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Effective of Sick Building Syndrome on Irritation of the Eyes and Asthma

Maryam Naimi

Mashhad University of Medical Sciences, Mashhad, Iran

ABSTRACT

In this research, we investigated basic symptoms of syndrome in illnesses of sick buildings. We designed a questionnaire and asked from male of dormitory residence. Questions of the questionnaire were more about known symptoms of buildings (Shortness of breath, inflammation, swelling and burning eyes, runny nose, malaise and fatigue, drowsiness, headache) exacerbations time intervals in the residence (6 am-2pm; 2pm-10pm and 10pm-6am) Equipment and devices that people deal with it in at least 10% (Personal computer, copier, printer, gas cookers) and the most symptoms of creating sick building syndrome (Lack of ventilation, proximity to street noise, high humidity, contaminated materials, pollution sources also most of places of syndromes (corridors, rooms, Toilets, kitchen, upper class, almost everywhere).

INTRODUCTION

There is increased concern about the health effects of the indoor environment (Norback, 2009) and the home is the indoor environment where both adults and children spend most of their time. Several studies have shown that building dampness and indoor mold growth are common in dwellings (Bornehag et al., 2001; Fisk et al., 2007; Husman, 1996; WHO, 2009). Building dampness and indoor mold growth is associated with an increased prevalence of both asthmatic symptoms and symptoms compatible with the sick building syndrome (SBS) (Bornehag et al., 2001;; Fisk et al., 2007;; Peat et al., 1998). Dampness approximately doubles the risk of health effects (Bornehag et al., 2001; Peat et al., 1998). One large study in Swedish multi-family residential buildings found a strong association between building dampness and SBS symptoms (Engvall et al., 2001). SBS is a set of non-specific symptoms (from eyes, upper airways, facial skin, headache, tiredness and nausea) occurring in a particular building (Norback and Edling, 1991). Various indoor factors, such as a low supply rate of outdoor air, high room temperature, and low indoor air humidity have been shown to influence the prevalence of SBS-symptoms (; Norback, 2009). Moreover, personal factors such as female gender and history of allergic disorder have been associated with SBS (; Bjornsson et al., 1998; Mendell, 1993). Building dampness may lead to an increased exposure to various types of molds, bacteria, microbial compounds and chemical compounds (WHO, 2009). It is well known that molds and bacteria emit certain VOCs, so-called microbial volatile organic compounds (MVOCs), when growing on building materials. One early study, which analyzed MVOCs by

gas chromatography– mass spectrometry (GC–MS) with selective ion monitoring (SIM) in air samples from damp and moldy buildings, reported data on concentrations of 26 different MVOCs. The concentrations were usually higher in indoor air than outdoor air (Wessen and Schoeps, 1996). One intervention study found that MVOC concentration was higher in a hospital building with dampness and SBS symptoms as compared to a dry control building (Wieslander et al., 2007). Another study reported that children living in dwellings with higher MVOC levels had a higher prevalence of asthma, hay fever, wheezing, and eye irritation, although the difference was not statistically significant (Elke et al., 1999). In a school environment study it was found that exposure to several MVOCs at school was associated with asthmatic symptoms in the pupils (Kim et al., 2007), while an earlier school environment study reported an association between asthma in school teachers and levels of MVOCs in the classrooms (Smedje et al., 1996). We found only one previous study on associations between MVOCs and SBS in dwellings. In that study, some MVOCs, especially 1-octen-3-ol, were associated with SBS (Araki et al., 2010). The use of MVOCs as a marker of fungal or microbial exposure has been criticized, since these compounds are also emitted from other sources such as tobacco smoke, plants, furniture, furnishing, and building materials (Schleibinger et al., 2008). One study comparing MVOC levels in moldy and mold-free dwellings found no significant association between most MVOCs and the mold status. Dampness may also influence the levels of volatile organic compounds, which are not produced by microorganisms. Formaldehyde is a reactive volatile compound that may induce airway irritation at low concentrations, and the emission may be influenced by dampness in building materials (Sarigiannis et al., 2011). Indoor sources include cigarette smoke, insulating materials, particle board and plywood furniture containing formaldehyde-based resins, water based paints, fabrics, and various other consumer products. Plasticizers are another group of compounds that are commonly found in dwellings, and used in plasticmaterial. Associations between phthalates, and asthma and rhinitis in pre-school children have been reported (Hsu et al., 2011; Naydenov et al., 2008). One study showed that building dampness in dwellings was associated with increased dust levels of phthalates, a common plasticizer in poly-vinyl-chloride (PVC) materials (Bornehag et al., 2005). Moreover, one school study found an association between the indoor air concentration of two common plasticizers (TMPD-MIB (2, 2, 4-trimethyl-1, 3-pentanediolmonoisobutyrate, Texanol) and TMPD-DIB (2, 2, 4-trimethyl-1, 3-pentanediol diisobutyrate, TXIB), and asthmatic symptoms in school children (Kim et al., 2007). Finally, the compound 2-ethyl-1-hexanol has been reported to be produced by molds (Claeson et al., 2002) as well as degradation of the plasticizer di-ethyl-hexyl phthalate (DEHP) or acrylate polymers in water-based carpet glue. This degradation is related to increased dampness in floor construction (Norback et al., 2000).

Sick Building Syndrome

Sick Building Syndrome (SBS), as described in UK/European terminology, or building related symptoms as it is referred to in the United States, has been described as ‘a group of symptoms of unclear aetiology’ (Burge, 2004). In broad terms, these symptoms can be divided into mucous membrane symptoms related to eyes, nose and throat; dry skin; general symptoms of headache and lethargy. These symptoms are common in the general population. What makes them part of SBS is a temporal relation with work in, or occupation of, a particular building. Therefore, with SBS most of the above symptoms should improve within hours of leaving the problem building. SBS is most clearly recognized in the office environment. However, similar problems could occur, and have been reported, in schools, hospitals or care homes. In Nordic countries, their dentition for SBS also attributes ill health symptoms to indoor air problems in domestic dwellings, especially associated with water damage (Berglund et al., 2002). In order to define SBS, Raw et al. (1995) developed a symptom questionnaire, which, in summary, comprised the following series of questions:

In the past 12 months have you had more than two episodes:

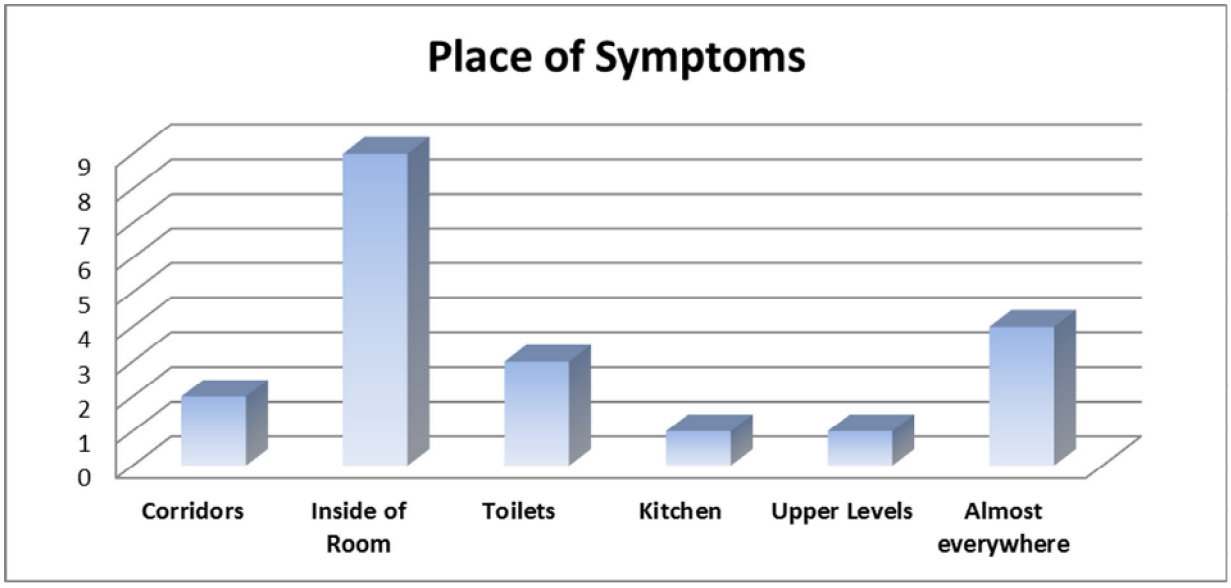
1. Itchy or watery eyes;
2. blocked or stuffy nose;
3. runny nose;
4. dry throat;
5. lethargy and/or tiredness;
6. headache;
7. Dry, itchy, or irritated skin

Asthma

Asthma is a common chronic inflammatory disease of the airways characterized by variable and recurring symptoms, reversible airflow obstruction and bronchospasm. Common symptoms include wheezing, coughing, chest tightness, and shortness of breath. Asthma is thought to be caused by a combination of genetic and environmental factors. Its diagnosis is usually based on the pattern of symptoms, response to therapy over time and spirometry. It is clinically classified according to the frequency of symptoms, forced expiratory volume in one second (FEV1), and peak expiratory flow rate. Asthma may also be classified as atopic (extrinsic) or non-atopic (intrinsic) where atopy refers to a predisposition toward developing type 1 hypersensitivity reactions. Treatment of acute symptoms is usually with an inhaled short-acting beta-2 agonist (such as salbutamol) and oral corticosteroids. In very severe cases, intravenous corticosteroids, magnesium sulfate, and hospitalization may be required. Symptoms can be prevented by avoiding triggers, such as allergens and irritants, and by the use of inhaled corticosteroids. Long-acting beta agonists (LABA) or leukotriene antagonists may be used in addition to inhaled corticosteroids if asthma symptoms remain uncontrolled. The prevalence of asthma has increased significantly since the 1970s. In 2011, 235–300 million people globally have been diagnosed with asthma, and it caused 250,000 deaths.

Environmental Factor effective on Asthma

Many environmental factors have been associated with asthma's development and exacerbation including allergens, air pollution, and other environmental chemicals. Smoking during pregnancy and after delivery is associated with a greater risk of asthma-like symptoms. Low air quality from factors such as traffic pollution or high ozone levels has been associated with both asthma development and increased asthma severity. Exposure to indoor volatile organic compounds may be a trigger for asthma; formaldehyde exposure, for example, has a positive association. Furthermore, phthalates in PVC are associated with asthma in children and adults as are high levels of endotoxin exposure. Asthma is associated with exposure to indoor allergens. Common indoor allergens include: dust mites, cockroaches, animal dander, and mold. Efforts to decrease dust mites have been found to be ineffective. Certain viral respiratory infections, such as respiratory syncytial virus and rhinovirus, may increase the risk of developing asthma when acquired as young children. Certain other infections, however, may decrease the risk.



CONCLUSION AND DISCUSSION

Based on, empirical data of the residence and interior condition of rooms, buildings environmental and physical condition and eventually, the most important reasons are as following:

Most of residence believed lack of ventilation system is the first reason of sick building syndrome and it is substantially higher than other problems. Following, 80 people of residence believed noises is the second reason of sick building syndrome. The third reason is contaminated materials like carpets, detergents, bacteria and mushrooms, which were approved by 74 people. Then, 73 people believed that fourth reason belongs to cars smoke, steam and cooking smoke, airborne dust. Fifth reason is a symptom in residents is noises (59 people).

Recommendations:

In new buildings for preventing potential development of mould contamination include:

1. _ Minimize exposure of interior building products to exterior
2. _ Monitor and maintain integrity of building impermeable envelope
3. _ Check material delivered clean and dry e reject wet or mouldy material
4. _ Protect stored materials from moisture.
5. _ Minimize moisture accumulation during construction
6. _ Balance HVAC systems to control thermal comfort and humidity

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