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The relationship between the predominant dietary pattern of pregnant women and the results of thyroid screening of their newborns

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Abstract

Introduction: The health of the baby is one of the indicators contributing in development of the countries, and its relationship with the mother's diet has been proved. Scientific researches In terms of the effect of the diet of pregnant women on the health of the newborn, enhancing of this diet can be aimed at improving the health of the newborn. Newborn thyroid screening at birth is one of the common tests in the country, and it is valuable to examine the factors affecting its results.

Methods: This study was a descriptive method of correlation type and 280 mothers were selected as available in the Gharazi hospital. The questionnaires included demographic information and FFQ dietary pattern with 117 items. The information was entered into spss software version 20 for analysis.

Results: According to the results of this study, the level of thyroid stimulating hormone (TSH) in 263 babies (94.9%) was less than 4 and healthy babies, and in 14 babies (5.1%) was more than 4 and babies with hypothyroidism. The average TSH in infants was 2.05±1.12. Three healthy, western and traditional food patterns were observed in the mothers of these babies. A healthy diet reduces the risk of increasing TSH levels, and there was a correlation between the western diet and an increase in TSH more than 4, and a correlation between the traditional diet and a decrease in TSH less than 4, but none of the relationships were statistically significant. Evidence of the existence of an inverse and significant relationship between the education level of the mother and her western food pattern and the weight loss of the baby was observed at the error level of 1%.

Conclusion: The evidence showed that in a healthy mother's diet, the newborn's TSH level and the newborn's weight are within the normal range. The risk of consuming western and traditional foods should be reminded to mothers by health workers.

Keywords: newborn thyroid screening, mother's dominant food pattern

Introduction

The effects of thyroid hormones during pregnancy and infancy on the growth and differentiation of cells and the integrity of tissues in the fetal period have been determined (1). Congenital hypothyroidism is a congenital error in thyroid metabolism and occurs in newborns that do not have the ability to produce enough amounts of thyroid

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hormone (2). This disease has few and non-specific symptoms in the first days of life, which makes timely diagnosis difficult in most cases. Failure to diagnose in the first days of life will cause irreparable brain complications and decrease the level of intelligence in the baby. Congenital hypothyroidism is considered as one of the most common preventable causes of mental retardation (3).

Screening of newborns is a preventive activity that leads to the diagnosis of treatable endocrine, metabolic, genetic, hematological and infectious diseases (4). In Iran, the national hypothyroidism-screening program was integrated into the country's health system in 1384 (5). The results of the screening test in the United States showed that this disease occurs in 1 case in every 3600-5000 babies. Studies conducted in different parts of Iran have reported the prevalence of hypothyroidism differently, for example, in a study in Shiraz, the prevalence of 1 in 1433 was reported (6). In Isfahan, a study. was done in 2003, which obtained the prevalence of 1 in 370 (7). The common feature of them is the high prevalence compared to the global average (6).

Sampling capillary blood from the heel and using dried blood sample on filter paper for screening, is the most practical method in the wide implementation of newborn screening programs (2). The food pattern reflects the actual consumption and its examination can provide the possibility of some changes in the diet and have a facilitating role in applying the findings in line with public health recommendations. Nutritionists use a dietary pattern perspective to examine the overall impact of diet on health outcomes (8). Analysis based on dietary patterns can provide more information on the nutritional etiology of diseases (9). Evaluation of food patterns that represent the actual consumption of people can pave the way to identify changes in food intake over time and facilitate dietary recommendations. Identifying food patterns makes it possible to look at the diet as a whole (not separating its components). This makes us to find a relationship beyond what is described by nutrients or foods in examining the relationship between diet and diseases (10). Inadequate energy intake of the mother increases the risk of giving birth to a low birth weight baby. Therefore, identifying the pattern of food consumption and the nutritional status of pregnant mothers is of particular importance (11). Considering the importance of the diet of pregnant women and the proven dependence of the health of the fetus on the condition of the mother, this study was conducted with the aim of determining the relationship between the dominant diet of mothers during pregnancy and the results of thyroid screening of their newborns at Dr. Gharazi Hospital in Isfahan in 2019.

Research Method

In this research, after obtaining the code of ethics with the number IR.IAU.KHUISF.REC.1398.041 and permission from the Faculty of Nursing and Midwifery of Isfahan Islamic Azad University (Khorasgan), and with a letter of introduction in the fall of 2019, she entered the research environment of Gharazi Hospital and after presenting a letter of introduction to the officials of the center, obtained their agreement and cooperation and proceeded to invite them to participate and introduce the study. The samples were pregnant women who referred to the hospital clinic of Dr. Gharazi, women hospitalized after giving birth in the obstetrics department and mothers with babies hospitalized in the neonatal department. In this research, a questionnaire was used to collect data, which included two questionnaires for demographic information and food pattern, and the result of the thyroid screening test was added to the demographic information questionnaire.

The dietary pattern questionnaire was delivered to the women who met the inclusion criteria and given guidance and time to complete the questionnaire, and after completing it, with the permission and introduction letter of Isfahan University of Medical Sciences, went to the provincial health center and the results of newborn screening using the national code of Mothers were obtained.

Demographic profile questionnaire including the age of the baby's parents, mother's weight at the beginning and end of pregnancy, pregnancy problems in the last pregnancy and also in previous pregnancies, parents' education, family income, health of parents and baby, baby's weight and gender. Due to the large number of titles of the dietary pattern questionnaire, the researcher investigated some demographic characteristics of mother and baby with dietary pattern and TSH level.

The food pattern questionnaire based on FFQ, 117 items whose validity and reliability were confirmed by Hashemi et al. in 2015, was completed and the information including the amount of food consumption based on the portion size was obtained on a daily, weekly and monthly basis. The information was converted into grams and using 4N software, the composition of food consumed by mothers was determined. Then this information was entered into spss software version 20 and using the method of factor analysis, dominant food patterns were extracted and analyzed.

Factor analysis is a statistical method that is used both to reduce the number of variables and to classify variables into factors. Factor analysis does not evaluate the relationship between dependent and independent variables, but it is used to identify the relationship between a large numbers of dependent variables. The statistical population in this research is all the women referred to the maternity ward, the neonatal department and the maternal and child health clinic of Dr. Gharazi Hospital and all the infants of these women from 0 to 28 days old who were screened for hypothyroidism, and their heel capillary blood samples were sent to Isfahan City Health Center in 2019. In this study, the research environment was the maternity ward, neonatal ward, midwifery and maternal and child health clinic of Dr. Gharazi Hospital in 2019.

To calculate the required sample size in determining the simple correlation coefficient between the dominant dietary pattern of pregnant women with the results of newborn thyroid screening at the error level of $\alpha=0.01$ and the power of the test is 80% ($\beta=0.2$) and the minimum value of the correlation coefficient for the significance of the relationship 0.1 was used in the hypothesis test of $\rho=0$ against $\rho=0\neq r$, based on which 259 people were required to be in the sample. By considering 10% dropout, 280 people were selected.

Results

The results of this research were extracted in 5 tables, based on the results of table 1, among all the babies screened for thyroid test for research, the largest number of babies were 131 baby girls (51.6%) and the largest number was 169 babies (68.4%) in the normal range of weight (2500-3500 grams) and the largest number of babies was 263 babies (94.9%) which had TSH levels less than 4 in the normal range.

According to the results of Table 2, among 263 babies with TSH level less than 4, healthy food pattern in mothers was almost balanced in all four quadrants. In addition, among infants with TSH level higher than four, the mother's healthy food pattern had the lowest observed value (14.3%) in the fourth quarter and the highest observed value (35.7%) in the third quarter.

Table 1: Frequency distribution of research units based on some characteristics of babies

variable	Group	Number	percentage	mean	Standard deviation
Gender	Boy	123	48.4	---	---
	Girl	131	51.6		
	Not answered	23			
Weight	Low weight	49	19.8	2897.79	642.77
	Normal	169	68.4		
	High weight	29	11.7		
	Not answered	30			
TSH level	<4	263	94.9	2.05	1.12
	>4	14	5.1		

Table 2: Frequency distribution of research units based on the consumption of healthy food patterns in mothers and TSH levels of newborns

	Less than 4		More than 4	
group	Abundance	percentage	Abundance	percentage
First quarter	65	24.7	3	21.4
Second quarter	64	24.3	4	28.6
Third quarter	63	24.0	5	35.7
Fourth quarter	71	27.0	2	14.3
Total	263	100.0	14	100.0

According to the results of Table 3, among 263 babies with TSH level less than 4, the western food pattern in mothers was almost balanced in all four quadrants. In addition, among infants with TSH levels higher than 4, the mother's healthy eating pattern had the lowest observed value (0.0%) in the first quarter and the highest observed value (42.9%) in the third quarter.

Table 3. Frequency distribution of research units based on the amount of consumption of western food pattern in mothers and TSH level of newborns

	Less than 4		More than 4	
group	Abundance	percentage	Abundance	percentage
First quarter	68	25.9	0	0.0
Second quarter	63	24.0	5	35.7
Third quarter	63	24.0	6	42.9
Fourth quarter	69	26.2	3	21.4
Total	263	100.0	14	100.0

According to the results of Table 4, among 263 babies with TSH level less than 4, the traditional food pattern in mothers was almost balanced in all four quadrants. Moreover, among infants with TSH level higher than 4, the mother's healthy food pattern had the lowest observed value (14.3%) in the fourth quarter and the highest observed value (35.7%) in the third quarter?

Table 4: Frequency distribution of research units based on the amount of consumption of traditional food pattern in mothers and TSH level of newborns

	Less than 4		More than 4	
group	Abundance	percentage	Abundance	percentage
First quarter	65	24.7	3	21.4
Second quarter	64	24.3	4	28.6
Third quarter	64	24.3	5	35.7
Fourth quarter	70	26.6	2	14.3
Total	263	100.0	14	100.0

Based on the results of the table by calculating Spearman's correlation coefficient, there is no significant relationship between TSH level of infants with dietary pattern 1 (r=0.054=0.371), dietary pattern 2 (p=0.094=0.118). r=0) and dietary pattern 3 (p=0.314, r=0.061).

Table 5: Examining the relationship between TSH level in infants and mother's food patterns

		Dietary pattern 1	Dietary pattern 2	Dietary pattern 3
TSH level	Numbers	277	277	277
	Correlation coefficient	0.054	0.094	0.061
	P value	0.371	0.118	0.314

Discussion

Based on the findings, three food patterns have been considered separately, which was named healthy, western and traditional food pattern according to the ingredients in each. Each food pattern has four quadrants, which increase the amount of consumption of food groups related to the same food pattern from the first to the fourth quartile. Thus, the lowest consumption of food groups is observed in the first quarter and the highest consumption of food groups related to the same food pattern is observed in the fourth quarter.

In systematic review and meta-analysis Arab and his colleagues (2018) reviewed a study that examined the dominant food pattern during pregnancy and the serum level in the first trimester of pregnancy and its relationship with the consequences and complications of pregnancy. The study was conducted on 812 pregnant women. From the results, three healthy, western and traditional food patterns were extracted, which are in line with the three food patterns of the present study (13).

Moradi and his colleagues (2013) investigated the relationship between dominant dietary patterns and risk factors for cardiovascular diseases in women, in which 486 female teachers in Tehran were investigated. From the obtained results, three dominant food patterns were extracted, which include: healthy, western and traditional, which are in line with the food pattern of the present study (14).

Abeshzadeh and his colleagues (2015) investigated dietary patterns and their relationship with anthropometric measurements in 320 female nurses. Three types of food patterns (healthy, traditional and unhealthy) were identified, which are in line with the food patterns of the present study. Of course, the unhealthy food pattern is consistent with the western food pattern. It seems that in Iranian culture, the common food pattern among families follows three healthy, traditional and western methods (15).

Aminzadeh and his colleagues (2007) investigated the effect of intervening factors on serum thyroid-stimulating hormone levels in the hypothyroidism

diagnosis program in Ahvaz, during which 90 percent of infants were healthy, which is in line with the results of this research(16). ordukhani and his colleagues (2013) studied the prevalence of hypothyroidism in newborns and the prevalence of hypothyroidism was 1 in 1002, which is consistent with the results of this study (17)

In a review study by HashemPuri and his colleagues in 2019, titled Systematic Review of Risk Factors Related to Congenital Hypothyroidism, one of the effective risk factors, the high-risk geographic area is mentioned, which refers to food access, food shortages, and diet traditions and its effect on hypothyroidism in newborns, which is consistent with this study (18).

Herbstman and his colleagues (2008) in order to investigate maternal and infant factors related to the thyroid hormone status of newborns, have dynamically mentioned the thyroid hormone level of the newborn during the period around birth, which is influenced by many biological and pregnancy-related factors, and attempts to identify Thyroid disorders in newborns should carefully consider these factors. This shows the importance of this study, which focused on the dominant diet of the mother and the relationship with the blood TSH level of newborns. However, he had used cord blood sample for the initial measurement of TSH in the newborn's blood, which was different from this study, which used capillary blood from the heel of a 3-5-day-old baby (19).

Trumpff and his colleagues (2015) in order to investigate maternal and neonatal factors on neonatal TSH levels, reported higher levels of this hormone in spring and winter compared to autumn and summer, which can be related to seasonal food availability and This relationship with the mother's permanent smoking was also significant, and neonatal, maternal, and pregnancy-related determinants were reported to have an effect on the TSH level of infants, which was consistent with this study (20).

Conclusion

As the final result of this research, according to the hypothesis of the research "the TSH level of the baby is related to the dominant food patterns in pregnancy", it can be concluded that there is a relationship between the dominant food pattern in pregnancy and the thyroid results of the baby. But according to this research, this relationship was not statistically significant. In a healthy food pattern, the risk of increasing TSH level (infant hypothyroidism) is reduced, and in the western food pattern, an increase in TSH is seen more than 4, but in the traditional food pattern, compared to the western one, the increase in TSH is less, even though the number of samples In this descriptive study can affect the results, but this does not mean ignoring the effective role of teaching mothers to use a healthy diet during pregnancy in order to reduce the birth of sick babies, and this should be done in pre-pregnancy and pregnancy care.

Conflicts of interest

The authors declared that there is no conflict of interest

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