**PROPOSITION OF DIET IN CONSTIPATION**

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**Abstract:**

Constipation is a common gastrointestinal condition which is now increasing enormously.Chronic constipation (CC) is characterized to be a common issue caused with a irregular bowel movement or difficulty in feces passage. It is presented by many forms with varied symptoms. Genetic predisposition, Type of diet, social economic status, absorption, daily behaviors, colonic motility, pharmaceutical and biological factors are the variables that contribute to the development of the disease. Diagnostic and therapeutic options are crucial in management of CC. Dietary fiber has been recommended as a step in the management of CC since it plays a significant role in this condition.

**Keywords:** CC, Nutrition, Physical activity, Fiber.

**1. Introduction:**

Constipation is characterized by the decrease in frequency of bowel movementsor increased difficulty in process of eliminating stool [1,2]**.** CC is a prevalent gastro-intestinal (GI) condition presented to surgeons, subspecialty physicians and primary-care physicians globally [3,4]. Worldwide, the constipation prevalence rate was estimated to be 16% [5]. In India, the Gut Health Survey results imply that 22% adults are complaining of CC [6] and 13% people with severe constipation and 6% suffers from constipation associated with certain co-morbidities [6]. The co-morbidities include Irritable bowel syndrome, gastro oesophageal reflux disease, depression, anxiety, dyspepsia, etc. Constipation is often associated with nausea, infrequent bowel movements bloating, [7] and abdominal pain (mild to severe), loss of appetite, infrequent bowel movements, hard stools, excessive straining [7]. CC was more prevalent in the elder people i.e., 50-70% [2].

Constipation is classified into acute and chronic based on duration of problem. Acute constipation is a type which lasts less than one week. Chronic constipation lasts for more than 4 weeks or more than months (consensus criteria) [8].

**Diagnostic Criteria for Functional Constipation:**

The functional constipation diagnosis criteria according to Rome III include- “1. Including two or more of the Criteria:(a) Straining for more than 25% of defecations, (b) Lumpy or hard stools (Stool Type 1, 2) [86] more than 25% of defecations, (c) Sensation of incomplete evacuation more than 25% of defecations, (d) Sensation of anorectal obstruction/ blockage more than 25% of defecations, (e) Manual maneuvers to facilitate more than 25% of defecations, (f) Fewer than 3 spontaneous bowel movements per week; 2. Loose stools are rarely present without the use of laxatives; 3. Insufficient criteria for irritable bowel syndrome: Criteria fulfilled for the last 3 months with symptom onset at least 6 months prior to diagnosis” [8,9]**.**

Primary chronic constipation is a type of CC without unknown cause. This can be of “improper bowel function due to dietary factors (insufficient fiber intake), lifestyle factors (lack of mobility or sedentary lifestyle) or a disorder of colonic propulsion or rectal emptying” [10].

Secondary chronic constipation results from treatment for organic diseases (opioids or antihypertensive agents), systemic diseases (hypothyroidism or Parkinson’s disease), local pathology in the colon related disorders (colon cancer or diverticular structure)” [10]

There are 3 types of primary chronic constipation- rectal evacuation disorders (outlet delay disorders or dyssynergic defecation), slow transit constipation (colonic inertia or chronic colonic pseudo obstruction) and normal transit constipation (functional constipation). The rectal evacuation disorders include lack of coordination in pelvic and abdominal muscles to evacuate feces (either by structural and functional defects); slow transit constipation include delayed movement of stool in the colon due to abnormalities in the pelvic and anal sphincter muscles; normal transit constipation due to unidentifiable biochemical or structural cause. This type overlaps irritable-bowel-syndrome (IBS).

Slow transit constipation responds to dietary changes. Increased intake of water and fiber hydrates the feces that hasten intestinal transit. On the contrary, dietary changes could not affect the dyssynergic defecation and could only improve stool consistency. The pelvic floor rehabilitation can be an effective therapy [11]. This type was more frequently observed in women [10,12].

Genetic predisposition plays a major role in functional constipation with positive family history of constipation [13]. Constipation is generally functional in origin and rarely a cause of organic aetiologies in >95% cases. Organic aetiologies include metabolic and endocrine factors, anorectal factors, neuropathic factors, and intestinal factors. Psychological disorders, lifestyle factors and genetic factors are the prevalent pathophysiological factors [13,14]. The age positively correlates with the onset of CC [15]. The CC is most commonly observed in women compared to men [15-17], whilst this correlation is not observed in children [19] and elders [10,18].

**2. Nutrition:**

The alimentary and functional CC can be treated by diet therapy. Besides these, the diet therapy also treats CC with organic origin [20]. The diet and fluid intake play an important role in improving functional constipation.High water intake and high fiber are affirmed to reduce risk of constipation among people aged 65 years and younger, but not significant among > 65 years [2].

**2.1 Minerals:**

The micro minerals like selenium and magnesium were considered essential to reduce chronic constipation (especially in children) [21]. Selenium is nutritionally essential trace element which is naturally present in many foods. This has wide range of physiological functions including antioxidant defense and anti-inflammatory effects and the recommended intake is 55μg/day for a normal adult and 60-70 μg/day for pregnant women [22,23]. Magnesium is 4th most abundant cation in the human body that acts as cofactor for more than 600 enzymes [24].

Magnesium salts such as magnesium sulfate have been used as a laxative in the treatment of constipation for their osmotic effects due to their incomplete absorption in the GI tract [25,26]. This effect has decreased the prevalence in a quartile of men [27,28]. Stool frequency was also inversely associated with constipation with the intake of magnesium. The natural mineral water rich in magnesium sulfate showed improved bowel movement frequency and stool consistency in functional constipation subjects [29,30]. Magnesium oxide also effectively treats constipation [31]. Magnesium acts as a mild laxative in the form of sulfates or citrate salts. These help in fluid retention and motility in digestive tract. Mg/Zn also play a major role in relieving constipation [42,43].

**2.2 Fiber:**

Men aged 19 to 50 should consume 38 grammes of protein per day, while women should consume 25 grammes. Men over the age of 51 should consume 31 grammes of protein per day, while women over the age of 51 should consume 21 grammes per day. For children ages 1-3, 19 g/day is advised, and for those ages 4–8, 25 g/day. The DRI guidelines for boys are 31 g/day for those aged 9 to 13 and 38 g/day for those aged 14 to 18. The DRI recommendations are 26 g/day for girls ages 9 to 18 [32,33].

Dietary fiber is of two types- soluble and insoluble fiber. Pectins, gums, and certain hemicelluloses make up soluble fibres, which can be found in foods like oats, apples, bananas, barley, beans, and barley [8]. Bulk is added to stools by soluble fibre [44]. Cellulose, lignin, and certain hemicelluloses are the main components of insoluble fibres, which do not dissolve in water. Foods including wheat bran, all fruits and vegetables, and entire grains contain it. It is sometimes referred to as roughage or bulk because it maintains regular digestion, lowers the risk of colon cancer, and helps relieve constipation and haemorrhoids [40]. Insoluble fibre facilitates the passage of food through the digestive system and aids in the avoidance of constipation [44]. Through mechanical stimulation of the gut mucosa, which causes secretion and peristalsis and has a considerable laxative effect, it raises the faecal bulk and colonic transit rate [8]. The majority of fiber-rich meals contain roughly a third soluble and a second-third insoluble fibre [45,46].

The type of stools the patient was passing were determined using the Bristol stool scale, which divides stools into 7 groups. According to the Bristol stool scale, the seven kinds of stools were divided into: Sort out hard lumps, such as nuts, that are difficult to pass; Type 2: Shaped like a sausage but bumpy; Type 3: Looks like a sausage but has surface cracks; Type 4: Smooth and soft, like a sausage or a snake; Type 5: Soft blobs with sharp edges that easily passed; Type 6: A stool made of squishy sections with rough edges; Type 7: Watery with no firm pieces. 100% liquid [86].

Glucans that are polymers of three or more monomeric units and are neither digested or absorbed in the small intestine are collectively referred to as fibre, along with lignins [62]. Fibre consists of a variety of molecules with different solubilities, viscosities, and fermentabilities [63]. Both viscous and non-viscous fibres are effective at bulking up stools because they both reach the lower gut in an undamaged state [64]. The luminal sac is further dilated and peristalsis is induced by an increase in stool bulk [65]. Fermentable fibres boost short-chain fatty acid (SCFA) synthesis and gut bacteria diversity, which increases faecal biomass. The increased colonic osmotic load that follows increases the water content of the faeces, making the stools softer [66].

Fiber can be further divided into:

- “Soluble, viscous, fermentable (e.g., Guar gum) [44]

- Soluble, viscous, unfermentable (e.g., Psyllium, HPMC—Hydroxypropyl methylcellulose)

- Soluble, non-viscous, fermentable (e.g., Inulin [44], FOS, GOS, Pectin)

- Soluble, non-viscous, unfermentable (e.g., PHGG—Partially Hydrolyzed Guar Gum)

- Insoluble and slowly fermentable (e.g., Wheat bran [44], Resistant starch, Whole grains)

- Insoluble and unfermentable (e.g., Cellulose, Lignin)”

In order to normalise stool consistency in constipation, soluble viscous fibre exhibits a high gel-forming capability that is preserved throughout the large bowel and undergoes minimal fermentation. Because it has a softening impact on the stool, stool water content has a strong correlation with stool consistency. Through mechanical stimulation of the gut mucosa, insoluble fibre increases the faecal bulk and colonic transit rate while having a laxative effect [45].

The Dietary Guidelines for Americans strongly advise eating foods high in nutrients, like whole grains. In order to boost dietary fibre, ensure appropriate GI function, and prevent chronic diseases in both children and adults, at least half of all grains are consumed. An ounce-equivalent serving of whole grain is equal to five whole-grain crackers, one-half cup of cooked whole-grain pasta, rice, or oatmeal, one slice of whole-wheat bread, and three cups of popped popcorn [33].

Wheatbran [44, 47], glucomannan (nonabsorbable fiber) [44], psyllium, or ispaghula (bulk-forming fiber) with water holding abilities [47,48], polydextrose, inulin, galactooligosaccharides [49], cellulose, guar gum were commonly used for the treatment of constipation [44,47]. While a low-fiber diet causes constipation, a high-fiber diet can increase stool weight and shorten colon transit time [50]. Young women who consumed more rice and coffee had lower rates of constipation [51]. Combining clarified butter and jiggery can also help with constipation [69].

**2.2.1 Fatty acids:**

Constipation was directly linked to dietary intake of high saturated fat, but the relationship between dietary unsaturated fat and constipation was the opposite [2]. Among participants who were physically active, dietary fibre intake was linked to constipation related to stool consistency but not significantly to stool frequency [33,34]. In order to delay the development of constipation, the WHO advises consuming 25 to 40 grammes of high dietary fibre per day [35]. High levels of lignans, linoleic acid, and alpha-linolenic acid can be found in flaxseed (Linum usitatissimum). It is an excellent source of soluble and insoluble fibre, which is useful for treating constipation [36]. The diversity of gut bacteria was raised by consuming 9 g of omega-3 unsaturated fatty acids daily from perilla oil for 8 weeks [37]. Constipation was relieved as a result of the favourable correlation between the diversity of the gut microbiota and blood levels of omega-3 unsaturated fatty acids [38].

**2.2.2 Mushrooms:**

Chitin, a straight-chain (14)-linked polymer of N-acetyl-glucosamine, and polysaccharides such as (13)-D-glucans and mannans, respectively, are both found in the fibrillar and matrix components of mushroom cell walls [40]. Beta-glucan, the fibre present in mushrooms, is comparable to the major fibre in goods made from oats. Beta-glucans relieve constipation and intestinal peristalsis. It is also advantageous for controlling blood sugar and cholesterol levels. In addition, mushrooms offer extra nutrients such selenium, copper, and potassium as well as the B vitamins pantothenic acid, riboflavin, and niacin [40, 41].

Mushrooms have been used for treating constipation [55]. A. auricula (black ear mushroom) has high water absorption and water holding capacity and also exhibit high antioxidant activity [52,53]. The phenolic compounds present in mushrooms will minimise the risks of free radicals [40]. The cloud ear mushrooms ([Auricularia polytricha](https://books.google.com/books?hl=en&lr=&id=ZR-pEAAAQBAJ&oi=fnd&pg=PT97&dq=ear+mushrooms+and+constipation+2023&ots=--FQAQV5PD&sig=4W3zHvWlZWrNYJdsF53BXWtVPyI)) significantly improve constipation related symptoms [54,55,82]. The mushrooms like Boletus edulis, *Flammulina velutipes* [57] have increased the propulsion rate of the small intestine [56]

**2.2.3 Fruits:**

Several fruits are great sources of dietary fibre in their fresh, dried, or juiced forms. Fruits with high fibre content are good for the GI tract [49]. A prune (dry plum) boosts peristaltic and gastrointestinal motility [58, 59]. It does not affect faecal water, only faecal bulk [61]. In adult clinical research, fruits including the polyphenol-rich mango, papaya, and green kiwifruit dramatically increase faeces frequency, volume, softness, and comfort. A natural laxative called Ficus carica (fig) increases the frequency of faeces [49].

The regularity of the stools and the intensity of the symptoms serve as indicators of intestinal health. It was discovered that the mango fruit supplementation was more successful at modifying these parameters [60]. Both fibre and sorbitol are abundant in apricots. Increased faecal weight, lipid content, and relative abundances of Bacteroides and Clostridium cluster IV are all provided. Gut transit time was sped up by kiwifruit, fig paste, and trifoliate orange extract powder in addition to apple fibre isolation. The only fruit that has been shown to raise human faecal and small bowel water content is the kiwifruit. In humans, raisins, prunes, and apple fibre isolate all increased faecal weight [61].

The primary components of fruits and fruit products that mediate the effects of fruits on gut microbiota, gut motility, and gut function [61] and consequently affect constipation are fibre, sorbitol, and polyphenols (Figure 1). Fruits, vegetables, cereals, tea, coffee, and wine are just a few examples of the many plant-based meals and beverages that include sorbitol (sugar alcohol) and polyphenols [67,68].



Figure 1: Main constituents in Fruits and fruit products

**2.2.4 Probiotics:**

CC patients showed improved defecation with the use of probiotics and fermented milk [36, 49], feces frequency, increased responsiveness to treatment, integrative symptoms and severity of incomplete evacuation. The use of *B. lactis* showed improvement in stool frequency and use of *“B. coagulans*  Unique IS2” for abdominal pain and defecation pain. For people who encounter negative effects from conventional therapy choices like fibre and laxatives, probiotics can be a great alternative. The probiotics would relieve constipation[70].

In animal model studies, Treatment with yoghurt dramatically reduced constipation-related symptoms and altered the microbiome. Additionally, yoghurt helped mice with antibiotic-induced constipation feel better and somewhat repaired their gut microbiota [71].

**Table 1: List of Various foods with available dietary fiber content**

|  |  |  |  |
| --- | --- | --- | --- |
| **Food**  | **Type** | **Fiber/100g** | **Reference** |
| Wheat bran | Grain  | 42.8 g | 47 |
| Oat Meal | Grain  | 10.6 g | 83 |
| Rye flour | Grain | 12.9 | 83 |
| Psyllium, or ispaghula | Seed | 70g | 48 |
| Guar gum | Seed | 90g | 49 |
| Flaxseed (Linum usitatissimum) | Seed | 26.6g | 36 |
| Prune  | Fruit | 6.1g | 58 |
| Apple | Fruit | 16.7 | 85 |
| Banana | Fruit | 10.1 |
| Cherries | Fruit | 8.7 |
| Grapefruit | Fruit | 14.5 |
| Orange  | Fruit | 18g |
| Peach  | Fruit | 16.1 |
| Pineapple | Fruit | 13.6 |
| Strawberry | Fruit | 31.6 |
| Watermelon | Fruit | 6.4 |
| Pear | Fruit | 21.2 |
| Mango | Fruit | 9.4g | 49, 60 |
| Papaya  | Fruit | 1.7g | 49 |
| Green kiwifruit | Fruit | 3g | 49 |
| Fig (Ficus carica) | Fruit | 2.9g | 49 |
| Shiitake mushroom | Mushroom | 4.6 | 84 |
| Pleurotus sajor-caju | Mushroom | 48.60 |
| Pleurotus ostreatus | Mushroom | 8.70 |
| Agaricus bisporus | Mushroom | 20.90 |
| Auricularia auricula | Mushroom | 19.80 |
| Calocybe indica | Mushroom | 3.40 |
| Lentinula edodes | Mushroom | 28.80 |
| Flammulina velutipes | Mushroom | 3.70 |
| Volvariella volvacea | Mushroom | 54.80 |
| Dried kidney bean | Seed | 19.6 | 83 |
| Dried cowpea | Seed | 18.4 |
| Dried azuki bean | Seed | 15.3 |
| Dried pea | Seed | 17.4 |
| Dried soybean | Seed | 17.9 |
| Beet root | Vegetable | 26.7 | 85 |
| Broccoli | Vegetable | 34 |
| Cabbage | Vegetable | 30 |
| Carrot | Vegetable | 34.2 |
| XCelery | Vegetable | 29.4 |
| Cucumber | Vegetable | 15.8 |
| Lettuce | Vegetable | 33.3 |
| Sweet corn | Vegetable | 22 |
| Tomato | Vegetable | 20.7 |

**2.3 Fluids:**

Adequate intake i.e for about one and a half litre to two litres of water per day is proposed as the first line treatment in chronic constipation [49]. Daily intake of at least 1.5 to 2 liters of fluid and daily exercise is significant [9]. Insufficient drinking of water causes constipation [72]. Water intake and hydration has decreased constipation [14] in adults and also in children [74]. The water intake and decreased constipation was questionable in older persons and secondary constipation [73]. Functional constipation group were observed to have a considerable low water intake (1200ml) than the non-functional constipation group (1500ml) [42]. Adequate hydration is important for maintaining intestinal motility [42].

**2.4 Physical activity:**

Physical inactivity is considered as treat for onset of CC [75,76]. Light to moderate exercise were coupled to propulsive mass movements in colon. This suggests that physical activity facilitates defecation and the recto-sigmoid or total colonic transit time. It also affects the BMI, constipation complaints, and the quality of life in premenopausal women [77]. In comparision with the normal people, malnourishment persons have higher risk of functional constipation [42, 43].

**3. Conclusion:**

Constipation can be prevented or treated by maintaining balanced diet that contain vegetables, fruits, wholegrain cereals, water intake along with slight moderate physical activity. Eatwell Guide provides the size and recommended type of various foods to consume a wholesome, balanced diet. According to PHE, 2016, it suggests having vegetables and fruits for atleast 5 portions or 400g daily. This contributes to 1/3rd of the food per day which would reduce the non-communicable diseases risk including constipation. This is robustly encouraged by the WHO (2015).

The daily fibre intake for patients with normal-transit or slow-transit constipation should be boosted to 20 to 25 g either by altering diet or by using packaged fibre diets. Osmotic laxatives should be used by patients who do not respond to fibre therapy. Until the stool softens, the osmotic laxative dosage should be adjusted, along with dietary adjustments. Surgery is not always required. Biofeedback could be used to retrain the evacuation process in patients with defecatory problems. Patients with severe defecatory disorders have to use oral laxatives often at high doses that might result in watery diarrhea and other adverse effects. Patients with enough fibre consumption and the use of laxatives to encourage regular bowel movements, additional bouts of faecal impaction should be avoided.

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