationship between Infertility Characteristics and Post-Traumatic Stress Disorder (PTSD) in Women Seeking Fertility Treatment: A Cross-sectional Study

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ABSTRACT

Background & aim: Infertility profoundly affects multiple aspects of human life, serving as a major stressor and often causing significant emotional distress for couples, especially women. This study investigated the relationship between the characteristics of infertility and symptoms of post-traumatic stress disorder (PTSD) in women undergoing fertility treatment.

Methods: This cross-sectional study examined 473 infertile women who sought treatment at one Infertility Center, affiliated with Mashhad University of Medical Sciences, Mashhad, Iran from December 2020 to February 2022. Participants were selected through convenience sampling. Data collection involved completing a demographic and infertility-related characteristics questionnaire, the Fertility Problem Inventory (FPI), and the Post-traumatic Stress Disorder (PTSD) Checklist on a self-report basis. To analyse data, independent t-test, chi-square test, Pearson correlations, one-way ANOVA and multiple regression analyses using SPSS version 23 were employed.

Results: Three Fertility Problem Inventory domains includingrejection of child-free lifestyle, social concern, and desire for parenthood showed a significant negative association with PTSD ($p<.001$). No significant relationship was found between PTSD and demographic factors or types of infertility.

Conclusion: Considering negative association between PTSD and three Fertility Problem Inventory domains, screening for PTSD symptoms by healthcare providers could play a critical role in identifying, assessing, and treating trauma-related conditions in infertility care. So, further research is recommended to deepen our understanding of these relationships.

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Introduction

Infertility refers to the inability to achieve pregnancy one or more years of trying regular, despite unprotected intercourse (1). According to the World Health Organization, approximately 17.5% of the global adult population—roughly 1 in 6 people experienced infertility in 2023 (2). A comprehensive systematic review and meta-analysis by Abangah et al. (2023) estimated the prevalence of primary infertility in Iran at 18.3% and secondary infertility at 2.5% (3).

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Infertility presents challenges on both personal and societal levels (4). Infertile couples often encounter a range of difficulties, including sexual dysfunction, financial strain from treatment costs, psychological distress such as depression, anxiety, and stress, as well as a reduced quality of life (5). Hassanzadeh et al. (2018) reported that 38.4% of infertile women undergoing IVF or ICSI treatment experienced moderate anxiety (6). These factors can detrimentally impact treatment outcomes by influencing the pituitary-hypothalamus axis (7, 8), sometimes causing up to 30% of couples to discontinue treatment due to excessive mental strain (9, 10). Contributing factors include treatment-related challenges, psychological stressors, and demographic variables (11). Women undergoing infertility treatment have been shown to experience stress levels comparable to those battling cancer, AIDS, and cardiovascular disorders (12).

As outlined in the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), post-traumatic stress disorder (PTSD) is marked by symptoms including recurrent or intense exposure to distressing details of traumatic events, prolonged or acute distress, notable physiological reactions, and intrusive recollections (13). Therefore, the experience of infertility and its treatment has been linked to symptoms associated with PTSD.

A study by Roozitalab et al. (2021) found that 41.3% of infertile women exhibited PTSD symptoms, which significantly correlated with infertility-related stress and quality of life (14). Bradow (2011) reported no significant difference in mean PTSD Civilian Version (PCL-C-C) scores between women experiencing primary and secondary infertility. Furthermore, demographic characteristics did not significantly influence the prevalence or intensity of PTSD symptoms in these groups (15). Corley (2017), in a study involving 200 infertile women, found that the type of infertility treatment used did not influence PTSD symptoms (12). While numerous quantitative and qualitative studies have examined the psychological consequences of infertility experiences (11), the relationship between infertility characteristics and PTSD symptoms remains unexplored. Therefore, the present study aimed to investigate the relationship between infertility characteristics and PTSD symptoms in infertile women seeking fertility treatment.

Materials and Methods

The current cross-sectional study was conducted from December 2020 to February 2022 focused on infertile women who visited one infertility center, affiliated with Mashhad University of Medical Sciences. This center is the only government-operated infertility treatment facility in northeastern Iran. It serves as a referral center for many patients with infertility problem from various parts of the province and the country, making it an ideal site for sampling due to the diversity of its patients.

The sample size was estimated based on the study by Bradow (2011) (15), which examined the prevalence of post-traumatic stress disorder (PTSD) among individuals experiencing infertility or undergoing infertility treatment. The mean and standard deviation of infertility types in Bradow's study were reported as 45.46 ± 13.72 for the primary infertility and 43.52 ± 9.78 for the secondary infertility cases. Using GPower software, with a power of 0.85, an alpha level of 0.05, and a two-tailed independent t-test, the required total sample size was estimated to be 473 participants across two groups(primary and secondary infertility). Convenience sampling was employed to gather the data.

The inclusion criteria were as follows: the ability to read and write, no use of medications related to mental disorders, no current or past psychiatric disorder within the last six months (according to the research units' reports or medical records), no history of mental disorders in first- and second-degree relatives, Iranian nationality, age between 18 and 49 years, no adopted children, first marriage for both partners, diagnosis of infertility unrelated to genetic causes, and a minimum of one year following the diagnosis of primary or secondary infertility.

The demographic and infertility-related characteristics questionnaire was divided into two sections. The first section collected demographic details such as age, educational level, occupation, income, residence status,

location, and parental status. The second section focused on infertility history, covering the duration, type, treatment history, ongoing treatment methods, and the frequency of treatment failures. It was developed based on the research objectives, through a review of relevant articles, books, theses, reliable websites, and expert opinions.

The Fertility Problem Inventory (FPI), developed by Newton et al. (1999), which provides a reliable measure of fertility stress includes 46 questions divided into five domains: social concerns, sexual concerns, relationship concerns, attitudes toward child-free living, and the desire for parenthood. Responses were rated on a 6-point Likert scale, ranging from strongly disagree (1) to strongly agree (6), with 19 questions scored in reverse. Scores ranged from 46 to 276, with higher scores reflecting greater stress (16). Samani et al. (2017) validated the FPI in Iran using a sample of 410 patients at various stages of infertility, achieving Cronbach's alpha coefficients above 0.70 for all domains (17). In our study, the reliability of the FPI, as measured by Cronbach's alpha, was 0.75.

The PTSD Checklist (PCL-C) was used to measure levels of post-traumatic stress disorder (PTSD). This assessment tool evaluates three domains: re-experiencing traumatic events, emotional numbing and avoidance, and heightened arousal. It consists of 17 items, with participants rating their responses on a 5-point Likert scale (1 = never, 2 = very low, 3 = moderate, 4 = high, 5 = very high). Total scores range from 17 to 85 (18). Razavi et al. (2024), in Iran, validated the checklist reliability using data from 901 participants, yielding a Cronbach's alpha coefficient of 0.87 (19). Based on the PCL-C-C scoring system, the most reliable approach for diagnosing PTSD involves using a total score cut-off, generally ranging from 30 to 50. In this study, as in study by Bradow, a cut-off point of 44 was employed (15). Additionally, the reliability of the PCL-C in the current study, based on Cronbach's alpha, was found to be 0.88.

Following ethical approval and coordination with university and clinic officials, a research assistant, well-versed in the stages of the project, facilitated the sampling process.

Upon entering the research setting, the research assistant introduced herself and explained the purpose of the study to eligible infertile women seeking treatment for Drug, IUI, ICSI, or IVF. Then, the research assistant identified research unit participants as infertile women who met the study's inclusion criteria. She provided participants with questionnaires on demographic and infertility-related characteristics, post-traumatic stress disorder, and a fertility problem inventory to be completed on a self-report basis. After sample collection, the researcher entered the questionnaire data into SPSS software for statistical analysis.

The data collected in this study included both quantitative and qualitative measures (nominal and ordinal data). The analysis comprised descriptive statistics, including absolute and relative frequencies, mean, and standard deviation. Inferential statistical methods were also employed, such as an independent t-test compared mean scores of the Fertility Problem Inventory domains between women with primary and secondary infertility. Multiple linear regression analysis identified predictors of PTSD symptom severity. Additionally, the chi-square test assessed associations between the presence of PTSD and categorical demographic and clinical variables, including occupation, educational level, place of residence, type of infertility treatment, type of infertility, and history of prior treatment failure, to examine the relationship between the domains of the PTSD questionnaire and the Fertility Problem Inventory, the Pearson correlation coefficient was used. To compare means across three or more groups, we employed a one-way Analysis of Variance (ANOVA). All analyses were conducted using SPSS version 23.

Results

In the current study, the majority of participants (366; 77.5%) were residents of Razavi Khorasan Province. The average age of the women was 31.25 ± 5.5 years. Table 1 provides a summary of the demographic and infertility-related characteristics of the research subjects.

The mean and standard deviation of the PCL-C-C scores were 36.45 ± 11.78. Within the PTSD checklist, 167 participants (35.35%) scored

below the cut-off point, indicating low to non-high levels of PTSD. In comparison, 181 participants (38.38%) scored within the medium to high-moderate cut-off range, while 125 participants (26.6%) scored above the cut-off point. In other words, of the 473 infertile women, 26.4% (n = 125) had a PCL-C-C total score exceeding 44.

Table 1. Frequency distribution of demographic and infertility-related characteristics of infertile women

Variable	N (%)
Education	
Elementary	24 (5.1)
Guidance school	80 (16.9)
Diploma	191 (40.4)
University	178 (37.6)
Job	
Housewife	393 (83.1)
Employee	43 (9.1)
Laborer	4 (0.8)
Self-employment	33 (7)
Place of resident	
City	368 (77.8)
Village	105 (22.2)
Housing conditions	
Own property	263 (55.6)
Rental	210 (44.4)
Type of infertility	
Primary	344 (72.2)
Secondary	129 (27.3)
Previous IVF	
Yes	141 (29.8)
No	332 (70.2)
Failure of IVF treatment	
Yes	45 (9.5)
No	428 (90.5)
Number of IVF Failure	
Once	28 (5.9)
Twice	15 (3.2)
Three times	2 (0.4)
No failure	428 (90.5)
Having child	
Yes	94 (19.9)
No	379 (80.1)
Type of infertility treatment	
Drug	20 (4.2)
IUI	156 (33)
ICSI	297 (62.8)

As stated by the National Center for PTSD (2018), a score of '3' or higher on individual PCL-C-C items is considered significant. Based on the mean scores of all participants, three criterion items showed significant scores. One item from Category B (Questions 1–5) of the DSM-IV PTSD criteria had a mean score of "3" or higher: "Repeated memories." Similarly, one symptom from Category C (Questions 6–12) met the threshold: "Avoiding thoughts and talk." Finally, one symptom from Category D (Questions 13–17) also reached this level: "Heightened awareness."

The Kolmogorov-Smirnov test confirmed that the data followed a normal distribution, allowing for the use of the Pearson correlation test. A significant inverse relationship was observed between the categories of the PCL-C questionnaire and the categories of the fertility problems inventory ($P < 0.001$) (Table 2).

Each item was analyzed in relation to the diagnosis of primary versus secondary infertility. Responses of '5,' '4,' or '3' were considered clinically significant for each diagnostic category (primary and secondary infertility) and were totaled for each individual symptom on the PCL-C-C. In Criterion B1 ('Repeated Memories'), 73.4% of women with primary infertility and 26.6% with secondary infertility scored within the clinically significant range (3–5). However, the chi-square test did not reveal a significant association between infertility type (primary vs. secondary) and PTSD levels ($P = 0.38$).

The mean feeling of distance (cut-off) was 2.05 ± 1.19 for women with primary infertility and 1.72 ± 1.07 for those with secondary infertility, showing a statistically significant difference ($P = 0.006$) (Table 3).

The mean and standard deviation of the Fertility Problem Inventory (FPI) scores were 172.95 ± 36.45. Within the FPI domains, the mean scores were as follows: social concern, 37.15 ± 6.65; sexual concern, 29.71 ± 4.74; relationship concern, 5.21; rejection of a childless lifestyle, 36.15 ± 4.23; and need for parenthood, 39.10 ± 7.15. No statistically significant relationship was observed between women's age and the domains of the Fertility Problem Inventory ($P > 0.05$).

Table 2. The relationship between the categories of the PCL-C questionnaire and fertility problem inventory

Variable	Social concern	Sexual concern	Relationship concern	Rejection of parenthood	Need for parenthood
PCL-C1-5					
Pearson Correlation	-0.258**	-0.151**	-0.180**	-0.159**	-0.292**
P-Value	0.000	0.001	0.000	0.001	0.000
PCL-C6-12					
Pearson Correlation	-0.313**	-0.216**	-0.225**	-0.239**	-0.298**
P-Value	0.000	0.000	0.000	0.000	0.000
PCL-C13-17					
Pearson Correlation	-0.277**	-0.136**	-0.159**	-0.183**	-0.235**
P-Value	0.000	0.003	0.001	0.000	0.000

Table 3. The analysis of PCL-C-C items according to the type of infertility

Individual criterion item	Number of Significant Responses Primary Infertility N (%)	Number of Significant Responses Secondary Infertility N (%)	P-Value	95% Confidence Interval of the Difference	
				Lower	Upper
B1 (Repeated Memories)	168 (73.4)	61 (26.6)	0.93	-0.23	0.25
B2 (Disturbing Dreams)	114 (76)	36 (24)	0.62	-0.17	0.28
B3 (Re-experiencing)	110 (71.9)	43 (28.1)	0.695	-0.28	0.19
B4 (Upset at Reminder Cues)	149 (70)	64 (30)	0.2	-0.42	0.09
B5 (Physical Reactions)	114 (74.5)	39 (25.5)	0.9	-0.26	0.23
C6 (Avoiding Thoughts and Talk)	126 (72.4)	48 (27.6)	0.9	-0.27	0.24
C7 (Avoiding Activities)	125 (74.9)	42 (25.1)	0.56	-0.17	0.31
C8 (Memory Trouble)	60 (65.9)	31 (34.1)	0.42	-0.26	0.11
C9 (Loss of Interest)	100 (73)	37 (27)	0.87	-0.21	0.25
C10 (Feeling Distant/Cut Off)	99 (78.6)	27 (21.4)	0.006	0.09	0.57
C11 (Emotional Numbness)	65 (77.6)	19 (22.6)	0.2	-0.07	0.32
C12 (Shortened Future)	81 (71.7)	32 (28.3)	0.77	-0.2	0.26
D13 (Sleep Disturbances)	96 (70.6)	40 (29.4)	0.333	-0.36	0.12
D14 (Irritability)	101 (69.2)	45 (30.8)	0.4	-0.33	0.13
D15 (Difficulty Concentrating)	100 (67.6)	48 (32.4)	0.175	-0.39	0.07
D16 (Heightened Awareness)	149 (72)	58 (28)	0.875	-0.26	0.22
D17 (Jumpy or Easily Startled)	105 (71.4)	42 (28.6)	0.900	-0.23	0.26

Table 4 presents the correlation between primary or secondary infertility and the various domains of the Fertility Problem Inventory. A statistically significant difference was observed in the mean scores of the FPI domains among women with primary and secondary infertility, except for the social concern domain, as determined by the independent t-test.

A linear regression analysis was conducted to predict post-traumatic stress disorder (PTSD). PTSD was treated as the dependent variable, with social concern, sexual concern, relationship concern, rejection of a child-free lifestyle, and the desire for parenthood acting as predictor variables.

In the initial model, with social concern as the sole independent variable, the R-value was 0.33, and the adjusted R^2 was 0.11. When the independent variable "desire for parenthood" was added, the R-value increased to 0.36, and the adjusted R^2 rose to 0.13. This indicates that including the second variable improved the R^2 value by 2.3%. In summary, social concern and

the desire for parenthood together explained 13.4% of the variability in this model.

Table 4. The relationship between Fertility Problem Inventory Domains and type of infertility

Type of infertility	Mean ± SD	P-Value	95% Confidence Interval of the Difference	
			Lower	Upper
Social concern				
Dimension 1				
Secondary	36.93±6.96	0.051	-.001	2.99
Primary	37.75±5.75			2.79
Sexual concern				
Dimension 1				
Secondary	29.43±4.66	0.017	.23	2.38
Primary	30.46±4.91			2.33
Relationship concern				
Dimension 1				
Secondary	35.56±5.05	<0.001	1.91	4.21
Primary	37.7±5.34			4.18
Rejection of childless life style				
Dimension 1				
Secondary	30.49±4.12	<0.001	1.19	3.07
Primary	31.7±4.41			3.04
Need for parenthood				
Dimension 1				
Secondary	38.26±7	<0.001	1.83	5.02
Primary	41.34±7.11			

In the third model, the addition of the independent variable "rejection of a child-free lifestyle" yielded an R-value of 0.37 and an adjusted R^2 value of 0.14. This represented an additional 0.8% increase in the R^2 value, resulting in a total explanation of 14.2% of the variance in the PTSD variable by the three variables: social concern, desire for parenthood, and rejection of a child-free lifestyle.

The analysis highlights the significance of all three independent variables: social concern ($P < 0.001$), desire for parenthood ($P = 0.005$), and rejection of a child-free lifestyle ($P = 0.03$).

The regression model is expressed as: Y = 68.46 - 0.26(desire for parenthood) - 0.38(social concern) - 0.27(rejection of child-free lifestyle)

According to this model, the desire for parenthood, social concern, and rejection of a child-free lifestyle are all negative predictors of the outcome variable. Specifically, a one-unit increase in the desire for parenthood is associated with a 0.26-unit decrease in the outcome variable, holding other variables constant. Similarly, a one-unit increase in social concern corresponds to a 0.38-unit decrease in the outcome variable, and a one-unit increase in rejection of a child-free lifestyle corresponds to a 0.27-unit decrease in the outcome variable, when all other factors are held constant.

The regression analysis revealed negative coefficients for the three variables: rejection of a child-free lifestyle, social concern, and desire for parenthood. These findings indicate that a reduction in these variables is linked to a higher likelihood of developing post-traumatic stress disorder (PTSD) This aligns with expectations, as these factors are thought to influence PTSD by addressing issues related to rejecting a child-free lifestyle, alleviating social concerns, and fulfilling the desire for parenthood.

The Chi-square test showed no statistically significant association between PTSD and factors such as women's occupation ($P = 0.47$),

educational level (P = 0.33), place of residence (P = 0.8), type of infertility treatment, previous treatment failure (P = 0.7), and type of infertility (P = 0.65).

Discussion

The study aimed to investigate the relationship between infertility characteristics and post-traumatic stress disorder (PTSD) in infertile women who sought fertility treatment. Using the Fertility Problem Inventory in this study, three variables—child-free lifestyle, social concern, and the desire for parenthood—showed negative coefficients, indicating that as these values decreased, PTSD symptoms increased. This outcome was expected, as these variables were presumed to influence PTSD by reducing aversion to a child-free lifestyle, minimizing social concerns, and tempering the longing for parenthood.

Conversely, Roozitalab et al. (2021) identified a strong inverse relationship between overall PTSD scores and all aspects of quality of life, with the exception of interpersonal relationships. They also observed a significant direct relationship between overall PTSD scores and all aspects of Newton's infertility-related stress inventory (14). However, the present study did not utilize infertility quality-of-life or infertility-related stress questionnaires.

In the present study, as in the findings of Faramarzi et al. (2024), the highest score among the Fertility Problem Inventory subscales was associated with the need for parenthood. Our study found a statistically significant relationship between all domains of the Fertility Problem Inventory and post-traumatic stress disorder (PTSD). However, in study by Faramarzi, there was no statistically significant relationship between PTSD and rejection of a child-free lifestyle (22). This may be due to cultural differences between societies

The DSM-V-TR criteria were used to assess mixed-method measures that reflect the defining characteristics of PTSD. Criterion B covers re-experiencing symptoms, such as intrusive thoughts and nightmares. Criterion C pertains to avoidance symptoms, including detachment and feelings of separation. Criterion D involves heightened arousal symptoms, such as difficulty concentrating and sleep disturbances. For a PTSD diagnosis, composite scoring requires at least one symptom from Criterion B, at least three symptoms from Criterion C, and at least two symptoms from Criterion D. In Bradow's study, 46% of participants met the diagnostic criteria for PTSD based on both symptom patterns and the suggested overall cutoff score (n=65) (15). In contrast, in our study, under Criterion B1 (Repeated Memories), 73.4% (n=168) of women with primary infertility and 26.6% (n=61) of women with secondary infertility scored within the range of 3–5.

T findings revealed that most participants were dealing with primary infertility, and Intracytoplasmic Sperm Injection (ICSI) being the most commonly used treatment method. The desire for parenthood was identified as the primary concern in the Fertility Problem Inventory. Additionally, over 38% of respondents scored within the moderate to high PTSD range, while more than 26% exceeded the high threshold for PTSD symptoms. Globally, approximately 70% of adults have experienced at least one traumatic event, with 31% having faced four or more such events in their lifetime. The lifetime prevalence of PTSD varies significantly, ranging from 1.3% to 12.2%, depending on societal and geographical factors, while the one-year prevalence lies between 0.2% and 3.8% (20). In a study by Roozitalab et al. (2021), 41.3% of infertile women were found to have PTSD (14), while the present study reported a prevalence of 36.45%.

PTSD, akin to a life-altering trauma, was notably prevalent among infertile women. Interestingly, the findings of the present study revealed no significant association between PTSD and the type of infertility treatment. The cyclical nature of infertility treatment could be likened to a form of complex trauma. Each treatment cycle involved consuming pills, administering injections, and undergoing procedures, only to culminate in the onset of menstruation—often signaling a lack of success despite therapeutic efforts. These repeated experiences could become deeply traumatic, as the combination of medical interventions and the arrival of menstruation reinforced feelings of despair (21).

Studies by Corley-Newman (2017) and Roozitalab et al. (2021) similarly found that the

type of infertility treatment had no significant impact on PTSD symptoms in infertile women (12, 14). These findings align with the results of the current study, further supporting this conclusion.

Bradow (2011) argued that there was no statistically significant difference in the prevalence, symptoms, or average PTSD scores between women with primary and secondary infertility (15). The findings of Bradow's study align with the results of the present study.

In contrast to the results of the present study that most participants had a high school diploma, in the research by Corley-Newman and Bradow included participants with higher educational backgrounds (12, 15). On the other hand, Rooney et al. (2018) highlighted that despite favorable prognoses and affordable treatment costs, psychological factors often led to the discontinuation of infertility treatments. Specifically, depressed infertile women were less likely to initiate treatment and more likely to discontinue after a single cycle (23).

In the current study, no statistically significant relationship was observed between post-traumatic stress disorder (PTSD) and occupation, education, or place of residence. However, in Faramarzi's study, a statistically significant relationship was observed between PTSD and these variables among infertile women (22). This variation is probably due to cultural and economic disparities in the populations examined.

This study, as far as we know, is the first study to investigate the relationship between infertility characteristics and PTSD in Iran on a substantial scale.

A notable limitation was the quantitative nature of the research, which provided statistical insights but limited the depth of understanding of the phenomena. Additionally, the absence of an cohort study restricted the ability to draw definitive conclusions. To address these limitations, both qualitative investigations and large cohort studies are recommended to provide richer, more nuanced insights into this subject matter.

Conclusion

The present study highlights the importance of social concern, desire to be a parent, and rejection of a childless lifestyle on PTSD. Given the cultural and personal importance of childbearing, screening for PTSD symptoms by healthcare providers could play a critical role in identifying, assessing, and treating trauma-related conditions in infertility care. Such screening efforts could also help connect women experiencing infertility with appropriate mental health services.

Declerations

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Conflicts of interest

The authors declared no conflicts of interest.

Ethical considerations

Written consent was obtained from those willing to participate. They were assured that their participation is entirely voluntary and that they could withdraw at any time, even after providing consent. Additionally, the confidentiality of all data collected through the questionnaire was guaranteed.

Code of Ethics

The research collaboration between Mashhad University of Medical Sciences and North Khorasan University of Medical Sciences received approval with ethics code of IR.MUMS.NURSE.REC.1399.096 from Institutional Review Board of Mashhad University of Medical Sciences, Mashhad, Iran.

Use of Artificial Intelligence (AI)

We have not used any AI tools or technologies to prepare this manuscript.

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Authors' contribution

MHB: Conceptualization, data collection, analysis, writing the original draft, reviewing and editing the manuscript and project supervision. SEZ: Conceptualization, and data collection. NJ: Data collection. MH: Methodology and data analysis. All authors read and approved the final manuscript.

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