



Comparing non-specific physical symptoms in environmentally sensitive patients: Prevalence, duration, functional status and illness behavior



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ARTICLE INFO

Article history:

Received 29 October 2013

Received in revised form 13 February 2014

Accepted 21 February 2014

Keywords:

Medically unexplained symptoms

Environmental sensitivity

Electromagnetic hypersensitivity

Idiopathic environmental intolerance

IEI-EMF

Primary care

ABSTRACT

Objective: Little is known about the potential clinical relevance of non-specific physical symptoms (NSPS) reported by patients with self-reported environmental sensitivities. This study aimed to assess NSPS in people with general environmental sensitivity (GES) and idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF) and to determine differences in functional status and illness behavior.

Methods: An epidemiological study was conducted in the Netherlands, combining self-administered questionnaires with the electronic medical records of the respondents as registered by general practitioners. Analyses included $n = 5789$ registered adult (≥ 18 years) patients, comprising 5073 non-sensitive (NS) individuals, 514 in the GES group and 202 in the IEI-EMF group.

Results: Participants with GES were about twice as likely to consult alternative therapy compared to non-sensitive individuals; those with IEI-EMF were more than three times as likely. Moreover, there was a higher prevalence of symptoms and medication prescriptions and longer symptom duration among people with sensitivities. Increasing number and duration of self-reported NSPS were associated with functional impairment, illness behavior, negative symptom perceptions and prevalence of GP-registered NSPS in the examined groups.

Conclusion: Even after adjustment for medical and psychiatric morbidity, environmentally sensitive individuals experience poorer health, increased illness behavior and more severe NSPS. The number and duration of self-reported NSPS are important components of symptom severity and are associated with characteristics similar to those of NSPS in primary care.

The substantial overlap between the sensitive groups strengthens the notion that different types of sensitivities might be part of one, broader environmental illness.

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Introduction

People often experience symptoms such as headaches, fatigue, musculoskeletal pain, sleep problems and bowel disturbances, which are not necessarily related to a medical condition. More than 80% of the general population experiences at least one of such non-specific physical symptoms (NSPS) in any given month [1,2]. When presented to the general practice (GP), between 30% and 50% of NSPS cannot be sufficiently explained by a pathological cause and are often labeled as medically unexplained [3,4]; according to more recent evidence, these rates can be even higher [5]. However, the term “medically unexplained” is perceived as negative by patients [6] or ambiguous, connoting that the health provider is not able to help or that the symptoms can only be

psychiatrically explained [7]. For these reasons and considering that such symptoms are usually reported in different organ systems [8], the term NSPS will be used in the following. In medical care, NSPS are associated with functional impairment similar to that of patients with medical disorders [9], increased illness behavior [10], high levels of psychological distress [11,12] and negative symptom perceptions [13,14].

Experiencing NSPS is a main characteristic of self-declared sensitivities attributed to low (in relation to established effect thresholds) levels of exposure to environmental agents such as electromagnetic fields (EMF). However, there is no convincing evidence for a causal dose-response association and a broadly accepted case definition for patients is missing [15–22]. Although not well-established, there is the notion that self-reported sensitivity to EMF sources, described by the WHO as idiopathic environmental intolerance attributed to EMF (IEI-EMF) [23] and other diverse environmental sensitivities, such as those to odoriferous chemicals, food additives and noise, may constitute dimensions of just one condition; a generalized environmental sensitivity which is usually referred to as idiopathic environmental intolerance (IEI) [24–27]. This

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notion is mainly based on evidence that patients tend to be sensitive to more than one environmental sources [28,29] and the lack of symptom patterns [28]; IEI has been considered as part of the broader spectrum of functional somatic syndromes [12] and can co-occur with syndromes such as fibromyalgia and chronic fatigue [30]. However, evidence on the clinical pertinence of symptoms reported by environmentally sensitive individuals is still scarce. Important information regarding the clinical profile of the patients such as prevalence of registry-based medical and psychiatric morbidity and prescribed medication is also missing at the population level.

On the one hand, only a diagnostic evaluation could sufficiently determine whether underlying pathology accounts for the symptoms [31,32]. On the other hand, persistent presentation of NSPS to the GP is relatively rare [33–35] and patients who seek health care are not always those with increased functional impairment [32,36–38]. This means that a large pool of symptomatic cases in the population has not been studied in primary care research [39]. Evidence from studies in the general population and among disaster survivors suggests that NSPS reported in surveys share several features with NSPS in medical care, showing that increased number of self-reported NSPS is a strong indicator of functional impairment and illness behavior [2,7]. However, it is not clear yet whether this is the case for NSPS reported by individuals with environmental sensitivities, such as IEI-EMF and the broader condition of IEI. Additional components of symptom severity, such as duration, should also be considered to understand the clinical importance of symptomatology [32].

The following research questions were addressed in the present study: 1) Do people with IEI-EMF and those with general environmental sensitivity experience more NSPS and NSPS of longer duration compared to participants without such sensitivities? 2) Do the examined groups differ in terms of symptom patterns, functional status and illness behavior? 3) What is the association between self-reported NSPS and functional impairment, illness behavior and GP-registered NSPS among sensitive and non-sensitive individuals?

Methods

Study design and participants

Data were collected within the framework of an epidemiological study into NSPS in relation to actual and perceived exposure to EMF (EMPHASIS). The study was carried out between January 21 and 23 June 2011 in the Netherlands, combining self-administered questionnaires and electronic medical records (EMR) of health problems, registered in GPs within the Dutch Information Network of General Practices (LINH) [40]; every Dutch citizen is obliged to be registered at one GP, so the population listed in family practice can be used as the denominator in epidemiological studies [40–42]. Data collection within the LINH network is carried out according to the Dutch legislation on privacy. Each patient is coded with an anonymous administrative number. The key to this coding number is only with the general practitioner. The privacy regulation of the study was approved by the Dutch Data Protection Authority. Based on the Law on Medical Scientific Research (WMO), the Dutch Medical Ethics Committee decided that an ethical approval was not required.

Twenty-one practices, varying in terms of number of patients and level of urbanization were selected from the primary care database of the Netherlands Institute for Health Services Research (NIVEL). Registered patients were listed according to postal codes and house number; a geographical information system (GIS) layer of these addresses was then created, resulting to a total pool of 76,684 eligible addresses. A random sample among the adult population (≥ 18 years) was drawn from the GP registry data set, initially stratified by age, gender and preliminary estimates of EMF exposure from mobile phone base stations [43]. Only one adult was sampled from each household. All invitees ($n = 13,007$) received a letter from their GP to fill out a questionnaire,

either electronically or in a paper version, entitled “Living environment, technology and health”, along with an information leaflet and informed consent form. If a completed questionnaire had not been received, a reminder letter was sent two weeks after the first invitation and a second reminder two weeks later. This resulted in $n = 5933$ respondents (response rate: 46%). Twenty percent of the respondents filled out the survey online. A non-response follow-up on a shorter version of the questionnaire was also conducted, including $n = 505$ individuals.

Case definitions

Selection of individuals with IEI-EMF was based on findings from a recent systematic evaluation of the relevant literature [21], considering that: 1) IEI-EMF is a highly heterogeneous condition in terms of severity and associated EMF sources; 2) self-reported (hyper) sensitivity to EMF is the most often used criterion for patient identification in the literature; 3) most people with IEI-EMF tend to be sensitive to more than one EMF source. Therefore, two items were used to assess IEI-EMF in the study sample, asking the extent to which people agree with the following statements:

1) “I am sensitive to mobile phone base stations and devices related to communication systems (e.g. mobile phones, wireless internet etc.)” and 2) “I am sensitive to electrical devices (e.g. domestic appliances etc.)”; answers were scored on a five-point scale, ranging from “strongly disagree” to “strongly agree”. Those who indicated “quite agree” to “strongly agree” were included in the IEI-EMF group.

A list of nine items assessing sensitivity to several environmental stressors (other than EMF) such as chemical substances, smells in general and in relation to scented detergents, noise, light, various materials, color, temperature changes and cold or warm environment was used to assess general environmental sensitivity (GES), adapted from Stansfeld et al. [44]. Answers were scored in a similar format as the items on IEI-EMF mentioned above. Respondents with a score at or above the 90th percentile of the score distribution (which corresponds to an average per-item response of at least “quite agree”), were included in the GES group. Participants who had more than one items missing were excluded from subsequent analyses.

Assessment of self-reported non-specific physical symptoms (NSPS)

To assess NSPS, 23 items from the recently developed Symptoms and Perceptions (SaP) scale [45] were selected. These correspond to physical symptoms similar to those reported by patients in general practice, based on the International Classification of Primary Care (ICPC-1) [46]. The included items ask respondents on a binary scale whether they experienced any of the examined symptoms in the past month; if so, respondents are asked about how long they have been bothered by these symptom(s), with responses formed on a 5-point scale, with “over 6 months” as the highest value. A higher total score in the corresponding characteristics indicates increased number of NSPS and related duration (Internal consistency based on the total analyzed sample: Cronbach's $\alpha = .80$ for and $\alpha = .82$ respectively).

Moreover, the sum scores were added together and categorized into four ranges, based on the approach of van den Berg et al. [7], to present more explicitly the relationship between graded increases in NSPS and the different indicators of functional status and illness behavior: The first range was 0 to 1 symptom, the second 2 to 9 symptoms, the third 10–14 symptoms and the fourth 15 or more symptoms. Following similar methodology, the total score on duration was categorized into 4 ranges as well, corresponding to different percentiles (>50 th, 50th–79th, 80th–94th and 95th), based on the distribution reported by the NS group.

Assessment of GP-registered NSPS

Non-specific physical symptoms in EMR were registered by the GP according to the ICPC-1 [46]. The evaluation of the clinical judgment

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