THE IMPACT OF ENVIRONMENTAL FACTORS INCLUDING COVID-19 ON THE REPRODUCTIVE HEALTH OF REFUGEE WOMEN AND INTERNALLY DISPLACED WOMEN DUE TO THE WAR IN UKRAINE

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INTRODUCTION

The COVID-19 pandemic has profoundly influenced the lives of women refugees worldwide, intensifying pre-existing vulnerabilities and introducing new adversities [1–5]. This influence extends across multiple facets of their existence, including health, mental well-being, and socioeconomic status [6–8].

Regarding health and mental well-being, there is evidence that refugee women in high-income countries have experienced heightened risks of mental health disorders amid the pandemic [9–11]. The psychological strain imposed by material hardship and fear has led to a greater incidence of major depressive disorder and post-traumatic stress disorder (PTSD) among these women compared to native-born counterparts [12–15]. Additionally, the ability of refugee women to access healthcare services was severely curtailed during the pandemic due to restrictions on hospital visits and limited follow-up care [16–20]. Such barriers were particularly burdensome for those caring for young children, who expressed feelings of isolation and stress as a consequence of these impediments [21–24].

In terms of socioeconomic challenges, the economic vulnerability of refugee women has been exacerbated by the pandemic [25]. Research indicates that while some positive experiences related to security were reported, many encountered significant obstacles in education, employment, and access to health services [26]. For Rohingya refugee women in Bangladesh, the economic fallout from the pandemic resulted in severe food scarcity and an elevated risk of gender-based violence [27]. Moreover, the integration process for refugee women into host societies has become more complex due to the pandemic [28]. Language barriers and public health measures have hindered their efforts to integrate effectively, thereby affecting their daily lives and employment prospects [29].

Specific populations, such as Afghan refugees in Germany, faced unique challenges during the pandemic [30]. Researchers working with this group highlighted ethical considerations, especially concerning domestic violence, which became more pronounced under pandemic conditions [29]. Similarly, Rohingya refugees experienced compounded socio-economic impacts, including increased food insecurity and risks associated with early marriage and pregnancy, reflecting the intersectional nature of their vulnerabilities [27].

The global impact of the COVID-19 pandemic has not only underscored but also deepened existing inequalities confronting women refugees [31]. It has revealed the urgent necessity for targeted interventions by governments and non-governmental organizations to address the distinctive needs of this marginalized group [31]. The disruptions caused by the pandemic, including the destruction of lung epithelial cells and vascular leak leading to sepsis in severe cases, further illustrate the critical need for comprehensive support mechanisms to mitigate the adverse effects on vulnerable populations like women refugees.

Objective of the study: to assess the impact of environmental factors, namely the war in Ukraine and the COVID-19 pandemic, on the reproductive health of refugee and internally displaced women, taking into account the roles of chronic stress and restricted access to healthcare.

MATERIALS AND METHODS

The research was grounded in a mixed-methods approach that combined quantitative and qualitative analysis to comprehensively assess the impact of environmental factors on reproductive health. The study included 100 women aged 18–49 years who were internally displaced between 2022 and 2024 years due to the war in Ukraine.

Study participants were stratified into two groups:

- Group 1 (n = 50) included women who were directly situated in active combat zones (e.g., along the frontlines);
- Group 2 (n = 50) comprised those who were preemptively displaced or relocated from areas without active combat.

Data collection encompassed two primary components. For the quantitative analysis, structured questionnaires were utilized to gather data on variables such as housing quality, access to healthcare, history of COVID-19 infection, menstrual cycle irregularities, pregnancy complications, contraceptive use, and mental health indicators (depression measured by the PHQ-9 scale (Patient Health Questionnaire-9), anxiety measured via GAD-7 scale (Generalized Anxiety Disorder 7-item), and PTSD using PCL-5 scale). The qualitative analysis was based on in-depth interviews with 20 participants (10 from each group), aimed at exploring traumatic experiences, barriers to accessing medical services, and the impact of the pandemic on their lives.

A variety of statistical methods were used for the analysis of quantitative data, providing a comprehensive evaluation of the influence of environmental factors on the reproductive health of the participants. All statistical analyses were conducted using R software version 4.2, ensuring the accuracy and reliability of the obtained results.

For comparing group differences in categorical variables, the χ^2 (chi-square) test was applied. This test facilitated the identification of significant disparities between Group 1 and Group 2 concerning indicators such as COVID-19 infection rates, menstrual irregularities, depression, anxiety, and PTSD symptoms. For instance, the comparison of COVID-19 infection frequency between the groups revealed a significant difference ($p < 0.05$), indicating a higher infection rate among women in active combat zones. In cases of small subgroup observations, Fisher's exact test was used instead of the chi-square test to provide more accurate results for smaller samples. For example, the comparison of vaccination rates against COVID-19 yielded a p-value of 0.04, confirming a difference between the groups.

Logistic regression analysis was performed to examine factors influencing reproductive health, such as menstrual irregularities, pregnancy complications, and unmet need for contraception. Potential confounding factors including age, education level, and COVID-19 infection status were considered in this analysis. Logistic regression results allowed for the estimation of adjusted odds ratios (aOR) with 95% confidence intervals (CI). For instance, the analysis of stress impact on menstrual irregularities resulted in an aOR = 3.2 (95% CI: 2.1–4.9; $p < 0.001$), indicating a significant effect of stress on this outcome. Similarly, the analysis of PTSD symptoms produced an aOR = 4.5 (95% CI: 2.8–7.1; $p < 0.001$), affirming the substantial role of traumatic experiences in mental health disorders.

Multivariate analysis was conducted to evaluate the combined impact of several factors on reproductive health. Variables such as age, education, COVID-19 infection, stress, and trauma were included in this analysis, enabling the identification of key factors most significantly affecting reproductive health within each group.

To account for potential corrections in multiple comparisons, Bonferroni correction was applied, controlling for Type I error. This ensured the validity and reliability of the conclusions by reducing the likelihood of random differences between groups. Consequently, all obtained results possess scientific rigor and can be utilized for developing recommendations to improve medical assistance for refugee women in conflict and pandemic settings.

The study was approved by the Ethics Committee of the SI «All-Ukrainian Motherhood and Childhood Centre» of the NAMS of Ukraine, protocol No. 4 of 26.05.2022. All women gave informed consent to participate in the study.

RESULTS

A demographic analysis of the sample (n = 100) revealed that 60% of participants in Group 1 (women from active combat zones) are in the younger age category (18–34 years), accounting for 30 individuals out of the total 50 (Table 1). The age group of 35–49 years constitutes 40% of participants (20 individuals). Regarding education, 70% of participants in this group have secondary or lower education (35 individuals), while only 30% have higher education (15 individuals).

Table 1. Characteristics of study participants by groups, % (n)

Variable	Group 1 (n = 50)	Group 2 (n =50)	Total
Age (years): • 18–34	60% (30)	50% (25)	55% (55)
• 35–49	40% (20)	50% (25)	45% (45)
Education: • Secondary or lower	70% (35)	50% (25)	60% (60)
• Higher	30% (15)	50% (25)	40% (40)
COVID-19 infection	40% (20)	20% (10)	30% (30)

50% of participants in Group 2, which comprises internally displaced women from non-active zones, belonged to the younger age category (25 individuals) and 50% of participants belonged to the older age category (25 individuals). 50% of the women had secondary or lower education (25 individuals) and 50% of the women had higher education (25 individuals).

The rate of COVID-19 infection also significantly differs between the groups. In Group 1, 40% of participants were infected (20 individuals), whereas in Group 2, this figure was 20% (10 individuals). The p-value for this comparison was < 0.05, indicating a significant difference between the groups. This can be attributed to limited access to information about vaccination and social distancing measures in combat zones, as confirmed by qualitative analysis where women from Group 1 noted: "There were no masks or vaccines. We feared COVID, but had more pressing issues."

Table 2 highlights differences between the groups concerning reproductive health. In Group 1, significantly higher rates of menstrual cycle irregularities (55% vs. 24%, $p < 0.001$) were observed. Pregnancy complications were also more prevalent in Group 1 (18% vs. 8%, $p = 0.04$), along with unmet need for contraception (40% vs. 20%, $p < 0.001$). Logistic regression showed an aOR of 3.2 for irregular menstruation (95% CI: 2.1–4.9; $p < 0.001$), indicating a significant impact of stress and limited access to healthcare on this indicator. Qualitative analysis underscores that women in Group 1 often described constant fear due to shelling and lack of safe housing, which may contribute to chronic stress, leading to hormonal imbalances.

Table 2. Reproductive health disruptions by groups, % (n)

Indicator	Group 1 (n = 50)	Group 2 (n = 50)	p-value
Irregular menstruation	55% (28)	24% (12)	< 0.001
Diagnosis of gestational diabetes mellitus (last year)	18% (9)	8% (4)	< 0.001
Unmet need for contraception	40% (20)	20% (10)	< 0.001

Table 3 illustrates differences between the groups regarding the impact of COVID-19 and mental health. In Group 1, the rate of depression (PHQ-9 ≥ 10) was 66% (33/50), twice that of Group 2 (30%, 15/50) with a p-value < 0.001. Anxiety (GAD-7 ≥ 10) was also more common in Group 1 (60% vs. 26%, p < 0.001). PTSD symptoms (PCL-5 ≥ 33) were found in 76% of Group 1 participants (38/50) compared to 36% in Group 2 (18/50) with a p-value < 0.001. Logistic regression indicated an aOR of 4.5 for PTSD symptoms (95% CI: 2.8–7.1; p < 0.001). Women in Group 1 frequently described traumatic experiences related to direct home loss and battle consequences, explaining the high levels of PTSD.

Vaccination against COVID-19 was less common among women in Group 1 (30% vs. 50% in Group 2, p = 0.04). Qualitative analysis showed that women in Group 1 noted the absence of doctors and infrastructure for vaccination: "There were no doctors left in our village. I gave birth alone." This explains the low vaccination rate in this group.

Table 3. Mental health indicators (depression, anxiety, PTSD symptoms) by groups, % (n)

Indicator	Group 1 (n = 50)	Group 2 (n = 50)	p-value
Depression (PHQ-9 ≥ 10)	66% (33)	30% (15)	< 0.001
Anxiety (GAD-7 ≥ 10)	60% (30)	26% (13)	< 0.001
PTSD symptoms (PCL-5 ≥ 33)	76% (38)	36% (18)	< 0.001
Vaccination against COVID-19	30% (15)	50% (25)	0.04

Qualitative data complemented quantitative results, highlighting key themes for each group (Table 4). In Group 1, narratives predominantly focused on constant fear due to shelling and lack of safe housing, explaining the high levels of stress and PTSD. Women in this group also noted difficulties in accessing medical care. In Group 2, although women also experienced stress, it was associated with overcrowding in temporary shelters and social isolation during lockdowns.

Multivariate analysis identified key factors most significantly influencing reproductive health in each group (Table 5). Irregular menstruation was associated with chronic stress, increasing the risk by 3.2 times (aOR = 3.2; 95% CI: 2.1–4.9; p < 0.001). PTSD symptoms were also significantly higher in Group 1 (aOR = 4.5; 95% CI: 2.8–7.1; p < 0.001), explained by direct home loss and battle consequences. Unmet need for contraception was also higher in Group 1 (aOR = 2.6; 95% CI: 1.7–4.0; p < 0.001), attributable to limited access to healthcare and stress.

Table 4. Qualitative themes by groups: traumatic experience, barriers in healthcare, and impact of the pandemic

Theme	Group 1 (combat zones)	Group 2 (displaced persons)
Traumatic experience	«We hid in basements for weeks. Bombs destroyed our clinic.»	«We fled early to avoid fighting, but lost everything.»
Barriers in healthcare	«There are no doctors left in our village. I gave birth alone.»	«Clinics here are overcrowded; appointments take months.»
Impact of COVID-19	«There were no masks or vaccines. We feared COVID, but had more pressing issues.»	«Quarantine delayed my prenatal check-ups.»

Table 5. Multivariate analysis of risk factors for reproductive health and PTSD

Indicator	aOR (Group 1 vs. Group 2)	95% CI	p-value
Irregular menstruation	3.2	2.1–4.9	< 0.001
PTSD symptoms	4.5	2.8–7.1	< 0.001
Unmet need for contraception	2.6	1.7–4.0	< 0.001

DISCUSSION

The findings of this study confirm the significant impact of military actions and the COVID-19 pandemic on the reproductive health of refugee women in Ukraine. Participants in Group 1 (women who were located in active combat zones) exhibited notably higher rates of menstrual cycle irregularities, pregnancy complications, depression, and anxiety compared to participants in Group 2 (internally displaced from non-active zones). These results can be attributed to a combination of interrelated factors such as stress, infrastructural limitations, and the influence of the pandemic.

Chronic stress is a key factor affecting the reproductive health of women. In Group 1, women were constantly under stress due to direct displacement and the consequences of warfare. For instance, one woman from Group 1 recounted: «We hid in basements for weeks. Bombs destroyed our clinic.» Such persistent fear and insecurity contribute to hormonal imbalances, leading to menstrual irregularities. Logistic regression analysis confirmed this impact, revealing an aOR of 3.2 for menstrual irregularities (95% CI: 2.1–4.9; p < 0.001), indicating a significant effect of stress on this indicator.

Moreover, stress also impacts mental health. In Group 1, the rate of depression measured by the PHQ-9 scale (score ≥10) was 66%, which was twice as high as that in Group 2 (30%). Anxiety (GAD-7 score ≥ 10) was also more prevalent in Group 1 (60% vs. 26%), and PTSD symptoms (PCL-5 score ≥ 33) were observed in 76% of Group 1 participants compared to 36% in Group 2. Qualitative analysis revealed that women in Group 1 frequently described traumatic experiences related to direct displacement and the aftermath of battles: «A bomb destroyed our house; we lost everything.» This explains the high prevalence of PTSD and its impact on overall health.

Limited access to healthcare is another critical factor influencing the outcomes. In Group 1, there were significantly fewer doctors and medical facilities, making it impossible to obtain necessary medical care, including vaccination against COVID-19. One woman from Group 1 noted: «There are no doctors left in our village. I gave birth alone.» This accounts for the lower vaccination rate (30% vs. 50% in Group 2, $p = 0.04$) and higher rates of pregnancy complications (18% vs. 8%, $p = 0.04$).

Unmet need for contraception was also higher in Group 1 (40% vs. 20%, $p < 0.001$). Logistic regression indicated an aOR of 2.6 for unmet need for contraception (95% CI: 1.7–4.0; $p < 0.001$), explained by limited access to healthcare and stress. Women in Group 1 often described difficulties obtaining advice on contraceptive methods: «After we fled, I didn't know where to find a doctor to consult about contraception.»

The COVID-19 pandemic also affected reproductive health. In Group 1, a lower rate of vaccination against COVID-19 was found (30% vs. 50% in Group 2, $p = 0.04$), attributable to infrastructure destruction and lack of information. One participant from Group 1 stated: «There were no masks or vaccines. We feared COVID, but had more pressing issues.» This explains the low vaccination rate and high infection rate (40% vs. 20%, $p < 0.05$).

Qualitative analysis further highlights the impact of the pandemic on reproductive health. In Group 2, although women also experienced stress, it was associated with overcrowding in temporary shelters and social isolation during lockdowns. One participant from Group 2 recounted: «The quarantine delayed my prenatal check-ups.» This explains the challenges in obtaining routine medical preventive care, potentially leading to pregnancy complications and other reproductive health issues.

Additional examples from qualitative analysis include:

- Traumatic experience: «We fled early to avoid the fighting, but lost everything.» This comment from a participant in Group 2 indicates emotional trauma linked to home loss, which may also affect reproductive health.
- Barriers in healthcare: «The clinics here are overcrowded; appointments take months.» This comment from a participant in Group 2 underscores problems with accessing healthcare, which could lead to pregnancy complications and other reproductive health issues.
- Impact of the pandemic: «We lost our jobs due to quarantine, and now it's harder to afford medical services.» This comment from a participant in Group 2 emphasizes economic difficulties impacting access to healthcare and reproductive health.

Thus, the study results demonstrate the substantial impact of both direct war conditions and indirect consequences of the pandemic on the health of refugee women. Chronic stress, limited access to healthcare, and economic hardships are key factors affecting reproductive and mental health. An important step is developing targeted vaccination programs, strengthening medical infrastructure, and integrating gender-sensitive approaches in humanitarian aid. The data underscore the necessity for urgent measures aimed at improving access to reproductive and psychological support, particularly in regions where conflict persists.

CONCLUSIONS

The findings of this study confirm that military actions, conditions of forced displacement, and the COVID-19 pandemic significantly deteriorate the reproductive and mental health of refugee women in Ukraine. Women who were situated in active combat zones (Group 1) exhibited notably higher rates of menstrual cycle irregularities, pregnancy complications, and depression compared to those displaced from non-active zones (Group 2). These differences are attributable to chronic stress, limited access to healthcare, and the direct traumatic impact of war, which disrupts physiological and psychological adaptation mechanisms. The low rate of vaccination against COVID-19 in Group 1 indicates systemic issues in providing preventive care under conflict conditions.

The obtained data underscore the necessity for immediate measures aimed at improving access to reproductive and psychological support, particularly in regions where active warfare persists. A crucial step is the development of targeted vaccination programs, strengthening medical infrastructure, and integrating gender-sensitive approaches into humanitarian aid. Limitations of the study, such as the small sample size and retrospective data collection, highlight the need for further longitudinal studies with more representative samples to conduct a deeper analysis of long-term consequences. Implementing such initiatives will not only mitigate the negative impacts of crises but also foster the recovery of social and medical well-being among vulnerable populations.

Conflict of interests

Authors declare no conflict of interests.

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Objective of the study: to assess the impact of environmental factors, namely the war in Ukraine and the COVID-19 pandemic, on the reproductive health of refugee and internally displaced women, taking into account the roles of chronic stress and restricted access to healthcare.
Materials and methods. The study included 100 Ukrainian women aged 18–49 who experienced displacement between 2022 and 2024 years. Study participants were stratified into two groups: Group 1 (n = 50) included women who were directly located in active combat zones (e.g., along the frontlines); Group 2 (n = 50) comprised those who were preemptively displaced or relocated from areas without active combat. Quantitative measures, including menstrual cycle disturbances, pregnancy complications, and contraceptive use, were obtained via structured questionnaires supplemented by mental health assessments (depression, anxiety, post-traumatic stress disorder). In-depth qualitative interviews explored barriers to healthcare access, levels of chronic stress, and the influence of the COVID-19 pandemic on daily life among refugee and internally displaced women.
Results. Women who remained in active combat zones exhibited a higher prevalence of menstrual cycle disturbances (55% vs. 24%), pregnancy complications (18% vs. 8%), and unmet contraceptive needs (40% vs. 20%) compared to those relocated prior to hostilities. Mental health indicators were also significantly worse: depression (66% vs. 30%), anxiety (60% vs. 26%), and post-traumatic stress disorder symptoms (76% vs. 36%). Logistic regression analysis confirmed significant associations between chronic stress and adverse reproductive health outcomes (adjusted OR = 3.2) as well as poor mental health outcomes (adjusted OR = 4.5). Additionally, low COVID-19 vaccination coverage (30% vs. 50%) and limited access to healthcare services further exacerbated the vulnerability of these populations.
Conclusions. The research demonstrated the profound impact of both the war in Ukraine and the COVID-19 pandemic on reproductive and mental health among refugee and internally displaced women. These findings underscore the urgent need to improve healthcare access, implement gender-sensitive humanitarian interventions, launch targeted vaccination programs, and provide comprehensive support to mitigate chronic stress and facilitate health restoration in vulnerable groups.
Keywords: reproductive health, refugee women, internally displaced persons, war in Ukraine, COVID-19 pandemic, mental health, chronic stress, healthcare access.

ВПЛИВ ФАКТОРІВ НАВКОЛИШНЬОГО СЕРЕДОВИЩА, ВКЛЮЧНО З COVID-19, НА РЕПРОДУКТИВНЕ ЗДОРОВ'Я ЖІНОК-БІЖЕНОК ТА ВНУТРІШНЬО ПЕРЕМІЩЕНИХ ЖІНОК ЧЕРЕЗ ВІЙНУ В УКРАЇНІ

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Мета дослідження: визначити вплив факторів навколишнього середовища, зокрема війни в Україні та пандемії COVID-19, на репродуктивне здоров'я жінок-біженок і внутрішньо переміщених осіб, з урахуванням ролі хронічного стресу та обмеженого доступу до медичної допомоги.
Матеріали та методи. Дослідження охопило 100 українок віком 18–49 років, які зазнали переміщення у 2022–2024 роках. Учасниць дослідження було розділено на дві групи: до групи 1 (n = 50) увійшли жінки, які безпосередньо перебували в зонах активних бойових дій (наприклад, вздовж лінії фронту); групу 2 (n = 50) становили ті, хто був превентивно переміщений або переміщений із районів без активних бойових дій.
Кількісні показники, зокрема порушення менструального циклу, ускладнення вагітності та використання контрацепції, визначалися за допомогою структурованих анкет із додатковою оцінкою психічного здоров'я (депресія, тривожність, посттравматичний стресовий розлад). Якісні інтерв'ю дозволили дослідити бар'єри в доступі до медичної допомоги, рівень хронічного стресу та вплив пандемії COVID-19 на повсякденне життя жінок-біженок та внутрішньо переміщених осіб.
Результати. Жінки, які залишалися в зонах активних бойових дій, мали вищу частоту порушень менструального циклу (55 проти 24%), ускладнень вагітності (18 проти 8%) і незадоволені потреби в контрацепції (40 проти 20%) порівняно з групою превентивного переселення. Показники психічного здоров'я також були значно гіршими: депресія – 66 проти 30%, тривожність – 60 проти 26% і симптоми посттравматичного стресового розладу – 76 проти 36% відповідно. Логістичний регресійний аналіз підтвердив асоціації між хронічним стресом і показниками репродуктивного здоров'я (скориговане відношення шансів (aOR) = 3,2) та психічного здоров'я (aOR = 4,5). Низький рівень вакцинації від COVID-19 (30 проти 50%) й обмежений доступ до медичної допомоги поглиблювали вразливість жінок-біженок та внутрішньо переміщених осіб.
Висновки. Дослідження показало критичний вплив війни в Україні та пандемії COVID-19 на репродуктивне та психічне здоров'я жінок-біженок і внутрішньо переміщених осіб. Результати підтверджують необхідність покращення доступу жінок до медичної допомоги, впровадження гендерно чутливих гуманітарних інтервенцій, цільових програм вакцинації та комплексної підтримки для зниження наслідків хронічного стресу й відновлення здоров'я вразливих груп.
Ключові слова: репродуктивне здоров'я, жінки-біженки, внутрішньо переміщені особи, війна в Україні, пандемія COVID-19, психічне здоров'я, хронічний стрес, доступ до медичної допомоги.