Socio-Economic Status and Academic Performance of Primary School-Aged Children with Asthma

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

Original Research Article	

ABSTRACT

Aims: This aim of this study was to determine the relationship between socio-economic class and academic performance of primary school children with asthma and to compare with those of children without.
Place and Duration of Study: Sample: Asthma clinic of the University of Nigeria Teaching Hospital Ituku/Ozalla, Enugu State and the schools attended by the children with and without asthma within Enugu metropolis.
Methodology: One hundred and twenty children with asthma (subjects) aged 5 – 11 years were consecutively recruited at the asthma clinic of UNTH Enugu and their age, sex and socio-economic class (SEC) - matched normal classmates were enrolled as controls. Their SEC was obtained using the tool described by Oyedeji while their academic performance was obtained using their scores over an academic session. Their Intelligence Quotient (IQ) was determined using the Draw-A-Person- Test. The relationship between SEC and academic performance of children with asthma was determined and was compared with that of the 120 controls.
Results: A significant association exists between academic performance and socio-economic class in both subjects (x^2 = 20.034, d.f = 6, *p* = .003) and control (x^2 = 18.926, d.f = 3, *p* < .001).

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Academic performance has a significant but weak correlation (Spearman's) with socioeconomic class among the subjects (r = 0.194; p = .03) but not among controls (r = - 0.122; *p* = .19).
Conclusion: Socio-economic class is directly related to academic performance as higher socioeconomic classes are associated with high academic performance both in children with asthma and in those without.

ABBREVIATIONS

C-ACT : Childhood Asthma Control Test
DAPA   : Draw-A-Person-Age
DAPP   : Draw-A-Person-Point
DAPQ   : Draw- A – Person Quotient
IQ   : Intelligence Quotient
SCA   : Sickle Cell Anaemia
SEC   : Socio-Economic Class

1. INTRODUCTION

Asthma is one of the most common chronic illnesses among children, affecting over six million children globally [1]. Children with asthma, similar to children with other chronic illnesses, are at the intersect of the health and education systems and are expected to compete with non-asthmatic counterparts in the same classroom under the same learning conditions [2]. At school, their health needs may be attended to by a school nurse, while their educational needs may be overlooked or under-estimated [3].

Asthma is one of the few diseases reported to be commoner in the higher social classes [4,5] but atopic asthma and severe asthma are said to be commoner in the lower socio-economic classes [5]. Severe asthma with increased hospitalisation and death has been linked to poverty, ethnic minorities, and urban living [4]. Children with asthma from deprived areas are reported to be more likely to miss school than their more affluent peers, and minority ethnic children are also more likely to have poor school attendance [6].

The relationship between socioeconomic status and academic performance amongst children with asthma, however, has been poorly studied, and reports from available research vary. Karadel and colleague [7] reported that poor school performance is higher among children from the poor socio-economic background and attributed it to poor motivation; unsatisfactory home environment and neglect; poor housing and nutrition [7]. Similar findings to that of Karadel and colleague were reported by Ong et al. [8] from Malaysia and by Ozmert and Colleagues [9] from Turkey. However, the finding was not in support of an earlier study by Guststadt and colleagues [10] which reported that socioeconomic status was not associated with low academic performance amongst children with asthma. While the study by Gutstadt et al. [10] was on children with asthma, the studies by Karadel and his colleague, [7] Ong et al. [8] and Ozmert et al. [9] were not specifically on children with asthma as children with other forms of allergy were included. The findings in these studies may also have been affected by geographical and socio-economic differences in the areas where the studies were done as well as differences in the socio-economic classification tools used.

This study, therefore, was done to determine the relationship between socio-economic class and academic performance among children with asthma. The result is expected to contribute to the existing body of knowledge about the relationship between socio-economic class and academic performance among children with asthma.

2. METHODS

2.1 Study Design

This was a cross-sectional, hospital- and school-based descriptive study.

2.2 Study Area

The study was carried out at the University of Nigeria Teaching Hospital (UNTH), Ituku/Ozalla, Enugu State. Enugu is the capital of Enugu State. Its suburbs include Ituku and Ozalla communities which are about 20km from the town and are the host communities to the hospital. Enugu is a major administrative, educational and trading centre, with coal as her most abundant natural resource. Enugu is inhabited by people from diverse walks of life and

of all socioeconomic classes. The ethnic groups are mostly of the Igbo speaking tribe.

2.3 Study Site

The University of Nigeria Teaching Hospital (UNTH) Ituku/Ozalla, Enugu State and the primary schools in Enugu metropolis attended by the study participants were the sites for the study. The UNTH offers primary, secondary and, importantly, tertiary healthcare services to persons of all social classes and is the referral centre for the populations of South-East Nigeria.

2.4 Study Population

The study population comprised of school children with asthma (subjects) living in Enugu metropolis. The control population (children without asthma) was healthy classmates. The choice of classmates as controls was informed by the need to remove school-related bias and to control for class grade as suggested by Richard and Burlew [11].

2.5 Inclusion Criteria

1. Children aged 5-11 years, attending primary school in Enugu metropolis.
2. Asthma diagnosed by a doctor [12,13].
3. Attendance in the same school for at least one session before study enrolment.
4. Attendance at the asthma clinic for at least 12months.
5. Consent for the study given by care-giver.

2.6 Exclusion Criteria

1. Out of school children.
2. Age less than five years or more than eleven years.
3. Children with other chronic diseases such as sickle cell disease, diabetes mellitus, tuberculosis, congenital heart diseases or with history of neurologic illness like seizure disorders and cerebral palsy.
4. Children attending school outside Enugu metropolis.
5. Attendance of the present primary school for less than one session before enrolment.
6. Refusal of consent by care-giver.
7. Asthmatic children with incomplete data, since some of the information, were obtained from the case notes.

2.7 Control Group

The child next to the asthma patient in the class register was selected as a control if he/she met the following criteria:

1. Of same sex, age (within 6 months) and socio-economic class as the child with asthma.
2. Has been in the same primary school and class as the asthmatic child for at least one session before study enrolment.
3. Does not have any of the exclusion criteria as listed for the subjects

If the next child to the asthmatic in the class register did not meet the criteria, the most suitable child without asthma down the register who meets the criteria was chosen as control.

2.8 Selection and Evaluation of the Subjects

2.8.1 At the asthma clinic

On presentation at the clinic, the caregiver and the child with asthma were informed of the study and written informed consent obtained from the caregiver. Before enrollment, in order to ascertain eligibility, the asthmatic child's socio-demographic data was obtained and the child subsequently assessed clinically for chronic and debilitating medical conditions such as heart disease, seizure disorders and cerebral palsy that are known to affect academic performance independently [14]. The information obtained was recorded in the questionnaire.

Children who meet the inclusion criteria were enrolled consecutively till the sample size was reached while those excluded were scheduled for the consultation. The socio-economic status of the Subjects was determined using the method described by Oyedeji [15]. This was determined using the occupation and educational attainment of the caregiver(s). The socio-economic class was obtained by finding the mean score for the parents' educational attainment and occupation rounded off to the nearest whole number. Where any of the parents were dead, the social class of the child was assessed using that of the living parent. Socio-economic class, I represent the highest socio-economic class and class V the lowest.

The level of asthma control was ascertained using the Childhood Asthma Control Test (C-

ACT) [16]. The C-ACT [TM] tool for children 4 to 11 years is made up of seven questions with a total score of 27 as the highest score obtainable. Each child, as much as possible, was allowed to answer the first four questions unaided while the care-giver answered the remaining three. A score of 19 and below signified poor control while scores above 19 indicate good control [17,18].

The subjects were then given a sheet of paper and pencil and left alone with as much time as they needed with the instruction to draw a person [19, 20]. Intelligence Quotient (IQ) was assessed using the Draw-A-Person Test (DAPT) [19]. The IQ of the subjects was calculated using the validated Ziler criteria and the table of DAPQ by Ebigbo and Izuora [19]. The total number of points scored is the Draw a Person Point (DAPP). DAPQ = DAPA/ Chronologic Age, where DAPA = (DAPP+ 3) / 4. The DAPQ score obtained was compared with the expected DAPQ score for age and sex using the table for average DAPQ scores by Ebigbo and Izuora. A score of less than 75% for sex and age was regarded as mental dullness or backwardness [19].

The child with asthma was subsequently reviewed, complaints attended to and a future clinic appointment given. However, children with acute exacerbation of asthma were first managed in the Children Emergency Room of UNTH before evaluation for the study.

2.8.2 In the schools

The clearance letter from the Ministry of Education was used to obtain permission for the study at the various schools. At the school/class of each enrolled asthmatic child, the head/class teacher was informed of the study in order to access the child with asthma and to enroll the child without asthma. Also, the need to obtain the information with regards to the children's school performance was explained.

With the help of the class teacher, the non-asthmatic child, next to the study Subject in the class register, who was of the same age and sex as the child with asthma was selected. The child was then informed of the study and given the consent form for the caregiver to fill. The consent form was retrieved on a subsequent visit to the school. The non-asthmatic child whose caregivers gave consent was then interviewed for eligibility for the study and the socio-economic status determined as described for the subjects.

The selected control was then enrolled and the questionnaire administered.

The control was also given a sheet of paper and pencil and left alone with as much time as needed with the instruction to draw a person and was scored using the validated Ziler criteria by Ebigbo and Izuora [19]. The DAPQ was also ascertained just as was done for the subjects.

With the help of the class teacher, using the pupils' academic records, information on class position, overall score and scores in key subjects (Mathematics, English, Social Studies and Sciences) for the subjects and controls was obtained and recorded. The average overall percentage score for each child in the three terminal examinations in the 2012/2013 academic year was documented and was used as an index of the general/overall academic performance [21,22]. The average of the three scores from the three academic terms for each child in four selected key subjects was used as the index of specific academic performance [21,22]. Children who scored <50% overall or in a specific academic skill were considered as having poor academic performance overall or with respect to that specific academic skill/key subject whereas scores ≥50% (average 50-74% and high scores ≥75%) were considered good academic performance [21,23,22]. Good academic performance was further classified into average scores (50- 74%) and high scores (≥ 75%) [21,23,22].

Information obtained from the participants was recorded in the questionnaire and subsequently transferred into the data editor of Statistical Package for Social Sciences (SPSS) software for Windows® version 19.0 (IBM Inc Chicago Illinois USA, 2011) for analysis. Descriptive statistics such as mean ± (SD) and median were obtained for continuous variables while categorical variables were summarised using frequencies and percentages. The comparison of the means of IQ which was normally distributed was done using Student's t-test and Analysis of Variance (ANOVA) while other variables that were not normally distributed (Academic performance and Socio-economic class) were compared using the Mann-Whitney U test. The significance of the association between categorical variables was determined using chi-square. Tests of relationships were also done using Pearson and Spearman's rho correlation. All the tests were

taken as significant at *p* < .05. Results are presented in tables and prose.

3. RESULTS

Thirty (25%) of the subjects were from socio-economic class I and sixty (50%) from socio-economic class II while only twelve (10%) were from socio-economic class III and eighteen (15%) from class IV. No subject or control studied was from socio-economic class V.

Thirty out of the 120 subjects (25%) had poor asthma control while 90 (75%) had good asthma control. The mean IQ scores for subjects and controls were 123.28 ± 21.45 and 118.41 ± 19.87, respectively. The difference was not statistically significant (t = 1.83; *p* = .07). Similarly, the difference in the median overall academic scores for the subjects (79.04%) and controls (80.01%) were also not statistically significant (*U*= 6804, *p* = 0.46).

Table 1 shows the relationship between academic performance and socio-economic class of subjects and controls. More of the children with high academic performance, in both groups (subjects and controls), were from the higher socio-economic classes (classes I and II). No control had poor academic performance however six subjects had poor academic performance. While none of the subjects with poor academic performance were in socio-economic class I, three (50%) of subjects with poor academic performance were in socio-economic class IV. None of the study participants (subjects and controls) were in socio-economic class V. A significant association exists between academic performance and socio-economic class in both subjects (x^2 = 20.034, *d.f* = 6*, p* = .003) and control (x^2 = 18.926, *d.f* = 3, *p* < .001). Academic performance has a significant but weak correlation (Spearman's) with socioeconomic class among the subjects (r = 0.194; p = .03) but not among controls (r = -0.122; *p* = .19).

4. DISCUSSION

In this study of the relationship between socio-economic class and academic performance among primary school children with asthma, the IQ and overall academic performance of the subjects was comparable with that of age-, sex- and socio-economic class- matched controls. Improved socio-economic status was associated with higher academic performance among subjects.

Majority of the subjects belonged to socio-economic classes I and II and none of the subjects were in socio-economic class V. This is in keeping with earlier reports [4,5] that noted asthma to be one of the few diseases that are more common in the higher socio-economic classes. The reason could be that more parents in the socio-economic classes I and II, compared to those in the socio-economic classes III and IV, avail themselves of the specialised services offered by the teaching hospital [22]. It could also be due to life style encounters like early use of formula feeds, canned foods with additives and other social factors that are more common among people of higher socio-economic class compared to those in the lower socio-economic classes and can predispose to airway hypersensitivity. Children growing up in rural areas different from the children in this study that grew up in an urban city seem to develop asthma less often due to increased exposure to particular viruses, bacteria or parasites. Similarly findings have also been reported for children that grew around animals and are from larger families [24,25] This study however did not look at their family size or find out whether they live around animals. Furthermore, the hygiene hypothesis by Strachan [24] lends support

Table 1. Relationship between academic performance and socio-economic class of subjects and controls

Socio-economic class	Academic performance of subjects			Academic performance of controls		
	Poor n (%)	Average n (%)	Good n (%)	Poor n (%)	Average n (%)	Good n (%)
Class1	0 (0.0)	15 (50.0)	15 (50.0)	0 (0.0)	18 (60.0)	12 (40.0)
Class2	3 (5.0)	18 (30.0)	39 (65.0)	0 (0.0)	30 (50.0)	30 (50.0)
Class 3	0 (0.0)	3 (25.0)	9 (75.0)	0 (0.0)	0 (0.0)	12 (100.0)
Class 4	3 (16.7)	12 (66.7)	3 (16.7)	0 (0.0)	3 (16.7)	15 (83.3)
Total	6 (5.0)	48 (40.0)	66 (55.0)	0 (0.0)	51 (42.5)	69 (57.5)
x^2/(d.f)/ P value	20.03/6/.003			18.93/3/< .001		

to the finding of asthma among children of higher socio-economic class in this study. It proposes that the increased incidence of allergy and asthma in Western countries observed in the last 50 years is due to environmental changes that include improved hygiene and a lack of infections. Therefore childhood exposure to germs and certain infections helps the immune system develop as it teaches the body to differentiate harmless substances from the harmful substances that trigger asthma. It is deducible that children who were brought up in an urban setting are less likely to have increased exposure to particular viruses, bacteria or parasites compared to those in a rural environment.

It is known, however, that there is a genetic component to the development of asthma and studies have identified many genes associated with asthma that act via release of high levels of pro-inflammatory mediators following a switch on to Th2 response triggered by the presence of environmental and or genetic factors [26,27]. Genetic polymorphisms may not cause asthma per se but predispose towards sensitisation in particular environments [25] Asthma currently is believed to be influenced by interplay between genetic and environmental factors now known to be mediated by epigenetics [28].

Comparatively more children in the upper socio-economic class had high academic performance compared to children in the lower socio-economic class in both the Subjects and Controls. This is in alignment with the finding of previous studies [7,8,9]. The larger proportion of children in upper socio-economic classes in this study may have influenced the finding of better academic performance among children in these classes compared to those in the lower socio-economic class. The parental motivation of these children from the upper socio-economic class via placement in good schools, extra lessons at school and at home may have contributed to the better academic performance seen among them [22].

However, Gutstadt and colleagues [10] in their study reported that academic performance was not related to socio-economic class amongst children with asthma [6]. The difference between the findings in this study and that by Gutstadt et al could be due to differences in the environment where these studies were done as well as differences in the socio-economic status assessment tool used. The reason suggested in a similar study, [22] for poor academic performance in children from low socio-economic background was that these children were more likely to miss school than their more affluent peers and also suffer from poor funding of education due to depleted family resources from patient care. Karadel and colleague [7] attributed it to poor motivation, unsatisfactory home environment and neglect, poor housing and nutrition.

5. CONCLUSION

Socio-economic class is directly related to academic performance as higher socioeconomic classes are associated with high academic performance in children with asthma.

DECLARATION

This is a dissertation research work with different parts some of which has same methodology with this current manuscript. Some are already published and others are currently being reviewed for publication by other journals.

CONSENT

As per international standard or university standard, written consent has been collected and preserved by the author.

ETHICAL APPROVAL

Received from Health Research Ethics Committee of UNTH Ituku/Ozalla, Enugu State, Nigeria

AVAILABILITY OF DATA AND MATERIAL

The datasets used and or analysed during the current study are available from the corresponding author on reasonable request.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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