PTSD, depression, and anxiety after the October 7, 2023 attack in Israel: a nationwide prospective study

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Summary

Background The magnitude of the Oct 7, 2023 attack in southern Israel was without precedent. More than 1300 civilians were murdered, and 240 civilians were kidnapped and taken hostage. In this national cohort study, for which baseline outcome data were established before the attacks, a prospective assessment of posttraumatic stress disorder (PTSD), depression, and generalized anxiety disorder (GAD) was conducted one month after the attack.

Methods A representative sample of 710 Israeli adults (362 female, 51.1%), Jews (557, 79.9%) and Arabs (153, 20.1%), aged 18–85 years (mean = 41.01, SD = 13.72) completed the study at two timepoints: T1, on Aug 20–30, 2023 (6–7 weeks before the attack) and T2, on Nov 9–19, 2023 (5–6 weeks after the attack). 30 (4.2%) of the 710 participants had direct exposure to the attack, and 131 (18.5%) had loved ones who were murdered, kidnapped, or injured during the attack.

Findings Probable PTSD prevalence almost doubled from 16.2% at T1 to 29.8% at T2 (p < 0.0001), with the prevalence of probable GAD and depression also increasing from 24.9% at T1 to 42.7% at T2, and from 31.3% at T1 to 44.8% at T2, respectively. Direct exposure to the attack was found to contribute to probable PTSD (OR = 3.15, 95% CI = 1.48–6.65) and probable depression (OR = 2.18, 95% CI = 1.02–4.87) at T2.

Interpretation Our study suggests a broad and significant impact of the Oct 7, 2023 attack on the mental health of the Israeli population. The findings underscore the need to provide rapid, nationwide assessments and triage for interventions to address the mental health needs of Jewish and Arab citizens.

Funding Not applicable.

Keywords: Terrorist attack; PTSD; Depression; Anxiety; Exposure

Introduction

While people facing disasters may manifest impressive levels of resilience,[1–3] previous work on the detrimental effects of human-made disasters, such as terrorist attacks and war captivity, has documented a wide range of psychiatric disorders, including posttraumatic stress disorder (PTSD), depression, and anxiety,[4–6] as well as decreased levels of optimism and hope[7] in exposed individuals. Yet, few studies have examined these changes prospectively, evaluating the trajectories of individuals' mental burden just before and after a terrorist attack).[6]

On Oct 7, 2023, Israel came under a brutal, vast, and unprecedented terrorist attack led by Hamas, the Palestinian organisation that governs the Gaza Strip.[8]

Beginning with a massive nationwide rocket attack, scores of terrorists infiltrated Israel, murdering about 1300 civilians[9–11] and kidnapping 240 civilians (including babies and the elderly).[12] The attack included the perpetration of atrocities, including the maiming, torture, and rape of children and women, not differentiating between Jewish and non-Jewish victims.[13] As all citizens in Israel were, in some fashion, exposed to this attack of unprecedented scope and traumatic impact, it reflects a mass national trauma.[14,15]

The October 7 attack can be considered to be one of the deadliest terrorist attacks in modern times. When taking into account the number of victims per capita, it ranks as the deadliest terrorist attack worldwide in recent decades.[16,17]

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Research in context

Evidence before this study
Previous research on the mental health sequelae of terrorist attacks is limited by cross sectional design, data collections which started after the attacks, and sampling methods. In addition, only few studies have attempted to examine the immediate mental health consequences of highly deadly terrorist events, that are followed by an all-out military confrontation.

Added value of this study
This nationwide prospective cohort study addressed limitations of previous research by utilizing a prospective study design, and studying the impact of highly deadly terrorist attack, the October 7 massacre. We used a wide range of probable outcome measures including posttraumatic stress disorder (PTSD), depression, and generalized anxiety disorder (GAD), assessing a cohort of Israeli citizens, both Jews and Arabs, twice, 6–7 weeks before the attack and 5–6 weeks after the attacks. Our findings indicated a sharp increase in

probable PTSD, from 16.2% at T1 to 29.8% at T2, with the prevalence of probable GAD and depression also increased significantly. While direct exposure to the attack and having a loved one who was murdered, kidnapped, or injured significantly contributed to the prevalence of probable PTSD and depression, the most robust predictors of psychological burden in the aftermath of the attack was the presence of pre-October 7th symptoms of PTSD, depression, and GAD.

Implications of all the available evidence
Our results underline the crucial importance of conducting an immediate assessment of those with pre-attack psychological difficulties and psychiatric 'diagnoses' in the aftermath of such a large-scale trauma. Moreover, early to mid-term interventions should be made accessible to citizens as a whole, with the aim of promoting self- and community efficacy, connectedness, and hope immediately after the attacks and during a massive military confrontation.

Most studies reporting mental burden and mental disorders following a terrorist attack have focused on individuals who were directly exposed, i.e., those in close proximity to the attack, such as New York citizens in the 9/11 terrorist attack.[5,18] Indeed, direct exposure to traumatic events carries with it a greater likelihood of developing psychiatric symptoms and diagnoses.[19,20] However, in some cases, the impact of terrorist attacks can go far beyond those directly exposed to the traumatic events; thus, it is crucial to understand the mental health consequences of the attacks from a broad perspective, calling for examining the response of citizens of the entire country. Thus, while studies that examined responses of nationwide representative samples related to the 9/11 terrorist attack[21–23] reported a relatively low prevalence of mental disorders (e.g., PTSD prevalence of 4–6%), it is crucial to reexamine this prevalence in the wake of the severe attack of October 7 in Israel.

While the mental health consequences of terrorist attacks have been previously documented,[4,5,22,23] longitudinal data on the mental health impact of extreme atrocities are rarely available due to feasibility barriers, thus limiting understanding of their aftermath and their determinants.

This study aimed to describe the prevalence and development of probable PTSD, depression, and generalized anxiety disorder (GAD) in light of the Oct 7, 2023 terrorist attack on Israeli citizens. Measuring these outcomes 6–7 weeks before the attack and again 5–6 weeks afterward presented a unique opportunity to explore the immediate national response to a severe mass traumatic event. Moreover, assessing multiple mental health outcomes enabled us to extend extant

knowledge of the mental health consequences of exposure to terrorist attacks beyond their established relationship with PTSD.[24] This exploration could yield crucially immediate implications relating to screening, interventions, and large-scale actions that need to be taken at this unprecedented time.

Methods

Study design and participants
In this cohort study, we utilized data on a nationally representative sample of Israeli citizens collected on Aug 20–30, 2023 (8–10 weeks before the attack; referred to as T1) as part of our study on the psychological consequences of the anticipated judicial reform in Israel. We conducted a second investigation of the same cohort on Nov 9–19, 2023 (4–5 weeks after the attack; referred to as T2). Thus, we were able to examine the temporal and immediate changes in mental burden following the Oct 7, 2023 attack.

A sample of 710 individuals (362 female, 51.1%) aged 18–85 years (mean = 41.01, SD = 13.2) took part in this longitudinal national survey study. Inclusion criteria included Israeli citizens older than 18 years. The initial survey (T1) involved 908 adults. Of those participants who completed the research questionnaires at T1, 710 (response rate = 78.1%) also participated in the second survey (T2; see flow chart in Supplement S1).

Procedures
Study participants were recruited online via a professional survey company (Panel4All), which specialises in online studies and offers a probability-based pool panel of about 100,000 Israeli panelists, thus enabling a

representative sampling of Israeli society according to various criteria. The company always provides monetary compensation to panelists for their participation. For participant recruitment, we set quotas on key demographic variables before data collection to ensure a demographically balanced sample. We used a quota sampling approach with quotas matching the Israeli national census data regarding age, sex, ethnicity, education, and socioeconomic status (SES), as reported by Israel's Central Bureau of Statistics (CBS). The survey was closed after the quotas and required sample size were reached. This approach ensured that the sample was comparable to national distributions of these variables.

Participants were provided with a link to the online questionnaire, which was constructed using Qualtrics software. Participants were free to participate in the panel and were offered vouchers by the survey company in exchange for their participation. They were provided with a recruitment letter outlining the purpose of the study and the researchers' contact information, and were assured of anonymity, confidentiality, and their right to withdraw from the study at any time in both waves. Those agreeing to participate were required to sign an informed consent form. Overall, 908 panel members participated at T1. All those who participated at T1 were approached again via email and asked to complete the second questionnaire on Nov 9–19, 2023. The ethics committee at the Ruppin Academic Center approved the study (protocol Number 175/2023).

Measures
PTSD: International Trauma Questionnaire (ITQ)
The ITQ is an 18-item self-report measure for PTSD and complex PTSD. In this study, we focused on PTSD and, thus, used only the nine items relevant to PTSD.[25] The first six items tapped three symptom clusters (re-experiencing, avoidance, and sense of threat). These items (two items per symptom cluster) are presented on a 5-point Likert-type scale, ranging from 0 (*not at all*) to 4 (*extremely*). Moreover, three additional items measure functional impairment, assessing the symptoms' impact on (i) relationships and social life, (ii) work or ability to work, and (iii) other important life domains, such as parenting, school, or college work. The ITQ was operationalised in this study both as a dichotomised self-report 'diagnosis' of PTSD as a continuous variable and as a total symptom severity score of PTSD symptoms. To yield a probable PTSD 'diagnosis,' participants reporting one of each symptom cluster pair was required, as well as an indication of functional impairment in the last three items. Previous ITQ versions have been shown to be reliable and valid measures of PTSD,[26] and the currently used version has recently been demonstrated to be a valid measure for PTSD diagnosis, based on the ICD-11.[16]

Depression: Patient Health Questionnaire-2 (PHQ)
This 2-item depression screening scale comprises the two DSM-5 diagnostic core criteria for depressive disorders[27,28]: "little interest or pleasure in doing things" and "feeling down, depressed, or hopeless." Equivalent to the full scale (PHQ-9), the PHQ-2 begins with the stem question: "Over the last 2 weeks, how often have you been bothered by the following problems?" Items are presented on a 4-point Likert-type scale, ranging from 0 (*not at all*), 1 (*several days*), 2 (*more than half the days*), to 3 (*nearly every day*). Thus, the total PHQ-2 sum scores range from 0 to 6. A score of ≥3 has been identified as a valid cutoff for differentiating between the normal range and probable cases of depression.[29,30] The scale has been found to have high validity and a good resemblance to the full PHQ-9 scale.[27]

Anxiety: generalized anxiety disorder-2 (GAD-2)
The GAD-2 is a 2-item validated screening measure for anxiety based on the well-validated Generalized Anxiety Disorder 7 scale (GAD-7).[31,32] Equivalent to the full scale (GAD-7), the GAD-2 begins with the stem question: "Over the last 2 weeks, how often have you been bothered by the following problems?". Items are presented on a 4-point Likert-type scale, ranging from 0 (*not at all*), 1 (*several days*), 2 (*more than half the days*), to 3 (*nearly every day*). Thus, the total GAD-2 sum scores range from 0 to 6. The GAD-2 has been validated for screening anxiety in the general population, with meta-analysis studies of diagnostic accuracy reporting pooled sensitivity and specificity values at a cutoff score of ≥3 for sensitivity, 0.76 (95% CI 0.55–0.89) and specificity, 0.81 (95% CI 0.60–0.92).[33]

Sociodemographic and trauma-related characteristics
We collected various demographic variables, including age, sex, educational level, SES, and ethnicity. Additionally, we collected the participants' trauma-related characteristics, which comprised three factors: (1) direct exposure to traumatic events on the 7th of October (individuals present at the Gaza envelope communities during the attack); (2) a family member or a close friend who was harmed during the attack (murdered, kidnapped, or injured); or (3) sought a sheltered space following the rocket attack on October 7 and subsequent days.

Statistical analysis
First, we computed descriptive statistics of demographic and questionnaire data. We calculated matched odd ratios (OR) of McNemar tests[34,35] in order to find out if there are different proportions of participants with elevated PTSD, depression, and GAD scores before and after the October 7 attack. Second, to understand the contribution of demographic and October 7-related trauma exposure characterizing the three probable diagnoses, we conducted two separate phases of analysis.

In phase one, we examined the specific contribution value of exposure to trauma and loss to probable PTSD, depression, and anxiety following the attack. Since the risk ratio of probable 'diagnoses' was greater than 10% in the study population, the odds ratio from a logistic regression model overestimates the risk ratio (RR). Therefore, we used the modified Poisson regression models to estimate the risk ratio and the corresponding 95% confidence intervals.

In the second phase, we conducted three hierarchical logistic regression analyses to understand the contribution of demographic and attack-related characteristics in predicting PTSD, depression, and GAD at T2 beyond baseline mental health symptoms.

To control for the non-proportional sampling effect of the dataset, iterative proportional fitting (ranking) method was employed in order to compensate for unequal selection probabilities resulting from issues such as disproportionate stratification and non-response. The weights were adjusted to make the weighted sample totals conform to the population totals obtained from reliable CBS sources. Box–Tidwell tests were applied in order to examine the linearity assumption underlying logistic regression model for quantitative predictors. We found that no violations of the linearity assumptions. The statistical significance of the coefficients was confirmed by constructing 95% confidence intervals using a percentile bootstrap procedure[36] with 1000 resamples. SPSS (v26.0 for Windows) was used for all analyses.

The sample size was based on power analyses using G*Power[37] for detecting a medium-sized effect (0.30) in nonparametric analyses based on standard alpha (0.05) and power (95%).[37,38] Based on the calculation, the *a priori* required sample size was 220. However, we recruited a higher number of participants in anticipation of the natural drop-out percentage common to longitudinal studies.

Role of the funding source
Not applicable.

Results

Participants' demographics and trauma exposure

The sample's demographic and October 7 attack-related variables are presented in Table 1. The study sample (n = 362, 51% women) had a mean age of 41 years (SD = 13.7) and a mean level of education that exceeded secondary, as measured by years of schooling (mean = 14.15, SD = 2.01). The sample comprised 80% Jewish Israeli citizens and 20% Arab Israeli citizens, reflecting the national proportionality. Comparing participants who participated only at T1 with those at both T1 and T2, we found no significant differences in most sociodemographic variables (see Supplement S2). Moreover, the sample at T2 comprise

Variables	M (SD)	n (%)
Sociodemographic characteristics		
Age (years)	41.01 (13.72)	
Education (years of schooling)	14.15 (2.02)	
Sex		
Male		346 (48.9%)
Female		362 (51.1%)
SES[a]		
Far below average		130 (23.0%)
Below average		159 (28.1%)
Average		147 (26.0%)
Above average		104 (18.4%)
Far above average		26 (4.6%)
Ethnicity		
Jewish		557 (79.9%)
Arab		153 (20.1%)
Exposure to the October 7 attack		
Present at Gaza envelope communities during the attack		
Yes		30 (4.3%)
No		669 (95.7%)
A nuclear family member or a close friend harmed during the attack (murdered, kidnapped, or injured)		
Yes		131 (18.6%)
No		575 (81.4%)
Sought shelter due to missile attacks		
Not at all		94 (13.3%)
Once		118 (16.7%)
Several times		249 (35.3%)
Many times		245 (34.7%)

[a]The average salary in Israel is approx. US$3300 per month.

Table 1: Characteristics of the study participants (N = 710).

a close representation of the Israeli population (e.g., the proportion of Jews and Arabs, sex, and age). The vast majority of the sample (n = 669, 95.7%) were not present in the Gaza envelope communities during the October 7 attack, but almost one in five participants (n = 131, 18.6%) had a close friend or family member who was harmed during the attack. Less than one-third (n = 212, 30%) of the sample reported they sought shelter due to rocket attacks once or not at all, and almost 35% (n = 245) reported seeking shelter many times.

Prevalence of probable PTSD, depression, and GAD

We calculated descriptive statistics and rates of probable self-reported PTSD, depression, and anxiety at T1 (6–7 weeks before the October 7 attacks) and at T2 (5–6 weeks after the attack). Regarding PTSD, at T1, the prevalence of probable PTSD based on a cutoff score was 16·2% (n = 115). As it can be seen on Figure 1, at T2, 29.8% of the cohort (n = 211) met this criterion for current probable PTSD, reflecting a double increase
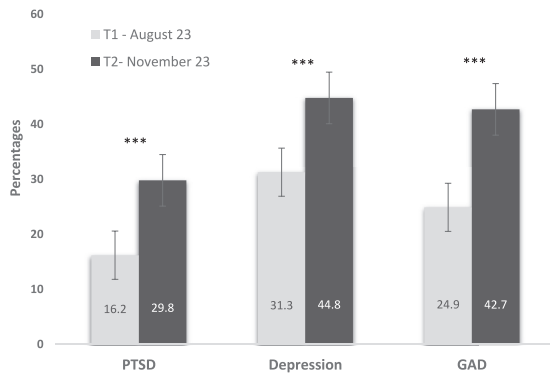
Fig. 1: Probable prevalence of PTSD, depression, and GAD before and after the October 7 terror attack (N = 710). *Note:* ***p < 0.0001. PTSD = probable PTSD diagnosis by the International Trauma Questionnaire (ITQ); Depression = probable depression diagnosis by the Patient Health Questionnaire-2(PHQ-2); GAD = probable generalized anxiety disorder diagnosis by the Generalized Anxiety Disorder-2 (GAD-2). Lines represent 95% confidence intervals (CIs).

relative to the prevalence at T1 (McNemar = 48.52; df = 1; p = 0.0001) and matched odd ratio of 1.95 (CI = 1.54–2.45). Most of the respondents with PTSD at T1 (60.9%; 70/115) had experienced PTSD also at T2, and most of the PTSD cases at T2 (66.8%; 141/211) revealed no PTSD at T1. Seventy participants (9.9% of the sample) met the criteria for current probable PTSD at both timepoints.

Regarding depression, at T1, the prevalence of probable depression based on a cutoff score of ≥3 was 31.3% (n = 205). At T2, 44.8% of the cohort (n = 293) met this criterion for current probable depression. This represents a significant increase in the prevalence of depression (McNemar = 33.49; df = 1; p = 0.0001) and a matched odd ratio of 1.95 (CI = 1.54–2.40). Most of the respondents revealing depression at T1 (66.3%; 136/ 205) experienced depression at T2, and most of the depression cases at T2 (53.6%; 157/293) reported no depression at T1. One hundred thirty-six participants (20.8% of the sample) met the criteria for current depression at both timepoints.

Similar to depression, the GAD 'diagnosis' at T2 based on a cutoff of ≥3 was more prevalent than at T1. At T1, the prevalence of probable GAD based on a cutoff score was 24·9% (n = 136), and this prevalence increased to 42.7% of the cohort (n = 279) who met the criterion for probable GAD. This represents a significant increase in the prevalence of GAD (McNemar = 63.58; df = 1; p = 0.0001) and a matched odd ratio of 2.31 (CI = 1.71–3.19). Most of the respondents with anxiety at T1 (71·8%; 117/163) revealed GAD at T2, and most of the GAD cases at T2 (58.1%; 162/279) presented no GAD 'diagnosis' at T1. One hundred thirty-six participants (17.9% of the total sample) met the criteria for current GAD at both timepoints.

Demographic and October 7-related trauma exposure characteristics as contributors to probable PTSD, depression, and GAD at T2

First, we conducted a series of adjusted risk ratio (RR) estimates (with 95% CIs) using modified Poisson regression models to examine the specific contribution value of exposure to trauma and grief to probable PTSD, depression, and GAD following the terrorist attack. The risk ratio of direct exposure (present at the Gaza envelope communities during the attack) was higher for probable PTSD (RR = 2.01, 95% CI = 1.31–2.58): 56.7% of those with direct exposure received a probable PTSD diagnosis, compared with 28.1% of those with no direct exposure.

Direct exposure was found to contribute to probable depression (RR = 1.65, 95% CI = 1.21–2.15): 63.3% of those who had direct exposure received a probable depression 'diagnosis', compared with 44.4% of participants with no direct exposure. Moreover, having a loved one who was murdered, kidnapped, or injured was also found to increase the likelihood of probable PTSD (RR = 1.13, 95% CI = 1.02–1.31): 38.8% of those whose loved one was murdered, kidnapped, or injured received a probable PTSD diagnosis, compared with 25.8% of those having no loved one murdered, kidnapped, or injured. Participants who had to seek shelter due to the rocket attacks did not report higher levels of probable PTSD, depression, or GAD relative to those who did not seek shelter.

Secondly, we aimed to understand the associations between demographic and terrorist attack-related characteristics in predicting participants' mental health condition at T2 after adjusting for baseline mental health symptoms (i.e., severity of PTSD, depression, and GAD symptoms at T1). To this end, we conducted three hierarchical logistic regression analyses in which probable PTSD, depression, and GAD at T2 were the outcome measures. We used demographic predictors of sex, age, education, and SES and terrorist attack-related characteristics of direct exposure (present at Gaza envelope communities during the attack), a nuclear family member or a close friend harmed during the attack, and seeking shelter due to rocket attacks. The results are presented in Table 2.

PTSD
After controlling for PTSD symptoms at T1, the odds of probable PTSD were higher for women (OR = 1.51 95% CI = 1.01–2.57) and individuals with direct exposure to the events (i.e., present at Gaza envelope communities during the attack; OR = 2.65 95% CI = 1.21–3.91). No other factors contributed to probable PTSD diagnosis at T2.

Depression
After controlling for depressive symptoms at T1, the odds of a probable depression were higher for women (OR = 2.14, 95% CI, 1.45–3.16) and individuals with direct exposure to the events (OR = 2.62 95%

Predictors	PTSD T2 (ITQ)			Depression T2 (PHS-2)			GAD T2 (GAD-2)		
	Adjusted OR 95% CI	p		Adjusted OR 95% CI	p		Adjusted OR 95% CI	p	
Step 1									
Level of symptoms at T1	1.13 (1.09–1.76)	0.0001		1.61 (1.42–1.86)	0.0001		1.77 (1.51–2.06)	0.0001	
Step 2									
Level of symptoms at T1	1.17 (1.09–1.17)	0.001		1.57 (1.34–1.78)	0.0001		1.71 (1.54–1.98)	0.0001	
Sex (1 = female)	1.51 (1.01–2.57)	0.04		2.14 (1.45–3.13)	0.001		2.24 (1.45–3.23)	0.0001	
Age (years)	0.98 (0.97–1.01)	0.17		0.98 (0.96–1.00)	0.09		0.99 (0.97–1.00)	0.34	
Education (years)	0.95 (0.85–1.07)	0.85		1.07 (0.96–1.12)	0.43		1.04 (0.94–1.10)	0.23	
SES	0.94 (0.77–1.10)	0.28		1.04 (0.87–1.22)	0.31		0.83 (0.69–1.00)	0.08	
Present at Gaza envelope communities during the attack (1 = yes)	2.65 (1.21–3.91)	0.01		2.62 (1.18–5.84)	0.12		1.61 (0.62–4.12)	0.25	
A nuclear family member or a close friend harmed during the attack (murdered, kidnapped, or injured during the attack (1 = yes)	1.55 (0.99–2.43)	0.09		1.35 (0.85–2.13)	0.22		1.45 (0.86–2.34)	0.10	
Sought shelter due to missile attacks (1 = yes)	0.99 (0.91–1.08)	0.24		1.04 (0.95–1.13)	0.43		1.01 (0.97–1.16)	0.65	

Note: ITQ = International Trauma Questionnaire; PHQ-2 = Patient Health Questionnaire-2; GAD-2 = Generalized Anxiety Disorder-2; OR = odd ratio. CI = confidence interval. Step 2 Negalkerkere R^2 = 0.19 for PTSD-T2; 0.22 for Depression T2; 0.29 for GAD-T2.

Table 2: Predictors of probable diagnoses at T2–one month after the October 7 terror attack (N = 710).

CI = 1.18–5.84). Having a family member or a close friend harmed during the attack was found to contribute to probable depression (OR = 1.55 95% CI = 0.99–2.43). No other factors contributed to depression at T2.

GAD
After controlling for anxiety symptoms at T1, the odds of probable GAD diagnosis at T2 were significantly higher for women (OR = 2.21, 95% CI, 1.47–3.30). No other factors contributed to GAD at T2.

Discussion
This study is the first to examine, longitudinally, the mental health consequences of the Oct 7, 2023, terrorist attack among Israeli civilians. Following the attack, the prevalences of probable PTSD, depression, and anxiety were found to be high (29% for PTSD, 42%–44% for depression and GAD, respectively), almost doubling the prevalences recorded two months before the attack. As noted, the brutality and the sheer number of casualties in the October 7 attack were unprecedented in Israel's history and likely beyond. Moreover, these events seem to have affected the participants' lives, including grieving those murdered, concern over those kidnapped, and the threat to personal safety (both personally and collectively). Thus, it may not surprise that the prevalences of PTSD, depression, and GAD are considerably higher than those reported in previous studies focusing on terrorist attacks, such as the 9/11 attacks and other terrorist attacks.[22–24] Following that, the current findings may reflect the psychological burden of the attack on the Israeli population, underscoring the impact of the attack on both Jews and Arabs within the community.

Aligning with other studies,[5] we found that direct exposure to the attack had a high impact on both probable PTSD and depression, as those present in the Gaza envelope communities during the attack had a 3-times higher likelihood of presenting with probable PTSD and a 2-times higher likelihood of presenting with depression. These findings are alarming, emphasizing the importance of implementing prevention efforts aimed at reducing chronicity.[24] Exacerbating the upended life of many citizens, those with direct exposure were compelled to evacuate their homes due to the war with Hamas that commenced following the attack.

Consistent with previous studies,[5,39] we found that the traumatic events had a more considerable impact on those already struggling with psychological difficulties. Specifically, the findings show that one of the robust predictors of psychological burden in the aftermath of the attack was the presence of pre-October 7 symptoms of probable PTSD, depression, and GAD. For example, having PTSD symptoms before the attack was found to increase the risk of probable PTSD by 2-times. These findings suggest the role that pre-attack psychological symptoms may have had in increasing the risk of short-term PTSD beyond demographic risk factors and direct exposure to the attack. Thus, when assessing those who are at risk of developing psychiatric diagnoses following a traumatic event, our findings may underscore the importance of considering individuals' pre-attack mental condition. Furthermore, the findings stress the urgent importance of following up on trauma-exposed patients with a known history of psychological difficulties over the long term to detect both early and late onset of psychiatric diagnoses and treat them appropriately as needed. While other studies note the prospect of spontaneous recovery from psychiatric symptoms over time,[19] the severity of the attack, as well as the impact of the war with Hamas in its aftermath, may result in continued high levels of psychiatric difficulties and psychological burden in the current situation. Future work is needed to determine these long-term effects.

Interestingly, we found that the levels of psychiatric symptoms at T1 (before the attack) were already higher than those anticipated under normal conditions. It is important to note that at T1, Israel was facing a 9-month-long civil upheaval against the government's efforts to implement a judicial and legislative overhaul.[40] Thus, while the source of the elevated psychiatric symptoms at T1 cannot be determined, we may suggest that the baseline levels of probable PTSD, depression, and GAD were high relative to Israel's general situation and may have been affected by the social upheaval and large-scale protests. This situation of "trauma on trauma" may increase vulnerability, partly due to the experience of betrayal,[41] which, in turn, can impact the citizens's resilience and vulnerability. On the other hand, the arrested implementation of the judicial and legislative overhaul in the wake of the terrorist attack may partly explain the unexpected result regarding participants who had presented probable PTSD and depression at T1 but not at T2.

The current findings should be considered in light of several limitations. First, while the probable PTSD, depression, and GAD were measured using validated, well-established self-report questionnaires, the single post-baseline point of measurement (T2) to determine the change in the prevalences of probable diagnoses is a limitation. While the findings of this study highlight the high early mental health impact of the October 7 attack, many participants presenting probable diagnoses a month after the attack may show spontaneous recovery or delayed onset of these short-term PTSD, depression, and anxiety symptoms in the coming months.[42,43] Thus, it is critical to continue studying the trajectories of these diagnoses over time. Second, while we examined several demographics and attack-related predictors, other unaddressed intervening factors (e.g., the war that began between Israel and Hamas after October 7) might play a role in the short-term course of the psychiatric outcomes. For example, receiving psychological treatment for psychiatric disorders between T1 and T2 could have influenced the responses on the research measures at T2, thus affecting the findings. In another example, being present at the Gaza envelope communities on October 7 serves in our study as a proxy of direct exposure to trauma, but we cannot be entirely certain that all who were there on October 7 were actually directly exposed to the traumatic events. Thus, while it is reasonable to assume that much of the change in individuals' mental health burden between T1 and T2 derived from the October 7 attacks, this study cannot presume a causal association between the attack and the change in the outcome measures. In this context, the unmeasured confounding and residual confounding due to measurement error of the confounders (such as SES), as well as selection bias in the sampling methodology, should also be acknowledged as a limitation. In general, more

longitudinal research is needed to determine the underlying psychosocial factors that may have contributed to the course of PTSD, depression, and anxiety. Lastly, it should be acknowledged that this study comprises an Israeli sample in a unique cultural context, encompassing the long-term Israel-Palestinian conflict,[15] comprising a backdrop to the October 7 attack.

The present study extends previous knowledge with regard to the wide mental health impact of attacks such as that imposed on Israel on October 7. Our findings show that the deleterious effects of these attacks were not restricted to those directly exposed to the brutal acts of terror but also to those indirectly exposed. Thus, these attacks are to be considered as a mass trauma event affecting an unprecedented proportion of the country's population.

Our findings have several immediate and urgent clinical implications. Previous research has shown that mass trauma events require multi-layered screening and intervention strategies aimed at the prevention and treatment of long-lasting mental health issues caused by such events.[44–46] Thus, to address the population's mental health needs following this attack, it would be crucial to conduct an immediate assessment of those with pre-attack psychological difficulties and probable diagnoses in the aftermath of such a large-scale trauma. These assessments should be followed by short-term and long-term interventions, which may help to ease long-term and persistent mental health problems. While assessment and intervention should target the general public, more focused attention should consider the many public servants and first responders involved in the attacks, given the risks to their mental health in the months following their supporting of victims of large-scale traumatic incidents.[47,48]

Along with the focus on those with psychiatric diagnoses, the October 7 attack had a large-scale deleterious effect on the entire country. Thus, early-term to mid-term interventions should be accessible to the entire citizenry with the aim of promoting a sense of safety and calm, a sense of self and community efficacy, connectedness, and hope.[49] Such interventions should be provided formally and informally by professionals and institutions[50] at the group, family, or community levels in parallel to individual-level interventions.[51,52] To conclude, we firmly believe that these strategies and layers of interventions should take into account natural healing processes, which may allow for the integration of grief processes and the fostering of resilient coping strategies.

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