Original Article

Perceived Stress and Emotion Regulation Difficulties among Women After a Devastating Earthquake

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Abstract
Background: Earthquakes not only result in loss of life and property but also have significant psychological effects, particularly on women.
Aim: This study aims to assess the perceived stress levels and difficulties in emotion regulation among women who experienced an earthquake.
Methods: This descriptive-correlational study was conducted with 302 women affected by an earthquake. Data were collected through a face-to-face questionnaire consisting of a personal information form, the Perceived Stress Scale, and the Emotion Regulation Scale-Short Form.
Results: The mean age of the participants was 26.86 ± 8.94 years. The mean scores for perceived stress and emotion dysregulation were 42.20 ± 3.55 and 43.66, respectively. A statistically significant relationship was found between income level and presence of any gynecological disease and the total Perceived Stress Scale score, as well as between health insurance status and the total Emotion Regulation Scale score ($p<0.05$). In addition, a weak positive correlation was identified between perceived stress and emotion dysregulation scores ($p < 0.01$).
Conclusion: The findings indicate that women who experienced an earthquake had high perceived stress levels and moderate difficulties in emotion regulation. Certain demographic and health-related factors influenced stress and emotional regulation difficulties. Furthermore, as perceived stress increased, difficulties in emotion regulation also increased.

Keywords: Earthquake, perceived stress, emotion regulation, women

Introduction

Earthquakes are natural disasters that cause widespread destruction and numerous challenges. They occur almost everywhere in the world and are responsible for more than 10,000 deaths each year (Baytiyeh & Naja, 2016; Farooqui et al., 2017). In Turkey, thousands of people lost their lives after the devastating earthquakes that occurred on February 6, 2023. At least 15 million people were adversely affected and a national emergency was declared and international aid

was requested (UNFPA, 2023). Beyond the physical destruction, earthquakes have profound psychological effects, as individuals struggle to cope with loss, displacement, and uncertainty (Villarreal & Meyer, 2020). Stress, a condition that negatively affects the normal functions of individuals, can lead to various health problems when prolonged and significantly diminishes quality of life. Research indicates a strong relationship between stress and mental health (Cevik & Senturk, 2008; Eskin et al., 2013). For example, following a major earthquake in Piura, Peru, one in five individuals was diagnosed with post-traumatic stress disorder (PTSD) (Valladares-Garrido et al., 2022).

Women from disadvantaged groups are among the most vulnerable populations affected by natural disasters such as earthquakes. Factors such as gender inequality, family dynamics, limited access to information, and low socioeconomic status contribute to their heightened vulnerability (Demirci &Avcu, 2021; Ilgın & Karagul, 2022). This situation affects women's physical and psychological health more deeply (Okay & İlkkaracan, 2018). Research indicates that women affected by disasters experience higher levels of mental health issues compared to men (Zhou et al., 2020), and their psychological well-being deteriorates further when they cannot receive support for a certain period of time (Fatema et al., 2019).

Emotion regulation refers to the processes of recognizing, understanding, accepting, and responding to one's emotions (Marques et al., 2018; See et al., 2022). It involves using flexible and situationally appropriate strategies to cope with negative emotions, maintaining goal-directed behavior despite emotional challenges, and exercising impulse control. Difficulties in these areas lead to emotion regulation impairments. Research in the general population indicates that emotion regulation difficulties are strongly associated with symptoms of anxiety and depression (Marques et al., 2018).

Identifying the factors that influence the level of stress emotion dysregulation perceived by women after natural disasters such as earthquakes is crucial for developing effective coping strategies, and establishing comprehensive support networks within social and health policies. Despite the significant psychological impact of earthquakes on women, studies on their mental health in this context remain limited (Arora, 2022; Handayani & Nurdin, 2021), particularly regarding emotion dysregulation (Kocyigit et al., 2024). Kocyigit et al. (2024) reported that the extent to which individuals were affected by an earthquake was directly and indirectly related to generalized anxiety disorder, coping flexibility and emotional dysregulation. Similarly, Handayani and Nurdin (2021) emphasized the importance of personal development and positive social relationships in enhancing women's resilience to disaster-related distress. However, no study has comprehensively evaluated both stress levels and emotion regulation difficulties among women affected by earthquakes. Accordingly, this study was conducted to assess the perceived stress levels and emotion dysregulation of women who have experienced an earthquake.

Research questions

1) What are the perceived stress levels of women who have experienced an earthquake?

2) What are the levels of emotion regulation difficulties among women who have experienced an earthquake?

3) What factors influence perceived stress levels and emotion regulation difficulties in women affected by an earthquake?

4) Is there a relationship between perceived stress and emotion regulation difficulties in women who have experienced an earthquake?

Material and methods

Research design

This study employs a descriptive-correlational research design.

Research aim

This study was conducted to determine the perceived stress levels and difficulties in emotion regulation among women after a devastating earthquake.

Participants

The population of this study, which was conducted at a Private Hospital between February and March 2023, consisted of

women who sought medical care at the hospital on relevant dates. The sampling method with a known population was used to calculate the sample size of the study. The total number of women admitted to the hospital in a month is 700. Considering that a similar number of people will apply to the hospital monthly, it was determined that the study should be conducted with 302 women as a result of the calculation (https://www.calculator.net/sample-size-calculator.html?type=1&cl=95&ci=5&pp=50&ps= 1400&x=Calculate). One of the researchers, residing in the earthquake-affected region, conducted face-to-face interviews with women who sought medical care at the hospital. These women were informed about the study before their participation.

Inclusion criteria

Women who volunteered to participate in the study, were open to cooperation and communication, understood and spoke Turkish, were between the ages of 18 and 49, had experienced the February 6 earthquake, and provided written and verbal consent were included in the study.

Data collection: Data were collected using a Personal Information Form, the Perceived Stress Scale, and the Emotion Regulation Scale - Short Form through face-to-face interviews. The reason for choosing the face-to-face interview method is that one of the researchers lives in the earthquake zone and this method helped the process proceed quickly. Each interview lasted approximately 8 to 12 minutes. Before data collection, participants were informed about the study, and their written informed consent was obtained.

Data collection instruments

Personal Information Form: This form, which was developed by the researchers based on relevant literature, consists of 14 questions assessing the socio-demographic, obstetric, and earthquake-related characteristics of pregnant women (Cengiz & Peker, 2023).

Perceived Stress Scale (PSS): This scale was developed by Cohen et al. (1983) and adapted into Turkish by Eskin et al. (2013). This 14-item, 5-point Likert-type scale measures an individual's subjective perception of stress. Seven items (4,5,6,7,7,9,10,13) are reverse scored. The total score ranges from 0 to 56, with higher scores indicating greater perceived stress. The Cronbach's alpha internal consistency coefficient of the Turkish version was reported as 0.84 (Cohen et al., 1983; Eskin et al., 2013), while in this study, it was found to be 0.71.

Difficulty in Emotion Regulation Scale (DERS-16): Developed by Bjureberg et al. (2006), this scale is a 16-item short version of the original 32-item scale by Gratz and Roomer (2004). It was adapted into Turkish by Yigit and Guzey-Yigit (2017). The scale is a 5-point Likert-type scale, ranging from 1 (almost never) to 5 (almost always). It consists of five subscales and 16 items. The subscales are “lack of emotional clarity” (1,2), “difficulties engaging in goal-directed behavior” (3,7,15), “impulse control difficulties” (4,8,11), “limited access to emotion regulation strategies” (5,6,12,14,16) and “nonacceptance of emotional responses” (9,10,13). There are no reverse coded items, and higher scores indicate greater difficulty in emotion regulation. The Cronbach's alpha internal consistency coefficient of the original Turkish version was reported as 0.92 (Bjureberg et al., 2016, 2016; Yigit & Guzey Yigit, 2019) . In this study, it was determined to be 0.95.

Statistical analysis*:* Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., 2017). Descriptive statistics were presented as number (n), percentage (%), mean, standard deviation (SD), median (M) and minimum (min), maximum (max) values. The normality of quantitative data was assessed using the Shapiro Wilk normality test. As the did not follow a normal distribution, non-parametric tests were applied. The Mann-Whitney U test was used for comparisons between two independent groups, while the Kruskal Wallis test was applied for comparisons involving three or more groups. The relationship between participants' perceived stress levels and emotion regulation difficulties was analyzed using Spearman’s correlation analysis. The strength of the correlation was interpreted as follows: r>0.60 was considered a strong correlation; r=0.30-0.60 was considered a moderate correlation; and r<0.30

was considered a weak correlation. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Ethical approval for the study was obtained from the Clinical Research Ethics Committee of Private Adana Middle East Hospital (08.02.2023/Decision:801). The study was conducted in accordance with the principles of the Declaration of Helsinki. Additionally, permission to use the scales employed in the study was obtained from their developers via e-mail.

Results

The mean age of the women who experienced the earthquake was 26.86 ± 8.94 years. Among them, 23.8% were high school graduates, and 66.9% were unemployed. Other descriptive characteristics are presented in Table 1.

The mean total score for perceived stress and emotion regulation difficulties were 42.20 ± 3.55 and 43.66 ± 14.63, respectively. The mean scores for the subdimensions of the Difficulty in Emotion Regulation Scale (DERS-16) were as follows: nonacceptance of emotional responses (7.32 ± 3.32), lack of emotional clarity (5.98 ± 1.86), limited access to emotion regulation strategies (13.37 ± 5.03), impulse control difficulties (8.44 ± 3.05), and difficulties engaging in goal-directed behavior (8.80 ± 3.06) (Table 2).

A statistically significant difference was found between women's income level, presence of any gynecological disease, and the total mean score of the Perceived Stress Scale (p<0.05). Participants whose income level was lower than their expenses and those with a gynecological disease reported significantly higher perceived stress levels (p<0.05). Additionally, a statistically significant relationship (p<0.05) was observed between women's health insurance status and the total DERS-16 score, as well as the Impulse Control Difficulties, Lack of Emotional Clarity, and Goal-Directed Behavior subscales. Women without health insurance exhibited significantly higher difficulty in emotion regulation (p<0.05) (Table 3).

A weak positive correlation was found between perceived stress levels and difficulty in emotion regulation (r=0.231, p<0.001), lack of emotional clarity (r=0.257, p<0.001), limited access to emotion regulation strategies (r=0.211, p<0.001), impulse control difficulties (r=0.207, p<0.001), and difficulties engaging in goal-directed behavior (r=0.212, p<0.001). No significant correlation was found between perceived stress levels and nonacceptance of emotional responses (r=0.097, p=0.092) (Table 4).

Table 1. Descriptive characteristics of the participants

	n(%) / $\bar{X} \pm SD$
Age (year)	26.86 ± 8.94
Educational Status	
High School	72 (%23.8)
University and above	230 (%76.2)
Working Status	
Yes	100 (%33.1)
No	202 (%66.9)
Income Status	
Income less than expenses	50 (%16.6)
Income equal to expenses	133 (%44)

Income more than expenses	26 (%8.6)
No income	93 (%30.8)
Health insurance	
Yes	261 (%86.4)
No	41 (%13.6)
Loss of a family member in an earthquake	
Yes	214 (%70.9)
No	88 (%29.1)
Gynecological disease	
Yes	24 (%7.9)
No	277 (91.7)

n: number, %: percentage, X: mean, SD: standard deviation

Table 2. Mean scores of participants' perceived stress, difficulty in emotion regulation and its sub-dimensions

	$\bar{X} \pm SD$	Min- Max
PSS	42.20 ± 3.55	30-54
DERS-16	43.66 ± 14.63	16-80
Nonacceptance of emotional responses	7.32 ± 3.32	3-15
Lack of emotional clarity	5.98 ± 1.86	2-10
Limited access to emotion regulation strategies	13.37 ± 5.03	5-25
Impulse control difficulties	8.44 ± 3.05	3-15
Difficulties engaging in goal-directed behavior	8.80 ± 3.06	3-15

X: mean, SD: standard deviation, PSS: perceived stress scale, DERS-16: difficulties in emotion regulation scale

Table 3. Comparison of participants' perceived stress, difficulties in emotion regulation and sub-dimensions scores with sociodemographic variables

		PSS		DERS-16		Nonacceptance of emotional responses		Lack of emotional clarity		Limited access to emotion regulation strategies		Impulse control difficulties		Difficulties engaging in goal-directed behavior	
	n (%)	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**	**X ± SD**	**M (IQR)**
Educational status															
High school	72 (%23.8)	42.12±3.24	42.00 (3.75)	44.48±14.47	42.50 (20.00)	7.19±3.16	6.00 (4.00)	5.86±1.77	5.00 (2.00)	13.98±5.10	13.00 (8.00)	8.61±3.12	8.00 (5.00)	9.34±3.18	9.00 (6.00)
University	230 (%76.2)	42.22±3.65	42.00 (4.00)	43.40±14.71	41.00 (21.00)	7.36±3.44	6.00 (4.00)	6.02±1.89	6.00 (2.00)	13.18±5.01	00 (6.00)	8.38±3.03	8.00 (5.00)	8.63±3.01	8.00 (5.00)
p		0.939		0.508		0.850		0.464		0.279		0.644		0.138	
Z		0.054		0.736		0.232		0.499		0.280		0.522		1.523	
Working status															
Yes	100 (%33.1)	42.38±3.45	42.50 (4.00)	43.99±15.50	41.00 (22.00)	7.76±3.52	6.50 (5.75)	5.95±1.85	6.00 (2.00)	13.37±5.29	13.00 (6.75)	8.45±3.10	8.00 (5.00)	8.62±3.17	8.00 (5.00)
No	202 (%66.9)	42.11±3.61	42.00 (4.00)	43.50±14.22	41.50 (19.00)	7.11±3.28	6.00 (4.00)	6.00±1.87	6.00 (2.00)	13.37±4.92	12.50 (6.00)	8.43±3.04	8.00 (5.00)	8.89±3.01	9.00 (5.00)
p		0.356		0.796		0.134		0.965		0.879		0.878		0.499	
Z		0.923		0.796		0.134		0.965		0.727		0.878		0.499	
Income status															
Income less than expenses	50 (%16.6)	43.24±3.71	42.00 (4.0)	43.08±15.52	38.50 (24.00)	7.26±3.51	6.00 (6.00)	5.84±2.17	5.00 (3.00)	13.14±5.31	12.00 (8.0)	8.42±3.51	8.00 (6.00)	8.56±2.93	8.00 (4.00)
Income equal to expenses	133 (%44)	42.00±3.56	42.00 (4.00)	42.95±14.60	40.00 (18.50)	7.41±3.44	6.00 (4.50)	5.78±1.70	6.00 (2.00)	13.06±5.00	12.00 (6.00)	8.34±2.95	8.00 (5.00)	8.50±2.99	8.00 (4.50)
Income more than expenses	26 (%8.6)	41.04±3.24	40.00 (3.25)	41.42±15.40	39.50 (20.25)	7.04±3.06	6.50 (4.00)	5.46±1.68	5.00 (3.00)	12.77±5.22	11.50 (6.25)	8.19±3.19	8.00 (4.75)	8.27±3.22	8.50 (5.00)
No income	93 (%30.8)	42.24±3.45	42.00 (5.00)	45.62±14.00	44.00 (21.00)	7.32±3.32	7.00 (4.00)	6.49±1.87	6.00 (3.00)	14.11±4.89	14.00 (7.00)	8.67±2.94	9.00 (5.00)	9.52±3.12	9.00 (5.00)
P		**0.009****		0.837		0.846		0.720		0.956		0.970		0.898	
KW		9.417		0.356		0.335		0.657		0.090		0.061		0.215	
Health insurance															
Yes	261 (%86.4)	42.19 ± 3.56	42.00 (4.00)	42.96 ± 14.78	40.00 (20.50)	7.29 ± 3.42	6.00 (4.00)	5.88 ± 1.82	6.00 (2.00)	12.94 ± 5.17	12.00 (7.00)	8.21 ± 3.01	8.00 (4.50)	8.67 ± 3.08	8.00 (5.00)
No	41 (%13.6)	42.29 ± 3.59	42.00 (4.00)	48.07 ± 13.02	48.00 (21.00)	7.51 ± 3.05	8.00 (4.00)	6.63 ± 2.01	6.00 (3.00)	14.44 ± 5.38	14.00 (9.00)	9.87 ± 2.96	10.00 (4.00)	9.66 ± 2.85	9.00 (5.00)
P		0.965		**0.017***		0.519		**0.039***		0.105		**0.002****		**0.046***	
Z		0.044		2.382		0.646		2.068		1.620		3.172		1.993	
Loss of a family member in an earthquake															

Yes	88 (%29.1)	42.65 ± 3.52	42.00 (4.00)	45.85 ± 14.75	46.00 (22.00)	7.68 ± 3.35	6.00 (4.00)	5.98 ± 1.76	6.00 (2.00)	14.33 ± 5.14	14.00 (7.00)	8.70 ± 3.00	8.00 (5.00)	9.18 ±3.16	9.00 (6.00)
No	214 (%70.9)	42.04 ± 3.56	42.00 (4.00)	42.79 ± 14.57	40.00 (19.25)	7.19 ± 3.38	6.00 (4.00)	5.97 ± 1.90	6.00 (2.00)	12.68 ±5.18	11.00 (6.25)	8.34 ± 3.08	8.00 (5.00)	8.63 ± 3.01	8.00 (5.00)
P		0.195		0.106		0.226		0.894		**0.013***		0.387		0.141	
Z		1.296		1.619		1.211		0.134		2.474		0.865		1.474	
Gynecological disease															
Yes	24 (%7.9)	43.79 ± 2.19	43.50 (3.00)	45.88 ± 11.84	42.50 (18.75)	7.58 ± 3.29	6.50 (3.00)	6.75 ± 1.65	6.50 (4.00)	13.21 ± 4.26	11.00 (7.00)	9.21 ± 2.51	9.00 (4.00)	9.17 ± 2.69	8.50 (4.00)
No	277 (%92.1)	42.07 ± 3.62	42.00 4.00)	43.48 ± 14.88	41.00 (21.00)	7.31 ± 3.38	6.00 (4.00)	5.91 ± 1.87	6.00 (2.00)	13.16 ± 5.29	12.00 (7.00)	8.38 ± 3.09	8.00 (5.00)	8.76 ± 3.09	8.00 (5.00)1
P		**0.006****		0.218		0.570		**0.026***		0.693		0.137		0.464	
Z		2.773		1.233		0.568		2.223		0.395		1.486		0.733	

n: number, %: percentage, X: mean, SD: standard deviation, M: median, IQR: interquartile range, Z: Mann-Whitney U, KW: Kruskal-Wallis, PSS: perceived stress scale, DERS-16: difficulties in emotion regulation scale, $p<0.05$.

Table 4. The relationship between participants' perceived stress, emotion dysregulation and its sub-dimensions

	1	2	3	4	5	6	7
1. PSS	1						
2. DERS-16	**0.231****	1					
3. Nonacceptance of emotional responses	0.097	**0.790****	1				
4. Lack of emotional clarity	**0.257****	**0.685****	**0.409****	1			
5. Limited access to emotion regulation strategies	**0.211****	**0.940****	**0.746****	**0.559****	1		
6. İmpulse control difficulties	**0.207****	**0.908****	**0.662****	**0.555****	**0.874****	1	
7. Difficulties engaging in goal-directed behavior	**0.212****	**0.902****	**0.590****	**0.672****	**0.836****	**0.809****	1

PSS: perceived stress scale, DERS-16: difficulties in emotion regulation scale, *p < 0.05; **p < 0.01., r: Spearman's correlation coefficient.

Discussion

This study examined the perceived stress and emotion regulation difficulties of women affected by a devastating earthquake, revealing that their perceived stress levels were high. Compared to existing studies on disaster-related stress, our findings indicated higher stress levels. Uğur et al. (2021) reported moderate stress levels in men and women with post-earthquake acute stress disorder, while Parayiwa et al. (2023) found lower stress levels in pregnant women exposed to a cyclone in Australia. Similarly, Ballard et al. (2023) identified being female as a factor increasing perceived stress among elderly Hurricane Maria survivors in Puerto Rico.

The COVID-19 pandemic, a global disaster, also contributed to increased stress levels. She et al. (2021) reported that Chinese women experienced above-average perceived stress levels during the pandemic, with higher levels than men (She et al., 2021). Overall, existing literature supports the notion that being female and experiencing disasters such as hurricanes, earthquakes, or pandemics correlates with higher levels of perceived stress (She et al., 2021; Ballard et al., 2023).

Considering the variability in perceived stress levels in different cultures and types of disasters, the higher stress scores observed in this study may be attributed to the severe and widespread impact of the earthquake in Turkey. The devastating consequences of the disaster likely intensified stress levels among affected individuals. Our findings also revealed that women with income levels lower than their expenses experienced significantly higher perceived stress. Similarly, Xu et al. (2021) reported a strong association between low household income and higher stress levels during the COVID-19 pandemic in China, emphasizing that individuals with greater risk perception exhibited higher stress. Inadequate income status of women may create an additional source of stress when compounded by challenges such as difficulties in meeting basic needs, childcare responsibilities, and household burdens (Xu et al., 2021).

Our study found that women with gynecological diseases experienced significantly higher perceived stress compared to those without any such condition. Similarly, Damone et al. (2019) reported that women with Polycystic Ovary Syndrome had higher perceived stress levels than those without the disease. Gynecological diseases often lead to physical discomfort and pain, which can negatively impact overall quality of life and contribute to increased

stress. Additionally, the uncertainty after both illness and disaster may increase anxiety about the future and lead to persistent stress.

Emotion dysregulation reflects an individual's inability to regulate emotional experiences and limited access to adaptive coping strategies for managing negative emotions (Gratz et al., 2018). In this study, participants exhibited a moderate level of emotion regulation difficulty. Comparing these findings with existing literature, Mikocka-Walus et al. (2021) reported that parents in Australia had below-average emotion regulation difficulties during the COVID-19 pandemic. After the earthquake in Turkey, the relationship between posttraumatic stress symptoms (PTSD) and generalized anxiety disorder (GAD) was found to be mediated by coping flexibility and emotion dysregulation (Kocyigit et al., 2024). In another study, it was reported that individuals exposed to natural disasters such as fires and explosions experienced emotion dysregulation difficulties below the moderate level (Berfield et al., 2022). The higher levels of emotion dysregulation observed in this study, compared to findings in the literature, suggest that the material and emotional devastation caused by the earthquake in Turkey had a greater psychological impact. This may indicate that coping strategies and access to emotion regulation resources were insufficient in effectively managing the emotional distress caused by the disaster.

In this study, it was observed that women without health insurance experienced difficulties in emotion regulation. A review of the literature revealed no previous studies specifically examining the relationship between health insurance and emotion dysregulation. However, women without health insurance may experience greater financial stress due to limited access to healthcare services and economic hardships, which may negatively affect their emotion regulation skills.

Additionally, our findings indicated that as perceived stress increased, difficulties in emotion regulation also increased. Paulus et al. (2018) reported that emotional dysregulation in firefighters exposed to trauma was associated with post-traumatic stress, depression and social anxiety. Similarly, the high levels of stress observed in women with emotion dysregulation in this study may be due to the increased challenges emotional difficulties pose in daily life. This can trigger feelings of anxiety and can make it difficult to cope with stressful events. Imbalances in emotional regulation may have played an important role in high levels of stress perceived by women affected by the earthquake.

Conclusion: This study found that perceived stress levels were high, while difficulties in emotion regulation were moderate among women whose income was less than their expenses and who had any gynecological conditions perceived stress more, and women who did not have health insurance experienced higher levels of difficulties in emotion regulation. In addition, as the stress perceived by women increased, difficulties in emotion regulation also increased. Although earthquakes change all life priorities, they also highlight the psychological needs of women in addition to their physiological needs. Women are more affected by extraordinary situations, so health professionals have important responsibilities such as providing adequate care and support in this process. It is expected that the risks will be minimized by developing, implementing and following individualized care processes in line with the needs of women, providing training and counseling. The findings of this study may not fully capture the experiences of all disadvantaged women, indicating the need for further research with larger and more diverse samples. In future studies, it may be recommended to protect women's mental health by implementing and evaluating effective interventions to minimize post-earthquake stress and emotion regulation difficulties.

Study limitations: The primary limitation of this study is that data were collected from a single center, and therefore, the results cannot be generalized to the whole population. Additionally, participation was entirely voluntary, with no coercion involved in recruitment. The study was conducted in accordance with the principles of the Declaration of Helsinki. It was explicitly

stated to participants that their decision not to participate would not affect their access to healthcare services. Furthermore, written informed consent was obtained from all participants prior to data collection.

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