Original Article

Anaemia in pregnant, postpartum and non pregnant women in Lak district, Daklak province of Vietnam

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Objectives: To determine anaemia prevalence and related factors in pregnant women (PW), post partum women (PPW) and non pregnant women (NPW) in a remote mountainous district.
Methods: A cross-sectional survey was conducted in 2001. All PW, all PPW within 6 months of delivery and a random number of NPW equivalents to the number of PW in each commune were selected. Hemoglobin (Hb) was measured using Hemocue method. Mild anaemia was defined as Hb=7g/dL-11g/dL in PW, and 8g/dL-12g/dL in NPW and PPW. Severe anaemia was defined as Hb<7g/dL in PW, and<8g/dL in NPW and PPW. Pregnancy status was determined using urine pregnancy test and calculation of expected menstruum.
Results: There were 901 women surveyed: 281 PW, 348 PPW and 272 NPW. More than half (58%) were anaemic: 54% mild and 4% severe. Mean Hb was 11.1g/dL. More PPW had anaemia (62%; OR=1.4; 95%CI=1.1-2.1 compared to NPW) than NPW (54%) and PW (53%). Other related factors were being BoY, Ede and Koho ethnics (OR=2.7; 95%CI=1.4-5.0 compared to Kinh ethnic), having primary education or lower (OR=1.5; 95%CI=1.1-2.1 compared to secondary education or higher). Among PW, being pregnant during the third trimester increased anaemia (OR=2.2; 95%CI=1.3-3.8 compared to being pregnant during the second trimester). Among PPW, women aged 30 or older were more anaemic (OR=1.7, 95%CI=1.1-2.9 compared to women aged 20-29).
Conclusion: Anaemia prevalence was very high. Interventions should be focused on PPW, PW during the last trimester, minority ethnic women, low-educated and older women.

Key Words: anaemia, women, pregnancy, postpartum, prevalence, factors associated, ethnicity, education, Vietnam, Lak district, Daklak province

Introduction

Anaemia is an important health issue in the developing world. Severe anaemia is related to mortality and mild anaemia increases health risk and reduces productivity.[1] Anaemia is especially dangerous in pregnant women (PW). The disease causes cardiac failure, haemorrhage and infection in PW.[2,3] In India, 19% of maternal deaths were related to anaemia.[4] Maternal anaemia increases intrauterine growth retardation and pre-term delivery.[2,3] Anaemia is also an important indicator for choosing medication. For example anaemic women should be strict to the use of intrauterine device due to blood loss side effect.[5] This is important in developing countries like Vietnam where more than 50% of women use intrauterine device.[6]

The prevalence of anaemia in women in developing countries is high. Eighty percent of PW and 60% of non pregnant women (NPW) in South East Asia have anaemia. Fifty percent of post partum women (PPW) in Bangladesh and 63% in Egypt had anaemia.[7] WHO established an epidemiological criteria to classify areas according to the prevalence of anaemia: mild (1% to 9.9%), moderate (from 10% to 39%) and severe (more than 40%).[8]

The most important biological causes of anaemia are malaria and intestinal worms.[3] Non-biological related factors include education, household size, income, age, parity,birth spacing, antenatal care[9] and Body Mass Index (BMI).[10]

The prevalence of anaemia in PW in Vietnam varies by area, from 32%[11] and 39%[12] in the plain areas to 41%[13] in the mountainous areas of the Central Coast and 60% in the Centre Highland.[14] The prevalence of anaemia in NPW ranges from 8%[12] to 24%.[11] Factors related to anaemia in PW include pregnancy during the third trimester, having four or more pregnancies, illness, low iron intake and hookworm.[13]

However, information about anaemia in women in remote mountainous areas is still limited. In addition, no information on the prevalence of anaemia in PPW in Vietnam has been identified. There has been no study that compares anaemia prevalence in PW, PPW and NPW in the same population.

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This study aimed to examine and compare the prevalence of anaemia in PW, PPW and NPW in the Centre Highland. The study also aimed to identify factors related to anaemia in women in this area.

Results from the study will contribute to the limited information about anaemia in PW and NPW in the most disadvantageous area of the country. The study provides the first information about anaemia in PPW in Vietnam and adds to little information on anaemia in PPW in the world. The information on related factors is useful for targeting resources to high risk groups of women.

Method

A cross-sectional survey was conducted in 2001 in Lak district, Daklak province, a mountainous area in the Centre Highland. Main inhabitants are minority ethnic groups. The district has 9 communes, a total of 45,000 populations and a birth rate of 3%.[15]

The district health service prepared a list of all PW, all PPW who gave birth within 6 months and all NPW aged between 15 and 49 years in all communes. All PW and all PPW were selected. A sample of NPW was randomly selected. The number of selected NPW in each commune was equivalent with the number of PW in that commune. Women were informed several days before the study by heads of the communes and were invited to community health centres on the days.

A questionnaire was administered. A blood sample was taken from each woman. Haemoglobin level was examined using HemoCue haemoglobin photometer.[16] Malaria parasites ware examined using Giemsa method.[17] The presence of malaria antibody to *P.falciparum* was tested using Paracheck dipstick method.[18] A urine sample was taken from each woman to examine the pregnancy status using HCG urine dipstick method.[19] Women were weighted and their height was measured.

Classification of indicators

Table 1 presents the classification of anaemia, BMI and pregnancy status. Anaemia was defined depending on the pregnancy status. Due to diluted blood during pregnancy, the cut off points for PW were lower than for NPW and PPW (7g/dL for severe anaemia and 11g/dL for mild anaemia in PW compared to 8g/dL and 12g/dL for PPW and NPW).[8,20] In addition, the cut off point for mild anaemia for PW during second trimester was even lower (10.5g/dL) than other PW (11g/dL).[21] There was no need to adjust for altitude because the average altitude of Daklak province ranges from 500 to 800 meters above the sea level.[22]

The BMI classification also varied. The cut off points for NPW is lower (eg. 18.5 for underweight) than for PW and PPW (eg. 19.8 for underweight).[23]

PPW were women who gave birth within 6 months prior to the study. PW were women who had expected menstruum, at the time of the survey, later than 2 weeks and the results of the pregnancy tests were positive. If a test was negative, a second test was performed. If the second test was positive, a third test was performed and a decision was made based on the results of the tests and the clinical signs. NPW had their expected menstruum period at the time of the survey not later than 2 weeks, had negative pregnancy tests and had not given birth within 6 months.

A stepwise selection method was used to build logistic regression models.[24] Anaemia was categorised as yes or no. Potential related variables were pregnancy status, age, ethnicity, education, occupation, family size, number of children, BMI and malaria. Factors related were analysed for all women and for each group of women separately. The pregnancy duration was added in the analysis of PW and time after delivery was added to the analysis of PPW. Variable with p values of less than 0.1 were included in the final models. Excel 5.0 and STATA 8.0[25] were used in the analyses.

Results

The survey was conducted in October and November 2001, in all communes of Lak district. There were 93 hamlets and 41,043 inhabitants in the studied area. Data was available for 901 women (272 NPW, 281 PW and 348 PPW). The number of PPW was slightly more than the number of PW or NPW. This might due to the fact that PPW were easier to be identified than PW, especially

Table 1. Classification of anaemia, Body Mass Index and pregnancy status

	Pregnant		Post partum	Non pregnant
	Trimester 1 &3	Trimester 2		
Haemoglobin level				
No anaemia	>=11g/dl	>=10.5g/dl	>=12g/dl	>=12g/dl
Mild anaemia	7-10.9g/dl	7-10.4g/dl	8-11.9g/dl	8-11.9g/dl
Severe anaemia	<7g/dl	<7g/dl	<8g/dl	<8g/dl
BMI = weight / height^2				
Underweight	<19.8		<19.8	<18.5
Normal weight	19.8-26.0		19.8-26.0	18.5-24.9
Over weight	26.1-29.0		26.1-29.0	25.0-29.9
Obese	>29.0		>29.0	>=30.0
Pregnancy status				
Last menstruum > 2 weeks	+			±
Positive pregnancy test	+			-
Give birth within 6 months			+	-

Sources for anaemia classification: Cook J, Skikne B, Baynes R 1992,[20] WHO 1968[8] and International Life Sciences Institute 2001.[21]
Source for BMI classification: Institute of Medicine 1990.[23]

Table 2. Women's characteristics

		Unit	All (N=901)	Pregnant (n=281)	Post partum (n=348)	Non pregnant (n=272)
Age (years)*	<=19	%	8.8	10	8.6	7.4
	20-29	%	60	62	64	53
	>=30	%	31	28	27	39
Ethnicity*	Kinh	%	31	31	28	35
	M'nong	%	62	61	67	56
	Others	%	7.2	8.2	4.6	9.6
Occupation *	Farmer	%	94	93	95	93
	Others	%	6.2	6.6	5	7.4
Education *	Primary education or lower	%	68	69	70	62
	Secondary education of higher	%	32	31	30	38
Family members	0-5	%	60	66	54	59
	>=6	%	40	34	46	41
Number of children	0-2	%	60	58	64	75
	>=3	%	40	42	36	25
BMI	Underweight	%	44	35	52	43
	Normal weight	%	56	64	48	57
	Overweight	%	0.7	0.8	0	1.5
Pregnancy duration*	1st trimester	%		19		
	2nd trimester	%		39		
	3rd trimester	%		42		
Time after birth	1-2 months	%			33	
	3-4 months	%			27	
	5-6 months	%			40	

* Statistical significantly associated with anaemia in bi-variate regression.

PW at their early stage of pregnancy. The response rate was 97%.

Women's characteristics
Characteristics of women are presented in Table 2. A majority of women were in their twenties (64%), were M'nong ethic (62%) or Kinh ethnic (the majority ethnic of Vietnam) (31%), were farmers (94%), had primary education or lower (68%). On average, a family had 5.3 people and a woman had three children. There were large proportions of women with low BMI in all groups (44%) and almost no overweight and obese women. The numbers of PW in the second and the third trimester of pregnancy were similar (39% and 42% respectively), which were more than the number of PW in the first trimester (19%). The numbers of PPW at different months after birth were somewhat similar. Thirty three percents of PPW were in their 1st or 2nd month post partum period, 27% were in their 3rd or 4th months and 40% were in their 5th or 6th months.

The characteristics were similar between groups of women, except that families of PW had an average of one person less than families of others and there were more women with low BMI among PPW (52%) than in NPW

(43%) and PW (35%).

Malaria parasites were found in only 3 women. Antibody to *P. Falciparum* was found in these 3 women and another woman.

Prevalence of anaemia
The prevalence of anaemia is presented in Table 3. There was a very high prevalence of anaemia in all women (58%). However, most of them had mild anaemia (54%), only a small proportion had severe anaemia (4%). PPW had more anaemia (62%) than PW (53%) and NPW (54%). PPW also had more severe anaemia (6%) than PW (2.9%) and NPW (2.6%).

Factors related to anaemia
Reduced logistic regression model is presented in Table 4. Factors significantly associated with anaemia in all women were pregnancy status, ethnicity and education. PPW had 1.4 times the odds of having anaemia than non NPW. Women of BoY, Ede and Koho ethnics had 2.7 times the odds of being anaemic than Kinh ethnic women. Compared to women who completed secondary education or higher, women who only completed primary education or lower had 1.5 times the odds of having anaemia. Age

Table 3. Prevalence of anaemia

	Unit	All N = 901	Pregnant women N = 281	Post partum women N = 348	Non pregnant women N = 272
Anaemic	%	58	53	62	54
	95% CI	54.7-61.2	47.5-59.2	56.8-67.1	47.3-59.3
Mild	%	54	51	56	51
Severe	%	4	2.9	6	2.6
Hb (g/dl)	Mean	11.1	10.6	11.1	11.5
	95%CI	11.0-11.2	10.4-10.8	10.9-11.3	11.3-11.8

Table 4. Reduced multiple logistic regression of factor associated with anaemia

Variable	Total OR (95%CI)	Pregnant OR (95%CI)	Post pregnant OR (95%CI)	Non pregnant OR (95%CI)
Pregnancy status				
Non pregnant	1.0			
Pregnant	1.0 (0.7-1.4)			
Post partum	1.4 (1.0-2.0)*			
Age				
<=19	0.6 (0.4-1.0)		0.5 (0.2-1.1)	
20-29	1.0		1.0	
>=30	1.2 (0.9-1.7)		1.7 (1.0-2.9)*	
Ethnicity				
Kinh	1.0	1.0	1.0	1.0
Mnong	1.3 (0.9-1.8)	2.1 (1.2-3.6)*	1.6 (1.0-2.6)	0.9 (0.5-1.7)
Ede, BoY, KoHo	2.7 (1.4-5.0)*	3.4 (1.2-9.2)*	2.7 (0.8-9.2)	2.6 (1.0-7.4)*
Education				
Secondary and higher	1.0			1.0
Primary and lower	1.5 (1.1-2.1)*			2.1 (1.2-3.8)*
Pregnancy duration				
First trimester		0.7 (0.4-1.4)		
Second trimester		1.0		
Third trimester		2.2 (1.3-3.8)*		
Number of women	901	281	348	272
Model Chi squared	27 (df=7)*	20 (df=4)*	15 (df=4)*	21 (df=5)*

* shows cells where $p<0.05$

was not significant but had a p value of less than 0.1 and was include in the model.

Among PW, the odds of anaemia were 2.1 times higher for Mnong ethnic women and 3.4 times higher for other minority ethnic groups than for Kinh ethnic women. Women who were pregnant during the last trimester had larger odds of anaemia than women who were pregnant during the second trimester (OR=2.2).

In PPW, women aged 30 years or older had larger odds of having anaemia than women aged between 20 and 29 years (OR=1.7). Ethnicity was not significant but had a p value less than 0.1 and was included in the model.

Factors related to anaemia in NPW were ethnicity and education. Women of BoY, Ede and Koho ethnics were more likely to have anaemia than Kinh ethnic women (OR=2.6). Women with lower education were more anaemic than women who had better education (OR=2.1).

Discussion

The aims of the study were to assess the prevalence of anaemia and factors related in PW, PPW and NPW in the most disadvantaged area of the country. The results showed a high prevalence of anaemia in all women (58%). According to WHO, this is a severe epidemiological anaemia area that needs special interventions.[8] Prevalence of anaemia in PW was higher than in other areas of Vietnam[11-13] and is similar to results from a study in the Centre Highland.[14] The prevalence of anaemia in NPW was also much higher than in other areas.[11,12] The reason for higher prevalence of anaemia in the Central Highland is that this is the poorest area of the country, where the main inhabitants are minority ethnic groups. Lack of food is probably the main direct cause of anaemia in this area.

Although anaemia was common in all women, PPW were most affected. The main reason could be due to breastfeeding for a prolonged period of time. All women

in the Central Highland breastfeed their babies and the median breastfeeding duration is 20 months.[26] Breastfeeding, looking after the demanding newborn babies and resuming work soon after delivery, without increase in the food intake, all make health of the PPW worse than others.

The other reasons for further blood loss in PPW could be resuming menstruation and using contraception. However these reasons would only play very minor roles, if any, because breastfeeding for a long period of time would delay menstruation recommencement in most of PPW at 6th month after delivery and therefore most of them would not use contraception. Some PPW at the 5th or 6th month post partum period may resume menstruation; however, there was no difference in the prevalence of anaemia between PPW at different post partum periods.

Vietnam has an iron supplementation program for PW, however only around 15% of the country is covered by the program due to limited resources.[27] There was no iron supplementation program in Lak district in 2001.[28] Therefore iron supplementation in PW is not the reason for PW to be better off than PPW.

Third trimester PW have more anaemia than PW at other semesters because more nutrition is required for the growing foetus during late pregnancy period but there is not much increase in the food intake and rest. Some women may have to work until delivery.

Factors associated with anaemia, other than pregnancy status were ethnicity, education and age. The Kinh ethnic group, the majority of Vietnamese population do better than others, despite the fact that they are the minority in this area. The reason may be that they are more likely to be government employees, technicians or trade people and live in more developed areas such as the district town. On the other hand, the Mnong are more likely to be farmers or forestry workers. The Ede, Bo y and KoHo traditionally lived mobile lives in the jungle and recently

settled in the new economic zones.

The reason why educated women have less anaemia could be explained by a possible higher income and more knowledge about health care. Women aged 30 years or older are not as physically strong as women who are younger. Their bodies may have more difficulties adjusting to pregnancy and lactating. The results were similar to findings from other studies on the effect of late pregnancy,[13,29] education[9,30] and age[9] on anaemia.

There was almost no malaria found in this study, which was similar to the result from a study on more than 800 PW in Quang Binh province, a malarious area in the centre of Vietnam.[13] Therefore malaria is not the cause for anaemia in women in this area.

The strength of the study was that it was done in most of PW and PPW and a relatively large number of NPW in the district, so that the results are representative of these groups of women in the district.

The limitation of the study was that worm infection was not examined. However, worm infection has been well known as the most important biological cause for anaemia in developing countries[3] and worm infection is common in this setting. A survey on intestinal worm carried out by the district health service several months before the study showed that 60% of the population in the province had worm.[31] Other potential factors such as iron intake, cultural and nutritional habit were also not included in this study. The study was done in one district; therefore generalisation can only be limited to other similar districts.

Interventions are urgently needed to improve anaemia situation in this area. Priorities should be given to all PPW, PW during the last trimester, minority ethnic groups, low educated women and women aged 30 and older. The iron supplementation program should be extended to PPW until they stop breastfeeding, which is 20 months after delivery in this community or an average of 18 months for the whole nation.[26]

Use of contraceptive methods in this area should be carefully considered because of blood loss side effect of contraceptive methods. Studies in the future should investigate other potential related factors such as cultural and nutritional habit to fully understand the factors related to high anaemia prevalence in this area and in Vietnam. There should be trial interventions targeted at identified high risk groups of women.

Acknowledgement

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Original Article

Anaemia in pregnant, postpartum and non pregnant women in Lak district, Daklak province of Vietnam

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越南 Daklak 省 Lak 區懷孕、產後及未懷孕的女性之貧血狀況

目的：評估在偏遠山區懷孕婦女(PW)、產後婦女(PPW)及未懷孕婦女(NPW)的貧血盛行率與其相關因子。

方法：一個橫斷性調查在 2001 年進行。研究納入每個行政區中所有的 PW、在六個月之內分娩的 PPW，及隨機選取與 PW 等量的 NPW。採用 Hemocue 法測量血紅素量(Hb)。輕微貧血的定義在 PW 為 Hb=7g-11g/dL，NPW 和 PPW 為 8g/dL-12g/dL；嚴重貧血的定義在 PW 為 Hb<7g/dL，NPW 和 PPW 為<8g/dL。懷孕狀態的評估是採用尿液驗孕並計算預產期。

結果：總共有 901 名女性接受調查：281 名 PW、348 名 PPW 及 272 名 NPW。超過一半(58%)的人有貧血的現象：54%輕微及 4%嚴重。平均血紅素為 11.1g/dL。PPW(62%；OR=1.4；95% CI=1.1-2.1)的貧血盛行率高於 NPW(54%)及 PW(53%)。其他相關因子為 BoY、Ede 及 Koho 族(與 Kinh 族相比 OR=2.7；95% CI=1.4-5.0)，教育程度為初等或更低(與中等教育或更高相比 OR=1.5；95% CI=1.1-2.1)。在 PW，懷孕第三期貧血機率也增加(與懷孕第二期相比 OR=2.2；95% CI=1.3-3.8)。在 PPW，年齡在 30 歲或以上的女性貧血機率也較高(與年齡在 20-29 歲的女性相比 OR=1.7；95% CI=1.1-2.9)。

結論：貧血盛行率非常高。介入的焦點應該放在 PPW 及懷孕最後期的 PW、少數民族的女性、低教育程度與較老的女性。

關鍵字：貧血、女性、懷孕、產後、盛行率、相關因子、氏族、教育程度、越南、Lak 區、Daklak 省。