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Correlation between anaemia and malaria infection among patients attending Murtala Muhammed Specialist Hospital Kano, Nigeria

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ABSTRACT: Correlation study between anaemia and malarial infection was conducted among patients of two age groups (0 – 12 years and 40 years above) attending MMSH, Kano. Samples obtained were tested for malarial parasites (MPs). Two hundred and twenty two MP positive samples, each under went haematocrit and Sahli's Haemoglobin estimation tests (parallel tests) so as to determine their haematological indices. Results showed correlation was significant between anaemia and malarial infection ($y=0.850$, $P = 0.050$; 2 – tailed). There was no significant difference between age groups and sex of the subjects ($T = 1.15$, $P = 0.2950$; 2 – tailed).

Key words: Correlation, Anaemia, Malarial Infection, Haematological indices.

Introduction

Malaria is a life threatening disease, which is caused by a protozoan called *Plasmodium*, that grows in blood cells, multiply and eventually causing anaemia due to haemolysis, immune response (e.g. erythrophagocytosis) as well as dyserythropoiesis (Means, 1994). Anaemia (Hb level $< 11\text{g/g}$) has remained one of the most serious public health problems in malaria – endemic countries of Africa, Nigeria inclusive, and severe anaemia (Hb level $< 5\text{g/dl}$) is associated with increased risk of death (Brabin *et al.*, 2001). One child dies of malaria or its complication like severe anaemia and/or cerebral malaria every 20seconds in Africa and there is one malarial death every 12 seconds some where in the world (WHO, 2003). Malarial anaemia in the adults at later age is found to be common in chronic infections, due to depressed immunity, poor nutritional intake and sub – clinical infection (especially in the sub – saharan Africa, which is a malaria – endemic and poverty stricken area)(Imam and Indabawa,2007).

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A cohort studies conducted in areas of stable, perennial malaria transmission in Tanzania and Kenya, showed that malarial infection correlates with decline in haemoglobin concentration of less than 8 g/dl (Schellenberg *et al.*, 2003). In one health centre in Ogun State, Nigeria, a survey of patients attending the centre showed 95% of the children under 5 years of age were anaemic, and some of them presented with severe anaemia necessitating blood transfusion which is risky bearing in mind the high prevalence of blood borne infections e.g. HIV/AIDS, hepatitis e.t.c. (Johnson, 2003). In Nigeria alone, 60 million people experience malarial attack at least a year (Roll Back Malaria, 2000). This study was aimed at correlating anaemia and malarial infection among patients (0 – 12 years, and 40 years – above) attending MMSH, Kano with the objective of evaluating the degree of anaemia among malaria infected subject, despite the presence of other anaemia inducing factors with a view that the findings will be a baseline of clinical assessment of malaria infected patients in MMSH, and the nation as a whole.

Materials and Methods

Study Area: Murtala Muhammad Specialist Hospital Kano. Is situated at the heart of Kano metropolis, (latitude 11°59'N an Longitude 8°30'E) built since 1926 by the then British colonial government, the hospital is a referral centre where patients from surrounding local government areas of Kano are referred. Also neighbouring states like Katsina and Jigawa States refer their patients to the centre.

Target Groups and Sample Size

The target groups 110 malaria positive children ages range from 0 – 12 years old and 112 malaria positive ageing adult age range from 40 years – above. All their blood samples were collected accordingly, observing universal precautions; their personal data (i.e. age and sex in particular) were also recorded.

Sample Collection and Handling

Blood samples were collected as described by Giles (1993), through venepuncture of post – cubital veins of the patients using 2cc syringe. The sample were withdrawn into clean test tubes containing EDTA crystals (anti coagulant). The test tubes were then capped, placed in the racks appropriately.

Preparation and staining of thin smear

Glass slides were used in the smear preparation. Staining as described by Giles (1993), thin smears were made, dried and stained using leishman stain, dried and then fixed in methanol by dipping slides into it for 5 seconds. The fixed slides after removal from methanol, Three drops of the leishman stain was added into them, then left for 2 minutes, later 15 drops of buffered distilled water was added, mixed thoroughly and left for 6 minutes, washed off with clean water. The stained slides were dried and examined.

Microscopy of Thin Blood Film

The stained slides were mounted, and observed under oil immersion using electric light microscope. Parasitaemia estimation were performed according to the method described by Giles (1993).

Haemoglobin Estimation

The estimation was done using Sahli's method (Linne and Ringsrud, 1970). In which 20µl of blood obtained was added to 20ml of freshly prepared 0.1N HCl acid in Sahli's diluting tube, and allowed to stand for 5 minutes for formation of acid haematin. Distilled water was then added drop wise to the mixture under vigorous stirring until the color matched that of the standard. The reading on the diluting tube was noted and the concentration of the Hb was estimated and consequently recorded.

Haematocrit Determination (PCV)

PCV determination was done using capillary tube method according to Strumia *et al.*, (1954). Blood sample was allowed to enter a heparinised capillary tube until the tube was three quarter filled. Then sealed with a sealant.

It was then spurned in centrifuge for 15 minutes at 10,000 rpm. After which the values were obtained directly from a micro Haematocrit reader.

Statistical Analysis

SPSS (Version 7.5) was used for descriptive and correlational analysis of the data obtained, including sum (N), mean, range and percentage, Kendall's tau – β rank correlation and T – test were employed for the analysis of non – parametric and parametric data respectively.

Results

The correlation study between anaemia and malarial infection among patients of the two age groups attending MMSH is presented in Tables 1 and 3 where prevalence of malarial anaemia was high in all age groups: 69 (62.73%) out of 110 in 0 – 12 years of age and 90 (80.36%) out of 112 among 40 years – above group. Correlation between PCV and Hb among the subjects is significant (Table 1), mean PCV and Hb values of the subjects were below standard as shown in table 2, in which results in the study were compared to that of Prescriber (1994), and Crawley (1997). Correlation was significant between anaemia and malarial infection: $\tau = 0.850$, $P = 0.05$ (2 – tailed), but there was no significant difference between age groups and sex of the subjects: $T = 11.5$, $P = 0.2950$ (2 – tailed).

Table 1: Haemological indices, mean age distribution, range and kendall's tau – β correlation among patients with malarial infection.

Age group (years)		Paediatrics		Adults		N
(years)		0 – 5	6 – 12	40 – 55	56 – above	
Mean age	M	2.28	8.24	46.68	61.41	99
	F	2.35	8.31	45.66	60.50	123
Haemoglobin	M	9.41	9.19	9.35	8.89	99
	F	9.03	8.49	8.56	11.78	123
PCV (%)	M	30.70	29.50	27.71	26.52	99
	F	30.13	29.25	26.75	35.67	123
Range		13.0 – 50.0	12.0 – 51.0	14.7 – 50.0	18.0 – 40.0	99
Hb (g/dl)		4.2 – 16.00	4.5 – 16.0	4.9 – 16.0	6.0 – 13.2	
Correlation (γ)	M	0.89	0.92	0.97	0.97	
	F	0.90	0.90	0.96	0.95	
N		83	27	100	12	222

* Correlation is significant at $P = 0.01$ (2 – tailed)

Key:

M = Male

F = Female

N = Number of subjects

Table 2: Mean PCV and Hb values of subjects compared with two standards.

Subjects	Current study		Prescriber (1994)		Crawley (1997)	
	Hb (g/dl)	PCV (%)	Hb (g/dl)	PCV (%)	Hb (g/dl)	PCV (%)
Paediatrics						
0 – 5	9.22*	30.42*	11	33	9.3	27
6 – 12	8.85*	29.4 ⁴	12	36	10.7	34
Adult						
Male	9.13*	27.1*	13	40	-	-
Female	10.2*	31.3*	12	36	-	-

* No. Significant difference between age group and sex of subjects: T = 11.5 at P = 0.02950 (2 – tailed).

Table 3: Correlation between Anaemia and Malarial Infection Among Patients Attending MMSH Kano.

Variables	Malarial Anaemia (%)	n	N
Paediatrics			
0 – 12 years	62.73*	69	110
Adults			
4 – above years	80.36*	90	112
Total	71.62*	159	222

* Correlation is significant between anaemia and malarial infection among subjects: T = 0.850, P = 0.050 (2 – tailed).

Discussion

The results of this study obtained have vividly shown that anaemia is correlated with malarial infection, (Tables 1, 2, and 3) this is in congruent with the study of Means (1994) whereby malaria was proven to cause anaemia due to haemolysis, erythrophagocytosis and dysenterythrophoiesis. The mean PCV and Hb values of the subjects studied were below standard (table 2) as compared with the works of Prescriber (1994), and Crawly (1997), this stressed the impact of the correlation in this study, and thus, underscores the need for ameliorating the scourge because anaemia (Hb level < 11 g/dl) has shown to be a serious public health problem in malaria – endemic countries of Africa and severe anaemia (Hb level <5 g/dl) is associated with increased risk of death (Brabin *et al.*, 2001). The generally reduced mean PCV and Hb values of the subjects as compared with the standards adult male age group: PCV = 27%, this lends credence to the fact that the subjects within the age group are vulnerable to malarial anaemia in the paediatrics and thus, no significant difference was observed between age groups and sex of subjects (Table 2). Also, the result of the total population under the study (table 3) has illustrated that malarial infection correlates with decrease in haematological indices (more especially PCV and Hb) where 159 (71.62%) out of 222 of the sampled population were anaemic, this is in agreement with the cohort studies conducted in areas of stable, perennial malaria malaria transmission in Tanzania, Kenya, and Malawi which showed that malarial infection correlates with decline in haemoglobin concentration of less than 8g/dl (Schellenberg *et al.*, 2003; Imam and Indabawa, 2007). The rate of malarial anaemia among the paediatric patients, 69 (62.73%) out of 110 is consistent with the study conducted by Johnson (2003) where 95% of children attending one health center with malarial infection in Ogun State, Nigeria were anaemic.

Conclusion

This study has confirmed that malarial infection is one of the most common causes of PCV and Hb depletion among patients attending MMSH, Kano. Thus, correlation between anaemia and malarial

infection was significant as vividly shown in this study, because haematological indices of the subjects obtained were relatively lower than that of the two standards (Prescriber, 1994; Crawley, 1997).

Recommendation

- Screening of blood donors for MPs should be an essential component of control campaign.
- Determination of haematological indices (PCV & Hb) should be an integral part of clinical assessment of patient with malarial infection.
- Management of malarial infection should incorporate haematinics (blood tonic) and other anti - oxidant as an adjuvant therapy.

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