RESEARCH ARTICLE

Sick of news? Television news exposure, collective stressful events and headache related emergency department visits

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Abstract

Stress is a well-known trigger for primary headache yet its impact is difficult to demonstrate in large epidemiological studies. Israeli national TV news is often referred to as the "tribal fire", as many Israelis watch national news coverage following terror attacks or military operations. We examined the association between exposure to television news and their content with headache related Emergency Department visits. This retrospective cohort study included data on daily Emergency Department visits with a chief complaint of headache in Soroka University Medical Center, during 2002–2012. Data on daily television news viewership ratings were obtained from the Israeli Audience Research Board and its content from Channel 2 headlines, the highest rated TV news program. To estimate the short-term effects of news rating during the evening news on the number of daily headache visits, we applied generalized linear mixed models. 16,693 Emergency Department visits were included in the analysis. An increase in five units of daily rating percentages was associated with increase in Emergency Department visits the following day, relative risk (RR) = 1.032, (95% CI 1.014–1.050). This association increased with the age of the patients; RR = 1.119, (95% CI 1.075–1.65) for older than 60-year-old, RR = 1.044 (95% CI 1.010–1.078) for ages 40–60 and RR = 1.000 (95% CI 0.977–1.023) for younger than 40-year-old. We did not find a specific content associated with ED visit for headache. Higher television news ratings were associated with increased incidence of Emergency Department headache related visits. We assume that especially among older persons, news viewership ratings provide an indirect estimate of collective stress, which acts as a headache trigger for susceptible subjects.

Introduction

Non-traumatic headache episodes are a common presenting complaint at emergency departments worldwide [1]. Intracranial pathology is found in only a minority of the patients, and it is therefore believed that most of the ED visits represent primary headache disorders [2].

Many intrinsic precipitating factors for headache episodes in susceptible individuals were reported [3–8]: afferent stimulation, physical activity, menstrual changes, psychological factors, sleep cycle disorders, and dietary factors, yet none of them can fully account for the variability in the frequency of ED headache related visits. Extrinsic factors such as climate patterns and ambient air pollution was previously reported to be associated with changes in daily headache related ED visits as well [9].

Patients, with both tension and migraine type headaches, often report stress to be one of their major triggers [4, 10]. Although stress is a universal experience, it is difficult to measure the personal level of stress, and it is almost impossible to quantify the level of collective stress, experienced by groups or communities.

A potential source of stress may be the news, particularly bad news. According to Affective Intelligence—AI [11], anxious individuals are motivated to be information seekers, as information may be vital to their own survival. Hence, it is not surprising, that while individuals state they do not appreciate negative news, we witness a tendency to seek such news [12].

News watching in itself might elevate anxiety. A study from the USA where self-reported data was collected, suggested that following the news was one of the biggest daily stressors among individuals who report a high level of stress [13]. Moreover, a recent internet-based survey following the Boston Marathon bombing showed that repeated bombing-related media exposure was associated with higher acute stress than was direct exposure (presence in the bombing area). In addition, watching a 15-minute news segment was enough to trigger persisting negative psychological feelings, which decreased only after a progressive relaxation [14].

In this ecological population based study we sought to evaluate the association between the daily national news consumption and their content with headache related ED visits.

Materials and methods

Study population

The Soroka University Medical Center (SUMC) internal review board approved the study—0361–12. Due to the nature of this study, patients did not sign a consent form. We correlate ER visits to TV ratings using no personal patient information. We obtained data on daily ED visits to SUMC with a primary complaint of headache in patients 18 years or older during a ten-year period (between December 1, 2002 and December 31, 2011). SUMC is a tertiary 1000 bed hospital and the only medical center in the Negev region, serving a population of 700,000 residents. The annual adult ED visits volume is ~100,000. We excluded from the analysis patients hospitalized following the ED visit as we presumed them to have a serious medical problem requiring ED visit unrelated to the stress trigger.

Television news rating data

National Israeli Television news exposure levels were obtained from the Israeli Audience Research Board (IARB), which measures TV viewership ratings using a "people meter" method. In this method, electronic tracking devices are connected to all the television sets in the homes of the panel participants, currently numbering 580 households with approximately 1800 individuals, comprising a representative sample of the television owners in Israel. The device monitors every act of turning on, turning off, and switching between channels on the television sets. Monitoring is performed in real time and continuously throughout the day, 24/7. Daily viewing ratings of the evening news edition in the three major TV news channels were obtained for the study period. Overall, television news consumption in Israel is quite high: 37.3% of Israelis watched in 2012 the evening news [15], in comparison to 27% of Americans who watched the networks' evening news in the USA [16].

Television news content analysis

To explore which news items generated the highest rating, we collected the first two headlines of Channel 2 evening news, the most watched evening news program, with 60% of all television nightly news viewership [15]. Headline data was available from 2008 till 2012. Two trained coders rated all the first two opening headlines from Channel 2 evening news. Headlines were categorized into seven non-exclusive categories. Categorization of 2,421 headlines into seven non-exclusive categories was performed by two coders which obtained a percent agreement of 92.3%, Cohen's κ = 0.578 (95% CI, 0.266 to 0.830), $p < 0.0001$. These categories are Military Conflict and Terrorism (military operations by or against Israel and terrorist attacks against Israelis), Israeli Politics (legislation, campaigns, etc.), Israeli Foreign Relations (peace negotiations, high level meetings or exchanges with foreign leaders and diplomats), Domestic Crime and Scandals, the Economy, World Events (disasters, foreign elections, wars, etc.) and Miscellaneous (all items which did not fit all other categories.

Statistical analysis

Data were summarized using frequency tables for categorical variables and summary statistics (median with inter-quartile range, mean with standard deviation and range) for continuous variables. To estimate the short term effects of daily news rating on number of daily headache ED visits, we applied a generalized linear mixed models (GLMM) methodology described by Szyszkowicz M. et. al. [17]. Poisson random-effects models were utilized to analyze the cluster counts where the groups of days, determined by the triplet (day of the week, month, year) formed the clusters. The hierarchical construction of the clusters allows the model to incorporate level specific random effects. We used the glmmPQL function from the R statistical package to perform the analysis. Relative risk (RR) with 95% confidence intervals (CI) represent the risk for of ED visits for headache associated with an increase in daily news rating adjusted for public holiday days. Additionally, we stratified our analysis by gender and by age groups (<40, 40–60 and >60 years old) to compare the magnitude of the effect. Scatter plot with overlay of LOESS (locally weighted scatter plot smoothing) curve was produced to examine the relationship between daily estimation and predicted daily ED visits with headache. P values less than 0.05 were considered statistically significant. We used R statistical package, v 3.2 to perform the analysis.

Results

The study population comprised 14,010 patients with 16,693 ED visits, with 19.1% of the patients having more than one visit during the study decade. Among them, 57.6% female and 54.3% were younger than 40 years old (Table 1). Mean, median, minimum and maximum daily television rating percentages (the percent of potential viewers who watched the evening

Table 1. Frequency of ED visits for headache (2002–2012).

Total Number of Headache ED visits	16,693
Age (years), mean ± SD	41.3 ±18.6
<40, n (%)	9,067 (54.3%)
40–60, n (%)	4,608 (27.6%)
>60, n (%)	3,018 (18.1%)
Gender	
Female, n (%)	9,616 (57.6%)
Number of visits per patients, median (Range)	1 (1–31)

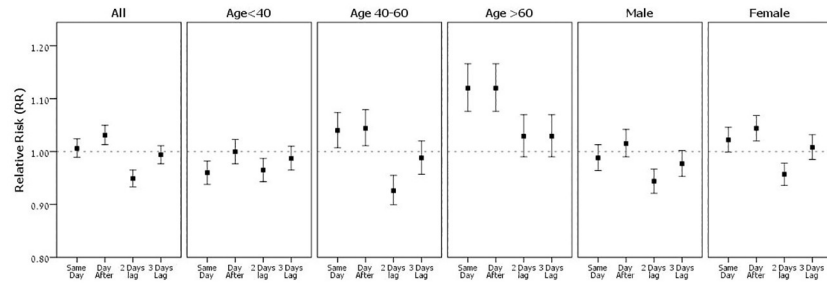https://doi.org/10.1371/journal.pone.0249749.t001

Fig 1. Relative Risk (RR) for daily ED visits for headache associated with daily rating percent, among age groups and by male and females. Relative Risk (RR) and 95% Confidence Interval for ED visits per increase in 5 units of daily rating percentages. Results of the separated Poisson regression models, for study period 2002–2012, adjusted for public holidays.

news) of all three major news channels during the study period were the following; 29.3±5.2, 29.5, 3 and 51.0, respectively.

Effect of daily news rating on the incidence of headache ED visits

An increase of 5% in daily rating was associated with increase in ED visits the following day, relative risk (RR) = 1.017, (95% CI 1.001–1.033). (Fig 1) but not two and three days after, RR = 0.953(95% CI 0.939–0.967) and RR = 0.990 (95% CI 0.973–1.007), respectively, where the association was protective. This association increased with the age of the patients; RR = 1.119, (95% CI 1.075–1.65) for older than 60-year-old, RR = 1.044 (95% CI 1.010–1.078) for ages 40–60 and RR = 1.000 (95% CI 0.977–1.023) for younger than 40-year-old. In addition, we observed a marginal increase in the effect among female patients, RR = 1.04 (95% CI 1.020–1.068) as compared to men, RR = 1.015 (95% CI 0.990–1.042). The non-linear association between rating estimation the following day and ED visits with headache was expressed as LOESS curve scatter plot (S1 Fig).

Similar to the linear analysis, the magnitude of effects observed was larger among older patients. We further examined whether two days of cumulative exposure to high percentage of rating estimates (above 29.5%—median rating percentage) is associated with an additional increase in risk of ED admission. This effect was found only among older patients (over the age of 60); RR = 1.275 (1.172–1.387) (Table 2).

Content analysis of leading evening news items

News broadcasts that open with reports on military operations and terror attacks against civilians were the most watched news editions over this period (top 10% rating headlines) (S2 Fig). We further analysis the magnitude of the effect of increase in ED visits the following day across

Table 2. Relative Risk (RR) for daily ED visits for headache associated with cumulative exposure over 29.5%* percent in two days preceding the ED visit.

	RR**	95%CI
All	0.990	0.952–1.030
Age >60	1.275	1.172–1.387
Age 40–60	1.039	0.967–1.116
Age <40	0.884	0.839–0.933
Male	0.958	0.905–1.015
Female	1.019	0.968–1.072

different content of the headlines (S1 Table). We did not find a specific content associated with ED visit for headache.

Discussion

In this analysis of more than fifteen thousand headache related ED visits over a decade, we attempted to assess the short term effects of Israeli national news consumption. We demonstrated an association between news consumption and the incidence of headache related ED visits (during the following day. This association was particularly pronounced in patients over 60 years of age. This effect was not related to the content of the news headlines.

Stress is a well-recognized headache trigger, in both migraine and tension type headache. Recently, in a longitudinal study [18] self-report of stress was associated with the frequency of both migraine and tension type headache (an increase of 10 points in stress intensity measured by VAS 0–100 was associated with an increase of 6.0% of TTH frequency and 4.3% for migraine). The effect was higher in younger age groups. Increased headache prevalence was also reported among survivors and responders following major natural or man-made disasters [19, 20].

While stress is a subjective experience affected by multiple biological, psychological and social factors, collective community wide experiences may affect the personal level of stress. The effect of such collective experiences is usually referred to as collective stress [21].

During major national or international crises, the public seeks information. This public attention, which elevates news consumption, may be indicative of increased stress levels. In this sense, the level of news exposure, gauged by television news ratings, can be perceived as a surrogate marker of increased collective stress. On the other hand, widespread media coverage transmits the impact of stressful events to populations not exposed to the event itself, amplifying collective stress and psychological trauma related symptoms. Such effect was demonstrated in several major events and disasters such as the Oklahoma City bombing [22], H1N1 influenza pandemic [23], 1994 California earthquake [24], Boston Marathon bombing [14], the 1990 Gulf War [25], and 9/11 [26]. Therefore, news consumption is not only a marker of collective stress, it is also a collective stress amplifier, contributing by itself to the stress and its effect.

Two mechanisms may explain the association between the collective stress and increased rates of headache associated ED visits. The first is a psychobiological effect, according to which, collective stress is a headache-precipitating factor similar to personal stress, possibly increasing the likelihood of headaches or their severity, resulting in increased rates of ED consultations. The second is a psychosocial effect, increasing the tendency of headache sufferers and their caregivers to seek emergency medical support for headache episodes during high collective stress events.

While the association between personal stress and different types of headaches was especially pronounced in young individuals, in our study, the association was the greatest among individuals older than 60 and had a marginal increase in the effect among female patients. Since TV news exposure is largely influenced by age, with higher exposure rates in the elderly population [27], it is possible that news viewing rates best reflect (or amplify) collective stress levels among older age groups, and not among younger individuals which mostly consume news from new media rather than television. It is also possible that elderly individuals with smaller support networks have a higher tendency to seek emergency medical assistance in high collective stress situations. Moreover, it was suggested that women suffer more stress than men and their coping style is more emotion-focused compared to men [28].

Our study has several important limitations. First, our study does not allow conclusions about the interaction between media consumption, collective stress and headaches. Moreover, Israel is unique in its continuing stressful events lifestyle and its media consumption style, therefore making the generalization of the results to other countries and communities difficult [29]. The nature of the data does not allow differentiating potential differences between TTH and migraine. Lastly, the ecological nature of our study does not allow for the individual assessment of news exposure.

The association of media consumption and headache morbidity should be further studied in different communities and setups. Prospective assessment of this association may provide us with new insights on the association between headache suffering and collective stress and possibly provide us with another possibly modifiable headache trigger.

Supporting information

S1 Fig. Predicted daily ED visits with headache associated with daily rating percent, among age groups and by male and females. Relative Risk (RR) and 95% Confidence Interval for ED visits per increase in 5 units of daily rating percentages. Results of the separated Poisson regression models, for study period 2002–2012, adjusted for public holidays.
(TIF)

S2 Fig. News headline categories by television ratings.
(TIF)

S1 Table. Relative Risk (RR) for daily ED visits for headache associated with daily raiting percent, by different content of the headlines.
(DOCX)

Author Contributions

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References

1. Ramirez-Lassepas M, Espinosa CE, Cicero JJ, Johnston KL, Cipolle RJ, Barber DL. Predictors of intra-cranial pathologic findings in patients who seek emergency care because of headache. *Arch.Neurol.* 1997 Dec; 54(12):1506–1509. https://doi.org/10.1001/archneur.1997.00550240058013 PMID: 9400360

2. Gilbert JW, Johnson KM, Larkin GL, Moore CL. Atraumatic headache in US emergency departments: recent trends in CT/MRI utilisation and factors associated with severe intracranial pathology. *Emerg. Med.J.* 2012 Jul; 29(7):576–581. https://doi.org/10.1136/emermed-2011-200088 PMID: 21856709

3. Wöber C, Holzhammer J, Zeitlhofer J, Wessely P, Wöber-Bingöl Ç. Trigger factors of migraine and tension-type headache: experience and knowledge of the patients. *J Headache Pain* 2006; 7(4):188–195. https://doi.org/10.1007/s10194-006-0305-3 PMID: 16897622

4. Rasmussen BK. Migraine and tension-type headache in a general population: precipitating factors, female hormones, sleep pattern and relation to lifestyle. *Pain* 1993; 53(1):65–72. https://doi.org/10.1016/0304-3959(93)90057-V PMID: 8316392

5. Zivadinov R, Willheim K, Sepic-Grahovac D, Jurjevic A, Bucuk M, Brnabic-Razmilic O, et al. Migraine and tension-type headache in Croatia: a population-based survey of precipitating factors. *Cephalalgia* 2003; 23(5):336–343. https://doi.org/10.1046/j.1468-2982.2003.00544.x PMID: 12780762

6. Spierings EL, Ranke AH, Honkoop PC. Precipitating and Aggravating Factors of Migraine Versus Tension-type Headache. *Headache* 2001; 41(6):554–558. https://doi.org/10.1046/j.1526-4610.2001.041006554.x PMID: 11437890

7. Turner L, Molgaard C, Gardner C, Rothrock J, Stang P. Migraine trigger factors in a non-clinical Mexican-American population in San Diego county: implications for etiology. *Cephalalgia* 1995; 15(6):523–530. https://doi.org/10.1046/j.1468-2982.1995.1506523.x PMID: 10357602

8. Robbins L. Precipitating factors in migraine: a retrospective review of 494 patients. *Headache* 1994; 34(4):214–216. https://doi.org/10.1111/j.1526-4610.1994.hed3404214.x PMID: 8014037

9. Vodonos A, Novack V, Zlotnik Y, Ifergane G. Ambient air pollution, weather and daily emergency department visits for headache. *Cephalalgia* 2015 Oct; 35(12):1085–1091. https://doi.org/10.1177/0333102415570300 PMID: 25653308

10. Boardman HF, Thomas E, Millson DS, Croft P. Psychological, sleep, lifestyle, and comorbid associations with headache. *Headache* 2005; 45(6):657–669. https://doi.org/10.1111/j.1526-4610.2005.05133.x PMID: 15953298

11. Marcus GE, Neuman WR, MacKuen M. *Affective intelligence and political judgment.* University of Chicago Press; 2000.

12. Trussler M, Soroka S. Consumer demand for cynical and negative news frames. *Int J Press Polit* 2014; 19(3):360–379.

13. Blendon R, Steel Fisher G, Weldon K, Benson J, Brule M, Mann F, et al. The burden of stress in America. NPR/Robert Wood Johnson Foundation Harvard School of Public Health 2014:1–12.

14. Holman EA, Garfin DR, Silver RC. Media's role in broadcasting acute stress following the Boston Marathon bombings. *Proc.Natl.Acad.Sci.U.S.A.* 2014 Jan 7; 111(1):93–98. https://doi.org/10.1073/pnas.1316265110 PMID: 24324161

15. Mann R, Lev-On A. Annual report: The media in Israel 2012: Agendas, uses and trends. The Institute for the Study of New Media, Politics and Society, 2013.

16. Kohut A, Doherty C, Dimock M, Keeter S. In changing news landscape, even television is vulnerable. *Pew Internet & American Life Project* 2012.

17. Szyszkowicz M. Use of generalized linear mixed models to examine the association between air pollution and health outcomes. *Int.J.Occup.Med.Environ.Health* 2006; 19(4):224–227. https://doi.org/10.2478/v10001-006-0032-7 PMID: 17402217

18. Schramm SH, Moebus S, Lehmann N, Galli U, Obermann M, Bock E, et al. The association between stress and headache: A longitudinal population-based study. *Cephalalgia* 2015; 35(10):853–863. https://doi.org/10.1177/0333102414563087 PMID: 25480807

19. Guetti C, Angeletti C, Papola R, Petrucci E, Ursini ML, Ciccozzi A, et al. Headache prevalence in the population of L'Aquila (Italy) after the 2009 earthquake. *J Headache Pain* 2011; 12(2):245–250. https://doi.org/10.1007/s10194-011-0311-y PMID: 21331753

20. Berríos-Torres SI, Greenko JA, Phillips M, Miller JR, Treadwell T, Ikeda RM. World Trade Center rescue worker injury and illness surveillance, New York, 2001. *Am.J.Prev.Med.* 2003; 25(2):79–87. https://doi.org/10.1016/s0749-3797(03)00110-7 PMID: 12880873

21. Gillespie DF. Barton's theory of collective stress is a classic and worth testing. *Int J Mass Emerg Disasters* 1988; 6(3):345–361.

22. Pfefferbaum B, Nixon SJ, Tivis RD, Doughty DE, Pynoos RS, Gurwitch RH, et al. Television exposure in children after a terrorist incident. *Psychiatry* 2001; 64(3):202–211. https://doi.org/10.1521/psyc.64.3.202.18462 PMID: 11708044

23. Codish S, Novack L, Dreiher J, Barski L, Jotkowitz A, Zeller L, et al. Impact of mass media on public behavior and physicians: an ecological study of the H1N1 influenza pandemic. *Infect Control Hosp Epidemiol* 2014; 35(06):709–716. https://doi.org/10.1086/676426 PMID: 24799648

24. Leor J, Poole WK, Kloner RA. Sudden cardiac death triggered by an earthquake. *N.Engl.J.Med.* 1996; 334(7):413–419. https://doi.org/10.1056/NEJM199602153340701 PMID: 8552142

25. Cantor J, Mares M, Oliver M. Desert Storm and the Mass Media, eds Greenberg B. Gantz W (Hampton, Cresskill, NJ) 1993:325–340.

26. Ahern J, Galea S, Resnick H, Kilpatrick D, Bucuvalas M, Gold J, et al. Television images and psychological symptoms after the September 11 terrorist attacks. *Psychiatry* 2002; 65(4):289–300. https://doi.org/10.1521/psyc.65.4.289.20240 PMID: 12530330

27. Wonneberger A, Schoenbach K, van Meurs L. Staying tuned: TV news audiences in the Netherlands 1988–2010. *J Broadcast Electron Media* 2012; 56(1):55–74.

28. Matud MP. Gender differences in stress and coping styles. *Pers Individ Dif* 2004; 37(7):1401–1415.

29. Doron G. The politics of mass communication in Israel. *Ann.Am.Acad.Pol.Soc.Sci.* 1998; 555(1):163–179.