Moringa oleifera Supplementation in Pregnancy and Breastfeeding

Subjects: Others

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The Moringa tree is highly prized for its nutritional and medicinal properties. Almost all parts of the tree are used for industrial, medicinal and nutritional purposes.

Keywords: Moringa oleifera ; pregnancy ; breastfeeding

1. Introduction

Pregnancy is a state linked with considerable physiological changes resulting in various ailments and medical conditions, including nausea, vomiting, gastric disturbance, and respiratory illness. The mother's diet and lifestyle before and during pregnancy and lactation constitute a determining factor in the infant's health that can project on the wellbeing of the child and future adult [1].

Breast milk is the best food for babies becayse it is safe and clean, and contains antibodies that protect them against common illnesses. It also contains helpful nutrients and energy for babies, especially in the first month of life. Breastfeeding provides physiological and health-relted benefits for both the mother and the baby. The World Health Organization (WHO) and the United Nations International Children's Emergency Fund (UNICEF) recommend that the baby be breastfed within the first hour and exclusively for the first 6 months of life. WHO actively promotes breastfeeding as the best source of nourishment for infants and young children and has set the rate of exclusive breastfeeding for the first 6 months as being up to at least 50% by the year 2025 [2].

Nutritional deficiencies are a significant health concern in developing countries and result in severe health consequences such as delayed physical and mental growth. *Moringa oleifera*, a highly nutritious plant grown in tropical regions of developing countries, has the potential to combat these deficiencies [3]. *Moringa* is well-known for its medicinal properties, with traditional use during pregnancy and breastfeeding to promote fetal growth and alleviate symptoms such as nausea, vomiting, and constipation [4]. *M. oleifera* Lam., belonging to the *Moringaceae* family, is a highly valuable plant with numerous applications in food, medicine, and industry. It has the remarkable ability to thrive in both humid tropical regions and hot, arid countries, making it adaptable to a wide range of environments, including barren or arid soils [5]. Originally native to the Indian and African continents, *Moringa oleifera* is now commercially cultivated in various parts of the world, including India, Africa, South and Central America, Mexico, Hawaii, Asia, and Southeast Asia. The extensive studies conducted on *Moringa* have not reported any adverse effects on human health [6]. However, it is important to note that the nutritional composition of this plant can vary significantly based on genetic factors, environmental conditions, and growing practices [7]. Therefore, the specific nutritional values of *Moringa* may differ depending on these variables.

2. Moringa and Pregnancy

Iron deficiency affects more than 2 billion people worldwide, with a high incidence in middle- and low-income countries. Iron deficiency anaemia (IDA) is a form of anaemia that accounts for 30–50% of all cases [8]. Due to the high prevalence of maternal IDA in developing countries [9] and the high iron content of *Moringa*, most studies available in the literature have focused on monitoring the effects of *Moringa* supplementation on anaemia during pregnancy and the postpartum period. Anaemia is one of the most frequent complications during pregnancy. This is due to the increase in plasma volume during pregnancy, which leads to a physiological decrease in haemoglobin concentration. Iron supplementation is known to increase the red cell mass, thereby increasing the oxygen-carrying capacity of pregnant woman [10]. *Moringa* supplementation has also been shown to increase haemoglobin levels, as well as other haematological parameters such as haematocrit, MCH, MCHC, and MCV values [11]. These benefits can be attributed to the presence of iron in the *Moringa* supplement. Therefore, *Moringa* can be considered to be a beneficial supplement for pregnant women, especially those who are at risk of developing anaemia. However, it is important to note that pregnant women should always consult

their healthcare provider before taking any supplements. One [12] of these is explained in the next section as it is concerned with the study of pregnancy and breastfeeding. In South Sulawesi Province (Indonesia) [13], the study, focusing on pregnant women between 29 and 31 weeks of gestation, compared the efficacy of taking four capsules/day (each containing 500 mg of M. oleifera leaves powder (MOLP)) versus four capsules/day (each containing 60 mg and 400 µg of elemental iron and folic acid (IFA), respectively). It was demonstrated that using the first resulted in a significant improvement in their hemoglobin levels and led to a decrease in their perceived stress and cortisol levels. Furthermore, the newborns of mothers who received MOLP supplements had a higher birth weight when compared to those who were given IFA capsules. In the coastal area of Makassar (Indonesia), a randomized double-blind controlled design, pretest–posttest controlled, was investigated by Nadimin et al. [14] for three months. *Moringa* leaf extract (2 capsules × 800 mg) were contrasted versus IFA (60 mg iron and 250 µg folic) supplements to evaluate nutritional status on the basis of the weight gain and mid–upper arm circumference (MUAC) of non-anaemic women at 5–6 months of gestational age. Based on the results, it appears that, for both studied groups, the intake levels of vitamins C and E, iron, and zinc fell below the recommended minimum adequacy of less than 70% of the recommended dietary allowance (RDA) and that there there was a significant change in the MUAC. Furthermore, the weight gain was greater in the IFA group (6.09 kg) compared to MOLP group (5.07 kg) during three months of intervention. Based on the results, it appears that the intake levels of vitamins C and E, iron, and zinc fall below the recommended minimum adequacy of less than 70% of the recommended dietary allowance (RDA) [15]. In the area of the Puskesmas Tibawa (Tibawa Subdistrict, Gorontalo Regency, Indonesia), the study [13] suggests that *Moringa* extract may be effective in improving haemoglobin (Hb) levels in pregnant women. After six weeks of treatment, a majority of women in the *Moringa* group (54%) had an increase in HB values between 0.1–1.0 g/dL, and a substantial percentage (45%) recorded an increase in HB values between 1.5–2 g/dL. In contrast, the control group had a lower percentage of women with an increase in HB values between 0.1–1.0 g/dL (22%), and a majority (77%) that underwent no change in HB values. It is important to note that this used a *Moringa* extract, rather than MOLP or whole-*Moringa* leaf powder, and compared the results to those from an FIA supplement. Manggul et al. [16] studied the use of *Moringa* leaf flour biscuit (cookies), which contained 78.3 kcal, 1.68 g, 4.63 g, 8.17 g and 0.99 mg of energy, protein, fat, carbohydrate and iron, respectively, for each biscuit. These authors used a design where the control (tablet of iron dose 2 times 250 mg) and intervention (*Moringa* leaf flour biscuit with dose 2 pieces biscuits in a day which that have *Moringa* flour content is 2.8 g each chip biscuit and dose of Fe tablets 2 times 250 mg) groups are not randomly selected. According to their findings, there was no significant effect of hemoglobin level on the intake of iron and zinc among the pregnant women studied in both the first and third trimesters. In a similar study by Loa et al. [17], the same recipe was used to prepare the biscuits. They studied the consumption of the intervention group, who were given *Moringa* leaf flour biscuit with a content of 2.8 g of *Moringa* leaf flour at a rate of 2 pieces/day and a Fe tablet 2 × 250 mg, and the control group, which received tablets of Fe 2 × 250 mg/day. The researchers evaluated the MCH, MCHC, and MCV values before and after a 60-day intervention period. The study group showed an increase in MCH values, while no significant difference was recorded in the control group. MCHC values varied in both groups, but the study group recorded a more significant increase. The MCV values increased significantly in the group that received *Moringa* biscuits, while the increase was not statistically significant in the control group. On the other hand, Andira et al. [18] conducted a study in which *Moringa* was used as an extract combined with royal jelly to evaluate its effect on hematocrit levels. The study compared the combination with a placebo over a period of 60 days. All three groups showed an increase in hematocrit values, but the group receiving the combination of *Moringa* extract and royal jelly showed the highest values.

3. Moringa and Breastfeeding

Numerous studies have investigated the galactagogue properties of *Moringa*, which refer to its ability to initiate, maintain, and/or increase breast milk production. *Moringa* has been included into lactation-promoting products and it is listed on the National Institutes of Health LactMed Lactation Database [19]. Galactagogues are substances or medications that are believed to have such benefits. *Moringa* contains flavonoids and polyphenols, which are thought to contribute to its effect on two hormones (prolactin and oxytocin) that are associated with increased milk production. Pujiastuti et al. [20] utilized *Moringa* to produce biscuits that were given to women in their intervention group in their study. The biscuits were administered 24 h after delivery and combined with iron and vitamin A supplementation in the intervention group, while the control group only received iron and vitamin A. The children's anthropometric parameters were measured before the intervention, on day 7, and day 14. The administration of *Moringa* biscuits had a positive impact on the children's growth, as a greater weight gain was observed in the study group as early as day 7. These positive effects could be attributed to the presence of flavonoids, polyphenols, protein, potassium, and magnesium, which are nutrients that can contribute to increased milk production. Specifically, polyphenols stimulate the hormone oxytocin, which plays a vital role in stimulating the secretion of breast milk. Manganese stimulates the pituitary gland and induces the secretion of prolactin, which increases milk production, while potassium stimulates the secretion of oxytocin, which is necessary for the expulsion of milk from the mammary gland. In 2020, Sari et al. [12] conducted a study to investigate the impact of an intervention

involving *Moringa* leaf extract (MLE), *Moringa* leaf powder (MLP), and IFA on the levels of docosahexaenoic acid (DHA) and arachidonic acid (AA) in breast milk. The lipid composition of breast milk is known to be sensitive to changes in the mother's diet [21][22]. Sari et al. [12] specifically focused on two categories of lipids that are crucial for the development of an infant's brain functions. The intervention lasted for 30 days, and the concentrations of DHA and AA in breast milk were measured in the three groups after the nutritional intervention. No significant differences were found in the concentrations of DHA and AA between the groups, although the levels of DHA in the MLE group were found to be more stable than those in the other two groups. The study also evaluated the quality and quantity of milk produced by monitoring growth during the first six months. In a study conducted by Zakaria et al. [23], a lactation education course was offered to all women included in the study. The study aimed to compare the effectiveness of two different *Moringa* supplements, namely, MLE capsules (3.2 g/day) in the intervention group and MLP capsules (3.2 g/day) in the control group, over a period of approximately 3 months. At the beginning of the study, there was no significant difference in the birth weight and height of the children in the two groups. After three months of treatment, the weight of male children showed no statistically significant difference, while the weight of female children in the intervention group was slightly higher. The height of the children was slightly higher in the control group at the end of the intervention, but the difference was not statistically significant. Based on the average of Z score of body length for age (BL/A) of infants, the control group had better growth, while the intervention group had better values based on the infant's weight/body length. At the end of the intervention, values of the Z score of body mass index for age (BMI/A) had improved in both groups, with the intervention group showing better values, but the difference was not statistically significant. However, in the control group, the difference in the mean deviation of the infant's BMI/A Z score was statistically significant before and after the intervention. The results of the study suggest that the administration of MLE capsules for three months may be more effective in preventing stunting compared to the administration of MLP. Hastuti et al. [24] carried out a longitudinal study to study effects of *M. oleifera*, folic acid, and iron supplementation on child development. The study included pregnant and breastfeeding mothers, and their children were monitored from 18 to 23 months of age in Jeneponto District (Indonesia). The sample size was 344 children, who were divided into three groups based on the type of supplementation received: MLP, MLE and IFA. Child development was assessed using the Denver developmental screening Ttst [24]. The authors obtained that 91.5% of children in the MLP group had normal social–personal development, which was higher than the 86.6% in the IFA group and 88.0% in the MLE group. Differences were also found in the social–personal development of children who were suspected to have developmental issues, with more children in IFA group than in the MLP or MLE groups displaying normal personal development. Overall, the study found no significant difference in children's social–personal development between the three study groups. Suhartatik et al. [25] conducted a study to investigate the relationship between the administration of *Moringa* to mothers and the incidence of morbidity in infants during the first 6 months of their lives. The intervention group in the study received *Moringa oleifera* flour capsules, while the control group received iron folate capsules. The babies' health status was monitored every three months, and the results showed that taking *Moringa* supplements is significantly better for babies during the first 3 months of life compared to taking iron tablets. Furthermore, the study found that the benefits of taking *Moringa* supplements are even greater in the long term as *Moringa* leaf powder is 7857 times more effective in reducing children's morbidity during the following 3 months compared to iron tablets.

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