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Comparison of Erythrocyte Parameters Between Urban and Rural Junior Secondary School Students in Port Harcourt, Rivers and Ekwulobia, Anambra, State, Nigeria

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ABSTRACT

Published reports of comparison of erythrocyte parameters for newly enrolled urban and rural junior secondary school students in different geographical zone in Nigeria are relatively scanty. To determine and compare erythrocyte parameters of newly enrolled urban and rural junior secondary school students in south-south and south-east, Nigeria. The study population was a total of 240 subjects (60 male and 60 female subjects for each urban and rural area) of JSS1 students. 5mls of blood sample were collected from ante cubital vein with minimum stasis and the values of Red blood cell count, Haemoglobin, Mean cell volume, Mean cell haemoglobin, Mean cell haemoglobin concentration, Red cell distribution coefficient volume, Red cell distribution standard deviation and Haematocrit, was determined by MAXCOM MC- 6200 fully automated haematology analyzer, while the data were analyzed using Z-test; p value less than 0.05 were considered statistically significant. There were significant gender variations in the values of these parameters in both urban and rural newly enrolled students. The mean values of Haemoglobin, Mean cell volume, Mean cell haemoglobin, Red cell distribution width standard deviation and Haematocrit were significantly higher in rural males and females compared to urban males and females ($p<0.05$). No significant differences were found in mean values of red blood cell count and Coefficient variation of red cell distribution width when compared both rural and urban males and females. From the above study, there is variation in the gender, age and some erythrocyte parameters amongst newly enrolled urban and rural junior secondary school students under investigation.

Keywords: Erythrocyte**,** newly enrolled, parameters.

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INTRODUCTION

Measurement of some haematological parameters has become increasingly important in clinical practice for the early detection of sub-clinical diseases[1]. The techniques of haematology are concerned mainly with determination of the cellular formed elements of blood, their numbers or concentration, the relative distribution of various types of cells and structural abnormalities that promote disease[1, 2, 3]. Erythrocyte parameters could be performed to support the diagnosis of; anaemia, polycythaemia, acute hemorrhagic states and other blood disorders[2]. The values of these parameters have long been well established in many parts of the world for several populations. Environmental conditions in rural communities are different from that of urban communities in terms of environmental factors, especially pathogens and the nutritional values of people based on the socio- economic standards[4]. Social, nutritional, and environmental factors together with age, sex body built, ethnic background and altitude are also required to get a unified standard[5]. It is well documented that haematological baseline values vary in different population groups and in different geographical areas[6]. The variations are usually due to age, sex, attitude[7, 8], environmental factors and social differences [9, 10, 11]. Report on the haematological reference values for pre-primary and primary school aged children in Port Harcourt, Nigeria showed no significant gender variation in both values of haematocrit, red blood cell count and haemoglobin parameters and no significant difference in values of haematocrit in both pre-primary and primary school children[12]. In that report, primary school subjects, irrespective of sex, were found to have significantly higher values of lymphocyte differential counts and erythrocyte sedimentation rate, and significantly lower platelet counts and total white blood cell and differential neutrophil counts compared to their pre-primary school counterpart[12]. Another report on changes in haematological parameters of children aged 5-18years in Abidjan, Cote d'Ivoire on the other hand showed an alteration in all the parameters according to sex i.e. the haematological parameters were higher in boys than girls. Several other conducted studies by the WHO and other researchers confirm this observation[13, 14, 15].

MATERIALS AND METHODS

A total number of 240 subjects, 120 students from the urban area and 120 students from the rural area consisting of 60 male and 60 female students in each location of newly enrolled JSS1 school students. Ethical approval was obtained from the University of Port Harcourt Ethical Committee. Informed consent was sought and obtained from the parents/guardians of each student prior to participation in the study. Questionnaire was used to collect age, parents occupation and sex of each student while standiometer was used to determine the weight and height using standard

procedure. The body mass index was calculated by the formula weight in kilogram divided by the square of the height in meters. Inclusive criteria were apparently healthy children who were students of selected secondary schools and students who volunteered to participate by giving their written informed consent from their parent/guardian, while exclusive criteria were subjects taking any form of medication for any illness and subjects with a history of sickle cell anaemia. 5mls of blood sample were collected from ante-cubital vein with minimum stasis from each subject using disposable syringe. The procedure was explained to each subject and was well reassured all through the procedure. The collected blood was immediately transferred to vacutainer K_3EDTA grenier bioone and was transported straight to the laboratory in a fully air-conditioned car for analysis within 4hours of data collection. All samples were collected between 8-11am for two different days during school hours. All subjects were new intake into the JSS1 who were recruited into the study within their first week of enrollment, lived around the selected geographic area and attend the same school. Measurement of various haematological parameters in each subject was carried out using MAXCOM MC- 6200 fully automated haematology analyser for 240 test samples. Statistical significant difference was determined between urban and rural subjects, and between sexes for both urban and rural groups using the Z-test, a P <0.05 was considered statistically significant, all values were indicated as mean ± SEM while the ranges were in parenthesis. Results were presented in tables 1, 2, 3 and 4 respectively.

Table 1: Anthropometric Parameters amongst newly enrolled Urban and Rural Junior Secondary School Male Students (ranges in parenthesis).

Anthropometric Parameters	Urban Males n = 60	Rural Males n = 60	Significant Difference
Age (years)	10.93 ± 0.13 (9 – 12)	12.88 ± 0.15 (10 – 16)	Yes p <0.0001
Height (meters)	146.58 ± 1.01 (133.5 – 171.5)	150.96 ± 0.90 (135 – 165)	Yes p=0.0015
Weight (kilogram)	39.02 ± 0.99 (31 – 66)	40.58 ± 0.79 (31 – 70)	No p=0.02200
Body Mass Index (kg/m^2)	18.12 ± 0.33 (14.74 – 27.1)	17.74 ± 0.23 (15.5 – 27.3)	No p=0.3546

All values = Mean ± SEM.

Table 2: Anthropometric Parameters amongst newly enrolled Urban and Rural Junior Secondary School female Students (ranges in parenthesis).

Anthropometric Parameters	Urban Females n = 60	Rural Females n = 60	Significant Difference
Age (years)	10.52 ± 0.12 (8 – 12)	12.50 ± 0.13 (10 – 14)	Yes, p <0.0001

Height (meters)	147.74 ± 0.93 (127 – 163.5)	153.94 ± 0.89 (138 – 165)	Yes, p<0.0001
Weight (kilogram)	43.30 ± 1.20 (25 – 74)	43.85 ± 1.25 (30 – 67)	No, p=0.1437
Body Mass Index (kg/m^2)	18.83 ± 0.39 (14 – 30.8)	18.69 ± 0.54 (14.3 – 25.8)	No, p=0.8403

All values = Mean ± SEM.

Table 3: Erythrocytes Parameters amongst newly Enrolled Urban and Rural Junior Secondary School Male Students (ranges in parenthesis)

Haematological (Erythrocytes) Parameters	**Urban Males n = 60**	**Rural Males n = 60**	**Significant difference**
Red Cell Count (RBC) (10^{12}/L)	6.02 ± 0.08 (4.86 – 7.61)	6.21 ± 0.10 (4.93 – 8.53)	No, p = 0.1450
Haemoglobin (HGB)(g/dL)	12.37 ± 0.13 (10.1 – 14.8)	13.26 ± 0.20 (10.5 – 16.7)	Yes, p = 0.0003
Mean Cell Volume (MCV)(fL)	68.10 ± 0.61 (57.6 – 75.3)	72.35 ± 0.46 (63.2 – 77.9)	Yes, p < 0.0001
Mean Cell Haemoglobin (MCH)(pg/cell)	20.68 ± 0.28 (16.6 – 24.1)	21.39 ± 0.17 (17.8 – 23.6)	Yes, p = 0.0322
Mean Cell Haemoglobin Concentration (MCHC) (g/dL)	30.34 ± 0.27 (24.6 – 35.0)	29.39 ± 0.20 (20.8 – 31.4)	Yes, p= 0.0049
Red Cell Distribution Width Coefficient Variation (RDW_CV) (fL)	12.24 ± 0.10 (11.0 – 14.6)	12.25 ± 0.10 (10.5 – 13.5)	No, p= 0.9813
Red Cell Distribution Width Standard Deviation (RDW_SD) (fL)	33.32 ± 0.36 (28 – 40)	35.45 ± 0.31 (31 – 40)	Yes, p<0.0001
Haematocrit (HCT)(%)	40.95 ± 0.56 (33.8 – 52.1)	45.19 ± 0.76 (34.5 – 63.0)	Yes, p<0.0001

All values = Mean ± SEM.

Table 4: Erythrocytes Parameters amongst newly Enrolled Urban and Rural Junior Secondary School Female Students (ranges in parenthesis)

Haematological (Erythrocytes) Parameters	Urban Females n = 60	Rural Females n = 60	Significant difference
Red Cell Count (RBC)(10^{12}/L)	6.031 ± 0.09 (5.19 – 9.36)	6.12 ± 0.09 (5.16 – 7.62)	No, p = 0.1306
Haemoglobin (HGB)(g/dL)	13.00 ± 0.13 (11.4 – 16.5)	13.09 ± 0.13 (10.7 – 15.2)	No, P = 0.6031
Mean Cell Volume (MCV)(fL)	70.39 ± 0.56 (59.3 – 78)	72.65 ± 1.17 (14.2 – 81.2)	No, P = 0.0805
Mean Cell Haemoglobin (MCH)(pg/cell)	20.77 ± 0.26 (15.8 – 24.8)	21.31 ± 0.22 (17.1 – 23.9)	No, p = 0.1183
Mean Cell Haemoglobin Concentration (MCHC) (g/dL)	29.44 ± 0.24 (24 – 31.9)	28.77 ± 0.23 (18.7 – 33.4)	Yes, p= 0.0392
Red Cell Distribution Width coefficient variation (RDW_CV) (%)	11.80 ± 0.09 (10.7 – 13.4)	12.44 ± 0.28 (11.1 – 27.9)	Yes, p= 0.0339
Red Cell Distribution Width standard deviation (RDW_SD) (fL/cell)	33.07 ± 0.36 (22 – 40)	35.49 ± 0.61 (11.9 – 42)	Yes, p=0.0009
Haematocrit (HCT) (%)	44.29 ± 0.59 (37.8 – 64.6)	45.32 ± 0.48 (37.8 – 52.5)	No, p=0.1760

All values = Mean ± SEM.

RESULTS AND DISCUSSIONS

The present study is an attempt to report a comparative study of some erythrocyte parameters of newly enrolled urban (South-South) and rural (South-East) Junior Secondary School students; University Demonstration Secondary School, University of Port Harcourt South-South and Monsignor Maduka Memorial Secondary School Ekwulobia, Anambra South-East, Nigeria,since previous report in this regard has been relatively scanty. The mean values showed both increasing and decreasing value. The result finding in this study is consistence with previous findings on erythrocyte parameters baseline variation which reported differences in age and sex[5, 6, 7], and environmental and social difference[8, 9, 10]. Anthropometric parameter of this study in tables1 and 2 reveals statistical difference when compared the urban males to rural males, and urban females to rural females. The newly enrolled urban male and female students were observed to enroll into the junior secondary school in early age, the range of this study confirms that urban students enrolls at the age range of 8-12years, while rural students enrolls at 10-15years. Height of the newly enrolled students were also noted to be significantly higher in rural than in urban areas of both male and female students. This could be due to the fact that rural newly enrolled students were older in age and therefore were taller than the urban counterpart. The weight of both the urban males and rural males, and urban female and rural females did not show any significant difference. The Body mass

index of urban students shows no significant difference in both males and females subjects when compared to their rural counterpart, since the body mass index is a derivative of height and weight. Thus the significant difference found in age and height does not affect the body mass index. The values of erythrocytes amongst newly enrolled males as shown in table3 reports a marked increased in the mean values of haemoglobin concentration, mean cell volume, mean cell haemoglobin, red cell distribution width standard deviation and Haematocrit in rural males compared to urban males, while the mean cell haemoglobin concentration showed a higher mean value in newly enrolled urban male students compared to rural male students. So also, the mean values of red blood cell and red cell distribution width coefficient variation showed no significant difference. The values of all the males' erythrocytes category of both urban and rural areas had similar range and fell with normal range[16]. On the other hand, the erythrocytes parameters amongst urban and rural newly enrolled female students in table4 showed no significant difference in red cell counts, haemoglobin concentration, mean cell volume, mean cell haemoglobin, and Haematocrit. A high increased were observed in mean values of red cell distribution width coefficient variation and red cell distribution width standard deviation of rural females than the urban females. This implies that the distribution width of the red cell is higher in rural females than the urban females. Yet increased values were also observed in mean cell haemoglobin concentration of urban females compared to the rural newly enrolled females.

CONCLUSION

In conclusion, the present study has provided information of great value on erythrocyte parameters of newly enrolled urban and rural junior secondary school students of these geographical areas, thus the results suggest that gender, age and haematological variation do exist in both urban and rural newly enrolled junior secondary school students, with significant increase in female gender's height, weight and BMI, while the age mean value are higher in males.

REFERENCES

1. Ramnik, S. Textbook of Medical Laboratory Technology. Jitendar P Vij, Jaypee Brothers Medical Pulishers(P), New Delhi. 2006: 201-210.
2. Cheesbrough, M. District Laboratory Practice in Tropical Countries, part 2. Press Syndicate of the University of Cambridge, United Kingdom. 2004: 267-319.
3. Ganong, WF. Review of Medical Physiolology. 22nd Edition. McGraw-Hill Companies, Asia. 2005: 515-532.
4. Gilles, HM. Haematology in tropical Africa, Clinical Haematology: 1981: 697 – 705.

5. Moshen AF and Arjumand SW. Normal reference values for haematological parameters and red cell indices from early childhood through adolescence in Saudis. *Annals. Saudi Med*; 2002; 1(2-3): 165-169.
6. Hawkins W, Speck E and Leonard VG. Variation of haemoglobin level with age and sex. *Blood*; 1954; 90-99.
7. Viteri FE, Tuna VD and Guzman MA, Normal Haemoglobin Values in Central American population *Brit J Haematol.*1972; 23: 189 – 204.
8. De Gruchy GC. The red cell: Basic Aspect of anaemia. In: Fikin F, Chesterman C, Pennington D, Rush B editors De Gruchy's Clinical Haematology in Medical Practice 5th Ed, oxford; Blackwell Scientific Publication. 1989: 17 – 36.
9. Sharper AG and Lewis P. Genetic neutrophenia in people of African origin *Lancet* . 1971; 6: 1201 – 1203.
10. Woodlif HJ, Kataha PK, Tibal eka AK and Nzaro K. Total Leucocyte Count in Africans, *Lancet*. 1971; 6: 1021–3.
11. Garn SM, Smith NJ, Clark DC. Lifelong differences in Haemoglobin levels between black and whites. *J. Nat Med Assoc*. 1975; 67: 91 – 99.
12. Dapper DV, Nwauche C.A., Siminialayi I.M. Some haematological reference values for pre-primary and primary school aged children in Port Harcourt, Nigeria. *Niger J Clin Pract* 2009; 12(3): 262 –267.
13. Mathieu NB, Andre BK, Amonkan AK, Delile H, Sawadogo D, Datte JY, Yapo PA. Changes in Haematological parameters of children aged 5-18years in Abidjan, COTE d' Ivoire. *J. of Physiology and Pathophysiology*. 2013; 4(2): 11-12.
14. Dallman PR and Sijunes MA. Percentile curves for haemoglobin and red cell Vol. in infancy and childhood. *J. Pediatr*. 1979; 94: 26-30.
15. World Health Organization (WHO) Nutritional anaemia: report of a WHO Scientific group. Technical Report Series. 1968; No. 405, WHO Geneva.
16. Wikipedia (2011) Free encyclopaedia. http.//en.wikipedia.org/wiki/Haematology.