

ANAEMIA ASSOCIATION WITH INTESTINAL PARASITIC INFECTION IN PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT TRIBHUVAN UNIVERSITY TEACHING HOSPITAL

Laxmi Sapkota¹ and Mahendra Maharjan²

²Central Department of Zoology, Tribhuvan University, Kirtipur, Kathmandu

Email Address: mmaharjan@cdztu.edu.np

Abstract

Anaemia is the common problem during pregnancy in developing countries like Nepal. A total of 200 stool samples for parasitic infection and their haemoglobin level data were collected from the pregnant women visiting TUTH. The overall prevalence of intestinal parasitic infection and anaemic rate among pregnant women was found to be 35% and 50%. Among 100 anaemic pregnant women 58 women were infected with intestinal parasites. The association of anaemia with intestinal parasitic infection was statistically significant ($P > 0.05$). The most dominant parasite among anaemic pregnant women was *A. lumbricoides* followed by *H. nana*. Total five different types of intestinal parasites were identified in this study. Among them *A. lumbricoides* (30.5%), *H. nana* 6(3%), *E. histolytica* 5(2.5%), *T. trichiura* 2(%) and *S. stercoralis* 2(1%) respectively. Pregnant women with single parasitic infection were found to be 64(32%) and multiple infection were 6(3%). Intensity of parasitic infection found to be 17(8.8%), 34 (17.0%) and 17 (9.5%) for light, moderate and heavy infection.

Keywords: Pregnant, Intestinal parasitic, anaemia, Teaching Hospital, antenatal

1. Introduction

Intestinal parasitic infection (IPI's) caused by pathogenic helminth and protozoan species are endemic throughout the world. The distribution of intestinal parasitic infection depends on many factors such as low socio-economic status (Nwizu et al. 2011, Mekonnen et al. 2014), poor sanitation and personal hygiene (Alene and Done 2014), lack of potable water (Wordemann et al. 2006, Amuta et al. 2010) etc, which stimulate the parasite infection.

There are so many factors that cause anaemia during pregnancy among them parasitic infection is major in developing countries (Roberts et al. 2011). It is defined as a reduction in the oxygen carrying capacity of the blood which may be due to a reduced number of red blood cells, a low concentration of haemoglobin or a combination of both (Norton 2003). Anaemia is regarded as a major risk factor for an unfavorable outcome of pregnancy. It has been associated with low birth weight and Intrauterine Growth Retardation (IUGR), (Acharya et al. 2004). Anemia in pregnancy is a major public health problem, especially in developing countries.

The cause of anaemia in pregnancy includes Iron, Folate, Vitamin B12 and Vitamin A deficiency (Allen 2000). During pregnancy women might suffer with anaemia during first trimester (Bardishi 2015), second trimester (Alene and Dohe, 2014) as well as third trimester (Lealem et al. 2015). Anaemia during pregnancy causes low birth weight (Acharya et al. 2004) and premature labour (Allen 1993). In developing countries intestinal parasites were considered as contributing factor of anaemia particularly helminth parasites were found responsible to cause anaemia (Dreyfuss et al. 2000, Rodriguez-Morales 2006, Boye et al. 2014). Among the helminth most of author showed association between hookworm and anaemia (Dreyfuss et al. 2000, Brooker et al. 2008) in pregnant women while some author showed not only hookworm but also *A. lumbricoides*, *T. trichiura* and *S. stercoralis* were prevalent among the anaemic pregnant women (Shah and Baig 2005, Chaudhary and Maharjan, 2014).

In order to assess the association between anaemia and intestinal parasitic infection during pregnancy, the present study was designed. It includes determination of parasitic infection by using stool examination as well as haematological data collection for estimation of haemoglobin level and analyzing statistical association of correlation.

2. Materials and Method

The study was carried out in the Tribhuvan University Teaching Hospital (TUTH), Maharajgunj. A Total of 200 pregnant women attending antenatal clinic of Tribhuvan University, Teaching Hospital during February to April (2015) were included in this study. Pregnant women who did not ready for stool collection were excluded. Orientation about the proper methods of collection of stool was provided to ensure the good condition of stool sample. Stool sample were collected in morning time and pregnant were instructed to avoid urine or other dust contamination of the stool sample. Pregnant women provided collecting vials with bamboo stick for stool collection and stool sample were collected in parasitological department of Teaching Hospital. After stool collection immediately 2.5% potassium dichromate solution was poured in vials as much as to cover the stool sample, which help in maintaining the shape and size of protozoan and helminth parasites and preventing further development. The stool samples were marked or coded for identification. These preserved samples were transported to a parasitological laboratory of the Central Department of Zoology, Tribhuvan University. Haemoglobin report of respective pregnant woman was recorded from Haematology laboratory of Gynecology department in TUTH.

3. Results

A total of 200 pregnant women were enrolled in the study and their stool samples were examined microscopically. The result revealed that the prevalence of intestinal parasitic infection (IPI) was found to be 35% (n =70) among the pregnant women.

Table 1 Prevalence of specific intestinal parasites in pregnant women.

Parasites	Frequency (N=200)
Protozoan parasites	
<i>E. histolytica</i>	5(2.5%)
Nematodes	
<i>A. lumbricoides</i>	61(30.5%)
<i>T. trichiura</i>	2(1%)
<i>S. stercoralis</i>	2(1%)
Cestodes	
<i>H. nana</i>	6(3%)

Pregnant women were found to be infected with five species of helminth parasites. Among them *A. lumbricoides* was the most prevalent (30.5%) compared to other intestinal parasites (Table 1). But none of them were infected with hookworm species. Pregnant women were found to be infected with either single parasite or multiple parasites. Degree of infection indicated that, out of total positive cases maximum 32% pregnant women were infected with single parasitic infection either by

protozoan parasite or by helminth parasite, while only 3% of them found infected with multiple infection by protozoan as well as helminth infection.

Haematological data of pregnant women were collected from hospital record. On the basis of the haematological data, 100 each pregnant women with anaemic and non anaemic were enrolled in the study. The result revealed that overall parasitic infection rate was found to be significantly higher in anaemic pregnant women compared to the non-anaemic pregnant women ($\chi^2 = 75.8$, d.f = 2, p = 0.000) as shown in (Fig 1)

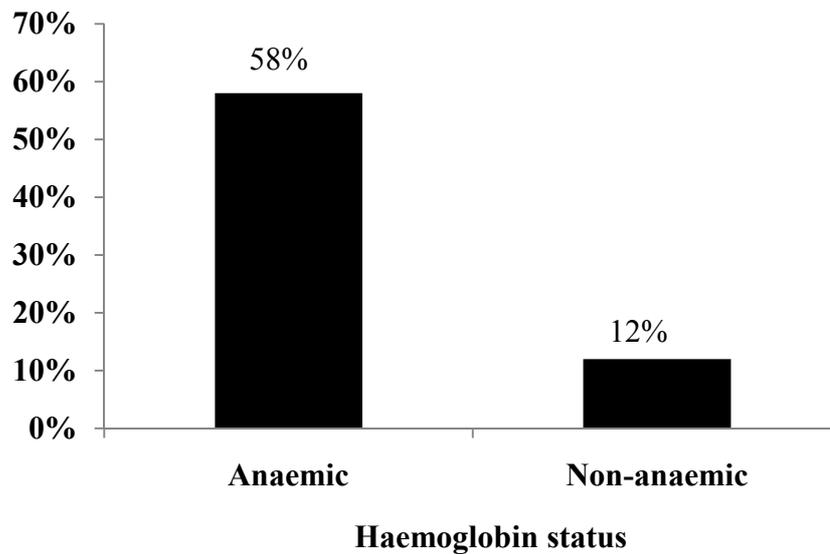


Fig 1 Prevalence of parasitic infection in anemic and non- anemic pregnant women

The hemoglobin level of pregnant women is the indicative of the normal fetus development. All pregnant women must have the haemoglobin level above 11 gm/dl, level below this is the indicative of the anaemia. The present result showed that pregnant women having either single infection or multiple infection have anaemia, while pregnant women without parasitic infection were found to be non-anaemic. Post Hoc analysis indicated the significant association between parasitic infection and anaemia. ($\chi^2 = 75.8$, d.f = 2, p = 0.000) (Table 2)

Table 2 Median haemoglobin level of pregnant women with and without parasite infection

Parasites	Number	Median Hb (gm/dl)	P-value
Absent	130	11.66	0.000
Single infection	64	10.35	
Multiple infection	6	10.28	

Protozoan parasitic infection due to *E. histolytica* in pregnant women showed almost similar infection which is statistically not significant. Although *H. nana* was high in anaemic pregnant women compared to non anaemic, the association was not significant. But with regard to *A. lumbricoides* infection, anaemic pregnant women showed remarkably high compared to non-anaemic with statistically significant association. But in case of *T. trichiura* and *S. stercoralis* the associations were not significant since the parasites were only recorded from anaemic pregnant women (Table 3).

Table 3 Association of specific intestinal parasite infection with anaemia in pregnant women

Species	Anaemia	Non-anaemia	X ² -Value	P-value
<i>E. histolytica</i>	3 (1.5%)	2 (1%0	0.205	0.50
<i>A. lumbricoides</i>	52 (26%)	9 (4.5%)	39.65	0.000
<i>T. trichiura</i>	2 (1%)	-	2.02	0.156
<i>S. stercoralis</i>	2(1%)	-	2.02	0.156
<i>H. nana</i>	5 (2.5%)	1 (0.5%)	2.75	0.106

4. Discussion

Present study was carried out among the pregnant women attending antenatal clinic at Tribhuvan University Teaching Hospital. Out of 200 pregnant women 70(35%) were infected with intestinal parasites. Among infected population, only 2.5% belonged to protozoan parasites and 32.5% infected with helminth parasites. In this study 5 different types of intestinal parasites were found which were *A. lumbricoides*, *H. nana* *T. trichiura* *E. histolytica* and *S. stercoralis* The present study showed *A. lumbricoides* (30.5%) as the most prevalent intestinal helminth parasites followed by *H. nana* 6(3%).

Overall prevalence rate of parasitic infection among pregnant women at TUTH showed comparatively less than result revealed from Sarlahi district (Navilsky et al. 1998, Dreyfuss et al. 2000) and Dhankuta district (Shah and Baig 2005) whereas some research showed comparatively lower IPI rate than present study as shown among pregnant women of Biratnagar (Chaudhary and Maharjan 2014) and Kathmandu (Marahatta 2009).

The common nematode parasites infecting human includes *A. lumbricoides*, *T. trichiura* *A. duodenale*, *N. americanus*, *E. vermicularis*, *S. stercoralis* *Trichostrongylus* sp etc. In the present study *A. lumbricoides*, *T. trichiura* and *S. stercoralis* were identified which were also identified in pregnant women of Biratnagar including hookworm (Chaudhary and Maharjan 2014), were also reported by other researcher (Shah and Baig 2005, Navitsky et al. 1998, Marahatta 2009) except *S. stercoralis* *A. lumbricoides* and hookworm were most common nematode in Nepal (Robert et al. 2011).

In global context, common nematode including *A. lumbricoides*, *T. trichiura* hookworm were reported from African countries such as Nigeria (Obiezue et al. 2013, Omorodian et al. 2012, Alli et al. 2011), Ethiopia (Kefiyalew et al. 2014, Jufar and Zewde 2014, Getachew et al. 2012, Lealem et al. 2015), Ghana (Fuseini et al. 2010), Kenya (Wekesa et al. 2014, McClure et al. 2014, Van Eijk et al. 2008), Indonesia (Nurdia et al. 2001). Robert et al. (2011) showed *A. lumbricoides* and hookworm were dominant in Kenya where *A. lumbricoides* and *T. trichiura* were common in Gabon. *Trichostrongylus* sp was recorded from Ghana (Fuseini et al. 2010).

Common cestode parasites infecting human being includes *H. nana* *H. diminuta*, *T. solium*, *T. saginata* in national as well as in global context. Among them in present study only *H. nana* was recorded from the pregnant women attending antenatal in TUTH, was also reported by Chaudhary and Maharjan (2014) in Biratnagar but not reported by some other earlier researcher (Shah and Baig 2005, Navitsky et al. 1998, Dreyfuss et al. 2000, Marahatta 2009).

Among three nematode parasites reported, *A. lumbricoides* was found to be highly prevalent (30.5%) as shown by Chaudhary and Maharjan (2014) also showed *A. lumbricoides* was dominant over Biratnagar. Similar result forwarded by Shah and Baig (2005) while some other earlier studied showed Hookworm as a predominant (Dreyfuss et al. 2000, Navitsky et al. 1998, Marahatta 2009). This higher rate of *A. lumbricoides* infection among pregnant women attending antenatal at TUTH

might be due to high prevalence rate (36.5%) of soil contamination with egg of *A. lumbricoides* (Rai et al. 2000) and contamination of drinking water with intestinal parasites (Bajracharya and Maharjan 2015) as well as contamination of raw sewage with water and vegetables, poor sanitation and poor personal hygiene.

In this study most of the pregnant women infected with moderate infection of intestinal parasites i.e. 34 (17%), compared to light and heavy infection. Pregnant women who had infected with much number of parasites (heavy infection) had more parasitic burden than light and moderately infected women.

Anaemia is a public health problem of both developed and developing countries. It has been identified that about 50% people in the world had anaemia (WHO 2002). Studies from South Asian countries (Bondivek et al. 2000, Dreyfuss et al. 2000) has estimated 75% prevalence of anaemia among pregnant women, the highest in the world (WHO 1992).

The most common cause of anaemia among pregnant women are menstrual blood loss, iron deficiency, malnutrition and parasitic infection (Marahatta 2009). Intestinal parasitic infection interfere with food intake, absorption, storage and use of many nutrients such as iron, vitamin A, vitamin B12, vitamin C, folic acid etc contribute to anaemia (WHO 2011). The prevalence of anaemia is high in developing countries due to poverty, inadequate diet, unhygienic drinking water, risky and high frequency of pregnancy and lactation and poor access to health (WHO 2011).

Sometimes *A. lumbricoides* along with hookworm was found associated with decreased haemoglobin level and were more prevalent among the anaemic pregnant women (Tefera 2014, Shah and Baig 2005), where Chaudhary and Maharjan (2014) revealed out of 17 hookworm infected women 10 were anaemic whereas 21 women with ascariasis, 11 had decreased haemoglobin level showed *A. lumbricoides* associated with anaemia in pregnant women. Similar result forwarded by Shah and Baig showed 24 patient with ascariasis, 14 had anaemia revealed association of *A. lumbricoides* infection with haemoglobin.

5. Conclusion

The pregnant women with or without anaemia were found to be infected with one each species of protozoan as well as cestode parasitic infection. Similarly maximum of them were found infected with three species of nematode parasitic infection with high prevalence of *Ascaris lumbricoides*. The anaemia in pregnant women were found significantly associated with the overall parasitic infection particularly *Ascaris lumbricoides*.

6. Acknowledgement

We are greatly thankful to all the persons who helped to complete this study and sincere thanks to staff of TUTH for their great support.

References

1. Alene, K.A. and Dohe, A.M. "Prevalence of anaemia and associated factors among pregnant women rural and urban area of Eastern Ethiopia". Hindawi Publishing Corporation. Article. ID 561567, (2014).
2. Alli, J.A., Okonko, I.O., Kolade, A.F., Nwanze, J.C., Dada, V.K. and Ogundele, M. "Prevalence of intestinal nematode infection among pregnant women attending antenatal clinic at the University College Hospital", Ibadan, Nigeria. *Advances in Applied Science Research*. 2(4): 1-13,(2011).

3. Amuta, E.U., Houmsou, R.S. and Mker, S.D. “*Knowledge and risk factors of intestinal parasitic infections among women in Makurdi*”, Benue State. Asian Pacific Journal of Tropical Medicine. **3**(12): 993-996(2011).
4. Bajracharya, P. “*Drinking water quality in Western part of Kathmandu Valley*”. M.Sc. Thesis. Central Department of Zoology Tribhuvan University, Kirtipur, Kathmandu, Nepal,(2015)
5. Bardisi, S.M. “*Evaluation of anemia during pregnancy at Rusaifah primary health care centre in Makkah Al Mukarramah*”, Saudi Arabia. International Journal of Medical Science and Public Health. **4**(5): 694-699(2015.).
6. Bondevik, G.T., Eskeland, B., Ulvik, R.J., Ulstein, M., Lie, R.T., Schneede, J., et al. “*Anaemia in pregnancy: possible causes and risk factors in Nepali women.*” European Journal of Clinical Nutrition. **54**(1): 3-8(2000).
7. Brooker, S., Hotez, P.J. and Bundy, D.A.P. “*Hookworm related anaemia among pregnant women: A systemic review*”. PLoS Neglected Tropical Diseases. **2**(9): e291. (2000)
8. Chaudhary, M. and Maharjan, M. “*Association of anaemia with parasitic infection in pregnant women attending antenatal clinic at Koshi Zone Hospital*”. Neplalese Journal of Zoology. **2**(1):1-7(2014).
9. Dreyfuss, M.L., Stoltzfus, R.J., Shrestha, J.B., Pradhan, E.K., Leclercq S.C., Khatry, S.K., et al. “*Hookworms, Malaria and Vitamin A Deficiency contribute to anemia and iron deficiency among pregnant women in the plains of Nepal*”. Journal of Nutrition. **130**(10): 2527-2536 (2000).
10. Fuseini, G., Edoh, D., Kalifa, B.G., Hamid, A.W. and Knight, D. “*Parasitic infections and anaemia during pregnancy in the Kassena-Nankana district of Northern Ghana*”. Journal of Public Health and Epidemiology. **2**(3): 46-52(2010).
11. Getachew, M., Yewhalaw, D., Tafess, K., Getachew, Y. and Zeynudin, A. “*Anaemia and associated risk factors among pregnant women in Gilgel Gibe dam area, Southwest Ethiopia*”. Parasites and Vectors. **5**: 295-303(2012).
12. Jufar, A.H. and Zewde, T. “*Prevalence of anemia among pregnant women attending antenatal care at Tikur Anbessa Specialized Hospital, Addis Ababa Ethiopia*”. Journal of Hematology and Thromboembolic Diseases. **2**(1):1000125(2014).
13. Kefiyalew, F., Zemene, E., Asres, Y. and Gedefaw, L. “*Anemia among pregnant women in Southeast Ethiopia: prevalence, severity and associated risk factors*”. Biomedical Central Research. **7**: 771-779(2014).
14. Lealem, G., Asrat, A., Yaregal, A. and Andualem, M. “*Aemia and associated factors among pregnant women attending antenatal care clinic in Wolayita Sodo town, Southern Ethiopia*”. Ethiopian Journal of Health Science. **25**(2):155-162(2015).
15. Marahatta., R. “*Study of anaemia in pregnancy and its outcome in Nepal Medical College Teaching Hospital, Kathmandu,Nepa*”1. Nepal Medical Colledge Journal. **9**: 270- 274(2009).
16. McClure et al. “*The association of parasitic infections in pregnancy and maternal and fetal anemia: A cohort study in Coastal Kenya*”. PLoS Neglected Tropical Diseases. **8**(2): e2724(2014).

17. Mekonnen, B., Erko, B. and Legesse, M. “Prevalence of intestinal parasitic infections and related risk factors among street dwellers in Addis Ababa, Ethiopia”. *Journal of Diseases and Public Health*. **2**(2):1000132(2014)
18. Nauvitsky, R.C., Dreffuss, M.L., Shrestha, J., Khatry, S.K., Stoltzfus, R.J. and Albonico, M. “*Ancylostoma duodenale* is responsible for hookworm infections among pregnant women in the rural plains of Nepal”. *Journal of parasitology*. **84**: 647-651(1998).
19. Norton J. “Recommendations to Prevent and Control Iron Deficiency Anaemia in United States Centre for Disease Control and Prevention”. *Morbidity and Mortality Weekly Recommended Report*. **47** (RR – 3):1 – 29(2003).
20. Nurdia, D. S., Sumarni, S., Suyoko, Hakim M., Winkvist, A. “Impact of intestinal helminth infection on anemia and iron status during pregnancy in Indonesia”. *The Southeast Asian Journal of Tropical Medicine and Public Health*. **32**(1):14–22(2001).
21. Nwizu, E.N., Iliyasu, Z., Ibrahim, S.A. and Galadanci, H.S. “Socio-demographic and maternal factors in anaemia in pregnancy at booking in Kano, Northern Nigeria”. *African Journal of Reproductive Health*. **15**(4): 33-41(2011).
22. Obiezue, N.R., Okoye, I.C., Ivoke, N. and Okorie, J.N. “Gastrointestinal helminth infection in pregnancy: Disease incidence and hematological alterations”. *Iranian Journal of Public Health*. **42**(5): 497-503(2013).
23. Omorodion, O.A., Isaac, C., Nmorsi, O.P.G., Ogoya, E.M. and Agholaor, K.N. “Prevalence of intestinal parasitic infection among tertiary institution students and pregnant women in South-South, Nigeria”. *Journal of Microbiology and Biotechnology Research*. **2**(5): 815-819(2012).
24. Rai, S.K., Hitrai, K., Abe, A. and Ohno, Y. “Infectious diseases and malnutrition status in Nepal: an overview”. *Maldives Journal of Nutrition*. **8**(2):191-200(2002).
25. Roberts, T.K., Gravett, C.A., Velu, P.P., Theodoratou, E., Wagner, T.A., Shayne, J. et al. “Epidemiology and aetiology of maternal parasitic infections in low and middle income countries”. *Journal of Global Health*. **1**(2):189-200(2011).
26. Shah, B.,K. and Baig, L.A. “Association of anemia with parasitic infestation in pregnant Nepalese women: results from a hospital-based study done in eastern Nepal”. *Journal of Ayub Medical Colledge, Abbottabad*. **17**(1): 5-9(2005).
27. Tefera, G. “Determinants of anemia in pregnant women with emphasis on intestinal helminthic infection at Sher-Ethiopia hospital”, Ziway, Southern Ethiopia. *Immunology and Infections Diseases*. **2**(4): 33-39(2014).
28. Van Eijk, A.M., Lindblade, K.A., Odhiambo, F., Peterson, E., Rosen, D.H., Karanja, D. et al. “Geohelminth Infections among Pregnant Women in Rural Western Kenya”; a cross-sectional study. *PLoS Neglected Tropical Diseases* **3**(1): e370(2009).
29. Wekesa, A.W., Mulambalah, C.S., Muleke, C.I. and Odhiambo, R. “Intestinal helminth infections in pregnant women attending antenatal clinic at Kitale District Hospital”, Kenya. *Journal of Parasitology Research*. **20**:1-5(2014)
30. Wordemann et al. “Prevalence and risk factors of intestinal parasites in Cuban children”. *Tropical Medicine and International Health*. **2**(12):1830-1820(2006).
31. World Health Organization. “Prevention and control of schistosomiasis and soil transmitted helminthiasis”: report of a WHO expert committee,(2002).