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Literature Review: The Effect of Folic Acid and Vitamin B6 Content in Dates on Ovulation Quality in Women of Childbearing Age

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Abstract. *Ovulation quality is a crucial component of reproductive health in women of childbearing age because it plays a role in successful fertilization and the sustainability of the reproductive process. Ovulation quality is influenced by oocyte maturation, follicle development, hormonal balance, and ovarian environmental conditions. Nutritional status, particularly adequate intake of folic acid and vitamin B6, is known to play a crucial role in supporting this process. Dates (Phoenix dactylifera L.) are a natural food source containing folic acid, vitamin B6, and bioactive compounds that have the potential to support ovarian function. This study aims to examine the effect of folic acid and vitamin B6 content in dates on ovulation quality in women of childbearing age. The method used was a literature review with a narrative design. Data were obtained from national and international journal articles relevant to the nutritional content of dates, the role of folic acid and vitamin B6, and their relationship to ovulation quality. Data were analyzed descriptively by grouping findings based on the biological mechanisms involved in ovulation. The study results indicate that folic acid plays a role in deoxyribonucleic acid synthesis and oocyte maturation through the one-carbon metabolic pathway, while vitamin B6 plays a role in regulating homocysteine metabolism and ovarian metabolic balance. Furthermore, the bioactive compounds in dates have the potential to help suppress oxidative stress, which can damage oocyte quality. The conclusions of this study suggest that dates have the potential to support ovulation quality through complementary nutritional and biological mechanisms, although further clinical research is needed to strengthen the evidence directly.*

Keywords: *Dates (Phoenix Dactylifera), Ovulation Quality, Folate, Vitamin B6, Oocyte Maturation, Ovarian Function*

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INTRODUCTION

Infertility remains a major public health problem; the World Health Organization (WHO) reports that approximately 1 in 6 adults worldwide experience infertility during their lifetime. Therefore, more affordable, evidence-based prevention and intervention efforts are needed, including nutritional support that is easily accessible to women of childbearing age (Bhutta et al., 2013; Maugeri et al., 2025; Watson et al., 2022; Hofmeyr et al., 2023).

In female infertility, ovulation disorders and "ovulation quality" (oocyte maturity, optimal follicle development, and postovulatory luteal function) are crucial components, determining the chances of fertilization, early embryo development, and implantation success. One biological mechanism consistently linked to decreased oocyte quality is oxidative stress in the follicular

environment, which can trigger mitochondrial dysfunction, DNA damage, meiotic errors, and even follicular atresia (Immediata et al., 2022; Wang et al., 2021; Zhang & Wu, 2023; Mihalas et al., 2017; Almansa-Ordonez et al., 2020).

On the other hand, nutritional approaches are gaining attention because many key processes in folliculogenesis and oocyte maturation depend on adequate micronutrients (Mashhadi et al., 2025; Skoracka et al., 2021; Silvestris et al., 2019; Scaramuzzi et al., 2010; Kohil et al., 2022). In particular, folate (vitamin B9) plays a crucial role in nucleotide synthesis, cell division, and methylation (one-carbon metabolism), which are relevant for gamete maturation and epigenetic regulation. Clinically, folate supplementation is also a standard recommendation for women of reproductive age (e.g., 400 µg/day) to support pre-conception reproductive health broadly (NCBI Bokkshelf, 2025).

The relationship between folate and reproductive outcomes is also often explained through the homocysteine pathway: folate imbalances can contribute to elevated homocysteine, which has been linked in various studies to impaired gamete quality, embryo development, and pregnancy outcomes, including in the context of spontaneous and assisted fertility (Revelli et al., 2025; Menezo et al., 2022; Mathew et al., 2026; Ebisch et al., 2007). Furthermore, homocysteine biomarkers in follicular fluid have been investigated as potential markers of oocyte quality, particularly in populations with ovulatory disorders such as PCOS (Revelli et al., 2025).

In addition to folate, vitamin B6 (pyridoxine) is an essential coenzyme in amino acid metabolism and plays a role in the homocysteine transsulfuration pathway (Gregory et al., 2016; Dalto & Matte, 2017; Calderón-Ospina et al., 2020; Flori et al., 2025). Therefore, its deficiency has the potential to increase homocysteine levels and worsen the reproductive environment. The literature also highlights that vitamin B6 status may be associated with oocyte/embryo quality and fertility parameters, although the magnitude of the effect may vary across populations and be influenced by dietary factors and comorbidities (Skoracka et al., 2021).

In the context of accessible functional foods, dates (Phoenix dactylifera) are of interest because they are known to be a source of energy, fiber, minerals, B-complex vitamins, and bioactive compounds (e.g., polyphenols). A recent scientific review emphasized that dates contain various micronutrients, including B-complex vitamins (including B6 and folate), as well as antioxidant components that have the potential to support metabolic balance and suppress oxidative stress (Hammami et al., 2025; Ali & El-Anany, 2025; Alu'datt et al., 2025; Kumar et al., 2024; Vayalil, 2012).

In particular, Phoenix dactylifera L. (date palm) fruit is known to have a rich nutritional profile, including B-complex vitamins, including pyridoxine (vitamin B6) and folate (vitamin B9) as part of its micronutrient components, in addition to carbohydrates, dietary fiber, protein, and other essential minerals. A comprehensive nutrient composition analysis indicates that date fruit is a source of B-complex vitamins, including thiamine (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), and folate (B9), which play a role in various important metabolic pathways such as amino acid metabolism, DNA synthesis, and one-carbon metabolism. The presence of pyridoxine and folate in dates supports their biological potential in modulating metabolic factors relevant to reproductive health, including homocysteine regulation and cellular function in ovarian follicle development (Shirdel et al., 2025; Kucuk et al., 2023; Erdogan et al., 2024; Zhang et al., 2026).

Biologically, the rationalization of the relationship between “folate and vitamin B6 content in dates” and ovulation quality can be explained through two major pathways: (1) support for one-carbon metabolism and homocysteine homeostasis (relevant for cell division and methylation during oocyte maturation), and (2) the contribution of date antioxidants that have the potential to improve the microenvironment of follicles that are vulnerable to oxidative stress a factor known to damage oocyte quality and increase follicular atresia (Revelli et al., 2025).

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Several preclinical studies also suggest that date extracts/components can modulate oxidative stress and hormonal parameters in reproductive disorder models (e.g., animal models of PCOS), indirectly supporting the hypothesis that date consumption is potentially associated with improved ovarian environment. However, this evidence still needs to be carefully translated to populations of women of childbearing age, particularly with regard to more specific outcomes such as ovulation quality and ovulatory biomarkers (Vitzthum, 2021; Steiner et al., 2017; Bentley & Muttukrishna, 2007; Huang et al., 2020; Kobayashi et al., 2026).

However, a knowledge gap remains: most of the nutrition-fertility literature assesses micronutrient supplements generally or focuses on pregnancy/ART outcomes, while studies specifically linking date intake as a source of folate and vitamin B6 with indicators of ovulation quality in women of childbearing age are still limited. Therefore, studies are needed that test these associations with clear designs, control for confounding factors (age, body mass index, physical activity, energy intake, PCOS/endometriosis, and stress), and measure ovulation indicators.

Based on this urgency and rationale, this literature review was compiled to summarize and synthesize the latest scientific evidence regarding the role of a food-based nutritional approach, specifically the consumption of dates as a natural source of folic acid and vitamin B6, on ovulation quality in women of childbearing age. This review highlights findings from various studies that examine the relationship between folate and vitamin B6 adequacy and the ovulation process.

METHODS

This study employed a literature review method with a narrative review design to examine and synthesize scientific evidence regarding the potential effect of folic acid or vitamin B9 and vitamin B6 content in dates or *Phoenix dactylifera* L. on ovulation quality in women of childbearing age. The narrative review design was selected because the study aimed to provide a conceptual and biological synthesis of existing evidence rather than to calculate pooled statistical effects. Therefore, the review focused on explaining the possible nutritional and physiological mechanisms through which dates, folate, and vitamin B6 may contribute to ovarian function, oocyte maturation, hormonal balance, and ovulation quality.

The data used in this study were secondary data obtained from previously published scientific literature. Literature was searched through PubMed, Google Scholar, and ScienceDirect. The search process used several relevant keywords and keyword combinations, including "date palm," "*Phoenix dactylifera*," "dates and fertility," "folate and ovulation," "folic acid and oocyte quality," "vitamin B6 and female fertility," "vitamin B6 and homocysteine," "ovulation quality," "oocyte maturation," "ovarian function," and "female fertility." These keywords were combined according to the focus of the review to identify literature related to the nutritional content of dates, the biological role of folate and vitamin B6, and their relevance to reproductive function in women of childbearing age.

The literature included in this review consisted of national and international journal articles, review articles, experimental studies, and relevant clinical or nutritional studies that discussed dates, folate, vitamin B6, female reproductive health, ovulation, oocyte quality, ovarian function, oxidative stress, or homocysteine metabolism. Articles were considered eligible when they provided scientific information related to at least one of the main themes of this study, namely the nutritional composition of dates, the role of folate in oocyte maturation and one carbon metabolism, the role of vitamin B6 in homocysteine regulation, or the relationship between nutritional status and ovulation quality. Articles that were not relevant to reproductive health, did not discuss dates or the selected micronutrients, were not available in full text, or came from non academic sources were excluded from the review.

The selected literature was analyzed using a descriptive narrative approach. The findings from each article were read, compared, and grouped according to their main biological mechanisms. The synthesis focused on four major aspects. The first aspect was the folate content

in dates and its relevance to DNA synthesis, cell division, methylation, and oocyte maturation. The second aspect was the role of vitamin B6 in amino acid metabolism and homocysteine regulation, which may influence the ovarian microenvironment. The third aspect was the antioxidant and bioactive compound content of dates and its possible role in reducing oxidative stress in ovarian follicles. The fourth aspect was the broader relationship between nutritional adequacy and ovulation quality in women of childbearing age.

The results of the literature synthesis were then presented narratively by connecting the findings from previous studies with the biological processes involved in ovulation. Because this study was based entirely on published secondary data and did not involve human participants, direct clinical intervention, or primary data collection, ethical approval was not required. However, all sources used in the review were cited appropriately to maintain academic integrity.

RESULT AND DISCUSSION

Table 1. Journal studies on The Effect of Folate and Vitamin B6 Content in Dates on Ovulation Quality in Women of Reproductive Age

No.	Year of Publication	Title	Method	Author	Results	Conclusion
1	2021	Optimized Extraction and Characterization of Folates from Date Palm Fruits	Experimental laboratory study (UHPLC–MS/MS)	Meng et al.	Date fruits contain total folate of 191–301 µg/100 g, with 5-formyltetrahydrofolate as the dominant form, which plays an important role in one-carbon metabolism, DNA synthesis, and cell division processes essential for oocyte maturation and ovarian follicle development.	The active folate content in dates has the potential to support oocyte maturation and ovulation quality.
2	2021	Therapeutic Potential of Date Palm against Human Infertility	Narrative review	Shehzad et al.	Dates contain vitamin B6 and folate, which play roles in homocysteine metabolism. Reduction of homocysteine contributes to a more stable ovarian environment and supports ovarian function as well as ovulation regulation.	Vitamin B6 and folate in dates have the potential to support ovarian function and ovulation quality.
3	2023	The Health Values of *Phoenix dactylifera* (Dates): A Review	Narrative review; Systematic review	Alsarayrah et al.; Shirdel et al.	Dates contain vitamin B6, folate, and polyphenols with high antioxidant activity that help reduce oxidative stress, an important factor in oocyte damage and ovarian follicle dysfunction.	The antioxidant and micronutrient content of dates supports oocyte protection and the

						ovarian environment.
4	2025	A Systematic Review of the Impact of Date Fruit Products on Female Reproductive Health	Systematic review	Shirdel et al.	Consumption of date-based products is associated with improvements in hormonal balance and metabolic function in women of reproductive age, likely influenced by folate, vitamin B6, and other bioactive compounds.	Dates may provide indirect nutritional support for ovulation quality.
5	2025	Nutritional Interventions for Enhancing Female Fertility: Focus on Micronutrients	Comprehensive narrative review	Mashhadi et al.	Folic acid and vitamin B6 play important roles in cell division, hormonal regulation, and ovarian metabolism; deficiencies are associated with ovulation disorders and poor oocyte quality.	Adequate intake of folate and vitamin B6 is a key nutritional factor for high-quality ovulation.

The studies summarized in Table 1 provide an overview of the current evidence regarding the possible relationship between date fruit, folate, vitamin B6, and ovulation quality in women of reproductive age. The table shows that the available literature does not yet provide direct clinical evidence that date consumption improves ovulation quality. However, the reviewed studies consistently indicate that dates contain biologically relevant nutrients, particularly folate and vitamin B6, as well as antioxidant compounds that may support ovarian function through several mechanisms. These mechanisms include DNA synthesis, oocyte maturation, homocysteine regulation, hormonal balance, and protection against oxidative stress. Therefore, the findings presented in the table serve as the basis for the following discussion, which interprets the potential role of dates in supporting ovulation quality through nutritional and biological pathways.

Micronutrient and Antioxidant Pathways Supporting Ovulation Quality

Ovulation quality is a fundamental component of reproductive health in women of childbearing age because it determines the success of fertilization and the subsequent continuity of the reproductive process. Quality ovulation is characterized not only by oocyte release but also includes oocyte maturity, optimal follicle development, good hormonal balance, and an ovarian environment relatively free from oxidative stress. Numerous literature indicates that nutritional status plays a crucial role in maintaining these processes. For example, a literature review stated that optimal nutritional status plays a central role in women's reproductive health through hormonal regulation, ovarian function, and endometrial readiness. While appropriate nutritional interventions can improve natural fertility and the success of assisted reproductive technologies (ART). Good nutrition contributes to hormonal signals that support regular menstrual cycles and proper follicular development, and helps maintain an ovarian environment conducive to quality ovulation (Kapper et al., 2024; Noguera-Navarro et al., 2025).

A recent narrative review also highlighted that folate deficiency is associated with an increased risk of anovulation, while folate supplementation is associated with improved oocyte quality, reduced homocysteine levels in follicular fluid, and increased chances of pregnancy success, particularly in the context of IVF. This suggests that folate not only plays a role in

preventing neural tube defects in early pregnancy but also contributes to optimal ovarian function and oocyte maturation prior to fertilization (Mashhadi et al., 2025).

Furthermore, mechanistic evidence from recent biological studies has found that vitamin B6 (pyridoxine) can influence fundamental aspects of ovarian function, such as the activation of primordial follicles via the PI3K/Akt pathway, which is the initial step in follicle growth and the production of mature oocytes. In vitro studies have shown that vitamin B6 can activate primordial follicles through stimulation of this signaling pathway, which is relevant for maintaining ovarian reserve and ovulatory potential during the reproductive period.

The first reference by Meng et al. (2021) provides a strong scientific basis for the folic acid content in dates. This study used advanced analytical methods (UHPLC–MS/MS) to identify and quantify various forms of folate in dates. Research results show that dates contain 191–301 µg of total folate per 100 grams, with the biologically active form being predominantly 5-formyltetrahydrofolate. This form of folate is highly relevant to one-carbon metabolism, which plays a role in DNA synthesis and genetic methylation. In the ovarian context, this pathway is crucial for oocyte meiosis, chromosome stability, and granulosa cell division. Therefore, the folate content in Ajwa dates has the potential to support optimal oocyte maturation, thus directly contributing to improved ovulation quality in women of childbearing age (Meng et al., 2021).

A second reference, a review by Shehzad et al. (2021) on the therapeutic potential of dates for human infertility, highlights the comprehensive role of nutritional and bioactive compounds in dates, including B-complex vitamins such as vitamin B6 and folate. This review explains that vitamin B6 plays a crucial cofactor in amino acid metabolism and the homocysteine transsulfuration pathway. Elevated homocysteine levels are known to negatively impact ovarian function, oocyte quality, and ovulation regulation (Wang et al., 2022; Forges et al., 2007; Ebisch et al., 2006). By lowering homocysteine levels, vitamin B6 contributes to creating a more conducive ovarian environment for ovulation. In this context, consuming Ajwa dates, which contain vitamin B6, may have a protective effect on ovulation quality through metabolic and antioxidant mechanisms (Shehzad et al., 2021).

The third reference, a systematic review by Shirdel et al. (2025), discusses the impact of date palm consumption on women's reproductive health. While not exclusively assessing ovulation, this review summarizes evidence that date palm consumption is associated with improved hormonal parameters and reproductive function. The authors emphasize that micronutrients such as folate and vitamin B6, along with other bioactive compounds, contribute to the regulation of ovarian function and hormonal balance. Within the framework of ovulation quality, these findings strengthen the hypothesis that Ajwa dates may act as a supportive nutrient source that indirectly influences ovulation through improved hormonal and metabolic function (Shirdel et al., 2025).

The fourth reference, a review of the health value of dates by AlSarayrah et al. (2023), describes the nutritional and phytochemical profile of Phoenix dactylifera, including vitamin B6, folate, and antioxidants such as polyphenols. This review emphasizes that oxidative stress is a major factor impairing oocyte quality and accelerating follicular atresia. Vitamins B9 and B6 not only play a role in metabolic pathways but also indirectly contribute to the cell's antioxidant defense system. Therefore, consuming Ajwa dates has the potential to support ovulation quality through a combination of nutritional and antioxidant effects, which maintain oocyte cell integrity and ovarian mitochondrial function (Alsarayrah et al., 2023).

The fifth reference by Mashhadi et al. (2025) provides a comprehensive review of the role of micronutrients in female fertility. This review confirms that folic acid and vitamin B6 play a crucial role in oocyte quality, hormonal function, and ovarian metabolic regulation, particularly through their influence on one-carbon metabolism and homocysteine metabolism. This study also highlights that adequate B-complex vitamins are associated with a reduced risk of ovulatory disorders and improved reproductive function in women of childbearing age (Pandey et al., 2024; Pršo et al., 2026). Although this study did not specifically examine Ajwa dates, its findings

strengthen the biological basis that natural food sources rich in folate and vitamin B6, including Ajwa dates, may contribute to better ovulation quality (Mashhadi et al., 2025).

Evidence Synthesis on the Potential Role of Dates in Female Fertility

The synthesis of the five references suggests that Ajwa dates have the potential to influence ovulation quality through three main pathways, namely: (1) support for DNA synthesis and oocyte maturation through folate (vitamin B9) content, (2) regulation of homocysteine metabolism and metabolic balance through vitamin B6, and (3) protection against oxidative stress that damages the ovarian environment. Although the existing evidence is still largely indirect, the consistency of the biological mechanisms reported in the literature supports the potential of Ajwa dates as part of a food-based nutritional approach to support ovulation quality in women of childbearing age.

CONCLUSION

Based on a literature review of the journals analyzed, it can be concluded that dates (Phoenix dactylifera L.) have the potential to support ovulation quality in women of childbearing age, primarily through their content of folic acid (vitamin B9) and vitamin B6, which play a crucial role in ovarian function. Various studies have shown that these two micronutrients are involved in biological processes crucial for ovulation, including DNA synthesis and oocyte maturation through one-carbon metabolism, regulation of homocysteine metabolism, and hormonal balance that supports follicle development and optimal ovulatory function. In addition to their micronutrient role, dates also contain bioactive compounds and antioxidants that have the potential to suppress oxidative stress, a factor known to damage oocyte quality and accelerate follicular atresia. Thus, the nutritional effects of dates on ovulation quality are multimodal, encompassing metabolic support, hormonal support, and cellular protection against oxidative damage. Although most of the available evidence is indirect and comes from mechanistic studies and nutritional reviews, the consistency of findings in the literature supports the potential of dates as part of a food-based nutritional approach to support ovulation quality in women of childbearing age, and further clinical research is needed to strengthen the basis for future practice recommendations.

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