

# Green and Red Remedies: Exploring Wheatgrass and Pomegranate Juices for Anaemia in Adolescent Girls

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## Abstract

This research paper reviews the potential of wheatgrass juice (*Triticum aestivum*) and pomegranate juice (*Punica granatum*) as natural supplements to help prevent anaemia in teenage girls. Anaemia, especially iron deficiency anaemia, is a widespread problem in this age group and can cause issues like poor physical and mental development. The study carefully examines the nutrients and beneficial compounds in these juices to see if they can raise haemoglobin levels and improve health. It also explores how these juices might work in the body to prevent anaemia. The paper also addresses the cultural and socioeconomic determinants influencing the acceptance and accessibility of these natural supplements, providing a comprehensive evaluation of their practicality as alternatives to conventional anaemia treatments. For this purpose, 41 research articles were identified and rigorously reviewed which clearly underscore the potential of wheatgrass and pomegranate juice as effective, culturally resonant and accessible interventions for anaemia in adolescent girls.

## Keywords

*Anaemia, Adolescent Girls, Pomegranate juice, Supplementation, Wheatgrass juice*

## Introduction

Anaemia, particularly iron deficiency anaemia (Clark, 2008), represents a critical public health challenge worldwide, with adolescent girls being especially susceptible. This condition can induce a range of severe health issues, including fatigue, cognitive impairment and stunted physical development, which undermine overall health and quality of life. Owing to the heightened nutritional demands during adolescence (WHO, 2008), it is imperative to address anaemia through effective dietary interventions. Among such interventions, wheatgrass juice and pomegranate juice are distinguished for their rich nutritional content and bioactive compounds, which hold promising for ameliorating anaemia.

The occurrence of anaemia among adolescent girls is notably high, particularly in urban slum areas where prevalence rates can soar to 90.1% (Kulkarni et al., 2012). This is further exacerbated by insufficient dietary intake and socio-cultural practices contributing to increased iron deficiency. During adolescence, the body's requirement for iron escalates dramatically, from 0.7 mg to 0.9 mg daily in preadolescents and to 3.27 mg daily in adolescent

girls (Kumari et al., 2017). If these increased needs are not met it can lead to significant long-term repercussions, including elevated risks of maternal and foetal mortality. Here our main objective is to investigate the efficacy of wheatgrass juice and pomegranate juice as dietary supplements for the aversion and handling of anaemia in adolescent girls, with primary objective being assessment of their nutritional benefits, elucidating their mechanisms of action and evaluating the impact of cultural and socioeconomic factors on their effectiveness. This study is important as it provides natural and pragmatic solutions to anaemia while addressing broader public health implications.

In this paper we first explore the prevalence of anaemia and the necessity for effective dietary interventions. This is followed by an analysis of the nutritional profiles and health benefits of wheatgrass and pomegranate juices. Then we review about the mechanisms by which these juices influence anaemia and finally the cultural and socioeconomic factors impacting the consumption of wheatgrass juice and pomegranate juice, culminating in a discussion on the broader public health implications and directions for future research.

### **Research methodology**

The key objective of this literature review is to find out how wheat grass juice and pomegranate juice impacts the anaemic condition of adolescent girls on the basis of three themes

1. Nutritional profile
2. Mechanism of action
3. Socioeconomic impact

For this purpose, we identified, reviewed and analysed about 41 articles and the details about the above three themes were found in 17 articles which were then thoroughly studied. A systematic and rigorous review of these 17 articles was done to study the effect of wheat grass juice and pomegranate juice on anaemic adolescent girls. The total articles reviewed also included articles on the rampancy of anaemia and the need and kinds of supplementation to combat anaemia in adolescent girls.

### **Literature Review**

#### *Prevalence of Anaemia in adolescent girls*

*“The World Health Organization (2008) defines adolescence as the period between 10 and 19 years, a crucial stage of development where nutritional needs are heightened, making adolescents particularly vulnerable to anaemia. This condition, if untreated, can lead to severe long-term consequences, including increased risks of maternal and foetal mortality”* (World Health Organization). Anaemia among adolescent girls in urban slums, with a prevalence as high as 90.1%, is a pressing public health concern. This condition has significant associations with certain factors, such as the girls’ education and their mothers’ occupations, while other socio-demographic factors, including menarche status and age, showed no correlation with anaemia (Kulkarni et al., 2012).

Iron is an essential micronutrient required for various bodily functions, including cellular growth, oxygen transport, enzymatic reactions and cognitive development. During adolescence, the daily demand for iron increases significantly in adolescent girls (Kumari et al., 2017). Therefore, if the demand is more and nutritional intake inadequate, this makes adolescent girls particularly susceptible to iron deficiency leading to anaemia.

Studies carried out in Bhopal highlighted that there was prevailing incidence of mild to moderate anaemia prevalence among adolescent girls and there is certain need of specific efforts like provision of iron and folic acid supplementation, intake of iron rich foods, healthy sanitary practices, and periodic deworming to overcome the menace of anaemia (Melwani et al., 2018). The research also noted that the risk of anaemia was higher in populations where the intake of fruit remained low and the consumption of iron-rich fruits such as apples and pomegranates was prevalent. This shows the salient role played by vitamin C in facilitating the absorption of iron by the body and hence, decreasing the incidence of iron deficiency anaemia (Ahankari et al., 2017).

In India, the scenario is further worsened by the social factors, which means that there is early marital and reproductive behaviour in girls which only adds to the chances of anaemia because of the greater demands for wafers owing to growth spurts, sexual maturation and the onset of menstruation (Upadhye & Upadhye, 2017). Additionally, the reasons for anaemia included a vegetarian diet, heavy menstrual flow, iron deficiency and worm infestations, also age, BMI, education and socio-economic status were not considered important enablers (Kaur et al., 2006).

#### *Supplementation for anaemia*

The reduction of anaemia in adolescent females is crucial because this condition impacts reproductive health concerns. It is important to prevent iron deficiency during pregnancy because existing deficits aggravated by the increased based of a pregnant woman make it difficult to manage anaemia. Iron –folate combination corrects the haemoglobin levels as well as enhance the growth of poor adolescent girls (Kurz & Galloway, 2000). Certain causes of anaemia in girls, how they are prevented and how they are treated are inadequately known. Comprehensive approaches should be applied to these populations by promoting the anti-anaemia measures addressing militant socio-economic factors like religion, caste and socio-economic status. Increasing the adult education level and considering measures for the improvement of the economic status of people may lower the rate of anaemia in these groups (Sachan et al, 2012). According to researches, it has been found that dry drumstick leaf powder can help to increase the levels of haemoglobin considerably. This low-cost locally available supplement helps to add iron into the body and fight iron deficiency anaemia particularly in poor communities (Choudhary et al., 2020).

Iron supplementation on a weekly basis, when made with dried fish leaf powder, amla powder and lemon water, proves to be more effective than iron-folic acid in the restoration of normal red blood cell levels, haemoglobin levels and iron levels which helps in preventing iron deficiency anaemia (Kaur & Sangha, 2016). Furthermore, iron supplementation is supportive of the cognitive skills such as the verbal learning and memory, in particular, to the adolescents that are iron deficient regarding the study of iron supplementation (Bruner et al., 1996). But a more reasonable approach for the same problem would be a combination of weekly iron-folic acid

supplementation and biannual deworming with the prospect of significant reduction of anaemia prevalence among adolescent girls (Vir et al., 2008). Supplementation of iron with either folic acid, Vitamin A or Vitamin B12 is far more beneficial than iron alone shows studies.

Supplementation is usually administered in form of tablets. But today we are slowly moving towards natural ways of combating anaemia. Of the many options such as beet root juice, carrot juice, spinach juice, nutraceuticals and superfoods for treating anaemia, wheatgrass juice and pomegranate juice are one of the most promising options to prevent and heal anaemia.

#### *Wheat Grass Juice*

Wheatgrass juice is very user-friendly remedy and has been widely known to boost the levels of blood haemoglobin in people suffering from anaemia making it a valuable treatment (Mathur, Mathur & Kohli, 2017). Moreover, wheatgrass has short production cycle, minimal nutritional requirements and adaptability to various geographical regions. This makes wheatgrass a very effective solution for fighting malnutrition, reducing unemployment and increasing income of the community through its commercial production. As a functional food, wheatgrass can address silent malnutrition and be utilized in managing various health conditions (Ogotu et al., 2017).

Wheatgrass is frequently described as 'green blood' because of the high levels of chlorophyll which comprise almost 70% of its chemical composition. It has been noted that chlorophyll is structurally close to haemoglobin proving its usefulness as a blood producing agent in conditions of scarcity thereby underscoring its therapeutic relevance in such situations (Rimple et al., 2016). Further, wheat grass juice contains all the vital nutrients including Vitamin A, C, E and the entire B complex along with several important minerals such as calcium, phosphorus, magnesium, potassium, zinc and iron. Furthermore, this has also sent forth potent protective agents comprising of crucial enzymes such as protease, amylase, lipase, cytochrome oxidase, transhydrogenase and superoxide dismutase (SOD) that are importantly contribute in its pharmacological actions (Chauhan, 2014; Kumar et al., 2016).

Apart from its nutritional value, wheatgrass is also rich in some amino acids, including aspartic acid, glutamic acid, arginine, alanine, serine and others. The juice contains various nutrients such as antioxidants in beta-carotene, bioflavonoids such as apigenin, quercetin and luteolin all of which enhance the health attribute of the juice (Kumar et al., 2016; Lakshmeesha, 2022). One interesting fact is that wheatgrass juice is regarded as total nutrition, as it contains all the nutrients needed by the individual. Nutrition wise, two ounces of wheatgrass juice is equal to five pounds of the best raw organic vegetables and is easy to drink especially during the summer months due to high vitamin A content that is above that of carrots, and vitamin C that is above that of oranges (Desai, 2005).

Moreover, wheatgrass is recognized for its oxygen-rich content, similar to other green plants with high chlorophyll levels, which supports optimal brain and body function in a highly oxygenated environment. This nutrient-dense

juice is also known for its antimicrobial properties, making it an effective health tonic that can rebuild the bloodstream without toxic side effects (Miller, 1941; Kapil, 2012; Lam & Brush, 1950).

Wheatgrass juice also works wonders in enhancing the function of red blood cell, improving cell-associated enzyme activity with its composition of natural antioxidant compounds. The analogy in the structure existing between the wheatgrass chlorophyll and the human body's haemoglobin (chlorophyll containing magnesium and haemoglobin iron) facilitates wheatgrass being regarded as a 'blood enhancer' in cases of haemoglobin deficit. This has made wheatgrass be referred to as 'green blood' (Chauhan, 2014; Lakshmeesha, 2022). Having a pH of approximately 8.6, close to that of blood, wheatgrass juice gets instantly assimilated in the system, and helps in correcting electrolyte balance as well as increasing the body's ability to detox. Chlorophyll found in wheatgrass is known to detoxify, encourage formation of red blood cells, enhance oxidation process, purify the body and help the growth of new blood cells. Besides, wheatgrass contains other minerals like beta carotene, vitamin A, vitamin E, vitamin C, selenium, zinc, magnesium, iron, folic acid as well as vitamin B12 making it a better treatment for anaemia. It aids to replenish both magnesium and lipid-soluble antioxidants which are usually depleted during anaemia (Desai, 2005). It is also worthwhile noting that intake of wheatgrass juice is free of any toxic effects and contains more oxygen and chlorophyll than any other food, when taken orally, or as a colon implant. It is antiseptic in nature and therefore facilitates the healing process both internally and externally while reconstructing the blood stream (Kumar et al., 2016). In general, wheatgrass juice aids the synthesis of red blood cells and growth of healthy tissues, therefore serves as a therapeutic tool to cure anaemia and other diseases (Beniwal et al., 2019).

In the case of the consumption of remedies such as wheat grass juice, people's culture, influences the extent to which they will use them. In the areas where the conventional or Ayurveda systems of medicine are dominant, wheatgrass juice is regarded as natural healthy aid. This integration into people's normal lives is well illustrated in organizations that espouse natural and cultural ways of dealing with disease. Plants with active ingredients contain usable medical value and food values. A specific type of remedy, food additive, or therapeutic food supplement known as herbal medicine or food supplement is on the rise, and so are the research on wheatgrass as a "functional food" (Minocha et al., 2022). This makes its use in these areas indebted to the fact that wheatgrass has been used in Ayurvedic system of medicine because of its detoxifying and rejuvenating qualities. However, in some markets, there may be some reluctance to accept the new product, especially when that product is wheatgrass juice, because they have not seen it in other products which they use.

Socioeconomic factors are the major challenges that limit the adoption of wheatgrass juice as treatment for anaemia. This juice can be expensive, whether as a result of fluctuating prices based on seasonal availability or commercial availability that makes it possible for these vegetables to be expensive therefore becoming a preserve of the upper-class individuals or families in societies that have a higher standard of living. Wheatgrass juice is relatively cheap to make especially when the wheat grass is grown at home but when purchased from stores etc the price is very high. This cost becomes a big put off to groups with low purchasing power, otherwise classified under the economically disadvantaged since they cannot afford to add such supplements to their diet on a regular basis (Ogutu et al., 2017).

### *Pomegranate Juice*

Pomegranate a fruit bearing shrub from the Lythraceae family is one of the most effective natural methods that can be used to increase blood count. This fruit contains iron and it is a house for vitamins A, C and E. The presence of vitamin C in pomegranate helps the body to increase its ability to absorb iron and thereby increasing and regulating the blood count (Patil & Navghare, 2019).

Pomegranate is considered to possess various nutritive values due to its bio active contents including various minerals. The fruit has polyphenols like Anthocyanins, Tannins, flavonoids which possess antioxidant activity (Kiran, Shivashankaramurthy & Pradeep, 2023). Iron is present in one of the highest quantities in the pomegranate juice along with other minerals such as calcium, selenium, potassium, magnesium and zinc (Hassani moghaddam & Sepahvand, 2020). Also, *Punica granatum* has other polyphenolic compounds that include ellagitannins, gallotannins, as well as anthocyanins that play an important role in benefitting health (Bhowmik et al., 2013). The fruit's phytochemicals, found in both the juice and peel, include important minerals like calcium, zinc, magnesium, and potassium, as well as polyphenols such as punicalin and various sugars and steroids (Kiran et al., 2024). These varying and interacting nutrients demonstrate all of pomegranate's versatility and benefits for good health.

According to Hassani Moghaddam and Sepahvand (2020) pomegranate juice cleanses blood and removes toxins from the body. It also improves blood circulation. Minerals that are accessible from the seeds of the pomegranate contain iron that is known to minimize the symptoms of anaemia such as tiredness, dizziness, weakness and even hearing loss (Bhowmik et al., 2013). It is found that pomegranate acts by imparting impact on three crucial regulatory systems in the human body regulating gene functionality which include Nrf2, NF-kB, and MAPK (Maphetu et al., 2022). These systems help regulate how the pomegranate's compounds affect the body (Bardwaj & Nandal, 2015).

The pomegranate juice is well accepted in different cultures because of its medicinal use dating back from the ancient time. Pomegranate has long been regarded as possessing antithrombotic properties in many cultures, a symbol of fertility especially in the treatment of haematological complaints (Jurenka, 2008). Thus, having a longer-standing tradition of use makes pomegranate juice more permissible culturally for treatment of anaemia. However, as with many juices, the quality and even the quantity of pomegranate juice varies from country to another especially if the fruit is not grown locally. This means that its regular consumption can be hampered, although the culture of taking it is well embraced (Johanningsmeier and Harris, 2011).

Pomegranate juice, though widely recognized for its health benefits. It can be costly, particularly when the fruit is out of season or when quality juice products are scarce. The economic burden of purchasing pomegranate juice regularly may be expensive for families with limited financial resources, thus reducing the frequency of its consumption (Bhowmik et al., 2013). Additionally, the preparation of this juice requires time and effort, resources that may be in short supply for families struggling with economic hardships. This lack of time and the associated inconvenience can lead to irregular use of this juice, thereby diminishing the potential benefits in preventing or treating anaemia.

## Core Findings

### Wheatgrass Juice

#### *Nutritional Profile*

- Wheatgrass known generally as the ‘green blood’ contains 70% chlorophyll in addition to other nutrients such as vitamins A, C, E and B complex as well as calcium and magnesium. It also consists of protease and glutamic acid, amino acids and enzymes that have a big positive impact to human health (Chauhan, 2014).
- Wheatgrass juice remains rich in iron, magnesium, calcium, phosphorus, antioxidants and insoluble fiber allowing it to be categorized under protective foods with high nutrient density (Lakshmeesha, 2022).
- All the nutrients and the ability of wheatgrass juice as an antimicrobial agent are the key components that enrich oxygen content in the body and enhance brain and tissues functions. Research confirms that, its chlorophyll content aids in reconstruction of the blood stream and restoration of the red blood cell count in anaemic persons (Pannu & Kapoor, 2015).
- Scientists over fifty years have been pointing out the fact that young plant of wheat contain vitamin, mineral, and protein in much more quantity than mature seeds. They are also powerful agents of enzymes and growth-regenerative bodies (Desai, 2005).
- Wheatgrass is known to contain nearly all nutrients which is why it is considered a “complete food”. It has 17 amino acids, vitamins A, B-complex, C, E, K, calcium, iron, magnesium, potassium, phosphorus and more. It has all 98 of the 102 earth elements such as the chlorophyll and a range of enzymatic materials such as superoxide dismutase SOD.
- Chlorophyll is said to have the structural similarity to that of haemoglobin, further strengthens the argument on wheatgrass as the “green blood” for its role in treating haemoglobin deficiency; thus, proving the claim made by Rimple et al., Murthy (2019).

#### *Mechanism of Action*

- Wheatgrass juice helps in the formation of red blood cells and in the right formation of tissues (Beniwal, et al., 2019).
- Wheat grass juice can be taken orally or administered as colon implant because of its chlorophyll content that has antibacterial properties; and increases the body’s blood stream without any harm to the body (Kumar et al., 2016).
- A components like chlorophyll, beta-carotene and vitamins A, C E, B12, selenium, Zinc, magnesium, iron and folic acid which are present in wheatgrass are highly effective in the treatment of anaemia. Chlorophyll, a natural blood-builder, addresses deficiencies in key nutrients and improves anemia-related conditions (Desai, 2005).
- It has a pH of 7, that is almost close to blood so absorption of such juice from wheat grass is quick which helps to restore the electrolytes and brings about the formation of red blood cells. The findings also suggest how it helps in detoxifying the body, synthesising new cells and helping in oxygenation of blood (Runjala & Murthy, 2019).

- Because chlorophyll's structure resembles haemoglobin where magnesium is central to wheatgrass it is a useful element in the treatment of haemoglobin deficiencies. This has earned it the nickname "Green blood" Lakshmeesha, (2022).
- Wheat grass juice helps in improving the antioxidant status of red blood cell, enhances cellular enzyme activity and the membrane stability. Wheatgrass is widely used as herbal medicine due to the chlorophyll which is known to play an important role in the formation of blood but, the prospect of wheat grass use remains virtually untouched due to lack of thorough research (Chauhan, 2014).

#### *Cultural and Socioeconomic Factors*

- It has been observed that the price of wheatgrass juice is relatively high where it cannot be locally grown and hence may not be easily affordable to low-income earners hence they cannot afford such supplements often (Ogutu et al., 2017).
- The use of wheatgrass in various parts of the world can be attributed to its employment in Ayurvedic system of medicine where it is accorded high status due to its cleansing ability and capacity to regenerate the whole body (Chauhan, 2014).

#### **Pomegranate Juice**

##### *Nutritional Profile*

- Pomegranate contains bio active compounds like polyphenols, anthocyanin, tannins, flavonoids etc (Kiran, Shivashankaramurthy & Pradeep, 2023).
- The juice has plenty of iron and calcium; it has also other elements such as selenium, cobalt, chromium, copper, potassium, magnesium, manganese, sodium, strontium, and zinc (Hassani Moghaddam & Sepahvand, 2020).
- Among polyphenols, the most abundant ones in *Punica granatum* are ellagitannins, gallotannins, anthocyanin metabolites, punicalcortin D, punicalin, punicalagin and 2-O-galloylpunicalin as indicated by Bhowmik et al. (2013).
- Nutrients and phytochemicals illustrate the rich nutrient composition of pomegranate which includes essential mineral and nutrient contents such as calcium, zinc, magnesium, potassium iodine and polyphenol contents such as punicalin, sugars and steroids (Siddiq et al., 2024).

##### *Mechanism of Action*

- The molecular targets through which Pomegranate exercises its effects to the largest extent include the Nrf2, NF-kB, and MAPK signaling pathways (Maphetu et al., 2022).
- Daily intake of pomegranate helps maintain healthy blood flow; seed extract contains iron to deal with the symptoms of anaemia which includes; weakness, dizziness, fatigue and hair loss (Bhowmik et al., 2013).
- Blood benefiting property of pomegranate also helps purify the blood and eliminate toxins as a result of which its efficacy for blood is undeniable (Hassani Moghaddam & Sepahvand, 2020).
- It is apparent that various active ingredients present in pomegranate juice function mainly through regulation of gene expression thus benefiting the human body (Bardwaj & Nandal, 2015).



*Cultural and Socioeconomic Factors*

- The purchasing cost of pomegranate juice for regular use is quite expensive and thus the families with limited income cannot afford to use the product frequently (Bhowmik et al., 2013).
- In the regions where pomegranate is not cultivated hence the availability and quality of the juice varies. It can thus be difficult to incorporate it in the diet on a daily basis even though it is culturally acceptable (Johanningsmeier & Harris, 2011).

Both wheatgrass juice and pomegranate juice contain many essential vitamins and minerals, enzymes and other natural acids that definitely help in treating anaemia. Wheatgrass juice contains chlorophyll which functions in a similar way like haemoglobin in our blood and it actually aids in producing more red blood cells as well as increases the quantity of oxygen carried in the body. It contains iron and polyphenol compounds which are good for increasing blood flow and the development on red blood cells. Since both types of juices are plant-based it means that they are natural and pose fewer side effects to the body when used to treat anaemia and do not disrupt other important functions in the body.

However, there are a few disadvantages of these juices which are not so challenging but make it hard to make use of the juices frequently. The preparation of wheatgrass juice is not an easy task because in order to prepare the juice one has to grow the wheat grass and then extract the juice from it. This can be quite a drawback for many people particularly if fresh wheatgrass is hard to come by. Fruits such as pomegranates are healthy but the juice is costly and hard to come by, or not available all year round particularly in regions with few pomegranate sources. This makes it difficult for people, especially the ones with less income, to integrate the juice into their diets in the desired frequency.

Therefore, if these challenges, for instance, the preparation of wheatgrass juice and the cost and availability of pomegranate juice are addressed, then both juices might be wonderful natural treatments for anaemia. If they were more available, especially in the local markets, the public would adopt their use and increase their ability to tackle anaemia.

### **Conclusion**

Nutritional and therapeutic potential of wheatgrass and pomegranate juices for the treatment of anaemia in adolescent girls seems obvious. Their rich nutritional profiles, particularly in iron and antioxidants, support their use in enhancing haemoglobin production and reducing oxidative stress. The mechanisms of action of these juices align well with the physiological needs of anaemic individuals, making them effective complementary therapies.

However, the applicability of these remedies is not independent of the culture and the economic status of the affected population. Both of the juices are acceptable in different cultures and locations; however, the availability and affordability may be an issue when it comes to large scale use especially for the disadvantaged population. It is therefore important to break these barriers through education and making the natural remedies easily available for the treatment of anaemia among adolescents.

Although wheatgrass and pomegranate juice are believed to cure anaemia, the benefits realised are significantly interfered by culture, socio-economic barriers and accessibility. Overcoming these barriers is crucial as integrating these natural remedies for the treatment of anaemia in to more comprehensive concepts on health, within the context of limited resources settings.

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