

carry their pregnancies to term. Previous research has documented the social consequences of early childbearing, including lower levels of educational achievement for both mother and child,⁷⁻⁹ increased poverty,^{10,11} and increased likelihood of welfare dependency.^{12,13} If more young women did, in fact, carry their pregnancies to term, such consequences could be considered as indirect effects of the parental notification legislation.

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Nutritional Anemias in the English-Speaking Caribbean: A Review of the Literature

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Abstract: A review of the published literature on nutritional anemias in the English-speaking Caribbean was carried out. Published articles on the subject are few in number and are concentrated in the larger islands such as Jamaica and Trinidad. Nutritional anemias are most prevalent among women of childbearing age. Iron and folate deficiencies and, to a much lesser extent, protein deficiency resulting from insufficient dietary intakes of these nutrients are the major nutritional factors contributing to this anemia. (*Am J Public Health* 1982; 72:285-289.)

Introduction

Nutritional anemias have been and still are a public health problem of widespread occurrence in the English-speaking Caribbean. In spite of this, few if any applied intervention programs aimed at alleviating the anemia problem exist. In the process of preparing this review of the literature, the authors were struck by the fact that published reports of

studies on nutritional anemias in the English-speaking Caribbean are somewhat limited in number and most of the published reports have been concerned with anemia in the larger Caribbean islands, such as Jamaica and Trinidad. While this literature review results from an intensive search of the published scientific literature, it may not be exhaustive. Much information on the subject is probably hidden away in unpublished reports which are unavailable to the authors.

Results and Discussion*

The drawing of conclusions from Table 1 and the comparison of the prevalence of anemia among the various Caribbean countries¹⁻¹⁴ are hampered by the fact that varying standards were used for the classification of anemia. However, it is evident that there is a relatively high prevalence of anemia among all age groups and in both sexes in the Caribbean countries where anemia studies have been carried out, particularly among young children and in women of childbearing age. In the few studies that have been conducted on the prevalence of anemia in pregnant and lactating women, high prevalences of anemia have also been found in these two groups.

The finding of particularly high prevalences of anemia among young children and women of childbearing age indi-

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*Further details concerning this material and the author's review of the literature are available on request to the author.

TABLE 1—Prevalences of Anemia in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0-5 years M & F	6-14 years M & F	15+ years M	15-44 years F	45+ years F
Jamaica ¹⁻⁴	10.4 ^b (866)	4.8 ^b (484)	9.3 ^f (896)	8.5 ^e (289)	12.1 ^c (714)
St. Kitts-Nevis- Anguilla ^{5,6}	89.7 ^c (29)	88.7 ^c (44)	1.6 ^c (190)	9.6 ^c (293)	52.0 ^c (25)
St. Lucia ^{5,7}	45.2 ^c (62)	42.1 ^c (233)	26.5 ^g (117)	25.4 ^c (180)	60.0 ^c (5)
Barbados ⁸	32.7 ^d (107)	9.3 ^e (162)	2.3 ^g (43)	19.0 ^h (121)	—
Grenada ⁹	38.5 ^e (26)	11.5 ^c (26)	5.6 ^g (18)	15.4 ^c (39)	—
Trinidad & Tobago ^{5,10-12}	80.0 ^c (40)	33.8 ^c (322)	7.0 ^c (242)	32.2 ^c (148)	35.9 ^c (39)
Guyana ^{13,14}	41.8 ^e (803)	43.8 ^c (858)	34.3 ^g (344)	43.3 ^c (494)	52.0 ^c (25)

- a) M = Male
F = Female
b) Hemoglobin < 10g %
c) Hemoglobin < 12g %
d) Hemoglobin < 10.5g %
e) Hemoglobin < 11g %
f) Hemoglobin < 12.5g %
g) Hemoglobin < 13g %
h) Hemoglobin < 11.5g %

icates that increased requirements for erythropoietic nutrients contribute to the problem.

Table 2 shows that iron deficiency is prevalent among most age and sex groups in Jamaica, Grenada, Trinidad and Tobago, and Guyana.

In St. Lucia, mean corpuscular hemoglobin concentration (MCHC) levels between 30 and 31 per cent were found in 11-17 per cent of children aged 2 to 14 years, 11 per cent of males aged 15 years or more, 12 per cent of females aged 15 years or older, and 33 per cent of pregnant females, suggesting that iron deficiency was one factor contributing to anemia.⁷

Seventy-seven per cent of anemic pregnant women in Trinidad and Tobago had hypochromic, microcytic anemia suggestive of iron deficiency.¹¹

Giglioli found that all of the anemia cases in British Guiana were microcytic in type.¹⁵

The results of the 1971 National Food and Nutrition Survey of Guyana¹³ found that MCHC levels below 31 per cent (suggestive of iron deficiency) occurred in 13-14 per cent of children 6 months-14 years of age, 13 per cent of males over 14 years of age, 21 per cent of females over 14 years of age, 34 per cent of pregnant females, and 21 per cent of lactating females. Approximately one-third of Guyanese

TABLE 2—Prevalences of Iron Deficiency in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0-5 years M & F	6-14 years M & F	15+ years M	15-44 years F	45+ years F
Jamaica ^{3,4}	—	—	6.4 ^d (325)	—	10.7 ^d (361)
Grenada ⁹	7.7 ^b (13)	0.0 ^b (19)	0.0 ^b (10)	7.3 ^b (26)	—
Trinidad & Tobago ¹⁰	—	8.5 ^b (224)	8.2 ^b (146)	13.0 ^b (54)	—
Guyana ¹⁴	16.2 ^c (74)	13.0 ^c (123)	1.6 ^c (64)	11.9 ^c (77)	13.6 ^c (22)

- a) M = Male
F = Female
b) Serum iron < 50 µg %
c) Serum iron < 50 µg %, and/or transferrin saturation < 15%
d) Serum iron < 50 µg %, Transferrin saturation < 17%

TABLE 3—Prevalences of Low Serum Folate Values in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0–5 years M & F	6–14 years M & F	15+ years M	15–44 years F	45+ years F
Grenada ⁹	13.0 ^b (23)	0.0 ^b (24)	0.0 ^b (18)	9.5 ^b (42)	—
Trinidad & Tobago ¹⁰	—	3.4 ^c (88)	19.4 ^c (77)	19.4 ^c (36)	—
Guyana ¹⁴	73.3 ^c (45)	82.8 ^c (87)	81.4 ^c (43)	80.0 ^c (50)	69.2 ^c (13)

- a) M = Male
F = Female
b) Serum folate < 4 ng/ml.
c) Serum folate < 3 ng/ml.

TABLE 4—Prevalences of Low Serum Vitamin B₁₂ Values in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0–5 years M & F	6–14 years M & F	15+ years M	15–44 years F	45+ years F
Trinidad & Tobago ¹⁰	—	2.8 ^c (72)	12.0 ^c (75)	5.7 ^c (35)	—
Guyana ¹⁴	28.6 ^b (49)	19.1 ^b (94)	19.2 ^b (52)	16.7 ^b (66)	6.7 ^b (15)

- a) M = Male
F = Female
b) Serum vitamin B₁₂ < 80 pg/ml.
c) Serum vitamin B₁₂ < 120 pg/ml.

TABLE 5—Prevalences of Hookworm Infestation in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0–5 years M & F	6–14 years M & F	15+ years M	15–44 years F	45+ years F
Jamaica ^{2, 3}	6.6 (296)	—	30.7 (251)	—	12.3 (260)
St. Lucia ⁷	16.5 (247)	51.2 (603)	—	—	—
Trinidad & Tobago ¹⁰	—	9.3 (131)	8.9 (56)	11.8 (36)	—
Guyana ¹⁴	0.9 (111)	0.0 (89)	0.0 (36)	0.0 (85)	0.0 (16)

- a) M = Male
F = Female

TABLE 6—Prevalences of Roundworm Infestation in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0-5 years M & F	6-14 years M & F	15+ years M	15-44 years F	45+ years F
Jamaica ²	6.9 (296)	—	—	—	—
St. Lucia ⁷	57.4 (247)	67.3 (603)	—	—	—
Trinidad & Tobago ¹⁰	—	6.5 (131)	—	—	—
Guyana ¹⁴	22.5 (111)	20.2 (89)	5.6 (36)	15.3 (85)	15.4 (13)

a) M = Male
F = Female

anemic subjects had hypochromic, microcytic anemia.¹⁴

The major cause of iron deficiency in the Caribbean appears to be insufficient dietary intake of iron. Ashworth and Waterlow¹ reported that anemia in Jamaican infants aged 12-18 months resulted mainly from a deficient intake of absorbable iron. The ICNND Survey⁵ found dietary iron intakes to be low in St. Kitts-Nevis-Anguilla, St. Lucia, and Trinidad and Tobago. In Barbados, 42 per cent of families surveyed were deficient in dietary iron, this iron deficiency being associated with low incomes.⁸ In Grenada, 58 per cent of the households were deficient in dietary iron.⁹ In the Guyana Food and Nutrition Survey,¹³ the hemoglobin level of individuals was significantly associated with the percentage of recommended intakes of dietary iron met in the households from which these individuals came.

Relatively few studies have been conducted on the role of folate deficiency in the etiology of anemia in the Caribbean. In all of the studies that have been conducted, with the exception of one in Barbados where red cell folate was determined,⁸ serum folate has been used as an index of folic acid deficiency. A low serum folate level is not specific for a deficiency of folic acid but may also indicate either lack of a recent intake of foods rich in folate, or a recent intake of alcoholic beverages. For this reason, serum folate levels should be interpreted with caution.

Examination of Table 3 shows that low serum folate levels are prevalent, especially in Guyana, and are not concentrated in any particular age or sex group. In the Guyana Food and Nutrition Survey,¹³ serum folate values below the normal range were found among 65 per cent of 344 subjects of all ages. Ashcroft, *et al*, reported that folate deficiency may be common in the first year of life in Jamaica.² Ashworth and Waterlow have also reported that folate deficiency may be widespread among Jamaican infants because many are seen in hospitals with very severe anemia (hemoglobin < 4g %) and a megaloblastic bone marrow which responds to folic acid.¹ In addition, low blood folate levels have been found in several clinically normal children from an orphanage in Kingston, the capital of Jamaica.¹

In a study conducted among pregnant women in Trinidad and Tobago, Chopra, *et al*, found that 20 per cent of the anemic subjects had anemia suggestive of a combination of iron and folate deficiency, while 3 per cent had anemia suggestive of pure folate deficiency.¹¹

Studies on the role of vitamin B₁₂ deficiency in the etiology of anemia appear to have been conducted only in Trinidad and Tobago^{10,11} and in Guyana.¹⁴ Low serum vitamin B₁₂ values were found in all age groups and in both sexes in these two countries (Table 4).

Vitamin B₁₂ deficiency is unlikely to be a contributor to

TABLE 7—Prevalences of Whipworm Infestation in Various Age and Sex^a Groups (Sample Sizes in Parentheses)

Country	Age and Sex Groups				
	0-5 years M & F	6-14 years M & F	15+ years M	15-44 years F	45+ years F
St. Lucia ⁷	53.0 (247)	80.2 (603)	—	—	—
Trinidad & Tobago ¹⁰	—	14.9 (131)	5.4 (56)	16.0 (18)	—
Guyana ¹⁴	5.4 (111)	6.7 (89)	2.8 (36)	0.0 (85)	0.0 (16)

a) M = Male
F = Female

anemia in populations, as in the Caribbean, where animal foods are widely consumed. Habib, on the other hand, observed and studied ten cases of nutritional vitamin B₁₂ deficiency (megaloblastic anemia) among lactovegetarian Hindus in Trinidad.¹⁶ MacIver and Back reported clinical, hematological, and other laboratory findings in 50 cases of megaloblastic anemia of infancy in Jamaica (average hemoglobin 5.4g per cent).¹⁷

Chopra, *et al*, studied anemia among 22 cases of second and third degree malnutrition (Gomez classification) aged 2 months to three years in Trinidad and Tobago.¹⁸ Hemoglobin values varied from 5.9–11.1g per cent, the average value being 8.7g per cent. Although the ingestion of iron was very low by National Academy of Sciences standards,¹⁹ most of the serum iron levels were within the normal range since the requirements were below normal because of low body weight, decreased blood volume, and low level of hemoglobin.

Table 5 shows that the prevalence of hookworm infestation in the various Caribbean countries varies considerably. Therefore, while it may be an important cause of anemia in a few instances, it seems to be relatively unimportant in most countries.

In Guyana, Giglioli reported that in a series of 6,246 inpatients and 61,723 outpatients from coastal sugar estates and villages, examined by Estate Medical Officers during 1958 to 1962, there were only 55 cases of anemia associated with hookworm infestation of some degree.¹⁵ In a survey conducted in 1976, only one case of anemia associated with hookworm was found.¹⁴

The prevalence of roundworm infestation is somewhat higher than that of hookworm infestation and also varies considerably among the Caribbean countries (see Table 6). However, in none of the countries has roundworm infestation been found to be a major cause of anemia. The same also appears to be true of whipworm infestation. However, Ramsey,²⁰ working in Jamaica, has described children between 2 and 5 years of age as having bloody diarrhea, prolapsed rectum, and severe iron deficiency anemia apparently caused by whipworm.

Infestation with *Schistosoma mansoni* was found to be common among all age groups in St. Lucia but was not usually associated with anemia.⁷

The overwhelming majority of the studies reviewed were conducted in the 1960s. This situation reflects the paucity of applied nutrition research and activities in the Caribbean, at least on nutritional anemias. Clearly there is a need for more up-to-date information on the nature, prevalence, and etiology of the nutritional anemias in the Caribbe-

an. Such information is vital for the planning and the success of applied intervention programs aimed at alleviating the anemia problem. In view of the fact that relatively few nationwide anemia intervention programs exist in the English-speaking Caribbean, such programs are greatly needed.

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