

Original articles

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

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Abstract

Background—Whether asthma morbidity in minority groups can be reduced by preventative health care measures delivered in the relevant ethnic dialects requires further evaluation. This study reports clinical outcomes and quality of life from a community based project investigating white European (W/E) and Indian subcontinent (ISC) ethnic groups with asthma living in deprived inner city areas of Birmingham, UK.

Methods—Six hundred and eighty nine asthmatic subjects (345 W/E, 344 ISC) of mean (SD) age 34.5 (15) years (range 11–59) and mean forced expiratory volume in one second (FEV₁) of 80% predicted were interviewed in English, Punjabi, Hindi, or Urdu. Subjects randomised to the active limb of a prospective, open, randomised, controlled, parallel group, 12 month follow up study underwent individually based asthma education and optimisation of drug therapy with four monthly follow up (active intervention). Control groups were seen only at the beginning and end of the study. Urgent or emergency interactions with primary and secondary health care (clinical outcomes) and both cross sectional and longitudinal data from an Asthma Quality of Life Questionnaire (AQLQ) were analysed.

Results—Clinical outcomes were available for 593 subjects. Fewer of the active intervention group consulted their GP (41.8% versus 57.8%, odds ratio (OR) 0.52 (95% CI 0.37 to 0.74)) or were prescribed antibiotics (34.9% versus 51.2%, OR 0.51 (95% CI 0.36 to 0.72)), but by ethnicity statistically significant changes occurred only in the W/E group with fewer also attending A&E departments and requiring urgent home visits. Active intervention reduced the number of hospital

admissions (10 versus 30), GP consultations (341 versus 476), prescriptions of rescue oral steroids (92 versus 177), and antibiotics (220 versus 340), but again significant improvements by ethnicity only occurred in the active W/E group. AQLQ scores were negatively skewed to the higher values; regression analysis showed that lower values were associated with ISC ethnicity. Longitudinal changes (for 522 subjects) in the mean AQLQ scores were small but statistically significant for both ethnic groups, with scores improving in the active and worsening in the control groups.

Conclusions—Active intervention only improved clinical outcomes in the W/E group. AQLQ scores, although lower in the ISC group, were improved by active intervention in both ethnic groups.

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Keywords: asthma; quality of life; ethnicity

Research has continued to identify disproportionate asthma morbidity in ethnic minority groups.^{1–8} In the UK, for example, where ethnic minority groups—that is, groups other than white subjects—make up three million (5.5%) of the population,⁹ higher hospital admission rates and attendance at accident and emergency (A&E) departments have been reported for Asian (Indian subcontinent, ISC) than for white European (W/E) subjects.^{2–4} This has been against a background of conflicting evidence on the prevalence of asthma in the two ethnic groups^{10–12} and similar severity of the acute episodes amongst admitted cases.² The risk of underdiagnosis and undertreatment amongst children from ethnic minority groups¹³ and, for older children and adults, differences in the way asthma is currently managed,¹⁴ have also been shown. Similar findings suggesting differences in access to and delivery of asthma care have also been reported

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for some other ethnic minority groups in New Zealand and the USA.⁶⁻⁸

Asthma education, if delivered in close association with medical care, has been shown to reduce morbidity,¹⁵⁻¹⁷ but studies evaluating ethnic minority groups have usually been directed towards the at risk groups including recent hospital discharges or frequent A&E attenders.^{18,19} Most asthmatic patients are, however, managed in the community where only a few have severe disease and it is recognised that not all of the clinical outcome markers used in assessing severe asthma are appropriate to investigation of mild to moderate disease.²⁰ However, quality of life assessments as a measure of the effect of disease on a patient's health and well being are considered important tools in clinical studies including mild asthma.²¹⁻²⁴ For ISC ethnic groups in the UK language barriers and cultural differences have been implicated in continuing asthma morbidity²⁻⁴ but there are no reports about their quality of life, how this compares with that of the indigenous white Europeans (W/E), or if morbidity measured by such assessments can be reduced by preventative health care strategies.

A study based in the community to investigate subjects across the whole spectrum of disease severity was undertaken to evaluate active intervention with a programme of asthma education, treatment optimisation, and follow up based in the relevant ethnic dialects. In a group of ISC and W/E asthmatic patients aged 11-59 years living in the same areas of socioeconomic deprivation in inner city Birmingham (UK) it was hypothesised that those of ISC ethnic origin would be more likely to seek urgent or emergency primary and secondary health care and would have a lower quality of life. The aims of the prospective part of this study were then to investigate both ethnic groups and to determine whether active intervention would reduce the utilisation of urgent health care and improve the quality of life.

Methods

STUDY POPULATION

Birmingham has a population of 1.1 million of whom 27.2% live in districts with medium or high socioeconomic deprivation (1991 National Census⁹; index based on Jarman score of >40). Ethnic minority groups make up 21.5% of the population, with twice as many of ISC origin (representing most of the non-English speaking groups) as black Afro-Caribbean (AFC) origin.⁹ Of the ethnic minority groups, 57.3% live in seven of the city's 39 electoral wards, geographically the inner city areas.⁹

All W/E and ISC patients aged 11-59 years with a diagnosis of asthma and registered with any of 12 participating inner city general practices (six single handed) within a 2.5 mile radius of the City Hospital in Birmingham were considered for the study. Another two single handed general practices had also been approached but declined involvement. Other minority groups (mainly AFC and some mixed race) and a small number of Bangladeshi

and/or only Bengali speaking patients who did not speak English, Punjabi, Urdu, or Hindi were excluded.

STUDY DESIGN

Permission for this open, randomised, controlled, intervention, parallel group 12 month follow up study was given by the local research ethics committee. None of the patients was previously known to the educator (HM) who was fluent in the appropriate dialects. To avoid any bias in selection all eligible patients were specifically requested to attend their general practice for review by the researcher. A computer program randomly allocated subjects from both ethnic groups to active (intervention) and control groups prior to sending out (an) initial written appointment(s). Objective measurements of airflow obstruction were made using a portable hand held spirometer with reference values as previously described.¹⁴

All subjects were reviewed individually and in a structured way. The control groups only attended at the beginning and end of the study and were asked to continue their usual asthma follow up. For the active groups, intervention used an individual asthma education programme (initial session approximately 40 minutes) which was reinforced after four and eight months. Emphasis was on appropriate prescribing (by advising the general practitioner regarding any necessary change to treatment) and optimising treatment including drug delivery (by checking and instructing on use of the inhaler devices) or compliance as well as improving knowledge about disease severity and medication. Peak flow meters were provided free of charge to all subjects within the active groups who did not have their own. Booklets to record peak flow measurements during the 12 months were provided to all active subjects along with individually tailored written self-management plans based on both previous best or predicted values for peak flow readings and symptom recognition. Plans to indicate a step up or down of treatment were based on existing British Thoracic Society guidelines with threshold values on peak flow measurements determining action or change in treatment adopted along lines such as those promoted by the National Asthma Campaign. Educational literature (Allen & Hanburys) in the various ethnic dialects describing aspects of asthma and its management including triggers, medication, delivery devices, etc were available to all subjects in the active groups and distributed accordingly. Data were collected during study visits and from general practice and hospital records.

An Asthma Quality of Life Questionnaire (AQLQ)^{22,23} was administered to all subjects at the beginning and end of the study. It had previously been validated for both evaluative and discriminative properties and used in comparing groups.²⁴ It contained 32 questions about asthma events over the preceding two weeks and scored responses on a seven point scale (from 1 = severe limitation or most of the time to 7 = no limitation or none of the time). Mean

Table 1 Subjects randomised to active and control groups

	Active (n = 343)	Control (n = 346)
Initial randomisation (W/E/ISC)	172/171	173/173
Mean (SD) age (years)	33.6 (15.2)	35.4 (15.5)
M/F	176/167	161/185
Current or past smoking (n (%))	99 (28.8)	124 (35.8)
Past asthma admission/A&E (n (%))	115 (33.5)	116 (33.5)
Mean (SD) duration diagnosis (years)	13.3 (11.7)	14.5 (13.2)
Mean (SD) FEV ₁ (l)	2.40 (0.89)	2.42(0.88)
Mean (SD) % predicted FEV ₁	79 (22)	81 (21)

W/E = white European; ISC = Indian subcontinent; FEV₁ = forced expiratory volume in one second.

Data are mean (SD) unless otherwise stated.

There were no significant differences between groups for any of the stated characteristics.

values provided an overall assessment and there were individual domain scores for activity limitation, symptoms, emotional function, and exposure to environmental stimuli. Some words did not exist or translate exactly into the different dialects and, although not formally pilot tested on patients, the terms used were agreed by two bilingual people after a translation-back translation process.

STUDY SIZE AND STATISTICAL CONSIDERATIONS

Study size was based on hospital admissions as the least likely but most important clinical outcome. Assuming an annual admission rate of 10%, a reduction in admissions to 3% could be identified with 95% confidence and 80% power with 257 subjects in each group or, for 90% power, 331 subjects in each group. Subgroup analysis, whether investigating within or between ethnic groups, would, however, reduce the power of the study for the less frequently occurring clinical outcomes reported here. Descriptive and comparative analyses were by standard computational methods using the Statistics Package for Social Sciences for MS Windows Release 6.0 and Epi Info version 5. *p* values of <0.05 were considered statistically significant.

CLINICAL OUTCOMES

The clinical outcomes reported represented urgent or emergency interactions by the subjects with both primary and secondary health care. Active and control groups were compared analysing all subjects together as well as by ethnic group. Firstly, the number of subjects with each clinical outcome were compared using the χ^2 test with Yates' continuity correction, substituting the two tailed Fisher's exact test where expected values were small (<5). Odds ratios are reported with Cornfield 95% confidence intervals. Secondly, the actual numbers of events (or episodes) for each outcome were compared by categorising each outcome (for example, admissions 0, 1, 2, . . .) and analysing proportions within each category using the Mantel-Haenszel test for linear association (χ^2 for trend). Lastly, as the two ethnic groups were not matched exactly for age or sex, they were not compared directly but entered into a logistical regression analysis where clinical outcomes (yes/no) were the dependent variables. Controlling for independent variables (continuous or indicator covariates) including age, sex, ethnic group, duration since diagnosis, smoking status, past asthma

emergency (admission and/or A&E attendance), education protocol being followed (active or control group), and forced expiratory volume in one second (FEV₁), the statistical significance of interactions between ethnic group and education protocol were assessed.

ASTHMA QUALITY OF LIFE

Cross sectional AQLQ scores were distributed with a skew towards higher values and so a non-parametric method (Spearman's rho, r_s) was used when correlating these with measurements of airflow obstruction. AQLQ scores were transformed (squared) to a more normal distribution when investigating by regression the factors influencing quality of life. AQLQ² (overall or individual domain scores) values were entered as dependent variables and age, sex, ethnicity, smoking status, and FEV₁ as independent variables. Differences in AQLQ scores analysed longitudinally were approximately normally distributed and so paired *t* tests were used for the within group comparison and results were verified by non-parametric tests (Wilcoxon ranked sum tests for paired data). The between group comparison (active versus control) was both by independent group *t* tests and by regression analysis which considered the role of ethnic group, intervention, and an interaction effect as independent variables and changes in AQLQ scores as outcomes.

Results

STUDY BIAS/RESPONSE RATE

Over a one year period to August 1996, 689 (57%) of the 1217 (715 W/E, 502 ISC) identified asthmatics attended. Their mean (SD) age was 34.5 (15) years (range 11–59) with mean FEV₁ 80% predicted. The response rates to the study and differences between ethnic groups including asthma management have previously been presented.¹⁴ Of those in the ISC ethnic group, 42% were born outside the UK (mainly immigrants from India, Pakistan, and East and Central African countries) and 34% spoke no or very little English. Table 1 characterises all these subjects by study protocol. There were no differences between active and control groups in demographic, lung function, or disease profile characteristics including duration since diagnosis, previous reported drug compliance, number of subjects prescribed, and/or the doses of anti-inflammatory asthma medications or follow up. Clinical follow up data were available for 593 subjects (86%) and AQLQ data for 522 subjects (76%) and they did not differ from the initial groups.

CLINICAL OUTCOMES

Table 2 reports the number of subjects with each outcome as well as the total number of asthma events or episodes for each outcome. Relatively few of the subjects were admitted, attended the A&E department, or were reviewed only by out of hours home visits by GPs or deputising services (DDS/GP); most of those who consulted for worsening asthma attended the GPs during normal working hours. In the intervention (active) group

Table 2 Number of subjects with each outcome and the total number of asthma events or episodes for each outcome

	No. (%) of subjects with clinical outcome				Actual total no. of events		
	Active	Control	OR (95% CI)	p value	Active	Control	p value
All subjects	n = 304	n = 289			n=304	n=289	
Admissions	10 (3.3)	18 (6.2)	0.51 (0.22 to 1.14)	0.1355	10	30	0.0246
A&E	8 (2.6)	12 (4.2)	0.63 (0.23 to 1.68)	0.4251	11	14	0.5657
DDS/GP	5 (1.6)	12 (4.2)	0.39 (0.12 to 1.20)	0.1135	8	19	0.1046
GP consults	127 (41.8)	167 (57.8)	0.52 (0.37 to 0.74)	0.0001	341	476	0.0044
Steroids	54 (17.8)	69 (23.9)	0.69 (0.45 to 1.05)	0.0831	92	177	0.0058
Antibiotics	106 (34.9)	148 (51.2)	0.51 (0.36 to 0.72)	<0.0001	220	340	0.0005
White Europeans	n = 153	n = 146			n = 153	n = 146	
Admissions	2 (1.3)	9 (6.2)	0.20 (0.03 to 1.01)	0.0545	2	19	0.0309
A&E	2 (1.3)	10 (6.8)	0.18 (0.03 to 0.90)	0.0319	2	12	0.0133
DDS/GP	1 (0.7)	8 (5.5)	0.11 (0.01 to 0.91)	0.0355	3	14	0.0651
GP consults	51 (33.3)	87 (59.6)	0.34 (0.21 to 0.56)	<0.0001	123	264	0.0002
Steroids	24 (15.7)	40 (27.4)	0.49 (0.27 to 0.90)	0.0199	34	105	0.0007
Antibiotics	35 (22.9)	71 (48.6)	0.31 (0.18 to 0.53)	<0.0001	57	177	<0.0001
Indian subcontinent	n = 151	n = 143			n = 151	n = 143	
Admissions	8 (5.3)	9 (6.3)	0.83 (0.28 to 2.44)	0.9081	8	11	0.4516
A&E	6 (4.0)	2 (1.4)	2.92 (0.52 to 21.2)	0.3184	9	2	0.1591
DDS/GP	4 (2.6)	4 (2.8)	0.95 (0.19 to 4.60)	1	5	5	0.9414
GP consults	76 (50.3)	80 (55.9)	0.80 (0.49 to 1.30)	0.3971	218	212	0.8782
Steroids	30 (19.9)	29 (20.3)	0.97 (0.53 to 1.79)	1	58	72	0.9458
Antibiotics	71 (47.0)	77 (53.8)	0.76 (0.47 to 1.23)	0.2922	163	163	0.7431

Number (%) of subjects analysed by χ^2 with continuity correction or Fisher's exact test, reporting odds ratios and 95% CI. The total number of asthma events within each group categorised (0, 1, 2, 3, ...) and analysed using Mantel-Haenszel test for linear association (χ^2 for trend). p values <0.05 significant.

Table 3 Distribution of AQLQ scores (overall and individual domains)

	W/E (n = 344)	ISC (n = 345)
Activity	6.42 (5.67–6.92)	6.25 (5.67–6.75)
Symptoms	6.25 (5.08–6.83)	6.17 (5.33–6.75)
Emotional	6.20 (5.20–7.00)	5.80 (4.60–6.60)
Exposure	6.25 (5.50–7.00)	6.25 (5.50–7.00)
Overall	6.30 (5.42–6.78)	6.13 (5.47–6.69)

W/E = white European; ISC = Indian subcontinent. Values are median with interquartile ranges. Range from 1 (minimum) = severe limitation or most of the time to 7 (maximum) = no limitation or none of the time. Data are presented by ethnic group but not compared directly.

significantly fewer consulted the GP or were prescribed antibiotics for chest complaints. By ethnic group, these only featured in the W/E group with reduced A&E attendance, DDS/GP, GP consultations, and prescriptions for both rescue oral steroids and antibiotics. The actual total number of asthma events or episodes for each outcome was reduced in the active group with significantly fewer admissions, GP consultations, and prescriptions of oral steroids and antibiotics. These reductions were noted only for the W/E group who had fewer admissions, A&E reviews, GP consultations, and prescriptions for rescue steroids and antibiotics.

In logistic regression (full data not included) there was also a statistically significant effect of active educational protocol in the W/E group; fewer of these subjects attended A&E departments ($p = 0.0177$) or their GP ($p = 0.0298$) or were prescribed antibiotics during an exacerbation ($p = 0.0315$). For all subjects a past history of asthma admission or A&E attendance and a lower initial FEV₁ were statistically significant risk factors for admission and, although ISC ethnicity was positively and asthma education negatively (that is, less likely) associated with admission, the values did not reach statistical significance. Increasing age and a lower FEV₁ were associated with increased GP attendance, and the latter also predicted prescriptions for antibiotics and rescue oral steroids.

ASTHMA QUALITY OF LIFE

Cross sectional data

AQLQ scores were distributed similarly with a skew towards higher values for both ethnic groups and for the overall as well as individual domain assessments. Table 3 reports the distribution of median values and interquartile range for all subjects. Scores correlated with % predicted values for FEV₁ and the peak expiratory flow rate in the range $r_s = 0.15$ – 0.44 (all $p < 0.001$) with only slightly higher values in the W/E group.

Regression models (full data not included) showed that lower (worse) asthma quality of life scores were associated with increasing age, female sex, ISC ethnicity, smoking history, and lower FEV₁, but the influence of each of these factors varied with the different domains. Findings in the ISC group were statistically significant for the overall assessment and domains of activity limitation and emotional function. Only a small proportion of the variability in any of the models was accounted for by the dependent variables and results were unchanged whether using raw AQLQ values or transformed data (AQLQ²).

Longitudinal data

The AQLQ scores at the end of the study were also skewed to the higher values, and changes in mean scores (differences) from the initial values were small but some were statistically significant. Table 4 reports the within group (active or control) and between group (active versus control) analysis of all subjects followed by analysis by ethnic group. AQLQ scores improved in the active group and worsened in the control group with similar findings when these changes were analysed within ethnic groups. The findings were confirmed by non-parametric tests (Wilcoxon). Regression analysis further confirmed that outcomes were dependent on intervention (always improved with active group) but not on ethnic group or a specific intervention with either ethnic group, except when considering the emotional do-

Table 4 Mean (SE) AQLQ scores by ethnic group at the start of the prospective study

	Study protocol	AQLQ start	Within group (start vs end) difference		Between group (active vs control) difference	
			Mean (95% CI)	p value	Mean (95% CI)	p value
All subjects (n = 522)						
Overall	Control	6.02 (0.06)	-0.12 (-0.17 to -0.07)	<0.001	0.22 (0.15 to 0.29)	<0.001
	Active	6.01 (0.05)	0.10 (0.05 to 0.15)	<0.001		
Activity	Control	6.13 (0.06)	-0.15 (-0.21 to -0.09)	<0.001	0.18 (0.09 to 0.26)	<0.001
	Active	6.21 (0.05)	0.03 (-0.03 to 0.08)	0.348		
Symptom	Control	6.01 (0.06)	-0.12 (-0.17 to -0.06)	<0.001	0.25 (0.17 to 0.33)	<0.001
	Active	5.95 (0.06)	0.13 (0.07 to 0.19)	<0.001		
Emotional	Control	5.77 (0.08)	-0.03 (-0.07 to 0.02)	0.313	0.24 (0.15 to 0.32)	<0.001
	Active	5.65 (0.08)	0.21 (0.15 to 0.28)	<0.001		
Exposure	Control	6.08 (0.06)	-0.17 (-0.23 to 0.11)	<0.001	0.22 (0.14 to 0.29)	<0.001
	Active	6.09 (0.05)	0.05 (0.00 to 0.10)	0.072		
White Europeans (n = 242)						
Overall	Control	6.04 (0.09)	-0.08 (-0.15 to -0.02)	0.016	0.17 (0.07 to 0.26)	0.001
	Active	6.03 (0.08)	0.08 (0.02 to 0.15)	0.015		
Activity	Control	6.21 (0.08)	-0.11 (-0.19 to -0.02)	0.014	0.13 (0.01 to 0.24)	0.028
	Active	6.20 (0.07)	0.02 (-0.06 to 0.09)	0.628		
Symptom	Control	5.97 (0.10)	-0.08 (-0.16 to 0.00)	0.060	0.19 (0.08 to 0.30)	0.001
	Active	5.96 (0.09)	0.11 (0.03 to 0.19)	0.007		
Emotional	Control	5.83 (0.11)	0.01 (-0.05 to 0.08)	0.746	0.14 (0.04 to 0.25)	0.009
	Active	5.83 (0.11)	0.15 (0.07 to 0.24)	0.001		
Exposure	Control	6.08 (0.09)	-0.17 (-0.27 to -0.07)	0.001	0.23 (0.11 to 0.34)	<0.001
	Active	6.03 (0.08)	0.06 (-0.01 to 0.13)	0.067		
Indian subcontinent (n = 280)						
Overall	Control	6.01 (0.07)	-0.15 (-0.21 to -0.09)	<0.001	0.26 (0.17 to 0.36)	<0.001
	Active	6.00 (0.06)	0.11 (0.00 to 0.19)	0.003		
Activity	Control	6.07 (0.07)	-0.18 (-0.26 to -0.10)	<0.001	0.22 (0.10 to 0.33)	<0.001
	Active	6.23 (0.06)	0.03 (-0.05 to 0.12)	0.417		
Symptom	Control	6.05 (0.08)	-0.15 (-0.23 to -0.07)	0.001	0.30 (0.18 to 0.42)	<0.001
	Active	5.95 (0.07)	0.15 (0.06 to 0.24)	0.001		
Emotional	Control	5.71 (0.11)	-0.06 (-0.13 to 0.02)	0.132	0.32 (0.06 to 0.44)	<0.001
	Active	5.49 (0.11)	0.26 (0.16 to 0.37)	<0.001		
Exposure	Control	6.09 (0.08)	-0.18 (-0.25 to -0.10)	<0.001	0.21 (0.10 to 0.31)	<0.001
	Active	6.13 (0.07)	0.03 (-0.04 to 0.10)	0.423		

Range from 1 (minimum) = severe limitation or most of the time to 7 (maximum) = no limitation or none of the time. Within group (start versus end) and between group (active versus control) analysis shown with mean (SE) differences and 95% CI. Statistically significant where $p < 0.05$.

main where improvement after active intervention was greater for the ISC group ($p = 0.041$).

Discussion

We have investigated subjects with asthma in the community and report new findings in both clinical outcomes and quality of life measures. Clinical outcome data confirm that the majority of urgent health care is provided in primary care with only a small percentage presenting to secondary care and suggest that active intervention resulted in improvements at both levels of health care. Importantly, despite delivering asthma education directly to both ethnic groups in the relevant dialects, we have not been able to show the same level of improvement in clinical outcomes in the ISC patients as in the W/E ethnic group. The difference in efficacy of intervention between ethnic groups was a result of post hoc examination of the data rather than a prior hypothesis. Subgroup analysis of subjects within ethnic groups this way, however, reduced the power of the study and, in the case of some of the infrequently occurring events reported here, would be a limited finding. Quality of life data showed that AQLQ scores for both ethnic groups were negatively skewed and that lower scores are associated with ISC ethnicity as well as with increasing age, female sex, lower FEV₁, and a smoking history. In contrast to clinical outcome data, active intervention did improve asthma quality of life scores, suggesting reduced asthma morbidity in both ethnic groups.

Asthma management for all subjects prior to the study¹⁴ had centred on drug prescription, delivery techniques, and compliance but had

been deficient, particularly in the ISC group, in developing an understanding about the disease and self-management. To what extent worse initial observations amongst the ISC group would contribute to final outcomes was uncertain, but the subsequent failure to improve clinical outcomes amongst the ISC group was a surprising but consistent finding. The open nature of this study was unavoidable and, although it is unlikely for any change in behaviour from the general practitioner, it is always possible that some of the subjects within the control groups became aware of the intervention group. This is possibly the case as they all originated from the same 12 general practices and most lived within the same districts. Whether they would have changed their own asthma care as a result of this is uncertain and at best can only be speculated. Similarly, uncertainty remains about subjects changing their attitude to disease management purely as a result of recruitment to a study, irrespective of whether they were in the active or control groups.

As expected from studying a disease with a low admission rate, most consultations for worsening asthma were with the GP during normal working hours with only a lower initial FEV₁ and a previous history of an asthma emergency being statistically significant risk factors for admission. Although the severity of disease among the asthmatic patients admitted did not differ between the two ethnic groups,² it is not fully known whether the ISC patients managed exclusively by their GP during an exacerbation actually had more severe disease or were simply more likely to report symptoms

and/or disability. This is an important aspect to investigate further because most of the patient/health care interface is at the level of primary care. Higher rates of GP consultation and drug prescription by ethnic minority groups have previously been reported,²⁵ as have the differing cultural attitudes among some ISC groups with some patients failing to recognise asthma as a chronic disease or to grasp the concept of prophylactic medication.²⁻⁴

Clinical outcomes reported here are those considered most likely to represent urgent or emergency health care utilisation, whether in primary or secondary care. For various reasons some other outcomes were not considered but require mention. These included days off from work (often inaccurate and difficult within inner city deprived areas with high rates of permanent or transient unemployment, large numbers on chronic sickness benefits, single parent families or housewives) or school (absenteeism from other illness or truancy), self-reported acute exacerbations (lack of specific definition), referral rates to specialists (may represent variability in clinical practice), symptom free days (difficult to maintain diary over one year), etc.

Whether clinical outcomes in this study would have been different if we had investigated only those subjects with severe disease or considered a broader age range is uncertain. Patients with more severe disease and younger children tend to have higher rates of admission or re-admission and older adults, particularly those from the ISC group, may have been those to benefit most from asthma education based in their own dialect. It may be argued that language difficulties are no longer dominant factors as the age structures for ISC groups in this country have changed, with more of the ISC subjects now having been born in the UK and being English speaking whilst others tend to register with practices where either the doctor(s) or nurse(s) can speak to them in the appropriate ethnic dialect.

Language barriers cannot be overlooked in a condition where patient education and preventative measures make a difference, as shown for the clinical outcomes in the W/E ethnic group and asthma quality of life in both ethnic groups in this study. Other barriers to education include economic status and literacy levels, psychological and interpersonal problems, and the attitude patients have towards following medical advice. We had identified and overcome the language barriers to asthma education and can only speculate that a different approach, possibly more culturally sensitive and directed towards altering attitudes and beliefs as well as towards physical management of the disease, may have been more successful.

Quality of life instruments may be the more relevant measures of asthma morbidity in a community setting and the high AQLQ scores reported here are as expected when investigating a population with disease of predominantly mild to moderate severity; however, similar studies in a general practice setting have been undertaken only infrequently.²⁶⁻²⁷ Comparisons with our findings are complicated in that the

AQLQ was primarily designed for evaluative purposes and normal ranges for populations are not available. Crude AQLQ data from the two ethnic groups were not compared directly but regression analysis adjusting for confounding factors did show the negative effect of ISC ethnicity. Accounting for such differences could only at best be speculative. The distribution of AQLQ scores at the end of this study remained negatively skewed for both ethnic groups, but had improved in the active and worsened in the control groups.

The AQLQ used in this study requires further discussion. The change in mean AQLQ scores indicating clinical significance is usually ± 0.5 which suggests that some of our observations were statistically but not clinically significant; however, our data must be interpreted in the context of the distribution of AQLQ scores towards high values where changes of this magnitude would be unlikely. A validated AQLQ had only previously been translated and used in Spanish²⁸ and Dutch,²⁹ and a separate validation for the questionnaire (with construct validity, test-retest reliability, and responsiveness to change) in each dialect used here in more homogeneous groups than ours would be required in future. Although the AQLQ was originally validated for an adult population, we included children as young as 11 years old who all responded independently. The measurement of health by such means in children is complex and various workers, including the authors of the AQLQ, have developed a questionnaire for use in children,³⁰ but most such questionnaires available at the beginning of this study had not been used extensively and we had intentionally decided to use the same AQLQ throughout the study.

In summary, we have shown that active intervention did improve clinical outcomes but that, despite delivering this in the relevant ethnic dialect, we were not able to demonstrate the same level of improvement in the ISC patients as in the W/E ethnic group. The AQLQ data gave support to the finding that the programme including asthma education had a weak but positive benefit on morbidity in both ethnic groups, and we can only speculate that there would be benefit with continued education. Although there were no inherent problems in administering the AQLQ to the different ethnic groups, further studies in homogeneous populations and a separate analysis of adults and children are necessary to validate the AQLQ for each of the dialects. We cannot say whether our results can be generalised to asthmatic patients from more affluent areas or to other ethnic minority groups because of the cultural diversity and differing physical or psychological needs.

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