Research Article

Spatial difference in the Socio-demographic characteristics of children with varied asthma control does it make a difference?

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Abstract

Background: The socioeconomic status and caregiver perception of the disease, availability of specialty care and medication adherence have major influence on outcome of asthma control in children with asthma. The control of asthma therefore depends on the optimizing the interplay of these factors taking into consideration the regional and racial variations.

Objective: The objective of this study was to evaluate the association between socioeconomic factors and asthma control outcome in children with asthma.

Materials and methods: This was a cross sectional studies involving 66 consecutively enrolled participants asthma whose economic burden for asthma were being assessed. These were consenting children and young adults between the ages of 1 and 20 years. Using standard methods, data on personal and family demographics, socio-economic status, including household number, mothers' educational attainments and employment status; and asthma control were collected and analyzed. Descriptive and inferential statistics were done at 5% level of significance.

Results: Of all study participants, 34 (51.55%) were male, with mean age (SD) of 11.6 (4.8) years. The mean (SD) age at initial asthma diagnosis was 6.2 (4.6) years. The majority (76.5%) of the mothers had tertiary education. Study participants belonging to the poorest; very poor; poor; and least poor socio-economic cadres were, 16 (24.2%); 17 (25.8%); 17 (25.8%); and 16 (24.2%) respectively. Asthma control classification showed that, 26 (39.4%); 31 (47%) and 9 (13.6%) participants had well controlled asthma, partially controlled asthma and poorly controlled asthma respectively. The Factors like age, socioeconomic status, mothers 'educational level, employment status and number of children in the household did not show any statistically significant association with the asthma control status of participants.

Conclusion: Asthma control outcome remains multifactorial as participants' socio-demographic characteristics did not impact on the level of control of asthma, among participants in our sub region.

Keywords: Asthma control; Children; Socio-demographic

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Introduction

Asthma is a chronic respiratory disorder, characterised by episodic acute exacerbations often triggered by protean factors.[1,2] Its time of onset spans from early childhood to adolescent age, after which onset during adulthood is rare. However, poorly managed early onset asthma, predisposes to worse clinical manifestation in adult life, with associated increased morbidity and mortality.[3] There have been a global increase in the prevalence of asthma among children and adolescents in recent years, and this is worse in Low Middle Income Countries (LMICs).[3,4] This global rise in asthma prevalence has been attributed to multiple factors which could be categorized as host or environmental factors.[4–7] Host factors are age, obesity, genetics (family history of asthma), respiratory infections especially viral, habits like smoking, and allergies. The environmental factors are essentially triggers like dust, pollen, mold and cold weather. Determinants of asthma control in sufferers include occupation, socioeconomic status, adherence to medication, and perception of the disease and its symptoms, and availability of specialty care.[8] The control of asthma depends on the optimal management of all the factors, both host and environmental, taking into consideration the regional and racial variations which exit among these factors. Children from LMICs are disproportionately affected by host factors such as younger age at first attack, frequent upper respiratory tract infection, history of other allergic diseases, and time trend of attacks, family history of asthma, low socioeconomic status as it pertains to poor housing conditions; and environmental factors such as indoor and outdoor pollution which predispose to them to poor asthma control.[4,5,9,10]

Studies have documented that low socioeconomic status which rely mainly on the occupation, education and wealth index of the family heads are associated with adverse health outcomes in asthma in all age groups.[11–14] Despite the evidence on the impact of socioeconomic status on individual's predisposition to episodes of asthma 'flares', researchers have omitted giving equal consideration to its impact on the control of acute exacerbations. Understanding the extent to which the socio-demographic characteristics of the child interfere with the level of control of his asthma becomes imperative. In this study we reviewed the variations in the socio-demographic characteristics of children with asthma with regards to their level of asthma control. The finding thereof will help clinicians to understand the im-

pact of socio-demographics on asthma control in children in our setting when other determinants such as access to optimal care and adherence to medicines are adequately addressed. This will also strengthen the multipronged approach to asthma management in our practice.

Materials and Methods

Study design

This was a descriptive cross sectional study done over a period of 9 months (September 2017 – May 2018); where consenting parents of children participating in a larger economic burden study, and consenting adolescents and young adults between ages 1 to 20 years with physician diagnosed asthma were interviewed, as they were consecutively enrolled.

Study population

Children with physician diagnosed asthma on controller medications according to the Global Initiative for Asthma (GINA) recommendations, and their accompanying caregivers who were attending paediatric asthma clinic of University of Nigeria Teaching Hospital (UNTH), Ituku Ozalla Enugu, South east Nigeria on follow up visits; were enrolled into the study.

The hospital is a major tertiary hospital in Enugu State, southeast; Nigeria which renders services to people that resides in Enugu State and in other south eastern states (Abia Anambra, Ebonyi, Imo states). Economically, Enugu State is predominantly rural and agrarian, with a substantial proportion of its working population engaged in farming. In the urban areas, trading is the dominant occupation, followed by civil service. About 18.8% of the inhabitants are traders while 12.9% are civil servants.

Sample size calculation

A minimum sample size for this study was 66 child/parent pair. The details of the sample size calculation and other components of the methods are contained in the already published aspect of the study, by Ughasoro et al.[15]

Data Management and analysis

Data collection: Participants with asthma were recruited consecutively until the minimum sample size was completed. Historic information (age at asthma diagnosis, duration of asthma disease, frequency of hospital visits, self/parental report of academic performance), and socio-economic variables including occupation and educational attainment of both parents and annual family income were obtained using an interviewer administered questionnaire.

Data analysis: The SES was estimated based on standard economic measures: monetary information, such as income or food consumption expenditure and variables that capture living standards.[16,17] Standard statistical software STATA was used to construct principal component analysis (PCA)-based SES. The PCA was used to create an SES index using the information on households' items owned.

The index was used to divide the household into four equal sized SES groups: the quartiles were Q1 (Poorest), Q2 (Very Poor), Q3 (Poor), Q4 (Least Poor).[15] Thus, SES was grouped into these four quartiles.

Their children's current Asthma control was assessed by parent report and Asthma control test scores (ACT) or Childhood Asthma Control Test (C-ACT) for younger children. The ACT is a validated, five item, patient completed measure of asthma control with a 4 week recall period. By summing the five item scores, three levels of control are identified: scores from 5 to 19 indicate poorly controlled (uncontrolled) asthma; scores from 20 to 24 indicate partially controlled asthma, and a score of 25 (or 27 for children 4 to 11 years) indicates well (fully) controlled asthma.[18,19]

Chi square test was used to check for any associations among the categorical variables. A significant value of $p < 0.05$ was used.

Ethical considerations

Ethical approval for the study was obtained from the Health Research and Ethics Committee of the University of Nigeria Teaching Hospital, Ituku Ozalla. A written informed consent was also obtained from caregivers of all patients and verbal assent from children above 8 years.

Results

Basic characteristics of study participants

66 child/parent pair was enrolled into the study, and were included in the data analysis. There were 34 (51.5%) males; with a male: female ratio of 1.06:1. Mean age in years (SD) at asthma diagnosis was 6.2 (4.6) years. The mean (SD) duration of suffering asthma was 5.4 (3.9) years. About 74.2% of the children had self-reported good academic performance in school despite their asthma diagnosis in Table 1.

Table 1: *Demographic characteristics and socio-economic status of the children with Asthma*

Participant Characteristics	n	%
Gender		
Male	34	51.5
Female	32	48.5
Mean (SD) age in years	11.6 (4.8)	
Mean (SD) age in years at Asthma diagnosis	6.2 (4.6)	
Mean duration of Asthma	5.4 (3.9)	
Patients' Academic Performance (n=64)		
Poor	3	4.6
Fair	12	18.8

Good	24	37.5
Very good	17	26.6
Excellent	8	12.5
Mothers' educational levels (n=64)		
None	0	0
Primary	4	6.3
Secondary	11	17.2
Tertiary	49	76.5
Fathers educational levels		
None	0	0
Primary	7	11.50%
Secondary	15	24.60%
Tertiary	39	63.90%
Socio-economic status		
Poorest	16	24.2
Very poor	17	25.8
Poor	17	25.8
Least poor	16	24.2
Average Household size (SD)	5.98(1.63)	
Number of children in the household (SD)	3.59 (1.4)	

Socio economic status

The mean (SD) household size was 5.98(1.63) total number of people, with a mean (SD) number of children of 3.59 (1.4) in each of the households. There were xyz number (76.5%) of the mothers who had attained tertiary education. The principal component analysis (PCA) based SES of the children revealed that the poorest of the participants were 16 (24.2%); while the very poor were 17 (25.8%); the poor 17 (25.8%); and the least poor were 16 (24.2%) in Table 1.

Level of asthma control

Using the Asthma Control Test (ACT) Scores, a greater number, 31 (47%) of the children had partially controlled asthma; while there were 26 (39.4%) who were well controlled. Only a few, 9 (13.6%) had poorly controlled asthma in Table 2.

Table 2: Asthma control Status details of study participant

Variable	n	%
Daytime Asthma control		
Yes	19	28.8
No	47	71.2
Night time Asthma control		
Yes	21	32.3
No	44	67.7
Regular Salbutamol need		
Yes	25	38.5
No	40	61.5
Activity limitation from asthma		
Yes	16	25
No	48	75
Grade of Asthma Control		
Poorly controlled	9	13.6
Partially controlled	31	47
Well controlled	26	39.4

Association between participants' socio-demographic characteristics and level of asthma control

Table 3 shows the association between the socio-demographic variable and participants' asthma control status. The Participants' age, and SES cadre did not affect their asthma control outcome; Furthermore, the mothers' educational level and employment status, and number of children in the household did not impact on the asthma control level.

Table 3: Association between participants' socio-demographic characteristics and asthma control status

Variable	Asthma Control			χ2	p-value
	Partially Controlled	Poorly controlled	Well controlled		
	N=31(%)	N=9 (%)	N=26 (%)		
Current age of participants					
5 years and less	4 (12.9)	1(11.1)	4 (15.4)	0.130†	0.94
More than 5 years	27 (87.1)	8 (88.9)	22 (84.6)		

SES Quartiles					
1	8 (25.8)	2 (22.2)	6 (23.1)		
2	6 (19.4)	3 (33.3)	8 (30.1)	1.644	0.95
3	8 (25.8)	2 (22.2)	7 (26.9)		
4	9 (29.0)	2 (22.2)	5 (19.2)		
Mothers' education					
(a) Secondary school education or less	21 (72.4)	7 (77.8)	21 (80.8)	0.542†	0.76
(b) Tertiary education and above	8 (27.6)	2 (22.2)	5 (19.2)		
Mothers' employment status					
(a) Unemployed	1	1	4	2.361†	0.307
(b) Employed	28	7	22		
Number of Children in households					
3 or less	16 (51.6)	4 (44.4)	11 (42.3)	0.518†	0.77
More than 3	15 (48.4)	5 (55.6)	15 (57.7)		

Discussion

In the index study we explored the impact of participants' socio-demographic indices on asthma control and we found that the parental socioeconomic status and participants' characteristics such as age at asthma diagnosis and duration of asthma did not have any significant impact on the asthma control outcome. Children of lower socio-economic status did show to have better control of their asthma than those from higher socio-economic class. Although the socio-economic status did not significantly relate with level of asthma control. This finding is quite different from reports by other workers which suggest the parents' socioeconomic background impacted significantly on their children's asthma control.[4,5,20] While some studies have linked socioeconomic status with adverse health outcomes in asthma;[9,12,13,21] including lower asthma control scores and low quality of life of the children and their parents,[22,23] a few other studies just as observed in the index study have found no relationships between socioeconomic status and asthma morbidity in their cohorts.[24–27] Low socioeconomic class translates to poor housing conditions, poor symptom control, increased asthma hospitalization rates and increased economic burden of asthma.[14,20,28]

Parental educational and employment status are key determinants of socioeconomic status of the family. Studies have eluded poor asthma control to low level of education of both parents. Low parental education were associated with increased risk of both inpatient and outpatient asthma diagnosis, poorer asthma control, more inpatient hospital care;[29,30] and poor home management of asthma in children.[31,32] while higher education in the parents reduced the risk of uncontrolled asthma.[33] Low maternal education have been independently associated with poor asthma control in children as mothers are primarily charged with the care of their asthmatic child directly, ensuring home care, medication adherence and regular follow up visits to the clinic.[34,35] The role of mothers in ensuring optimal home environment for the child cannot be overemphasized. Education of the mothers translates to healthy practices at home. Ungar and colleagues observed that children whose mothers had no post-secondary education had higher probability of being exposed to indoor allergens and having worse asthma outcome.[36] In contrast, maternal education was not significantly associated with asthma control status of participants in the current study.

A number of studies have also attributed poor asthma control in children to 'employment status' of the mother rather than maternal educational level. Children of mothers who worked outside the home environment have been reported to have poorer control of their asthma than those whose mothers worked at home.[36] Although 90% of mothers in the current study worked outside the home, mothers' employment status was not significantly associated with the level of asthma control in their children.

The diverse results obtained in the index study and other studies could be due to different study designs and sample sizes, as well as varying measures of SES. Because of multiple indicators for SES, there is no uniform definition

of SES across these studies. Some researchers used family indicators such as household income, level of educational attainment of parents, and insurance status while others used community indicators such as percentage of residents living below the poverty level. Beside the traditional social-class variables (income, education and occupation), the spectrum of social stratification also includes differences in urbanization, family size and diet.[26] Braveman and colleagues noted that the use of different variables to assess socioeconomic status in health research has given rise to inconsistent reports.[37] They suggested that health research could be improved significantly with a more conceptually and empirically sound approach to measurement of SES.

Besides the socioeconomic status of parents, other attribute of the child such as age at first attack of asthma/asthma diagnosis, duration of asthma, availability and accessibility of optimal asthma care and medication adherence significantly impact on asthma treatment outcomes.[25,29] We observed that asthma diagnoses in our study participants were made at 6 years of age or less; implying young age at first attack of asthma. Participants' age at diagnosis and duration of asthma were, however, not significantly associated with their level of asthma control. This is because asthma control can be affected by a lot of multiple factors, and if medication and environmental control is put in place, then asthma is likely to be well controlled irrespective of when the diagnosis was first made. Furthermore, any long term effect of childhood asthma may be seen in the adult population when the children are much older. Such effects of chronic asthma may not be easily discernible in the pediatric cohort. The gains of well-organized services being rendered to these children in our clinics may explain our observations in the current study. The routine asthma education being rendered on every clinic day to our patients and their caregivers who are mainly mothers, in addition to the use of individualized asthma action plan for these children translates to medication adherence and conscious efforts at environmental control of possible triggers by the family.

Study limitations: The information on parental income was based on parents' recall and estimation. Underestimation and possible wrong classification of participants into lower SES quintiles may affect the overall outcome of this index study. Furthermore, Asthma Control Test (ACT) scoring was also based on parents or child's ability to recall and report symptom frequency and severity in the last 4 weeks. Under-reporting of mild or remote symptoms in the ACT questionnaires may contribute to inconsistencies in grading of asthma control scores. These notwithstanding, the study have demonstrated that optimal asthma control in our patients may be attributable to other factors which are not directly linked to their socio-economic status. A larger sample size and specific aspects of medication adherence may have been more revealing on other possible factors that influence control outcomes in asthma. These were however not within the scope of the current study.

Conclusion

In conclusion, the findings in this study supports the fact that the relationship between socioeconomic variables and level of asthma control in children remains inconsistent, may vary with sub regions and definitely multifactorial. Further studies on a large scale are recommended to fully explore the impact of socio-demographic variables on a child's level of asthma control.

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Conflict of Interest

The authors have no conflict of interest to declare.

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