INFORMATICS JOURNALS

Short Communication

Journal of Natural Remedies
DOI: 10.18311/jnr/2026/52022

eISSN: 2320-3358 | Vol 26(5), 2026 | pp. 1337-1348

Nutritional Evaluation of *Jeevantyadi Avaleha*: A Polyherbal *Ayurvedic* Formulation for Pregnancy

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Abstract

Background: Maternal nutrition significantly influences both foetal and maternal health. Foetal growth largely relies on the mother's capacity to provide adequate nourishment. *Ayurveda* provides specific guidelines for pregnancy, known as *Masanumasika Garbhini Paricharya* (month-wise regimen during pregnancy), which encompasses *Ahara* (dietary), *Vihara* (lifestyle), and *Oushadha* (medicinal) recommendations. The guidelines emphasise a balanced diet and the use of drugs possessing Rasayana (rejuvenative) properties to support foetal development and fulfil the heightened nutritional demands of pregnancy. *Jeevantyadi Avaleha*, a formulation endowed with *Rasayana* (rejuvenative) properties, is specifically designed to support pregnancy. Despite the widespread use of *Ayurvedic* formulations as nutritional and supportive supplements during pregnancy, scientific evidence on their nutritional composition remains limited. Therefore, a laboratory-based nutritional characterisation of *Jeevantyadi Avaleha* is essential to generate evidence supporting its role in pregnancy. **Aim:** The study aimed to evaluate the nutritional composition of *Jeevantyadi Avaleha* indicated in pregnancy to support foetal growth and enhance maternal well-being. **Methods:** The nutritional evaluation of *Jeevantyadi Avaleha* was conducted at two independent laboratories for various nutritional parameters, such as macronutrients, micronutrients, and phytochemicals, following standard guidelines. **Results:** The formulation demonstrated a high energy density (350.27 kcal/100 g) and a high carbohydrate content (83.45 g/100 g), with comparatively low protein content (3.6 g/100 g). It also contained meaningful amounts of iron (22 mg/100 g) and vitamin C (52 mg/100 g), along with moderate levels of calcium, magnesium, and potassium. In addition, the formulation showed appreciable levels of antioxidants, including beta-carotene, flavonoids, anthocyanins, as well as various macro and micronutrients, trace elements, and phytochemicals in varying amounts. This indicates that *Jeevantyadi Avaleha* may contribute to meeting the increased nutritional requirements of pregnancy. Rich in antioxidants, it may play a supportive role in maternal nutrition and foetal development. **Conclusion:** The nutritional evaluation revealed that *Jeevantyadi Avaleha* is rich in macronutrients, micronutrients, and antioxidants; and thus, it may have a promising role as *Garbhini Rasayana* (rejuvenative drugs that can be used by pregnant women).

Major Findings: The findings of the study indicate that *Jeevantyadi Avaleha*, an *Ayurvedic* formulation, may serve as a nutritional supplement during pregnancy, supporting foetal growth and maternal well-being due to its rich nutritional composition.

Keywords: Antioxidant, *Jeevantyadi Avaleha*, Nutritional Evaluation, Pregnancy, *Rasayana*

(Article Chronicle: Article Received on: 27.09.2025; Revised on: 09.04.2026; Accepted on: 15.04.2026)

1. Introduction

Pregnancy and childbirth are pivotal events in a woman's life, crucial for sustaining the continuity of life. Foetal growth is primarily influenced by the mother's capacity to provide adequate nourishment, highlighting the crucial role of maternal nutrition in ensuring the health and well-being of both mother and foetus. Comprehensive antenatal care includes maintaining adequate maternal nutrition and

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adopting healthy habits throughout pregnancy. During pregnancy, the demand for micronutrients surpasses that of macronutrients, and insufficient intake resulting in poor nutritional quality can negatively impact the health outcomes for both the mother and the developing baby[1]. The adequacy of foetal nourishment hinges on both the maternal diet and the placental competence to provide essential nutrients. Despite substantial progress in reducing global poverty and food insecurity in the past 50 years, the prevalence of maternal and child undernutrition is highly prevalent in low-income and middle-income countries[2]. The Maternal Mortality Ratio (MMR) of India was 88/1,00,000 live births in 2021-23 as per the Sample Registration System (SRS)[3]. Maternal deaths are primarily caused by complications arising during pregnancy and childbirth, as well as inadequate nutrition. Approximately 750,000 newborns die each year in India, the highest number of neonatal deaths reported by any country globally[4]. According to WHO statistics, India reported the highest number of preterm births across the globe in 2020[5]. The Infant Mortality Rate (IMR) was 25 infant deaths per thousand live births for the year 2023, according to the Sample Registration System (SRS)[6]. As per the Cause of Death Statistics 2020-22 released by the Office of the Registrar General and Census Commissioner, India, prematurity and low birth weight contributed the largest share among the causes of neonatal mortality (44.7%), infant mortality (31.6%), and child mortality (28.7%) in India[7]. Collectively, this evidence draws attention to the vital need for adequate nourishment during pregnancy.

Antenatal care serves as a vital entry point for pregnant women to access comprehensive health promotion and preventive services, playing a key role in ensuring favourable outcomes for both mother and newborn (WHO/UNICEF, 2003)[8]. The majority of maternal weight gain occurs after the first trimester, with approximately 80–90% of total gestational weight gain taking place during the second and third trimesters[9]. Attaining optimal weight gain and ensuring favourable foetal outcomes during pregnancy can be accomplished through enhanced dietary intake, increased micronutrient consumption, education, and improved awareness.

Deficiencies in micronutrients can impact conception, the duration of pregnancy, and foetal growth and development, potentially leading to adverse outcomes such as pregnancy loss, preterm birth, low birth weight, congenital anomalies, and long-term metabolic disorders[10]. Iron deficiency is responsible for approximately 18% of maternal deaths and is associated with a greater risk of preterm birth and low birth weight. Inadequate folic acid levels are connected to pregnancy-related issues, including placental abruption, spontaneous miscarriage, neural tube defects, and marked language development problems in problems in the offspring. Subclinical iodine deficiency raises the risk of miscarriage and foetal growth restriction. Vitamin A deficiency in mothers can lead to foetal growth restriction, insulin resistance, and glucose intolerance in adulthood, foetal renal agenesis, and a threefold increased risk of schizophrenia and other complications, including early embryonic death. Other essential micronutrients during pregnancy include vitamin D, zinc, and vitamin B_{12}. Due to the difficulty of maintaining a well-balanced and affordable diet throughout pregnancy, supplementation becomes indispensable in minimising the likelihood of poor birth outcomes resulting from nutritional deficiencies.

Growing evidence indicates that the impact of foetal nutrition can extend into adulthood, potentially influencing health across generations[10]. The "Barker hypothesis" or "Foetal Origins of Adult Disease" (FOAD) underscores the association between Low Birth Weight (LBW), both foetal and adult health[11,12]. The hypothesis proposes that exposure to environmental factors during critical stages of intrauterine development can have a profound effect on an individual's short- and long-term health outcomes. This concept links intrauterine growth retardation, low birth weight, and premature birth to the early origins of chronic conditions such as hypertension, coronary heart disease, and diabetes in middle age[13].

In contemporary medical practice, routine iron and calcium supplementation during pregnancy is routinely endorsed to contribute to favourable maternal and foetal outcomes. However, current evidence is insufficient to fully assess the potential benefits or risks of multiple micronutrient supplementation on maternal and infant health outcomes[14]. There is also a growing recognition that food-based and multi-nutrient approaches may offer broader benefits.

Ayurveda offers a robust approach aimed at supporting the well-being of both the expectant

mother and the foetus throughout pregnancy through systematic *Masanumasika Garbhini Paricharya* (month-wise regimen during pregnancy), encompassing *Ahara* (diet), *Vihara* (lifestyle), *Oushadha* (medicinal support), and behavioural modifications of pregnant women. This approach considers both the nutritional requirements of the rapidly developing foetus and the mother's needs during this crucial period, recognising that a standard routine diet may be inadequate to fulfil these requirements. The primary intent of *Garbhini Paricharya* (antenatal care) is to ensure *Paripurnatva* (adequate maternal nutrition and optimum growth and development of the foetus), *Anupaghata* (an uncomplicated pregnancy), and *Sukha Prasava* (a smooth and normal delivery), ultimately aiming for the birth of a healthy child.

1.1 Association Between Maternal Nutrition and Growth Restriction[15]

Prior research has continually highlighted that inadequate maternal nutrition can lead to foetal growth restriction. Cuervo *et al*., highlighted how maternal nutrition impacts foetal-placental growth and metabolic patterns, with lasting effects on the offspring. Vonnahme *et al*., emphasised that maternal undernutrition adversely affects placental vascularity and nutrient transport, both of which are essential for proper foetal growth. Wood-Bradley *et al*., examined how maternal malnutrition, including protein restriction and high-fat diets, affects kidney development in the offspring. Assessing maternal body composition is essential for accurately estimating energy requirements during pregnancy and for understanding the effects of maternal nutrition on the offspring, as highlighted by Darnton-Hill *et al*.

1.2 Significance of *Rasayana Chikitsa* (Rejuvenative Therapy) in Pregnancy

According to classical texts, *Garbha vriddhi* (foetal growth) occurs by *rasa nimitta* (due to primary circulating nutrient fluid) and *maruta adhmana nimitta* (inflation by air), underscoring the significance of optimal *Ahara rasa* (primary product of digestion) and *Rasa dhatu* (primary circulating nutrient fluid) for foetal development. Upon critical analysis of *Ayurvedic* dietary guidelines for pregnancy, it becomes evident that *Ayurveda* advocates a well-balanced and highly nourishing diet with *Rasayana* (rejuvenative) properties, which effectively enhances the quality of *Rasa dhatu* (primary circulating nutrient fluid)[16], effectively meeting the heightened nutritional demands of pregnancy. The fundamental principle of *Rasayana chikitsa* (rejuvenative therapy), encapsulated in the *shloka* (Sanskrit verse) *'Labhopayo hi shastaanam rasaadeenaam rasayanam*[16,17], underscores the aim of enhancing the production of excellent *Rasaadi dhatus* (body tissues). *Rasayana* (rejuvenation) promotes nourishment by direct enrichment of the nutritional quality of *Rasa* (primary circulating nutrient fluid) by improving *Agni*, i.e., digestion, metabolism, and by promoting the patency of *Srotas* (microcirculatory channels in the body)[18]. Consequently, along with a dietary regimen, incorporating *Rasayana* (rejuvenative) drugs during pregnancy can offer additional nutrition and lead to *uttama dhatu nirmana* (formation of excellent body tissues) in the developing foetus, facilitating tissue growth without leading to growth restriction or other complications.

Studies suggest that *Rasayana* (rejuvenative) drugs possess antioxidant, immunomodulatory, hematopoietic, nutritive, anabolic, neuroprotective, anti-ageing, and adaptogenic properties[19-21]. When administered judiciously, *Rasayana* (rejuvenative) drugs may contribute to foetal growth, boost the immune system, and help mitigate the risk of "Foetal Origins of Adult Disease". They may help meet nutritional needs, improve tissue quality, and foster the overall health and well-being of both mother and child, ultimately striving to ensure the birth of a healthy offspring, referred to in *Ayurveda* as *Shreyasi Praja* (healthy progeny)[22].

1.3 Rationale of the Study

A food or dietary supplement is a complex combination of nutrients and bioactive compounds that act synergistically, both within the supplement and in interaction with other components[23]. The greater the variety and concentration of nutrients, the more nutritionally rich a food is considered to be[24]. As pregnancy progresses, the nutritional requirements of a pregnant woman increase to accommodate physiological changes, prepare for childbirth and lactation, and ensure proper foetal and infant development. Given that nutrition plays a

vital role in the concept of *Rasayana* (rejuvenation), the use of *Rasayana Chikitsa* (rejuvenative therapy) is highly valued in *Garbhini Paricharya* (antenatal care). *Rasayana Chikitsa* (rejuvenative therapy), aimed at the optimal formation of *Rasaadi Dhatus* (body tissues), also functions as an antioxidant therapy by preventing the accumulation of free radicals[21]. *Jeevantyadi Avaleha* is one such *Rasayana* (rejuvenative) formulation intended for improving nutritional status and supporting maternal and foetal well-being. The combination of several herbal and nutritional ingredients may offer a synergistic therapeutic effect by providing macro and micronutrients as well as bioactive phytoconstituents.

In-depth nutritional profiling receives little attention in the majority of the literature currently available on *Ayurvedic* formulations. Additionally, there is a disconnect between traditional claims and contemporary biochemical validation because *Rasayana* (rejuvenative) formulations are rarely assessed in light of current nutritional science. The lack of standardised compositional data makes it difficult to scientifically support *Jeevantyadi Avaleha*'s nutritional value, especially when it comes to pregnancy supplements. To address the gap and improve acceptability within integrative health frameworks, laboratory-based evidence regarding its nutritional content must be generated.

In this context, the present study was undertaken to assess the nutritional profile of *Jeevantyadi Avaleha* through laboratory evaluation, to provide baseline data to support its potential role as a nutritional supplement for pregnant women to support foetal growth and maternal well-being, aligning with the recommended nutritional recommendations for pregnancy presented in Table 1.

2. Materials and Methods

2.1 Collection and Authentication of Drugs

The trial drug *Jeevantyadi Avaleha*, a formulated combination, comprises drugs with *Rasayana* (rejuvenative) properties; namely *Jeevanti*, *Satavari, Amalaki, Guduchi, Atibala*, *Arjuna, Draksha,* and *Sita* (as shown in Table 2). Individual raw drugs – root of *Jeevanti* (*Leptadenia reticulata* Retz. Wight and Arn.), root of *Satavari* (*Asparagus racemosus* Willd.), fruit of *Amalaki* (*Emblica officinalis* Gaertn.), stem of *Guduchi* (*Tinospora cordifolia* Miers.), root of *Atibala* (*Abutilon indicum* Linn.), stem bark of *Arjuna* (*Terminalia arjuna* Roxb.), fruit of *Draksha* (*Vitis vinifera* L.), and *Sita* (Sugar) were procured from Jamnagar, Gujarat, India. The identification, authentication, and microscopic evaluation of raw drugs were done in the Pharmacognosy Laboratory of Institute of Teaching and Research in Ayurveda (I.T.R.A), Jamnagar, Gujarat. The standards mentioned in Ayurvedic Pharmacopoeia of India (API) were employed to authenticate the drugs based on morphological characteristics, organoleptic features, and powder microscopy of the individual drugs.

2.2 Method of Preparation of *Jeevantyadi Avaleha*[25]

The raw drugs were properly washed and dried. All ingredients, except *Draksha* and *Sita*, were finely powdered and thoroughly mixed. Water, amounting to four times the total weight of the other drugs, was heated, and *Sita* was added in a quantity four times the total weight of the other drugs. After the complete dissolution of *Sita*, a paste of *Draksha* was incorporated into the mixture. Continuous stirring was maintained while boiling the contents until a thread consistency developed, at which point the mixture was taken off the flame. The remaining ingredients were gradually added and thoroughly mixed to achieve a uniform blend. The prepared *Jeevantyadi Avaleha* was then allowed to cool before being packed and stored in airtight, food-grade plastic containers. Preclinical and clinical safety studies were conducted initially; however, histopathological evaluation was not performed as animal sacrifice was not conducted. Nutritional evaluation of *Jeevantyadi Avaleha* was performed at two distinct laboratory facilities simultaneously for different nutritional parameters. Two 300 g samples of *Jeevantyadi Avaleha*, prepared from the same batch, were sent in airtight, food-grade plastic containers to the laboratories in satisfactory condition. The analyses were conducted according to standard guidelines and included assessment of various nutritional parameters such as macronutrients, micronutrients, and phytochemicals.

3. Results

The results of the nutritional evaluation of *Jeevantyadi Avaleha* are shown in Tables 3 and 4.

Table 1. Nutritional recommendations for non-pregnant and pregnant females

Nutrient	Recommendations for Interventions/Supplement Use	Non-pregnant Females (19–50 Years)	Pregnant Females (19-50 Years)
Macronutrients			
Energy	Restricting energy intake lowers GWG** but may harm birth weight, so it is not advised in pregnancy.	EER*(kcal/day)[3]=354-(6.91*age[year] +PA(***) *[(9.36*weight[kg]+[726*height[m])]	Non-pregnant EER*+340 and 452 kcal/day in 2nd and 3rd trimesters
Protein	Balanced energy-protein supplements (with ≤25% energy from protein) are recommended only for undernourished women to reduce the risk of stillbirth and SGA**** births	0.8 g/kg/day(46 g/day)	0.8 increasing to 1.1g/kg/day in the 2nd half of pregnancy(71g/day)
Total fibre	A fibre-rich diet may help reduce the risk of pre-eclampsia and GDM*******; however, no specific guidelines are currently available. Fibre supplements may be considered for relieving constipation when dietary modifications are ineffective	14 g/1000 kcal (or 25 g/day)	14g/1000 kcal (or ~28 g/day to account for GWG**)
Carbohydrates (GI***** and GL******)	Low GL****** or GI***** diets may help women at risk of GDM******* or LGA**** births, but could raise the risk of SGA**** births. No clear guidelines exist at present	130 g/day	175 g/day
Essential fatty acids (linoleic acid[n-6] and α-linoleic acid [n-3])	n-3 PUFAs******** may help reduce preterm birth risk but could raise the chances of post-term birth and LGA**** births. Currently, no specific guidelines are available	12 g/day (linoleic) 1.1 g/day (α-linoleic)	13 g/day(linoleic) 1.4 g/day(α-linoleic)
Micronutrients			
Folate/folic acid	Recommended (400 µg/day) from preconception until at least 12 weeks of gestation to prevent NTDs*********	400 µg/day	600 µg/day
Vitamin A	Supplementation is not recommended except in regions with a high prevalence of severe deficiency or night blindness	700 µg/day	770 µg/day
Thiamine (B_1)	B-complex vitamins are not currently advised for enhancing pregnancy outcomes because of limited supporting evidence	1.1 mg/day	1.4 mg/day
Niacin (B_2)		14 mg/day	18 mg/day
Riboflavin (B_3)		1.1 mg/day	1.4 mg/day
Pyridoxine (B_6)		1.3 mg/day	1.9 mg/day
Cyanocobalamin (B_{12})		2.4 µg/day	2.6 µg/day
Vitamin C	Not advised until stronger evidence on safety and the risk of PROM********** is available	75 mg/day	85 mg/day
Vitamin E		15 mg/day	15 mg/day
Vitamin D	Not recommended for enhancing pregnancy outcomes, but supplementation (200 IU/day) is advised for women with confirmed deficiency	5µg/day	5µg/day
Calcium	A dose of 1.5–2 g/day is recommended to prevent hypertensive disorders in women with low calcium intake or at high risk of hypertension	1g/day	1g/day
Iodine	Recommended only for women at high risk of IDDs, especially in regions where less than 20% of households use adequately iodised salt	150µg/day	220-250µg/day
Iron	A daily dose of 30–60 mg is recommended to help prevent maternal anaemia, puerperal sepsis, LBW**********, and preterm birth	18 mg/day	27-60 mg/day
Zinc	Not advised for enhancing pregnancy outcomes until stronger and more reliable evidence is available	8 mg/day	11 mg/day
Alcohol	Not recommended during pregnancy until safe upper intake limits are clearly established	Not applicable	None

Table 1. Continued...

Caffeine	Reducing caffeine intake is advised for women consuming over 300 mg/day to help lower the risk of pregnancy loss and LBW********** infants	Not applicable	<200mg/day

Nutritional needs are presented as Recommended Dietary Allowances (RDAs), derived from WHO guidelines and the Dietary Reference Intakes of the Institute of Medicine[1].
* Estimated energy requirement
**Gestational weight gain
***Physical activity
**** Small / Large-for-gestational-age
*****Glycaemic index
******Glycaemic load
*******Gestational diabetes mellitus
********Polyunsaturated fatty acids
*********Neural tube defects
**********Premature rupture of membranes
***********Iodine deficiency disorders
********** Low birth weight

Table 2. Composition of *Jeevantyadi Avaleha* (formulated)

Name of drugs	Latin Name	Part Used	Ratio
Jeevanti	*Leptadenia reticulata* (Retz.) Wight and Arn.	Dried root	1
Satavari	*Asparagus racemosus* Willd.	Dried root	1
Amalaki	*Emblica officinalis* Gaertn.	Dried fruit	1
Guduchi	*Tinospora cordifolia* Miers.	Dried stem	1
Atibala	*Abutilon indicum* (Linn.)	Dried root	1
Arjuna	*Terminalia arjuna* (Roxb.)	Dried stem bark	1
Draksha	*Vitis vinifera* L.	Dried fruit	1
Sita (Sugar)			28(7x4)
Jala (Water)			28(7x4)

The laboratory evaluation showed that *Jeevantyadi Avaleha* provides 350.27 kcal per 100 g, highlighting its energy-rich nature. Carbohydrates formed the major proportion (83.45 g/100 g), with nearly half contributed by sugars (49.86 g/100 g), which largely explains its caloric density. The protein content (3.60 g/100 g) and dietary fibre (2.05 g/100 g) were present in moderate amounts, indicating a supportive role in tissue nourishment and digestive health. The formulation contained very little fat (0.23 g/100 g), with only traces of saturated and unsaturated fatty acids, and no detectable trans-fat or cholesterol, reflecting a predominantly low-fat profile.

Concerning micronutrients, 22 mg/100 g of iron was present, which is noteworthy considering its relevance in nutritional support, particularly in populations prone to anaemia. Calcium (69 mg/100 g), magnesium (40 mg/100 g), potassium (93.57 mg/100 g), phosphorus, zinc, copper, and manganese were also detected, suggesting a broad mineral spectrum. Sodium levels were low (35.48 mg/100 g). Importantly, mercury and selenium were not detected, and lead was found only in a minimal amount (0.15 mg/kg), remaining within acceptable safety limits. The analysis further demonstrated the presence of vitamin C (52 mg/100 g), vitamin A (128.13 µg/100 g), thiamine, pyridoxine, niacin, pantothenic acid, and folate, while vitamins B_2, B_7, and B_{12} were below quantifiable levels. In addition, measurable amounts of beta carotene (19.63 mg/100 g), flavonoids (319.60 mg/100 g), and anthocyanins (12.17 mg/kg) were detected, suggesting antioxidant potential alongside its nutritive value. Taken together, the findings indicate that *Jeevantyadi Avaleha* is primarily a carbohydrate-based, energy-dense formulation with

Table 3. Nutritional parameters of *Jeevantyadi Avaleha* analysed at Laboratory No. 1

Sr. No.	Quality Characteristics	Result	Test Method
1	Energy, kcal/100 g	350.27	AL/SOP/6.4/C-035[26]
2	Total fat, g/100 g	0.23	AL/SOP/6.4/C-111[27]
3	Saturated fat, g/100g	Traces	FSSAI manual for analysis of oils and fats[28]
4	Polyunsaturated fat, g/100g	Traces	FSSAI manual for analysis of oils and fats[28]
5	Monounsaturated fat, g/100g	Traces	FSSAI manual for analysis of oils and fats[28]
6	Cholesterol, mg/100 g	0.0	AOAC 21st Edition[29]
7	Carbohydrate, g/100g	83.45	AL/SOP/6.4/C-036[26]
8	Sugar, g/ 100g	49.86	AL/SOP/6.4/C-109[30]
9	Sodium, mg/100 g	35.48	AL/SOP/6.4/C-088[31]
10	Protein, g/100g	3.60	AL/SOP/6.4/C-156[32]
11	Dietary fibres, g/100g	2.05	AOAC 985.29[33]
12	Trans fat, g/100g	ND*	FSSAI manual for analysis of oils and fats[28]
13	Iron, mg/100 g	22	FSSAI manual for analysis of metals[34]
14	Calcium, mg/100 g	69	IS 5949: 1990[35]
15	Vitamin C, mg/100g	52	AL/SOP/6.4/C-171
16	Potassium, mg/100 g	93.57	AL/SOP/6.4/C-088[31]
17	Vitamin D, mcg/100 g	ND*	AL/SOP/6.4/C-172[36]
18	Vitamin E, mcg/100 g	ND*	AL/SOP/6.4/C-192[37]
19	Iodine, mg/100 g	ND*	AL/SOP/6.4/C-202[28,38]
20	Magnesium, mg/100 g	40	AL/SOP/6.4/C-310[35]
21	Mercury, mg/kg	ND*	AL/SOP/6.4/C-157[39]
22	Lead, mg/kg	0.15	AL/SOP/6.4/C-157[40]
23	Selenium, mg/kg	ND*	AL/SOP/6.4/C-157[40]
24	Phosphorus, mg/kg	251	AL/SOP/6.4/C-157[41]
25	Zinc, mg/kg	3.63	AL/SOP/6.4/C-157[34]

*Not detected

Table 4. Nutritional parameters of *Jeevantyadi Avaleha* analysed at Laboratory No. 2

Sr. No.	Characteristics	Limit of Quantification	Result	Test Method
1	Beta carotene, mg/100 g	5.00	19.63	HPLC[42]
2	Anthocyanins, mg/kg	0.50	12.17	GC-MS[43]
3	Copper, mg/100 g	0.10	10.63	ICP-OES[34,44,45]
4	Flavonoids, mg/100 g	0.50	319.60	HPLC[46]
5	Manganese, mg/100 g	0.10	389.63	ICP-OES[34,44,45]
6	Zinc, mg/100 g	0.10	19.72	ICP-OES[34,44,45]
7	Vitamin A µg/100g	5.00	128.13	IS 5886[42]
8	Vitamin B_1, mg/100 g	0.01	10.66	IS 5398[47]
9	Vitamin B_2, mg/100 g	0.10	BLQ	IS 5399[48]
10	Vitamin B_5, mg/100g	0.20	0.99	IS 9840[49]
11	Vitamin B_6, mg/100g	0.50	16.17	IS 7530[50]
12	Vitamin B_7, µg/100 g	0.50	BLQ	IS 9820[51]
13	Vitamin B_9, µg/100 g	10.0	18.63	IS 7234[52]
14	Vitamin B_{12}, µg/100mg	0.50	BLQ*	1S 1529[53]
15	Vitamin B_3, mg/100 g	0.50	3.73	IS 5400[54]

*Below the limit of quantification

meaningful iron content and a range of supportive micronutrients and phytoconstituents, aligning with its traditional use as a nourishing preparation.

4. Discussion

During pregnancy, a woman's nutritional requirements rise to support physiological changes, prepare the body for childbirth and lactation, and promote the healthy development of the foetus. Pregnant women must carefully monitor their dietary intake to ensure that sufficient levels of essential micronutrients are maintained.

The trial drug *Jeevantyadi Avaleha* comprises individual drugs with *Rasayana* (rejuvenative) properties; namely *Jeevanti*, *Satavari, Amalaki, Guduchi, Atibala*, *Arjuna, Draksha,* and *Sita,* which is formulated for administration during pregnancy with the specific goals of promoting foetal growth and ensuring maternal well-being. Consequently, this preparation should meet the increased nutritional demands of pregnancy, necessitating a high nutritional value. The utilisation of *Rasayana Chikitsa* (rejuvenative therapy) during pregnancy is indirectly alluded to in *Garbhini Paricharya* (antenatal care). *Rasayanas* (rejuvenative drugs) also possess antioxidant properties, preventing the accumulation of free radicals[21]. In pursuit of this additional objective, nutritional evaluation of *Jeevantyadi Avaleha* was conducted to ascertain the presence of various nutritional parameters in the formulation. The evaluation revealed considerable levels of macronutrients, including carbohydrates, fats, and proteins, as well as a wide range of micronutrients such as iron, calcium, vitamin C, potassium, sodium, magnesium, phosphorus, zinc, manganese, vitamin A, and B-complex vitamins, as mentioned in Tables 3 and 4. Additionally, notable amounts of beta-carotene, copper, anthocyanins, and flavonoids were also identified, as mentioned in Table 4.

The nutritional evaluation of *Jeevantyadi Avaleha* demonstrated that the formulation is an energy-dense preparation, primarily manifested by its high carbohydrate content. The predominance of carbohydrates, especially simple sugars, aligns with findings from other *Avaleha* formulations mentioned in *Ayurveda* classics[55,56]. Gestational weight gain is largely determined by energy intake, essential for the generation and development of new tissues, including the foetus, placenta, and amniotic fluid, as well as for the growth and expansion of maternal tissues such as the uterus, breasts, and adipose stores[1].

The protein and dietary fibre content observed in this study, though moderate, is typical of herbal preparations that are not primarily protein-based supplements. In comparison, fortified nutritional supplements tend to report higher protein levels due to added legumes or dairy protein isolates. Protein is crucial for structural functions (keratin, collagen) and functional processes (enzymes, protein transport, hormone regulation)[1].

The low lipid content and absence of trans fat and cholesterol further differentiate *Jeevantyadi Avaleha* from many commercially marketed nutritional supplements, which may incorporate vegetable oils or emulsifiers to enhance texture and caloric density. Mineral analysis revealed appreciable levels of iron, calcium, potassium, magnesium, and trace elements such as zinc and copper. The iron content (22 mg/100 g) is particularly notable given that many over-the-counter health supplements provide iron in isolated form only. Iron is crucial for haemoglobin synthesis, oxygen transport, and cellular functions. Calcium facilitates the development of the foetus, and its deficiency can have harmful effects on the health of both the mother and the foetus[1]. Potassium helps maintain blood pressure, countering excess sodium[57]. Magnesium helps regulate blood pressure, benefiting pregnancy by reducing the risks of hypertension and preterm birth[57]. Zinc is vital for enzyme function, protein synthesis, and immune function.

Vitamins identified in *Jeevantyadi Avaleha* include vitamins A, C, and B-complex components. Vitamin A is needed for foetal growth, tissue maintenance, and maternal metabolism[1]. B-complex vitamins are vital for energy production and the metabolism of proteins, fats, and carbohydrates. Folate (Vitamin B_9) is vital for DNA and neurotransmitter synthesis, amino acid metabolism, protein synthesis, and cell proliferation. Insufficient folate can cause preeclampsia and foetal anomalies, but supplementation can prevent neural tube defects[1]. Vitamin C is vital for collagen synthesis, iron absorption and mobilisation, and plays a key role in preventing anaemia while mitigating oxidative stress linked to pregnancy complications[1].

The evaluation demonstrated the presence of considerable antioxidant constituents, including beta carotene (19.63 mg/100 g), flavonoids (319.60 mg/100 g), anthocyanins (12.17 mg/kg), and vitamin C (52 mg/100 g). These bioactive compounds are known to contribute to free radical scavenging activity and may support cellular protection and overall health. In addition, carotenoids (reflected through vitamin A content of 128.13 µg/100 g), along with trace minerals such as manganese (389.63 mg/100 g) and copper (10.63 mg/100 g), were detected, which serve as important cofactors for antioxidant enzymes such as superoxide dismutase and contribute to oxidative stress regulation. Excessive reactive oxygen species (ROS) during pregnancy leads to complications such as foetal loss, intrauterine growth restriction, and gestational diabetes mellitus[58]. The intake of flavonoids has been associated with a reduced risk of hypertensive disorders in pregnancy, including pre-eclampsia, by regulating inflammation, oxidative stress, and vascular dysfunction. Anthocyanins, phenolic pigments, contribute to cardiovascular and neuroprotective health[59,60]. Copper helps prevent adverse outcomes such as preeclampsia, foetal growth restriction, and miscarriage. Manganese is essential for pregnancy progression and foetal growth, defending against oxidative stress. Carotenoids are beneficial in preventing preeclampsia and may help prevent preterm birth and intrauterine growth restriction.

When compared with other traditional *Ayurvedic* products analysed in scientific studies, *Jeevantyadi Avaleha*'s nutrient profile aligns with the typical compositional patterns seen in energy-dense, carbohydrate-rich classical *Avaleha* (linctus) preparations. For instance, *Kushmanda Avaleha* has been shown to contain high carbohydrate and total sugar content with low fat, indicating a predominance of carbohydrate constituents similar to *Avaleha kalpana* preparations like *Jeevantyadi Avaleha*[56]. *Chyavanaprasha* also demonstrated a high carbohydrate and phenolic content with measurable antioxidant activity and consistently exhibited moderate vitamin C and phenolic levels, supporting antioxidant claims similar to the flavonoid and betacarotene findings in *Jeevantyadi Avaleha*[55]. The presence of significant iron and antioxidants in *Jeevantyadi Avaleha*, in parallel with findings from *Chyavanaprasha*, suggests a potential role not merely as an energy source but also as a functional supplement with nutritive and bioactive benefits. In comparison with polyherbal nutritive granules studied for their nutritional characteristics, polyherbal formulations also reported carbohydrates as the major macronutrient, low fat, and appreciable mineral content, including calcium and magnesium[61]. These patterns align with the proximate profile observed in *Jeevantyadi Avaleha*, where carbohydrates dominated, and fat remained minimal, while micronutrients such as iron, magnesium, and potassium were present in significant amounts.

Even though comparisons with commercially available nutritional supplements and other traditional formulations provide the baseline, individual nutrient content comparisons are limited due to differences in formulation purpose, ingredient sourcing, and methods of analysis. In contrast to commercially available nutritional supplements that often focus on macro and selected micronutrients with limited phytochemical content, the combination of micronutrients and phytoconstituents in *Jeevantyadi Avaleha* may provide added oxidative stress modulation and holistic support beyond basic nutrition. The traditional *Rasayana* (rejuvenative) understanding of this formulation as promoting nourishment, strength, and vitality appears to be supported by its biochemical profile, which integrates energy provision with a spectrum of macronutrients, micronutrients and antioxidants. *Jeevantyadi Avaleha*, a formulated combination of *Rasayana* (rejuvenative) drugs, may thus be considered as a *Garbhini Rasayana* (rejuvenative drugs that can be used by pregnant women), being a rich source of macronutrients, micronutrients, and antioxidants, which may have a promising role in promoting foetal growth and ensuring maternal well-being during pregnancy.

5. Limitations

The present nutritional evaluation of *Jeevantyadi Avaleha* was conducted on samples drawn from a single batch, which may not reflect batch-to-batch variations. Correlation with classical *Ayurvedic* pharmacodynamic attributes was also beyond the scope of the study.

6. Conclusion

In conclusion, the nutritional evaluation of *Jeevantyadi Avaleha* highlights its richness in essential macronutrients, micronutrients, and antioxidants, which are critically needed during pregnancy to support both maternal and

foetal health. Considering the heightened nutritional demands during this period, *Jeevantyadi Avaleha* may function as an effective *Garbhini Rasayana* (rejuvenative drugs that can be used by pregnant women), supporting *Uttama Garbha Poshana* (optimal foetal nourishment) and promoting *Garbhini Swaasthya* (maternal well-being). It may also contribute to the prevention of pregnancy-related complications. Future research should focus on advanced micronutrient and phytochemical profiling, assessment of bioavailability, and establishment of standardised quality control benchmarks. Additionally, batch-to-batch consistency analysis will strengthen its evidence base. Such studies will facilitate scientific validation and integration of *Jeevantyadi Avaleha* into maternal health and public health nutrition programmes.

7. Acknowledgments

We sincerely extend our heartfelt gratitude to the Ministry of Ayush, Institute of Teaching and Research in Ayurveda (I.T.R.A), Jamnagar, Gujarat, for the financial support and ground-level assistance throughout this research project. We extend our appreciation to Accurate Laboratory, Ahmedabad, Gujarat, and Lilaba Analytical Laboratories, Surat, Gujarat, for providing the necessary facilities and technical assistance for the study. Finally, we gratefully acknowledge Dr. Muhammed Nissam, Assistant Professor, Department of Shalakya Tantra, Government Ayurveda College, Kannur, Kerala, for his invaluable feedback and unwavering encouragement throughout the research process. We also acknowledge Dr. Anjaly M. V., Associate Associate Professor, Department of Prasuti Tantra and Streeroga at Amrita School of Ayurveda, for her support in the preparation of this manuscript.

8. Funding

Ministry of Ayush through Institute of Teaching and Research in Ayurveda (I.T.R.A), Jamnagar, Gujarat.

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Author Contribution

Conceptualisation: L.D. and L.C.; methodology: L.D. and L.C.; literature content: L.C.; study: L.D. and L.C.; data acquisition and interpretation: L.D. and L.C.; manuscript preparation: L.C.; manuscript editing: L.C.; manuscript review: L.D.; supervision: L.D. All authors have read and agreed to the published version of the manuscript.