# Value of Short Chain Fatty Acid in Stool in Diagnosis of Irritable Bowel Syndrome

*Thesis*

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# INTRODUCTION

Short-chain fatty acids are produced in the human colon by bacterial fermentation of dietary fibers and other saccharides escaping absorption in the small bowel ***(Ruppin et al., 1980)***.

The principal short-chain fatty acids consist of the beneficial (fibre/carbohydrate-derived) fatty acids acetate, propionate and butyrate, and the putrefactive (protein-derived) fatty acids valerate, iso-valerate and iso-butyrate ***(Garcia et al., 2008)***.

Approximately 80-90% of SCFAs, which are produced from the breakdown of dietary food, are absorbed in colon while the rest are excreted in faeces**.** SCFAs content in faeces could be used as a biomarker for the physiological processes in the organisms as well as for the effect of nutritional interventions**.** The level of SCFA content in faecal samples have been shown to be related with some diseases such as IBD, irritable bowel syndrome (IBS) ***(Garcia et al., 2008)***.

In clinical practice it may be difficult to differentiate patients newly-presenting with either IBS-D or inflammatory bowel disease (IBD)**.** Consequently, many physicians rely on invasive procedures in order to exclude IBD and other organic diseases. Furthermore, patients with IBS may harbor fears that their symptoms are due to serious pathology, especially when they experience severe pain ***(Eamonn, 2005)***.

In general, a normal level of total short-chain fatty acids reflect overall health of the colonic bacterial popuation. This in turn reflects intake of fibre/carbohydrate-containing foods and also reflects the nature of the bacterial community ***(Vinolo et al., 2011).***

Measuring level of short chain fatty acid in stool can provide a non invasive method in diagnosis of IBS-D and IBD patients as they almost represent the majority of patients presenting by abdominal pain and diarrhea, and in differentiating them from normal individuals ***(Ahmed et al., 2013).***

# AIM OF STUDY

Is to measure level of short chain fatty acid in stool of patients diagnosed to have IBS-D,inflammatory bowel disease and normal individuals to detect its value as a non invasive method in diagnosis of patients newly presenting by abdominal pain.

*Chapter 1*

# IRRITABLE BOWEL SYNDROME

Irritable bowel syndrome is a relapsing functional bowel disorder defined by symptom-based diagnostic criteria, in the absence of detectable organic causes. The symptomatic array is not specific for IBS, as such symptoms may be experienced occasionally by almost every individual ***(Kellow, 2001).***

## Definition:

Irritable bowel syndrome (IBS) is a functional bowel disorder in which abdominal pain or discomfort is associated with defecation and/or a change in bowel habit. Sensations of discomfort (bloating), distension, and disordered defecation are commonly associated features. In some languages, the words "bloating" and "distension" may be represented by the same term ***(Kellow, 2001)***.

## The condition usually causes long-term symptoms:

- These may occur in episodes.
- Symptoms vary and are often associated with food intake and, characteristically, with defecation.
- Symptoms interfere with daily life and social functioning in many patients.

- Symptoms sometimes seem to develop as a consequence of an intestinal infection (postinfectious IBS) or to be precipitated by major life events, or occur during a period of considerable stress.
- Symptoms may develop following abdominal and/or pelvic surgery ***(Kellow, 2001)***.

## IBS subclassification

According to the Rome III criteria, IBS may be subtyped or subclassified on the basis of the patient's stool characteristics, as defined by the Bristol Stool Scale:

- IBS with diarrhea (IBS-D): — Loose stools > 25% of the time and hard stools < 25% of the time — Up to one-third of cases — More common in men
- IBS with constipation (IBS-C): — Hard stools > 25% of the time and loose stools < 25% of the time — Up to one-third of cases — More common in women
- IBS with mixed bowel habits or cyclic pattern (IBS-M): — Both hard and soft stools > 25% of the time — One-third to one-half of cases
- Un-subtyped IBS — Insufficient abnormality of stool consistency to meet criteria IBS-C or M ***(Dorn et al., 2009).***

**It must be noticed that:**

- Patients commonly transition between these subtypes.
- The symptoms of diarrhea and constipation are commonly misinterpreted in IBS patients. Thus, many IBS patients who complain of "diarrhea" are referring to the frequent passage of formed stools and, in the same patient population, "constipation" may refer to any one of a variety of complaints associated with the attempted act of defecation and not simply to infrequent bowel movements.
- In addition, bowel habit must be evaluated without using antidiarrheals or laxatives ***(Dorn et al., 2009)***.

## Rome IV criteria:

***Must have ≥2 of the following:***

Associated with recurrent abdominal pain ≥1 day/wk in the last 3 months (on average)

1. Related to defecation either increasing or improving pain
2. Associated with a change in stool frequency
3. Associated with a change in stool form (appearance) ***(Dorn et al., 2009)***

**Causes:**

There is no exact underlying cause known for IBS. The symptoms may be due to increased sensitivity to the function of the bowel. This can be responsible for discomfort, and abnormal contractions in the bowel muscle. Certain factors can 'trigger' attacks in susceptible individuals. These include:

- Infection – An episode of gastroenteritis may result in persistent bowel symptoms. The cause is unknown, but may involve changes to nerve function in the bowel or changes in the normal bacterial population of the bowel.
- Food intolerance – Impaired absorption of lactose (a sugar found in dairy and many processed foods), fructose or sorbitol (an artificial sweetner) may trigger IBS.
- General diet – Low fiber diets can exacerbate constipation in some with IBS.
- Stress – Strong emotions, such as anxiety or stress, can affect the nerves of the bowel in susceptible people.
- Medications – Certain medications (such as antibiotics, antacids and painkillers) can lead to constipation or diarrhea ***(Rajilić-Stojanović et al., 2015)***.

## Clinical Features

### History

Abdominal Discomfort or Pain

IBS should not be diagnosed in the absence of abdominal discomfort or pain. The discomfort/pain in IBS typically is relieved by defecation, or its onset is associated with an increase or decrease in stool frequency, or with looser or harder stools. The pain often is poorly localized ***(Drossman et al., 2006)***.

#### *Constipation and Diarrhea*

Patients with IBS experience constipation, diarrhea, or a mixture of these symptoms. Symptom predominance has led to classify IBS patients by their predominant symptom: constipation (IBS-C), diarrhea (IBS-D), and mixed (IBS-M), although these symptoms often are variable and intermittent, and patients can change from one stool pattern to another. An irregular stool consistency (abnormal stool form) is characteristic ***(Drossman et al., 2006)***.

#### *Bloating and Visible Distention*

A feeling of bloating is very common in patients with IBS, and its site can be difficult for the patient to localize ***(O'Connor et al., 2012).***

### *Noncolonic Symptoms*

Other clinical features can help support the diagnosis of IBS but in themselves are not diagnostic. Epigastric discomfort or pain (dyspepsia) is 8-fold more in individuals with IBS ***(Ford et al., 2010).*** Symptoms compatible with GERD occur 4-folds more in IBS patients ***(Lovell and Ford, 2012).*** Extraintestinal symptoms including headache (and migraine), backache, impaired sleep, chronic fatigue, increased urinary frequency or urgency, pelvic pain, and dyspareunia are more common in patients with IBS but have no accepted diagnostic value. Musculoskeletal pain syndromes including fibromyalgia and temporomandibular joint disorder also are associated with IBS ***(Riedl et al., 2008).***

### *Physical Examination*

Physical examination in patients with IBS is usually normal, although deep tenderness over the colon may be appreciated ***(Cash and Schoenfeld, 2008).***

### *Pathophysiology*

A number of different mechanisms have been implicated in the pathogenesis of IBS, including abnormal motility, visceral hypersensitivity, low-grade inflammation, and stress ***(Burgmann et al., 2006).***