

**CRUZ ROJA GUATEMALTECA**  
**DELEGACION COBAN, A.V.**  
*Programma Desarrollo Humano*

## **STUDY of the INCIDENCE and TREATMENT of ANEMIA in UNMARRIED WOMEN AGED 12-21**

IN THE AREA OF SECOCPUR  
ALTA VERAPAZ, GUATEMALA.

June - August 2000

Sarah Lynne Welch, RN  
Volunteer  
**INTRODUCTION**

This is a report of a study of anemia which I conducted regarding the detection and treatment of anemia in unmarried women aged 12-21 within the 55 communities in Secocpur, Alta Verapaz, Guatemala during the time period of 19/06/00 through 25/08/00. This is the area northwest of Coban attended by the Desarrollo Humano team.

"Anemia is defined as having below normal values for the total volume of red blood cells, the number of normal red blood cells, or the amount of hemoglobin in these cells. Normal values are defined as those found in healthy populations. Anemia results from one or more of the following processes:

- Defective red cell production due to: lack of essential nutrients in the diet, poor bioavailability of iron, or increased utilization of nutrients such as during pregnancy, lactation, or rapid growth periods.

- Increased red cell destruction (hemolysis) due to parasitic diseases such as malaria or genetic conditions such as sickle cell anemia or thalassemia.
- Blood loss, resulting from intestinal worm infestation, notably hookworm, or heavy menstrual flow.

Anemia is most commonly detected by measuring hemoglobin (the oxygen-carrying component in red blood cells) or by determining the hematocrit (the volume of red blood cells expressed as a percentage of the total blood volume)." 1 For this investigation I measured hemoglobin using a Hemocue portable machine specifically designed to measure hemoglobin (particularly in field conditions). This machine was donated for the purpose of completing this project by the staff of the Kingston Hospital, Kingston, New York.

During the last 40 years research has clearly documented the overwhelming occurrence of anemia in developing countries particularly in the female population. In fact, studies have previously been done here in Guatemala measuring rates of anemia. Two Cuban doctors working with the Red Cross Coban Delegation performed a study of anemia in October-December 1999. In this study Dr. Eugenio Hernandez Dias and Dr. Jose Saes Soler used a sample of 200 people from the area of Secocpur (the rural area surrounding Coban) both men and women and people from all age groups. In this study in which they examined for presence and type of anemia through venous blood sampling (examined in the laboratory of the Coban School of Nursing). They found 41.2% incidence of anemia in males and 42.6% incidence of anemia in females. Of these findings 48.9% of anemia was Ferriprevia anemia (iron deficient) and 36.2% being classified as Megoblastic anemia (Vitamin B-12 and Folic Acid deficiency anemia). From this sample we note incidence of 42.6% anemia in the female population of the area of Secocpur. This is concurrent with all of the professional and scientific studies I have read regarding incidence of anemia in third world countries. (See Bibliography) It has been stated in all of these documents that as many as 50% of pregnant women suffer from anemia in developing countries. (Pregnant women with adequate nutrition in industrialized countries also suffer from anemia due to the increased blood capacity created by the necessity of the body need to nourish the developing fetus.) These documents also state that all women of child bearing age and young children in developing countries also suffer from anemia at a rate of 30-45%.

The intent of this study was to demonstrate the results of different treatments of anemia using 4 treatment methods in the group of women aged 12-21 years of age who were not pregnant. I chose to use non pregnant subjects because half of the women would be treated with Albendazol which is not suitable for pregnant women. For this study I wanted to measure the level of anemia in a specific target group of the population who are most important in the chain of poor nutrition and lack of education regarding nutrition as they are future mothers. Education is certainly at the heart of this issue as I discovered throughout my 7 months volunteering with the Red Cross Delegation Coban and especially during this project. Education programs, cultivation programs and economic growth programs are desperately

needed to help these communities to learn to help themselves, but these all take a significant amount of time. The Guatemalan Red Cross hopes to improve the nutritional status of the indigenous population and especially focusing on women of child bearing age as evidenced by this study.

Indigenous women of child bearing age are in desperate need of preventive services and they receive virtually none. These women will be the future mothers of the next generation of Guatemalans and there is great need for nutritional teaching to begin to change the vicious cycle of mal-nutrition and its numerous effects. It is important to begin to provide them with education regarding the importance of iron and nutritional health before they begin having children. " The important role women play in improving families' micronutrient status has been well-recognized. As child bearers, child caretakers, food producers, food preparers, and income earners, women are at the crux of the cycle of micronutrient malnutrition and critical to the success of most micronutrient interventions. " 2

There are many factors that contribute to anemia in developing nations including mal-nutrition, poor nutrition because of lack of education and resources, micronutrient mal-nutrition, diseases including malaria and certain types of intestinal worms.

Anemia causes general malaise, exhaustion, decreased work capacity, decreased mental capacity to varying degrees in its mild and moderate states and if severe can cause severe, incapacitating physiological problems and even death. In growing fetuses and young children in severe cases anemia can cause mental retardation. This is indeed a huge problem that is well documented the world over. In order to combat anemia there are numerous factors involved, the most basic of which are education and improved nutrition. These are no easy challenges to overcome, especially with limited resources and staff and trying to implement changes in a different culture and language in a short period of time.

I was asked by the president of the Cruz Roja Coban Delegation, Dr. Holguer Coronado and the Team Coordinator of Desarrollo Humano, Senora Iraida Winter to develop a project to determine and/or treat anemia in the population of Secocpur. The Secocpur region is a rural area surrounding Coban, and is inhabited by an indigenous group of Guatemalans who speak Quec'chi. These people have limited access to potable water (often having to walk for miles for the nearest source of water), food, work. The types of crops grown there are: cardamom, pineapple, banana, frijoles and maize. The nutritional staples of these people are maize and frijoles with some chile and extremely limited access to fruits, vegetables, and meats. There is a lack of education regarding the necessity of these important nutritious foods in the diet.

## **OBJECTIVE**

### **General Objectives:**

- Study Population: non-pregnant women of child bearing age (12-21, non-married).
- Realize the level of anemia in this specific population.
- Demonstrate the effectiveness of three different treatments for anemia.

### **Specific Objectives:**

- To treat those women who test positive for anemia on a finger stick sample of blood hemoglobin (Sample A) using the Hemocue portable blood hemoglobin machine.
- Provide treatment randomly to those women who test positive for anemia as indicated by hemoglobin value (Sample A).
- Provide second blood test (Sample B) to determine hemoglobin values after 6 - 8 weeks of treatment (depending on date of initial blood sampling; Sample A).
- Provide education and information regarding anemia and nutritional practices to help combat anemia.

## **MATERIAL**

Transport  
Hemocue Machine

Cuvettes  
Lancets  
Alcohol  
Cotton  
Paper Towels  
Pens  
Latex Gloves  
Notebook  
Prenatal vitamins  
Albendazole

## **METHOD**

At each center of convergencia I measured blood hemoglobin (using the Hemocue portable machine). Samples were taken from a total of 294 unmarried women without children aged 12-21 years during a period of four weeks (19/6/00 - 13/7/00) of these 91 or 30.9% were anemic. This group of 91 women is called Sample A. The original plan was to take blood samples during a two week period but due to a lack of participants I extended blood sampling for two additional weeks.

Notices were sent in advance to all of the facilitadores at the centros de convergencia by members of the team as well as by the community midwives (comadronas) to inform the population of women aged 12-21 years to visit the centros de convergencia to participate in the investigation. In addition I spoke with many comadrones and facilitadores explaining the project during several weeks prior to the commencement of the investigation. I worked with the Desarrollo Humano team of Cruz Roja Guatemalteca Delegacion Coban and I travelled with the team to each Centro de Convergencia to obtain my blood samples.

Each woman was placed in a treatment group (Groups 1,2,3 or 4) in this order as anemia was detected. Each woman then received her treatment in groups 2-4 or recieved nothing in group 1 the control group.

There were 4 groups as indicated below:

- 1) Control Group
- 2) Prenatal vitamins (60 day supply)
- 3) Albendazole 400mg every other day X 3 days
- 4) Prenatal vitamins daily and Albendazole (as above)

Sample A provided information regarding the level and severity of anemia in this population.

A second finger stick hemoglobin exam (Sample B) was measured during a 2 week period (14/8/00 - 24/8/00) at the end of the course of treatment (6-8 weeks in duration depending on the date of initial blood sampling). Basic nutritional teaching including a cooking demonstration was also provided on this final day followed by a question and answer session for the women.. Unfortunately the opportunity to provide nutritional teaching was very limited due to the lack of a linguistic translator (Quec'chi) throughout the project. However, a translator was available during the final two weeks of the study.

## **ANALYSIS**

Sample A hemoglobin values demonstrate the incidence of anemia in the population of women 12-21 years old. The results of the Sample A hemoglobin values measured in 294 women proved a 30.9% anemia rate with 90% falling in the mild range of anemia with hemoglobin between 9.0 - 12.0 g/dl and 10% falling in the moderate range of anemia with hemoglobin

between 7.0 - 9.0 g/dl.

There was no statistical pattern as to age, community or severity of anemia evident in this sample.

On the day of initial blood sampling each woman was placed in a treatment group (Groups 1,2,3 or 4) in this order as anemia was detected. Each woman then received her treatment in groups 2-4 or received nothing in group 1 the control group. All of the women were also asked to return to their center of convergencia on a specific date for the second blood sampling, Sample B.

Sample B blood hemoglobin values were measured 6-8 weeks after the initial Sample A was measured (depending on the date of initial sampling which occurred during a 4 week period instead of the projected 2 weeks, extended due to a lack of participants).

The results of the Sample B hemoglobin values provided a second set of values to compare against the Sample A values.

These are the findings:

#### Group 1 (Control Group)

This group received no treatment during the initial phase of the study but instead served as a control group to demonstrate the incidence of change between hemoglobin values of Sample A and Sample B without any form of treatment. The participants in this group were instructed to return for follow-up blood sampling and on this date receive prenatal vitamins. After Sample B was measured these women were given a 70 day supply of prenatal vitamins.

22 women were included in Group 1, Sample A. 14 of 22 returned for the second exam, Sample B. There was a 7.706% increase in hemoglobin values between Sample A and Sample B results. Refer to Appendices 1a-1c.

#### Group 2 (Prenatal Vitamins)

This group received a 60 day supply of prenatal vitamins (including iron and folic acid). The participants in this group were instructed to take one vitamin daily and return for follow-up blood sampling. After sample B was measured these women were given an additional 30 day supply of prenatal vitamins.

23 women were included in Group 2 Sample A. 19 of 23 returned for the second exam, Sample B. There was a 25.013% increase in hemoglobin values between Sample A and Sample B results. Refer to Appendices 2a-2c.

#### Group 3 (Albendazol)

This group received Albendazol. Each participant in this group was instructed to take Albendazol 400 mg. every other day X 3 days and to return for follow-up blood sampling and then receive prenatal vitamins. After Sample B was measured these women received a 70 day supply of prenatal vitamins.

23 women were included in Group 3 Sample A. 20 of 23 returned for the second exam, Sample B. There was a 23.288% increase in hemoglobin values between Sample A and Sample B results. Refer to Appendices 3a-3c.

#### Group 4 (Prenatal vitamins and Albendazol)

This group received a 60 day supply of prenatal vitamins and Albendazol. Each participant in this

group was instructed to take Albendazol 400 mg. every other day X 3 days and one vitamin daily, and to return for follow-up blood sampling and receive additional prenatal vitamins. After Sample B was measured these women received an additional 30 day supply of pre-natal vitamins.

23 women were included in Group 4 Sample A. 17 of 23 returned for the second exam, Sample B. There was a 27.104% increase in hemoglobin values between Sample A and Sample B results. Refer to Appendices 4a-4c.

## **DISCUSSION**

The data shows a 30.9% anemia rate in this population based on a sample of 294 women aged 12 - 21 years. The results of the treatment trials prove a combination of prenatal vitamins including iron and folic acid with albendazol 400 mg. every other day X3 days is the most effective treatment.

What is most significant to me after working with this population in various healthcare projects in the area of Secocpur during the last seven month period was the interest expressed by each community. At the end of the investigation a great deal of interest was expressed by not only the women but by the men, comadronas and facilitadores to continue to offer nutritional teaching, provide more anemia testing for all community members, particularly pregnant women and mature women with many children, to children and also to men. I was also asked about provision of nutritional courses regarding nutrition of infants and children especially as the diet changes from breast milk to solid foods. The people were very interested to know about additional vitamin supplementation particularly for pregnant women (supplies of iron and folic acid in the centros de convergencia were not sufficient to meet the demands of the people).

The people in these communities showed overwhelming interest in learning how to improve their health and responded very positively to participatory instruction. The women responded positively and abundantly to the question and answer session at the end of the nutritional teaching program. They were also open to the cooking demonstration and were interested in learning new ideas about food preparation.

Problems regarding the lack of availability of a variety of food items due to lack of cultivation of a variety of fruits and vegetables was also mentioned in 3 of the 7 communities.

## **CONCLUSIONS**

As evidenced by these results participants in Group 4 fared the best with an increase in hemoglobin value of 27.104% using a combination of daily prenatal vitamins and albendazol 400 mg. every other day X 3 days as treatment.

Group 2 followed closely behind with a 25.013% increase in hemoglobin values after treatment with daily prenatal vitamins.

The results of group 3 proved very interesting to this author with a 23.288% increase in hemoglobin value after treatment with Albendazol 400 mg. every other day X 3 days.

The increase in hemoglobin values between Sample A and Sample B of 7.706% in Group 1 is also interesting. This increase could be due to any number of factors including dietary changes due to consumption of different foods as different fruits, vegetables and herbs come in and out of season; menstruation; accuracy of the Hemocue machine which has an 85% sensitivity rating in field settings (100% sensitivity rating in laboratory settings).

## **RECOMMENDATIONS**

Provide more nutritional and healthcare programs for women of childbearing age in a same sex, non-threatening environment. There seems to be a lack of general knowledge in this specific group regarding health in general.

Provide more nutritional education programs that address questions and concerns of the communities and which are interactive. The comadronas and many mature women seem to be a particularly interested group within the communities.

Develop a cultivation program with the communities to teach the people how to cultivate more nutritious fruits and vegetables utilizing the resources at hand, including local Guatemalan university agricultural programs. This program should include foods which include iron and those which are high in vitamin C (which aids in the absorption of iron in the body). The communities could then learn how to produce these foods independently, learn to maintain sustainable resources and include these in their diets so that they can help themselves. Some examples are: dark green leafy vegetables like spinach, cabbage, potatoes, carrots, tomatoes, lemons, oranges and local "hierbas" including chipilin and macuy.

Develop a program to help the communities raise chickens using enclosed chicken houses to ensure longer life span and healthier fowl, which will in turn produce more eggs and poultry to be consumed by the community to increase the protein and iron intake in the diet and help the people to help themselves by maintaining sustainable resources.

Develop a program regarding family planning and general sexual education in non-threatening same sex groups. Both men and women in the communities expressed interest in learning more about sexual education and especially about the spacing of children and choosing to have fewer children.

These people seem hungry for knowledge and eager to learn but I have learned during my seven months here these are a modest and private people and an environment for learning must be cultivated over time and with sensitivity. It is important to work within their community and plan with the facilitators and comadronas and the community leaders to ensure success in any program. It is crucial to follow through.

### **Problems Encountered During Investigation** **Proving Detrimental to the Investigation**

In my 7 months working with the Coban delegation of the Red Cross I discovered the difficulty of logistics in working with this population including: language barrier (lack of appropriate staff to act as translator for me), lack of understanding, lack of organized communication system, the fact that some communities had to walk for miles to reach the health clinics (especially during the rainy season), compliance to medication/supplementation regimen, etc.,.

It must be stated here that possibly 50% of the women in this age category were ineligible to participate because they were married or pregnant due to the use of albendazole as a treatment method in this study. Albendazole has teratogenic side effects and so it was not possible to include any woman who was pregnant or had the likelihood to become pregnant in this study. There is also the fact that many women were unwilling to participate as fear persists regarding the taking of blood or enduring the pain of a finger stick to obtain it or general mistrust of persons outside of the community. Some women were unable to participate due to distance of the center of convergencia, inclement weather, or because of school, family commitments or any number of other possibilities.

There was also difficulty for this evaluator due to the lack of a translator throughout the investigation which proved to be a very difficult obstacle in the communication process.

Coordination between Cruz Roja and the Secocpur community proved to be an ongoing and significant problem as well including a frequent lack of communication between the Red Cross offices and the communities. There were continuing problems within the Desarrollo Humano Program coordination including frequent last minute changes in planning, staffing, decisions regarding funding, transportation, work plans, inavailability of equipment, etc.

### **FOOTNOTES**

- 1) Anemia Detection Methods in Low-Resource Settings; A Manual for Health Care Workers, U.S. Agency for International Development, December 1997, page 1.
- 2) OMNI Update Julio 1997 - "Focusing on Women in Micronutrient Programs", Pagina 1, Internet: Mostupd.Jul97.htm.

### **BIBLIOGRAPHY**

Anemia Detection Methods in Low-Resource Settings: A Manual for Health Care Workers, U.S. Agency for International Development, December 1997

Ary D, Jacobs LC, et al. Introduction to Research in Education, 5th ed. Fort Worth: Harcourt Brace College Publishers, 1996.

Kutty K, Sebastian JL, et al. (eds). Kochar's Concise Textbook of Medicine, 3rd ed. Baltimore: Williams and Williams, 1998.

Werner D, Thuman C, et al. Where There Is No Doctor, new revised edition. Berkeley: The Hesperian Foundation, 1999.

Aguilar CM, Desnutricion Materna En El Embarazo y sus Consecuencias. Vida Medica Internacional, 1996; año 1 No. 8: 24.

Buzina-Suboticanec K, Buzina R, et al. Effects of Iron Supplementation on Iron Nutrition Status and Cognitive Functions in Children. Food and Nutrition Bulletin, 1998;vol 19, no.4: 298-306.

DeMaeyer EM et al. Preventing and Controlling Iron Deficiency Anaemia Through Primary Health Care: A Guide for Health Administrators and Programme Managers. Geneva, World Health Organization, 1989.



Hadary Cohen J, Haas JD. Hemoglobin Correction Factors for Estimating the Prevalence of Iron Deficiency Anemia in Pregnant Women Residing at High Altitudes in Bolivia. Pan American Journal of Public Health. 1999; 6(6): 392-399

Holst MC. Nutrition and the Life Cycle: Developmental and Behavioral Effects of Iron Deficiency Anemia in Infants (Based on the 1997 Avanelle Kirksey Lecture Presented by Betsy Lozoff at Purdue University). Nutrition Today. 1998; 33 no.1: 27-36.

Hurtado, Hartl Claussen A, et al. Early Childhood Anemia and Mild or Moderate Mental Retardation. American Journal of Clinical Nutrition. 1999: 69: 115-119

Roncagliolo M, Garrido M, et al. Evidence of Altered Central Nervous System Development in Infants with Iron Deficiency Anemia at 6 Months: Delayed Maturation of Auditory Brainstem Responses. American Journal of Clinical Nutrition. 1998: 68:683-690.

Scrimshaw NS, Malnutrition, Brain Development, Learning and Behavior. Nutrition Research. 1998: 18 No. 2; 351-379.

Walter T. Impact of Iron Deficiency on Cognition in Infancy and Childhood. European Journal of Clinical Nutrition. 1993; 47; 307-316.

Guidelines for the Control of Maternal Nutritional Anemia: A Report of the International Nutritional Anemia Consultative Group (INACG). (I have no more available information on this article. It was copied at the library of INCAP in Guatemala City, Guatemala.)

Recommendations to Prevent and Control Iron Deficiency in the United States. Women's Health Information Center. The Journal of the American Medical Association. <http://www.ama-assn.org/special/womh/newsline/special/rr4703a-c.htm>

Major Issues in the Control of Iron Deficiency: Summary and Conclusion. <http://www.micronutrient.org/publications/sumiron.htm>

### **BIBLIOGRAPHY (cont'd)**

Alnwick D, Brown K, et al. Improving Child Health Through Nutrition: The Nutrition Minimum Package. Minimum Package. BASICS, for USAID. 1997

The following 10 articles may be found at the OMNI/MOST Project website: [www.mostproject.com](http://www.mostproject.com) (publications):

OMNI Update: Workshop Addresses Iron Interventions for Child Survival. June/July, 1995. MostJunJul95.htm.

OMNI Update: OMNI Research: Converting Theory Into Practice. October/November, 1995. MostOctNov95.htm

OMNI Micronutrient Fact Sheet: Guatemala. MostGuatm.htm.

OMNI Update: Quality Assurance: A Key to Fortification Efforts. November, 1996. MostUpdNov96.htm.

Micronutrient Malnutrition. MostTechfact1.htm.

OMNI Update: Moving Toward Consensus and Action on Anemia in Young Children. July, 1997.

MostUpdJul97.htm.

Allen LH, Namanjeet A. Improving Iron Status Through Diet - The Application of Knowledge Concerning Dietary Iron Bioavailability in Human Populations. June 1997. MostIron1.htm.

OMNI Update: Focusing on Women in Micronutrient Programs. July, 1997. MostUpdJul97.htm.

OMNI Update: Assessing the Problem: National Micronutrient Surveys. March 1998. MostUpdMar98.htm.

Draper A. Child Development and Iron Deficiency (Report of presentation at University of Oxford, September 16-17, 1996). OMNI Project for USAID, May 1997.

OMNI Update July 1997 - "Focusing on Women in Micronutrient Programs", Internet: Mostupd.Jul97.htm.

### **THANKS**

There are many people who contributed time, material and a great deal of personal and professional support to me. Without them I would not have been able to realize this investigation and its completion.

The Desarrollo Humano Team and everyone at Cruz Roja Guatemalteca, Delegacion Coban thank you to all for your help and cooperation.

To Esther Barend, Holland Delegate for the Red Cross, for professional and personal support.

The staff of The Kingston Hospital for the donation of the Hemocue machine and its related equipment.

Lisa and Matthew Oldham, for your support, time, efforts, contacts, everything!

Thanks to all of the volunteers, especially to: Maartje Zuuring, and Sofie Ova for their monetary contributions which funded the nutritional education and cooking classes provided at each centro de convergencia, and to Nicole Messer for professional advice regarding statistics and development of the investigation.

Thanks to Leon Prop, for your support.

Thank you to Omar Dary, Ph.D. and Ricardo Bressani, Ph.D. of INCAP for your time and advice during the initial stages of this project.