



Association between media coverage and prevalence of idiopathic environmental intolerance attributed to electromagnetic field in Taiwan



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ARTICLE INFO

Keywords:

Electromagnetic field
Hypersensitivity
Idiopathic environmental intolerance
Media coverage
Prevalence
Taiwan

ABSTRACT

Idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) describes symptoms sufferers attribute to exposure to electromagnetic fields (EMF). In Taiwan, the prevalence rate of IEI-EMF was 13.3% in 2007, but a survey using the same method found the rate declined to 4.6% in 2012. Because media reports may encourage readers to attribute their symptoms to EMF, the change might be related to media coverage. We searched articles indexed in the largest newspaper database in Taiwan to evaluate the association between media coverage and the prevalence of IEI-EMF. We also assessed the effects of other potential affecting factors. The number of newspaper articles related to EMF and IEI-EMF increased from 2005 to 2007 and then has been decreasing until 2012, which is compatible with the change in the prevalence of IEI-EMF. However, from 2007 to 2012, the other potential affecting factors such as density of mobile phone base stations, number of mobile phone users, total mobile phone calling time, and number of text messages sent through mobile phones all increased in Taiwan. This finding indicated a positive association between media coverage and the prevalence of IEI-EMF in Taiwan, which might also be true in other countries.

1. Introduction

Nowadays people are inevitably exposed to electromagnetic fields (EMF) because of the ubiquitous usage of electrical devices, such as mobile phones, microwave ovens, televisions, etc. The World Health Organization (WHO) coined the term “idiopathic environmental intolerance attributed to electromagnetic fields” (IEI-EMF) in 2005 to describe symptoms that people attribute to the existence of EMF (WHO, 2005), which include insomnia, headache, anxiety, skin itching, tinnitus, vomiting, etc. (Baliatsas et al., 2012). However, these symptoms are hardly attributable to the exposure of EMF on the basis of biological evidence. Sufferers of IEI-EMF with severe symptoms may not function normally in daily life and thus may try to shield themselves from exposure to EMF. These behaviors may hinder the sufferers' interactions with the society and thus lower their job performances, which finally contribute to the loss of jobs in some cases (Leitgeb and Schröttner, 2003). Therefore, even though the clinical standards of diagnosing IEI-EMF have not been established, it is recognized as a disability in Sweden (Johansson, 2015).

Although the health effects of EMF have been studied for decades, no reliable findings have been obtained to support that short-term EMF

exposure can evoke the IEI-EMF-like symptoms (Rubin et al., 2010, 2011; Kwon and Hämäläinen, 2010; Rööslä et al., 2010). In fact, many studies have been conducted to examine the ability of human beings to detect the existence of EMF, but no convincing evidence has been obtained (Hietanen et al., 2002; Lyskov et al., 2001; Rööslä, 2008; Rubin et al., 2011). At present, uncertainties concerning the potential health effects of exposure to EMF remain an important public issue.

Substantial prevalence rates of IEI-EMF have been reported from many countries around the world. In Sweden, the rate was 1.5% in 1997 (Hillert et al., 2002) and grew to 2.6–3.2% in 2001 (Ahlbom et al., 2001; Johansson, 2006). In Austria, the rate was 2% reported in 1994 (Leitgeb, 1994; Schröttner and Leitgeb, 2008) and grew to 3.5% in 2008 (Schröttner and Leitgeb, 2008). Because of these increasing trends, some researcher predicted that the rate would reach 50% worldwide in 2017 (Hallberg and Oberfeld, 2006). Contrary to the prediction, however, a population-based survey conducted in Taiwan found the prevalence rate of IEI-EMF to be 4.6% in 2012 (Cheng, 2014), a substantial decline from the 13.3% rate observed in a survey in 2007 using the same study method (Tseng et al., 2011). The decreasing prevalence of IEI-EMF contradicts the increased trends of wireless device use. Therefore, there must be some factors other than EMF that contribute to

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the occurrence of IEI-EMF.

Messages conveyed by media reports may influence risk perceptions of the public (Combs and Slovic, 1979). A study in Canada found that readers might be affected by the fright factors mediated from the newspaper coverage (Deignan et al., 2013). Another study has shown that poor reporting by the media had the potential of encouraging people to misattribute their symptoms to EMF (Witthöft and Rubin, 2013). An analysis of the contents of Norwegian newspapers found that 65% of the newspaper articles related to etiology of IEI-EMF conveyed the message that symptoms are associated with exposure of EMF below the international guidelines, which is much in conflict with the current evidence in the field (Huiberts et al., 2013). A similar content analysis of British newspaper assessed whether newspaper reporting reflected scientific evidence and found that of the random sample of 60 articles, 71.7% presented a mainly electromagnetic cause (Eldridge-Thomas and Rubin, 2013). The authors concluded that the media establishes the connection between EMF exposure and the symptoms of IEI-EMF without considering the fact that the connection is only bolstered by weak scientific evidence. They also found that articles quoting someone with IEI-EMF were more likely to report an electromagnetic cause and articles using a scientist as a source were more likely to present a non-electromagnetic cause. Consequently, the authors argue that the widespread poor reporting had the potential to encourage more people to misattribute their symptoms to electromagnetic fields. Therefore, we conducted a study to assess the changes in some potential contributing factors to the prevalence of IEI-EMF, including media coverage, and we evaluate their associations with the prevalence of IEI-EMF.

2. Materials and methods

We assessed changes in two major potential contributing factors for IEI-EMF over time, the exposure to EMF and the media reports of the EMF, and compared their trends to the trend of the prevalence of IEI-EMF.

2.1. Exposures to mobile phones and base stations

To assess the exposure of the Taiwanese population to EMF from mobile phones and their base stations, we collected data on four indicators from National Communications Commission (NCC), including mobile phone calling time, density of base stations, number of mobile phone accounts, and number of text messages (TMS). As the authority responsible for regulating telecommunications and broadcasting services in Taiwan, NCC has the most comprehensive and accurate nationwide statistical data on telecommunications. These data are published on the official website of the agency (National Communications Commission, 2017), and the statistics on mobile phone services date as far back as 1998. As the data are open to the public, they have been used by researchers to evaluate the effects of EMF (Hsu et al., 2013).

We collected data from 2005 to 2012 but excluded those on outlying islands. The density of mobile phone base stations was estimated by dividing the number of base stations in a given administrative region by the size (in km²) of that region.

2.2. Media reports

We searched the newspaper database “News Knowledge Database (Tudor Tech Systems Co., Ltd.),” which collects information from the 10 major newspapers in Taiwan that cover more than 95% of the newspaper sale in the country. Taiwan is a relatively small geographic area with convenient transportation, and therefore all the 10 newspapers included in the database are distributed nationwide, although some of them may have more subscribers in certain geographic areas. Of the 1345 articles included in our analyses, 20 (1.5%) were from newspapers with more localized focuses. The computerized database contains headlines and abstracts of the newspapers with links to the full

texts and images, which date back to 2002. We searched for articles from 2005 to 2012 using the keywords “base station,” “mobile phone,” and “electromagnetic field.” According to the contents, we categorized articles into seven categories: “Confrontation” covering conflicts related to the installation of base stations or power lines in the country, “Government Policy” covering issues related to governmental policy on EMF and regulation of the EMF exposure, “Telecommunication Company” covering news of the telecommunication and electric power company handling the public's fear of EMF exposure, “International News” covering news originated from outside Taiwan, “Environmental Groups” covering activities of the non-official environmental protection groups in Taiwan, “Commercial Products” covering commercial products available in Taiwan that claimed to be capable of protecting individuals from exposures to EMF, and “Others” (Claassen et al., 2012; Eldridge-Thomas and Rubin, 2013).

In addition, because media reports may affect the reader's attitudes (Vasterman et al., 2008), we also studied the implications conveyed by the newspaper articles. We categorize the articles according to the implications of their messages. Articles were categorized as “negative,” if they conveyed negative messages, such as claiming that EMF is detrimental to human health, or suggested that the public avoid or reduce their exposures to EMF. The remaining articles were categorized as “others,” because few of them reported beneficial health effects of EMF exposure or encouraged increased EMF exposure.

Two members of the research team categorized the articles independently, and the final decisions on articles with inconsistent messages were made by consensus. Inter-observer agreements were assessed by using the Cohen's Kappa test (Cohen, 1960; Viera and Garrett, 2005). Annual variations of EMF exposure indicators and media coverage were presented in figures. The Cohen's Kappa test showed excellent agreement between the two raters in the classifications of both the contents of the media reports (kappa = 0.85, $p < 0.0001$) and the implications they conveyed (kappa = 0.75, $p < 0.0001$).

2.3. Statistical analysis

To assess the time trends in EMF exposure indicators and media reports, univariate linear regressions were applied. With an EMF exposure indicator or media reports in a given category as the outcome variable and the calendar year as the predictor variable, the regression model evaluate if a stable time trend exists across the years. The differences among the proportions of newspaper articles in the categories of media reports in all the reports (expressed as percentage) were evaluated by chi-square tests. Through the Bonferroni procedure, we set the significance level at 0.0024.

3. Results

3.1. Indicators of exposures to mobile phones and base stations

The density of base stations in Taiwan increased annually from 0.24 per km² in 2005 to 0.46 per km² in 2012, at a rate of 3.12 station/km² per year ($p = 0.0020$) on average (Fig. 1).

The number of mobile phone accounts also increased annually, from 22.2 million in 2005 to 29.5 million in 2012, at a rate of 1.99 million per year ($p < 0.0001$) on average. The total length of mobile phone calling time increased every year from 288.7 billion minutes in 2005 to 434.8 billion minutes in 2012, at a rate of 23.1 billion minutes per year ($p < 0.0001$) on average. Likewise, the number of text messages increased every year from 27.96 billion in 2005 to 85.41 billion in 2012, at a rate of 8.15 billion per year ($p < 0.0001$) on average. However, the prevalence rate of IEI-EMF declined from 13.3% in 2007 to 4.6% in 2012.

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