Migration Experience of Pregnant Women and Iodine Deficiency Disorder in Newborns in Nan Province, Thailand

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Introduction

For internal migration, rural to urban flows in Japan, Philippines and Thailand are mainly female, while flows in the Republic of Korea and Indonesia are slightly majority female. Rural to urban migration in South Asian countries are still majority male, although female participation is increasing (The United Nations Economic and Social Commission for Asia and the Pacific - UNESCAP, 1995). Obviously, in Thailand, migrants are greatly concentrated on the young females as evidenced in rural to urban migration streams (Guest, 2003). Women migrate in response to opportunities and constraints. Structural factors include the demand for female labour in industrial and service sector occupations, which is determined by trends such as the relocation of light industries to Asian regions (Jolly, 2003; Lim, 1993).

Various reports and studies stated migration episode of an individual's life as one of the most important determinants influencing of health (International Organization for Migration - IOM, 2003 and 2005; Prothero, 2001; Jolly, 2003; Biao, 2004). In this regard, it should be noted that migration is not only the number of people moving into or out of an area but migration is also a mechanism of change, especially health and well-being because migration leads migrants to live in a new environment, which is, in many ways, different from the one they come from (Liamputtong, 2003; IOM, 2003 and 2005). As all sorts of migration represent a significant alteration in an individual's life, it can mark an impact on health. In other words, this argument initiates from the concept that migration causes socio-economic, environmental and cultural change in migrants' lives that can be either beneficial or detrimental for their health. If

migration, on the one hand, creates advantages to migrants' lives it is expected to have some positive results on their health. On the other hand, if it adds hazards it is considered to cause negative health consequences. Thus, migration health is a critical issue for policymakers that should consider in the public policies to reduce the social and economic costs of burdens in the health problem of migrants (IOM, 2005).

From the argument stated above, both positive and negative relation between migration and health can be drawn. If migration brings economic, educational, job and income opportunities for migrants, it can be predicted to improve their health condition because it is considered as human capital. In worldwide, two groups: temporary migrants and female migrants, are always seen as the most vulnerable groups in terms of health, and Thailand is no exception. When comparing by gender, women are often employed in sectors of the economy vulnerable to exploitation. Migration's positive potential is hampered by discrimination and lack of access to resources. Many previous studies found that migrants are often subject to environmental deterioration and health risk behavior, which certainly can have a detrimental effect on health (Jolly, 2003; Biao, 2004). Particularly, pregnant women who should maintain not only their health but their fetal health as well are also risked from various factors both environments and self management. Food consumption behaviors of pregnant women have direct effect on newborn's health, especially food which are rich of iodine substance such as sea food or food cooked with iodized salt are essentially needed, the better nutritional status of mothers, the better good health of the newborns. Moreover, migration may be seasonal from rural to urban area, according to demands for agricultural labour in sending or receiving areas. People may migrate repeatedly for short periods, typically in societies in transition, but also due to customs such as young women leaving home for marriage, and returning to parental home for childbirth and early childcare (Chant, 1992).

Iodine deficiency disorders (IDD) jeopardize children's both physical and mental health. Serious iodine deficiency during pregnancy may result in newborn health such as stillbirths, abortions and congenital abnormalities (e.g. cretinism, a grave, irreversible form of mental retardation) that affect people living in iodine-deficient areas of Africa and Asia (World Health Organization - WHO, 2000). However, of far

greater global and economic significance is IDD's less visible, yet more pervasive, level of mental impairment that lowers intellectual prowess at home, at school and at work (Hetzel and Pandav, 1996). In the past, the likely occurrence of IDD in a given region was regarded as being signalled by certain geographical characteristics. These include mountain ranges and alluvial plains, particularly at high altitude and at considerable distance from the sea. This occurrence is confirmed by a high prevalence of goitre in the resident population. However, the greater availability of urinary iodine estimation and other methods for assessing iodine deficiency has demonstrated that IDD can and do occur in many areas where none of these conditions are met. Indeed, significant iodine deficiency has been found: 1) where the prevalence of goitre, as based on palpation, is normal; 2) in coastal areas; 3) in large cities; 4) in highly developed countries; and 5) where IDD have been considered to have been eliminated, either by prophylactic programmes or general dietary changes (WHO, International Council for the Control of Iodine Deficiency Disorders - ICCIDD, and United Nations Children's Fund - UNICEF, 1996). Nutrient needs are determined, at least in part, by the stage of gestation, in that the amount of fetal growth varies during the different stages of pregnancy (Lowdermilk and Perry, 2004). For daily need of iodine, several international groups have made recommendations, which are fairly similar. WHO, ICCIDD, and UNICEF recommended the following daily amounts 200-220 microgram in pregnant women (WHO, ICCIDD, UNICEF, 1996). That the pregnant women need iodine more than other groups is because they have to transfer iodine to developing brain of the fetus. Although daily need of iodine in pregnant women is not so much more, the iodine intake, however, is needed everyday for referring to their fetus. If iodine intake is insufficient it leads to let newborn facing iodine deficiency disorder. Therefore, pregnant women should consume iodine through two main approaches in order to preventing of IDD, food fortification and supplementation.

In Thailand, iodine deficiency disorder had been considered as one of the most important problems in public health since 1963 that all governments have concerned and set the strategies in the national agenda for dealing with this problem. According to the statistics of public health, it is found that the percentages of Thai pregnant women who have iodine deficiency, measured by Thyroid Stimulating

Hormone (TSH) in newborn blood, were 35.4, 45.1, 47.0, 44.5 and 49.4 percent during 2000-2004, respectively. These prevalences tend to increase while the percentages of iodized salt consumption in household were declining as 76, 74.6, 80.2, 63.5 and 59.2 percent during 2000-2004, respectively (Nutrition Division, Department of Health, the Ministry of Public Health, 2005).

Health of pregnant women is closely related to newborn's health. Anaemia and iodine deficiencies top the list (United Nations, 2005). Previous studies about pregnant migrants and newborn health were very rarely or limited. Jolly (2003) mentioned that women are generally disadvantaged throughout the migration process. In China, female migrants are mainly young. Migrants' reproductive health status of women was worse than that of the general women's. For example, female migrant workers in Shanghai were becoming pregnant unintentionally due to even more liberal in their lifestyle than the local women, and they started their pregnancy checks later, check less frequently, and were more prone to premature delivery, stillbirth, and giving low birth weight babies when compared to women who are permanent residents (Biao, 2004).

In Thailand, the migration steam mainly found in women from rural to urban areas, especially in Bangkok and the big city. However, the studies about migrant pregnant women are very few, and studies with respect to the association between pregnant migration exposure and iodine deficiency disorder in newborns are never carried out. This study attempts to examine the association between migration experience of pregnant women and their newborn's health emphasizing in iodine deficiency disorder (IDD) in newborns, comparing with non-migrant pregnant women. Research on migration and health cannot be complete unless the non-migrant group is taken into account. As non-migrant pregnant women may have different characteristics than migrant pregnant women, it may be reasonable to further argue that IDD in newborns of migrant and non-migrant pregnant women are likely to differ. The findings will provide the knowledge base for policy implications to promote the appropriate strategies for enhancing the quality of pregnancy related to iodine deficiency prevention among Thai women, especially those who have migration experience.

Research Question

Does migration experience have any effect on the iodine deficiency disorder in newborns of migrant pregnant women compared to non-migrant pregnant women?

Objective of this study

1. To assess the incidence of iodine deficiency disorder in newborn of migrant pregnant women examined in contrast with the non-migrant pregnant women.
2. To examine the association between migration experience of pregnant women and iodine deficiency disorder in newborns, controlling with socio-demographic and economic characteristics, and mediating with iodine-supplemented consumption.

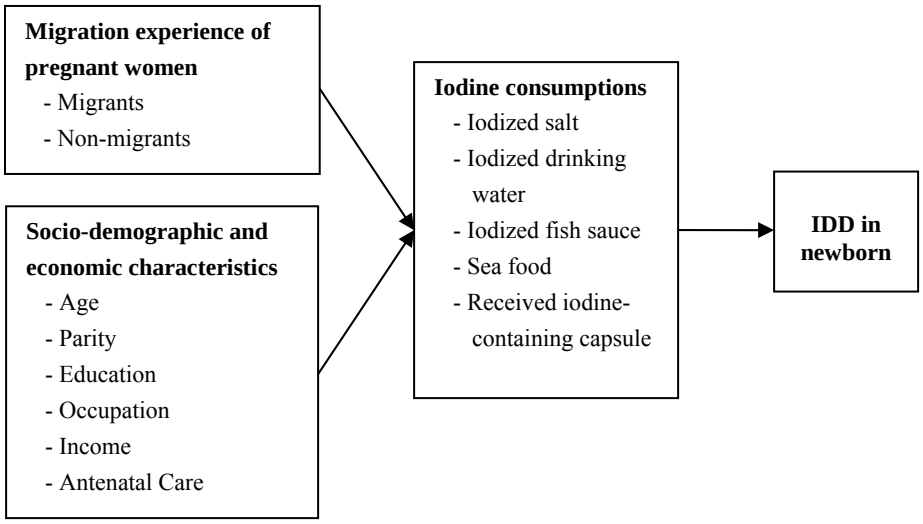
Conceptual Framework

According to the literature reviews related to pregnant women's migration and health, particularly iodine deficiency of both mothers and newborns, it can be found that many factors related to the outcome of pregnancy in case of iodine deficiency disorder (IDD) in newborns. Migration may lead the different outcome of newborn's health; however, socio-demographic and economic statuses of pregnant women are also yielding the difference of both mother's health and newborn's health. Obviously, the important factors that let pregnant women receive sufficient iodine intake in daily life are the consumption behaviors in iodine-rich food or iodine-containing supplements such as sea food, iodized salt, iodized drinking water, including iodine solution in form of iodine drug capsule. All of these factors mentioned above associate with IDD in newborn as shown in figure below.

As mentioned, the outcome variable, IDD level in newborn of migrants' and non-migrants' pregnant women is measured by Thyroid Stimulating Hormone (TSH) in newborn blood. The focus of this research is to understand whether there is any IDD in

newborn disparity between migrants and their non-migrant counterparts at the place of origin.

The causal models contain intervening proximate determinants. Iodine supplement consumption behaviors for preventing IDD are treated as proximate determinants that will sketch the mechanism through which migration characteristics, socio-demographic and economic factors affect IDD in newborns.



Methodology

Data sources

The data employed for this study were obtained from the Survey of Preventive Behaviours for Iodine Deficiency Disorder of Pregnant Women in Nan province, Thailand, funded by the Volunteer Doctors of the Princess Srinakarindhra Foundation that conducted from January to May 2002. Data were collected by stratified random sampling with proportional to size of pregnant women in each hospital. Samples consisted of 400 pregnant women who gave birth in the 13 community

hospitals by using questionnaire and the laboratory results of Thyroid Stimulating Hormone (TSH) of newborn blood measured by immunoradiometric assay. The questionnaire was assessed content validity by experts, and the alpha cronbach reliability of the questionnaire with respect to preventive iodine deficiency behaviors was 0.77.

Operational variables

Dependent variable: Iodine deficiency disorder (IDD) in newborn is defined by using Thyroid Stimulating Hormone (TSH) level in newborn blood, using criteria of ICCIDD and WHO (1994), and categorized into 2 groups: 1) having IDD in newborn (TSH > 5 mIU/L) coded = 1, and 2) not having IDD in newborn (TSH ≤ 5 mIU/L) coded = 0.

Independent variables: classified into three groups:

Migration experience is defined basing on the question of numbers and places of ante natal care (ANC) utilization during pregnancy, confirming in the ANC record that help us know about the time period of migration exposure. Migration experience is determined as pregnant women stayed in the other provinces more than 6 months, and is classified into two groups: non-migrant coded = 0 and migrant coded = 1. However, migrant pregnant women are captured only those who utilized ANC in other provinces and came back for delivery in Nan province.

Socio-demographic and economic characteristics: ages, parity, education, occupation, income, and number of antenatal care.

Iodine-supplemented consumption: there are five categories of the importantly iodine-supplemented consumption: 1) iodized salt, obtained from the question "Do you use iodized salt when you are cooking" 2) iodized drinking water, gained from the question "Do you drink the iodized drinking water" 3) iodized fish sauce, obtained from the question "Do you use iodized fish source when you are cooking" 4) sea food, obtained from the question "Do you eat sea food such as sea fish, shrimp, or squid" and 5) iodine-containing capsule, gained from the question "Do you receive iodine-containing drug capsule during pregnancy". Each question had three

response categories: never, occasionally, and regularly by giving scores 0, 1, and 2, respectively. For receiving iodine-containing capsule, it was categorized into two groups: 0 = not receiving and 1 = receiving.

Data analysis

There are many variables that are related to both pregnant women's migration and iodine deficiency (IDD) in newborns. The factors controlled in the analysis include demographic and socioeconomic characteristics, and mediating with iodine-supplemented consumption. To analyze the relationship of pregnant women's migration and IDD in newborns, logistic regression models are increasingly applied. In this study, binary logistic regression will be employed to analyze impact of independent variables on dependent variable (IDD in newborn).

Results

1. Demographic and socioeconomic characteristics of respondents

The demographic and economic characteristics of the samples were shown in Table 1. From 400 pregnant women, more than one-fourth had migration experience during pregnancy (29%). Mean age most migrant pregnant women was slightly lower than those of non-pregnant migrants (24 years compared to 26 years), Teenage pregnancy (age lower than 20 years) of migrants was higher than non-migrant women (31% and 17%). For education, half of migrant pregnant women completed in secondary school, followed by primary school (50% and 42%, respectively) whereas 48% and 36% of non-migrant pregnant women completed primary school and secondary school, respectively. For occupation, a majority of migrant pregnant women (63%) were working as employee while about half (51%) of non-migrant pregnant women work in agricultural sector. About 70% of both migrant and non-migrant pregnant women had income range of 1,000-4,000 bahts per month. More than half (57%) of migrant pregnant women were the first parity whereas those of non-migrant

pregnant women were second and first parities (43% and 40%, respectively). Based on the standard of ANC established by the Ministry of Public Health, 4 times of ANC during the period of pregnancy were on: 1) less than 28 weeks, 2) 29-32 week, 3) 33-36 weeks, and 4) 37 weeks and above. Data showed that about one-fourth (25%) of migrant pregnant women used the ANC services less than 4 times, and only 19% of non-migrant pregnant women used the ANC services less than 4 times.

Table 1: Percentage distribution of migrant and non-migrant pregnant women classified by socio-demographic characteristics (n = 400)

Variable	Pregnant women migration status			
	Migrant		Non-migrant	
	n	%	n	%
Migration experience	115	28.8	285	71.2
Age				
Lower than 20 years	36	31.3	48	16.8
20-29 years	62	53.9	172	60.4
30 years and over	17	14.8	65	22.8
Total	**115**	**100.0**	**285**	**100.0**
	Mean=24, Max=40, Min=16		Mean=26, Max=42, Min=14	
Education				
No education	3	2.6	12	4.2
Primary school	48	41.7	137	48.1
Secondary school	58	50.4	102	35.8
Higher than secondary	6	5.2	34	11.9
Total	**115**	**100.0**	**285**	**100.0**
Occupation				
Agriculture	27	23.5	146	51.2
Employees	72	62.6	45	15.8
Commercial	2	1.7	21	7.4
Housewife	9	7.9	49	17.2
Government officer	5	4.3	24	8.4
Total	**115**	**100.0**	**285**	**100.0**

Table 1: (Continued)

Variable	Pregnant women migration status			
	Migrant		Non-migrant	
	n	%	n	%
Incomes (per month)				
1,000-2,000 baht	39	33.9	123	43.2
2,001-4,000 baht	43	37.4	87	30.5
4,001-6000 baht	22	19.1	37	13.0
6001 baht and over	11	9.6	38	13.3
Total	**115**	**100.0**	**285**	**100.0**
Parity				
First	66	57.4	116	40.7
Second	33	28.7	124	43.5
Third and above	16	13.9	45	15.8
Total	**115**	**100.0**	**285**	**100.0**
Antenatal care utilization				
Less than 4 times	29	25.2	55	19.3
More than 4 times	86	74.8	230	80.7
Total	**115**	**100.0**	**285**	**100.0**

2. Iodine-supplemented consumption and iodine deficiency disorder in newborn

Table 2 illustrated of the levels of iodine-supplemented consumption of pregnant women consisted of iodized salt, iodized fish sauce, iodized drinking water and sea food, included receiving iodine-containing drug capsule which contains iodine 200 mg. It was found that iodized salt was the iodine-supplemented substance that pregnant women were more preferable to use regularly compared to others. More than half (53%) of non-migrant pregnant women regularly consumed iodized salt, while about one-third (32%) of migrant pregnant women did. Few pregnant women regularly use iodized drinking water and iodized fish sauce. However, migrant pregnant women regularly consumed iodized drinking water less than non-migrant pregnant women, whereas both groups consumed at a similar lever for iodized fish sauce. Percentage of migrant pregnant women were regularly consuming sea food was slightly higher than

non-migrant pregnant women. The migrant pregnant women consumed iodine-containing capsule (39%) less than non-migrant pregnant women (49%). It was found that about 61% of migrant pregnant women did not receive iodine-containing capsule from health service facilities during pregnancy while about half of non-migrant pregnant women did not get it. When compared the iodine deficiency in newborns defined by Thyroid Stimulating Hormone (TSH) testing in newborn blood over 5 mIU/L (ICCIDD, 1994), it was found that iodine deficiency disorder (IDD) in newborns of migrant pregnant women were higher than those of non-migrant pregnant women (48% and 37%, respectively).

Table 2: Percentage distribution of migrant and non-migrant pregnant women by the levels of iodine-supplemented consumptions and IDD in newborns (n = 400)

Variable	Pregnant women migration status			
	Migrant		Non-migrant	
	n	%	n	%
Iodine-supplemented consumption				
Iodized salt				
Never	37	32.2	42	14.7
Occasionally	41	35.7	91	31.9
Regularly	37	32.2	152	53.3
Total	**115**	**100.0**	**285**	**100.0**
Iodized drinking water				
Never	68	59.1	67	23.5
Occasionally	37	32.2	146	51.2
Regularly	11	8.7	72	25.3
Total	**115**	**100.0**	**285**	**100.0**
Iodized fish source				
Never	57	49.6	134	47.0
Occasionally	50	43.5	129	45.3
Regularly	8	7.0	22	7.7
Total	**115**	**100.0**	**285**	**100.0**
Sea food				
Never	18	15.7	46	16.1
Occasionally	46	40.0	128	44.9
Regularly	51	44.3	111	38.9
Total	**115**	**100.0**	**285**	**100.0**

Table 2: (Continued)

Variable	Pregnant women migration status			
	Migrant		Non-migrant	
	n	%	n	%
Receiving iodine capsule				
No	70	60.9	145	50.9
Yes	45	39.1	140	49.1
Total	**115**	**100.0**	**285**	**100.0**
Iodine deficiency disorder in newborns				
No	60	52.2	181	63.5
Yes	55	47.8	104	36.5
Total	**115**	**100.0**	**285**	**100.0**

3. Multivariate analysis

To analyze the relationship between pregnant women's migration and iodine deficiency (IDD) in newborns, it is necessary to control for potentially confounding factors. The factors controlled in the analysis include demographic and socioeconomic status, and iodine-supplemented consumption. To estimate the net effect of pregnant women's migration on iodine deficiency (IDD) in newborns, logistic regression models were needed.

As the outcome variable is dichotomous in nature, binary logistic regression seems to be the most appropriate method. The method is used to model the odds of measuring IDD in newborns versus not having IDD in newborns. Three logistic regression models were presented in Table 3 for predicting IDD in newborns. The first model, which only included migration status of pregnant women to test a relationship between pregnant women's migration and iodine deficiency (IDD) in newborns. The second model was used to test the influence of individual demographic and socioeconomic characteristics (such as age, parity, education, occupation, income and antenatal care) and the IDD in newborns. The third model tested whether preventive behaviors of pregnant women through iodine-supplemented consumption such as iodized salt, iodized drinking water, iodized fish sauce, sea food, or received iodine capsule affecting on the IDD in newborns.

The first model showed that there was a statistically significant association between pregnant women's migration and IDD in newborns. The migrant pregnant women had 1.6 times more likely to affect IDD in newborns compared to non-migrant pregnant women.

The second model, demographic and socioeconomic factors were added to the first model. The statistically significant relationship between pregnant women's migration status and IDD in newborns still appeared. Education and incomes of pregnant women were also significantly affected the IDD in newborns at 99% confidence interval.

For the third model, preventive behaviors of IDD in newborns by consuming iodine-supplemented substances such as iodized salt, iodized drinking water, iodized fish sauce, and sea food, including iodine-containing capsule were added. After controlling for demographic, socioeconomic and behaviors of iodine-supplemented consumption, the effect of pregnant women's migration and IDD in newborns was less statistically significant at 90% confidence interval. Whereas education and incomes were still significantly affected the IDD in newborns at 99% confidence interval. Interestingly, iodized salt consumption, and received iodine-containing drug capsule of pregnant women were highly significant affected on the IDD in newborns at 99.99% confidence interval.

The results from these three models showed that migration experience affected on IDD in newborns in the first model, but after control for demographic and socioeconomic variables the effect was not strong. However, when included the behavior of iodine-supplemented consumption into the model, it did not highly significant affected on IDD in newborns. This meant that migration might not directly effect on IDD in newborns when controlling the preventive behavior of iodine-supplemented consumption. This finding implied that there was a positive relationship between migrant exposure of pregnant women and IDD in newborns although the effect was not as strong as education, income, and iodine-supplemented consumption.

Comparing within the groups, results showed that pregnant women who had no education and completed primary school had more chance in terms of odd ratios to have IDD in newborns compared to those who had higher education, and the odds of IDD in newborns were 17 times and 7 time more likely than those who completed more than secondary school. Similar to education attainment, the likelihood of IDD in

newborns was also found in the poor pregnant women. The odds of IDD in newborns for pregnant women who earned income of 1,000-2,000 bahts a month were 4 times higher than those who received income 6,001 bahts and over. It was noted that the pregnant women having lower economic status were more likely to face IDD in their newborns than those who had higher economic status.

In case of iodine-supplemented consumptions, iodized salt consumption was distinctly strong for predicting the IDD in newborns. The odds of IDD in newborns for pregnant women who never and occasionally consumed iodized salt were 4 times and 2 times more likely than those who were regularly consumed iodized salt in daily life. Regarding pregnant women receiving iodine-containing capsule, the odd of IDD in newborns for those did not receive iodine-containing capsule during pregnancy was nearly 4 times higher. It is indicated that sufficiently iodine intake among pregnant women is very important and influences on IDD in their newborns.

Table 3: Logistic regression analysis results for IDD in newborns among pregnant women

		Model 1			Model 2			Model 3		
Variables	**N**	**B**	**S.E.**	**Odds**	**B**	**S.E.**	**Odds**	**B**	**S.E.**	**Odds**
Migration status										
Migrants	115	0.467*	0.224	1.595	0.654*	0.275	1.922	0.392	0.325	1.479
Non-migrant ®	285									
Age	400				0.002	0.023	1.002	0.002	0.026	1.002
Education										
No education	15				2.483**	0.786	11.981	2.845**	0.854	17.208
Primary school	185				1.628**	0.550	5.095	1.961**	0.586	7.109
Secondary school	160				1.064*	0.554	2.897	1.194*	0.574	3.301
More than secondary school ®	40									
Occupation										
Agriculture	173				0.845	0.683	2.328	0.732	0.730	2.080
Employees	117				0.746	0.687	2.108	0.592	0.734	1.807
Commercial	23				1.580	0.791	4.856	1.701	0.848	5.482
Housewife	58				1.338	0.712	3.811	1.232	0.761	3.428
Government ®	29									
Income(per month)										
1000-2000 baht	162				0.978**	0.443	2.660	1.439**	0.481	4.218
2001-4000 baht	130				0.571	0.442	1.769	0.700	0.469	2.013
4001-6000 baht	59				0.171	0.494	1.187	0.336	0.531	1.399
6001 and above ®	49									

Table 3: (Continued)

Variables	N	Model 1			Model 2			Model 3		
		B	S.E.	Odds	B	S.E.	Odds	B	S.E.	Odds
Parity										
First	182				0.664	0.375	1.942	0.663	0.422	1.941
Second	157				0.384	0.342	1.468	0.315	0.385	1.370
Third and above ®	61									
Antenatal Care										
Less than 4 times	84				0.171	0.273	1.187	0.527	0.309	1.694
More than 4 times ®	316									
Iodine-supplemented consumptions Iodized salt										
Never	80							1.433***	0.339	4.190
Occasionally	136							0.659**	0.273	1.933
Regularly ®	184									
Iodized drinking water										
Never	135							0.139	0.383	1.149
Occasionally	201							0.086	0.340	1.089
Regularly ®	64									
Iodized fish sauce										
Never	191							0.387	0.493	1.473
Occasionally	179							0.341	0.477	1.406
Regularly ®	30									
Sea food										
Never	64							0.595	0.385	1.813
Occasionally	174							0.489	0.265	1.631
Regularly ®	162									
Receiving iodine-containing capsule										
No	215							1.318***	0.258	3.736
Yes ®	185									
-2 Log likelihood		533.236			487.858			431.692		
df		1			15			24		
R^2		0.015			0.158			0.315		
Total	**400**	**400**			**400**			**400**		

Note: * P<0.05, ** P<0.01, *** P<0.001. ® is reference groups.

Discussion

The pregnant women of this study were selected by using stratified random sampling from 13 community hospitals and using questionnaire to interview the respondents. The samples may not represent all pregnant women in Nan Province, the high prevalence of IDD in newborns are usually happen in rural areas where pregnant women usually come to use ANC services at the district hospitals, but the evidence could represent health problem of pregnant women with respect to iodine deficiency.

Migration of pregnant women has emphasized in many studies of maternal health and pregnancy outcomes, including fetus and newborn health (Biao, 2004). As migration is selectivity, migration exposure might affect the socio-economic status, lifestyle changes, and fetus health when they get pregnant. Little is known about the effect of pregnant women migration on iodine deficiency disorder (IDD) in newborns. This study is the original contribution that examines the association between pregnant women migration and IDD in newborns in Thailand.

The finding from this study indicated that migrant pregnant women were more likely to face with IDD in newborn than non-migrant pregnant women with a strong effect when controlled for socio-economic status (Model 1 and 2). As most of migrant pregnant women were young age, low education, employee in urban area, first parity, and disadvantage of antenatal care, the knowledge and experience to care her pregnancy health might be inadequate which in turn strongly effect IDD in newborn. However, when the iodine-supplemented consumption was added into the model (Model 3), the effect of migration experience on IDD in new born was weaker compared to model 2. The result implied that the consumption of iodine-supplemented substances, particularly iodized salt and iodine-containing capsule were strong predictors of IDD in newborn. According to the international standard (WHO, ICCIDD, UNICEF, 1996), sufficient iodine intake in daily life is essential for pregnant women to develop fetus's brain. This means that iodine-supplemented consumption directly affect IDD in newborn, whereas migration exposure of pregnant women indirectly affect IDD in newborn through Iodine-supplemented consumption and socio-

economic status. The findings of this study were correspond with various studies which have showed that migrant had inferior health status compared to non-migrants due to their worsen lifestyles and health risk behaviors, including the disadvantage in health care utilization (Chant and Radcliffe, 1992; Gaur and Saxena, 2003; Liamputtong, 2003). For the study in migrant pregnant women in China, Biao (2004) stated that most of female migrants were young, and migrants' reproductive health status was worse than that of the non-migrant women. When compared to non-migrants, migrant pregnant women in Shanghai were disadvantage to utilize antenatal care, and are more prone to facing with the problems of boththemselves and their babies (Biao, 2004). Thus, ways of mainstreaming perspectives into health policies and health services for migrants remain one of the major challenges (IOM, 2005).

The finding signified that the pregnant women who had low economic status were more likely to have IDD in newborns than those of high economic status. Despite the restriction of accessibility in iodine-rich food such as sea food or milk and the beneficial nutrition which are rather expensive. The poor pregnant women are so risky to have IDD in their newborns if they are not consuming iodized salt regularly. Former researches treated socio-demographic and economic status as a 'persistent and pervasive' predictor of disparity in health outcomes (Bunker et al., 1989; Krieger et al., 1993). Particularly, income has frequently been used as a predictor of health in both developed and developing countries (Gaur and Saxena, 2003). Also, Findley (1988) stated that physical and psychological health status of migrants will deteriorate if income declines.

Moreover, the findings revealed that the pregnant women who had lower education, especially uneducated women, were more likely to have IDD in newborns than those of higher education. The reason might be that the higher the education, the more opportunities to have better job and income to facilitate them improving their health and having easy access to knowledge and health care services. Among the socio-economic status (SES), education is a stable measure than either occupation or income (Williams and Collins, 1995). Correspondingly, Ross and Wu (1995) have mentioned

that education has positive association with health through work and economic conditions, social-psychological resources, and health lifestyle.

The finding illustrated that percentage of migrant pregnant women regularly consumed less iodine-supplemented substances than non-migrant pregnant women, especially iodized salt (32% vs. 53%). This indicated that pregnant migrant women might insufficiently receive iodine in daily life when compared to non-migrant pregnant women. The possible explanation might be that normally, most of pregnant women work for wages such as working in the textile, garment or microelectronic factory that their time for food preparation and consumption might be different from non-migrants. Due to different contextual environment, non-migrant pregnant women living in rural areas mostly cooking by themselves, using iodine salt (Thanakwang, 2005). Whereas migrant pregnant women living in urban areas may not cook by themselves everyday or eat out or buy food from shops, so iodized substance receive from iodized salt would be lower than non-migrant pregnant women. Thus the non-migrant pregnant women probably tend to have less iodine deficiency problem in newborn than migrant pregnant women. These findings correspond with the argument of Chant and Radcliffe (1992) who mentioned the behavioral approach assumed that women were influenced by the socio-cultural context where they live. Thus, consuming behaviors of pregnant women, particularly iodine rich-food consumption, might depend upon various surrounding psychosocial factors, such as environments of living and working, socio-economic conditions, perception and knowledge, including ante natal care utilization. As iodine-rich foods only get by oral way, eating behaviors of each pregnant women eventually indicate whether or not she sufficiently receives iodized substance in daily life that effect both her health and newborn's health.

Recommendations

Based on the findings of this study, the following issues should be considered in order to improve and prevent iodine deficiency disorder in newborns and promote the healthy pregnant women, especially migrant pregnant women.

1. The findings indicate that pregnant women's migration was positively associated with IDD in newborns, and most of migrant pregnant women were young and first pregnancy. Therefore, the migrant pregnant women should be informed and promoted self-care for promoting the healthy pregnancy, especially the ways that they should consume sufficient iodine intake in daily life to prevent IDD in newborns. Moreover, antenatal care utilization during pregnancy of them should be emphasized by policymakers to provide the health care services appropriate with their works in respect of availability and accessibility.

2. Most of pregnant women consume iodized salt regularly in daily life even it was not so high (47.3%), but the migrant pregnant women consumed nearly two times less than non-migrant pregnant women. So, the campaign for universal iodization via iodized salt should be continuously carried out appropriate with contextual and social changes.

3. Iodine-containing drug capsule should be universally provide for all pregnant women because it was negatively related to IDD in newborns, with particular emphasis on migrant pregnant women. This is one of the channels helping the pregnant women receiving sufficient iodine during pregnancy.

4. The pregnant women with low socio-economic status should be focused and supported to obtain beneficial and sufficient nutrition, especially iodine by both government and non-government agencies.

5. Due to IDD in newborns related to iodine-supplemented consumption of pregnant women, groups of migrant pregnant women living in urban areas are interest for further investigation in both quantitative and qualitative approaches about their consumption behaviors in daily life, and what conditions, factors, or contexts are affecting them to consume iodine-supplemented food for prevention IDD in newborns.

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