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Original Research Article

Factors affecting to neonatal thyroid hormone deficiency in the era of the COVID-19 pandemic, Akat Amnuai district, Sakon Nakhon Province

Jirattikal Suttawanit[1], Preedie Srisamai[2]*

[1]Department of Pediatrics, Akat Amnuai Hospital, Akat Amnuai, Sakon Nakhon, Thailand
[2]Department of Primary Health and Holistic Care, Akat Amnuai Hospital, Akat Amnuai, Sakon Nakhon, Thailand

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***Correspondence:**
Preedie Srisamai,
E-mail: Pridha.12@gmail.com

ABSTRACT

Background: In the spread of COVID-19 Less exposure to iodine affects the health of the pregnant woman and fetus, causing miscarriages and premature births. low birth weight, anemia and hypothyroidism in newborns. Changes in levels of thyroid-stimulating hormone besides genetics, and many environmental factors can also affect thyroid function. This research aims to study the impact of environmental factors on thyroid-stimulating hormone in newborns.
Methods: The sample consisted of 134 postpartum women randomly selected by simple method from 807 postpartum women in 2020-2022. The data were collected between June-July 2022 by interviewing social, environment, and household economy. Lifestyle, Iodine salt intake, drugs, iodine supplements and quality antenatal care correlation with Thyroid-stimulating hormone were determined by multiple logistic regression, adjusted odd ratio (ORadj), and 95%Confidence Interval (95% CI) were presented.
Results: The results revealed that 67.7% were pregnant aged 20-34 years, 50.7% took iodized salt before pregnancy, 67.2% consumed during pregnancy, 45.5% received salt during antenatal care, 30.6% took folate(B9) before pregnancy,53.0%took antenatal care qualitatively and took iodine supplementation (57.5% daily intake, 29.9% intake 4-6 days/week, 11.9% intake 2-3 days/week). Most of them consume high iodine foods not variety and not frequent enough. High iodine supplements/diet intake, household income, COVID-19 infection, and antenatal care qualitatively were not significant. The significant correlation factor was not eating iodized salt, low education level and residing in the sub-district administrative organization. The results of the correlation analysis using Backward elimination showed that positively correlated with pregnant women whose husbands drink alcohol were hypothyroidism 0.3 times (95%CI=0.10-0.66), husbands smoking 0.4 times (95% CI=0.20-0.94, and pre-pregnancy malnutrition were 2.6 times (95%CI=1.17-5.74).
Conclusions: The findings iodine affects to health of pregnant women and fetuses, Therefore, a more rigorous monitoring system for Iodized salt should be designed to encourage a higher rate of pregnant women to take iodine supplementation daily.

Keywords: Pregnant woman, Thyroid stimulating hormone, Iodized salt, Iodine supplement

INTRODUCTION

Coronavirus is an emerging disease that is spreading rapidly and spreading all over the world. Today, nearly all Gavi-eligible countries (72 out of 73) have been impacted by the virus, with more than 81.38 million confirmed cases and 1,020,878 deaths.[1] In Thailand, the number of infections and mortality rates is also high. As a result, the

economy, society, and society rising public debt affects the lives of all age groups.[2] In reproductive women, the infection affects the fetus in the first trimester. Pregnant women quarantined impaired access to and consumed iodine-containing foods. Low iodine exposure affects the health of the pregnant women and newborn, causing miscarriage. Low birth weight, anemia and hypothyroidism in newborns.[3] As pregnant women do not receive enough iodized salt, in 2019 - 2021, newborns have abnormal thyroid hormone levels, increasing by 3.4, 9.3 and 3.9 percent, respectively.[4] pregnant women with COVID-19 who have a lack of thyroid hormones metabolize protein synthesize proteins in the immune system. There will be heavy symptoms, long sleep treatment. It causes eventual death to prevent pregnant women and babies from iodine deficiency.[5] If infected with COVID-19, it will reduce the severity, so it is important to encourage adequate iodine exposure. The researchers were interested in influential socio-economic and environmental factors to effectively monitor, promote, prevent and correct hypothyroidism.

Objectives

This research aims to study the impact of environmental factors on Thyroid-stimulating hormone (TSH) in newborns.

METHODS

Current study was a cross-sectional descriptive study.

Sample size

Pregnant women gave birth from January 2020 to May 2022, selected using a simple random sampling method by the Microsoft Excel 2021 computer program, randomly 1-150 out of 807 patients.[9]

$$n = \frac{\mathrm{Np}(1-\mathrm{p})\mathrm{z}^2_{1-\alpha/2}}{\mathrm{d}^2(\mathrm{N}-1)+\mathrm{p}(1-\mathrm{p})\mathrm{z}^2_{1-\alpha/2}}$$

From the formula a sample size of 89 people was obtained. Recruited into volunteers and eliminated for use as a study group. 134 persons with the mentioned criteria were included.

Inclusion criteria

Inclusion criteria for current study were; a postpartum woman domiciled in the area, antenatal and maternity in the network from 2020 to 2022, voluntarily or voluntarily allowed by the parent or husband. Can read, write, listen, communicate very well, and have no schizophrenia.

Exclusion criteria

Exclusion criteria for current study were; termination of pregnancy or stillbirth, it can't follow up, going to provincial or involuntary this project or asking to stop volunteering.

Research instrument

Structured interview form created according to the theoretical framework of health promotion including pregnant women consisting of general information individuals. Economic factors, society, environment, iodine intake from iodine products, antenatal care, and health conditions. validated the objective content of 5 experts, experimented with and determined the alpha Cronbach coefficient of 0.80.[6] Collected June-July 2022 data, the researchers trained the research assistants to collect the interview data, giving one day of response time, completeness of the data based on antenatal and maternity medical records.

Data analysis

Economic, social, environmental variables the person attribute is converted to binomial distribution, where the range and scale ratio variables are cut by tertiles[7] to 3 levels, low, medium, high, and grouped into 2 groups: good, bad. As follows: High iodine scores (good ≥ 1.70, bad <1.7), taking medications (good ≥ 0.5, bad <0.5), analyzing the relationship with hypothyroidism in postpartum children-normal (0) ≤5 IU/l, (1) hypo-thyroidism >5 IU/l).[8] Analysis with the STATA program, finding a correlation with multiple logistic regression statistics by way of backward elimination presented as crude odd ratio (OR_{crude}), adjusted odd ratio (OR_{adj}), and 95% confidence interval (95% CI).

RESULTS

General characteristics

Total 67.9% of postpartum mothers were aged 20-34, median 25 years old (15, 44 years). 20.2% had teenage pregnancies and 11.9% were pregnant at the age of 35, most of them finished secondary school, 79.6% were common-law married, 19.4% were married (Table 1).

Table 1: General characteristics (n=134).

Variable studies	N	%
Age (in years)		
20-34	91	67.9
16 - 19	27	20.2
≥35	16	11.9
Median 25.0 (15, 44)		
Education level		
Secondary school-Bachelor's Degree	108	79.6
Primary school	26	19.4
Marital status		
Common-law married	97	72.3
Married	26	19.4
Single/widowed/divorced/separated	11	8.2

Economic factors and household income

Most of them are employed 57.4%, unemployed 35.3%, median income 10,250 (2,000, 150,000) baht per month, median debt 5,820-baht (up to 466,000) baht per year. 53.4% of households decreased in revenue are affected by COVID-19 (Table 2).

Table 2: Economic factors and household income.

Variable studies	N	%
Employed	77	57.4
Unemployed	47	35.3
Farmer	45	32.8
Government officer/employee	13	9.7
Income mean 10,250 (Min 2,000 Max 150,000)		
<22,000 บาท (Thai Baht)	101	75.4
≥22,000 บาท (Thai Baht)	33	24.6
Debt per year mean 5,820 (Min 0.0 Max 466,020)		
Debt	73	54.5
Debt below 5,000	61	45.5
Effect of COVID-19	71	53.4
Non effect of COVID-19	62	46.6

Social and environmental factors

Total 72.4 percent of postpartum mothers were in extended families, half of whom lived in the Sub-District Administrative Organization. 20.1 percent had relocations. 14.9% work less than 8 hours a day, and 10.4% were infected with COVID-19. Caught during pregnancy and before pregnancy 6.7 percent and 3.7 percent, respectively. 28.4 percent have received more than two doses of the vaccine. 63.4 percent washed their hands with alcohol every time. 96.3 percent waring mask every time and 9.8% exercised (walked, yoga, stretched) (Table 3).

Iodine intake from foods and iodized salt

High iodine intake from iodine foods. Pregnant women eat seafood or high-iodine foods found eating sea fish every day, ate iodized boiled fish, fish sauce or soy sauce and folate (Table 4-5).

Health screening of pregnant women and newborns

Total 11.2% Husbands and wives are carriers of thalassemia. Pregnant women have diabetes, 1.5%, pregnant women has smoke and drinking when pregnant 13.4 percent (Table 6).

Table 3: Social and environmental factors.

Variable Studies	N	%
Residing in the sub-district administrative organization	69	51.5
Residing in the municipal district	65	48.5
Family characteristics		
Expand	97	72.4
Single	37	27.6
Work		
Labor	114	85.0
Work less than 8 hours a day	20	14.9
Waring mask every time	129	96.3
Washing hands with alcohol every time	85	63.4
Infected with COVID-19 after childbirth	45	33.6
Get the COVID-19 vaccine 2 or more dose	38	28.4
Move resident that is in the gestational stage	27	20.1
Infected with COVID-19 before pregnancy	14	10.4
Exercised (walked, yoga, stretched)	13	9.8

Factors that are associated with hypothyroidism in newborns

Groups belonging to the sub-district administrative organization were 3.5 times more associated with hypothyroidism than municipalities (p=0.009, OR 3.47, 95% CI 1.37-8.82). Maternal education was 0.4 times lower than secondary school children with thyroid depletion (p 0.025, OR 0.39, 95% CI 0.17-0.89). Working with labor, children with thyroid depletion 0.17 times (p=0.005, OR 0.17, 95% CI 0.05-0.59), non-intake of iodine salt, children with hypothyroidism 3.4 times (p=0.017, OR 3.42, 95% CI 1.25-9.37), husband drinking alcohol, children with hypothyroidism 0.3 times (p=0.005, OR 0.26, 95% CI 0.10-0.66). (p=0.035, OR 0.43, 95% CI 0.20-0.94). Have a history of a miscarriage of children with thyroid depletion 5.6 times (p=0.019, OR 5.60, 95% CI 1.33-23.69). There was malnutrition before pregnancy, children with hypothyroidism 2.6 times (p 0.019, OR 2.59, 95% CI 1.17-5.74), postpartum children with anemia had 35.6 times thyroid depletion (p=0.010, OR 35.60, 95% CI 2.32-54.67). Births had 0.2 times thyroid depletion complications (p=0.018, OR 0.19, 95% CI 0.05-0.75) (Table 7).

Table 4: Iodine intake from foods and iodized salt.

Eating/using seasonings	Every day	4-6 day/wk.	2-3 day/wk.	2-3day/month	Do not intake
Intake of iodine before pregnancy	24 (17.9)	14 (10.5)	22 (16.4)	8 (6.0)	66 (49.3)
At pregnancy, iodine salt is used for cooking	35 (26.1)	17 (12.7)	35 (26.1)	14 (10.5)	33 (24.6)

Continued.

Eating/using seasonings	Every day	4-6 day/wk.	2-3 day/wk.	2-3day/month	Do not intake
Fish sauce	118 (88.1)	8 (6.0)	8 (6.0)	-	-
Soy sauce	66 (49.2)	27 (20.1)	33 (24.6)	5 (3.7)	3 (2.2)
Sea fish	4 (3.0)	27 (20.1)	61 (45.5)	38 (28.4)	4 (3.0)
Fresh sea shrimp dried sea shrimp	1 (0.7)	10 (7.5)	18 (13.4)	63 (47.0)	42 (31.3)
Sea crab	-	7 (5.2)	11 (8.2)	51 (38.0)	65 (48.5)
Squid	-	17 (12.7)	40 (29.9)	66 (49.2)	11 (8.2)
Seaweed	-	4 (3.0)	21 (15.7)	27 (20.2)	82 (61.2)
Instant noodles (add iodine)	1 (0.7)	17 (12.7)	37 (27.6)	47 (35.0)	32 (23.9)
Iodized eggs	-	-	-	-	134 (100)
Canned pickles	1 (0.7)	7 (5.2)	5 (3.7)	26 (19.4)	95 (70.9)
Cheesy tofu	3 (2.2)	11 (8.2)	26 (19.4)	50 (37.3)	44 (32.8)
Boiled fish with iodine	49 (36.6)	32 (23.9)	31 (23.1)	12 (9.0)	10 (7.5)
Sauce/iodized salt	32 (23.9)	31 (23.1)	31 (23.1)	19 (14.2)	21 (15.7)
Freshwater prawns cooked with sauce/iodized salt	3 (2.2)	7 (5.2)	20 (14.9)	47 (35.0)	57 (42.5)
Salted egg	-	4 (3.0)	10 (7.5)	36 (26.9)	84 (62.7)
Shrimp paste	2 (1.5)	11 (8.2)	16 (11.9)	60 (44.8)	45 (33.6)
Taking folate drugs	27 (20.2)	6 (4.5)	6 (4.5)	1 (0.8)	94 (70.2)
Eat vitamin C	27 (20.2)	8 (6.0)	6 (4.5)	2 (1.5)	91 (67.9)
Eat calcium/vitamin D	23 (17.2)	5 (3.7)	7 (5.2)	1 (0.8)	98 (73.1)
Eat glutamine/transamine	-	6 (4.5)	-	-	128 (95.5)
Take isosortren acne medication	-		-	-	134 (100)
Take multivitamin B complex, iron, ferrocal	-	1 (0.8)	-	-	133 (99.2)
Take triferdine or obimin ace	77 (57.5)	40 (29.9)	16 (11.9)	-	1 (0.8)

Table 5: High iodine dietary intake score.

Variable studies	N (%)					
	Q1	Q2	Q3	Good*	Insufficiency	Total
High iodine dietary (4 score) Median 1.41 (0.70, 3.29), Q3=1.7058	57 (42.5)	34 (25.3)	43 (32.1)	35 (26.1)	99 (73.9)	134 (100)
iodine supplements (1 score) Mean 0.446±0.112 (0.25,0.75), Q3=0.5	4 (34.3)	46 (34.3)	42 (31.4)	40 (29.8)	94 (70.2)	134 (100)
Eat iodine salt before pregnancy				68 (50.7)	66 (49.3)	134 (100)
Iodine salts are obtained from antenatal clinics				61 (45.5)	73 (54.5)	134 (100)
Eating iodine during pregnancy				90 (67.2)	44 (32.8)	134 (100)
There is iodine salt at home				76 (56.7)	58 (43.3)	134 (100)
Take an iodine supplement every day.						77 (57.5)
Reserve iodine supplementation before 12 weeks of gestation.						71 (53.0)
Side effects from medication						44 (32.8)
Taking iodine supplements irregularly						40 (29.9)
Eat folate before pregnancy						41 (30.6)
Stop taking iodine supplements						16 (11.9)
Do not take iodine supplements						1 (0.7)

*Tertiles.[7]

Table 6: Health screening of pregnant women and newborns.

Health data variables	Pregnancy women, N (%)	Husband, N (%)
Thalassemia carrier	12 (8.96)	15 (11.2)
Thalassemia	5 (3.7)	6 (4.5)
Hepatitis B	-	1 (0.8)
DM	2 (1.5)	-

Continued.

Health data variables	Pregnancy women, N (%)	Husband, N (%)
HT	2 (1.5)	-
Smoking	8 (6.0)	65 (48.5)
Used to smoke	4 (3.0)	20 (14.9)
Drink once in a while	-	63 (47.0)
Drinking alcohol ≥3 times/week	-	46 (34.3)
Stop drinking alcohol when pregnant	18 (13.4)	-
Drink a little	15 (11.2)	-
Used to drink alcohol	-	8 (6.0)
1st antenatal care before 12 weeks of gestation	71 (53.0)	-
Have a history of abortion	15 (11.2)	-
At risk	37 (27.6)	-
Complications during pregnancy and postpartum	30 (11.9)	-
BMI* before pregnancy 9 (kg/m2), malnutrition (< 18.5) and (>30.0)	34 (25.3)	-
Weight throughout pregnancy- not meeting criteria**	80 (59.7)	-
Prenatal criteria median 270 (245, 371)	12 (8.6)	-
Infant complications	32 (23.5)	-
Jaundice	14 (10.4)	-
Anemia-iron deficiency, Median 54 (31.0, 68.0)	4 (2.99)	-
Body weight <2.500 kg, Median 2.988 (2.094, 5.600)	10 (7.5)	-
Thyroid hormones-normal TSH ≤5 u/l	89 (66.4)	-
-Depletion of TSH >5 u/l	45 (33.6)	-
Abnormal 11.25≥TSH >5 u/l	42 (31.3)	-
Abnormal 11.25<TSH <22u/l	2 (1.5)	-
Abnormal TSH ≥ 22 u/l	1 (0.8)	-
Median 4.22 (0.33,37.76)		

*BMI Asian woman according to the instructions Western Pacific Region of WHO (WPRO) criteria 2004, **underweight (12.5-18) normal weight (11.5-16) overweight (7-11.5) obesity (5-9).

Table 7: Factors that are associated with hypothyroidism in newborns.

Variable studies	Thyroid hormone Normal	Deficit	OR_{Crude} (95% CI)	P value	OR_{adj} (95%CI)	P value
Income						
>22,000 bath	18	15	1	0.099	-	-
<22,000 bath	71	30	0.51 (0.23-1.14)			
COVID-19 infection						
No	12	2	1	0.125	-	-
Yes	77	43	3.35 (0.72-15.67)			
High iodine dietary intake						
High score	28	7	1	0.052	-	-
Lower score	61	38	2.49 (0.94-6.26)			
Taking iodine supplements						
High score	47	30	1	0.347	-	-
Lower score	42	15	1.45 (0.67-3.15)			
Quality ANC (weeks)						
12	79	36	1	0.175	-	-
After 12	10	9	1.98 (0.74-5.28)			
Take folate						
Yes	12	15	1	0.027	-	-
No	77	30	0.39 (0.18-0.90)			
Residing in						
Municipal district	48	17	1	0.079	3.47 (1.77-8.82)	0.009
Sub-district administrative organization	41	28	1.92 (0.93-4.01)			

Continued.

Variable studies	Thyroid hormone		OR_{Crude} (95% CI)	P value	OR_{adj} (95%CI)	P value
	Normal	Deficit				
Education level						
Secondary school	30	22	1	0.090	0.39 (0.17-0.89)	0.025
Primary school	59	23	0.53 (0.26-1.10)			
Occupation						
Officer	10	10	1	0.097	0.17 (0.05-0.59)	0.005
Labor	79	35	0.44 (0.17-1.16)			
Intake of iodine at pregnant						
Yes	70	31	1	0.218	3.42 (1.25-9.37)	0.017
No	19	14	1.66 (0.74-3.73)			
Husband smoking						
No	28	11	1	0.086	0.43 (0.20-0.94)	0.035
Yes	61	24	0.52 (0.25-1.09)			
Husband drink alcohol						
No	11	14	1	0.011	0.26 (0.10-0.66)	0.005
Yes	78	31	0.31 (0.12-0.76)			
Abortion history						
No	83	36	1	0.028	5.60 (1.33-23.69)	0.019
Yes	6	9	3.45 (1.15-10.43)			
Prenatal nutrition						
Normal	48	15	1	0.026	2.59 (1.17-5.74)	0.019
Abnormal	41	30	2.34 (1.10-4.94)			
Newborns anemia						
Normal	88	42	1	0.116	35.6 (2.32-54.67)	0.010
Abnormal	1	3	6.28 (0.63-62.24)			
Complications after childbirth						
No	64	38	1	0.113	0.19 (0.05-0.75)	0.018
Yes	25	7	0.47 (0.19-1.19)			

DISCUSSION

In addition to genetics, hypothyroidism of thyroid hormones in newborns. The lifestyle of the spouse shows the most obvious correlation to changes in thyroid-stimulating hormone levels in pregnant women. Alcohol affects the pituitary gland, the regulatory part of thyroid hormones affects almost all aspects of thyroid function.[10,11] And affecting the sperm, the cell after fertilization has a cell division disorder which involves iodine in the cell further developing into the thyroid gland.[12] Smoking causes changes in thyroid function. Lower prevalence of thyroglobulin antibodies, thyroperoxidase antibodies and hypothyroidism in smokers.[13] This causes TSH levels to decrease and triiodothyronine (T3) and tyroxin (T4) levels increase.[14] There are currently no reports confirming the benefits of cigarettes. As for the body mass index, pregnant women are positively correlated with independent TSH and T3 levels.[13,14]

Body mass before pregnancy affects the growth of the uterus. Malnutrition and dietary iodine affects the regulation of fetal thyroid hormones.[13,15,16] High iodine diet and iodized salt affect the intake of sufficient iodine, also resulting in the baby giving birth to normal thyroid hormones.[17,18] This study yielded the opposite effect, probably due to a lack of inquiry into eating other foods with varying levels of less iodine. There are groceries outside and in the household. Eating those foods varied and frequently also leads to adequate iodine accumulation each day Data on taking iodine supplements for pregnant women may provide misalignment of eating information, resulting in high discrepancies. As for eating iodine salt, cooking food is consistent with other studies, eating iodine salt at every meal and eating it on a daily basis will have enough primary iodine to help prevent widespread deficiency.[18-22] Emphasize eating salts containing enough iodine.[23,24] Studies of pregnant women from secondary school were associated with mother's iodine exposure and decreased hypothyroidism, the thyroid hormones of the child, consistently with several reported levels of favorable studies, with high iodine dietary choices, salt use, and adequate iodine exposure in pregnant women.[23,25]

A history of miscarriages, anemia, and complications in the baby are associated with high levels of thyroid stimulating hormones, with an inherent risk of miscarriage.[26] Hematocrit below 50% Newborns have anemia, causing TSH. high level.[27] Neonatal metabolism is associated with hypertrophy of blood bilirubin, thyroid-stimulating hormone (TSH) and C-18:2 decreased jaundice associated with levels of TSH, T4, and G6PD.[28,29] Residential zones are associated with hypothyroidism. Home locations affect pregnant women using iodine salt and getting enough iodine from food.[21,22,25,30] The nature

of outdoor labor requires high iodine, insufficient exposure leads to iodine deficiency in the mother and depletion in the baby after childbirth.[24]

Child hypothyroidism born in households was associated with the economy and household incomes where high-income households had access to and obtained more iodine in food than poor households.[22,31] This study found household economic status. Monthly income and debt burden are insignificantly related. The legal distribution of iodine in food provides an effect that covers all classes. The population receives no different amounts of iodine per day.

Limitations

The limitation of this research is the difficulty of collecting data in areas where the coronavirus is spreading.

CONCLUSION

Pregnant women before use iodine salt 50.7 percent, receive iodine salt when antenatal 45.5 percent, while pregnant use iodine salt for cooking 67.2 percent of households, currently use iodine salt 56.7 percent take folate before pregnancy, 30.6 percent of pregnant women receive quality antenatal care, most pregnant women ate high iodine diets, did not diversify, and rarely ate regularly. A multi-regressive correlation analysis-controlled variables with hypothyroidism factors in children after childbirth and eliminated the non-correlated variables one by one, finding that household income, COVID-19 infection, and correlation were excluded. Relocation, pregnant women drinking alcohol, smoking, taking high iodine medications/foods, and quality antenatal care have no direct correlation with thyroid depletion. Correlated factors include pregnant women who have a husband drinking/smoking, having pre-pregnancy malnutrition, not eating iodine salt at home, having a history of miscarriages, postpartum babies with anemia/complications, under-secondary education, and living in the county.

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