Ethnic and socio-economic differences in the prevalence of wheeze, severe wheeze, asthma, eczema and medication usage at 4 years of age: Findings from the Born in Bradford birth cohort

Emily S. Petherick [a, *], Neil Pearce [b], Jordi Sunyer [c], John Wright [d]

[a] School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, LE11 3TU, UK
[b] Centre for Global Non-Communicable Diseases, London School of Hygiene and Tropical Medicine, London, UK
[c] Center for Research in Environmental Epidemiology, Barcelona, Spain
[d] Born in Bradford, Bradford Institute for Health Research, Bradford Teaching Hospital NHS Foundation Trust, Bradford Royal Infirmary, Bradford, UK

ARTICLE INFO

ABSTRACT

Background: Asthma, wheeze and eczema are common in early childhood and cause considerable morbidity. Generally rates of these conditions are higher in high income compared to low income countries. Rates in developed nations are generally higher than in less developed countries. After migration to Western countries, differences in risks of developing these conditions may between migrant and non-migrant may diminish.

Methods: A convenience sample of 1648 children of White British, Pakistani or Other ethnicity aged between 4 and 5 years were recruited from the main Born in Bradford cohort. Children's parents or guardians were asked to report on a range of potential risk factors and their associations with wheeze, asthma and eczema. Relationships between ethnicity and disease outcomes were examined using logistic regression after adjustment for other relevant risk factors and confounders.

Results: Ethnic differences in doctor diagnosed asthma were evident, with children of other ethnic Origin being less likely and children of Pakistani origin more likely to have a diagnosis than White British or other origin children, although after adjustment for other risk factors this difference only remained significant for the Other Ethnic group. Ethnic differences were not observed in other outcomes including wheeze in the past 12 months, severe wheeze and taking medications for breathing problems.

Conclusions: In UK born children, traditional risk factors such as gender, family history, socio-economic status and child's medical history may be stronger risk factors than ethnicity or familial migration patterns.

1. Background

Asthma, wheeze and eczema are common in early childhood and cause considerable morbidity. Globally wheeze and asthma prevalence in children aged 6—7 is generally highest in high income countries, with the prevalence of current wheeze being lowest in the Indian subcontinent and highest in English-speaking countries such as the United Kingdom and New Zealand [1]. Within Western countries, migrants generally have lower prevalence rates than native born populations [2]. However, the prevalence of wheeze and asthma symptoms may be higher in migrants compared to their peers in their countries of origin, and prevalence and severity increase with each additional year of residence in high-prevalence countries [2—4]. The ethnic differences in eczema prevalence are not as consistent, with high prevalence observed in Western countries, such as the UK and NZ, but also high prevalence in some low and middle income countries in Africa and Latin America [5]. Similar to the situation with asthma, recent migrants to affluent and Western countries experience lower eczema prevalence than populations already resident in host countries [2].

The prevalence of physician-diagnosed asthma in childhood has been reported to differ by ethnicity in UK and other western populations. In the UK, highest rates have been reported in children of Black ethnicity followed by those of White and South Asian ethnicity [6]. Phenotypes of asthma, wheeze and atopy may also

* Corresponding author.
 E-mail address: e.petherick@lboro.ac.uk (E.S. Petherick).

differ by ethnicity [7]. Atopy has also been shown to vary by ethnicity, with South Asian children having higher rates than their White British peers [8], although it is being increasingly recognised that not all persons who experience asthma, wheeze and/or eczema are also atopic [9,10]. Despite persons of South Asian origin resident in the UK being less likely to experience symptoms of wheeze and asthma, there are reports of poorer outcomes, with higher risks of exacerbations and hospitalisations [6,11,12]. South Asian populations resident in the United Kingdom (UK) are heterogeneous, originating from different countries including India, Pakistan and Bangladesh, experiencing differing cultural and socio-economic profiles.

Few studies of ethnic differences in childhood eczema have been reported. Lower eczema prevalence in children of Indian, Pakistani and Bangladeshi origin compared to children of White British origin has been reported in a London based study [3], whilst another prevalence study conducted in Leicester found no differences between White and Asian children [13].

The current study therefore examines the risks of wheeze, severe wheeze, doctor diagnosed asthma and eczema, and treatment provision for breathing problems, in an early childhood population that is UK born and predominantly of White British and Pakistani ethnic origin [14]. We also examine the comparability of these results to studies that have included heterogeneous South Asian populations with differing migration profiles [1,3,15].

2. Methods

A sub-cohort of children from the Born in Bradford cohort study were recruited to participate in this study of asthma and allergy; this work was conducted as part of a larger EU FP7 project entitled Mechanisms of the Development of ALLergy (MeDALL) [16]. This subcohort consisted of a convenience sample of 1648 children aged between 4 and 5 years recruited between 22nd October 2012 and 24th April 2014 whose parented consented for participation. Full details of the main Born in Bradford study and recruitment processes have been reported elsewhere [14].

Children's parents or guardians were asked to report on a range of potential risk factors and their associations with wheeze, asthma and atopy. Children's ethnicity was assigned based on maternal self-reported ethnicity and classified as White British, Pakistani and Other. We excluded responses from cases where maternal ethnicity was missing (excluded n = 2), resulting in an eligible study population of 1646 children and their carers; which was predominantly their mother (n = 1621) or father (n = 22).

2.1. Clinical outcomes

Wheeze: defined as self-reported wheeze in the past 12 months.

Severe wheeze: defined as reported wheeze on four or more occasions in the past year.

Asthma: defined as a positive report of doctor diagnosis of asthma ever.

Eczema: defined as a positive report of ever been diagnosed by a physician with having eczema/atopic dermatitis.

Medication use: defined as a positive response to question asking if child had received medication for asthma or other breathing problems during the previous 12 months.

2.2. Statistical analysis

The variables included in the analysis were based on previous literature, and in the case of socio-economic variables, were selected to ensure that a wide range were considered as our previous work in the cohort has shown that socio-economic measures

and health behaviours may differ between different ethnic groups [17,18]. In particular, we considered adjusting for variables that have previously been shown to be associated with wheeze, asthma, eczema or medication usage in childhood. These included mothers age at delivery, maternal history of asthma or atopy (yes vs no), paternal history of asthma or atopy (yes vs no), maternal smoking during pregnancy (yes vs no), child currently exposed to smoke (yes vs no), visible signs of mould or damp in the home (yes vs no), gas cooker used in the home (no, yes always use an extractor fan, yes sometimes use a fan, yes never use a fan) mother born abroad (yes vs no), father born abroad (yes vs no), child seen doctor for chest infection in the past 12 months (yes vs no), born at term (yes vs no), gender of child (male vs female), ever breastfed (yes vs no), older sibling (yes vs no), birthweight (<2500g, 2500–2999g, 3000–3499g, 3500–3999g, >=4000g), mode of birth (vaginal vs caesarean), ever eczema ever (yes vs no), ever had a problem with sneezing, or a runny or blocked nose when s/he did not have a cold or the flu (yes vs no) and mother's BMI at first pregnancy appointment with a midwife (booking).

We included three different socio-economic indicators: highest maternal education level reported in the baseline questionnaire; (categorised as less than 5 General Certificates of Secondary Education (GCSEs), >5 GCSEs, A level, Degree Level, Other, Foreign Unknown or Other); current home ownership (yes vs no); and subjective poverty (yes vs no). Subjective poverty was derived by asking women how they felt they were managing financially and were classified as subjectively poor if they responded that they were "finding it very difficult" or "finding it quite difficult" and not subjectively poor if they responded that they were "living comfortably", "doing alright" or "just getting by".

Comparison of characteristics between study participants of different ethnic backgrounds was performed using Chi square tests to investigate differences in proportions and ANOVA or Kruskall-Wallis tests to compare continuous data items.

Univariate associations between covariables and outcomes were estimated using logistic regression. The optimal inclusion of socio-economic variables into final mutually adjusted models was determined by creating models with different combinations of socio-economic variables and calculating the Bayesian Information Criterion (BIC) to determine the most parsimonious model. The model with the lowest BIC value for each clinical outcome was chosen as the final model. All logistic regression analyses used complete case analysis only. Output from models was expressed as odds ratios and 95% confidence intervals of the effect estimates and corresponding p values provided. Estimates were assumed to indicated statistically significant differences if p values < 0.05. All analyses were conducted using Stata SE 14.1 (Statacorp, Texas).

3. Results

The baseline characteristics of the participating mother-child pairs, by ethnicity, are shown in Table 1 below.

Maternal and paternal history of asthma or atopy was more common in children of White British origin compared to Pakistani and Other ethnic groups. The Other ethnic group consisted of 60 Indian, 29 Bangladeshi, 25 White Other, 24 Black, 12 Mixed White and Black, 8 Mixed White and South Asian and 32 of Other ethnic background which included Arab and other Asian backgrounds which included Chinese and Philippino.

Maternal smoking during pregnancy was higher in the White British group compared to the Other ethnic group and lowest in the Pakistani group. Current exposure to smoke in the home was higher in the Pakistani group compared to White British and lowest in the Other group. Women of Pakistani ethnicity were most likely to be in the normal weight category at booking.