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Metformin Is the First Choice of Oral Medicated Breastfeeding Mothers

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Abstract

Diabetes mellitus (DM) is a group of metabolic disorders in which there are high levels of glucose in the blood. The effects of DM are long-term damage, dysfunction and failure of various organs. Metformin is a common first-line treatment for type 2 diabetes (T2D) patients. It is one of the oldest treatments for diabetes, dating back to the 1960s. Some scholars in their studies have found that Metformin used by mothers is safe for their breastfeed infants. Most T2D breastfeeding mothers choice Metformin for their initial treatment of diabetes. Sometimes Metformin is found in low levels in the serum of breastfed infants. But no adverse effects are seen when breastfeeding women use Metformin as an oral medication. Although metformin does not lower plasma glucose, it should be used by breastfeeding mothers very carefully and should stop immediately if any side effect is observable.

Keywords: Type 2 diabetes, metformin, breastfeeding

1. Introduction

Breast milk is the ideal food for infants, and breastfeeding is one of the most effective ways to ensure child health and survival. Breastfeeding begins within the first hour of a baby's life, and continues as much as the baby wants. Exclusive breastfeeding for the first six months of life, followed by continued breastfeeding with appropriate complementary foods for up to two years and beyond (Johnston et al., 2012; Kramer & Kakuma, 2012).

Breastfeeding is safe, clean and contains antibodies that help to protect against many common childhood illnesses. It is related to nutritional, immunological, emotional, economic, and social benefits. It has a perfect mix of vitamins, protein, and fat that a baby needs to grow. It helps to build a strong immune system in baby and lowers risk of certain diseases (Escobar et al., 2002).

Metformin is an antihyperglycaemic agent that improves glucose tolerance in patients with T2D. In many studies it is believed that Metformin used by mothers is safe for their breastfed infants (Hale et al., 2002). Metformin passes into breast milk in such a small amount that it seems unlikely that these will harm the infant. Oral medicines for lactating mothers are mostly based on the concept of risk and benefit. The medicines that reduce the mother's production of milk should be avoided during the lactation period (Chaves & Lamounier, 2004).

2. Literature Review

In any kind of research, literature review is a starting section, where works of previous researchers are highlighted to find the basic idea of the current research (Polit & Hungler, 2013). It helps the new researchers to understand the subject area for completing their research successfully (Creswell, 2007). Phung Thi Hoang

Nguyen and her coauthors have studied the relation between gestational diabetes and breastfeeding outcomes (Nguyen et al., 2019). Roberto G. Chaves and Joel A. Lamounier have tried to contribute with information about the adequate administration of drugs during breastfeeding. In their study they have found that most of the drugs are compatible with breastfeeding (Chaves & Lamounier, 2004). Maren Johnsen and her coworkers have aimed to determine the feasibility of antenatal breast milk expression (ABE) in terms of practicality and acceptability among women with medically (Metformin or insulin) treated diabetes. They have observed that ABE may lead to increase maternal empowerment and increase breastfeeding rates among women with diabetes in establishing breastfeeding (Johnsen, 2021).

Thomas W. Hale and his coworkers have studied on seven breastfeeding women who are taking Metformin and their infants are feeding with breast milk. They have found that Metformin concentrations in plasma and milk are high performance liquid chromatography. They have also estimated that infant exposure of milk production rate and the average concentration of the drug in milk, and also express as a percentage of the weight-normalized maternal dose. In the study they have found that the mean milk-to-plasma ratio for Metformin is 0.35; the mean of its average concentrations in milk over the dose interval is 0.27 mg/l; and the absolute infant dose averaged 0.04 $mgkg^{-1}day^{-1}$; and the mean relative infant dose is 0.28%. Metformin is present in very low or undetectable concentrations in the plasma of four of the infants who are studied. No health problems are found in the six infants who are evaluated (Hale, 2002).

William M. Hague has shown that Metformin improves insulin sensitivity and reduces hepatic glucose of T2D pregnant women. From the study he has realized that limited amounts of Metformin are transferred into breast milk, but the risk of neonatal hypoglycaemia is negligible (Hague, 2007). Devajit Mohajan and Haradhan Kumar Mohajan have studied various anthropometric tools to measure body weight and body fat that are harmful and may create DM (Mohajan & Mohajan, 2023c-g). They have also discussed eating disorders that may cause obesity (Mohajan & Mohajan, 2023h, i, l). They have also consulted on the hyperglycaemia and extreme obesity in brief (Mohajan & Mohajan, 2023j, m, n, o).

3. Research Methodology

To the academicians there is no alternative but research. It is considered as an essential and influential work for his/her carrier development (Pandey & Pandey, 2015). Methodology is a guideline to perform a research precisely and efficiently (Kothari, 2008). Research methodology is a working procedure for planning, arranging, designing, and conducting a meaningful and valuable research (Legesse, 2014).

In this study we have briefly discussed aspects of diabetes and Metformin. Then we have briefly discussed the effects of Metformin during the breastfeeding of diabetes women. To prepare this paper we have taken help from the secondary data sources related to the article about Metformin using breastfeeding mothers. We have consulted the published books, handbooks, and published and unpublished articles of famous authors (Mohajan, 2018). We have also collected valuable information and necessary materials from websites and internets to develop this study (Mohajan, 2017, 2020).

4. Objective of the Study

The central objective of this study is to discuss the various effects of Metformin during the breastfeeding of women. Other some minor objectives of the study are as follows:

to highlight on diabetes mellitus and Metformin,

to show the actions of Metformin, and

to focus on safety of infant and mother during breastfeeding.

5. Diabetics Mellitus

Diabetes mellitus (DM) is a group of metabolic disorders in which there are high levels of sugar in the blood, either for inadequate insulin production, or for the body cells do not respond properly to insulin, or both (García, 2017; Mohajan & Mohajan, 2023a, b). The causes of diabetes are complex and not fully understood. It is due to a group of aetiologically different metabolic defects (WHO, 2002). It is caused by a deficiency in the production of insulin in the β-cells of the Islets of Langerhans within the pancreas (Schwartz et al., 2016). The genetic make-up, family history, ethnicity, health, and environmental factors that influence the patient can all have an impact on the causes of diabetes (WHO, 2002).

DM reduces life expectancy and increases significant morbidity related to microvascular complications, and diminished quality of life. If it is uncontrolled or poorly controlled for a long-time, it may damage heart, vasculature, eyes, kidneys, and nerves (Mohajan & Mohajan, 2023r, t). The risk factors of DM are obesity, physical inactivity, uncontrolled and unhealthy eating, increasing age, insulin resistance, family history of diabetes, genetic factors, and race and ethnicity (Boulton et al., 2005). In 2019, diabetes caused 4.2 million deaths, and 463 million adults aged between 20 and 79 years old are living with diabetes that costs $720 billion

per year for diagnosis, treatment, and social consciousness purposes (Galicia-Garcia et al., 2020). About 30 minutes or more of moderate to vigorous aerobic exercise, such as brisk walking, biking, swimming, jogging, running, etc. per day a total of at least 150 minutes a week is beneficial for diabetes patients (Goodpaster, 2010; Mohajan & Mohajan, 2023u, v). Recently, modern pharmaceuticals, such as insulin, biguanides, sulfonylureas, and thiazolidinediones are discovered for the treatment of diabetes (Goodpaster, 2010; Mohajan & Mohajan, 2023k, p).

6. Metformin

The word "Metformin" was first described in the scientific literature in 1922, by Emil Werner and James Bell. French physician Jean Sterne (1909-1997) first used Metformin to treat diabetes in 1957 (Fischer, 2010). Metformin (1,1-dimethylbiguanide hydrochloride) is an old and widely accepted first-line agent that is anti-hyperglycaemic and improves endothelial dysfunction, hemostasis and oxidative stress, insulin resistance, lipid profiles, and fat redistribution (Rojas & Gomes, 2013). It works in liver and intestine by stopping to release too more glucose (Verdonck et al., 1981). It reduces hepatic glucose output and increases uptake of glucose by the periphery, including skeletal muscle (Bannister & Berlanga, 2016). It lowers glycated hemoglobin (HbA1c) values up to 1-1.5%. In the body, Metformin absorption is relatively slow and may extend over about 6 hours (NICE, 2015).

7. Activities of Metformin

Metformin is one of the safest and most effective glucose-lowering oral drug therapies (Mohajan & Mohajan, 2023s, w). It works in liver and intestine by stopping to release too more glucose. It lowers blood glucose without altering insulin secretion. Sometimes it is used in combination with insulin or other oral medications (Verdonck et al., 1981). It is available in different formulations, such as tablets, capsules, oral suspensions, oral solutions or modified-release tablets (Bannister & Berlanga, 2016).

Metformin should be introduced in low dose and gradually titrate upwards. Starting dose should be 250 to 500 mg once or twice daily (Pernicova & Korbonits, 2014). Metformin is widely used in the management of infertility. It is also used for the treatment of polycystic ovarian syndrome (PCOS) in pregnant and non-pregnant women. PCOS is characterized by anovulation, and hyperandrogenism (Lord et al., 2003). Metformin improves ovulatory function and stabilizes endocrine function in insulin-resistant women with PCOS to reduce first trimester miscarriage (Glueck et al., 2001). About one-third of the 463 million T2D patients worldwide use Metformin as their oral medication (Galicia-Garcia et al., 2020).

8. Metformin in Breastfeeding

Very small amount of Metformin passes into breast milk, and pre-existing diabetes women can use it safely during breastfeeding (Briggs et al., 2005). Metformin presents in very low or undetectable concentrations in the plasma of the infants who are in breastfeeding (Mohajan & Mohajan, 2023q, w). Various studies indicate that Metformin levels in milk are low and infants would receive less than 0.5% of their mothers' weight-adjusted dosage, and detectable in low levels in the serum of breastfed infants. Although Metformin in milk is very low, it is sometimes detectable in low levels in the serum of breastfed infants (Anderson, 2018).

9. Conclusions

From this study we have observed that only safety oral medications should be administered during breastfeeding. The most commonly used oral medications to treat T2D during breastfeeding are insulin, metformin, and some second-generation sulfonylureas. Among these drugs, Metformin is the cheapest and have fewer adverse effects. As a result, most of the breastfeeding mother's first choice is Metformin. Although it seems that Metformin does not affect infants during breastfeeding, it should be used with very carefully. In future more researches are needed to use Metformin as an ideal medicine for the breastfeeding T2D patients.

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