Measuring the impact of Gaza war on the wellbeing of Israeli civilians using real-time wireless sensing

Kavidha V[1], Munieswari P[1], Thanga Shymala R[1] and Sakthi Lakshmi P[1]

[1]Department of Computer Science and Engineering, Holy Cross Engineering College, Thoothukudi, Tamil Nadu, India. (Correspondence to V Kavidha: vkavidha1@gmail.com).

Abstract

Background: The conflict in Gaza has had catastrophic effects on the wellbeing of Gaza's inhabitants as well as civilians in Israel.

Aim: To investigate the impact of the conflict in Gaza on the wellbeing of Israeli civilians, using real-time wireless sensing on smart phones and smart watches.

Methods: We prospectively monitored acute and robust reaction to the conflict in Gaza among 954 Israelis aged ≥ 50 years over a 6-week period. Measurements were recorded using mental related, energy expenditure related and sleep related indicators. We calculated the weighted average for 4 different periods, examined the correlation between the distances of participants' residential city from Gaza, and tested the long-term effect of the war on different wellbeing indicators using mixed ANOVA.

Results: Sixty-eight (7.1%) of the participants lived in high-risk areas, 704 (73.8%) in medium-risk areas and 182 (19.1%) were not exposed to missile attacks. The Israelis showed acute and robust reaction to the conflict, as all indicators worsened during the war, including spikes in heart rates, excessive onscreen time and reduction in sleep duration and quality. The changes were more significant among people who lived closer to the battlefield, younger individuals and women. However, all the indicators returned to normal within 2 weeks after ceasefire or humanitarian pause.

Conclusion: Real-time monitoring of victims during a humanitarian crisis can help in early detection of their subjective and objective wellbeing and in designing and providing prompt assistance.

Keywords: real-time monitoring, wellbeing, war, conflict, military attack, ceasefire, Gaza, Israel

Citation: Kavidha V , Munieswari P, Thanga Shymala R, Sakthi Lakshmi P. Measuring the impact of Gaza war on the wellbeing of Israeli civilians using real-time wireless sensing. East Mediterr Health J. 2025;31(4):288–294. https://doi.org/10.26719/2025.31.4.288.

Received: 16/10/2024; Accepted: 16/04/2025

Introduction

The 20th Century was the most war-ridden and most fatal for civilians (*1*). There were stark increases in war-related civilian fatalities, from 7% casualties at the beginning of the century to 16% during World War I, 75% by the end of World War II, and more than 95% during wars that erupted in the 1990s (*2*). The wars left victims with war-related psychological scars and severe long-lasting effects on mental health and wellbeing in the form of reduced happiness, anxiety, fear, depression, and post-traumatic stress disorder (PTSD) (*3–7*).

A recent study suggests that 1 in 5 people living in conflict-affected regions in the previous 10 years will experience depression, anxiety, PTSD, bipolar disorder, or schizophrenia (*8*). The recent Russian invasion of Ukraine has been reported to have extraordinary mental impact on Ukrainians and is likely to cause large-scale mental health crisis in the near future (*9*). There is therefore a need for health systems and aid organizations to conduct targeted investigations and prepare to provide prompt mental health support to vulnerable populations (*10*).

Increased access to the media, particularly social media, has been shown to further increase fear levels among individuals and preoccupation with disturbing thoughts regarding mortality (*11*). For example, after the 2016 terror attack in France, media information was associated with insomnia (*12*). Memory loss and delayed recall are characteristic of traumatic events and are serious drawbacks in assessing those events retrospectively (*13*). Studies have shown that wearable sensors could be more sensitive than humans in detecting physiological changes following infection and vaccination, and smartphones and smart watches have been recently used by researchers to investigate the effects of the COVID-19 lockdowns on wellbeing (*14–16*). In the context of mental health, the ability of these devices to continuously record objective measures such as heart rate, heart rate variability and sleep patterns make them appropriate for monitoring early markers of PTSD (*17,18*).

This research was conducted as part of a larger PerMed study, which aims to provide earlier and improved diagnosis of highly common acute infectious diseases through the combined use of electronic medical records (EMRs), behavioural information collected from smartphones and smartwatches, and daily questionnaires. It was a prospective observational

study among 954 participants using smart watches and a dedicated smartphone application.

Methods

The PerMed design

The PerMed real-time recording app was developed as a tool for early diagnosis of respiratory infectious diseases. This study included PerMed participants aged ≥50 who were active between 26 April 2024 and 17 May 2024. The participants were recruited through a professional survey company. The company ensured that participants met the study requirements and were willing to compete the app questionnaire 3 times a week and wear a smart watch all though the study period. Eligible participants were provided details about the study and were requested to sign a digital consent form. Then, they were requested to fill a one-time enrolment questionnaire and to install 2 apps on their smartphones: the Garmin Connect app, which was used to collect data from their smart watch, and the dedicated PerMed app, which collected GPS-based location and allowed participants to fill the daily questionnaire. Ethics approval was obtained for the study from the Israel Medical Association Ethics Board.

Data collection

We created 12 indicators, which were grouped into 3 main categories, to collect self-reported data daily through the Permed app questionnaire. The data were reported on a scale of −2 to 2: for mood 2 was excellent and −2 awful; for stress level −2 was very low and 2 very high; for sleep quality and duration −2 was awful and 2 was excellent. Sport time was reported in minutes and social encounters reported in number of times. The Garmin smart watch recorded daily aggregated indicators as step count, average heart rate in bpm, sleep start hour and percentage of awake time during night sleep in seconds. On-screen time in hours was collected daily through android-based smart phone sensors. On-screen time is known to be highly correlated with stress.

We measured the mental related indicators, including on-screen time, reported mood level, reported stress level and the reported number of social encounters. Then we measured energy expenditure related indicators, including step count, average heart rate, percentage still time and sport time. We also measured sleep related indicators, including awake time, sleep start hour, sleep duration, and sleep quality. In addition to these 12 indicators, we collected data on age, gender, income level, and city of residence. Location data from the smart phone was sampled every 15 minutes and used to determine the residential area for each participant.

Data processing

We processed the daily data before analysis. Only the latest questionnaire for a particular day was considered to enable participants to correct any errors in previously submitted questionnaires for the day. Then, for each participant and for each of the 14 indicators, we calculated a single weighted average for each of 4 periods: baseline (B), wartime (W), first back to routine (R1), second back to routine (R2). Back to routine refers to the period after the war when participants got back to the routine of waking up early and going to work. After calculating the average corresponding wellbeing indicator values separately for work days and free days, we calculated the weighted average for each participant. We gave a weight of 5 out of 7 to work days and 2 out of 7 to free days, then we calculated the weighted average of these two values. We identified the weekly rhythm across various indicators, including free days, weekends and national holidays to correct for a potential bias since the study period was relatively short and had more free days than national holidays.

We correlated the participants' residential city and its distance from Gaza to the 12 wellbeing indicators to differentiate the direct and indirect effects of the missile attacks, such as empathy with relatives and friends. Around 4:00 am each day, we examined all the GPS coordinates collected for each participant at baseline and selected the most frequent ones, to determine the most up-to-date residential area for each participant.

Statistical analysis

To test the longer-term effect of the war on different wellbeing indicators, we conducted a separate mixed ANOVA test for each of the 14 indicators, with the considered indicator as the dependent variable. For the independent variables (main factors), the within-subject factor was the period, comprising 4 levels: baseline, wartime, first back to routine and second back to routine. The between subject factor was the distance based exposure group, comprising 3 exposure levels: high, medium and low.

The return to baseline values remained stable during the following 2 weeks period (R2). Evidence for this remarkable recovery is presented by the data showing that the changes between the baseline period (B) and the first back to routine period (R1) are distributed roughly normally around 0, with a relatively small standard deviation and seemingly symmetric tails. Back to routine analysis is the distribution of the difference between the first back to routine period (R1) and the baseline period (B) for various wellbeing indicators. The mental factors are screen time in hours, mood level, stress level, number of encounters, step count, average heart rate in beats per minute, percentage still time, sport time in minutes, awake time during night sleep in seconds, sleep start hour, sleep duration in hours, and sleep quality.

For each of the 14 wellbeing indicators, the considered mixed ANOVA model included the 2 main factors and their interaction as shown in the following equation:

Indicator = Time period + Exposure group + Time period x Exposure group

For the independent variables, we considered: (1) exposure group as a factor with 2 levels: medium and high (the 2 affected exposure risk groups according to the previous analysis); (2) age group as a factor with 2 levels: younger (≤59) and older (≥60), where the groups were divided based on the median age; (3) gender as a factor with 2 levels: men and women; (4) income level as a factor with 3 levels: below median, median and above median. We adjusted for the effect of the following independent variable: (5) baseline level as a factor with 2 levels: below the population median value and equal to or greater than the population median value (before the war).

For each of the 14 wellbeing indicators, the considered ANOVA model was described by the following equation:

Indicator = Exposure group + Age group + Gender + Income level+ Baseline level

Results

The study included 964 participants aged ≥50 years, median age 59 years, 559 (58%) female and 405 (42%) male. However, analysis was conducted on 954 participants. Of the participants, 475 (49.8%) earned above the median income level, 185 (19.4%) median income and 258 (27.0%) below median; 36 did not answer the relevant question in the enrolment questionnaire. In terms of exposure to missile attacks, 68 (7.1%) participants lived in high-risk areas, 704 (73.8%) in medium-risk areas, and 182 (19.1%) were not exposed to missile attacks (Table 1).

The mixed ANOVA tests showed, similar to the acute and clear effects of the war, quick recovery immediately after the war. There was immediate return to baseline values in all 12 indicators within the first 2 weeks after the war (R1) (Table 2).

Table 2 presents the P values of the within-subject effects for the mixed ANOVA test that was conducted for each of the 14 wellbeing indicators. Each row represents a single indicator (i.e. a single test). The P value for the 2 main ANOVA columns represent the period factor and period exposure group interaction. The other 6 columns present the P values obtained for different pairs of periods, applied only for significant main ANOVA effects, where B indicates the baseline period, W the war period, R1 the first back to routine period, and R2 the second back to routine period.

Discussion

This PepMEd study evaluated the real-time effects of the Gaza war on the wellbeing of the older Israeli population aged ≥50 years. To the best of our knowledge, it is the first design to use a combination of objective (smartphone and smart watch sensors) and subjective (self-reported questionnaire) measures in real-time, before and during a war. The Israelis showed acute and robust reaction to the war regarding mood level, stress level, number of social encounters, sharp responses, on-screen time, energy expenditure step count, average heart rate, percentage still time, sport time, sleep awake time during night sleep, sleep start hour, sleep duration, and sleep quality. Although all these measures worsened during the war, they showed some resilience after the war, as majority of them recovered to life normal within 2 weeks after ceasefire or humanitarian pause.

A similar research among the inhabitants of Gaza would also be helpful. A study in Gaza has shown that around 30% of children and adolescents who were exposed to the war developed PTSD and other disorders (*20*). A broader meta-analysis of among the Palestinian population reported a high rate of PTSD and anxiety

Table 1. Characteristics of the study participants (N = 954)

Characteristic	High-risk % (*No.*)	Medium risk % (*No.*)	Low risk % (*No.*)
Age (years)			
40–49	20.6 (14)	7.1 (50)	13.7 (25)
50–59	47.1 (32)	40.6 (286)	48.9 (89)
60–69	22.1 (15)	35.4 (249)	25.8 (47)
≥70	10.3 (7)	16.9 (119)	11.5 (21)
Gender			
Men	47.1 (32)	40.6 (286)	47.8 (87)
Women	52.9 (36)	59.4 (418)	52.2 (95)
Income*			
Above median	63.2 (43)	49.4 (348)	46.2 (84)
Median	22.1 (15)	18.9 (133)	20.3 (37)
Below median	13.2 (9)	28.0 (197)	28.6 (52)
Unspecified	1.5 (1)	3.7 (26)	5.0 (9)

**The median income specified in the questionnaire was 15 000 NIS per household.*

Table 2. Within-subject effects of the mixed ANOVA tests

Characteristic		Period factor				Period*Exposure group interaction			
		Main ANOVA	Post hoc			Main ANOVA	Post hoc		
			B & W	B & R1	B & R2		B & W	B & R1	B & R2
Mental	On-screen time (hours)	0.00***	0.00*** (↑)	1	1	0.00***	Low exposure: 0.003** (↑)	Low exposure: 1	Low exposure: 1
							Medium exposure: 0.00*** (↑)	Medium exposure: 0.736	Medium exposure: 1
							High exposure: 0.00*** (↑)	High exposure: 1	High exposure: 1
	Mood level	0.00***	0.00*** (↓)	0.08	0.47	0.00***	Low exposure: 0.133	Low exposure: 0.242	Low exposure: 1
							Medium exposure: 0.00*** (↑)	Medium exposure: 0.237	Medium exposure: 0.152
							High exposure: 0.00*** (↑)	High exposure: 1	High exposure: 1
	Stress level	0.00***	0.00*** (↑)	1	1	0.00***	Low exposure: 0.26	Low exposure: 1	Low exposure: 1
							Medium exposure: 0.00*** (↑)	Medium exposure: 1	Medium exposure: 0.916
							High exposure: 0.00*** (↑)	High exposure: 1	High exposure: 1
	Number of encounters	0.00***	0.007**(↓)	1	0.571	0.642	–	–	–
Energy	Step count	0.00***	0.00*** (↓)	0.374	1	0.14	–	–	–
	Average heart rate (bpm)	0.002**	0.00*** (↓)	1	1	0.488	–	–	–
	% Still time	0.00***	0.00***(↑)	1	1	0.476	–	–	–
	Sport time (minutes)	0.00***	0.00*** (↓)	0.195	0.684	0.003**	Low exposure: 0.627	Low exposure: 1	Low exposure: 0.362
							Medium exposure: 0.00*** (↓)	Medium exposure: 1	Medium exposure: 0.657
							High exposure: 0.00*** (↓)	High exposure: 0.426	High exposure:1
Sleep	Awake time (seconds)	0.00***	0.00*** (↑)	1	1	0.245	–	–	–
	Sleep start hour	0.003**	0.021* (↑)	0.396	1	0.495	–	–	–
	Sleep duration (hours)	0.004**	0.008** (↓)	1	0.624	0.021*	Low exposure: 1	Low exposure: 1	Low exposure: 1
							Medium exposure: 0.00*** (↓)	Medium exposure: 1	Medium exposure: 1
							High exposure: 0.013* (↓)	High exposure: 1	High exposure: 0.781
Sleep	Sleep quality	0.00***	0.00*** (↓)	1	1	0.00***	Low exposure: 1	Low exposure: 1	Low exposure: 1
							Medium exposure: 0.00*** (↓)	Medium exposure: 1	Medium exposure: 1
							High exposure: 0.00*** (↓)	High exposure: 1	High exposure: 0.771

*Each row represents a mixed ANOVA test for a single well-being indicator. The two "Main ANOVA" columns represent the p value obtained by the mixed ANOVA test for the time period factor and time period * exposure group interaction. The other six columns present the p values obtained by Bonferroni post hoc tests for different pairs of time periods (applied only for significant "main ANOVA" effects), where B indicates the baseline period, W the war period, R1 the first "back to routine" period, and R2 the second "back to routine" period. Statistically significant effects are marked with stars and the direction of these effects is marked with corresponding arrows. A table detailing the mean values and the number of participants included in each test is available in Supplementary Table 1.*

****P < 0.001; **P < 0.01; *P < 0.05.*

disorders due to the war (*21*). Although the hostilities affect Israelis and Palestinians in the Gaza Strip, each group's response may be different at many levels (*19*).

Our research identified subgroups of individuals, particularly those who lived closer to the battlefield, women and younger individuals, who were more affected by the war. This finding could aid decision-making and increase the efficiency of assistance provided. To test the differences between subgroups, we used a simple ANOVA test. In principle, a panel regression analysis would be more appropriate. However, since most participants filled the daily questionnaire only 2–3 times a week, such analysis would be of limited value. Future research should aim at collecting data from participants more frequently to enable panel regression analysis. This could add valuable insights to the complex relationships between variables over time.

Our research has some limitations, which we tried to mitigate. Due to the sensitivity of the data being collected and analysed, this research may raise certain ethical concerns. However, we have taken all necessary precautions to prevent data misuse for any real world implementation, and we explicitly declared the purpose for the data collection to the participants. To simplify interaction with the participants, we minimized the use of subjective measures to required limits.

Conclusion

The conflicts in Gaza are often terminated abruptly with some form of ceasefire, which usually holds for a few weeks, months or years. This makes it an atypical type of war with the type of stress experienced differing from most other conflicts. Although our findings suggest that most of the participants were resilient, they could be at risk of long-term health effects. Therefore, early detection of at-risk sub-populations and individuals, as well as prompt response, is crucial during conflicts, using real-time technologies like the ones used in this study.

Acknowledgements

This research received technical support from by the National Institute of Epidemiology, Chennai, Tamil Nadu, India.

Funding: None.

Conflict of interest: None declared.

Mesurer l'impact de la guerre de Gaza sur le bien-être des civils israéliens à l'aide d'un suivi sans fil en temps réel

Résumé

Contexte : Le conflit à Gaza a eu des effets catastrophiques sur le bien-être des habitants de ce territoire et des civils en Israël.

Objectif : Étudier l'impact du conflit à Gaza sur le bien-être des civils israéliens, au moyen de la technologie de suivi sans fil en temps réel dont sont équipés les smartphones et les montres connectées.

Méthodes : Nous avons suivi de manière prospective les réactions aiguës et marquées de 954 Israéliens âgés de 50 ans ou plus, face au conflit à Gaza, sur une période de six semaines. Les mesures ont été enregistrées à l'aide d'indicateurs liés à l'état mental, à la dépense énergétique et au sommeil. Nous avons calculé la moyenne pondérée pour quatre périodes différentes, examiné la corrélation entre les distances séparant Gaza de la ville où résident les participants, et testé l'effet à long terme de la guerre sur différents indicateurs de bien-être à l'aide d'une analyse de la variance (ANOVA) mixte.

Résultats : Soixante-huit des participants (7,1 %) vivaient dans des zones à haut risque, 704 (73,8 %) dans des zones à risque modéré et 182 (19,1 %) n'étaient pas exposés à des attaques de missiles. Les Israéliens ont montré une réaction aiguë et marquée face au conflit, tous les indicateurs s'étant détériorés pendant la guerre, notamment des pics de fréquence cardiaque, une utilisation excessive des écrans, ainsi qu'une diminution de la durée et de la qualité du sommeil. Les changements étaient plus importants chez les personnes vivant plus près de la zone de conflit, chez les individus plus jeunes ainsi que chez les femmes. Cependant, tous les indicateurs sont revenus à la normale dans les deux semaines qui ont suivi le cessez-le-feu ou la trêve humanitaire.

Conclusion : Le suivi en temps réel des victimes pendant une crise humanitaire permet la détection précoce des altérations de leur bien-être subjectif et objectif ainsi que la conception et la fourniture d'une aide rapide.

قياس أثر حرب غزة على رفاه المدنيين الإسرائيليين باستخدام الاستشعار اللاسلكي الآني

كافيدها ف، مونيسواري بي، ثانجا شيمالا آر، ساكثي لاكشمي بي

الخلاصة

الخلفية: خَلَّف النزاعُ في غزة آثارًا كارثية على رفاه سكان غزة والمدنيين في إسرائيل أيضًا.

الأهداف: هدفت هذه الدراسة الى تقصِّي تأثير الصراع في غزة على رفاهية المدنيين الإسرائيليين، باستخدام الاستشعار اللاسلكي الآني عبر الهواتف الذكية والساعات الذكية.

طرق البحث: بشكل استطلاعي، وعلى امتداد 6 أسابيع، رصدنا رد الفعل الحاد والقوي للصراع الدائر في غزة بين 954 إسرائيليًّا ممن أعمارهم 50 عامًا أو أكثر. وسُجلت القياسات باستخدام مؤشرات متصلة بالصحة النفسية ومستويات استهلاك الطاقة ومعدلات النوم. وحسبنا المتوسط المرجَّح لأربع فترات مختلفة، وفحصنا الارتباط بين مدى بُعد المدينة التي يقطن فيها المشاركون من غزة والقياسات المُسجلة، واختبرنا الأثر الطويل الأمد للحرب على مؤشرات الرفاهية المختلفة باستخدام تحليل التبايُن المختلط.

النتائج: تبيَّن أن ثمانية وستين (7.1%) من المشاركين يعيشون في مناطق شديدة الخطورة، ويعيش 704 (73.8%) في مناطق متوسطة الخطورة، و 182 (19.1%) لم يتعرضوا لهجمات بالقذائف. وأظهر الإسرائيليون رد فعل حادًّا وقويًّا للنزاع، إذ ساءت جميع المؤشرات خلال الحرب، لا سيما ارتفاعات مفاجئة في ضربات القلب، وفرط قضاء الوقت على الشاشة، وانخفاض مدة النوم وجودته. وكانت التغييرات أكثر بروزًا بين الأشخاص الذين يعيشون بالقرب من ساحة المعارك، وبين الأفراد الأصغر سنًّا والنساء. ومع ذلك، عادت جميعُ المؤشرات إلى وضعها الطبيعي في غضون أسبوعين بعد وقف إطلاق النار أو الهُدَن الإنسانية.

الاستنتاجات: إن الرصد الآني يمكن أن يساعد الضحايا في أثناء الأزمات الإنسانية في الاكتشاف المبكر لأمور تخص رفاههم الذاتي والموضوعي وفي تصميم المساعدة الفورية وتقديمها.

References

1. Hanson E, Vogel G. In Trauma Counseling: Theories and Interventions. Springer Press, 2012, 24 pp. https://doi.org/10.1080/15299732.2015.970110.
2. Khorram-Manesh A, Burkle FM, Goniewicz K, Robinson Y. Estimating the number of civilian casualties in modern armed conflicts–a systematic review. Front. Public Health J. 2021;765261(9). https://doi.org/10.3389/fpubh.2021.765261.
3. Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: part ii. Summary and implications of the disaster mental health research. Psychiatry J. 2002;65(3):207-239. https://doi.org/10.1521/psyc.65.3.207.20173.
4. Murthy RS, Lakshminarayana R. Mental health consequences of war: a brief review of research findings. World Psychiatry J. 2006;5(1):25-30. https://pubmed.ncbi.nlm.nih.gov/16757987/.
5. Landau SF, Beit-Hallahmi B, Levy S. The personal and the political: Israelis' perception of well-being in times of war and peace. Soc. Indic. Res J. 1998;44:329–365. https://doi.org/10.1023/A:1006885502825.
6. Neria Y, DiGrande L, Adams BG. Posttraumatic stress disorder following the September 11, 2001 terrorist attacks: a review of the literature among highly exposed populations. Am. Psychol J. 2011;66(6):429. http://dx.doi.org/10.1037/a0024791.
7. Weinberg M, et al. War and well-being: the association between forgiveness, social support, posttraumatic stress disorder, and well-being during and after war. Soc. Work J. 2017;62(4):341–348. https://doi.org/10.1093/sw/swx043.
8. Charlson F, et al. New who prevalence estimates of mental disorders in conflict settings: a systematic review and meta-analysis. Lancet J. 2019;394(10194):240–248. https://doi.org/10.1016/s0140-6736(19)30934-1.
9. Jawaid A, Gomolka M, Timmer A. Neuroscience of trauma and the Russian invasion of Ukraine. Nat. Hum. Behav J. 2022;6(6):748–749. https://doi.org/10.1038/s41562-022-01344-4.
10. Ridout TN, Grosse AC, Appleton AM. News media use and Americans' perceptions of global threat. Br. Polit. Sci. J. 2008;38:575–593. https://doi.org/10.1017/S000712340800029X.
11. Das E, Bushman BJ, Bezemer MD, Kerkhof P, Vermeulen IE. How terrorism news reports increase prejudice against outgroups: a terror management account. Exp. Soc. Psychol. J. 2009;45(3):453–459. https://psycnet.apa.org/doi/10.1016/j.jesp.2008.12.001.
12. Goodwin R, Lemola S, Ben-Ezra M. Media use and insomnia after terror attacks in France. Psychiatric Res J. 2018;98:47–50. https://doi.org/10.1016/j.jpsychires.2017.12.006.
13. Kahneman D, Wakker PP, Sarin R. Back to Bentham? explorations of experienced utility. Q. Econ J. 1997;112(2):375–406. https://doi.org/10.1162/003355397555235.
14. Oved S, et al. Differential effects of COVID-19 lockdowns on well-being: interaction between age, gender and chronotype. Royal Soc. Interface J. 2021;18(179):20210078. https://doi.org/10.1098/rsif.2021.0078.
15. Sun S, et al. Using smartphones and wearable devices to monitor behavioral changes during COVID-19. Med. Internet Res J. 2020;22(9):e19992. doi: 10.2196/19992.
16. Mofaz M, et al. Self-reported and physiologic reactions to third bnt162b2 mRNA COVID-19 (booster) vaccine dose. Emerg. Infect. Dis J. 2022;28(7):1375. https://doi.org/10.3201/eid2807.212330.
17. Van Boxtel GJ, et al. Heart rate variability, sleep, and the early detection of post-traumatic stress disorder. Biol. Psychiatry J. 2018;55:953–956. http://dx.doi.org/10.1007/978-1-4939-7148-0_22.
18. Weber FC, Wetter TC. The many faces of sleep disorders in post-traumatic stress disorder: An update on clinical features and treatment. Neuropsychobiology J. 2022;81(2):85–97. doi: 10.1159/000517329.

19. WeWorld. Situation in the occupied Palestinian territory. Flash Update #2, 24 May 2021. https://reliefweb.int/report/occupied-palestinian-territory/flash-update-02-situation-occupied-palestinian-territory.

20. Khamis V. Coping with war trauma and psychological distress among school age Palestinian children. Am. Orthopsychiatry J. 2015;85(1):72-79. https://doi.org/10.1037/ort0000039.

21. Hammad J, Tribe R. Social suffering and the psychological impact of structural violence and economic oppression in an ongoing conflict setting: the Gaza strip. Community Psychol J. 2020;48(6):1791–1810. https://doi.org/10.1002/jcop.22367.