Anemia in Sakon Nakhon Province

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Abstract

The study of anemia in Sakon Nakhon province during the period of 1996-1997 was conducted by a multistage random sampling in a population aged 1-90 years in ten villages. The prevalence of anemia was 15.29 per cent (14.5 per cent in children under 15 years, 14.4 per cent between 15-60 years and 34.3 per cent in those over 60 years). The prevalence of anemia in males and females was not statistically different. The mean level of hematocrit and hemoglobin was 39.9 ± 4.6 per cent and 13.2 ± 1.4 g. per cent. About 28.3 per cent of the studied population had undernutrition. This finding showed that the nutritional status could be statistically linked to anemia, while parasitic infestation had no effect on the rate of anemia, most probably the worm load in the cases infected was rather low. Nutritional anemia and thalassemia are also common causes of anemia in Sakon Nakhon. Thus, we proposed that the public health programme should focus on preventive activities to reduce thalassemia hemoglobinopathy and the rate of undernutrition to solve the problem of anemia in Thailand.

Key word : Anemia, Thai Population, Sakon Nakhon Province

Anemia has long been recognised as a major medical problem affecting a considerable proportion of the world's population at all ages especially in developing countries including Thailand (1,2). The prevalence of anemia in different communities varies according to age, sex, residence, nutritional status, prevalence of thalassemia and hemoglobinpathies and parasitic infestation(3). The prevalence of anemia is highest in the northeast and lowest in the central parts of Thailand, 11.5 per cent of children in Bangkok whereas 12-14 per cent in rural areas, 15-40 per cent in male adults, 35-50 per

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cent in non pregnant women and the most common type of anemia found was iron deficiency[3-5]. According to the 8th National Developmental Plan (1997-2001); it was proposed that thalassemia is one of the urgent anemia problems in Thailand. Sakon Nakhon is a province in the northeastern part of Thailand which is prevalent for thalassemia and hemoglobinopathy[6-8]. The survey of the population in Sakon Nakhon in 1994, revealed that the prevalence of thalassemia and hemoglobinopathy reached about 70 per cent[9]. Thus it was timely that we conducted an analytic cross-sectional survey, covering both adult and child populations in Sakon Nakhon to determine the prevalence of anemia and its risk factors.

MATERIAL AND METHOD

During the period between October 1996 and June 1997, we studied the people in ten rural villages in Sakon Nakhon by multistage random sampling. An experienced nurse-technician collected venous blood from 837 subjects and recorded relevant data in the questionnaires. 2 ml of EDTA blood was drawn from each subject, 1 ml for complete blood count and the rest was sent in ice by bus to Bangkok where it was examined for hemoglobin typing on the following day. Hemoglobin examinations were carried out by the standard method. Hemoglobin concentration was measured by the Cyanmethemoglobin method. The packed red cell volume was determined by a microhematocrit method. Hemoglobin typing was performed by starch gel electrophoresis in tris-borate EDTA buffer, pH 8.6 and stained with orthodianisidine[10]. Hemoglobin A_2 was quantitated by microcolumn chromatography.

Data about age, sex, occupation, family income, height and weight were recorded on all subjects. Adult nutritional status was assessed by body mass index (BMI) or Quetelet's index, computed from weight (kg) divided by height^2 (meter^2). The normal range of body mass index was 20 to 25 kg/m^2 (WHO, 1985)[11]. Child nutritional status was defined according to the growth curve of Thai children by Chavalittamrong[12].

Data Analysis

Data was analysed by use of spss/pc+, Epi Info program[13]. Anemia was defined according to WHO criteria, the level of hematocrit lower than 33 per cent in children aged 3 months to 4 years and pregnant woman, the level of hematocrit lower than 36 per cent in children over the age of 4 years and adult females, and lower than 39 per cent in adult males[14]. Descriptive study was used to determine the prevalence of anemia and risk factors.

RESULTS

The surveyed population consisted of 837 subjects, 294 males and 543 females. Their ages ranged from 1-90 years, with an average age of 27.77 years old. 344 subjects were under the age of 15 years, 458 subjects were between the age of 15 and 60 years and 35 subjects were over the age of 60. Table 1 shows the prevalence rate of anemia, mean hematocrit, mean hemoglobin in the different age

Table 1. The hemoglobin (g/dl), hematcrit (%) and prevalence rate of anemia at Sakon Nakhon province in different age group.

Age group (years)	Male	Female	Total cases	Total anemic cases	Prevalence rate (%)	Hb (g/dl)		Hematocrit (%)	
						X±SD	Range	X±SD	Range
<15	150 (22*)	194 (28*)	344	50	14.5	12.9±1.3	6.6-16.1	38.7±4.2	20.6-48.5
15-60	135 (16*)	323 (50*)	458	66	14.4	13.9±1.4	8.0-17.1	40.9±4.3	23.7-51.3
>60	9 (5*)	26 (7*)	35	12	34.3	11.3±1.1	7.8-13.5	34.4±3.8	22.8-4.07
All	294 (50*)	543 (78*)	837	128	15.29	13.2±1.4	6.6-17.1	39.3±4.6	20.6-51.3

(*) = Anemic cases

Table 2. Type of hemoglobin and anemia.

Designation (%)	Total subjects	Anemic subjects	Per cent
Normal (AA_2)	386	25	6.5
Hb E trait	332	54*	16.3
Homozygous Hb E	83	29*	34.9
ß-thalassemia trait	14	3	21.4
ß-thalassemia/HbE disease	5	5*	100
Homozygous ß-thalassemia	3	3*	100
α-thalassemic diseases**	14	9*	64.3

* Statistically significant difference from normal Hb. (P<0.001)
** Hb H disease, Hb H with CS, Hb CS, AE bart's disease

groups. The mean level of hematocrit and hemoglobin was 39.3 ± 4.6 v% and 13.2 ±1.4 g% respectively and the lowest level was in the group of subjects over 60 years (34.4 ± 3.8 v% and 11.3 ± 1.1 g%). The overall prevalence rate of anemia was 15.29 per cent and increased with advancing age over 60 years (34.3%). According to WHO criteria for anemia, there were 128 anemic subjects, 50 males and 78 females. There was no statistically different prevalence of anemia between the two groups.

A total of 837 blood samples studied by starch gel electrophoresis for hemoglobin analysis revealed 386 subjects with normal hemoglobin (AA_2), 332 subjects with Hb E trait, 83 subjects with homozygous Hb E, 14 subjects with ß-thalassemia trait, 5 subjects with ß-thalassemia/Hb E disease, 3 subjects with homozygous ß thalassemia, 14 subjects with α-thalassemic diseases (Hb H disease, Hb H with CS, HbCS, AE Bart's disease), (Table 2). Among 128 anemic subjects, there were 25 subjects (19.5%) with normal hemoglobin, 54 subjects, (42.2%) with Hb E trait, 29 subjects (22.6%) with homozygous Hb E, 3 subjects (2.3%) with ß-thalassemia trait, 5 subjects (3.9%) with ß-thalassemia/Hb E disease, 3 subjects (2.3%) with homozygous ß-thalassemia disease and 9 subjects (7.0%) with α-thalassemia. Of these 128 anemic subjects, 103 subjects (80.5%) had abnormal hemoglobin types.

Fig. 1 shows mean hemoglobin and hematocrit level in subjects with different hemoglobin types. The mean hemoglobin and hematocrit level were lowest in homozygous ß-thalassemia and ß-thalassemia /Hb E disease.

Table 3 shows the relationship of anemia and nutritional status. There were 237 subjects (28.3%) with undernutrition while 600 subjects (71.7%) had normal nutrition. Out of 237 subjects with undernutrition, 55 subjects (23.22%) had anemia. Out of 600 normal subjects, 84 subjects (14%) had anemia. By chisquare test, the prevalence of anemia in the undernutrition group was significantly higher than the prevalence of anemia in the normal nutrition group ($p < 0.05$)

Stool examination was performed on 742 subjects. 45 subjects (6.1%) had parasitic infestation and 6 cases of these had anemia. Strongyloides is the most common parasite (48.9%) in this area and the other parasites were hook worm (17.8%), *Taenia* spp. (15.5%), *Opisthorchis viverrini* (11.1%) and ascaris (6.7%). Fig. 2 shows mean hemoglobin and hematocrit levels in subjects with and without different parasitic infestation. By statistical analysis, gastrointestinal parasitic infection had no effect on the occurrence of anemia ($p > 0.05$).

DISCUSSION

There has been wide variation in the prevalence of anemia, studied in Thailand. The classic study, Wasi P, et al[15] reported anemia among 4,378 adults from 13 provinces of Thailand revealing that the prevalence of anemia varied from 11 per cent in Saraburi to 89 per cent in an Ubon village. Valyaseri A, et al (1972)[16] studied anemia in pregnant women, in Bangkok and Ubon Ratchathani, and showed that 31 and 39 per cent of pregnant women in Bangkok and Ubon had anemia. Sanchaisuriya P, et al (1991)[17] studied the prevalence of anemia in non-pregnant women of child bearing age (15-39 years) from 20 villages in Maha Sarakham province. The results revealed that the prevalence of anemia was 22 per cent. Sirijarachai C, et al (1991)[18] conducted a community survey in Khon Kaen province,

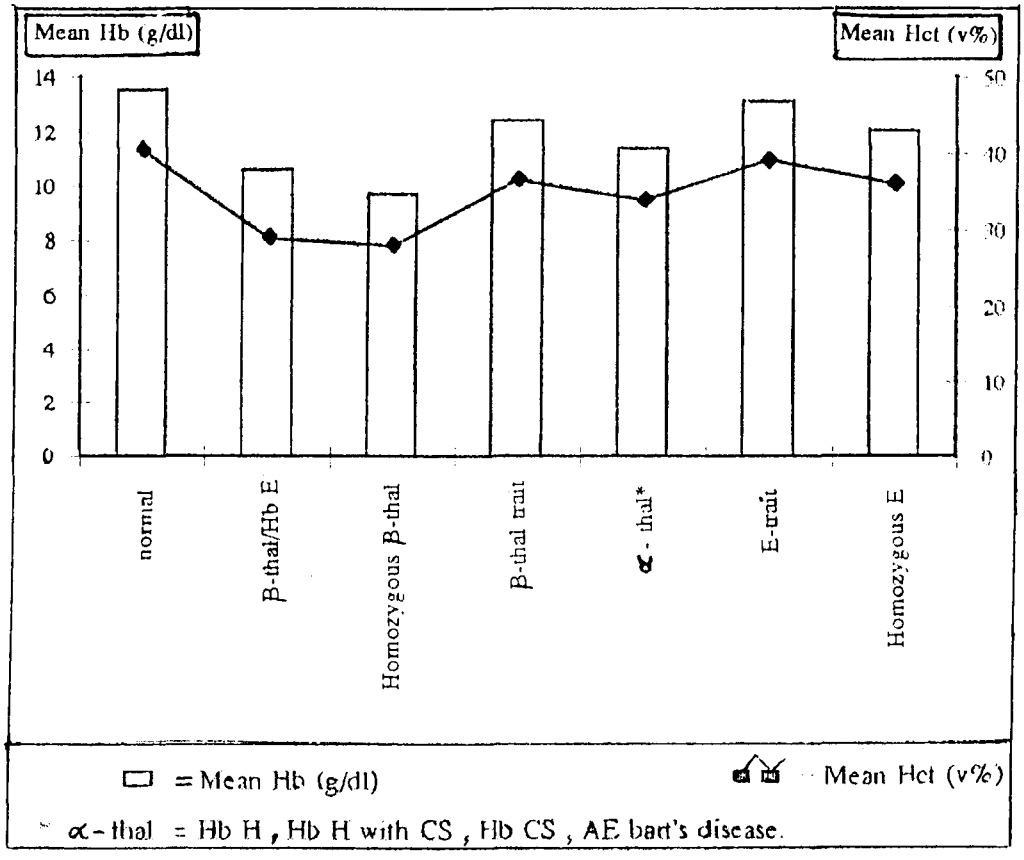

Fig. 1. Comparison of mean hemoglobin and hematocrit between normal subjects and thalassemia.

Table 3. Nutritional status and anemia.

Subjects	Normal nutrition	Undernutrition	Total
Normal subjects	516	182	698
Anemic subjects	84	55*	139
Total	600	287	837

* Statistically significant P<0.05

the prevalence of anemia in a population aged 30-65 years was 22 per cent. According to various surveys of adults in Thailand, the prevalence of anemia in adults was estimated at about 20-25 per cent[5, 15,18]. The prevalence of anemia was highest in the northeast and lowest in the central parts of Thailand, and the most common type of anemia found was iron deficiency[5,15,19,20].

A considerable approach to subjects aged 1-90 years investigated in this study had anemia, malnutrition, hemoglobinopathy and various infected intestinal parasites. In our study, the overall prevalence of anemia (15.29%) was relatively low compared with other studies and increased with advancing age (over 60 years) by inadequate intake due to dental problems and decreased appetite.

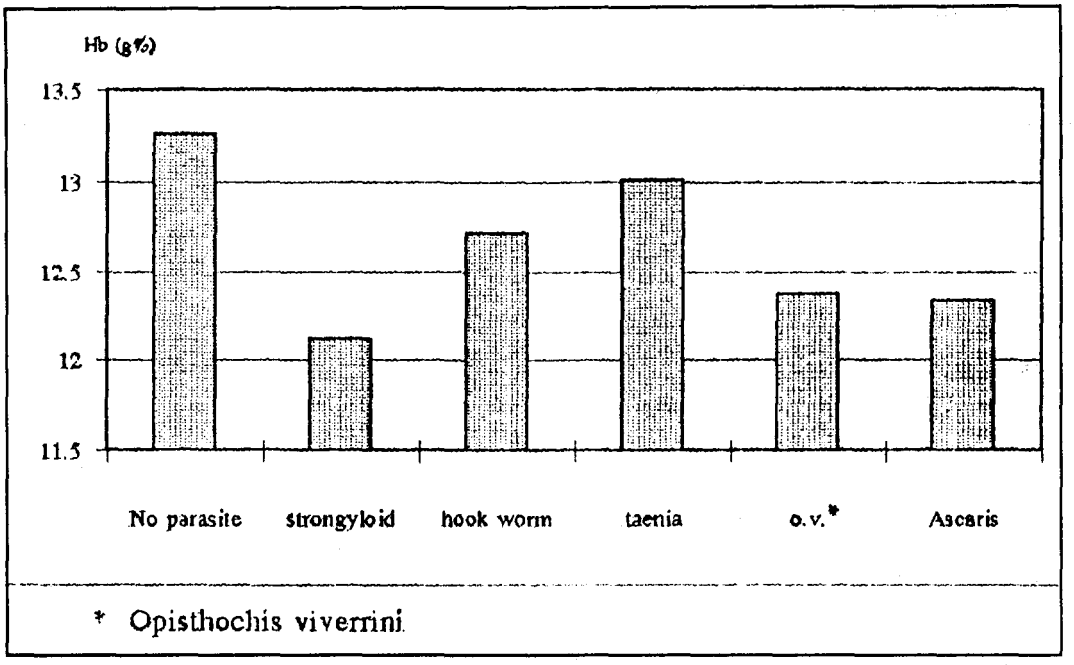

Fig. 2. Comparison of mean hemoglobin among subjects infected with various parasites.

Ningsanon W[21] revealed that the prevalence of anemia in children both preschool and school aged in Thailand was about 12-14 per cent, 11.5 per cent in Bangkok. The relatively high prevalence of anemia in those under 15 years in this study (14.5%) is in agreement with other studies undertaken in Thailand. Obviously, nutritional status of the population affects the prevalence of anemia. The most common cause of nutritional anemia is considered to be iron deficiency due to inadequate intake or blood loss[3,20,22]. In Northeast Thailand it might be caused by low iron content in local food, low absorption of iron due to high phytate intake, low protein intake, hook worm infection which was found in up to 40 per cent of the population. In this study, parasitic infections with other helminth had no effect on the occurrence of anemia, the same result as studied in Maha Sarakham province by Sanchaisuriya P[17]. According to the sixth and seventh national developmental health plan, it recommended that over 80 per cent of Thai students must be administered antiparasitic drugs twice a year, so most probably the worm load in subjects infected was rather low. The other common type of anemia in the Northeast was thalassemia hemoglobinopathy. Chan-ngam P, et al (1994)[9] studied the prevalence of thalassemia in Sakon Nakhon province during the period of 1994-1995. The results revealed that the prevalence of homozygous ß-thalassemia, ß-thalassemia trait, ß-thalassemia/ Hb E, AE Bart's disease, homozygous Hb E and hemoglobin E trait was 0.24 per cent, 1.43 per cent, 0.83 per cent, 0.95 per cent, 9.99 per cent and 39.59 per cent respectively. The gene frequency of ß-thalassemia was 0.014 while that of Hb E, 0.367, is one of the highest among the Thai population. The prevalence of α-thalassemia was studied by identifying Hb Bart's in cord blood specimens, 28.97 per cent of newborns were shown to have Hb Bart's in cord blood which is the highest prevalence among the Thai population in the northeastern part[9]. In this study, there were more anemic subjects among those with thalassemia or abnormal hemoglobin genes so we think that an adequate nutritional supplementation and thalassemia control program will play a role in solving the problem of anemia in Sakon Nakhon.

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ภาวะโลหิตจางในจังหวัดสกลนคร

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การศึกษาภาวะโลหิตจางในจังหวัดสกลนคร ระหว่างปี 2539 - 2540 โดยการสุ่มตัวอย่างโดยวิธี Multistage random sampling ในประชาชน 10 หมู่บ้าน อายุตั้งแต่ 1 ปี -90 ปี ผลการศึกษาพบว่าความชุกของภาวะโลหิตจางเท่ากับร้อยละ 15.29 (ในเด็กอายุต่ำกว่า 15 ปี ร้อยละ 14.5 ในคนอายุ 15-60 ปี ร้อยละ 14.4 และในผู้สูงอายุมากกว่า 60 ปี ร้อยละ 34.3) ความชุกของภาวะโลหิตจางในเพศชายและหญิงไม่มีความแตกต่างกันทางสถิติ ค่าเฉลี่ยฮีมาโตคริตของประชาชนทั้งหมด คือ 39.3 $\pm$ 4.6% และค่าเฉลี่ยฮีโมโกลบิน คือ 13.2 $\pm$ 1.4 กรัม/ดล ประมาณร้อยละ 28.3 ของประชาชนที่ทำการศึกษาพบว่ามีภาวะทุพโภชนาการ ซึ่งมีความสัมพันธ์กับภาวะโลหิตจางทางสถิติอย่างชัดเจน แต่พบว่าการติดเชื้อหนอนพยาธิ ของประชาชนไม่มีผลต่อความชุกของภาวะโลหิตจาง อาจจะเนื่องมาจากจำนวนหนอนพยาธิที่ติดมีไม่มากพอ จากการศึกษานี้พบว่าภาวะโลหิตจางจากการขาดสารอาหาร และธาลัสซีเมียหรือฮีโมโกลบินผิดปกติ เป็นสาเหตุที่พบมากของจังหวัดสกลนคร ดังนั้นโปรแกรมการพัฒนาสาธารณสุข ควรจะมีจุดมุ่งหมายไปในการวางมาตรการการป้องกันเพื่อลดปริมาณ โรคธาลัสซีเมีย, ฮีโมโกลบินผิดปกติ และลดปริมาณการเกิดโรคขาดสารอาหาร ซึ่งจะเป็นวิธีแก้ปัญหาโรคโลหิตจางที่สำคัญในประเทศไทยต่อไป

คำสำคัญ : ภาวะโลหิตจาง, จังหวัดสกลนคร

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