

## Research Paper

# Evaluation of Women's Reproductive Health Status After the 2017 Earthquake in Kermanshah, Iran



Elham Rajabi<sup>1</sup>, Hamidreza Khankeh<sup>1,2</sup>, Maryam Ranjbar<sup>1\*</sup> , Mirtaheer Mousavi<sup>3</sup>, Mehdi Norouzi<sup>4</sup>, Mehrdad Farokhi<sup>2</sup> 

1. Health in Emergency and Disaster Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.

2. Department of Clinical Sciences and Education, Karolinska University, Stockholm, Sweden.

3. Social Welfare Management Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.

4. Social Determinants of Health Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.



**Citation** Rajabi E, Hamidreza Khankeh HR, Ranjbar M, Mousavi M, Norouzi M, Farokhi M. Evaluation of Women's Reproductive Health Status After the 2017 earthquake in Kermanshah, Iran. *Health in Emergencies and Disasters Quarterly*. 2022; 7(4):183-192. <http://dx.doi.org/10.32598/hdq.7.4.271.2>

**doi** <http://dx.doi.org/10.32598/hdq.7.4.271.2>



### Article info:

Received: 05 Jun 2021

Accepted: 13 Sep 2021

Available Online: 01 Jul 2022

## ABSTRACT

**Background:** Women are at higher risk of death during disasters due to physical, biological, psychological, and cultural differences. After a disaster, they experience more miscarriages, premature births, inadequate fetal growth, low birth weight, sexual violence, and unwanted pregnancies. This study aims to investigate the reproductive health status of women affected by the 2017 earthquake in Kermanshah, Iran.

**Materials and Methods:** This descriptive cross-sectional study was conducted in 2018. The study population consists of women aged 15-49 years (Mean age=31.7 years) living in Sarpol-e Zahab, Javanrood, and Thalab Babajani towns in Kermanshah city affected by the earthquake in 2017. The questionnaire used for assessing the status of reproductive health in women was the Reproductive Health Assessment Questionnaire for Women of Reproductive Age, which has already been localized in Iran and its reliability and validity have been confirmed. Native Kurdish language experts completed the questionnaires on behalf of 396 participants. Descriptive statistics were used to describe the variables.

**Results:** It was found that 42.4% of women complained of abnormal menstruation and 34.09% of limited menstrual hygiene materials. Sixty women were pregnant at the time of the earthquake, all of whom gave birth in hospital; two had miscarriages, two had premature births, and one had stillbirth. Urinary tract infection was the most common problem (21%) in pregnant women. Moreover, 48% of women used contraceptive methods after the earthquake, the most commonly used method was the use of contraceptive pills (23%). Access to contraception methods was difficult for 14.4% of them after the earthquake. Furthermore, 25% had experienced violence after the earthquake; of these, 30 reported physical violence, 86 verbal violence, and 13 sexual violence.

**Conclusion:** The control of pregnancy and safe delivery in earthquake-affected areas of Kermanshah is relatively acceptable; however, the provision of reproductive health services seems to be challenging. It is recommended to pay attention to the menstrual hygiene of women and regular distribution of contraceptives (despite the current population growth plan), address sexual acts of violence, and develop a protocol to support the victims.

### Keywords:

Women, Disasters,  
Reproductive health,  
Earthquake; Reproductive age

### \* Corresponding Author:

Maryam Ranjbar, PhD.

Address: Health in Emergency and Disaster Research Center, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran.

E-mail: maryam.ranjbar.75@gmail.com

## 1. Introduction

Natural disasters worldwide have increased. According to the Centre for Research on the Epidemiology of Disasters report, 389 natural disasters occurred in the world in 2020. These disasters killed 15,080 people, affected another 98.4 million, and cost 171.3 billion USD [1]. The disasters, both natural and man-made, pose serious threats to the health, safety, and security of communities. The Centers for Disease Control and Prevention (CDC) reported that 34 million people worldwide are affected by disasters each year, 80% of whom were women or children. It is estimated that 25% of women are of reproductive age [2].

Hence, these disasters do not affect men and women equally; they mostly affect women of reproductive age (15-49 years) [3, 4]. On the other hand, due to differences in vulnerability, women and children are up to 14 times more likely to die from disasters than men [5]. In addition to gender inequality, the physical, biological, psychological, and cultural differences, as well as differences in the reproductive system, are among the important reasons for the difference in vulnerability between men and women after disasters. In critical situations, women experience recurrent abortion, preterm delivery, inadequate fetal growth, low birth weight, sexual violence, and unwanted pregnancies [6]. It is estimated that 4% of the population affected by disasters are pregnant women and 15% of this group experience at least one of the major obstetric problems [5]. Access to reproductive health services is reduced in these conditions, mostly in women with the poor financial situation [7]. In addition to married women, the girls who are exposed to rape or forced sexual intercourse are also at risk. On the other hand, gender inequality and the prevailing culture in society can lead to experiences such as early or forced marriage. This can be increased during disasters and lead to early pregnancies [5].

According to previous studies, there are still many unmet needs for reproductive health after disasters [7-12]. In a study by Kamal et al. in 2018 on the impact of floods on women's reproductive and sexual health in Bangladesh, the majority of women were reported to suffer from leukorrhea, urinary tract infection, malnutrition (65%), pregnancy-related complications (47%), recurrent abortion (23%), and low back pain (12%) during the flood [13]. All women stated that there were no special services for sexual and reproductive health in their area and that access to health care was impossible due to its fragmented geographical location, poor

economic situation, and socio-religious prejudices. On the other hand, all service providers who participated in their study reported that they had no adequate resources, such as skilled physicians, especially a gynecologist, to provide sufficient medicine and health care to people in need [13]. Suleiman et al. in 2016 examined the impact of a flood in Kelantan, Malaysia on some aspects of reproductive health [14]. They stated that breastfeeding mothers and their infants were at higher risk after the flood. According to them, there was a need for controlling the distribution of powdered milk and providing safe and hygienic water, health infrastructure, and electricity to mothers [14]. Sohrabzadeh et al. also conducted a qualitative study to evaluate reproductive health during recent disasters in Iran in 2018. In their results, six themes of lack of attention to cultural factors, lack of planning, lack of skills training, inadequacy of data collection systems, lack of attention to the men's reproductive health, and lack of monitoring systems were extracted. They concluded that there are various management challenges in providing reproductive health services after disasters in Iran, and it is necessary to develop plans and policies to provide an appropriate response to the target population in disaster-affected areas [9].

It seems that one of the reasons for the failure to meet the reproductive health needs of women during disasters is the lack of knowledge of existing challenges and gaps. It is necessary to plan and respond to maternal and infant health needs [3]. This study aims to evaluate the reproductive health status of women affected by the earthquake in Kermanshah, Iran. This 7.3-magnitude earthquake occurred on November 13, 2017, at a depth of 11 km, 5 km from the Ezgeleh town lasted for 30 seconds. The earthquake killed 625 people and injured more than 15,000 people [15].

## 2. Materials and Methods

This descriptive cross-sectional study was conducted in 2018. The study population consists of women of reproductive age (aged 15-49 years) in Kermanshah, Iran. In addition to the reproductive age, the condition for inclusion in the study was to live in one of the urban or rural areas of the cities affected by the November 2017 earthquake (Sarpol-e Zahab, Javanrood, and Thalab Babajani) in Kermanshah. At a 95% confidence interval and with a probability of 50%, the sample size was estimated 384. The sampling was done using a convenience method. After identifying the eligible samples, the questionnaire was completed by native Kurdish-speaking experts on behalf of 396 eligible samples. The

questionnaire was the Reproductive Health Assessment Questionnaire for Women of Reproductive Age (RHAQWRA). This questionnaire has already been translated to Persian and its good reliability and validity have been reported [16]. The first part of the questionnaire surveys demographic information including the number of households, current place of residence, marital status, health insurance status, income, age, education, race, number of shifts since the earthquake, marital status of children, home damage, and history of physical or mental illness. The RHAQWRA has five dimensions which are: Family stressors (high-risk behaviors, current health problems requiring special care, social needs, number of household members before and after the disaster, food security, feeling unsafe before and after the disaster, alcohol and tobacco use, risk of getting AIDS and sexually transmitted infections, or STIs), violence (violence by a partner or another person since the disaster, understanding its effects on health, and consequently helpful behavior); pregnant women (current pregnancy, visits for prenatal care, barriers to prenatal care, and health problems requiring special care during disaster); infants (infant weight at birth, postpartum checkup, how to get a baby checkup, barriers to baby checkup, and infant nutrition), and Family planning (the used birth control methods, the reasons for not using birth control methods, and the place where the latest birth control method was obtained). It is worth noting that some items measure the situation before and after the earthquake. Data analysis was performed in SPSS software version 19. Descriptive statistics were used to describe the results.

### 3. Results

The mean age of participants was  $31.7 \pm 7.8$  years; 106 (27%) were from rural areas and 290 (73%) from urban areas. Their other demographic information is presented in Table 1.

Most of the women were married (87.6%) and had middle school or high school education (41%). About 25% of them had a university education. More than 85% of them were housewives or unemployed. Overall, 310 (about 79%) had very low family incomes. Families with 3-4 members had the highest frequency (51.5%) and large families (with 7 and more members) had the lowest frequency (7.4%), while 33 did not answer this question. Most of the women (about 78.5%) had social security insurance for themselves or their husbands before and after the earthquake. However, some of them lost their insurance coverage after the earthquake due to the unemployment of their husbands. In terms of family

stressors after the earthquake, feeling of being in danger (96.2%) and seeing the death of someone (77.8%), were the most frequent stressors. It was also reported that factors such as housing (51.5%), loss of a family member (47.7%), abnormal menstruation without previous history (42.4%), and the difficulty in finding health materials during menstruation (34.09%) had a significant frequency and were other problems for many women in the region after the earthquake.

The number of household members that women were taking care of them was reported more than 10 people only in one case, which was not different before and after the earthquake. The number of people who had eaten less food after the earthquake was two times higher than that before the earthquake (9% vs. >20%). Financial difficulty to buy food, insufficient food for the family members, the priority of children in nutrition over their mother, and anorexia were the main causes of malnutrition. The feeling of insecurity in women after the earthquake significantly increased such that before the earthquake, about 88% of women had a lower feeling of being unsafe in their place of residence, while after the earthquake, more than 65% of them felt very insecure. The t-test results showed a statistically significant difference in their feeling before and after the earthquake ( $P < 0.001$ ). Tobacco use and drug abuse were not very common among the women and there was no significant change in their pattern compared to the pre-earthquake period.

Most women (91%) did not perceive to be at risk for getting AIDS and STIs; only 8 (2%) perceived that they were at risk for these infections. The reasons given for this perception were: having more than one partner for women or their husbands, history of unprotected sex, husband's drug injection, and use of contaminated public restrooms. In response to the question "Have you been subjected to violent behaviors since the earthquake?", 99 women (25%) answered "yes" and 7 did not answer the question. The rest answered "no". The frequency of violence-related items in women after the earthquake is shown in Table 2.

Interestingly, the number of women who were abused ( $n=99$ ) was less than the number of people who answered about the effect of violence on their mental and physical health ( $n=105$ ); of whom, 77 believed that the violence negatively affected their mental and physical health, and 6 answered "no idea". Of 77 women, only 17 had sought treatment. Among the women who did not seek treatment, 24 reported the reasons as: "It was not so important to need counseling" and "It was no big deal and I had to solve it myself"; 13 women mentioned the lack of

**Table 1.** Demographic characteristics of women affected by the 2017 earthquake in Kermanshah

Characteristics	No. (%)	
Marital status	Married	346(87.6)
	Divorced	5(1.3)
	Widow	3(0.8)
	Remarriage	18(4.6)
	Single	22(5.6)
	Living with another spouse	1(0.3)
Occupational status	Employed	30(7.7)
	Unemployed and housewife	335(85.5)
	Student	26(6.5)
	Home jobs	1(0.3)
Education level	Illiterate	28(7)
	Reading & writing literacy	105(27)
	Middle school and high school	161(41)
	Associate degree and Bachelor's degree	93(24)
	Master's degree and higher	8(2)

Health in  
Emergencies and Disasters Quarterly

a good counselor or physician, and the rest reported the reasons such as the need for maintaining their reputation, lack of familiarity with services, financial difficulty, having small children, having fear, and lack of time.

Forty women reported their experienced violence to a person they trusted (mostly relatives). Only one woman had shared her experience with a neighbor. Of 40 women, 37 believed that talking about their violence experience with trusted people had a positive effect on them. Interestingly, the number of respondents to the question about reporting violent behaviors to trusted people (n=110) was more than the number of respondents who have been abused and reported it (n=99). Moreover, 63 women (15.9%) had violent behaviors inside or outside their homes since the earthquake, while 42 women (10.1%) did not answer to this question, and the rest answered "no". Their violent behaviors were mostly in the form of verbal violence (swearing and insults), verbal conflict, argument (at work or home), yelling, and beating children. The reasons for these violent behaviors included fear and loneliness due to post-traumatic stress, retaliation for the aggressive behavior of family members, and extreme anger.

Furthermore, 62(15.6%) women knew another person who had been the victim of mostly verbal and physical abuse (beating) in the post-earthquake period; 37 of whom had tried to help the victim, and others did not take any action to help the victim because they considered it as an interference in the life of the abused person and thought that it may upset the person. Two women did not intervene because they were the violent behaviors by men and they were not considered themselves strong enough to deal with them. Among the abused women, 39 were abused only by their husbands, 6 by their friends, relatives, and neighbors, and 15 by their both husbands and children, husbands' families, their own families (parents, siblings), etc. Of these, 30 reported physical violence (4 bruises, 2 bleeding, 22 pushings, 1 kicking, and 1 slapping), 86 verbal violence (offensive language, cursing, and swearing), and 13 reported being forced to have unwanted sex.

Place of residence (rural or urban areas) and household income were the factors affecting the incidence of violence in women. According to the findings, with 74.3% confidence, between 5%-8% of changes in the incidence of violence in women of reproductive age in Kerman-

**Table 2.** Frequency of violence-related items in women affected by the 2017 earthquake in Kermanshah

Items	Total Number of Respondents	No. (%)
Abused	389	99(25)
The belief that violence affects mental and physical health	105	77(19.4)
Seeking treatment	105	17(3.4)
Reporting the experience of violent behaviors to trusted people	110	40(10.1)
Having violent behaviors (at home, work, etc.)	354	63(15.9)
Witnessing violence against other person	352	62(15.6)
Trying to help a victim of violence	68	37(9.3)

Health in Emergencies and Disasters Quarterly

shah after the earthquake was predicted by living in rural areas and low household income. The lower income level of rural families was associated with a higher incidence of violence among women. Other study demographic factors did not show a statistically significant relationship with the variable of violence.

At the time of the study (one year after the earthquake), 38 women (10.9%) were pregnant; about 89% of them, before the end of the first trimester, had received their first prenatal care. More than half of them did not receive regular and timely prenatal care due to financial difficulty or lack of insurance coverage. On the other hand, 6 women who lived in rural areas could not visit in time for prenatal care after the earthquake due to challenges related to traveling a long distance to the clinics located in urban areas. In terms of pregnancy problems, urinary tract infection was the most common problem in pregnant women (21%).

At the time of the earthquake, 60 women (15.2%) were pregnant, all of whom had given birth in the hospital. The outcomes of their delivery were 53 live single births, 2 multiple births, 2 premature births, 2 miscarriages, and one stillbirth. Furthermore, 90% had a postpartum checkup at birth. For 18 (30%), the checkup was difficult for some reasons, where financial difficulty (32%) and traveling problems (27%) were the most important reasons.

Moreover, 49 (82%) of women who gave birth after the earthquake confirmed that their child received checkups at the time of birth. Others could not have baby checkups; the most important reason was not having enough money or adequate health insurance to pay to see a doctor. Furthermore, 32(53%) of women who gave birth after the earthquake were breastfeeding; 15 women who used powdered formula alone or in combination with breast milk (equivalent to 25%

**Table 3.** Reasons for not using contraceptive pills for birth control by women affected by the 2017 earthquake in Kermanshah

Reasons	No. (%)
I do not have sex with my husband	44(11.1)
I am planning to get pregnant	32(8.1)
I am currently pregnant	41(10.4)
I do not want to use contraception methods	6(1.5)
My husband is reluctant to use contraception methods	5(1.3)
I do not think I can get pregnant (infertility)	11(2.8)
I cannot afford contraceptives	7(1.8)
Other	9(2.3)

Health in Emergencies and Disasters Quarterly

of all women who gave birth after the earthquake) reported that they had difficulty getting formula after the earthquake, and 12 women (20% of women who gave birth after the earthquake) had difficulty finding clean water to make milk or wash the bottles.

Regarding the family planning subscale, 194 women (49%) used at least one birth control method before the earthquake, and 190 (48%) continued to use birth control methods after the earthquake. The most commonly used method was contraceptive pills (23%) followed by natural methods (15%), while emergency contraception (0.3%) and the interruption of intercourse (1%) were the least common methods. For 57 women (14.4%), access to contraceptive pills was difficult since the earthquake, while 85.6% had no problem. The reasons for not using contraceptive pills are listed in Table 3. More than 55% of women reported being unaware of how women of the same age have sexual behavior in post-earthquake housing conditions (temporary accommodation in tents, shelters, living with family groups, etc.). In the case of temporary accommodation, only 26% of women were reported to have sexual intercourse with their husbands.

#### 4. Discussion

Iran is a disaster-prone country, which has experienced different disasters with varying severity. On the other hand, 85% of its population requires reproductive health. According to previous studies on the experiences of disasters that occurred in Iran, there are still unmet needs and unknown gaps in responding to the health needs of women affected by these disasters. In this regard, this study was conducted to investigate the reproductive health status of women after the 2017 earthquake in Kermanshah, Iran.

In the present study, the “feeling of being in danger” was the most stressful factor for the women. Similarly, in Aghamiri et al.’s study, seeing dead bodies, fear of being harmed by unknown people, fear of being left alone, feelings of sadness and hopelessness, irritability, anxiety about the unknown future, and fear of various causes were reported as the most important psychological problems of crisis survivors [17]. In a study by Harville et al. on the effect of the recovery after Hurricane Katrina in 2012 on pregnancy outcomes, the results showed that the highest indicator associated with worsened pregnancy outcomes was the fear of the recurrence of the hurricane in the region [18].

In the present study, the number of women who reported eating less food increased after the earthquake, and anorexia due to fear was the most common cause. A similar situation was reported in the study by Khankeh et al., who studied the reproductive health status after the earthquake in East Azerbaijan and Bushehr cities of Iran in 2012 [19]. In the study by Kamal et al., 65% of malnutrition was reported in women of reproductive age exposed to the flood in Bangladesh [13]. Previous studies have shown that economic resilience varies greatly between different households and is not the same even among the neighbors of a disaster-affected village. Therefore, there is a need for finding a solution to financial worries, providing facilities, and paying attention to the poor nutrition of women affected by disasters [20, 21].

Based on the results of the present study, 2% of women perceived that they were at risk of getting STIs. In Khankeh et al.’s study, 8% of women considered themselves at risk for AIDS and other STIs [19]. In a study by Kissinger et al., on sexual behaviors in young women after Hurricane Katrina, it was reported that 10% of women had a new sex partner after experiencing the disaster which indicates the increased risk of STIs after disasters [22]. Harville et al., who reviewed the studies on disasters and their impact on perinatal health, also suggested that after disasters, even if the women are not directly exposed, a change in the conditions of the affected regions can also lead to increased consequences such as STIs [23]. Dunlap examined the knowledge and attitudes of people at risk of getting HIV/AIDS after disasters such as Hurricane Katrina and concluded that, although a large percentage of respondents perceived that they were not at risk of getting HIV/AIDS, they had this worry and regularly tested to ensure that they are not infected [24]. Today, the emphasis is mainly on testing for diseases such as AIDS, but the focus should be on the people’s knowledge about STIs after the disasters, the sources they get the information they need, and their behaviors about getting such diseases. It is also necessary to ensure that people have a good understanding of the information they collect about the risk of STIs. Unfortunately, after disasters, the prevention of STIs such as AIDS, is often neglected or forgotten. On the other hand, in such cases, infected people may not have access to treatment methods, and therefore they are at more risk of getting infected. As a result, it should not be forgotten that the prevention of STIs is critical in the disaster response phase [25].

In the present study, 25% of women reported they had been physically, verbally, or sexually abused since the earthquake. The rate of violence against women in our study is higher than the rate reported in a study on women after the earthquakes in Bushehr and East Azerbaijan provinces (4.3%) [19]. This discrepancy may be due to differences in the severity of the earthquakes and their effect on the lives of women, ethnicity, and culture issues. The person who commits violent acts may be the victim of violence in childhood. The occurrence of disasters can cause people to be the victims of a type of violence imposed on them by the nature. Previous studies have shown that women are more likely to be subjected to domestic and sexual violence when they become homeless [26, 27]. On the other hand, health care providers often do not look for the victims of gender-based violence after disasters when the main focus is on maintaining the lives and health of the affected people [25].

In the present study, only 17 women had personally referred to a doctor or psychologist to treat their problems, and there was no evidence of looking for the victims of sexual and domestic violence by the health care team. Moreover, 13 women stated that the reason for not visiting was the unavailability of a good counselor or doctor. Since the earthquake, 15.9% of women had violent behaviors inside or outside their place of residence mainly in the form of verbal violence (swearing and insults), verbal conflict and argument (at work or home), yelling, and beating children. The reasons for such behaviors were the feeling of fear and loneliness due to stress after the earthquake, retaliation for those who were aggressive in the family, and severe anger. Women are considered primary caregivers for people affected by natural disasters, including children and the elderly, which greatly increases their workload and emotional load, while having limited resources and facilities compared to the pre-disaster period [28]. In the present study, 77 abused women believed that the experienced violence had negative effects on their mental and physical health. Unfortunately, the psychological problems of the victims of sexual violence prevent them from returning to society in the long run after disasters [25].

Results reported that 13 of 99 women who reported being abused since the earthquake reported forced sexual intercourse as an example of violence against them. In the study by Khankeh et al., sexual coercion was reported only in one case, and 92.5% had no unwanted sexual intercourse [19]. Ardalan et al. also indicated the sexual threats in 10 households after the Bam earthquake [29]. In addition to being less resilient than men in the face of natural disasters, women are more vulnerable to sexual and reproductive health problems

due to their gender-related characteristics, and may be the victims of both sexual and domestic acts of violence [28]. The violence may be perpetrated by their husbands or others. In Iranian society, due to cultural, religious, and social sensitivities, it is not possible to differentiate between the women suffered from sexual and domestic acts of violence simply by asking them, and it is necessary to spend time and gain their trust. In cases where sexual violence is committed by someone other than the husband, it is necessary to have a clear protocol and take necessary and immediate actions to limit the harmful consequences of sexual violence such as taking the history of the victim, providing emergency contraceptive pills and prophylactic drugs to prevent the STIs, reporting the one who raped and ensuring the safety of the victim, and establishing specific regulations during the temporary accommodation. Specialists with experience in providing care for the victims of sexual violence need to identify the girls who are exposed to sexual violence during the disasters, such as orphans or those far from their family members [25]. Previous studies have even reported that, after disasters, women may be forced into prostitution for food, shelter, and even security. Girls may also be forced into early or forced marriages due to the unfavorable conditions in which they live [30]. The United Nations High Commissioner for Refugees (UNHCR) has reported male dominance, psychological stress, lack of support, alcohol and drug abuse, and general lawlessness as some of the factors contributing to sexual violence [31].

In this study, some pregnant women and new mothers were unable to visit in time for prenatal care after the earthquake. In Bahman Janbeh et al.'s study on the reproductive health indicators of women affected by the 2012 earthquake in East Azerbaijan province of Iran, women had their first visits for prenatal care one year after the earthquake. In this year, the number of first visits had increased compared to previous years [32]. In the present study, the reasons for the decrease in the number of visits for receiving prenatal care were the long distance, lack of a car, and traffic problems, in addition to financial and insurance problems. Urinary tract infection was reported as the most common problem in pregnant women (21%). Similarly, in Kamal et al.'s study in Bangladesh, most women complained of leukorrhea and urinary tract infections [13]. However, it should be noted that the rate of urinary tract infections in women during pregnancy is higher due to physiological changes in the mother such as dilatation of the ureter and renal pelvis, decreased ureteral motility, changes in hormone and glucose levels, followed by accumulation of urine and its return to the upper urinary tract. Some studies have estimated the prevalence of urinary tract infections in pregnant women as 20% or more [2, 33, 34].

We found that 60 women were pregnant at the time of the 2017 earthquake in Kermanshah, where there were two miscarriage cases and one stillbirth case. In Khankeh et al.'s study, 100% of pregnant women were able to give live births during the earthquake. Previous studies have recommended to ensure that a safe and private space is prepared for women to give birth under the supervision of a skilled person, as well as sterilized equipment and proper storage space for the baby after delivery [28]. In the present study, 25% of women who gave birth after the earthquake had difficulty getting formula and 20% had trouble getting clean water to prepare milk or wash the bottles. In the study by Khankeh et al., despite the very small number of infants in need of formula consumption, various organs and institutions had distributed all types of infant formula in the region without estimating and assessing the needs of the region. This increased the workload of health workers to educate the public and prevent unreasonable consumption of formula by infants who were breastfeeding [19]. In Bahman Janbeh et al.'s study, the percentage of formula consumption in children under one year of age increased in the year when the earthquake occurred compared to the years before the earthquake [32]. Suleiman et al.'s study on the effect of the flood in Kelantan, Malaysia on some aspects of reproductive health, stated that breastfeeding mothers and their infants were a very special population who were in need of specific services. They emphasized that the rights of breastfeeding mothers and their infants should be improved by controlling the distribution of formula and providing safe and hygienic water, infrastructure, and electricity. For this purpose, a specialized team must address these issues and improve the conditions of women and their infants affected by natural disasters [14].

According to the findings of the present study, the most common method of birth control after the earthquake was the use of contraceptive pills while emergency pills and interrupted intercourse had the lowest frequency. Similarly, Hapsari et al. examined access to contraceptive methods before and after the 6.2-magnitude earthquake in Indonesia in 2006, and reported that unplanned post-earthquake pregnancies: In the year after the earthquake, the tendency to use implantable and injectable contraceptives decreased while the tendency to use contraceptive pills increased [35]. The CDC recommended that injectable contraceptives (i.e., Depo-Provera) are optimal for post-disaster conditions, because they are easy to use and are effective for at least 3 months [36]. In the present study, 49% of women used at least one method of contraception before the earthquake, which was reduced by only 1% after the earthquake. In Khankeh et al.'s study, despite the provision of family planning interven-

tion in earthquake-stricken areas, a decrease of 6.5% was reported. In their study, the reason for this decline was the prevalence of some misconceptions among families about the methods. In their study area, men were reluctant to use contraceptives and only 1 per 94 husbands had a vasectomy [19].

Access to contraceptive methods after the Kermanshah earthquake was difficult for 14.4% of married women. Similarly, Ardalan et al. indicated the challenges of accessing family planning methods after the Bam earthquake and highlighted the need to pay attention to reproductive health at the time of disasters [29]. This issue has also been reported in Bahman Janbeh et al.'s study. They stated that the use of family planning methods decreased after the earthquake in East Azerbaijan [32]. In Khankeh et al.'s study, a 35-day delay in the distribution of sanitary equipment needed by rural women and the lack of same-gender health workers to report the family planning problems after the earthquake was reported [19]. In the study by Hapsari et al., the incidence of unplanned pregnancy was significantly higher in women who had no sufficient access to family planning methods than in other women. They concluded that simply providing family planning methods among disaster-affected women is not enough; it is necessary to educate families about unplanned pregnancies after the disasters [35].

In the present study, more than 55% of women were unaware of how their peers sexually behaved during temporary accommodation after the earthquake. Of course, since sexual behavior is private and a culturally sensitive issue, it may affect the ignorance of the respondents to answer the question. During the temporary accommodation, only 26% of affected women had sex with their husbands. Since many of them were still living in temporary houses for more than one year after the earthquake, this is significant from a reproductive health perspective. Similar to this finding, Kohan et al., who investigated the effects of the 2012 earthquake in East Azerbaijan on women's reproductive health, reported decreased sexual desire and intimacy was reported as one of the consequences of the earthquake. The reasons were stress and severe depression after the earthquake, increased workload and fatigue, living in shared tents, the proximity of tents to each other, and the presence of people around their tents, which lasted for a month or even for two years [37].

## 5. Conclusion

It seems that the reproductive health of women after the earthquake in Kermanshah is a challenging issue. Post-earthquake stressors such as the feeling of being in

danger and the loss of loved ones, limited access to food, feeling of insecurity, and occupational and insurance concerns can affect women's reproductive health. On the other hand, the conditions after the earthquake can create the ground for violent behaviors including verbal, physical, or sexual violence. Although the level of safe pregnancies and deliveries in disaster-prone areas is relatively acceptable, the provision of services in this area still faces challenges. It is recommended to pay attention to women's menstrual hygiene, regular distribution of contraceptives after disasters (regardless of the country's recent population growth plan), and sexual violence, and develop a protocol to support the victims.

## Ethical Considerations

### Compliance with ethical guidelines

Clear and verbal explanations about the study were provided to the participants and their informed consent was obtained. They were also assured that their personal information would be kept confidential and that their opinions would be used anonymously.

### Funding

This study was funded by the United Nations Population and Population Fund in Iran (UNFPA).

### Authors' contributions

All authors equally contributed to preparing this article.

### Conflict of interest

The authors declared no conflict of interest.

### Acknowledgments

The authors would like to thank the women participated in this study.

## References

- [1] EM-DAT. Centre for Research on the Epidemiology of Disasters (CRED). 2020 Annual Report. Brussels; 2021. [\[Link\]](#)
- [2] Centers for Disease Control and Prevention (CDC). Reproductive Health in Emergency Preparedness and Response. Atlanta: Centers for Disease Control and Prevention; 2021. [\[Link\]](#)
- [3] Dickinson FM, Pyone T, van den Broek N. Experiences from the field: Maternal, reproductive and child health data collection in humanitarian and emergency situations. *International Health*. 2016; 8(2):83-8. [\[DOI:10.1093/inthealth/ihv045\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [4] United Nations Office for the Coordination of Humanitarian Affairs (OCHA) [Internet] [Cited 2020 December 1]. Available from: [\[Link\]](#)
- [5] Zeid S, Gilmore K, Khosla R, Papowitz H, Engel D, Dakkak H, et al. Women's, children's, and adolescents' health in humanitarian and other crises. *The BMJ*. 2015; 351:56-60. [\[DOI:10.1136/bmj.h4346\]](#) [\[PMID\]](#)
- [6] Lafarga Previdi I, Welton M, Díaz Rivera J, Watkins DJ, Díaz Z, Torres HR, et al. The impact of natural disasters on maternal health: Hurricanes Irma and María in Puerto Rico. *Children*. 2022; 9(7):940. <https://doi.org/10.3390/children9070940>
- [7] Warren E, Post N, Hossain M, Blanchet K, Roberts B. Systematic review of the evidence on the effectiveness of sexual and reproductive health interventions in humanitarian crises. *BMJ Open*. 2015; 5(12):e008226. [\[DOI:10.1136/bmjopen-2015-008226\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [8] Swatzyna RJ, Pillai VK. The effects of disaster on women's reproductive health in developing countries. *Global Journal of Health Science*. 2013; 5(4):106-13. [\[DOI:10.5539/gjhs.v5n4p106\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [9] Sohrabzadeh S, Jahangiri K, Khani-Jazani R. Reproductive health in the recent disasters of Iran: A management perspective. *BMC Public Health*. 2018; 18:389-96. [\[DOI:10.1186/s12889-018-5311-2\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [10] Ali M, Bhatti MA, Kuroiwa C. Challenges in access to and utilization of reproductive health care in Pakistan. *Journal of Ayub Medical College Abbottabad*. 2008; 20(4):3-7. [\[PMID\]](#)
- [11] Anwar J, Mpofu E, Matthews LR, Shadoul AF, Brock KE. Reproductive health and access to healthcare facilities: Risk factors for depression and anxiety in women with an earthquake experience. *BMC Public Health*. 2011; 11:523. [\[DOI:10.1186/1471-2458-11-523\]](#) [\[PMID\]](#) [\[PMCID\]](#)
- [12] Department of Midwifery. Expert panel: Reproductive health services during disasters. Kermanshah, Iran: 2018.
- [13] Kamal A-HM, Umama U, Roman S, Khan MM. Impact of flood on women's sexual and reproductive health: An empirical evidence from northern Bangladesh. *Global Journal of Medical Research*. 2018; 18(5):56-64. [\[Link\]](#)
- [14] Sulaiman Z, Mohamad N, Ismail TAT, Johari N, Hussain NHN. Infant feeding concerns in times of natural disaster: Lessons learned from the 2014 flood in Kelantan, Malaysia. *Asia Pacific Journal of Clinical Nutrition*. 2016; 25(3):625-30. [\[DOI:10.6133/apjcn.092015.08\]](#) [\[PMID\]](#)

- [15] Khankeh H, Kolivand PH, Jam MB, Rajabi E. Case Report: Kermanshah health care services: A lesson learned from Iran's recent earthquake. *Health in Emergencies and Disasters Quarterly*. 2018; 3(4):221-33. [DOI:10.32598/hdq.3.4.221]
- [16] Rahmani-Bilandi R. Reproductive Health Status after Disasters [PhD dissertation]. Tehran: Tarbiat Modares University; 2014.
- [17] Aghamiri S S, Rezaee Zanganeh M, Poshtyar A. [The study of individual and social situations of survivors in disasters and crises (Persian)]. *Quarterly Scientific Journal of Rescue and Relief*. 2012; 4(2). [Link]
- [18] Harville EW, Giarratano G, Savage J, Mendoza VBd, Zotkiewicz T. Birth outcomes in a disaster recovery environment: New Orleans women after Katrina. *Maternal and Child Health Journal* volume. 2015; 19(11):2512-22. [DOI:10.1007/s10995-015-1772-4] [PMID] [PMCID]
- [19] Khankeh HR, Kiani K, Mohammadi R, Daddoost L, Soltani A, Fatemi F, et al. Evaluating reproductive health care after Iranian recent earthquakes and developing related strategies based on experiences and perceptions of involved people and standard tool. Tehran: United Nations Population Fund, Emergency Management Center, Research Center in Emergency and Disaster Health, 2013.
- [20] Sharifi R. [The role of women in dealing with crises caused by natural disasters with an emphasis on the capabilities of the Basije khaharan and the experience of the Bam earthquake (Persian)]. *Fasnameh Motaleate Basij*. 2004; 24. [Link]
- [21] Sharifi R. [Psychological and social damages caused by natural disasters and the cultural role of Basij in dealing with it, emphasizing the disaster of the Bam earthquake (Persian)]. *Fasnameh Motaleate Basij*. 2003; 20 & 21. [Link]
- [22] Kissinger P, Schmidt N, Sanders C, Liddon N. The effect of the hurricane Katrina disaster on sexual behavior and access to reproductive care for young women in New Orleans. *Sexually Transmitted Diseases*. 2007; 34(11):883-6. [DOI:10.1097/OLQ.0b013e318074c5f8] [PMID]
- [23] Harville E, Xiong X, Buekens P. Disasters and perinatal health: A systematic review. *Obstetrical & Gynecological Survey*. 2010; 65(11):713-28. [DOI:10.1097/OGX.0b013e31820eddb] [PMID] [PMCID]
- [24] Dunlap E. Knowledge, awareness and behavior: HIV/AIDS and disasters. *Journal of Alcoholism and Drug Dependence*. 2016; 4(1):1-14. [DOI:10.4172/2329-6488.1000230] [PMID] [PMCID]
- [25] Nour NN. Maternal health considerations during disaster relief. *Reviews in Obstetrics & Gynecology*. 2011; 4(1):22-7. [PMID] [PMCID]
- [26] United Nations High Commissioner for Refugees (UNHCR). Prevention and response to sexual and gender-based violence in refugee situations. Geneva: United Nations High Commissioner for Refugees; 2001. [Link]
- [27] Azemikhah A, Emami Afshar N, Jalilvand P, Radpouyan L, Valafar S, Kavianpour S, et al. [National program to improve the health of mothers (Persian)]. Tehran: Ministry of Health, Treatment and Medical Education, Office of Health, Family and Population; 2001. [Link]
- [28] Humanitarian Coalition (HC). Women and Disaster Relief. Canada: Humanitarian Coalition; [updated 2019]. Available from: [Link]
- [29] Ardalan A, Holakouie Naieni K, Aflatounian M, Nekouie M, LaPorte R, Noji E. [Experience of a population-based study on needs and health status of affected people in Bam earth Quake (Persian)]. *Iranian Journal of Epidemiology*. 2005; 1(1 and 2):33-45. [Link]
- [30] Abdolahi M, Moosavi M. [Social Capital in Iran: Current status, prospect, and feasibility (Persian)]. *REFAHJ*. 2007; 6(25):195-234. [Link]
- [31] No author. ACOG Committee Opinion No. 457: Preparing for disasters: Perspectives on women. *Obstetrics & Gynecology*. 2010; 115(6):1339-42. [DOI:10.1097/AOG.0b013e3181e45a6f] [PMID]
- [32] Bahmanjanbeh F, Kohan S, Yarmohammadian MH, Haghshenas A. Evaluation of reproductive health indicators in women affected by East Azarbaijan earthquake on August 2012. *Iranian Journal of Nursing and Midwifery Research*. 2016; 21(5):504-9. [DOI:10.4103/1735-9066.193414] [PMID] [PMCID]
- [33] Bohlolikhavi R. [An overview of urinary tract infection during pregnancy (Persian)]. *Journal of Laboratory and Diagnosis*. 2015; 7(28):74-9. [Link]
- [34] Nwachukwu E, Onyebuchi O, Michael O. Prevalence of urinary tract infections in pregnant women in Onitsha, Nigeria. *Journal of Bacteriology and Mycology: Open Access*. 2018; 6(5):284-5. [DOI:10.15406/jbmoa.2018.06.00219]
- [35] Hapsari ED, Widyawati, Nisman WA, Lusmilasari L, Siswihanto R, Matsuo H. Change in contraceptive methods following the Yogyakarta earthquake and its association with the prevalence of unplanned pregnancy. *Contraception*. 2009; 79(4):316-22. [DOI:10.1016/j.contraception.2008.10.015] [PMID]
- [36] Ellington SR, Kourtis AP, Curtis KM, Tepper N, Gorman S, Jamieson DJ, et al. Contraceptive availability during an emergency response in the United States. *Journal of Women's Health*. 2013; 22(3):189-93. [DOI:10.1089/jwh.2012.4178] [PMID] [PMCID]
- [37] Kohan S, Yarmohammadian MH, Bahmanjanbeh F, Haqshenas A. Consequences of earthquake (August 2012) on Iranian women's reproductive health: A qualitative study. *Acta Medica Mediterranea*. 2016; 32:1503.