



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Factors associated with current posttraumatic stress disorder among COVID-19 vaccinated older adults in Israel

ARTICLE INFO

Keywords

Post traumatic stress disorder
COVID-19
Vaccine hesitancy
Ageism
Vaccine side effects

ABSTRACT

This is the first study to examine COVID-19 vaccine-related stressors in the context of current posttraumatic stress disorder (PTSD) symptoms amongst older adults exposed to traumatic events prior to the COVID-19 outbreak, with particular focus on the associations between ageism, vaccine-related stressors and PTSD. Five hundred and sixty-three participants aged 65 and above reported exposure to at least one traumatic event, their current PTSD level, physical and mental health, ageist attitudes, and vaccine related stressors. Univariate logistic regression revealed that depressive symptoms, ageism, vaccine hesitancy and severity of side effects were the main factors associated with clinical levels of current PTSD. These results suggest that older adults were vulnerable to intensified PTSD symptoms, not only as a result of greater depression, but also as a consequence of other factors, including ageism, vaccination hesitancy and vaccination side effects. Practitioners would benefit from awareness to these factors.

1. Introduction

Older adults have been greatly influenced by the deleterious consequences of the COVID-19 pandemic, which has resulted in a deterioration of mental health (Shrira et al., 2020; Zhu et al., 2021). However, in line with the literature on posttraumatic stress disorder (PTSD), during both the SARS-CoV-1 and COVID-19 (SARS-CoV-2) pandemics, older adults were more resilient, and experienced a lesser mental health burden than younger adults (Sterina et al., 2021). This is despite evidence that those with previous pre-pandemic exposure to trauma were more susceptible to current posttraumatic stress symptoms (Solomon et al., 2021), and those at greater risk of infection by COVID-19 report higher levels of posttraumatic symptoms (Jiang et al., 2020; Sun et al., 2020). The current study examines whether vaccination in this context is perceived as a 'possible' light at the end of the pandemic tunnel or as a potent stressor. The novelty and speedy development of the new COVID-19 Pfizer vaccine contributed to a great deal of misinformation and the spread of conspiratorial fears (Donovan, 2020; Fusick et al., 2020). Vaccine concerns were particularly prominent in Israel during the initial vaccination stage, as Israel was the first country to roll out a nationwide vaccination program (Ministry of Health, Israel, 2021). As in other countries, one concern was that "vaccination is more dangerous than COVID-19" (Berry et al., 2021). Therefore, it was expected that vaccination may also be a stressor due to its novelty and rumored risks, which we predict will be positively associated with PTSD symptoms. We present the first study to address the association between potential vaccine-related stressors and current PTSD symptoms amongst older adults vaccinated for COVID-19.

While some have treated PTSD symptoms as an independent variable during COVID-19 (Maytles et al., 2021), in our study PTSD was treated as an outcome for two reasons. First, although trauma exposure may have likely preceded COVID-19, our assessment of PTSD frames this in

the context of the last month. Second, and more importantly, previous longitudinal studies have shown that COVID-19 related experiences, e.g., news exposure (Solomon et al., 2021), or COVID-19 exposure (Wathelet et al., 2021), exacerbated prior PTSD symptoms. We thus anticipated that vaccine-related stressors (e.g., vaccine hesitancy, and post vaccination side-effect severity) may be associated with current PTSD, among participants with pre-COVID-19 trauma exposure. Another important factor we examined was ageism (e.g., negative stereotypes against older adults) as the COVID-19 pandemic was portrayed, as a "problem of older adults" (Ayalon et al., 2021, p. 1221). We, thus, examined the putative association of ageism with current PTSD status (see Levy et al., 2019). Finally, we examined the classical concomitants of PTSD (i.e., self-rated health, anxiety, and depressive symptoms).

2. Methods

2.1. Sample and process

Using a web-based survey company, data were collected from January 25 to February 4, 2021 amongst the Jewish population across Israel using representative proportional sampling. On the last day of data collection 3,387,105 (36.42%) Israelis had received their first vaccine dose, and more than two million citizens (21.77%; 58.8% of them 60+) received their second dose of vaccination (Ministry of Health, 2021). The survey included 563 participants (average age = 68.91 ± 3.38 , range 65–85) who reported receiving at least one vaccination dose and reported exposure to at least one traumatic event prior to the COVID-19 pandemic. Respondents were predominately female ($n = 339$, 60.2%), 73.2% were married/cohabitating ($n = 412$), and 49.9% had tertiary-education ($n = 281$).

2.2. Measures

Participants indicated their age, gender, marital-status (1 = not married, 2 = married/living as cohabitant) and education (five levels: 1 = elementary education to 5 = academic education). Physical health was reported using a self-rated health item “In general, how do you rate your health?” on a scale ranging from 1 (not good at all) to 5 (very good) (Idler and Benyamini, 1997), mental health was measured both by the depressive symptoms 9-item PHQ-9 scale ($\alpha=.846$; Spitzer et al., 2006), and by the general anxiety 7-item scale (GAD-7, $\alpha=.948$; Kroenke et al., 2001). A 20-item questionnaire evaluated ageism ($\alpha=.869$, North and Fiske, 2013). Finally, three vaccination measures were: (1) number of days since first vaccine, (2) vaccine hesitancy (8 items adapted from Giambi et al., 2018, $\alpha=.832$), (3) 23-items indexing severity of COVID-19 vaccine side effects on a 5-point Likert scale (1 = not at all to 5 = very-severe; $\alpha=.830$, taken both from the FDA website (<https://www.fda.gov/media/144414/download>) and the Israeli Ministry of Health <https://www.health.gov.il/English/Pages/HomePage.aspx>). PTSD symptoms were measured by the ITQ which included 6-items comprising three clusters: re-experiencing, avoidance, and a sense of threat (ITQ; $\alpha=.839$; Cloitre et al., 2013) experienced in the last month with reference to their pre-COVID-19 traumatic exposure. Clinical PTSD levels were determined when each of the three symptom clusters caused a high/very high level of suffering and significant functional impairment. There was no multicollinearity; tolerance was 0.790; the variance inflation factor (VIF) was 1.226 (Field, 2009; O'Brien, 2007). Ethical approval was received from the Institutional Review Board at the university of the second and last authors.

3. Results

In our sample 134 (23.8%) participants reached the clinical PTSD criteria levels. Participants with clinical PTSD levels were younger, suffered from more adverse health condition, showed more anxiety and depressive symptoms, had more negative age stereotypes, were vaccinated a few days later, showed higher vaccine hesitancy levels, and displayed more severe side effects (see Table 1).

A univariate logistic regression analysis showed that none of the demographic variables was significantly associated with PTSD. Depressive symptoms were associated with a higher risk for PTSD (PHQ-9: OR = 1.09, 95%CI: 1.03–1.15); ageism was also related to a higher risk for PTSD (OR = 1.50, 95%CI: 1.08–2.08). Finally, PTSD was linked both with higher levels of vaccine hesitancy (OR = 1.49, 95%CI: 1.06–2.10) and severity of side effects (OR = 2.39, 95%CI: 1.06–5.39).

4. Discussion

The current study assessed factors associated with current PTSD in vaccinated older adults who were exposed to a pre-COVID-19 traumatic event. Prevalence of clinical PTSD levels was high (23.8%). To contextualize this PTSD prevalence rate, note that a web-based young adult sample conducted three years ago by the same survey company revealed a PTSD prevalence of 9.0% (Ben-Ezra et al., 2018). Moreover, such a high PTSD prevalence rate is similar to that obtained in midlife and older-adults civilians after two decades of missile attacks, where PTSD prevalence was estimated at 24.8% (Palgi, 2017). Thus, it is likely that both preceding COVID-19 conditions (death, sickness, etc.) along with the pioneering accelerated Israeli vaccination program may have served as stressors, especially for those exposed to past trauma. Additionally, elevated vaccine suspicion and mistrust of medical authorities, likely evidenced through vaccine hesitancy, were also linked with higher PTSD symptom levels. These findings emphasize the necessity for a comprehensive public awareness campaign focusing on vaccination safety and targeted at those with higher levels of vaccine hesitancy. Such a campaign may not only encourage vaccination willingness but may also reduce levels of PTSD.

Table 1

Univariate logistic regression analyses.

Variable	Difference Tests		Univariate Logistic Regressions, Likelihood of Diagnosis Relative to No Diagnosis
	Not PTSD vs. PTSD Mean (SD)/N (%)	Difference test	PTSD cutoff, (429 vs. 134) OR (95% CI)
Age	69.13 (3.44) vs. 68.22 (3.10)	$t(561) = 2.75^{**}d = .27$.936 (.871–1.005)
Gender ^a	46 (8.2%) vs. 88 (15.6%)	$\chi^2(1) = 2.27; p = .13$.970 (.593–1.585)
Marital status ^b	39 (6.9%) vs. 95 (16.8%)	$\chi^2(1) = .49; p = .49$.934 (.554–1.574)
Education ^c	5.26 (.90) vs. 5.12 (1.09)	$t(561) = 1.49; p = .14; d = .15$.901 (.719–1.130)
Self-rated health ^d	3.70 (.93) vs. 3.29 (.98)	$t(561) = 4.42^{***}d = .44$.863 (.678–1.098)
GAD-7	2.95 (4.77) vs. 5.75 (5.47)	$t(561) = -5.72^{***}d = .57$	1.037 (.991–1.085)
PHQ-9	3.73 (3.97) vs. 6.94 (5.55)	$t(561) = -7.37^{***}d = .73$	1.089 (1.032–1.150)**
Ageism	2.20 (.67) vs. 2.43 (.66)	$t(561) = -3.42^{**}d = .34$	1.500 (1.081–2.084)*
Days since vaccination	28.56 (9.30) vs. 25.91 (10.13)	$t(561) = 2.82^{**}d = .28$.986 (.963–1.010)
Vaccine hesitancy	1.83 (.62) vs. 2.23 (.75)	$t(561) = -6.09^{***}d = .60$	1.491 (1.061–2.096)*
Severity of side effects	1.21 (.24) vs. 1.36 (.31)	$t(561) = -5.85^{***}d = .58$	2.386 (1.057–5.386)*

* $p < .05$, ** $p < .01$, *** $p < .001$.

Note: Total N = 855; Nagelkerke $R^2 = .22$, Positive PTSD = 134, negative PTSD = 429.

^a PTSD for 1 = male, 2 = female.

^b PTSD for 1 = not married, 2 = currently married, or living with a partner.

^c = five education levels from 1) preprimary education to 5) tertiary education.

^d 1 = not good at all to 5 = very good.

While ageism has been previously associated with higher PTSD levels (Levy et al., 2019), it may have been that COVID-19 ageism (Ayalon et al., 2021) would have been less relevant after vaccination, as older adults no longer compete with younger counterparts for necessary life-saving resources. Our data suggests, however, that even after vaccination older adults reacted to the internalized ageist attitudes prevalent during COVID-19 (see Ayalon, 2020), with this vulnerability associated with their susceptibility to trauma. Likewise, experiencing more severe vaccination side effects potentially questioned vaccination safety, acting as a stressor that in turn was positively related to higher risk for PTSD. However, the cross-sectional nature of the current study did not allow us to discern directionality (whether anxieties related to vaccination safety exacerbated PTSD or vice-a-versa). Similarly, as we did not assess the type of pre-COVID-19 exposure or COVID-related stress, we cannot know if and how different exposures or stressors may have impacted results. Furthermore, our study may have been biased by including only vaccinated older adults exposed to at least one traumatic event that occurred before the COVID-19 outbreak. Nevertheless, our findings show it is important for practitioners to pay attention to ageist attitudes, vaccine hesitancy, and severe vaccination side-effects in light of their association with PTSD symptoms amongst older adults.

Funding

This study was supported by internal research grant from Ariel University, given to Menachem Ben-Ezra.

Statement of interest

The authors declare that they have no actual or potential conflict of interest of any kind in relation to this study.

Acknowledgements

we would like to thank to all those who helped us to distribute the questionnaire.

References

- Ayalon, L., 2020. There is nothing new under the sun: ageism and intergenerational tension in the age of the COVID-19 outbreak. *Int. Psychogeriatr.* 32, 1221–1224. <https://doi.org/10.1017/S1041610220000575>.
- Ayalon, L., Chasteen, A., Diehl, M., Levy, B., Neupert, S.D., Rothermund, K., et al., 2021. Aging in times of the COVID-19 pandemic: avoiding ageism and fostering intergenerational solidarity. *J. Gerontol. B Psychol. Sci. Soc. Sci.* 76, 47–52. <https://doi.org/10.1093/geronb/gbaa051>.
- Ben-Ezra, M., Karatzias, T., Hyland, P., Brewin, C.R., Cloitre, M., Bisson, J.I., et al., 2018. Posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) as per ICD-11 proposals: a population study in Israel. *Depress. Anxiety* 35, 264–274. <https://doi.org/10.1002/da.22723>.
- Berry, S.D., Johnson, K.S., Myles, L., Herndon, L., Montoya, A., Fashaw, S., Gifford, D., 2021. Lessons learned from frontline skilled nursing facility staff regarding COVID-19 vaccine hesitancy. *J. Am. Geriatr. Soc.* 69, 1140–1146. <https://doi.org/10.1111/jgs.17136>.
- Cloitre, M., Garvert, D.W., Brewin, C.R., Bryant, R.A., Maercker, A., 2013. Evidence for proposed ICD-11 PTSD and complex PTSD: a latent profile analysis. *Eur. J. Psychotraumatol.* 4, 20706.
- Donovan, J., 2020. Social-media companies must flatten the curve of misinformation. *Nature*. <https://doi.org/10.1038/d41586-020-01107-z>.
- Field, A.P., 2009. *Discovering Statistics Using SPSS*. Sage, London.
- Fusick, A.J., Gunther, S., Sullivan, G., 2020. The anti-vaccination movement: when does a belief become delusional? *J. Public Health* 1–2. <https://doi.org/10.1007/s10389-020-01244-9>.
- Giambi, C., Fabiani, M., D'Ancona, F., Ferrara, L., Fiacchini, D., Gallo, T., et al., 2018. Parental vaccine hesitancy in Italy—results from a national survey. *Vaccine* 36, 779–787. <https://doi.org/10.1016/j.vaccine.2017.12.074>.
- Idler, E.L., Benyamini, Y., 1997. Self-rated health and mortality: a review of twenty-seven community studies. *J. Health Soc. Behav.* 38, 21–37. <https://doi.org/10.2307/2955359>.
- Jiang, H., Nan, J., Lv, Z., Yang, J., 2020. Psychological impacts of the COVID-19 epidemic on Chinese people: exposure, post-traumatic stress symptom, and emotion regulation. *Asian. Pac. J. Trop. Med.* 13, 252–259. <https://doi.org/10.4103/1995-7645.281614>.
- Kroenke, K., Spitzer, R.L., Williams, J.B., 2001. The PHQ-9: validity of a brief depression severity measure. *J. Gen. Intern. Med.* 16, 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>.
- Levy, B.R., Chung, P.H., Slade, M.D., Van Ness, P.H., Pietrzak, R.H., 2019. Active coping shields against negative aging self-stereotypes contributing to psychiatric conditions. *Soc. Sci. Med.* 228, 25–29. <https://doi.org/10.1016/j.socscimed.2019.02.035>.
- Maytles, R., Frenkel-Yosef, M., Shrira, A., 2021. Psychological reactions of Holocaust survivors with low and high PTSD symptom levels during the COVID-19 pandemic. *J. Affect. Disord.* 282, 697–699. <https://doi.org/10.1016/j.jad.2021.01.007>.
- Ministry of Health, 2021. COVID-19 in Israel. Retrieved from. https://datadashboard.health.gov.il/COVID-19/general?utm_source=go.gov.il&utm_medium=referral on 7/3/21.
- North, M.S., Fiske, S.T., 2013. A prescriptive intergenerational-tension ageism scale: succession, identity, and consumption (SIC). *Psychol. Assess.* 25, 706–713. <https://doi.org/10.1037/a0032367>.
- O'Brien, R.M., 2007. A caution regarding rules of thumb for variance inflation factors. *Qual. Quantity* 41, 673–690.
- Palgi, Y., 2017. Matter of will: the association between posttraumatic stress symptoms and the will-to-live. *Psychiatr. Res.* 249, 180–186. <https://doi.org/10.1016/j.psychres.2017.01.021>.
- Shrira, A., Hoffman, Y., Bodner, E., Palgi, Y., 2020. COVID-19 related loneliness and psychiatric symptoms among older adults: the buffering role of subjective age. *Am. J. Geriatr. Psychiatr.* 32, 1371–1375. <https://doi.org/10.1016/j.jagp.2020.05.018>.
- Solomon, Z., Ginzburg, K., Ohry, A., Mikulincer, M., 2021. Overwhelmed by the news: a longitudinal study of prior trauma, posttraumatic stress disorder trajectories, and news watching during the COVID-19 pandemic. *Soc. Sci. Med.* 278, 113956.
- Spitzer, R.L., Kroenke, K., Williams, J.B., Löwe, B.A., 2006. Brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch. Intern. Med.* 166, 1092–1097. <https://doi.org/10.1001/archinte.166.10.1092>.
- Sterina, E., Hermida, A.P., Gerberi, D.J., Lapid, M.I., 2021. Emotional resilience of older adults during COVID-19: a systematic review of studies of stress and well-being. *Clin. Gerontol.* 1–16. <https://doi.org/10.1080/07317115.2021.1928355>.
- Sun, L., Sun, Z., Wu, L., Zhu, Z., Zhang, F., Shang, Z., Jia, Y., Gu, J., Zhou, Y., Wang, Y., Liu, N., Liu, W., 2020. Prevalence and Risk Factors of Acute Posttraumatic Stress Symptoms during the COVID-19 Outbreak in Wuhan, China. *MedRxiv*. <https://doi.org/10.1101/2020.03.06.20032425>.
- Wathelet, M., Fovet, T., Jousset, A., Duhem, S., Habran, E., Horn, M., et al., 2021. Prevalence of and factors associated with post-traumatic stress disorder among French university students 1 month after the COVID-19 lockdown. *Transl. Psychiatry* 11, 1–7.
- Zhu, K., Niu, Z., Freudenheim, J.L., Zhang, Z.F., Lei, L., Homish, G.G., et al., 2021. COVID-19 related symptoms of anxiety, depression, and PTSD among US adults. *Psychiatr. Res.* 301, 113959.

Yuval Palgi*

Department of Gerontology, University of Haifa, Haifa, Israel

Lee Greenblatt-Kimron

School of Social Work, Ariel University, Ariel, 40700, Israel

Yaakov Hoffman

Interdisciplinary Department, Bar-Ilan University, Ramat-Gan, Israel

Robin Goodwin

Department of Psychology, Warwick University, Coventry, UK

Menachem Ben-Ezra

School of Social Work, Ariel University, Ariel, 40700, Israel

* Corresponding author. Department of Gerontology and the Center for Research and Study of Aging, University of Haifa, Mount Carmel, 3498838, Israel.
E-mail address: ypalgi@research.haifa.ac.il (Y. Palgi).