

# Association between anemia and intestinal parasitism among pregnant women (ages 15-44 years-old) attending antenatal clinic in a tertiary hospital\*

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## ABSTRACT

**Background:** Intestinal parasitic infections is one of the leading public health problem encountered more especially of the developing countries. Parasitic infections affect millions of pregnant women worldwide, and may directly or indirectly lead to a spectrum of adverse maternal and fetal effects, one of which is anemia that may result to detrimental fetal and maternal outcomes.

**Objective:** The objective of this study is to determine the prevalence of intestinal parasitism and anemia among pregnant women ages 15-44 years old consulting for antenatal check-up in a tertiary hospital.

**Materials and Methods:** Study population was based on inclusion criteria and was significance was statistically determined using odds ratio statistical analysis using SPSS software.

**Results:** The results of this study showed evidences of an alarming association between prevalence of soil-helminthiasis and anemia among Filipino pregnant women. These diseases have been a major global public health concern and up to date have been very difficult to address despite the efforts done by the local and international health organizations. Although this study is limited only in gathering sufficient data on the prevalence of anemia and intestinal parasitism, this may have provided future researches on possible benefits of deworming among pregnant women.

**Conclusion:** Health education and promotion truly have great impact in reducing the prevalence of the burden of these diseases. Therefore, antenatal care should be further emphasized in improving the maternal health in the country.

*Keywords: anemia, intestinal parasitism*

## INTRODUCTION

Intestinal parasitic infections are endemic worldwide and have been described as one of the greatest single worldwide cause of illness and disease. It is one of the leading public health problem encountered more especially of the developing countries. Parasitic infections affect millions of pregnant women worldwide, and directly or indirectly lead to a spectrum of adverse maternal and fetal effects, one of which is anemia that may result to low pregnancy weight gain and intrauterine growth retardation (IUGR), followed by low birth weight, with associated greater risks of infection and higher perinatal mortality rates (Rodriguez-Morales et al., 2006).

Intestinal worm infections are common worldwide, but thrive in developing countries, where poor water supply and poor sanitation are common. The burden of infection is estimated to exceed 100 million infected persons each year for roundworm (*Ascarislumbricoides*), hookworm (*Ancylostomaduodenale* and *Necatoramericanus*) and whipworm (*Trichuristrichiura*) (Crompton, 2000).

Infection by intestinal helminths rarely cause death, the burden of the disease, however, lies on the chronic effects of the infection on the health and nutritional status of the host. Intestinal helminths are among the most common and widespread of human infections contributing to poor nutritional status and anemia. Intestinal parasites like hookworms, which are prevalent in tropical and subtropical regions are a significant cause of the high prevalence of anemia in many countries (Smith and Brooker, 2010). Hookworm and other soil-transmitted helminths contribute significantly to the chronic loss of blood and iron in the tropics (Brooker et al., 2008). Hookworm infection has been singularly named as a strong predictor of iron deficiency and anaemia in many populations. Intestinal parasitoses could be associated with conditions for development of anemia at pregnancy. A study conducted by Bondevik and colleagues in 2000 correlated hookworm infection with women receiving antenatal care in a hospital in Nepal.

To our knowledge, conduct of local studies on the burden of intestinal parasitism among pregnant women are yet to ensue. In this study, we aim to gather data on the prevalence of intestinal parasitoses and anemia among pregnant women having antenatal check-up in

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Ospital ng Maynila Medical Center. Further, this study aims to determine the association between the presence of intestinal parasitism and the development of anemia among pregnant women ages 15-44 years old.

## REVIEW OF RELATED LITERATURE

### Intestinal parasitism among pregnant women

Intestinal parasitism remains a global health burden in numerous developing countries mainly due to fecal contamination of water and food, sympathetic climatic, and environmental and socio-cultural factors enhancing parasitic transmissions. Among the most common parasitic infestations in pregnancy are malaria, hookworm, amoebiasis and tapeworm (Yakasai and Umar, 2013). Infection by a parasite may initially be asymptomatic and may go unnoticed. However, rapid multiplication and spread to major organs can cause very serious and life-threatening conditions.

Intestinal parasitism among pregnant women is not uncommon, especially in developing countries. Environmental, nutritional, and immunologic factors influence the clinical manifestations and determine the need for treatment of intestinal parasitism during pregnancy. In a study by D'Alauro et al., 147 pregnant refugees living and delivering in a refugee camp in Thailand were determined to have parasitic infestation. No serious medical or obstetric problems attributable to intestinal parasites developed among these women. These patients received adequate nutrition, careful prenatal monitoring, and no antiparasitic drug therapy. It was recommended that chemotherapy for intestinal parasites should not be used unless required for appropriate clinical and public health reasons during pregnancy.

In another study by Yakasai and Umar, it was determined that pregnancy can be disrupted at the maternal, fetal and placental levels by parasitic infestations. Women who are infected with one parasite are usually infected with a second and sometimes a third parasite. Almost every parasite either directly or indirectly causes anaemia and malnutrition. Both anaemia and malnutrition are associated with an increased incidence of adverse pregnancy outcomes.

Infection occurring during the first trimester is associated with more severe fetal and placental consequences than those occurring later in pregnancy. Maternal infection is often more severe in the primigravida, and tends to result in a higher degree of parasitemia. Incidentally, the natural immune response to pregnancy causes women to be more susceptible to parasitic infections when pregnant than in the non-pregnant state (Muhangi et al., 2007).

Hookworm adheres to the intestinal mucosa and extracts blood and nutrients, leading to anemia and malnutrition which can lead to fetal growth restriction and low birth weight infants. Infections with *Ascaris lumbricoides* are initially asymptomatic. However, as the worm burden increases, abdominal pain, pulmonary symptoms, and anaemia may become more severe. The acute phase of the infection is characterized by fever, cough, and pulmonary congestion (Loeffler's phenomenon). Heavy worm burden has been shown to cause pancreatitis, biliary obstruction, and intestinal obstruction not only in non-pregnant women but also in gravid women as well, with biliary obstruction being the most common complication (Zapardiel et al., 2010). Elevated progesterone levels in pregnant women is thought to increase the risk of biliary ascariasis because progesterone alters/relaxes the motility of the sphincter of Oddi. Biliary infection is also most commonly seen in the third trimester, as levels of progesterone rise during this time. *Ascaris'* coagulopathic properties may play a role in post-partum haemorrhage.

Acute infection with *Schistosoma* is usually subclinical, causing mild anemia. However, chronic infection can lead to granuloma formation and a fibrotic tissue response. Granulomas may lead to portal hypertension, pulmonary hypertension, and cystitis, and even bladder cancer. Tubal granulomas affect tubal motility and patency, and are associated with infertility and ectopic pregnancy (Friedman et al., 2007). *Schistosoma* can infect the placenta and the fetus and may lead to IUGR, LBW, preterm labour and still birth.

In spite of the risks associated with parasitic infections, pregnant women are often excluded from deworming programs due to the lack of consensus concerning the risks and benefits of treating helminth infections in pregnancy. The benefits of treating pregnant women include reduced maternal anaemia and improved infant birth weight and survival (Omorodion et al., 2012). The proven benefits of antenatal deworming in the absence of any evidence indicative of drug teratogenicity or embryotoxicity in humans provides compelling evidence to support the treatment with albendazole or mebendazole of women for STH after the first trimester of pregnancy. Evidence also shows that women can be treated with praziquantel at any stage of pregnancy and during lactation (Allen et al., 2002).

### Anemia among pregnant women

Anemia is one of the most common nutritional problems in the world. The World Health Organization (WHO) estimates that some two billion people are anemic. Its prevalence globally affects about 56 million pregnant women. In Asia alone, about 32 million (42%) of pregnant

women have anemia (WHO, 2005).

Anemia contributes to 40 percent of maternal deaths in third world countries. In the Philippines, estimates of anemia prevalence among pregnant women showed 43.9% which was considered a severe public health problem (FNRI, 2003).

Anemia is the result of a wide variety of causes that can be isolated, but more often coexist. The main causes of anemia include iron deficiency; infectious diseases such as malaria, hookworm infections and schistosomiasis; deficiencies of other key micronutrients including folate, vitamin B12 and vitamin A; or inherited conditions that affect red blood cells such as thalassemia (WHO and CDC, 2007).

Anemia is an indicator of both poor nutrition and poor health. Most dramatic health effects of anemia, like increased risk of maternal and child mortality due to severe anemia, have been well documented (Bothwell, 1981.; Scholl and Hediger, 1994)

When hemoglobin levels are less than 10g/dL, this is considered a hematological abnormality in pregnancy. CDC defined anemia as less than 11 g/dL in the first and third trimesters, and less than 10.5 g/dL in the second trimester.

Anemia diagnosed early in pregnancy is associated with increased risks of low birth weight and preterm delivery. Maternal iron-deficiency anemia, diagnosed at entry to prenatal care, was associated with low dietary energy and iron, inadequate gestational gain, and two-fold or greater increases in the risks of preterm delivery and low birth weight (Rodriguez-Morales et al., 2006)

## **OBJECTIVES OF THE STUDY**

### **General objectives:**

- To determine the prevalence of intestinal parasitism and anemia among pregnant women ages 15-44 years-old consulting for antenatal check-up in a tertiary hospital

### **Specific Objectives:**

1. To describe the socio-demographic characteristics of the pregnant women ages 15-44 years-old attending antenatal check-up in a tertiary hospital
2. To determine the prevalence of intestinal parasitism among pregnant women ages 15-44 years-old attending antenatal check-up in a tertiary hospital
3. To determine the prevalence of anemia among pregnant women ages 15-44 years-old attending antenatal check-up in a tertiary hospital
4. To determine the association between intestinal parasitism and anemia among pregnant women ages 15-44 years-old attending antenatal check-up in a tertiary hospital

## **MATERIALS AND METHODS**

The study was carried in the Department of Obstetrics and Gynecology - OPD in Ospital ng Maynila Medical Center (OMMC) from June-December 2014. Blood and stool samples were extracted from pregnant women having their antenatal check-up regardless of their trimester in OPD of OMMC by medical clerks and/or interns rotating in the the department of OB-Gyn. Prior to the collection of samples, informed consents were given by individual participants after explaining the objectives, possible outcome and benefits of the research. The participation in the study was pure voluntary and the identity of the participants was maintained in full confidentiality. Socio-demographic characteristics such as age, OB index (Gravidity and Parity), number of sexual partner/s, educational attainment and intake of iron supplements were obtained from the OPD charts.

### **Study population**

The participants in this study were selected through the following inclusion criteria: all pregnant women aged 15-44 years-old, consulting for their 1st prenatal check-up and may or may not consulting due to GI symptoms or anemia. Exclusion criteria include those patients who were diagnosed with confirmed cases of chronic disorders such as cancer, lymphoma, leukemia, PTB, below normal BMI, and those patients who did not consent.

### **Prevalence of Anemia**

Blood samples were collected from pregnant women of age group 15-44 years-old by venepuncture on their first antenatal visit. The samples were processed and examined for complete blood count at the Laboratory Department of OMMC. Women with hemoglobin levels of <10 mg/dL were considered anemic.

### **Prevalence of Intestinal Parasitism**

Fecal samples were collected from pregnant women of age group 15-44 years-old, having their antenatal check-up in OMMC. After stool collection, the samples were processed and examined for gastrointestinal parasites using Kato-Katz techniques at Laboratory Department of OMMC. The presence of any ova in the stool will be considered positive for intestinal parasitism. Those who tested positive were referred for treatment.

### **Statistical processing and analysis**

Data gathered were processed in the microsoft excel software. Completeness of data were checked. Afterwards, the data obtained from this study were subjected to odds ratio analysis using SPSS statistical software. The difference was considered statistically significant when  $P < 0.05$ .

## RESULTS AND DISCUSSION

There was a total of 249 pregnant women ages 15-44 years-old attending their first prenatal visit in the OPD of OB-GYN department of OMMC. Among these patients, majority belong to the 21-25 age group which is about 37% of the total study population (Table 1). Further, 45% of those consults were Gravida 1 and 45% were Parity 0 (Table 2). About 60% of the patients said they only have 1 sexual partner, which they confessed as the father of their child (Table 3). The educational attainment revealed that 25% of the patients have college degree (Table 4). Since this is their first prenatal check-up, 75% of which were on their 1st trimester (Table 5) and around 68% of the patients did not have history of iron supplement intake yet (Table 6).

The 249 patients consented to have their blood and stool be examined. Among the participants, 48 participants or 19% had positive Kato-katz. These patients may or may be asymptomatic when they presented at the OPD. About 78% of the patients who tested positive in the Kato-Katz technique had ascaris ova in their stool, and the remaining 10% were shared by the presence of hookworm and trichuris (Table 7). These parasites are

**Table 1.** Percent distribution of patients according to age group

Age Group	Number	Percentage
15-20	56	22.49%
21-25	89	36.74%
26-30	47	18.88%
31-35	26	10.44%
36-40	18	7.23%
41-44	13	5.22%
TOTAL	249	100.00%

**Table 2.** Percent distribution of patients according to gravidity and parity

Gravidity	Number	Percentage
G1	112	44.98%
G2	36	14.46%
G3	43	17.26%
G4 and above	58	23.29%
TOTAL	249	100.00%
Parity		
Para 0	114	45.78%
Para 1	53	21.29%
Para 2	26	10.44%
Para 3	42	16.87%
Para 4 and above	14	5.62%
TOTAL	249	100.00%

**Table 3.** Percent distribution of patients according to number of sexual partners

Number of Sexual Partner/s	Number	Percentage
1	149	59.84%
2	53	21.29%
>3	47	18.88%
TOTAL	249	100.00%

**Table 4.** Percent distribution of patients according to educational attainment

Educational Attainment	Number	Percentage
Elementary level	14	5.62%
Elementary Graduate	19	7.63%
High School level	41	16.47%
High School Graduate	57	22.89%
College level	62	24.90%
College Graduate	45	18.07%
Vocational	10	4.01%
None	1	0.40%
TOTAL	249	100.00%

**Table 5.** Percent distribution of patients according to intake of iron supplements

Intake of Iron Supplements	Number	Percentage
Yes	78	31.33%
No	171	68.67%
TOTAL	249	100.00%

**Table 6.** Percent distribution of patients according to trimester

Trimester	Number	Percentage
1 <sup>st</sup>	186	74.70%
2 <sup>nd</sup>	47	18.88%
3 <sup>rd</sup>	16	6.43%
TOTAL	249	100.00%

**Table 7.** Percent distribution of types of ova present in the patient

Intestinal Parasitism	Number	Percentage
Ascarislumbricoides ova	38	78.33%
Hookworm ova	5	10.83%
Trichuristrichiura ova	5	10.83%
TOTAL	48	100.00%

the most common soil-helminths associated to cause intestinal parasitism among humans. According to the World Health Organization in 2010, the main species that infect people are the roundworm (*Ascarislumbricoides*), the whipworm (*Trichuristrichiura*) and the hookworms (*Necatoramericanus* and *Ancylostomaduodenale*) and most commonly found in areas with poor hygiene practices. The results of this study are comparable to the study done in Venezuela by Rodriguez et al in 2006 where During 19 months, 1038 pregnant women revealed intestinal parasitosis of 73.9%: A lumbricoides 57.0%, T trichiura 36.0%, G lamblia 14.1%, E hystolitica 12.0%, N americanus 8.1%, E vermicularis 6.3%, Sstercoralis 3.3%.

Below is the percent distribution of hemoglobin levels according to the trimester of the patients (Table 8). It is normal that pregnant women may have mild anemia due to the fact that their body produces more blood to support the developing fetus inside their womb. However, hemoglobin that is very low may already bring about

deleterious effects for the mother and her baby as well. In this study, about 31% of the 1<sup>st</sup> trimester patients have hemoglobin level below 10mg/dl. Among 2<sup>nd</sup> trimester patients, there were 32% below 10mg/dl hemoglobin level and 94% those who were in 3<sup>rd</sup> trimester. Of the total 249 patients, 35% have hemoglobin level of below 10mg/dl, 34% for 10-14mg/dl and 30% for 15mg/dl and above. This may be attributed to the health education received by the patients from their parents, relatives and/or friends who have been pregnant before.

This study embarked in the determination of association between anemia and the presence of intestinal parasitism. Using the odds ratio, it was found out that the odds of having anemia is 11 times more likely when exposed to intestinal parasitism which is very statistically significant for a p-value of <0.00001. Although there are lots of factors that may have contributed to having anemia of the pregnant patients, it is still believed that intestinal parasitism may have a major impact to develop this public health disorder.

**Table 8.** Percent distribution of patients according to trimester and hemoglobin level

Hemoglobin Level	1 <sup>st</sup> trimester	2 <sup>nd</sup> Trimester	3 <sup>rd</sup> Trimester	TOTAL
<10mg/dl	58 (66%) (31%)	15 ((17%) (32%)	15 (17%) (94%)	88 (35%)
10-14mg/dl	56 (65%) (30%)	30 (35%) (64%)	0	86 (34%)
>15mg/dl	72 (96%) (39%)	2 (3%) (4%)	1 (1%) (6%)	75 (30%)
TOTAL	186 (75%)	47 (19%)	16 (6%)	249 (100%)

## CONCLUSION

The results of this study showed evidences of an alarming association between prevalence of soil-helminthiasis and anemia among Filipino pregnant women. These diseases have been a major global public health concern and up to date have been very difficult to address despite the efforts done by the local and international health organizations. Although this study is limited only in gathering sufficient data on the prevalence of anemia and intestinal parasitism, this may have provided future researches on possible benefits of deworming among pregnant women. Health education and promotion truly have great impact in reducing the prevalence of the burden of these diseases. Therefore, antenatal care should be further emphasized in improving the maternal health in the country.

**Table 9.** Association between intestinal parasitism and anemia in pregnant women

Intestinal parasitism	ANEMIC		NON-ANEMIC		Total	ODDS RATIO	ODDS RATIO	p-value
	Frequency	Percentage (%)	Frequency	Percentage (%)				
Positive	38	79% 43%	10	21% 6%	48	11.47	5.0 33	<0.00001
Negative	50	25.00% 57%	151	75.00% 94%	201		- 24	
TOTAL	88	35.00%	161	65.00%	249		0.6 9	

## LIMITATIONS OF THE STUDY

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The study used a descriptive cross-sectional study design. The study may have temporal ambiguity in which the investigator couldn't totally conclude that the presence of anemia among the participants was due only to the presence of intestinal parasitism. However, to minimize the possible effects of confounding variables such as the presence of the chronic disorders, the investigator excluded these patients. Moreover, the study covered only the laboratory-confirmed prevalence of intestinal parasitism and anemia. This research did not cover the clinical findings such as pallor in diagnosing anemia and gastrointestinal symptoms in diagnosing intestinal parasitism. The results of the Kato-katz technique was limited to only identification of ova. The burden or degree of infestation and the identification of each parasite were no longer covered in this research.

## RECOMMENDATION

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### *For the improvement of the study*

The investigator recommends that in the future study related to this topic, it is important to quantify the burden of the parasitoses and level of anemia. This may give a better picture of the burden of these diseases. To associate intestinal parasitism only to the development of anemia, experimental study design may be used where a post-treatment hemoglobin may be collected. This may exclude the presence of other risk factors that may contribute to developing anemia. Future studies may limit the study population among a certain age group with a particular trimester common to all.

### *For the results of the study*

The results of the study may be used by the institution to further improve their campaign in enhancing maternal and child health. This may be done by health education in the form of lay lectures at the OPD and posters. Further, the patients who have been positive in the tests will be given proper treatment and management.

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