

ANAEMIA STATUS AND CURRENT METHODS FOR ITS CONTROL
IN ANTIGUA

SUGGESTED METHODS FOR ITS CONTROL THROUGH
THE PRIMARY HEALTH CARE SYSTEM

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1. INTRODUCTION

Anaemia is one of the most prevalent nutritional problems in the English-speaking Caribbean. In different countries of the Region the prevalence varies from 22.2% to 100.0% in pregnant and lactating mothers and from 11.1% to 76.0% in pre-school children (1). In some of the countries school age children and adults have also been found to be suffering from anaemia (1). As part of the ongoing CFNI programme in its member countries to assess the prevalence and severity of nutritional anaemia and the present methods of its prevention, control and treatment, this investigation is an attempt to assess the situation in Antigua and to develop a programme to control the disease through the Primary Health Care System.

2. MATERIALS AND METHODS

2.1. The Study Area and Its Characteristics

Antigua, with its dependencies, the islands of Barbuda and Redonda, lies in the outside of the Leeward Islands chain between 61° and 62° West and 17° and 18° North. They are small islands, Antigua having a land area of only 108 square miles, Barbuda 62 and Redonda, a rocky islet, less than half a square mile.

Antigua has deeply indented shores which are lined by reefs and shoals, but there are many natural harbours. The island is, in the main, low-lying. The highest hill, Boggy Peak (1,330 feet) in the south-west, is of volcanic origin. In the north and east the land is undulating and flat and is composed of calcareous marls and coarse sandstone while the central portion is of clay formation.

The extreme heat and humidity normally encountered in tropical regions are tempered by the almost continual sea breezes and limited rainfall making "dry and sunny" perhaps the best description of the island's climate.

The mean average temperature is about 81.5°F with extremes as high as 93°F in August and 60°F in January although 85°F and 75°F are the general averages during the summer and winter seasons.

Rainfall is generally slight averaging only about 46 inches but with extremes ranging from 25.51 inches in the drought year of 1930 to 73.59 inches in 1899. The following figures are as recorded by the Agricultural Department.

In 1976 mid-year population of Antigua was 71,420. In 1970 and 1960 the estimated population was 65,000 and 55,000, respectively.

In 1970 as much as 44% of the population was under 15 years of age. Fourteen percent was under five years and only five percent was over 65 years of age.

The capital of Antigua is St. John's which is situated in the north-west of the island.

Most of the food in Antigua is imported. Some food is produced locally. In 1975 7,551,936 lbs. of wheat flour; 1,079,420 lbs. of cornmeal; 1,067,322 Irish potatoes; 429,057 lbs. of macaroni and spaghetti were imported into Antigua. Local food production includes bananas, pineapples, pumpkins, tomatoes, cucumbers and squash among some other foods.

2.2. Health Services

In the island of Antigua there is one general hospital, one psychiatric hospital and one private hospital. There are four main health centres and fourteen sub-centres. The sub-centres provide general medicine, ante-natal care and child health care.

2.3. Methodology of Data Collection on Anaemia

CFNI staff visited Antigua in 1979 and 1980.

The people visited were the Permanent Secretary, Chief Medical Officer, Physicians, Chief of Public Health Nursing, Public Health Nurses, Public Health Inspectors and Laboratory Technologists from the Ministry of Health. The Chief of the Central Marketing Corporation was also visited.

Haemoglobin values were obtained from records from the ante-natal clinic at Holberton Hospital, from a central registrar in the Chief of Public Health Nursing Office and from records in the Paediatric Ward, Holberton Hospital, St. John's, Antigua. Data on stool parasite infestations and sickle cell anaemia was obtained from records in the central laboratory. The suggested haemoglobin levels are those recommended by the World Health Organization (Table 1). Since there is some controversy about these levels, all haemoglobins were divided by one gramme percent level. Three supermarkets

were visited in St. John's to obtain information on the type and level of iron fortification of foodstuffs.

In Antigua haemoglobins from the ante-natal clinic and the Paediatric Ward at the Holberton Hospital are estimated at the central laboratory at the same hospital by the cyanmethaemoglobin method (2). The haemoglobins from the other ante-natal clinics are estimated at those clinics by the Tallqvist method (3).

3. RESULTS

3.1. Anaemia in the Ante-natal Period

In Tables 2 and 3 can be seen the haemoglobin levels of pregnant women divided by different haemoglobin levels. This included the haemoglobin levels of 189 pregnant women presently attending the ante-natal clinic at Holberton Hospital. The majority of the ante-natals in Antigua attend this ante-natal clinic. The haemoglobins were estimated on the first visit to the ante-natal clinic and the average period of gestation on the first visit was 25.8 weeks. The haemoglobins were estimated at the central laboratory by the cyanmethaemoglobin method (2). The recommended WHO Standard for haemoglobin levels is 11.0 g/dl (5-6). Fifty-eight percent of the ante-natals had haemoglobin levels below 11.0 g/dl. Thirty percent had haemoglobin levels below 10.0 g/dl. Three percent had haemoglobin levels below 8.0 g/dl.

In Table 4 can be seen the haemoglobin values for all ante-natal clinics outside of St. John's. The haemoglobins were estimated at the first visit to the clinic. The haemoglobins were done by the Tallqvist method (3) in each individual clinic. The Tallqvist method has been found by some investigators to be as much as 3.0 g/dl inaccurate (4). Sixteen and five tenths percent of the ante-natals had haemoglobin levels below 11.0 g/dl. Three and two tenths had haemoglobin values below 10.0 g/dl. Only 0.4 percent had haemoglobin values below 8.0 g/dl.

The estimated ante-natal clinic attendance in Antigua is 90%. This includes at least three visits per pregnancy (Table 5).

3.2. Anaemia in Pre-school and School Age Children

The ages and haemoglobin levels of pre-school age children aged 3-59 months admitted to the Paediatric Ward of Holberton Hospital in 1973 can be seen in Tables 6 and 7. The haemoglobins were estimated at the central laboratory by the cyanmethaemoglobin method when the pre-school age child first entered the hospital (2). The recommended WHO Standard for haemoglobin levels is 11.0 g/dl (5-6). Fifty-five percent of the children aged 3-59 months had haemoglobin levels below 11.0 g/dl. Thirty-two and three percent of the children had haemoglobin levels below 10.0 and 8.0 g/dl, respectively. Twenty-eight percent of the children were between 1.0 - 1.9 years of age.

In Tables 8 and 9 the ages and the haemoglobin values for the pre-school age children aged 6 years and older who were admitted to the Paediatric Ward of the Holberton Hospital can be seen. The haemoglobins were estimated on the beginning of the stay in hospital. The estimations were done at the central laboratory by the cyanmethaemoglobin method. The suggested standard for children over 6 years of age is 12.0 g/dl. Sixty-eight percent of the children had haemoglobins below 12.0 g/dl. Nine percent of the children had haemoglobins below 8.0 g/dl probably reflecting the fact that the children were seriously ill enough to be hospitalized. The majority of the children aged from 6.0 - 7.9 years.

The haemoglobin values in Tables 6-9 are those from hospitalized children and therefore are not a representative sample of Antigua children.

3.3. Stool Analyses for Parasites

One of the causes of anaemia throughout the world is infestation of different parasites such as hookworm and whipworm.

The stool analyses for parasites done at the central laboratory are shown in Table 10. These figures do not represent a random sample of the population but only those people who had their stool examined. The figures cover a five year period.

In 1979 0.7% of people with positive parasite counts had an infestation of hookworm. Eight point four percent of the people with positive parasite counts had an infestation of Trichuris (whipworm).

3.4. Sickle Cell Anaemia

In the Caribbean sickle cell anaemia is commonly found. Studies have shown that about 0.8% and 9.0% are homozygous and heterozygous for sickle cell anaemia respectively (7). Tests for sickle cell anaemia were conducted at the central laboratory. However, since there is sometimes a shortage of chemicals to conduct the tests accurately figures in sickle cell anaemia in Antigua were impossible to obtain.

3.5. Eating Patterns and Food in Antigua

Tables 11-13 show a typical family and infant diet in Antigua. The data was collected from Public Health Nurses and Community Health Aides. Much bread, bread products and home-made lemonade seems to be consumed in Antigua.

3.6. Present Methods of Treatment of Anaemia

One of the methods of control of anaemia in Antigua is the treatment of the cases. In Tables 14-17 can be seen foods, baby cereals and infant

formulae that are fortified with iron. Table 18 shows the contents of five kinds of vitamin and mineral preparations distributed through the ante-natal and child health clinics.

4. DISCUSSION

A World Health Organization Expert Group has suggested an arbitrary cut-off point for haemoglobin levels below which anaemia is likely to be present in individuals living at sea level (Table 1). As in the case of any standard, there are controversies as to how rigidly these standards should be adhered to. Also there is increasing evidence that there may be racial differences in the frequency distribution of normal haemoglobin (8-10). However, this much is certain that persons with haemoglobin concentrations below these cut-off points have a high probability of being anaemic and the lower the value the higher is the probability.

Using the WHO criteria it is evident that like most of the countries of the Caribbean anaemia is highly prevalent in Antigua although data is only available from ante-natal clinics.

Using WHO suggested haemoglobin levels 58% of the ante-natals had haemoglobin levels below 11.0 g/dl. This is a similar situation to Grenada, Guyana, Jamaica and Trinidad and Tobago (Figure 1).

Since the haemoglobin data from children is from the admission to the Paediatric Ward at the Holberton Hospital it is impossible to draw any conclusions regarding the prevalence of anaemia in children. As can be noted in Figure 2, anaemia in pre-school age children is a problem in the English-speaking Caribbean. The prevalence ranges from 11.1% to 76.0% in various Caribbean countries. A sample study would have to be conducted in Antigua to ascertain whether or not anaemia is a problem in children. Since studies have shown that about 29.1% of pre-school age children attending child health clinics suffer some degree of malnutrition according to the Gomez classification probably anaemia exists also (11-12).

It has long been known that infestations of hookworm are associated with anaemia and that there is some relationship between the severity of the infestation and the degree of anaemia (13-14). Measurement of the blood loss caused by trichuris indicates that each worm is responsible for a loss of about 0.005 ml/day (15). Since the parasites live in the large intestine, there is no reabsorption of haemoglobin iron, so with a heavy infestation, a significant degree of iron loss may result. A further investigation to explore the role of trichuris in the causation of anaemia in Antigua is indicated.

5. SUMMARY AND RECOMMENDATIONS

Because of information gaps it is difficult to draw definite conclusions on the problem of anaemia in Antigua. There is good information on the haemoglobin levels of ante-natals attending the Holberton Hospital ante-natal clinics. Pregnant women attending these clinics have their haemoglobin level determined at the central laboratory by the cyanmethaemoglobin method.

Of the three important causes of anaemia from the public health point of view sickle cell anaemia is probably a problem in Antigua although there is no data from Antigua to substantiate those points. Parasite infestation may be playing a role in its causation. However, the parasite stool counts from hookworm are low. Trichuris is more common but the actual number of ova is not known.

The anaemia in Antigua is probably more of a nutritional problem. It is probably a problem of decreased iron intake with a poor absorption. A deficiency of folate could also be a contributing factor.

Based on the Data the following Recommendations to Control Anaemia are Being Made:

1. At present CFNI is conducting an investigation on the most appropriate method to screen haemoglobins in the Primary Health Care System. CFNI would be pleased to collaborate with the Government of Antigua in helping to implement the result of the study.
2. That a rapid study on prevalence of anaemia in pre-school age children be conducted. This study could be conducted by two CFNI staff members at little expense to the Government of Antigua.

3. More emphasis should be placed on dietary management of anaemia in pregnancy. Every pregnant woman should be provided with a list of foods rich in iron to make a better choice of iron containing foods and its use should be encouraged at every ante-natal visit.
4. A careful review should be made of the side effects of iron tablets being distributed through the ante-natal clinics. If non-compliance of the therapy is a problem, a different type of iron may be indicated.
5. Every case of anaemia should be investigated for stool parasites. Knowing the geographic location (address) of those cases may facilitate future programme development.
6. Develop a programme of community participation to stimulate early attendance of ante-natals at ante-natal clinics.

Table 1: WHO Criteria for the Diagnosis of Anaemia

Haemoglobin Concentrations below which Anaemia is likely to be present at Sea Level according to Different Age, Sex and Physiological Status (5-6)

	g/dl
Children 6 months to 6 years	11.0
Children 6-14 years	12.0
Adult males	13.0
Adult females, non-pregnant	12.0
Adult females, pregnant	11.0

Table 2: Haemoglobin Levels of Pregnant Women Attending Holberton Hospital Ante-natal Clinic (Haemoglobin g/dl)

	Percent with Haemoglobin below 11.0 g/dl	Percent with Haemoglobin below 10.0 g/dl	Percent with Haemoglobin below 8.0 g/dl
Pregnant Women	58%	30%	3%

WHO Suggested Standard = 11.0 g/dl

Table 3: Holberton Hospital Ante-natal Clinic Haemoglobins - 1978-1979*
(Haemoglobin g/dl)

	Anaemic according to WHO Standard				11.0-11.9	12.0-12.9	13.0>	TOTAL
	<8.0	8.0-8.9	9.0-9.9	10.0-10.9				
Number of Women	5	9	41	53	53	22	6	189
Percent of Women	3%	5%	22%	28%	28%	11%	3%	100%

*Includes all ante-natals presently using the Holberton Hospital Ante-natal Clinic. The haemoglobins were estimated at the first visit at the central laboratory by the cyanmethaemoglobin method (2). Average period of gestation at the first visit was 25.8 weeks. (Late 2nd or early 3rd trimester)

Table 4: Ante-natal Haemoglobins as Seen at Some Clinics Outside St. John's - 1978* (Haemoglobin g/dl)

	Anaemic according to WHO Standard				11.0-11.9	12.0-12.9	13.0>	TOTAL
	<8.0	8.0-8.9	9.0-9.9	10.0-10.9				
Number of Women	1	2	4	28	53	86	35	208
Percent of Women	0.4%	0.9%	1.9%	13.3%	15.4%	41.3%	16.7%	100%

*Haemoglobins were estimated by the Tallqvist Method at the individual clinics (3). The haemoglobins were estimated at the first visit.

Table 5: Clinic Coverage at Ante-natal and Child Health Clinics

Child Health	Estimated 80%	at least six visits per year in the first year of life
Ante-natal	Estimated 90%	at least three visits per pregnancy

Table 6: Percent of Children 0-6 Years of Age Admitted to the Paediatric Ward, Holberton Hospital, St. John's, Antigua Whose Haemoglobins were Estimated

1978

Age at Admission	Children	
	No.	%
3.0 - 5.9 months	32	11
6.0 - 11.9 "	48	17
1.0 - 1.9 years	81	28
2.0 - 2.9 "	59	21
3.0 - 3.9 "	26	9
4.0 - 4.9 "	18	6
5.0 - 5.9 "	22	8
	286	100

Table 7: Holberton Hospital Paediatric Admissions, St. John's - 1978, Children 3-59 Months (Haemoglobin g/dl)

	Anaemic according to WHO Standard				11.0-11.9	12.0-12.9	13.0>	TOTAL
	<8.0	8.0-8.9	9.0-9.9	10.0-10.9				
Number of Children	8	35	48	67	83	27	18	236
Percent of Children	3%	12%	17%	23%	29%	9%	7%	100%

Table 8: Percent of Children 6-11 Years of Age Admitted to the Paediatric Ward, Holberton Hospital, St. John's, Antigua Whose Haemoglobins were Estimated

1978

Age at Admission	Children	
	No.	%
6.0 - 6.9 years	13	28
7.0 - 7.9 "	14	30
8.0 - 8.9 "	7	16
9.0 - 9.9 "	6	13
10.0 - 10.9 "	6	13
>11.0 years	0	0
	46	100

Table 9: Holberton Hospital Paediatric Admissions, St. John's - 1978
Children 6 Years Old and Older (Haemoglobin g/dl)

	Anaemic according to WHO Standard					12.0-12.9	13.0>	TOTAL
	<8.0	8.0-8.9	9.0-9.9	10.0-10.9	11.0-11.9			
Number of Children	4	0	2	9	16	8	7	46
Percent of Children	9%	0	4%	20%	35%	17%	15%	100%

Table 10: Stool Analyses for Parasites at the Central Laboratory

1979

3266 Stool Analyses Conducted

Parasites	Trichuris	Hookworm	Ascaris	Giardia	Strong Yloides	Pinworm	Total
Number of People	275	26	13	96	26	2	438
Percent of People	8.4%	0.7%	0.4%	2.9%	0.8%	0.06%	-

1978

2670 Stool Analyses Conducted

Parasites	Trichuris	Hookworm	Ascaris	Giardia	Strong Yloides	Pinworm	Total
Number of People	179	16	12	115	11	2	335
Percent of People	6.7%	0.6%	0.4%	4.3%	0.4%	0.07%	-

Table 10: Stool Analyses for Parasites at the Central Laboratory (cont'd)

1977

2186 Stool Analyses Conducted

Parasites	Trichuris	Hookworm	Ascaris	Giardia	Strong Yloides	Tapeworm	Total
Number of People	210	5	13	76	4	1	309
Percent of People	10%	0.2%	0.5%	3.4%	0.1%	0.04%	-

1976

1794 Stool Analyses Conducted

Parasites	Trichuris	Hookworm	Ascaris	Giardia	Strong Yloides	Total
Number of People	185	14	6	26	3	234
Percent of People	10.3%	0.7%	0.3%	1.4%	0.1%	-

1975

2134 Stool Analyses Conducted

Parasites	Trichuris	Hookworm	Ascaris	Giardia	Strong Yloides	Pinworm	Total
Number of People	305	46	30	17	3	3	404
Percent of People	14.2%	2.1%	1.4%	0.7%	0.1%	0.1%	-

Table 11: Diet in Antigua (From Interviews with Public Health Nurses)

	Family	Infants
Breakfast	Bread Egg Sausage Hot Drink coffee, tea, Ovaltine or Milo, milk and sugar	Encourage breastfeeding Use Cow & Gate, SMA or Lactogen (most)
Lunch	Dumplings (from wheat flour) Chicken or beef Greens Carrots Lemonade - homemade or from cans	Four months Cornmeal, oats, cream of wheat, vegetables
Dinner	Bread Egg Sardine	Five months Eggs, fish or dumplings used

Table 12: Adult Diet in Antigua (From Interviews with
10 Community Health Aides)

Breakfast	Bread - 4 slices Butter - ½ oz. Cheese - 1.0 oz. Ovaltine - 1 cup with milk and 1 tablespoon brown sugar
Lunch	Bread - 4 slices Pudding - bread or potato Lemonade - homemade or Sweet potato Green banana Fish Lemonade - homemade or Soup - sweet potatoes Green bananas Fish - with maybe spinach, greens, fungi
Dinner	Fungi Saltfish Spinach or Dumpling and mackerel or Macaroni and chicken

If a heavy lunch was consumed the individual will have a sandwich for dinner.

Table 13: Diet for Children in Antigua (From Interviews with 10 Community Health Aides)

0 days - 1 month
Breastmilk only - almost all mothers
1 month - 3 or 6 months
SMA
or
Cow and Gate
plus
Breastmilk morning and evening
6 months
Cereals
Cornmeal with evaporated milk
or
Cow's milk
6-9 months
Start food from the family pot

Table 14: Some of the Common Foods Fortified with Iron Available in Antigua, March 1980

Food	Amount	Type	Country of Origin
Pillsbury's Best All-Purpose Enriched Flour	1 oz. has 3.75% USRDA	Not Given	U.S.A.
Pillsbury's Best Self-Rising Enriched Flour	1 oz. has 3.75% USRDA	Not Given	U.S.A.
Easy Bake Flour Vitamin Enriched	1 oz. has 8.1% of the minimum daily requirement	Not Given	St. Vincent
Purity Enriched Flour	2.9 mg/100 g of flour	Reduced Iron	Canada
Mueller's Spaghetti Enriched	1 oz. has 5.0% of USRDA	Not Given	U.S.A.
White Rose Enriched No. 8 Spaghetti	1 oz. has 5.0% of USRDA	Not Given	U.S.A.
White Rose Enriched Egg Noodles	1 oz. has 5.0% of USRDA	Not Given	U.S.A.
Mueller's Egg Noodles Enriched	1 oz. has 5.0% of USRDA	Not Given	U.S.A.
Catelli Long Macaroni Not Enriched	Not Enriched		Canada

USRDA for Iron = 16.0 mg

Table 15: Foods Not Enriched with Iron but Iron is Added in Some Countries

Salt	
Mortons	U.S.A.
Al	England
White Rose	U.S.A.
Red Cross	U.S.A.
Hyde Park	U.S.A.
Saxa	England
Some have iodine and some have not	
Sugar	
White sugar	Canada
White sugar	England
Brown sugar	St. Kitts
Brown sugar	Dominican Republic

Table 16: Available Baby Cereal in Antigua and Their Iron Contents

Cereal	Added Iron		
	Type	Amount per 100g	Country of Origin
Cow and Gate Cereal	Iron Ammonium Citrate	14.0 mg	U.S.A.
Nestle Nestum Baby Cereal	Not Given	15.6 mg (25 mcg folate and 2 mcg B ₁₂)	Belgium
Farlene High Protein Baby Food	Reduced Iron	12.0 mg	England
Cow and Gate Instant Cereal Rice	Reduced Iron	25.0 mg	England
Gerber Baby Food (in jars)	No added Iron present	-	U.S.A.

Table 17: Infant Formulae and Milks Available in Antigua

Food	Amount of Iron, Folate & B ₁₂	Type of Iron	Cost	Country of Origin
Lactogen Nestle	per 100 g of food 5.1 mg Fe 20 mcg Folate 2 mcg B ₁₂	-	EC\$4.82 per 450 g	Belgium
Formula M Cow & Gate	per 100 g of Formula 5 mg Fe 5 mcg Folate 2 mcg B ₁₂	-	EC\$6.40 per 450 g	U.K.
Baby Milk plus Cow & Gate	per 100 g of Formula 5 mg Fe 28 mcg Folate 0.88 mcg B ₁₂	-	EC\$4.77 per 400 g	U.K.
SMA Food Formula for Infants	A normal dilution each litre has: 12.7 mg Fe 53 mcg Folate 1.1 mcg B ₁₂	FeSO ₄	EC\$6.99 per 450 g	U.S.A.
Prosobee	5 fluid ozs. have: 1.9 mg Iron 16 mcg Folate 0.31 mcg B ₁₂	FeSO ₄	EC\$6.59 per 400 g	U.S.A.
Enfamil with Iron	5 fluid ozs. have: 1.9 mg Iron 16 mcg Folate 0.31 mcg B ₁₂	-	EC\$4.25 per 13 fl. ozs.	U.S.A.
Olac Mead Johnson	1.5 mg Iron/litre 0.1 mg Folate/litre 2 mcg B ₁₂ /litre	-	EC\$6.63 per 450 g	Jamaica
Dutch Baby Powdered Whole Milk	No Iron added	-	EC\$3.53 per 450 g	Holland

Table 17: Infant Formulae and Milks Available in Antigua (cont'd)

Food	Amount of Iron, Folate & B ₁₂	Type of Iron	Cost	Country of Origin
Dutch Baby Instant Powdered Whole Milk	No Iron added	-	EC\$4.16 per 400 g	Holland
Skimmed Milk Powder	-	-	-	U.S.A.

Table 18: Vitamin and Mineral Preparations

1. Minadex Liquid per 5 ml

Vitamin A	650 I.U.
Vitamin D	65 I.U.
Iron Ammonium Citrate	150 mg
Glycerol PO ₄	22.5 mg
K Glycerol PO ₄	2.25 mg
Manganese SO ₄	0.5 mg
CuSO ₄	0.5 mg

Glaxo, England

2. Ferrous Sulphate Liquid per 5 ml

Ferrous sulphate	30 mg
Hypophosphoric acid	25 mg
Mixed in lemon or orange syrup in Antigua	

3. Ferrous Sulphate Tablets

Each tablet contains:	
Ferrous sulphate	200 mg

Imported from England

4. Slow Iron Folate

Each tablet contains:	
Dried FeSO ₄	160 mg
Folic acid	400 mcg

Imported from England

5. Folic Acid

Each tablet contains:	
Folic acid	5 mg

Imported from England

Figure 1. The Percent of Pregnant Females Below Certain Haemoglobin Levels, WHO Suggested Standards is 11.0 g/dl (1)

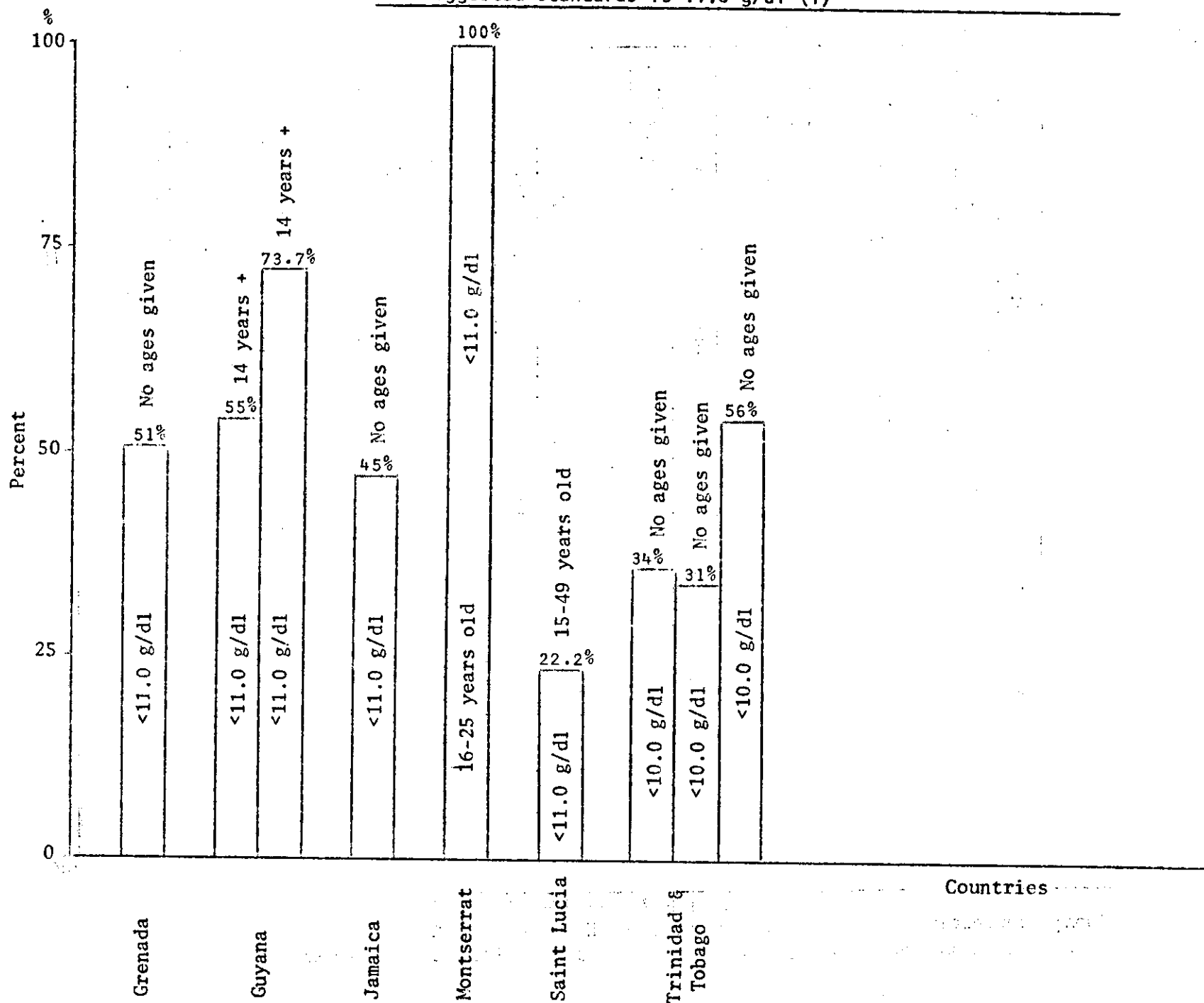
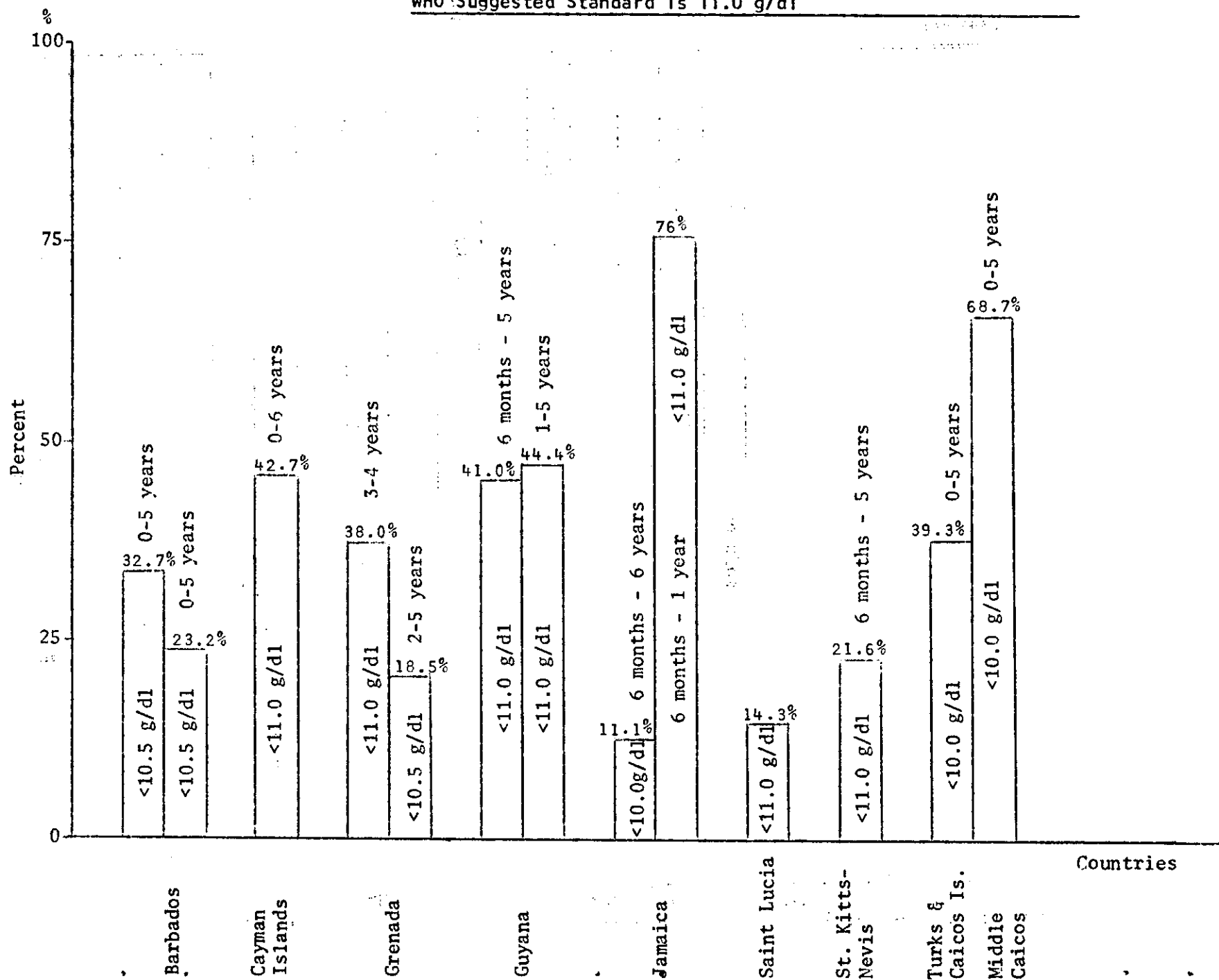


Figure 2. The Percent of Pre-school Age Children 6 Months to 6 Years Below Certain Haemoglobin Levels (Ages and References Given) WHO Suggested Standard is 11.0 g/dl



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