

Factors Affecting Metabolic Diseases in Neonates

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ABSTRACT

In the periods of pregnancy or lactation, feeding from mothers ensures appropriate growth of the future fetus, baby and adults. It is likely related to changes in embryo and programming epigenetic regulations. Physical programming is determined in response to environmental stimuli in the first months of pregnancy; it may be susceptible to metabolic disorders. Changes in fatty acids are likely to cause fetal and neonatal diseases. The purpose of this research is to investigate the role of different fatty acid consumption during pregnancy or lactation in embryo metabolism and growth. Unsaturated fatty acids (PUFAs) play an important and useful role in the children that received fatty acid during vital periods. Consequently, maternal nutritional conditions and the consumption of fatty acids during the periods of pregnancy or lactation are important factors that are highly related to the natural growth of the fetus and newly-born child.

Keyword: metabolic disease, neonates, metabolic factors

INTRODUCTION

MetS Syndrome (MetS) is one of the greatest and most severe public health problems all over the world. Due to increased urban living, low mobility, low energy consumption and increased obesity, the diseases have spread. Metabolic is 5 times higher than the risk of type 2 diabetes (T2DM) and 2 times higher than the increase of the risk of cardiovascular disease (CVD) in the next 5 to 10 years (Alberti, 2009). Blood lipid disorders, insulin resistance, and disposing a person to type II diabetes are metabolic complications of childhood obesity (Kelishadi, 2003). In addition, MetS patients are exposed to the risk 2 to 4 times the risk of stroke, 3 to 4 times the risk of myocardial infarction (MI) and 2 times the risk of death. Hence, in comparison with those without metabolic syndrome, these patients have a longer history of cardiovascular disease (Alberti, 2005). Metabolic disease is a type of disorder that causes a problem in the process of natural metabolism (conversion of foodstuffs to energy at the cell surface). During the process of metabolism, thousands of enzymes are involved. Metabolic diseases affect the ability of the cell to carry out vital biochemical reactions which includes protein transport (amino acid), carbohydrates (sugars and starch), and fat (fatty acids) (Sanderson, 2006). Metabolic diseases are hereditary. Metabolic disorders are primarily genetic that children inherit from their parents. Metabolic disorders may not appear in parents, but they are transmitted to the child, hereditary metabolic disorders (IEMs) cause the activity of the enzymes involved in the metabolic pathways of the body to be decreased or increased. This disease is a group of complex abnormalities and heterogeneous genetics that cause clinical signs resulted from mutation in genetic codes. Regarding the high clinical incidence, metabolic disorders are considered as the main reasons of death in newly-born children (Gan, 2010). Severe cerebral lesions, mental retardation, muscle paralysis, liver problems, urinary stones, ocular defects such as cataracts and glaucoma, and cardiovascular diseases are complications that will make a problem for children affected by hereditary metabolic diseases. At present time, with the advancement of facilities and performing new screening tests at birth, the

inherited metabolic diseases can be detected. If the illness of child is not known, and treatment is not begun at the first year of birth, about 50% of the child's IQ capacity will be reduced and his/her treatment will be confronted with more problems in the future (Chen, 2012).

The findings indicate that the mother's diet before and after birth has been directly related to the growth of the fetus, newly-born child or even during child maturity which is likely resulted in phenotypic with changes in fetal planning and epigenetic regulations. During the period of pregnancy, a diet is an important factor affecting the growth of fetal and metabolism. As a result, nutritional factors including energy, fatty acids, proteins, nutrients, and folate influence several aspects of fetal planning. Mothers' malnutrition during pregnancy may affect the metabolism of the fetus (Mathias, 2014). The mothers' nutrition patterns and health status of the metabolism of mothers may affect the health of the baby, it may be due to transmit of nutrients from mother to fetus. During pregnancy, maternal metabolism show compatibility with fetus for continuing drainage and thus guarantee the growth of fetus.(Harira 2002). Regarding to fat metabolism early in pregnancy, the mother's body collects the lipid while in pregnancy period, activity of mother's adipose tissue increases and as a result creates catabolism statue.

The metabolic disease has several types; one of the most important metabolic diseases is based on general form of involved metabolism. There are some disorders in the diseases that may occur at the same time in different types of diseases. These diseases are calssified according to the pathogenesis or symptoms of the disease (Scaturro, 2013). There are two main groups of these diseases. The first group is caused by the accumulation of toxic substances due to the blockage of metabolic pathways that including acute or progressive disorders, poisoning or encephalopathy and the second group are the disorders that coming with energy reduction.

Besides the general symptoms of metabolic disease, the systemic symptoms that mainly depend on the nature and course of the biochemical defect improves. If an enzyme deficiency is at the onset of a catabolic pathway as with phenylneurea, the accumulation of metabolic components is minor and clinical findings at the onset of

the disease is negligible. By disease's continuity and more accumulation of metabolic substances, the symptoms become more affective. Sometimes these metabolites have a direct effect, such as ammonia within the neurotoxic or indirectly cause poisoning in central nervous system, just like organic academia by creating disorder in acid-base balance (Baumgartner, 2016). Biochemical defects in the catabolism of Glycolipids, Glycoprotein and carbohydrates appear since the late infancy period to puberty and often accompanied by disorder in central nervous system performance. Some of these diseases are along with face changes that became clearer with ageing such as mucopolysaccharidosis and lipidosis (Shevell, 2014).

Clinical symptoms and simple tests that cause suspicion of metabolic disease include the following:

- 1- Continuous vomiting
- 2- Anorexia and lack of growth
- 3- Neurological complications such as weakening in consciousness level, seizure, disordered muscle tonus or abnormal breathing or disability in the activity that expected a baby can do, such as sucking power.
- 4- Abnormal liver tests and acute liver failure
- 5- Acidosis
- 6- Abnormal smell, such as the smell of foot sweat in Isovaleric academia or the smell of maple syrup in ketoaminoacidmia
- 7- Hypoglycemia
- 8- Neutropenia and thrombocytopenia for example, in propionic academia and methylmalonic academia
- 9- Hypothermic dehydration with or without vaginal penis in adrenogenital syndrome caused by a shortage of 21 – hydroxylase
- 10- Symptoms that are less common: Diarrhea, hypothermia, abnormal hair, Cardiomegaly and heart failure, cataract (Nelson, 1992)

Many researches and studies on metabolic diseases have been done, which can be said similarly Albuquerque et al., Showed that the total amount of PUFA, arachidonic acid (AA) and DHA were significantly in the brain of 21-day field mouse's offspring of dams with rich diet of TFA during pregnancy and lactation decreases. In addition, Hanebutt et al. proposed that the placental tissue has lipoprotein receptors and expresses the enzyme with Lipase and phospholipase in the maternal transmission mechanism throughout the pair to maintain fetus's lipid requirements. Maternal diet, metabolism and lipid tissue stores define the combination of maternal FA (tags) in plasma. Herrera et al. showed that, in relatively smaller proportion the more fatty acids of (nefas) that derived from maternal metabolism can be separated from the pair without pre-change by passive transmission and ineffective transport. During the lactation period, the fetus is exposed to the FAs by its secretion in the breast milk. The study by Lauritzen and Carlson showed that, the contribution of mothers' diet and food storage of Fas by mammary gland to milk formulations is dependent on the time of food intake in fasting time. Therefore, both dietary regimes of nursing mothers and mother's FAs storage may affect the composition of mother's breast milk fat.

TFA unsaturated factors are derived from two main sources: (A) Naturally due to the biohydrogen of bacteria in the rumen of animal; therefore, the dairy and meat products

of these animals contain low Trans-fat content, and (B) industrial with minor hydrogen that hydrogenated liquid oils containing unsaturated fatty acids (Remig 2010). However, it has been shown that TFAs are harmful to human health and affect lipid metabolism, endothelial function, increase of cardiovascular diseases and insulin resistance.

Monounsaturated fatty acids (MUFAs) have a dual bond in each FA that can occur in different situations. The most common form is a chain of 16 to 22 carbons with independent commonwealth configuration. These acids are the main component of some oily seeds which are widely found in animals and plants (Monitiaia, 2014). PUFAs have two or more bonds in FA and are divided into omega-3 (n-3) and omega-6 (n-6) series. LA (18: 2n-6) and ALA (18: 3 n-3) are essential nutrients and LC-PUFA precursors containing 20 or more n-6 and n-3 carbon atoms (Das Sentus, 2010).

Although these diseases are rare, they generate different types of diseases. Some of these diseases can be cured and should be detected very soon in order to prevent the progress of the disease by correct and timely treatment. Many types of these diseases are untreatable and cause the baby or the infant to die at their early age. Precise knowledge about the disease is very important for genetic consultants since they inform the parents about having future babies and possibly pre-natal diagnosis. These diseases should be diagnosed at their early stages to save the patient's life. It can also be said that even after delivery, the nutritional status of mothers or their diet during pregnancy and lactation are important factors that are highly related to the normal growth of the fetus. It seems that this factor fetal development and changes individual risk for the development of metabolic diseases throughout life.

MATERIAL AND METHODOLOGY

The SFA fatty acids are completely hydrogenated so they have a linear chain without dual bonding between the carbon atoms. At room temperature, they are in solid state and are detected by Lauric acid. To reduce the consumption of fatty acids, it is advisable to use less red meat to prevent cardiovascular disease, obesity, metabolic syndrome and cancer. In this study, the effects of mothers' malnutrition on fetal growth have been widely studied, and the role of prenatal diet in increasing the risk of long-term cardiovascular and metabolic diseases is well known. Diets rich in saturated fats associated with poor control hypoglycemia. Although the planting process differs between mice and humans, the mouse is a unique animal model for studying various mechanisms involved in natural pregnancy including fetoplacental development. The structure of the placentas is significantly different among the mammalian species. However, basic morphology, types of primary cells, functions, and underlying molecular mechanisms and functions are maintained for species sustainability. The trophoblast cells that make up the placentas guarantee a suitable nutrient stream for normal growth and embryo maturity.

DISCUSSION

Embryo planning has been a growing goal in scientific research, especially from a nutritional point of view. The purpose of this research is to investigate the role of different fatty acid consumption during pregnancy or lactation in embryo metabolism and growth. Regarding the studies, it can be said that the type of fatty foods consumed during pregnancy or lactation may have good or bad effects on the health of the embryo. Besides, the physiological roles of some of the fatty acids existed in the diet are different. Global dietary rich in TFAs and SFAs can lead to abnormalities in the metabolism and growth of the embryo which essentially is activated by 4TLR. However, most of the studies conducted on the early detection of PUFAs, in particular n-3PUFA, show its benefits for the embryo's growth and it seems that epigenetic regulations prevent from obesity, insulin resistance, and cardiovascular disease. Some evidences suggest that using MUFA acid by the mother can stimulate the normogenic capacity and change the metabolism of the liver and support the health of the offspring. As a result, more research is needed to examine the effects of using different types of fatty acids during pregnancy or lactation on the metabolism, development, epigenetic and anti-inflammatory status in offsprings. In this study, controversial results were observed, especially in relation to PUFAs.

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