ORIGINAL ARTICLE

Parental attitudes towards the management of asthma in ethnic minorities

Nigel C Smeeton, Roberto J Rona, Jane Gregory, Patrick White, Myfanwy Morgan

Arch Dis Child 2007;**92**:1082–1087. doi: 10.1136/adc.2006.112037

See end of article for authors' affiliations

Correspondence to: Nigel C Smeeton, King's College London, Division of Health and Social Care Research, Capital House, 42 Weston Street, London SE1 3QD, UK; nigel.smeeton@kcl.ac.uk

Accepted 24 January 2007
Published Online First 6 February 2007

Objectives: Children from Indian and Pakistani (South Asian) and black minority groups have relatively high rates of attendance at accident and emergency (A&E) departments and admissions to hospital in the UK. We examine parents' beliefs and management of childhood asthma that possibly contribute to their greater use of hospital services.
Design: Questionnaire survey.
Setting: Three London hospitals serving multicultural communities with a high proportion of South Asian subjects.
Participants: Parent(s) accompanying 150 children aged 3–9 years with asthma attending asthma clinics and A&E departments.
Main outcome measures: White, South Asian and ''other'' ethnic group parents were compared regarding their children's symptoms and asthma in relation to why their children had developed asthma, use of asthma treatments, views about the prognosis of their children's asthma, and their feelings associated with stigma.
Results: South Asian more often than white parents stated that they did not give preventers to their children (odds ratio (OR) 0.30; 95% confidence interval (CI) 0.12 to 0.75), that most drugs were ''addictive'' (OR 3.89; 95% CI 1.47 to 10.27), and that medicines could do more harm than good (OR 3.19; 95% CI 1.22 to 8.34). South Asian and ''other'' ethnic groups were more reluctant to tell others about their children's asthma (OR 0.11; 95% CI 0.01 to 1.06 and OR 0.06; 95% CI 0.01 to 0.65, respectively).
Conclusion: Cultural perspectives related to ethnicity are key factors in the understanding of asthma management. Health staff should give high priority to eliciting parents' beliefs regarding management of their children's asthma.

Ethnicity is one of the most important risk factors for asthma and its exacerbation in Britain and elsewhere.[1–6] In Britain, South Asian and black patients have higher rates of attendance at accident and emergency (A&E) departments, and relative to white patients the prevalence of admissions to hospital is double for South Asian and black patients.[1 7–10] Higher rates of exacerbation could be explained by a series of barriers to care in terms of patient and parental health beliefs, knowledge of asthma and its management, access to health care, cultural background, and competing socio-economic pressures in a hostile environment.[11] Under-diagnosis and under-treatment have been shown to be important features of asthma management in ethnic minorities,[12] although another study reported similar drug prescription and delivery techniques between ethnic groups, albeit there were deficiencies in understanding of the disease and self-management skills in South Asian subjects.[13]

For childhood asthma, the parents' health beliefs are powerful barriers to quality health care for ethnic minorities and in inner city areas.[11] It is possible that an important component in the greater severity of asthma in South Asian and other ethnic minorities in Britain could be related to the cultural beliefs of ethnic minority parents. These beliefs in turn could impinge on the management of asthma because they are at variance with the beliefs of health staff. This contrast in cultural perspectives may impose a challenge for clinicians to address their patients' beliefs in a co-operative way that enables these parents to consider the possibility that their children may be at a disadvantage if they do not adhere to the prescribed treatment.

We should be careful not to focus on the interpretation of facts in a ''victim blaming'' approach to culture. It has been acknowledged that modern medicine may adopt explanatory models that have been developed by a particular cultural group.[14 15] Many of the views of medicines may have been firmly established over generations, as suggested by Horne and colleagues in a study which demonstrated that Asian university students were less satisfied with ''Western'' medical care compared with ''Western students''.[15]

We hypothesised that the beliefs and attitudes of ethnic minorities differ from those of white subjects with regard to stigma, asthma management and attitudes. Hence, we examined parental beliefs about their children's asthma, management and prognosis of the condition, in a sample attending asthma clinics and A&E departments of hospitals located in multi-ethnic areas. Our study had a particular focus on South Asian parents. In this analysis we assess the associations, if any, and effect sizes of risk factors related to beliefs on asthma and its management.

METHODS

The study was conducted in three district general hospitals in three areas of London with a large multi-ethnic population and a high proportion of South Asian (Indian and Pakistani) residents. A clinical specialist advised the fieldworker as to the clinics which parents with children suffering from asthma were likely to attend. At these clinics, all parents of children with asthma aged 3–9 years were invited to participate in the study; very few refused. We decided a priori to focus on three groups of parents: those originating in South Asian countries, white parents and those from ''other'' ethnic minorities in Britain.

Abbreviations: A&E, accident and emergency; 95% CI, 95% confidence interval; GP, general practitioner; OR, odds ratio

Table 1 Characteristics of the study respondents by ethnicity

	White	South Asian/ South Asian British	Other (black African /black Caribbean /mixed)
Age of child, mean (SD) (n)	5.52 (2.07) (n = 65)	5.90 (2.15) (n = 41)	5.69 (2.04) (n = 42)
Parent's level of completed education (%)			
Primary/none	5 (7.7)	7 (18.4)	6 (15.8)
Secondary	15 (23.1)	14 (36.8)	6 (15.8)
Further education	14 (21.5)	8 (21.1)	12 (31.6)
University/polytechnic	31 (47.7)	9 (23.7)	14 (36.8)
Country of birth			
United Kingdom	58 (90.6)	10 (24.4)	23 (56.1)
Elsewhere	6 (9.4)	31 (75.6)	18 (43.9)
Child's asthma severity (based on waking with breathlessness in last 3 months) (%)			
Not at all	20 (30.8)	6 (15.0)	13 (32.5)
Less than twice a month	26 (40.0)	16 (40.0)	8 (20.0)
Greater than twice a month	9 (13.8)	12 (30.0)	7 (17.5)
More than once a week	7 (10.8)	2 (5.0)	8 (20.0)
Every night	3 (4.6)	4 (10.0)	4 (10.0)

Ethical approval was obtained from St George's Hospital Research Ethics Committee and Ealing Hospital Research Ethics Committee.

A short self-completed questionnaire focussed on seven areas: the child's symptoms and asthma severity, use of hospital services, general practitioner (GP) consultations, beliefs about why the child had developed asthma, use of asthma treatments, views about the prognosis of the child's asthma, and parent's feelings about others knowing of their child's problem. The questionnaire was piloted using 10 appropriate clinic cases and adapted accordingly to produce the study version. A Punjabi version of the questionnaire was produced for parents for whom this was their preferred language. Only parents who could both read and write either English or Punjabi were entered into the study; the few parents who did not satisfy this criterion were excluded. In addition, the fieldworker attending the clinic was available to explain any items of the questionnaire that were unclear.

Ethnicity was recorded by self-selection from the responses of the 2001 United Kingdom Census question on ethnic origin. For the analyses ethnicity was categorised as white (British, Irish, any other white background), South Asian/South Asian British (Indian, Pakistani, Bangladeshi, any other South Asian group) and ''other'' (including black Caribbean, black African and those of mixed ethnicity). The gender of the parent who completed the questionnaire (mother or father) was noted.

Statistical methods

The study sample size was determined by assuming that the prevalence of ''felt'' stigma (represented in the questionnaire by a negative answer to the statement ''I would be happy for my friends to know that my child has asthma'') was 25% in the white population and 50% in the parents of South Asian children. This difference could be detected with a two-tail test having 80% power and a significance level of 5% if there were 66 cases per group or 132 in all. In the event we recruited 150 cases.

Questionnaire items were dichotomised and analysed using forward stepwise multiple logistic regression. They covered issues related to parental views and beliefs about their child's asthma, about asthma medication received, about managing their child's asthma, about the use and consequences of the prescribed drugs, and parental attitudes and behaviour about asthma and its management in relation to other people in the community. The main explanatory factor in the analysis was ethnicity. We also included as explanatory variables in the analysis the child's age, gender, frequency of the child being woken by symptoms (more than once a week or not), the parent's level of education (post-secondary or not), the parent's gender and the location of the hospital. Frequency of the child being woken by symptoms was used as a proxy for severity of asthma and further analyses were conducted in which use of A&E services in the previous 12 months was chosen as an alternative proxy for asthma severity to assess the consistency of our findings.

RESULTS

Altogether 150 questionnaires were completed. The mother completed the questionnaire for 117 children, the father for 27, and both parents together for five.

Table 1 shows the main characteristics of the children and their parents. The 41 South Asian parents comprised 22 of Indian origin, nine of Pakistani origin, two of Bangladeshi origin and eight from other South Asian groups. Of the 42 parents from ''other'' ethnic groups, 17 were black African, 11 black Caribbean and 11 of mixed ethnicity. Nearly two thirds of the fathers and mothers who completed the questionnaire had received post-secondary education. The children showed a wide range of asthma severity according to the frequency of waking at night with breathlessness. More than half (57.4%) of the children had been taken to A&E as a result of wheezing or asthma at least once in the previous 12 months.

Tables 2–4 display the results from the stepwise multiple linear regression analyses. Odds ratios are shown by each significant variable; these are independent of the other potential explanatory variables.

Table 2 shows the significant factors in the responses to the questionnaire items on beliefs about asthma as a disease. South Asian parents were more likely to believe that their child had asthma. These parents also showed greater confidence during an attack of asthma that their child would get better from their condition. Those of ''other'' ethnicity were more likely to agree that their child's asthma was largely out of control and that faith was more important.

Regarding treatment for asthma in the previous 12 months, 133 (97.1%) of the parents said that their children were prescribed β-agonist inhalers (relievers), 134 (98.5%) corticosteroid inhalers (preventers) and 57 (38.0%) oral corticosteroids. The factors influencing the statements regarding the treatment of asthma are shown in table 3.

Table 2 Beliefs about asthma as a disease

Statement	Number of parents endorsing (%)	Significant factors	OR (95% CI)	p Value
Do you think your child has asthma? [Yes]	116/148 (78.4%)	South Asian	4.04 (1.04 to 15.76)	0.044
		Older child	1.27 (1.01 to 1.60)	0.045
		Frequent waking	4.93 (1.02 to 23.93)	0.048
Do you feel that asthma is serious? [Yes]	129/148 (87.2%)	None		
I find [an attack] frightening	98/125 (78.4%)	Older child	0.77 (0.60 to 0.98)	0.034
		Frequent waking	4.97 (1.02 to 24.30)	0.048
I am confident that he or she will get better [from the condition]	82/115 (71.3%)	South Asian	6.19 (1.38 to 27.77)	0.017
		Frequent waking	0.24 (0.08 to 0.74)	0.013
		Female child	0.17 (0.04 to 0.66)	0.011
How confident are you in controlling your child's asthma attacks? [Confident/very confident]	127/146 (89.0%)	Older child	0.73 (0.54 to 0.97)	0.033
I feel my child's asthma is largely out of control and you just need to have faith	16/145 (11.0%)	Other ethnicity	7.43 (1.38 to 39.93)	0.019

Independent variables: ethnicity (white, South Asian, ''other''); child's gender, age and frequency of waking by breathlessness; parent's gender, level of education; hospital). Reference group: parents who did not endorse the statement. 95% CI, 95% confidence interval; OR, odds ratio.

Those of ''other'' ethnicity were more likely to have worries about the drugs prescribed for their child's asthma. Respondents of South Asian ethnicity were less likely to try to give their child the preventer medication every day, as were those of ''other'' ethnicity. South Asian parents were more likely to agree that most medicines were addictive, as were those of ''other'' ethnicity, and agree with the statement ''medicines can do more harm than good''.

Table 4 shows the findings on parents' use of hospital emergency services and GP services in the event of their child having an asthma attack. Those of South Asian ethnicity were much more likely to believe that better help and support was available through the hospital than from their GP. Parents with post-secondary education were more likely to be dissatisfied with their GP's initial explanation of their child's asthma treatment. Families in which the child concerned had frequent waking with breathlessness brought on by asthma were more likely to take the child straight to A&E.

Interactions with friends, family and the wider community showed some patterns related to ethnicity and parental education. South Asian parents were less likely to agree that they would be happy about their friends knowing that their child had asthma (as hypothesised by the sample size calculation), as were parents of ''other'' ethnicity. Parents with post-secondary education were less concerned about this. Those of ''other'' ethnicity were less happy about their relatives knowing of their child's asthma, but this greater reticence did not seem to apply to the South Asian parents. Ethnicity did not seem to be linked to whether the parent objected to their child using an inhaler in public, although those with post-secondary education were less concerned about what others thought.

The additional analyses using the number of visits to A&E in the previous 12 months as the proxy for asthma severity produced similar findings to those described above.

DISCUSSION

In comparison with white parents, the South Asian and ''other'' ethnic groups, predominantly black African and black Caribbean, more often stated that they did not give preventer medication to their child as prescribed and more frequently expressed the view that most medicines are addictive. The South Asian parents more often than the other two groups expressed the belief that their child would get better from their asthma, and compared with the parents in the white and South Asian groups, those of ''other'' ethnicity more frequently endorsed the opinion that their child's asthma was out of control. More South Asian parents believed that medicines could do more harm than good. Those of ''other'' ethnicity expressed concern about the drugs prescribed for their child's asthma.

Parents of ''other'' ethnicity without post-secondary education were more reluctant to tell others about their child's asthma. The only indication that the provision of primary care services may be less satisfactory for South Asian parents than for those of white or ''other'' ethnicity was that they were more satisfied with the service received from hospital than from their

Table 3 Beliefs about the treatment of asthma

Statement	Number of parents endorsing (%)	Significant factors	OR (95% CI)	p Value
I find it difficult to know when I should use the different inhalers	42/143 (29.4%)	Frequent waking	0.14 (0.05 to 0.40)	<0.001
It is easy to get my child to take his/her asthma treatment	136/146 (93.2%)	None		
I find it easy to remember to give my child the medication regularly	139/148 (93.9%)	None		
I have worries about the drugs prescribed for my child's asthma	83/147 (56.5%)	Other ethnicity	3.67 (1.43 to 9.52)	0.007
I try to give my child the preventer medication everyday	96/147 (65.3%)	South Asian	0.30 (0.12 to 0.75)	0.010
		Other ethnicity	0.34 (0.13 to 0.87)	0.024
		Frequent waking	3.18 (1.04 to 9.76)	0.043
Most medicines are addictive	67/127 (52.3%)	South Asian	3.89 (1.47 to 10.27)	0.006
		Other ethnicity	4.27 (1.57 to 11.58)	0.004
Medicines can do more harm than good	58/125 (46.4%)	South Asian	3.19 (1.22 to 8.34)	0.018

Independent variables: ethnicity (white, South Asian, ''other''); child's gender, age and frequency of waking by breathlessness; parent's gender, level of education; hospital). Reference group: parents who did not endorse the statement. 95% CI, 95% confidence interval; OR, odds ratio.

Table 4 Interacting with others

Statement	Number of parents endorsing (%)	Significant factors	OR (95% CI)	p Value
If my child has an asthma attack I usually come directly to A&E	67/149 (45.0%)	Frequent waking	2.58 (1.04 to 6.43)	0.041
I get better help and support from the hospital than from my GP	80/146 (54.8%)	South Asian	4.27 (1.67 to 10.96)	0.003
At my GP surgery my child's asthma treatment was initially explained well	49/146 (33.6%)	Better education	0.44 (0.20 to 1.00)	0.050
At my surgery I usually see the same doctor	92/149 (61.7%)	None		
I would be happy for my friends to know that my child has asthma	131/144 (91.0%)	South Asian	0.11 (0.01 to 1.06)	0.056
		Other ethnicity	0.06 (0.01 to 0.65)	0.020
		Better education	6.29 (1.22 to 32.50)	0.028
I would be happy for my relatives to know that my child has asthma	131/141 (92.9%)	Other ethnicity	0.08 (0.01 to 0.88)	0.039
I would mind my child using an inhaler in public	25/144 (17.4%)	Better education	0.21 (0.06 to 0.68)	0.009
		Frequent waking	8.57 (2.45 to 29.97)	0.001

Independent variables: ethnicity (white, South Asian, ''other''); child's gender, age and frequency of waking by breathlessness; parent's gender, level of education; hospital). Reference group: parents who did not endorse the statement. 95% CI, 95% confidence interval; OR, odds ratio.

GP. It is possible that the GPs involved with the South Asian parents might have been less experienced in the management of childhood asthma than the GPs with whom the white families were registered, leading South Asian parents to have greater confidence in hospital services. All the differences described above showed large effect sizes.

Our findings endorse the underlying model that ethnic groups differ in the social meanings they attribute to asthma. This is demonstrated in our study in relation to beliefs about fate and the interpretation of the nature of asthma. It is also demonstrated in the meaning attributed to prescribed treatments as shown by the differential concerns between ethnic groups expressed about prescribed drugs, about the use of preventer medication, about the belief that medicines may be addictive and about their potential to do more harm than good.

Approximately 20% of the children in our sample had moderate or severe asthma based on parents' reports of the frequency of waking with breathlessness. In the previous year 60% had attended A&E for asthma. Most children in our study were prescribed β-agonists and corticosteroid inhalers, and almost 40% of the parents reported that their children had been prescribed oral corticosteroids. A recurrent theme in the literature is the persistence of ethnic differences in the rates of attendance at A&E departments for acute asthma episodes regardless of the treatment received and with adjustment for a series of socio-demographic factors.[2 3 5] However, attribution of the difference to socio-economic factors and less developed approaches to cope with crises have also been documented.[16] We aimed to keep the questionnaire short and did not include economic measures, but the large effect size found in our study (2.58) would make it unlikely that an additional socio-economic question would have explained our results. In most studies the researchers should endeavour to keep the questionnaire short and relevant to the participants.

Adherence to asthma management in some ethnic minority groups has been shown to be poor.[17–19] Social cognition models state that some individuals in ethnic minority groups have strong beliefs that impact on the interpretation of information and behaviour.[19–21] From this theoretical framework our findings suggest that parents from ethnic minorities would hold beliefs that may greatly influence the management of their children's asthma. Horne and Weinman found that the difference in scores between necessity and concerns using the Beliefs about Medicines Questionnaire was the strongest predictor of adherence to treatment.[19] Parents from non-white ethnic groups in our study more frequently stated concerns about the safety and addiction potential of asthma drugs in the treatment of chronic conditions in concordance with the findings from a qualitative study.[11] This could be the reason why more parents of the two non-white ethnic groups may have recognised that they did not provide the preventer medication as prescribed and that parents of ''other'' ethnicity expressed concern about the asthma drugs prescribed. As poor adherence to asthma treatment may be a lost opportunity for health gain and an inefficient use of resources, we would advise, based on our results, that health care providers discuss with parents and older children their concerns in relation to the management of asthma, especially in those from ethnic minorities. Intentional non-adherence may be high in ethnic minorities in the UK because of their cultural perspectives. Two studies to reduce unscheduled asthma care in multi-ethnic communities in Britain demonstrated a beneficial effect in the management of asthma, but in both studies there was concern that the effect was less noticeable in those from ethnic minorities.[22 23] This would indicate that any educational package should include a cultural perspective that would be relevant to those from ethnic minorities. Such an approach has been tried in a small study involving Afro-Caribbean and Hispanic groups in the United States. The findings look promising, but the programme is resource intensive as it involves three 1 h sessions.[24]

Parents of ''other'' ethnicity were prone to indicate that faith is an important coping mechanism regarding their child's asthma, while those from the South Asian group were confident that their child would get better. In conjunction with their views about asthma management, these beliefs would suggest that parents from ethnic minorities have views about asthma that perceive its outcome as independent of treatment. Our findings were around cultural rather than educational level issues because none of the variables related to management or outcome of asthma were associated with the parental educational level. However, it is possible that other socio-economic factors might also play a role in influencing parent behaviour concerning the management of their children's asthma. There is much less research on cultural barriers to appropriate care in relation to the subjects' beliefs that by being proactive they could modify the prognosis of a disease.[15] Parents from ethnic minorities in our study expressed reliance on destiny, faith and optimism more frequently than white parents. From this perspective our study supports the contention that asthma management could be improved by developing confidence in parents from ethnic minorities that they are able to cope with their children's asthma.[25 26]

What is already known on this topic

- In Britain South Asian parents and those of black ethnicity use Accident and Emergency services more often than white parents when their children have an asthma attack.
- Parents' health beliefs act as barriers to health care in ethnic minorities.

What this study adds

- South Asian and other ethnic minority groups are reluctant to let others know that their children have asthma.
- Parents of non-white ethnicity are less willing to give their children with asthma preventer medication on a daily basis and have greater concerns about the unintended effects of the medicines that are prescribed.

A finding of great concern from our study is the reluctance of parents to share issues related to their children's asthma with others. This same reluctance was found to be associated with a lack of post-secondary educational level. These attitudes are paralleled in studies of Indian mothers who expressed concern and denial when confronted with a diagnostic label of asthma.[27] The degree of stigma attached to asthma may be greater among those of lower educational level and may explain the lack of consistency of findings on the prevalence of asthma in South Asian in comparison to other ethnic communities.[12 28–31] Findings of the association between ethnicity and the excess admission to hospital and use of A&E departments are more consistent.[1 7–10]

We acknowledge that cultural differences occur among Pakistani and Indian families. In our sample the majority of South Asian participants had a relatively low level of education (the socio-economic proxy measure) and were therefore likely to comprise less advantaged groups in the population, who retain stronger cultural beliefs. Relating to this, three-quarters of South Asian respondents were born outside the UK (table 1).

Our study was restricted to a population receiving care from specialised hospital services and A&E departments and therefore does not represent the population with asthma in the community but a subgroup under hospital care. Our study has the advantage of focussing on children with more serious asthma already receiving care. It has the disadvantage that we cannot extrapolate our findings to the general population in which the percentage of severe cases of asthma is usually low, for analysis. It provides a sample of parents well aware of their child's asthma, concerned about the condition and managing the asthma.

In this study, due to the sample size relatively large effect sizes were required in order to identify statistically significant explanatory variables. For some items of the questionnaire, inspection of the p values shows that a number of variables were of marginal statistical significance. However, with many of the items the effect of ethnicity was evident, pointing to consistent findings regarding the importance of ethnic group.

In conclusion, our study has uncovered possible mechanisms that may act as barriers to the management of asthma, especially in South Asian and other ethnic minorities. These barriers are related to beliefs that asthma medicines may be more harmful than beneficial, that the outcome of asthma is more subject to faith and chance than to the usefulness of treatment, and that asthma in children generates unacceptable stigma. Higher rates of admission to hospitals and attendance at A&E of children from ethnic minority groups in comparison to white patients may be reduced by a management strategy that takes into account the differences in beliefs about asthma and its treatment.

ACKNOWLEDGEMENTS

We wish to thank all the parents and their families, and the health care professionals involved. We are grateful to Dr Katherine Sloper, Ealing Hospital for advice regarding the conduct of the study. Ros Darampal and Joanna Smeeton assisted in the collection of the data.

Authors' affiliations

Nigel C Smeeton, Jane Gregory, Myfanwy Morgan, Division of Health and Social Care Research, King's College London, London, UK
Roberto J Rona, Division of Asthma, Allergy and Lung Biology, King's College London, London, UK
Patrick White, Department of General Practice and Primary Care, King's College London, London, UK

Funding: This study was funded by Guy's and St. Thomas' Charity. All the researchers are independent of the source of funding. The funders have not been involved in any decisions regarding the conduct of the study or the dissemination of the findings.

Competing interests: None.

Ethical approval: Ethical approval was obtained from St George's Hospital Research Ethics Committee and Ealing Hospital Research Ethics Committee.

REFERENCES

1 **Gilthorpe MS**, Lay-Yee R, Wilson RC, *et al*. Variations in hospitalization rates for asthma among black and minority ethnic communities. *Respir Med* 1998;**92**:642–8.
2 **Duran-Tauleria E**, Rona RJ. Geographical and socioeconomic variation in the prevalence of asthma symptoms in English and Scottish children. *Thorax* 1999;**54**:476–81.
3 **Goodman DC**, Stukel TA, Chiang C. Trends in pediatric asthma hospitalization rates: regional and socioeconomic differences. *Pediatrics* 1998;**101**:208–13.
4 **Fox Ray N**, Thamer M, Fadillioglu B, *et al*. Race, income, urbanicity, and asthma hospitalization in California. *Chest* 1998;**113**:1277–84.
5 **Joseph CLM**, Havstad SL, Ownby DR, *et al*. Racial differences in emergency department use persist despite allergist visits and prescriptions filled for anti-inflammatory medications. *J Allergy Clin Immunol* 1998;**101**:484–90.
6 **Lara M**, Akinbami L, Flores G, *et al*. Heterogeneity of childhood asthma among Hispanic children: Puerto Rican children bear a disproportionate burden. *Pediatrics* 2006;**117**:43–53.
7 **Ormerod LP**. Adult Asian acute asthma admissions reassessed: Blackburn 1991–1992. *Respir Med* 1995;**89**:415–17.
8 **Myers P**, Ormerod LP. Increased asthma admission rates in Asian patients: Blackburn 1987. *Respir Med* 1992;**86**:296–300.
9 **Rona RJ**. Asthma and poverty. *Thorax* 2000;**55**:239–44.
10 **Netuveli G**, Hurwitz B, Levy M, *et al*. Ethnic variations in UK asthma frequency, morbidity, and health-service use: a systematic review and meta-analysis. *Lancet* 2005;**365**:312–17.
11 **Mansour ME**, Lanphear BP, DeWitt TG. Barriers to asthma care in urban children: parent perspectives. *Pediatrics* 2000;**106**:512–19.
12 **Duran-Tauleria E**, Rona RJ, Chinn S, *et al*. Influence of ethnic group on asthma treatment in children 1990-91: national cross-sectional study. *BMJ* 1996;**313**:148–52.
13 **Moudgil H**, Honeybourne D. Differences in asthma management between white European and Indian subcontinent ethnic groups living in socioeconomically deprived areas in the Birmingham (UK) conurbation. *Thorax* 1998;**53**:490–4.
14 **Greenhalgh T**, Helman C, Chowdhury AM. Health beliefs and folk models of diabetes in British Bangladeshis: a qualitative study. *BMJ* 1998;**316**:978–83.
15 **Horne R**, Graupner L, Frost S, *et al*. Medicine in a multi-cultural society: the effect of cultural background on beliefs about medications. *Soc Sci Med* 2004;**59**:1307–13.
16 **Hanania NA**, David-Wang A, Kesten S, *et al*. Factors associated with emergency department dependence of patients with asthma. *Chest* 1997;**111**:290–5.
17 **Cochrane GM**, Horne R, Chanez P. Compliance in asthma. *Respir Med* 1999;**93**:763–9.
18 **Bender B**, Milgrom H, Rand C, *et al*. Psychological factors associated with medication nonadherence in asthmatic children. *J Asthma* 1998;**35**:347–53.
19 **Horne R**, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *J Psychosom Res* 1999;**47**:555–67.
20 **Conner M**, Norman P. *Predicting health behaviour: research and practice with social cognition models*. Buckingham, UK: Open University Press, 1996.
21 **Weinman J**, Petrie K. Illness perceptions: a new paradigm for psychosomatics? *J Psychosom Res* 1997;**42**:113–16.
22 **Griffiths C**, Foster G, Barnes N, *et al*. Specialist nurse intervention to reduce unscheduled asthma care in a deprived multiethnic area: the east London randomised controlled trial for high risk asthma (ELECTRA). *BMJ* 2004;**328**:144–7.
23 **Mougdil H**, Marshall T, Honeybourne D. Asthma education and quality of life in the community: a randomised controlled study to evaluate the impact on white

European and Indian subcontinent ethnic groups from socioeconomically deprived areas in Birmingham, UK. *Thorax* 2000;**55**:177–83.
24 **La Roche MJ**, Koinis-Mitchell D, Gualdron L. A culturally competent asthma management intervention: a randomized controlled pilot study. *Ann Allergy Asthma Immunol* 2006;**96**:80–5.
25 **Clark NM**, Gong M, Schork MA, *et al*. Impact of education for physicians on patient outcomes. *Pediatrics* 1998;**101**:831–6.
26 **Lorig KR**, Sobel DS, Stewart AL, *et al*. Evidence suggesting that a chronic disease self-management program can improve health status while reducing hospitalization: a randomized trial. *Med Care* 1999;**37**:5–14.
27 **Partridge MR**. In what way may race, ethnicity or culture influence asthma outcomes? *Thorax* 2000;**55**:175–6.
28 **Smith JM**, Cooper SM. Asthma and atopic disease in immigrants from Asia and West Indies. *Postgrad Med J* 1981;**57**:774–6.
29 **Johnston IDA**, Bland JM, Anderson HR. Ethnic variation in respiratory morbidity and lung function in children. *Thorax* 1987;**42**:542–8.
30 **Parajasingam CD**, Sittampalam L, Damani P, *et al*. Comparison of the prevalence of asthma among Asian and European children in Southampton. *Thorax* 1992;**47**:529–32.
31 **Melia RJW**, Chinn S, Rona RJ. Respiratory illness and home environment of ethnic minority groups. *BMJ* 1988;**296**:1438–41.

IMAGES IN PAEDIATRICS

doi: 10.1136/adc.2007.129692

Radiological findings in cyclical administration of intravenous pamidronate in children with osteoporosis

A 5-year-old boy with moderately severe osteogenesis imperfecta and spontaneous fractures was treated with serial courses of intravenous pamidronate. Pamidronate is a second-generation bisphosphonate drug that binds strongly to bone mineral and interferes with bone remodelling by slowing osteoclastic bone resorption. It is used in a cyclic dosage of 1 mg/kg/day intravenously on 3 successive days at 4-monthly intervals. A radiograph of the knee after treatment showed a pattern of parallel dense metaphyseal lines (fig 1A).

A 16-year-old boy with camptodactyly coxavara arthropathy pericarditis syndrome (C-CAP syndrome) also had osteoporosis (Z score −4) with associated spontaneous fractures. After several courses of intravenous pamidronate a radiograph of his knee showed a pattern of parallel dense metaphyseal lines similar to those of the first child but much more closely packed because of less bone growth between courses of the drug in this older patient (fig 1B).

The value of bisphosphonate administration in paediatric patients for the treatment of osteoporosis and osteogenesis imperfecta has been reported.[1–3] We present the radiographic finding of parallel dense metaphyseal lines in two children treated with cyclical intravenous pamidronate. As reported by others, the number of lines corresponded to the number of treatments received and the separation of the lines was determined by the age of the child and the rate of growth of the bone imaged.[4]

C Onwuneme, K Abdalla, N Cassidy, O Hensey, S Ryan
Children's University Hospital, Temple Street, Dublin, Ireland

Competing interests: None.

Parental/guardian informed consent was obtained for publication of the persons' details in this report.

Correspondence to: C Onwuneme, Children's University Hospital, Temple Street, Dublin 1, Ireland; drchike2001@yahoo.com

References

1 **Plotkin H**, Coughlin S, Kreikemeier R, *et al*. Low doses of pamidronate to treat osteopenia in children with severe cerebral palsy: a pilot study [correction appears in *Dev Med Child Neurol* 2006;**48(12)**:1024]. *Dev Med Child Neurol* 2006;**48(9)**:709–12.
2 **Henderson RC**, Lark RK, Kecskemethy HH, *et al*. Bisphosphonates to treat osteopenia in children with quadriplegic cerebral palsy: a randomized, placebo-controlled clinical trial. *J Pediatr* 2002;**141(5)**:644–51.
3 **Falk MJ**, Heeger S, Lynch KA, *et al*. Intravenous bisphosphonate therapy in children with osteogenesis imperfecta. *Pediatrics* 2003;**111(3)**:573–8.
4 **Grissom LE**, Harcke HT. Radiographic features of bisphosphonate therapy in pediatric patients. *Pediatr Radiol* 2003;**33(4)**:226–9.

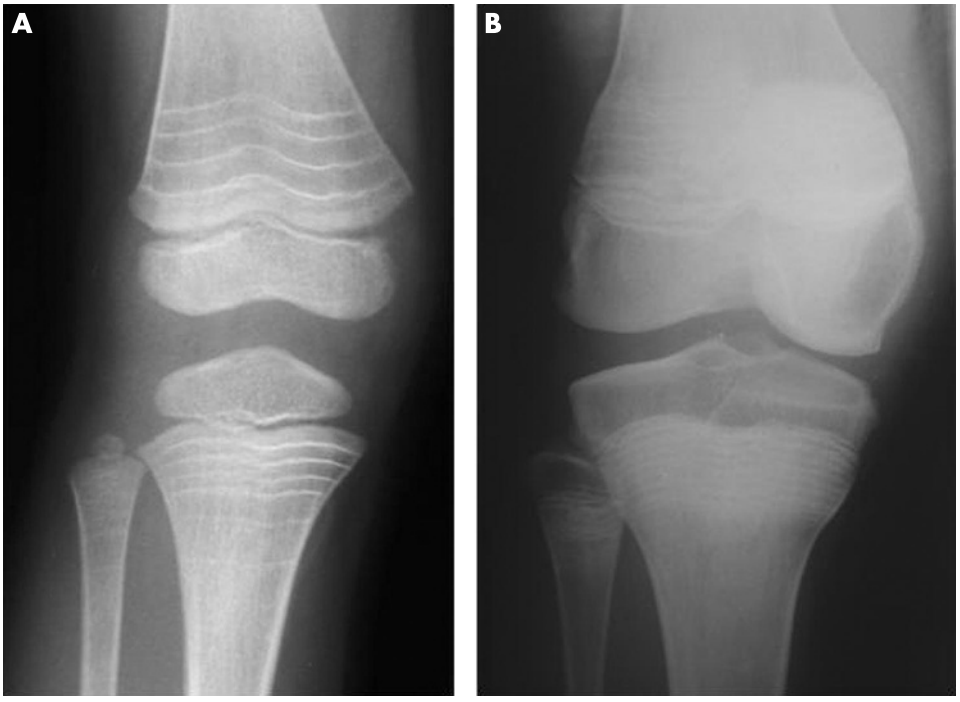

Figure 1 (A) A 5-year-old boy with osteogenesis imperfecta after cyclic treatment with biphosphonates. AP radiograph of the knee shows dense parallel bands in distal femoral and proximal tibial and fibular metaphyses. (B) A 16-year-old boy with camptodactyly coxavara arthropathy pericarditis syndrome (C-CAP syndrome) and osteoporosis who had cyclic treatment with biphosphonates. AP radiograph of the knee shows dense parallel bands in distal femoral and proximal tibial and fibular metaphyses. Lines are closer to each other than seen in the younger boy.