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Relationship between birth weight and school performance of children in Zaria, Nigeria

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ABSTRACT

School difficulties have been found to be associated with low birth weight, an observation that has social and economic implications. This study focuses on the relationship of birth weight and school performance in children in Zaria, Nigeria. Subjects [n = 525] for the study were pupils in Reception class, Class One and Two of the Ahmadu Bello University, Staff School, Zaria with mean age 7.02 ± 0.94 [SD]. School subjects considered for analyses included Mathematics, English Language, Creative Arts and General Paper. Means of respective subjects were obtained and statistically compared. The results showed significant relationship between birth weight and performance in all subjects. When birth weight was categorized in to four groups (<2.5kg, 2.51-3.0kg, 3.1-3.5kg and >3.5kg), boys showed significant difference according to all birth weight category the differences failed to reach statistical significance in the girls. Correlation between age and academic performance did not show any significant relationship, but strong relationship was established between birth weight and school performance with statistical significance of P <0.05 and < 0.001 both in boys and girls. The findings are consistent with a growing body of research evidence, which suggest that low birth weight children suffer from academic deficits compared to normal birth weight children.

Keywords: birth weight, children, school, performance, Nigeria

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INTRODUCTION

Reports have established that birth weight is central to neonatal morbidity and significantly associated with a number of adult outcomes, one of such risk is cognitive function [1-3]. The consequences of very low birth weight (VLBW) seem to be lifelong [4]. First, VLBW is a major contributor of neonatal and infant mortality and childhood neurodevelopmental morbidity [5, 6]. Research on the long-term cognitive outcomes of low birth weight (<2500 g) children has focused primarily on very low birth weight, defined as <1500 g. This cutoff and lower birth weight

cutoffs (e.g., 1000 g or even 750 g), used in recent follow-up studies, identify the very small fraction of low birth weight children who are at the highest risk for severe developmental disabilities [7-10]. Extreme LBW is associated with periventricular hemorrhage and/or infarction, which conveys a high risk of neurologic and cognitive sequelae, as well as a range of other neonatal morbidities that may impair neurodevelopment [11]. However, studies that include heavier LBW children have demonstrated lower scores on cognitive abilities or academic achievement in school-age children throughout the LBW range (<2500 g), compared with normal birth weight (NBW) [12-15].

From a human biological point of view, new born size is of special importance, as new born size is not only a main factor in determining the potential survivorship of infants within the first few months of life, but there is also increasing evidence that the development and function of many internal organs and even adult life is influenced by fetal conditions. Low birth weight and small newborn size in general are associated with higher blood pressure, higher risk of later heart disease, diabetes or early menopause [16].

The present study looks at the relationship between birth weight and school performance in primary school pupils, and to the best of our knowledge this is the first of such studies in Nigeria.

MATERIALS AND METHODS

Sample and Data

The birth weights, sex and year of births for reception class and class one pupils of the Ahmadu Bello University, Zaria Staff School, Main campus (n = 204) and Kongo campus (n = 332) were obtained from the birth certificates in their school files. The average score (percentage) of each of these pupils in Mathematics, English Language, Creative Arts and General Paper for the 2004/2005 academic year was obtained from the school diaries.

The total sample size obtained from the two schools is 526 and the data collected (birth weight, sex, and average scores of each of these pupils for the 2004/2005 academic year in Mathematics, English language, Creative Arts, General paper and Primary Science) were calculated and subjected to statistical analyses.

Statistical Analyses

Data were expressed as Mean ± SD. Differences in birth weight and performance in school subjects in boys and girls were evaluated using the Student's t-test. Performance in school subjects according to birth weight categories were evaluated using one way analysis of variance. Pearson correlation analysis was used to study the relationship between birth weight and performance in all the school subjects. P value of < 0.05 was deemed statistically significant. SigmaStat 2.0 for Windows (Systat Inc., Point Richmond, CA) was used for the statistical analyses.

RESULTS

The means of the birth weight and performance in subjects considered for boys and girls were compared as shown in Table 1, all parameters considered showed no statistical significant difference. Performance in school subjects according to birth weight categories were evaluated using one way analysis of variance. The mean performance in all the subjects considered for the various birth weight categories for boys and for girls are presented in Table 2 respectively. In all, the boys' birth weight categories showed statistically significant difference exist but this was not seen in the girls. Table 3 presents the correlation of age, birth weight and performances in subjects considered for boys and girls respectively with no significant correlation. The correlation of birth weight and performance in subjects considered for boys and girls shows significant correlation ($P < 0.05$ and $P < 0.001$).

Table 1: Birth weight and performance of children in the subjects considered

Parameters	Boys Mean ± SD (n = 287)	Girls Mean ± SD (n = 283)	t	p
Birth Weight	3.02 ± 0.47	3.08 ± 0.50	-1.52	0.13
Mathematics	61.10 ± 23.98	59.82 ± 25.56	0.59	0.56
English	58.65 ± 22.29	59.67 ± 24.39	-0.50	0.62
Creative Arts	69.67 ± 14.04	70.73 ± 15.24	-0.83	0.41
General Paper	61.43 ± 21.10	66.61 ± 39.95	-1.90	0.06
Average	250.84 ± 74.99	256.84 ± 85.73	-0.86	0.39

Table 2: Birth weight categories and performance in subjects considered for boys and girls

Parameters	≤2.50 kg Mean ± SD	2.51-3.00 kg Mean ± SD	3.10-3.50 kg Mean ± SD	>3.51 kg Mean ± SD	F	P
Males	**(n = 58)**	**(n = 82)**	**(n = 122)**	**(n =25)**		
Mathematics	53.06 ± 22.37[a]	63.77 ± 23.64[b]	63.02 ± 23.71[b]	61.52 ± 27.31[c]	2.83	0.04
English	50.89 ± 20.16[a]	59.82 ± 23.33[b]	60.51 ± 21.67[b]	63.73 ± 23.61[c]	3.21	0.02
Creative Arts	63.12 ± 13.27[a]	69.95 ± 13.37[b]	72.15 ± 13.51[b]	71.85 ± 16.73[b]	5.95	<0.001
General Paper	52.91 ± 19.92[a]	60.80 ± 23.01[a]	65.98 ± 18.64[b]	61.07 ± 23.22[a]	5.30	0.001
Average	219.98 ± 69.15[a]	254.34 ± 76.83[b]	261.67 ± 71.11	258.16 ± 85.16[c]	4.41	0.01
Females	**(n = 59)**	**(n = 71)**	**(n = 81)**	**(n = 27)**		
Mathematics	54.96 ± 28.07	58.38 ± 24.76	63.05 ± 25.34	64.59 ± 21.34	1.54	0.20
English	56.73 ± 23.42	56.62 ± 25.38	62.89 ± 24.31	64.45 ± 23.34	1.48	0.22
Creative Arts	66.79 ± 14.70	70.41 ± 15.05	73.32 ± 16.02	72.44 ± 13.24	2.25	0.08
General Paper	60.49 ± 20.12	72.53 ± 66.26	65.66 ± 20.68	67.32 ± 17.93	1.00	0.39
Average	238.96 ± 79.78	257.93 ± 103.69	264.92 ± 76.43	268.80 ± 69.22	1.28	0.28

Means with different superscript are significantly different with P <0.05.

Table 3: Correlation of age, birth weight and performance in subjects considered in boys and girls

	Boys (n = 287)		Girls (n = 238)	
Parameters	Age	Birth weight	Age	Birth weight
Mathematics	0.01	0.38**	-.0.10	0.31**
English Language	-0.04	0.41**	-0.10	0.34**
Creative Arts	-0.08	0.52**	-0.12	0.33**
General Paper	-0.10	0.47**	-0.11	0.14*
Average	-0.03	0.47**	-0.13	0.31**

** P< 0.05 **P<0.001*

DISCUSSION

In this study, we evaluated the effects of birth weight on school performance independent of the effects of social environments. Our key strategy was to investigate the association between birth weight and school performance in children. This study was intended to corroborate the findings that related strong association between birth weight and academic performance in man [9, 10]. The lower means in school performance seen in lower birth weight categories in the majority of subjects may have to do with deficit in attention as reported by some investigators [17-19]. Unfortunately, the study was not able to cut across the complete social strata of the Nigerian society. This was because information on birth weight could not be obtained for children attending public schools as their school record contains no birth certificates, as many of the pupils were delivered at home, so they were excluded from the study. The study comparing the variable studies in both boys and girls showed that girls had higher scores in all the

variables, except in Mathematics. This finding tends to agree with established reports that men have better numeric ability and women are good at verbal and spatial abilities [20].

These variables were studied in relation to four birth weight categories. In the boys all variables showed significant differences, but these failed to show in the girls, even tough there was an increase in the scores of subjects from > 2.50 kg to > 3. 51 kg. This may be explained on the basis that evolutionary speaking competition is seen more among males than females [21]. Another possible reason for the effect of birth weight seen in relation to school performance may be due to deficit in attention as pointed out by previous investigators [17-19]. This should be understood as attention deficit hyperactivity disorder is more prevalent in males than females. In fact it has been reported to be 2:1 in epidemiological samples and 10:1 in professionally referred clinical samples [22,23].

Correlation analysis of birth weight and subjects scores for the volunteers showed strong correlation in both sexes confirming the existence of the phenomenon as reported by earlier investigators [15]. In order to rule out the effect of age, age was correlated with subject performance of pupils, but school performance failed to show significant relationship. This further proves the genuine relationship of birth weight and school performance in children.

CONCLUSION

The findings are consistent with a growing body of research evidence, which suggest that low birth weight children have academic deficit compared to normal birth weight children. The low birth weight children had significantly lower test scores in all the subjects considered than the general child sample. In view of the results obtained and the conclusion drawn, the followings are hereby recommended. The public should be adequately informed about the risk of low birth weight and school difficulties or academic deficits. The government should also ensure that all schools especially Primary/Nursery schools demand for the birth certificates of their pupils before they are admitted so that those pupils who are low birth weight (≤ 2.50kg), can be identified and given special educational help to manage these academic defects. Further studies to investigate this phenomenum in adolescents and adults among secondary and university students would further confirm the influence of birth weight on school performance.

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REFERENCES

[1] I Elgen, K Sommerfelt, Acta *Paeditrica,* **2002**; 91:939-945.
[2] SD Shenkin, JM Starr, IJ Deary, *Psychology Bulletin,* **2004**; 130:989–1013.
[3] MZ Silva, FJ O'Callaghan, Annals *of Epidemiology,* **2006**; 16:469-476.
[4] S Saigal, LA Hoult, DL Streiner, BL Stoskopf, PL Rosenbaum, *Pediatrics*, **2000**; 105:325–331.
[5] S Saigal, P Rosenbaum, B Hattersley, R Milner, *Journal of Pediatrics,* **1989**; 114:839–846.
[6] JM Lorenz, DE Wooliever, J R Jetton, N A Paneth, *Archivives of Pediatrics and Adolescent Medicine,* **1998**; 152:425–435.
[7] M Hack, AA Fanaroff, *Seminar in Neonatology,* **2000**; 5:89–106.
[8] M Lester, CL Miller-Loncar, *Clinical Perinatology,* **2000**; 27:461–481.
[9] GP Aylward, Mental *Retardation and Developmental Disability Research Review,* **2002**; 8:234–250.
[10] JM Perlman, *Minerva Pediatrica*, **2003**; 55:89–101.
[11] A Lemons, CR Bauer, W Oh, et al, *Pediatrics,* **2001**; 107[1]. Available at: www.pediatrics.org/cgi/content /full/107/1/e1
[12] N Breslau N, *Epidemiological Review,* **1995**; 17:96–106
[13] N Breslau, HD Chilcoat, J DelDotto, P Andreski, *Biological Psychology,* **1996**; 40:389–397.

[14] N Breslau, EO Johnson, VC Lucia, *Journal of Abnormal Child Psychology*, **2001**; 29:273–279.
[15] EO Johnson, N Breslau, *Social and Biological Psychology*, **2000**; 490–500
[16] DS J Barker, *British Medical Journal*, **1995**; 311: 171-174.
[17] P Anderson, L W Doyle, *JAMA*, **2003**; 289:3264–72.
[18] S Potgieter, J Vervisch, L Lagae, Clinical *Neurophysiology*, **2003**; 114:1841–9.
[19] D Jeyaseelan, M O'Callaghan, K Neulinger, D Shum, Y Burns, *Early Human Development*, **2006**; 82:249-255
[20] SM van Anders, E Hampson, Hormone *Behavior*, **2005**; 47:92–98.
[21] L Pokrywka, D Rachon, K Suchecka-Rachon, L Bitel, *American Journal of Human Biology*, **2005**; 17:796-800.
[22] KJ Gingerich, P Turnock, JK Littin, A Rosen, *Journal of Clinical Psychology*, **1998**; 54: 415-426.
[23] A Lahat, RJ VanLieshout, S Saigal *et al*. *Frontiers in Psychology*, **2014** doi: 10.3389/fpsyg.2014.00446