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Original Article

Anemia in Reproductive-Age Women of an Ethnic Minority, Vietnam

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Abstract

Anemia is one of the major public health problems in world population. It can be found in all age groups including reproductive age women. The main causes of anemia in Southeast Asian population include thalassemia and iron deficiency. This study aimed to determine the prevalence of anemia in reproductive age women of an ethnic minority in Thua Thien Hue, Vietnam. A total of 392 Ta-Oi women aged 15-49 years were recruited. Blood samples and demographic information were collected from each participant. All blood samples were investigated for anemia. Iron deficiency was determined in anemic cases. The prevalence of anemia was 9.9% (95% CI=7.2-13.3). Amongst the anemic cases, ID was identified in one woman (2.6%), whereas thalassemia carriers were identified in 76.9% (30/39). Causes of anemia among the remaining 3 cases were unknown. Of the thalassemic participants, hemoglobin Constant Spring (Hb CS) and α^{+}-thalassemia were most common. This information may contribute essentiality to the thalassemia database and prevention and control program in the region.

Keywords: *Anemia, Iron deficiency, Thalassemia, Minority, Vietnam*

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นิพนธ์ต้นฉบับ

ภาวะเลือดจางในหญิงวัยเจริญพันธุ์ชนกลุ่มน้อยชาติพันธุ์ ประเทศเวียดนาม

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บทคัดย่อ

ภาวะเลือดจางเป็นหนึ่งในปัญหาสาธารณสุขที่สำคัญของประชากรโลก ที่สามารถพบได้ในทุกกลุ่มอายุรวมถึงหญิงวัยเจริญพันธุ์ โดยสาเหตุหลักของการเกิดภาวะเลือดจางในประชากรกลุ่มประเทศเอเชียตะวันออกเฉียงใต้ ได้แก่ ธาลัสซีเมียและการขาดธาตุเหล็ก การศึกษานี้มีวัตถุประสงค์เพื่อหาความชุกภาวะเลือดจางในหญิงวัยเจริญพันธุ์ที่เป็นชนกลุ่มน้อยในจังหวัดทัวเทียนเว้ ประเทศเวียดนาม เก็บตัวอย่างเลือดและข้อมูลด้านประชากรของกลุ่มตัวอย่างที่เป็นผู้หญิงชาว Ta-Oi อายุระหว่าง 15-49 ปี จำนวน 392 คน ตรวจหาภาวะเลือดจางในตัวอย่างเลือดทั้งหมด และตรวจหาภาวะขาดธาตุเหล็กในผู้ที่มีภาวะเลือดจาง พบว่า ความชุกภาวะเลือดจางเท่ากับร้อยละ 9.9 (ช่วงเชื่อมั่นร้อยละ 95 เท่ากับ 7.2-13.3) ทั้งนี้ กลุ่มตัวอย่างที่มีภาวะเลือดจางมีภาวะขาดธาตุเหล็กหนึ่งราย (ร้อยละ 2.6) ในขณะที่มีผู้เป็นพาหะธาลัสซีเมียร้อยละ 76.9 (30 ราย/39 ราย) ส่วนการเกิดภาวะเลือดจางในกลุ่มตัวอย่าง 3 รายที่เหลือไม่ทราบสาเหตุ สำหรับกลุ่มตัวอย่างที่มีธาลัสซีเมีย พบ ฮีโมโกลบิน คอนสแตนท์สปริง (Hb Constant Spring; Hb CS) และ α^{+}-thalassemia เป็นส่วนใหญ่ ทั้งนี้ ข้อมูลนี้ชี้ให้เห็นความจำเป็นในการจัดทำฐานข้อมูล และโครงการป้องกันและควบคุมโรคธาลัสซีเมียในภูมิภาคนี้

คำสำคัญ: *ภาวะเลือดจาง, การขาดธาตุเหล็ก, ธาลัสซีเมีย, ชนกลุ่มน้อย, เวียดนาม*

Introduction

Anemia is considered as a major public health problem in developing countries where the prevalence of anemia is as high as 50%. (World Health Organization, 2008) Three population groups namely pre-school children, pregnant women and reproductive-age women are at high risk. In Southeast Asia, World Health Organization (WHO) has estimated that the number of people affected by anemia was 315 millions in which 182 millions were reproductive age women. (World Health Organization, 2008; Balarajan et al., 2011) Causes of anemia include nutritional deficiency, thalassemia, and infectious disease.

Iron deficiency (ID) is considered to be one of the major factors contributed to anemia. Iron deficiency anemia (IDA) results in several unpleasant outcomes including impaired growth development for children, increased morbidity and mortality for pregnant women, and reduced work performance for all individuals. Without appropriate treatment and care, severe anemia and heart failure may be developed. (Andrew, 2009) The prevalence of IDA is considered to be high in all developing countries in the world. (Balarajan et al., 2011)

Amongst other causes of anemia, inherited disorders of hemoglobin, thalassemia and hemoglobinopathies, are of most important. The condition is caused by globin gene mutation which leads to a reduction in Hb synthesis within red blood cell (RBC). (Weatheral, & Clegg, 2001) Hence, carriers of thalassemia may have anemia with varying severity depending on types of abnormal genes inherited. The conditions are prevalent in countries of tropical regions, particularly Mediterranean basin and Southeast Asia. (William & Weatherall, 2012; Weatherall, 2010)

In Vietnam, the prevalence of anemia varies considerably depending on age groups and ethnicities. According to the Vietnam National Institute of Nutrition, prevalence of anemia among children under 5 years old, reproductive age women and pregnant women were 29.2%, 28.8%, 36.5% respectively. (Hop & Tuyen, 2010) A low rate of ID and IDA of less than 5% reported from women of reproductive age indicates that ID may be no longer the main cause of anemia within this population group. (Nguyen et al., 2015) Information about anemia in relation to thalassemia and ID among Vietnamese is limited, especially among the ethnic minorities.

In this study, we determined the prevalence of anemia in reproductive age women of an ethnic minority, the Ta-Oi. Iron deficiency and thalassemia among anemic women were also investigated. Results from this study provide evidence for building up intervention programs for anemia among the minorities.

Materials and Methods

A cross-sectional survey was conducted in A-Luoi mountainous district, Thuathien Hue province. A-Luoi mountainous district comprises 20 communes and one town. Most of people live in this area are minorities, mainly Ta-Oi and Co-Tu. Each minority lives separately in different communes. Catchment areas of this study included 8 communeswith high number of the Ta-Oi, .i.e. A Ngo, BắcSơn, HồngBắc, Hồng Kim, HồngThủy, HồngTrung, HồngVân, and Nhâm. Ethical approval was received from the Institution Review Board of both Thailand and Vietnam.

Apparently healthy women of reproductive-age (15-49 years old) of the Ta-oi ethnic minority were invited to enroll the project. The enrollment was voluntary. Informed consent was obtained from all participants. In case of age under 18 years, their guardians signed in assent form. Those who were currently having the confounding

conditions (i.e. acute or chronic disease, blood loss because of injury and/or surgery, taking iron supplementation or having the menstrual period) were excluded.

A sample size was calculated using the formula for estimating proportion in a finite population. Clustered sampling was used to recruit subjects. Firstly, 8 communes with highest number of Ta-Oi minorities were selected, then random sampling was used to recruit individual into the project. A total of 392 women enrolled.After obtaining consent and assent, demographic information and blood samples were collected by well-trained staff of the commune health center (CHC). Five milliliters (ml) of blood sample were taken from each participant. Hematological parameters were determining using an automated blood cell counter (Sysmex KX-21, Sysmex Co, Kobe, Japan). Anemia was diagnosed when hemoglobin level below 12.0 g/dl. (World Health Organization, 2008) Serum ferritin (SF) was measured using the Access Chemiluminescent Immunoassay Test Kit (Beckman Coulter Inc., CA, USA). Individual with SF<15 μg/ml was considered as getting iron deficiency. (World Health Organization, 2001) To exclude women with inflammation C-reactive protein (CRP) was determined using the particle immunoassay methodology (CRPH reagent kit Synchron System; Beckman Coulter). Range of CRP level from 0-8 mg/l was interpreted as no inflammation. Thalassemia and hemoglobinopathies were investigated using standard methods including hemoglobin and DNA analyses. (Brancaleoni et al., 2016)

Statistical analysis

Statistical analysis was performed using Microsoft office excel 2013 (Microsoft, USA) and Stata software version 12 (STATA Corp., TX, USA). Prevalence of anemia was presented as percentage and 95% confident interval (CI). Mean and standard deviation were used to describe hemoglobin and hematocrit levels among anemic women with various causes.

Results

Table 1 shows the social-demographic characteristics of participants in the study. The mean age of participants was 30.6 (S.D.=7.9). The majority of them were within 20-35 years. Approximately 3/4 had normal body mass index (BMI). The average BMI value of the total population was 20.8 (S.D.=2.5) kg/m^2. Underweight accounted for 16.6%. Most of participants was educated at high school level or lower with the main occupation of farmer. Most of them were in middle and low level of economy based on local government classification. More than 80% were married and had children less than two. Almost 40% reported either irregular or no menstruation.

The prevalence anemia among the study population was 9.9% (95% CI=7.2-13.3). Table 2 illustrates factors explaining anemia among the anemic women. A total of 35/39 were carriers of thalassemia; 30 (76.9%) had thalassemia and 5(12.8%) coincided with ID. Only one woman (2.6%) had ID solely. Cause of anemia in the remanding 3 cases were unknown. None of anemic women had inflammation as CRP level did not exceed 8 mg/l. Comparison of general characteristic of participants, i.e. age, occupation, education, economic, BMI, number of children, proportion of ID and hemoglobinopathies between anemic and non-anemic groups displayed no significant difference (data not shown).

Table 3 summarizes hemoglobin (Hb) and hematocrit (Hct) levels of anemic women categorized by the causes. All of them but one ID had mild anemia with average Hb level of 11.2 g/dl and Hct level of approximately 35%. Hb levels among thalassemia carriers coincident with ID did not differ from the carriers. However,

an IDA case had rather low Hb of 7.6 g/dl. The main types of thalassemia found among anemic participants included hemoglobin Constant Spring (Hb CS) a^{+}-thalassemia (a^{+}-thal) and hemoglobin E (Hb E). Complex interaction of these 3 form was found in several women (data not shown).

Discussion

Considering the Ta-Oi minorities live in remote area and had low to middle economic level with undergraduate background (Table 1), it is expected that anemia might be high. Surprisingly, we reported a rather low prevalence of anemia of 10% among the Ta-Oi reproductive age women. The finding indicates a low burden of health due to anemia in this group.Unlike this study, several investigators reported a high prevalence of anemia among Vietnamese reproductive-age women, ranging from 20% to 54%. (Hop & Tuyen, 2010; Casey et al., 2009; Pasricha et al., 2008; Nguyen et al., 2006; Trinh & Dibley, 2007) Even in pregnant women, a relatively higher prevalence of anemia of 19.3% has been reported. (Siridamrongvattana et al., 2013) The fact that Vietnam has implemented a Congenital Differences Project of Handicap International Organization among the minorities aiming at increasing folic acid intake for reducing number of disable children, this might somehow improve food consumption behavior among women of reproductive age. (Handicap International, 2013) As a result, the burden of anemia due to ID is also reduced, as confirmed by the low proportion of ID among anemic women.

Previous studies conducting in Thailand and Cambodia have shown that thalassemia and hemoglobinopathies, particularly for Hb E, are the main factors associated with anemia (Sanchaisuriya et al., 2016; Thurlow et al., 2005; Panomai et al., 2010; Wieringa et al., 2010; Karakochuk et al., 2015) Our study obtained the same result in that the proportion of thalassemia among anemic participants was high (Table 2). Unlike Thailand and Cambodia where Hb E is most common, it appears that Hb CS was responsible for anemia in this particular group. It is hypothesized that the prevalence of Hb CS in this population might be high. Similar to this study, a remarkably high occurrence of Hb CS was reported from the neighboring minority group, the Co-Tu (Nguyen et al., 2014) Anemia among the carrier of this thalassemic Hb might be explained by a low production of Hb within red blood cell (Weatherall & Clegg, 2001)

It should be noted that the severity of anemia among the study population was mild for all causes except one IDA case (Table 3). The findings did not differ from previous reports in that most of thalassemia carriers had mild anemia (Handicap International, 2013; Thurlow et al., 2005; Tungsuwansopin et al., 2014), and they need no treatment and care. For ID, anemia severity depends on the duration of negative iron balance, i.e. duration being deficiency as well as duration and amount of blood loss. (Andrew, 2009) A rather low Hb level in a case with IDA therefore reflects a long term negative balance in which appropriate treatment is needed. To prevent severe anemia among those carriers with ID, iron supplementation should also be considered. However, simple indicators for differentiation between these 2 conditions require further studies. In addition, cause of anemia among those with unknown cause needs elucidation.

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Table 1 General characteristics of the 392 participants

Characteristics	Number	Percent
Age (years)[a]		
15-19	37	9.4
20-35	244	62.2
36-49	111	28.3
Body mass index; BMI (kg/m^2)[b]		
< 18.5	65	16.6
18.5-24.9	302	77.0
> 25	25	6.4
Education		
Illiteracy	33	8.4
Primary school	82	20.9
Secondary school	94	24.0
High school	154	40.1
College/University	26	6.6
Occupation		
Farmer	291	74.2
Government service	44	11.2
Others (Labor/Seller/Housewife)	47	14.6
Economic level[c]		
Low (< 400,000 VND)	133	33.9
Middle (400,000-520,000 VND)	250	63.8
High (> 520,000 VND)	9	2.3
Marital status		
Yes	341	87.0
No	51	13.0
Number of children		
None	68	17.4
1-2	247	63.0
> 2	77	19.6
Menstruation		
None	23	5.9
Irregular	128	32.6
Regular[d]	241	61.5

a: mean±S.D.=30.6±7.9 years, b: mean±S.D.=20.8±2.5 kg/m^2, c: Using monthly income as indicator; classified by the local government, d: Having menstruation regularly (within 5 days)

Table 2 Proportion of iron deficiency and thalassemia among 39 women with anemia

Cause	Number	Percent
Thalassemia*	30	76.9
Thalassemia* with iron deficiency	5	12.8
Iron deficiency (ID)	1	2.6
Unknown	3	7.7
Total	**39**	**100**

*Including Hb CS, a+-thal, Hb E, and complex interaction of these 3 forms.

Table 3 Hemoglobin and hematocrit levelsamong anemic women with various causes

Cause (n)	Hb level (g/dl)	Hct (%)
Thalassemia (n = 30)	11.2±0.8	35.5±2.0
Thalassemia with ID (n = 5)	11.2±0.7	34.8±2.6
ID (1)	7.6	27.4
Unknown (3)	11.2±0.2	34.5±0.9