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Validity of subjective questionnaire in evaluating dwelling characteristics, home dampness, and indoor odors in Shanghai, China: Cross-sectional survey and on-site inspection

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ABSTRACT

Numerous questionnaire-based studies were conducted to investigate associations of home environment with childhood health, whereas few studies confirmed validity of parents-reported questionnaire regarding dwelling characteristics and dampness-related indicators. According to data obtained by standard questions regarding these items *via* on-site inspection in 454 residences with young children during 2013–2014, and data collected for these items from their parents-reported questionnaires in cross-sectional survey during 2011–2012 in Shanghai, China, this paper validated consistencies of information for these items between the two phases, thus to confirm validity of parents-reported questionnaire regarding these items. According to Kappa (k) values, parents and inspectors had moderate/substantial consistencies regarding dwelling characteristics (k = 0.212–0.894), but had slight consistencies regarding dampness-related indicators and indoor odors (absolute k = 0.019–0.144). However, according to the observed, positive, and negative proportional agreement (P_o, P_{pos}, and P_{neg}), parents and inspectors had substantial/prefect consistencies in most of the studied items (P_o = 0.45–0.96). These trends of consistencies for different items had no notable differences, regardless of father or mother as the questionnaire-reporter, and among the residences inspected in different seasons. This study suggests parents-reported questionnaire could be a reliable and valid method to indicate the overall status of dwelling characteristics and home dampness-related exposures.

1. Introduction

Subjectively reported questionnaire is a cheap and convenient way to assess human exposures and their health effects in a huge sample size, and has been performed extensively to explore associations between home environment and childhood health around the world [1–8]. In China, several epidemiological surveys by parent-reported questionnaire also were conducted to investigate associations of dwelling characteristics and home environment with childhood asthma, allergies, and airway diseases [9–14]. Among these studies, the largest survey was the phase one of the China, Children, Homes, Health (CCHH) study among about 50 thousands preschool children from ten metropolitan cities of China [9].

However, some findings in the cities involve in the CCHH study were not always consistent [15–25]. Specifically, in Shanghai, we found that parents-reported habits of opening windows often and

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cleaning the home often during daily lifetime have significant associations with a reduced risk of home dampness-related exposures [15], thus these habits have significant associations with a decreased risk of asthma and allergic rhinitis in childhood [16–18]. Whereas, the similar study in Urumqi did not find significant effects of home ventilation and cleaning habits on the risks of home dampness-related exposures with asthma and allergies in childhood [19]. Besides, Data from all of these cities indicated that home dampness-related exposures were significantly associated with childhood asthma, allergies, and airway diseases [16,17,19–25]; but the associations were slightly different in different cities, including Shanghai [16,17,20], Wuhan [21,22], Chongqing [23,24], Urumqi [19], and Taiyuan [25]. Several studies suggested a potential error resulting from over-reporting those risk factors that respondents are aware of [26–28]. Specifically, the Dampness in Buildings and Health (DBH) study in Sweden found that compare to parents with health children, parents with sick children could report more home dampness-related exposures if they considered that such exposures are risk factors for asthma and allergies in childhood [26]. Thus, we suspected that the inconsistent findings and the differences in the associations of the CCHH study may partly derive from reported error or bias in different cities. Using on-site check by the trained inspectors, several studies validated the reliability of parents-reported questionnaire in evaluating dwelling characteristics and home dampness-related exposures for preschool children in Sweden [26,27] and Bulgaria [28], as well as of self-reported questionnaire for college student in China [29]. However, to our best knowledge, there is no study confirming the validity of parents-reported questionnaire in evaluating dwelling characteristics and home dampness-related exposures for preschool children in China.

Therefore, in the present study, according to parents-reported data in the phase one of the CCHH study as well as parents-reported and on-site inspected data in the phase two of the CCHH study in Shanghai, we compared findings of dwelling characteristics and home dampness-related exposures from parents-reporting and on-site inspection, and validated the reliability of these questions in evaluating these items. Since the knowledge of home dampness-related exposures as risk factors for asthma and allergies in childhood is likely not as great in China [16] as in Sweden, where a large campaign about risk factors for these diseases was conducted for the general public a few years before the DBH study [26], we hypothesized that parent-reported questionnaire could effectively indicate the actual situations of those studied items among preschool children in Shanghai, China.

2. Materials and methods

2.1. Phase one of the CCHH study in Shanghai

Phase one of the CCHH study was a questionnaire-based cross-sectional study [9]. In Shanghai, we surveyed 17,898 parents or guardians of 1–8 year-old children in 72 kindergartens from five districts of Shanghai city; and finally collected 15,266 valid questionnaires (response rate: 85.3%) during April 2011-April 2012. All the data for the present study are from the questionnaire. The previous articles provided more information for the selection of kindergartens in each district and the method we applied to distribute and collect the questionnaire [16,30]. Questions for basic family information, home dampness-related exposures, dwelling characteristics and decoration were derived from the DBH study in Sweden [1,26,27] and the ALLHOME study in Bulgaria [28]. We slightly modified these questions according to local characteristics regarding dwelling characteristics in Shanghai. The questions with respect to dwelling characteristics and home dampness-related exposures we studied in the present study were summarized in the supplemental Tables A.1 and A.2. A previous paper provided the full questionnaire as supplemental information [9]. The CCHH study was approved by the ethical committee of the School of Public Health, Fudan University in Shanghai, China.

2.2. Phase two of the CCHH study in Shanghai

Phase two of the CCHH study was an on-site inspection-based case-control study which was nested after or along with the cross-sectional study. During March 2013–December 2014, we conducted on-site inspections in 454 residences with young children (mean age: 6.9 year-old) of Shanghai. Herein 186 residences were for children who had been diagnosed asthma by a doctor during the total lifetime since birth (cases) and 268 residences for children without doctor-diagnosed asthma ever (controls). These residences were not changed and/or redecorated after the cross-sectional survey (phase one of the CCHH study). For each residence, three inspectors were assigned in each residence; herein two inspectors subjectively assessed dwelling characteristics and home dampness-related indicators by the same questionnaire, which also derived from the similar studies in Sweden [1,26,27] and Bulgaria [28]. All inspectors were trained by our senior members before the inspection and did not know the child's health status (case or control) during home inspection. Before the formal inspection in the child's residence, we conducted a pilot study and inspected dwelling characteristics and home dampness-related indicators in four residences of teachers with young children. A total of six inspectors were trained, as well as judgments on these factors were introduced and were uniformed by our senior members. The six trained inspectors were stratified into two groups to inspect the 454 residences. Herein, two inspectors (one in each group) were assigned to collect home dusts, and four inspectors (two in each group) were assigned to report home characteristics and dampness-related exposures. Each of these inspectors averagely visited about half of the inspected residences. Parents of the inspected children also filled out a questionnaire involved questions regarding dwelling characteristics and indoor odors. The supplemental Tables A.1–A.4 summarized the studied questions from these questionnaires. Besides, we continuously measured daily (24 h) relative humidity (RH) and temperature in outdoor, in the child's bedroom, and living room by HUMLOG20 [E + E Inc., Austria; 1) for RH, detection range: 10%–95%; accuracy: ±2%; resolution: 0.5%. 2) for temperature, detection range: −20–+50 °C; accuracy: ±0.3 °C; resolution: 0.1 °C]. The ethical committee of the School of Public Health in Fudan University also approved this case-control study. Before the home inspection, both inspector and participant signed an informed consent form (one same copy for each). We carried out the on-site inspection in strict accordance with the approved guidelines. A previous article provided more information with regard to selection of the inspected residences and to the on-site inspected method and equipment [31].

2.3. Statistical analysis

SPSS 19.0 (SPSS Ltd., USA) and Microsoft Office Excel 2010 (Microsoft Ltd., USA) were applied to perform the statistical analyses. Kappa (k) values in 2*2 Crosstab of SPSS were used to indicate the consistency between the reported information from parents and the two inspectors with regard to dwelling characteristics, home dampness-related indicators, and indoor odors during the cross-sectional survey (phase one) and on-site inspection (phase two). The absolute kappa (k) value <0.01 indicated a poor consistency, while 0.01–0.20 mean a slight consistency, 0.21–0.40 fair consistency, 0.41–0.60 moderate consistency, 0.61–0.80 substantial consistency and 0.81–1.00 for perfect consistency [32].