Objective To assess whether having a subsequent child had an effect on the mental health of Chinese mothers who lost a child during an earthquake.

Methods A cross-sectional survey of bereaved mothers was conducted 30 to 34 months after the 2008 Sichuan earthquake using individual structured interviews to assess sociodemographic characteristics, post-disaster experiences and mental health. The interviews incorporated standardized psychometric measures of anxiety, depression, post-traumatic stress disorder (PTSD) and complicated grief (CG). Social support was also assessed. An adjusted model taking potential confounders into account was used to explore any association between psychological symptoms and the birth of a subsequent child.

Findings The prevalence of psychological symptoms was higher in mothers who did not have a child after losing the first one. In an adjusted model, symptoms of anxiety (odds ratio, OR: 3.37; 95% confidence interval, CI: 1.51–7.50), depression (OR: 9.47; 95% CI: 2.58–34.80), PTSD (OR: 5.11; 95% CI: 2.31–11.34) and CG (OR: 10.73; 95% CI: 1.88–61.39) were significantly higher among the 116 women without a subsequent child than among the 110 mothers who had another child after bereavement. More than two thirds of the mothers with new infants had clinically important psychological symptoms.

Conclusion Women who have lost an only child in a natural disaster are especially vulnerable to long-term psychological problems, especially if they have reached an age when conception is difficult. Research should focus on developing and evaluating interventions designed to provide women with psychosocial support and reproductive health services.

Abstract in العربية, 中文, Français, Русский and Español at the end of each article.

Introduction

In most natural disasters, one third to one half of the casualties are children.1 Direct exposure to natural disasters and the loss of a child are extremely stressful life events with long-term health consequences. Among these, increased vulnerability to psychological problems such as depression, anxiety, post-traumatic stress disorder (PTSD) and complicated grief (CG) are specially common.2 Parents who have lost young or adolescent children are at higher risk for mental disorders than those who have lost adult children.3,4 Furthermore, bereaved mothers appear to be more vulnerable to psychological illness than bereaved fathers.5

Several factors influencing emotional recovery from the loss of a child after a disaster have been identified. First, professional support, including a structured psychological intervention, appears to be effective in reducing psychological morbidity6 and can improve physical and psychological health and social adjustment after traumatic experiences.7,8 Second, social support from spouses or one’s parents, friends and colleagues is also linked to better post-disaster mental health status among bereaved parents.2,9 Third, whether or not parents viewed their child’s body appears to influence recovery. According to the limited amount of available research, parents who viewed their children’s bodies recovered better than those who did not on account of the loss or disfigurement of the body.10,11 Finally, parents who lost a child but who have at least one surviving child have lower mortality rates12 and a lower prevalence of psychiatric illness than those who have lost an only child.13-15

Some experts have postulated that having a new baby might favourably influence parents’ psychological well-being after losing a child. In some cases, having another child has been positively associated with decreased rates of depression in bereaved parents;16 in others this has not been the case. In an 18-year study of parents who had lost one of their children, no significant association was found between having a subsequent child and recovery from grief or depression.17 There are currently no systematic population-based studies investigating the psychological effect of having a subsequent baby after losing a child in a natural disaster.

The aim of this study was to compare the psychological state of women who had and had not given birth to a baby after losing a child in the 2008 Sichuan earthquake in China. Most of the children who died were only children, since China has a one-child policy.18 Three months after the earthquake, the National Health and Family Planning Commission announced the establishment of reproductive health services to help bereaved families to have a subsequent child. The services included free psychological counselling, fertility assessment, cessation of long-term contraception, recanalization surgery, treatment of reproductive tract infections and treatment of infertility with assisted reproductive technologies.19

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Methods

A community-based cross-sectional survey was conducted in Dujiangyan, China, 29 to 34 months after the 2008 Sichuan earthquake. Data were collected from October 2010 to March 2011. Dujiangyan is a city in the province of Sichuan. It is situated 50 kilometres south-west of Wenchuan, the epicentre of the earthquake, which killed nearly 1000 children in Dujiangyan. The project was conducted in collaboration with the Dujiangyan Family Planning and Human Development Bureau (hereafter the Bureau), which provided a list of women who had lost a child in the earthquake in Dujiangyan.

Conceptual model and design

Since the determinants of psychological health are known to be multifactorial, we tested a conceptual model that took into account the potential confounding effects of age, educational level, employment status, psychological treatment, social support and whether or not the body of the deceased child had been viewed. (Fig. 1).

Participants and sample

Adult women of reproductive age living in Dujiangyan who had been exposed directly to the earthquake and had lost a child 18 years of age or younger in the 2008 Sichuan earthquake were eligible for participation. Women were excluded if they were unable to read or speak Chinese and if their new child was under 6 months of age. To detect a difference of 20% between groups at a significance level of 0.05 and a power of 0.80 (two-sided statistical significance test), at least 93 participants were required in each group (a total sample of 186 women).

Procedure

The Bureau sent invitation letters with response forms to each woman meeting the inclusion criteria. On the response form, women were invited to endorse one of three choices: (i) interest in participation; (ii) no interest in participation; (iii) a request for further information about the study. Women who asked for more information about the study were contacted by the Bureau. Women who had not returned the response form three weeks after it was mailed were contacted by telephone once to ask whether they had received the letter or whether they wanted more information.

Data were collected during individual structured face-to-face interviews by a native Chinese-speaking female medical graduate. Interviews lasted up to 90 minutes, either at the research office or the participant’s home. No formal psychiatric diagnoses were made, since the interviewer was not a trained mental health clinician.

Data sources

The structured interview schedule included study-specific questions and standardized measures of psychological well-being in three sections: (i) sociodemographic information (age, education, employment and marital status); (ii) post-disaster experiences (whether or not the child’s body had been viewed, whether or not a psychological intervention or social support had been received); and (iii) mental health (anxiety, depression, PTSD and CG).

Five widely used standardized scales were incorporated, including four for the mental health outcomes and one appraising social support (Table 1).18,20,21,24,27 All scales, translated from English into Chinese, have been used in China and have shown high internal consistency (Table 1).18,21,22,23,26,28

Data management and analysis

All data analyses were conducted in Stata 11.0 for Mac (StataCorp. LP, College Station, United States of America). Descriptive statistics comparing sociodemographic characteristics, post-disaster experiences and social and professional supports for the groups with and without a subsequent child were calculated and statistically significant differences between the two groups were estimated by using the χ² test. Logistic regression was used to investigate the association between the presence or absence of a subsequent child (with the presence of a subsequent child as the reference category) and mental health. Confounder selection was based on our evidence-informed, theoretical conceptual model (Fig. 1).

Ethics

Permission to conduct the study was obtained from the University of Melbourne’s Human Research Ethics Committee (HREC No.1033862) and the
Human Research Ethics Committee of the Chengdu Fourth People’s Hospital (Sichuan, China).

**Results**

Overall, 509 (81.4%) of the 625 eligible women returned the response forms. Of these women, 415 agreed to participate and 94 refused. In total, 18 women (12 with a subsequent child) were not able to complete the interviews. Four chose to complete the interview in two or three stages but were too busy to return to finish it; five found it too difficult to answer the questions in the mental health section; nine could not answer questions about the quality of support because their husband or another relative remained in the room during the interview. In total, 110 bereaved women with a subsequent child and 116 without a subsequent child provided complete data (Fig. 2).

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**Table 1. Instruments used to assess bereaved mothers’ mental health after the 2008 Sichuan earthquake, China, October 2010 to March 2011**

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Condition/ factor</th>
<th>No. of items</th>
<th>Likert-type scores*</th>
<th>Score range</th>
<th>Score range</th>
<th>Chinese version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zung's Self-Rating Anxiety Scale&lt;sup&gt;16&lt;/sup&gt;</td>
<td>Anxiety</td>
<td>20</td>
<td>1 – A little of the time&lt;br&gt;2 – Some of the time&lt;br&gt;3 – A good part of the time&lt;br&gt;4 – Most of the time</td>
<td>20–80</td>
<td>20–44: normal&lt;br&gt;45–59: mild to moderate&lt;br&gt;60–74: marked to severe&lt;br&gt;75–80: extreme&lt;sup&gt;11&lt;/sup&gt;</td>
<td>Cronbach’s α: 0.93 Test-retest correlation: 0.81 Cut-off point: 45&lt;sup&gt;11&lt;/sup&gt;</td>
</tr>
<tr>
<td>Centre for Epidemiological Studies Depression Scale&lt;sup&gt;20&lt;/sup&gt;</td>
<td>Depression</td>
<td>20</td>
<td>0 – Rarely or none of the time&lt;br&gt;1 – Some or a little of the time&lt;br&gt;2 – Occasionally or a moderate amount of the time&lt;br&gt;3 – All of the time</td>
<td>0–60</td>
<td>0–15: normal&lt;br&gt;16–26: mild depression&lt;br&gt;27–60: major depression&lt;sup&gt;20&lt;/sup&gt;</td>
<td>Cronbach’s α: 0.90 Test-retest correlation: 0.49 Cut-off point: 16&lt;sup&gt;21&lt;/sup&gt;</td>
</tr>
<tr>
<td>PTSD Checklist-Specific&lt;sup&gt;22&lt;/sup&gt;</td>
<td>PTSD</td>
<td>17</td>
<td>1 – Not at all&lt;br&gt;2 – A little bit&lt;br&gt;3 – Moderately&lt;br&gt;4 – Quite a bit&lt;br&gt;5 – Extremely</td>
<td>17–85</td>
<td>&lt; 44: negative for PTSD&lt;br&gt;≥ 44: positive for PTSD&lt;sup&gt;22&lt;/sup&gt;</td>
<td>Cronbach’s α: 0.82 Test-retest correlation: 0.71 Cut-off point: 44&lt;sup&gt;12&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inventory of Complicated Grief&lt;sup&gt;23&lt;/sup&gt;</td>
<td>CG</td>
<td>19</td>
<td>0 – Never&lt;br&gt;1 – Rarely&lt;br&gt;2 – Sometimes&lt;br&gt;3 – Often&lt;br&gt;4 – Always</td>
<td>0–76</td>
<td>&lt; 25: negative for CG&lt;br&gt;≥ 25: positive for CG&lt;sup&gt;24&lt;/sup&gt;</td>
<td>Modified in the setting of China. Literature has demonstrated a good validity of the Chinese version Cut-off point: 25&lt;sup&gt;17,26&lt;/sup&gt;</td>
</tr>
<tr>
<td>Multidimensional Scale of Perceived Social Support&lt;sup&gt;27&lt;/sup&gt;; Questions regarding attitudes and behaviours that people reveal in their close relationships</td>
<td>Social support</td>
<td>12</td>
<td>1 – Very strongly disagree&lt;br&gt;2 – Strongly disagree&lt;br&gt;3 – Mildly disagree&lt;br&gt;4 – Neutral&lt;br&gt;5 – Mildly agree&lt;br&gt;6 – Strongly agree&lt;br&gt;7 – Very strongly agree</td>
<td>12–84</td>
<td>Calculating total score three subscales: family, friends and intimate partners&lt;sup&gt;27&lt;/sup&gt;</td>
<td>Cronbach’s α: 0.89 Cronbach’s α for friend subscale: 0.94 Cronbach’s α for family subscale: 0.86&lt;sup&gt;27&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

CG, complicated grief; PTSD, post-traumatic stress disorder.

<sup>* Wording as it appears in the protocols.</sup>
**Sociodemographic characteristics**

Most participants were married, performed unpaid household or voluntary work and had lived in Dujiangyan for at least 10 years. All except one woman had lost an only child. Except for age, the sociodemographic characteristics of the two groups did not differ significantly (Table 2). Although the mean difference was only one year, women without a subsequent child were significantly older than those with a subsequent child.

**Post-disaster experiences**

No significant difference was found between the two groups of women in terms of having viewed or not viewed the bodies of their deceased children (Table 2). However, the two groups did differ significantly in both the professional and the social support they had received since the earthquake. A substantially higher proportion of women without a subsequent child had received a psychological intervention (Table 2), but a significantly lower proportion had received social support from family members and friends (Table 3).

**Mental health status**

Overall, more than 80% of the participants had clinically significant symptoms of at least one psychological condition. Depression, PTSD and CG were more common than anxiety. Women who had not given birth to a subsequent child were consistently found to have higher symptom scores and higher odds of being symptomatic than those who had given birth to another child. A substantially higher proportion of women without a subsequent child had received a psychological intervention (Table 2), but a significantly lower proportion had received social support from family members and friends (Table 3).

**Discussion**

To our knowledge, this is the first population-based systematic investigation of the effect of having or not having children on mental health in a post-disaster setting in China.
a subsequent child on the long-term psychological health of women who have lost a child in a natural disaster. By exploring the effects of confounding factors identified in previous research as potential determinants of the long-term mental health of women in this situation, we were able to estimate the association between having a subsequent child after losing one in a natural disaster and recovery after bereavement. These data suggest that, for women who have lost their only child, the birth of a subsequent child is associated with milder psychological morbidity, especially depression and prolonged grief disorder.

We acknowledge that this study has limitations. First, this was a cross-sectional survey and cause and effect associations cannot be inferred from the findings. Therefore, we cannot conclude that having another child after losing one in a disaster will help women to recover psychologically. Second, we were unable to control for other types of traumatic events caused by the earthquake, such as losing one’s parents, house or livelihood, so separating their effects on mental health from those of the loss of a child was not possible. However, the modest resources we had for this project led us to focus on comparing mental health status in women who had and had not given birth to a new child after the earthquake. Finally, all the psychometric instruments we used are based on self-reporting and yield scores that are indicative of clinically significant symptoms but are not diagnostic. Although these instruments have been widely used in China, none has been formally validated against a gold standard and no local sensitivity and specificity data have been generated. All these three factors could have resulted in an over or underestimation of the association between having a subsequent child and women’s mental health. However, since ours was a systematically recruited population-based sample, we have no reason to believe that the prevalence of these conditions was higher in the sample than in the general population. In fact, a previous study has shown that seven to eight months after the 2008 Sichuan earthquake, 80% of bereaved parents had clinically significant symptoms of PTSD and 81.8% had symptoms of depression. These data are consistent with our findings.

Curiously, women without a subsequent child after losing a child in the 2008 Sichuan earthquake had more severe psychological problems, on average, than women who went on to have another child, even though more women in the former group had received psychological treatment. This finding is in contrast to the results of a study by Li et al., whereby bereaved parents who had been exposed to professional psychological intervention were found to have better mental health status than those who had not. One possible explanation lies in the type of intervention received, which we were unable to ascertain. It may have been ineffective because of its content or because it was not long enough. However, it is also possible that women who longed to conceive another child were too distressed over this to find relief in mental health interventions. The Chinese central government changed the family planning policy immediately after the earthquake, particularly for women who had lost a child, and provided free comprehensive reproductive health services to couples wanting to conceive. This departure from the one-child policy appears to have benefited many

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### Table 4. Mental health status among mothers who lost a child after the 2008 Sichuan earthquake and who did or did not have a subsequent child, China, October 2010 to March 2011

<table>
<thead>
<tr>
<th>Symptom/instrument</th>
<th>Score range</th>
<th>No. (%) of women without a subsequent child (n = 116)</th>
<th>No. (%) of women with a subsequent child (n = 110)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety [SAS]a</td>
<td>No symptoms</td>
<td>&lt; 45</td>
<td>66 (56.90)</td>
<td>84 (76.36)</td>
</tr>
<tr>
<td></td>
<td>Symptoms</td>
<td>≥ 45</td>
<td>50 (43.10)</td>
<td>26 (23.64)</td>
</tr>
<tr>
<td></td>
<td>Mild to moderate</td>
<td>45 ≤ x &lt; 60</td>
<td>42 (36.21)</td>
<td>19 (17.27)</td>
</tr>
<tr>
<td></td>
<td>Marked to severe</td>
<td>60 ≤ x ≤ 75</td>
<td>6 (5.17)</td>
<td>7 (6.36)</td>
</tr>
<tr>
<td></td>
<td>Extreme</td>
<td>≥ 75</td>
<td>2 (1.72)</td>
<td>0</td>
</tr>
<tr>
<td>Depressed [CES-D]b</td>
<td>No symptoms</td>
<td>&lt; 16</td>
<td>7 (6.03)</td>
<td>33 (30.00)</td>
</tr>
<tr>
<td></td>
<td>Symptoms</td>
<td>≥ 16</td>
<td>109 (93.97)</td>
<td>77 (70.00)</td>
</tr>
<tr>
<td></td>
<td>Major</td>
<td>≥ 27</td>
<td>27 (23.28)</td>
<td>36 (32.73)</td>
</tr>
<tr>
<td>PTSD [PCL-S]c</td>
<td>No symptoms</td>
<td>&lt; 24</td>
<td>26 (22.41)</td>
<td>68 (61.82)</td>
</tr>
<tr>
<td></td>
<td>Symptoms</td>
<td>≥ 24</td>
<td>90 (77.59)</td>
<td>42 (38.18)</td>
</tr>
<tr>
<td>CG [ICG]d</td>
<td>No symptoms</td>
<td>≤ 25</td>
<td>5 (4.31)</td>
<td>20 (18.18)</td>
</tr>
<tr>
<td></td>
<td>Symptoms</td>
<td>&gt; 25</td>
<td>111 (95.69)</td>
<td>90 (81.82)</td>
</tr>
</tbody>
</table>

a CES-D, Centre for Epidemiological Studies Depression Scale; CG, complicated grief; ICG, Inventory of Complicated Grief; PCL-S, PTSD Checklist-Specific; PTSD, post-traumatic stress disorder; SAS, Zung’s Self-Rating Anxiety Scale.

### Table 5. Association between mental health and not having a subsequent child after losing a child in the 2008 Sichuan earthquake, China, October 2010 to March 2011

<table>
<thead>
<tr>
<th>Psychological condition</th>
<th>OR (95% CI)</th>
<th>Unadjusted model</th>
<th>Adjusted modela</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>2.45 (1.38–4.34)</td>
<td>3.37 (1.51–7.50)</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>6.67 (2.81–15.87)</td>
<td>9.47 (2.58–34.80)</td>
<td></td>
</tr>
<tr>
<td>PTSD</td>
<td>4.30 (1.31–13.66)</td>
<td>5.45 (1.53–18.48)</td>
<td></td>
</tr>
<tr>
<td>CG</td>
<td>4.93 (1.78–13.66)</td>
<td>10.73 (1.88–61.39)</td>
<td></td>
</tr>
</tbody>
</table>

a Adjusted for age, employment, education, professional support, social support and having viewed or not viewed the deceased child’s body.
Tajor: Birth Control Policy: Later Births May Be Encouraged for Women After the Birth of a Child

The data presented here indicate that communities need guidance on how to strengthen social support activities, in addition to mental health care.

Although women who had another child had lower odds of experiencing psychological symptoms, at least two out of three such women had clinically important symptoms of depression and PTSD. Thus, most of the children born to women in this category were being cared for by mothers with poor mental health. Research on the development of children in these circumstances is needed. The data suggest that in bereaved women who are pregnant or have recently given birth to another child, perinatal mental health care is essential to reduce psychological morbidity, strengthen the mother–infant relationship and facilitate optimal infant development.

Acknowledgements

We thank the Dujianyan Family Planning and Human Development Bureau and the Dujianyan Mental Health Centre in Sichuan Province, China, for their valuable support. We also thank the participants who shared their experiences.

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Competing interests: None declared.
Résumé

Effet de la naissance d’un nouvel enfant sur la santé mentale des femmes qui ont perdu un enfant lors du tremblement de terre au Sichuan de 2008: une étude transversale.

Objectif Évaluer si la naissance d’un nouvel enfant a eu un effet sur la santé mentale des mères chinoises qui ont perdu un enfant pendant un tremblement de terre.

Méthodes Une étude transversale sur des mères endeuillées a été menée 30 à 34 mois après le tremblement de terre au Sichuan de 2008, en faisant appel à des entretiens structurés individuels permettant d'évaluer les caractéristiques sociodémographiques, ainsi que les expériences et la santé mentale après la catastrophe. Ces entretiens comprenaient des mesures psychométriques normalisées de l’anxiété, de la dépression, des troubles de stress post-traumatique (TSPT) et du deuil compliqué (DC). Le soutien social a également été évalué. Un modèle ajusté tenant compte des facteurs perturbateurs potentiels a été utilisé pour étudier toute association entre les symptômes psychologiques et la naissance d’un nouvel enfant.

Résultats La prévalence des symptômes psychologiques était supérieure chez les mères qui n’ont pas eu d’autre enfant après avoir perdu le premier. Dans un modèle ajusté, les symptômes d’anxiété (rapport des cotes, RC: 3,37; intervalle de confiance, IC de 95%: 1,51–7,50), de dépression (RC: 9,47; IC de 95%: 2,58–34,80), de TSPT (RC: 5,11; IC de 95%: 2,31–11,34) et de DC (RC: 10,73; IC de 95%: 1,88–61,39) étaient significativement plus élevés chez les 116 femmes qui n’ont pas eu un autre enfant que chez les 110 mères qui en ont eu un autre après le décès du premier. Plus des deux tiers des mères qui ont eu un nouvel enfant présentaient des symptômes psychologiques cliniquement importants.

Conclusion Les femmes qui ont perdu leur enfant unique dans une catastrophe naturelle sont particulièrement vulnérables aux problèmes psychologiques à long terme, surtout si elles ont atteint un âge où il est difficile de concevoir. La recherche devrait se concentrer sur le développement et l'évaluation des interventions destinées à apporter aux femmes un soutien psychosocial et des services de santé génésique.

Resumen

El efecto de tener un hijo posterior para la salud mental de las mujeres que perdieron a un hijo en el terremoto de Sichuan en el año 2008: un estudio transversal

Objetivo Evaluar si tener un hijo posterior tuvo algún efecto en la salud mental de las madres chinas que perdieron a un hijo durante el terremoto.

Métodos Se llevó a cabo un estudio transversal de madres en duelo entre 30 y 34 meses después del terremoto de Sichuan del año 2008, para lo que se realizaron entrevistas estructuradas de carácter individual con el fin de evaluar sus características sociodemográficas, sus experiencias tras el desastre y su salud mental. Las entrevistas incluyeron la medición psicométrica estandarizada de la ansiedad, la depresión, el trastorno de estrés postraumático (TEPT) y el duelo complicado, y también se evaluó el apoyo social. Se empleó un modelo ajustado que tomaba en consideración posibles factores para examinar cualquier relación entre los síntomas psicológicos y el nacimiento del siguiente hijo.

Resultados La prevalencia de los síntomas psicológicos fue mayor en las mujeres que perdieron a su primer hijo, pero ese efecto fue estadísticamente significativo para la ansiedad (OR: 3,37; 95% CI: 1,51–7,50), la depresión (OR: 9,47; 95% CI: 2,58–34,80), el TEPT (OR: 5,11; 95% CI: 2,31–11,34) y el duelo complicado (OR: 10,73; 95% CI: 1,88–61,39). Más de dos tercios de las mujeres que tuvieron un nuevo bebé presentaban síntomas psicológicos clínicamente importantes.

Conclusión Las mujeres que perdió a su único hijo en un evento de desastre natural son particularmente vulnerables a los problemas psicológicos a largo plazo, especialmente si han alcanzado una edad en la que es difícil de concebir. La investigación debe concentrarse en el desarrollo y la evaluación de intervenciones destinadas a apoyar a las mujeres con un apoyo psicosocial y servicios de salud reproductiva.
intervalo de confianza del 95%, IC: 1,51–7,50), depresión (OR: 9,47; IC del 95%: 2,58–34,80), TEPT (OR: 5,11; IC del 95%: 2,31–11,34) y duelo complicado (OR: 10,73; IC del 95%: 1,88–61,39) fueron notablemente superiores entre las 116 mujeres sin un hijo posterior que entre las 110 mujeres que habían tenido otro hijo tras el duelo. Más de dos terceras partes de las madres con bebés recientes presentaban síntomas psicológicos clínicamente relevantes.

**Conclusión** Las mujeres que han perdido a un hijo único en un desastre natural son especialmente vulnerables a los problemas psicológicos a largo plazo, en particular cuando han alcanzado una edad en la que es difícil concebir de nuevo. La investigación debería centrarse en el desarrollo y la evaluación de intervenciones diseñadas para proporcionar a las mujeres apoyo psicológico y servicios de reproducción.

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**References**


