

Review Article

Phoenix Dactylifera (Dates) as a Non-pharmaceutical Traditional Food for Expectant and Lactating Mothers: Implications for Reproductive Health

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Abstract

Date palm is known to be the oldest plant in the world. Both fruit and seeds are packed with powerful nutritious and therapeutic properties. Important in Muslim community due to mentioned in Quran and Hadith for its therapeutic and healing properties in reproductive age, which proved by Modern scientific studies for both fetus, infant, and mother. Play crucial role to increased energy stores for delivery, high content of potassium act as a vasodilator and presence of angiotensin-converting enzyme inhibitor and reduce risk of preeclampsia and eclampsia, promote breastmilk production during lactation. Rich bioactive profile acts as an antioxidant and suppresses oxidative damage and boosts up fertility as well as enhance immune response by increasing count of WBC and Nk cell. In short dates fruit might be considered one of the complete nutritional foods to fulfil the requirements of reproductive health. This review highlighted pharmacological and nutraceutical properties of dates fruit and its potential use as a non-pharmacological traditional medicine in reducing pregnancy, lactation, and infertility consequences.

Keywords

Dates, Quran and Hadith, Chemical Composition, Reproductive Health, Breastfeeding

1. Introduction

Date palm, having scientific name is “Phoenix dactylifera” grows in extreme condition, belonging from the family Arecaceae [1]. Its trees have been cultivated since ancient times and have 200 genera and approximately 2,500 species. As it grows in warm areas, in well drained sandy soil up to 1500 m of altitude [2]. Throughout the world such as Middle east, south America, North Africa, as well as Pakistan, India and some parts of Europe, it is cultivated [3]. Pakistan ranked among the leading global producers of palm via several cultivars, and is

the seventh-biggest producer of dates, with an overall yield of 557,279mt in 2011 [4]. Saudi Arabia is second highest producer of date palm having 300 cultivars (Sukkari, Safawy and Ajwa) [5]. India, US, UK, Canada, Germany, Denmark, Malaysia, and Indonesia are the primary purchasers of both fresh and dried dates from Pakistan. The major dates plants are the Dhakki, Aseel and Begum Jangi. The most abundant dates are found in Muzaffar Garh, Multan and Bahawalpur (Punjab), D. I. Khan, Khairpur and Sukkur, Jhang [6]. According to the size,

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color texture and special taste, these fruits are available in abundant variety [3]. Most common date fruits are Ajwa, Safawy and Sukkari and they are currently cultivating in Saudi Arabia [5]. In traditional Persian medicine, dates were frequently utilized as an organic food for inducing labor. This traditional custom, that goes back to the Middle East, Iran, and India, recommended dates as an effective supplementary and alternative form of medicine [7]. This review addresses pharmacological and nutraceutical properties of dates fruit. Which is an affordable, nutritious, and readily attainable food item, contains a variety of biologically active elements that could assist with preventing infertility, boosting breastmilk, and reducing pregnancy consequences.

1.1. Quran and Hadith

With a 700-year history, date palm is known to be the oldest plant in the world [8]. Which is famous for its therapeutic properties [9]. Important in different cultures specifically in Islamic due to various reasons, but most important is mentioned in Holy Quran [10]. With several other fruits. Hadith regarding efficacy of dates mentioning, *Sa'ad (RA) reported: I heard Rasulullah (SAW) say: "Whoever eats seven 'Ajwa dates every day in the morning, no poison or witchcraft will harm him on that day."* (HR. Bukhari: 5327) [11]. Another Hadith from Abu Hurairah (RA) narrated by Imam Ahmad that the Prophet (SAW) said, *"Al-Ajwa (the Prophet's date) is a fruit from heaven, and it is a cure for poison, and Al kam'ah (a kind of plant) is from Al Manna, its water is a cure for poison."* (Sahih Muslim 3814) [12].

1.2. Nutritional Composition

Dates contain high nutritional value and are very effective in fulfilling nutritional needs. For instance, 100 gm of fresh dates provides 157 calories and dry 100 gm data providing 300 calories [1].

1.2.1. Macro and Micronutrients

It is also gaining much interest due to its rich and inexpensive source of micro and macro nutrients. [13] In spite of low protein and lipid content, containing essential amino acid and fatty acid of high quality, good for human health. Among different date varieties, protein content varies between 1.57% & 3.51%. Not only the flesh of date contains nutrients but also the seeds contain protein (5–6%), glycinin and β -conglycinin [14], dietary fiber (75–80%), minerals (2–3%) [15]. Dates contain high concentration of potassium and magnesium and moderate amount of calcium, zinc, copper and selenium [10, 14]. Also contains water soluble vitamins such as B1, B2, B9 and C. β -carotene, lutein and neoxanthin. Carotenoids, which are precursors of retinol, are present in some dates [16]. For the progression of commercialized cultivars, several studies have been done on the nutritional value of the dates fruit, some have given positive feedback [13].

1.2.2. Dietary Fiber and Phenolic Composition of Dates

Date pulp is a combination of non-starchy polysaccharides with insoluble cellulose and moderately soluble hemicelluloses and pectin, as well as hydrocolloids and lignin. Also it contains a great variation of dietary fiber ranging from less than 1.9% up to more than 20.25%, insoluble fiber content is 84% to 94% and soluble fiber is between 6% to 16% [17]. Comparatively, date seeds contain more fiber than flesh, approximately 67% to 74% in combination with water-insoluble manna fiber as the most prominent. Several reported that date seed can be utilized as excellent source of dietary fiber [10].

1.2.3. Nutraceutical Composition of Date

Along with several health benefits, have rich bioactive profile, credited bioactive non-nutrients called phytochemicals [18]. Phytochemicals achieved much interest in the studies as it has properties like free radical scavenging, antioxidating, anti-microbial etc. (Figure 1) [15, 19]. Known food for many phytochemicals such as carotenoids, polyphenols, especially phenolic acids isoflavones, lignans, and flavonoids, tannins, and sterols. All these play a vital role in boosting immunity [20]. Still this area of studies are exploring more about the different varieties of dates grown in different regions of the world [18].

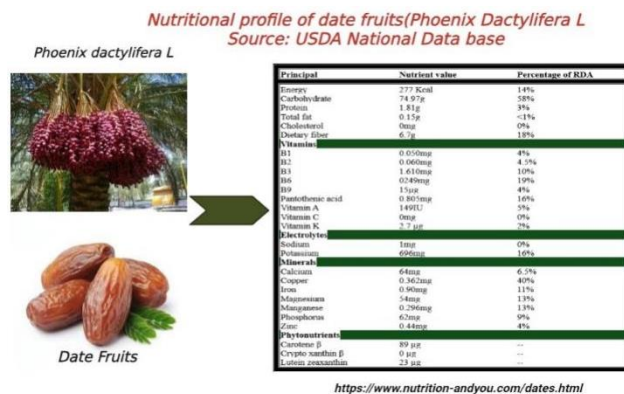


Figure 1. Chemical composition of dates fruit based on USDA national data Base.

2. Maintaining a Healthy Pregnancy

During pregnancy women experience extensive physiological, hormonal, metabolic [21, 22] as well as immunological challenges [23]. Which result various physical responses that female might experience [21]. Maternal and perinatal outcomes depend upon nutritional status. Early nutrient consumption is linked to developmental changes that could influence long run offspring health [24]. In the Holy book of Islam, Surah Maryam verses 22 to 26, "Allah directs the Virgin Mary, Mariam (AS), to consumption of date fruits (And shake towards you the trunk of the palm tree; it will drop upon you

ripe, fresh dates) when Maryam (AS) give birth to prophet Isa (AS) [25-27]. Thus, it shouldn't be shocking that Islamic tra-

dition repeatedly recommends date fruits as beneficial for expectant mothers. Which sounds like a suitable dietary choice for pregnant mothers when make a part of their meal [28].

Table 1. Daily Dates Recommendations in pregnancy and lactation on basis of research.

Dates Type	Recommendation	Duration	Finding	References
Mazafati Bam	G1-100g of dates -	2 hrs. after delivery	Promoting delivery	[29]
Khalas	7 dates soaked in boiled water (1000 ml) for 6 hrs. with 1 medium size lemon	14d	Promote gestational immunity	[30]
Ajwa	70-75 g dates	14d	Promoting healthy pregnancy	[31]
Rotana rutab	7 dates	n-r	Significant labor phase	[32]
Tamer, Sukari	3 dates/d (40 gr/d)	7d	Increase Hb level	[33]
Tamer, Deglet Nour	4-5 dates (50 gr)	n-r	Reduced postpartum hemorrhage	[34]

gr-Gram, n-r- Non reported, d- day, ml- milliliter, hrs.- hours.

2.1. Prostaglandin and Uterus Contraction

Dates act as a good source of saturated and unsaturated fatty acids. Which change into eicosanoid acid, Act as a key of prostaglandin synthesis [28]. Also, serotonin which regulates smooth muscles contraction [35]. Prostaglandins act as a hormone-like substance called autacoids that are part of proteinoids, which is the subclass of eicosanoid acid [36]. Play a vital role in fertilization and ovulation [37]. Prostaglandins perform 'triple action' Like [38]. First action as, stimulation of breakdown of collagen fiber in cervical tissues promoting ripening and softening of cervix, Secondly Prostaglandins bind with G protein receptor of myometrial cell and stimulate contraction by enhancing intracellular calcium level which regulates smooth muscles contraction and relaxation [39]. Also sensitize oxytocin which is a uterus contraction stimulating hormones [4]. The third fold of action of prostaglandins is a membrane rupturing process before and during delivery. PG weakens amniotic fluid membrane, promoting rupture and onset of pain [40]. Evidence reported that, consumption of Ajwa dates frequently during gestation period increases production of prostaglandin and stimulation of oxytocin, which promote childbirth and decrease postpartum hemorrhage [4]. Saadah's finding showed that some pregnant mothers who consume dates fruit during pregnancy face shorter second phase of delivery than those whose didn't [40].

2.2. Oxytocin Enhancement

During gestation, the level of oxytocin receptors increased 200–300 times [31, 41], especially in late pregnancy. Due to content of semi oxytocin like hormone in dates fruit, facilitat-

ing induction of contractions [31, 42]. Oxytocin is that hormone which is produced in hypothalamus and released from paraventricular nucleus and stored in posterior pituitary gland [43, 44]. Which was released in gestation age especially in last trimester, to induce uterine contraction [43, 45]. By increasing number of oxytocin receptors on myometrium cells in uterus and Oxytocin travels to the uterus where it [31, 43]. increasing intracellular calcium levels in uterine fibrils which help in contraction of uterus cells [44].

2.3. Boosting Energy Levels

During Childbirth, contractions of uterus compelled the cervix to expand immensely along with expulsion of placenta as well as fetus maternal body [46, 47]. Which demands a lot of energy [48]. Which stored in form of glycogen in body which might be utilized at time of delivery [37, 41]. Energy needed for delivery is like required for aerobics, which is estimated to be between 50 to 100 calories/hr. [49]. Because smooth muscles during gestation need 20 to 400 times more strength and energy as compared to skeletal muscles. Fat and fatty acids are more efficient source of energy for smooth muscles as compared to glucose [50]. Dates is one of energy dense fruit and intakes of 6 dates/day in last trimester (36-40 weeks) during delivery supply enough energy to reduce risk of fatigue and malnutrition [32]. Dates have a lot of carbs in form of sucrose, glucose and fructose [51]. In dry weighted dates glucose content are 70% (70-73 g/ 100 g) [52]. Inadequate supply of energy in form of glucose will cause fatigue in smooth muscles [50] due to accumulation of lactic acid [25], which inhibits glycolytic enzymes activity as a result disrupts the metabolic reactions of muscle cells and release of Ca²⁺ ions [53].

2.4. Anti Anemic Effects

According to WHO, pregnant women will consider anemic, if serum hemoglobin level <11.0 g/dl regardless of pregnancy [54]. Various international guidelines define anemia for the 2nd trimester (Hb <10.5 g/dL) alongside the WHO criterion [55]. Several causes of anemia during pregnancy such as Inadequate iron intake and Increases iron requirement, expanded blood volume beyond the mass of RBC and postpartum hemorrhage might be a dominant cause of anemia during pregnancy [55, 56]. Hence, anemia is still one of the alarming public health issues of pregnancy [54]. Which is strongly associated with fetal and maternal mortality and morbidity rate during pregnancy [56, 57]. Dates fruit can be act as an iron rich food along with their strong antioxidant profile, helping to improve the anemic condition of patients [58, 59]. Iron act as part of hemoglobin that helps in transportation of oxygen for regulating macronutrients metabolism [60]. Ministry of Health reports that dates iron content is also quite high (0.90 mg/100 g of dates) [61]. Iron absorbed by intestine and bind with protein globin form hemoglobin. So, dates fruit indirectly help in regulation of hemoglobin [60]. According to studies, intake of iron tablets [62] and dates greatly influence the Hb level in pregnant women, if consumed in daily basis during pregnancy [60].

2.5. Promoting Immunity

Biological changes during pregnancy made expectant

mother more vulnerable to infections [63]. While production, completion and maintenance of healthy pregnancy depend upon mother immune system [64]. Dates high fiber and antioxidant profile, play significant role in promoting gut microflora and reduce risk of inflammation [65]. Research on the immunostimulant characteristics of date palm fruit was also conducted, shown to enhance the immune systems by a spike number of IFN- γ + CD4+ cells (WBC), which play important role against microbial infection [66]. Ajwa date water extraction was shown to play a key role in stimulation of natural killer cells in laboratory mice [30]. Evidence suggests that high bioactive profile of dates act as anti-inflammatory functional food and play key role in inhibiting inflammatory cascades during pregnancy [67].

2.6. Others Health Benefits

Evidence suggests that Intake of 7 of Ajwa/d (100g) for 8 weeks in pregnancy significantly reduced BP because of high potassium content [68]. The known cause of eclampsia and pre-eclampsia is endothelial damage [69]. Ajwa date possesses the ability to reduce the risk of preeclampsia by managing BP and inhibit angiotensin-converting enzyme due to content of antiangiogenic compounds like sFlt-1 [70]. High content of polyphenols and flavonoid compounds in date palm sap (Lagmi) indicated their anti-inflammatory properties, also promote wound healing procedures [71]. Expecting women who eat dates might be reduce risk of hemophilia in the infant due to vitamin K content [22].

Table 2. Findings of multiple dissertations on association between *Phoenix dactylifera* and reproductive health.

Dates type/ Country	Sample size	Study design	Age (Y)/ Gestational age (W)	Duration of Interventions/ Treatment	Objective	Finding	Author
Dates/ Indonesia	Total- 40 Intervention-20 Control-20	Non-RCT	25-30y/>38 weeks	Duration-3-4 weeks 7 dates/d (~80 gr/d) → ~147-196 dates,	To assess association of dates with breastfeeding milk on the initial postnatal day.	Minimize the smooth spending of nursing milk.	[72]
Dates/ Pakistan	Total- 140 Intervention-70 Control-70	RCT	18-40y/>35 weeks	Duration: 2-4 weeks 7 dates/d (80 gr/d) → ~98-196 dates.	To evaluate the effects of dates on gestational outcomes	More natural delivery, shorter delivery time.	[26]
Rutab Dates/ Indonesia	Total- 60 Intervention-30 Control-30	Non-RCT	n-r/37 weeks	Duration- 4 weeks Dates juice -2/W-37-41 weeks.	To find the effectiveness of date juice on the timeframe of second phase of delivery.	Dates juice significantly helped gestational women in second phase of childbirth.	[42]
Dry Date fruits / Indonesia	Total-30 Intervention-15 control-15.	Non-RCT	n-r/>37 weeks	n-r	To determine how iron supplements along with pure dates affect the blood haemoglo-	Iron tablets along with dates effectively elevate haemoglobin levels pregnant women.	[60]

Dates type/ Country	Sample size	Study design	Age (Y)/ Ges- tational age (W)	Duration of Inter- ventions/ Treat- ment	Objective	Finding	Author
	pretest and post test				bin levels in last tri- mester.		
Mazafati Bam dates/ Rashit	Total-98 Intervention- 49 Control-49	Non blinded _RCT	n-r/ After deliv- ery	Duration- 2hrs. G1-100 g of date fruits was providing 2 hrs. after delivery	To find out the associ- ation of dates fruit with haemorrhage af- ter delivery.	Intake of dates after normal delivery re- duces haemorrhage.	[29]
Date juice/ Kesumadadi	Total-30 Intervention- 15 Control-15	Quasi-experi- ment	20-35y/n-r	Duration- 3 months (10ml/2tbsp)	To determine associa- tion of dates with se- rum Hb level of post- partum mothers.	Direct association be- tween dates fruit and postpartum mothers.	[58]
Khalas date Lemon/ In- donesia	Total-40	pre-experiments	20-35y/ >35 -2 nd and 3 rd tri- mester	Duration-14d 7 dates soaked in boiled water (1000 ml) for 6 hrs. -1 medium size lemon.	To promote gesta- tional age immunity by ensuring a healthy diet.	Boosting immunity and minimizing illness	[30]
Dates/ Thai- land	Total-48 Intervention -25 Control group-23.	Parallel ran- domized con- trolled trial.	n-r/ Pairs of Breastfeeding mothers and in- fants aged 1-3 months	Duration- 4 weeks 10 dates/day	To determine effect of dates intake on breast milk and infants' nu- tritional status.	Increasing production and amount of breast- milk in lactation.	[73].
Dates/ Indo- nesia	Total -15 One group study	1 group pretest- post-test design	n-r/ Postpartum mother day 3-9	Duration- 7-days intervention 100 g wet dates/day (Twice a day). -50 g after break- fast, 50 g after din- ner)	To find out the poten- tial effect of dates on production of breast- milk.	Can be recommended as a natural alternative source to promote breastfeeding.	[74].
Dates/ Iran	Total-15 rats. Group 1-05 Group 2- 05 Group 3- 05	n-r	8 weeks/ Lac- tating rats	-Duration-22 days -Suspension of palm fruit (Bam date) G1-1 g/kg G2- 2 g/kg G3-Control group	-To analyse the levels of Prolactin in the bloodstream of the mother and the off- spring to assess asso- ciation of dates with breastmilk production.	Promote health and breastfeeding of moth- ers in addition to de- velopment and reduc- tion anxiety in off- springs.	[75]
Rutab Dates fruit/ Iraq	Total-24 rab- bits. Group 1-08 Group 2-08 Group 3-08	RCT	5 to 6M old fe- male rabbits/ Before and dur- ing 1st and 2 nd pregnancy.	-Duration- 120d G1-20 gm Rutab date (80 gm pel- lets), G2-20 gm celery plants (80 gm pel- lets), G3-1(00gm pellets)	To determine the ef- fect of dates as com- pared to celery on some secondary sex- ual hormones	Found significant ef- fects of dates palm on some secondary sex- ual hormones like LH, FSH and Progester- one.	[76]
Date palm pollen/ Iraq	Total-10 crossbred heifers. T1-05 Control	n-r	6 Month/ Pu- berty	Duration-n-r -T1- Main ration plus 2 g date palm pollen. -T2-Main ratio	To analyze the possi- ble impacts of palm dates pollen consump- tion on puberty of heifers.	Found significant as- sociation between dates pollen and pu- berty, maturity	[77]

Dates type/ Country	Sample size	Study design	Age (Y)/ Ges- tational age (W)	Duration of Inter- ventions/ Treat- ment	Objective	Finding	Author
	group-05			without Supple- mentation only.			
Ajwa/ Indo- nesia	Total – 60 Treatment G- 30 Control G-30	Quasi-experi- ment	20-35y/37- 38(W)	-Duration- 14d 70-75 g dates/d	To investigate the im- pact of date intake on oxytocin concentra- tions.	Dates can be used as an alternative food for promoting healthy pregnancy and labour outcome.	[31]

2.6.1. Promoting Breastfeeding

Most nutritious food for infant is breastfeeding specially for first six months [78]. Which promotes the growth and well-being of mothers and infants [79]. Four hormones play significant role in production and regulation of milk such as PTH, Prolactin, Glucocorticoid and insulin. Among these, prolactin act as a key for production of milk [75]. In various tradition dates are used as a medical food and recommended to both pregnant and lactating mother for promoting health status of both infant and mother [66]. Intake of dates fruit during last trimester of pregnancy is recommended by Holy Quran and

which health benefits proved by scientific studies for both infant and mother [80] and boosting the mother's breast milk production [4, 66]. Dates have completed nutritious [81] and phytosterol profile, which change into cholesterol, act as a precursor of glucocorticoid steroids and estrogens, which stimulate proliferation of the breast ducts and alveoli, and promote milk production [77, 82]. After delivery prolactin level increases, which act as a milk production stimulating hormone [75]. Another advantage of dates is the oxytocin content Which is also directly affect milk production. By stimulating myoepithelial cells contraction around the alveoli and triggers letdown reflex [81].

2.6.2. Fertility Enhancement

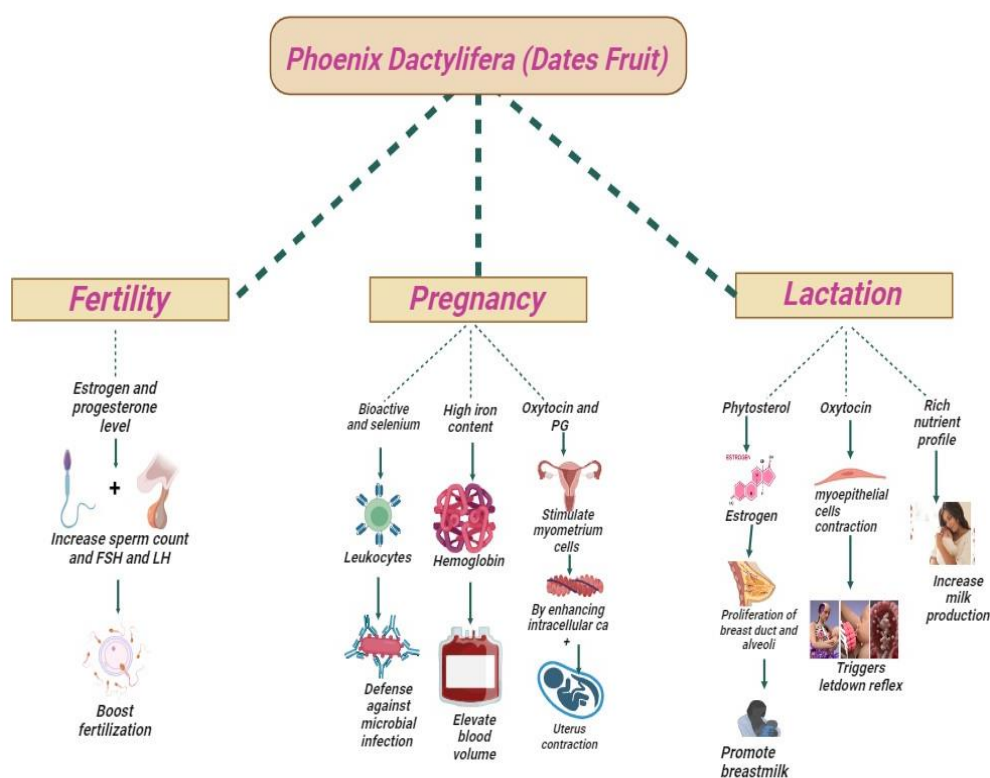


Figure 2. Graphically representation of mechanism action of dates in reproductive health.

Investigation into the impact of nutrition on the reproductive system becomes a growing trend as science advances. Certain meals may contribute to boost fertility and enhance safety [83]. Dates fruit and palm pollen act as a vital role in reproductive health by promoting fertility in both male and female [84]. According to previous research, dates fruits elevate level of estrogen and progesterone in female rats and increases sperm count in male rats [85]. and promote testosterone production [86]. as well as stimulation of hormones such as Follicle Stimulating Hormone (regulates sperm production) and Luteinizing hormones (Regulate function of tests and reproductive system) [27]. Although dates fruit act as a natural traditional fruit used to improve fertility in both male and female [87]. Act as a strong antioxidant and protect sperm cell membrane and seminal duct from oxidative damage, which maintain sperm cellular composition and reduce risk of infertility [88]. Studies found that alcoholic dates fruit extract increase ovarian follicle count and improve female rats' fertility [89]. Dates pollen rich in plant estrogen (increasing sperm count and egg production) [66]. Dates fruit sterol composition converts into cholesterol, which convert into pregnenolone in mitochondria, Pregnenolone molecule change into estrogen, progesterone and testosterone, in the male testes, and in female granulosa cells, and corpus luteum, respectively [77, 90].

3. Conclusion

Dates palm fruit is recommended as a medicinal food from the last several decades to expectant and lactating mother for promoting healthy nutritional status of both mother and infant. reduce the health consequences during and after pregnancy without side effects. Dates consumption during last trimester of pregnancy is recommended by Holy Quran and which proved by scientific studies for both fetus and mothers. In short, this review highlights the pharmacological and nutraceutical properties of dates fruit and its potential use as a non-pharmacological traditional medicine in treating pregnancy, lactation, and infertility consequences.

Abbreviations

WBC	White Blood Cell
NK Cell	Natural Killer
PG	Prostaglandin
WHO	World Health Organization
Hb	Hemoglobin
IFN- γ ⁺ CD4	Th1-polarized CD4 T Cells That Secrete
T cells	Interferon-gamma
RCT	Randomized Controlled Trial

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Aroosha Shafi: Writing – review & editing

Asfiya Nadeem: Formal Analysis

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

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