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Case Study RRJOASYN

An Ayurveda Management of High Levels of Fecal Calprotectin – A Single Case Study

Barming C. Bhalodiya[1,*], Rohini Salve[2], Haresh Vyas[3], Tanuja Patel[4]

Abstract

Calprotectin is a protein found in leukocytes. Calprotectin plays a crucial role in various physiological processes, including cell differentiation, immune modulation, tumor development, programmed cell death, and inflammatory responses. Gut inflammation due to various causes like genetic inheritance, changes in microbiota within intestine, defective immune regulation. Also, some infective, such as Salmonella, E. coli, cytomegalovirus, amoebiasis, etc., and non-infective such as ischaemic colitis, non-steroidal anti-inflammatory drugs, colonic carcinoma, etc., can mimic an inflammatory condition of the intestine. Which can increase mucosal permeability, leading to the migration of immune cells toward chemotactic signals. Bacterial components trigger the release of calprotectin from immune cells, resulting in elevated levels of calprotectin in faces. Faecal calprotectin distinguishes between inflammatory bowel disease (IBD), with high levels, and irritable bowel syndrome (IBS), which typically has normal levels. It's a valuable tool for identifying the underlying pathology when symptoms overlap. Faecal calprotectin is valuable for monitoring IBD patients and detecting mucosal healing or inflammation recurrence. A male patient with the age of 45 year having the symtopms like Sharirabhar hras (weight loss), Agnimandya (loss of apetite), Kshudha kale udara shula (pain on empty stomach), Udara kathinyata (hardness of abdomen), Jirna Antah Jwaranubhuti (fever), Klama (fatigue), Bhrama (giddiness), Daurbalyata (weakness) since 1 year and history of Varamvar Pratishyay (recurrent cold), Nasa strava (nasal discharge), Kantha daha (sore throat), since childhood came to Ayurveda Chikitsa Mandir and Panchakarma Research Center, Ahmedabad, Gujarat, India. The patient was treated with ayurvedic medication for a duration of 1 year and got relief for a further 1 year. Medicine is continuing to check for relapsing of disease. Results increase the faith of the patient in Ayurveda.

Keywords: Fecal calprotectin, IBD, immunity, Ayurveda, shaman

***Author for Correspondence**
Barming C. Bhalodiya
E-mail: barmingpatel@gmail.com

[1]PG Scholar, Department of Panchakarma, Government Akhandanand Ayurveda College. Ahmedabad, Gujarat, India
[2]Associate Professor, Department of Panchakarma, Government Akhandanad Ayurveda College and Hospital, Ahmedabad, Gujarat, India
[3]M.D., Ayurveda Practitioner, Department of Kayachikitsa, Ayurveda Chikitsa Mandir and Panchakarma Research Center, Ahmedabad, Gujarat, India
[4]M.D., Ayurveda Practitioner, Department of Kayachikitsa, Ayurveda Chikitsa Mandir and Panchakarma Research Center, Ahmedabad, Gujarat, India

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INTRODUCTION

Calprotectin, also known as MRP8/14 and S100A8/A9, is a kind of protein that binds calcium and zinc. It belongs to the S-100 protein family and was initially isolated from blood leukocytes. A corresponding amount of calprotectin is found in neutrophils, accounting for about 60% of the cytosolic protein content. It is also present, though to a lesser extent, in monocytes and macrophages throughout the body, including in plasma, urine, cerebrospinal fluid, saliva, and synovial fluid. The protein plays various physiological roles, including cell differentiation, immune regulation, tumor development, apoptosis, and inflammation. During inflammation, calprotectin acts as a positive acute-phase protein and is involved in several key processes:

1. *Cell receptor expression:* Calprotectin facilitates the expression of various cell receptors involved in the processes of neutrophil migration, adhesion, and phagocytosis, including CD35, CD11b, CD18, and CD66b.
2. *Chemotaxis:* It promotes chemotaxis, guiding immune cells to sites of inflammation.
3. *Innate immune response:* Calprotectin contributes to the innate immune response by functioning as a damage-associated molecular pattern (DAMP) protein.

Pathological conditions can lead to gut mucosal infection or inflammation, resulting in increased mucosal permeability. This enhanced permeability attracts monocytes and granulocytes toward chemotactic substances found in the intestines. Additionally, bacterial components from the intestinal lumen stimulate the release of mediators like calprotectin from these immune cells, leading to elevated levels of calprotectin in feces. Therefore, the presence of calprotectin in feces reflects the migration of neutrophils into gastrointestinal tissue during infection or inflammation.

Remarkably, fecal calprotectin is highly stable against degradation by intestinal pancreatic secretions, proteases, and bacterial activity. Its stability in stool samples for up to a week at room temperature makes it a suitable fecal biomarker. Consequently, fecal calprotectin surpasses serum calprotectin in specificity for gastrointestinal tract inflammation.

Laboratories frequently measure calprotectin in stool samples using standard enzyme-linked immunosorbent assays (ELISA). Intestinal inflammation and fecal calprotectin levels have been strongly correlated throughout various studies. This simple, non-invasive, and economically priced test is frequently utilized as an alternative marker to track intestinal inflammatory activity.

The clinical applicability of fecal calprotectin goes beyond diagnosis. It helps differentiate between organic and functional causes of gastrointestinal symptoms, especially when symptoms or clinical examination alone cannot provide a clear distinction.

Inflammatory bowel disease (IBD) vs. irritable bowel syndrome (IBS): Fecal calprotectin aids in distinguishing between IBD (an organic disease involving intestinal wall inflammation) and IBS (a functional disorder due to gut motility issues). Their similar symptoms can be challenging to differentiate clinically, but calprotectin levels offer valuable insights.

Moreover, fluctuations in fecal calprotectin levels serve as markers for mucosal healing or inflammatory recurrence. Thus, keeping an eye on fecal calprotectin levels can aid in the management of IBD patients and help identify individuals who may relapse [1]. The clinical utility of faecal calprotectin depicts in Table 1.

CASE PRESENTATION

A 45-year-old male patient living in Ahmedabad, Gujarat, approached the Ayurved Chikitsa Mandir and Panchkarma Research Center, Ahmedabad, Gujarat, India on 17/08/2020 with chief complaints of

- *Agnimandya* (loss of appetite),
- *Kshudhita Avasthya samaye udara shula* (empty stomach pain),
- *Udara kathinyata* (hardness of abdomen),
- *Klama* (weakness),
- *Bhrama*, *Daurbalyata* (weakness),
- *Jirna Antah Jwaranubhuti* (fever),
- *Sharir bhar hrasa* (weight loss) from 1 year history of *Varamvar Pratishyay* (cold), *Kantha daha* (sore throat), *Nasa strava* (nasal discharge) from childhood

Personal History

Patient eating at irregular times and junk food due to his sedantory lifestyle of less walking and exercising.

Table 1. Clinical utility of fecal calprotectin [2].

Condition/Disease	Clinical Utility of Faecal Calprotectin
Inflammatory bowel disease (IBD)	*Diagnosis:* Clinical guidelines suggest using fecal calprotectin as a non-invasive biomarker for diagnosing Crohn's disease and ulcerative colitis. It offers high sensitivity and moderate specificity, correlating closely with endoscopic assessments of inflammation. Compared to endoscopy, it is more affordable, quicker, and less invasive for patients. However, it is not entirely specific to IBD and can be elevated in other gastrointestinal conditions like colorectal carcinoma and diverticulitis. Normal ranges usually fall between 10 to 50 or 60 μg/mg. Values higher than this range often indicate abnormality [3].
	– *Monitoring disease activity:* In both ulcerative colitis and Crohn's disease, fecal calprotectin levels increase significantly even in the presence of the mildest signs of inflammation. – Fecal calprotectin was found by Aggarwal et al. to have a significant correlation with findings from capsule endoscopy findings, indicating that it may be used as a reliable marker to track mucosal inflammation in small bowel Crohn's disease.
	– *Response to therapy:* Superior to serum indicators and clinical indices for evaluating mucosal healing. – It levels show are strongly correlated with endoscopic examination of disease extent.
	Prediction of disease relapse: Individuals with asymptomatic IBD who have high levels of fecal calprotectin had an 80% chance of relapsing clinically in the next six months.
Post-operative IBD recurrence	Predicts early recurrence post-surgery; surgery reduces calprotectin levels.
Colorectal carcinoma	– In colorectal carcinoma tissue and adenomatous polyps is higher compared to healthy mucosa. It correlates strongly with neutrophil infiltration. – Higher expression in carcinoma tissue; good sensitivity and specificity but not recommended for screening asymptomatic patients.
Other intestinal disorders	*Infectious gastroenteritis:* Differentiates bacteria from viral diarrhoea.
	Acute appendicitis: Help differentiate acute uncomplicated appendicitis from other abdominal pains and assess its severity, but its analysis is often too slow for timely diagnostic decisions in this context.
	NSAID-induced small bowel enteropathy: Role unclear; elevated levels observed with NSAID use. A study found that diclofenac raised fecal calprotectin levels in 75% of healthy subjects after two weeks.
	Acid-related diseases/peptic ulcer disease: Adds value in decision-making for endoscopy.
	Cystic fibrosis: Fecal calprotectin levels are higher in infants with cystic fibrosis, indicating early intestinal changes. Higher levels in those with pancreatic insufficiency correlate with intestinal changes.
	Coeliac disease: Marker for disease severity and diet response. but the reasons for increased levels are unclear.
	Transplant rejection/GvHD: Correlates with rejection risk and severity in gastrointestinal complications post-transplantation.

History

The patient gave a history of recurrent colds, sneezing, and nasal discharge since childhood and was taking allopathic medications for that more frequently.

INVESTIGATION

The haematological test is depicted in Table 2.

Samprapti Ghataka

Dosha- Kapha Pradhana Tridoshaja Vyadhi Dushya- Rasa, Rakta, Mansa Agni-Jatharagni, Srotas Annavahasroto Dushti- Sanga Vyadhiudbhavasthana- Pakwashaya Vyadhi Adhisthana- Pakwashaya Avastha- Chirakari Prabhava-Kruchhasadhya.

Table 2. Haematological test (on 15/11/2019).

Hb	12.3%
Total RBC	3.81 million/cmm
Total WBC	3900/cmm
ESR	16 mm/1 hrly
	46 mm/ 2 hrly
TSH	4.27 µU/mL

RBC: red blood cell, WBC: white blood cell, ESR: erythrocyte sedimentation rate, TSH: thyroid stimulating hormone,
USG (On 23/4/21): Mesenteric lymph node inflammation.

TREATMENT PROTOCOL

The planning of the treatment was as follows: medications (Table 3) for approx. 2 years with strictly on *Laghu aahar.*

Table 3. Medication with dosage and *Anupan.*

Duration	**Medication**	**Dose**	***Anupan***	**Time**
17/8/2020–3/9/2020	*Swadishta Virechana Churna*	3 gm	*Ushnodaka*	1 time before meal. At night.
4/9/2020–17/11/2022		2 gm		
17/8/2020–15/7/2022	*Shatapal Ghrita*	7.5 ml	*Ushnodaka*	7am–5pm 2 times/day.
5/10/2020–4/2/2021	*Eranda Sneha*	*For Nasyaarthe* QS		
5/10/2020–4/2/2021	*Ajamodaka*	*For Nasyaarthe* QS		
20/12/2021–5/2/2022				

OBSERVATION

Patient's symptoms were assessed at an interval of 5 days, firstly, and then after every 20 days the patient came to the Ayurvedic clinic for follow-up. The patient got complete relief in symptoms with the normal level of fecal calprotectin within 1 year of treatment. After that, for 1 year, the patient kept on observation mentioned in Tables 4, 5, and 6. Result of treatment before and after treatment mentioned in Table 7: Fecal Calprotectin Level, Table 8: Stool Culture Test, and Table 9: Stool Routine and Micro.

Table 4. Observation of symptoms from date: 17/08/2020 to 13/01/2021.

Symptoms	17/8 20	24/8 20	4/9 20	15/9 20	5/10 20	27/10 20	9/11 20	4/12 20	25/12 20	13/1 21
Agnimandya	++++	+++	++	+	----	----	----	----	----	----
Kshudhita avasthya samaye udara shula	++	+	+	----	----	----	----	----	----	----
Udar kathinyata	++++	+++	++	+	+	----	----	----	----	----
Klama,Bhrama, Daurbalyata	++	++	+	----	----	----	----	----	----	----
Jirna antah jwaranubhuti	+	+	----	+	----	+	----	----	----	----
Sharir bhar hrasa	++	+	----	----	----	----	----	----	----	----
Weight (Kg)	38	----	----	----	----	37.4	36.7	37	40	43.5
Mala pravrutti	1/day	*Sam yak*	*Sam Yak*	1/ day	1/day *Snigd ha*	----	1/ day	----	1/ day	*Durgan dhita, Alpa* 1/day
Varamvar pratishyay	++	+	+	++	+	+	----	+	----	----
Kantha daha	++	++	+	+	----	----	----	----	----	----
Nasa strava	++	++	+	++	+	----	----	----	----	----

PROBABLE MODE OF ACTION OF DRUG

Svadishtha virechaka churna [4]: There is no such reference of *Svadishta virechana churna* directly found in Samhita. It contains *Shuddha Gandhaka, Yashtimadhu, Senna, Mishri, and Mishreya*. Which

are mentioned in *Aamayik prayoga* of *Gandhaka* in *Ras Tarangini* [5]. Administered in *Malavarodha, Amavruddhi, Shiroruja, Arsha, Raktavikara, Charmaroga, Pama, and Udara Shodhanartha.* The effects of the medication depend on senna leaves, which contain sennoside alkaloid; senneoside irritate the bowel lining, stimulate the bowel muscle, and induce laxation. While all other ingredients are to reduce the side effects of senna leaves [6]. In this patient, the innate immune mechanism is weak, as he got frequent upper respiratory tract infections. For that, he is taking repeatedly antibiotics and other medications. That can change the intestinal microbiota, act as an important host defence mechanism, prevent enteric colonization. Furthermore, a stool culture report found *E. coli* infection might be due to his food habits. Due to alterations in the body's defence mechanism, it cannot fight against ingested infection, which can increase the permeability of the intestinal tight junction. Bacterial invasion and damage to the intestinal mucosal cells lead to inflammatory colitis. Also, the impairment of intestinal motility increases the frequency of bacterial overgrowth and infection in the bowel [7]. *Svadishta virechaka churna* has properties of laxative, blood purifier, antibacterial and antimicrobial, and antipyretic, so helpful in breaking down *Samprapti* in this patient case [8].

Table 5. Observation of symptoms from date: 04/02/2021 to 24/01/2021.

Symptoms	4/2 21	20/2 21	16/3 21	23/4 21	24/5 21	17/6 21	5/8 21	27/8 21	16/9 21	6/10 21	26/10 21	24/1 21
Agnimandya	----	----	----	++	----	----	----	----	----	----	----	----
Kshudhita Avasthya samaye udara shula	----	----	----	----	----	----	----	----	----	----	----	----
Klama,Bhrama, Daurbalyata	----	----	----	----	----	----	----	----	----	----	----	----
Udar kathinyata	+	----	----	----	----	----	----	----	----	----	----	----
Jirna antah Jwaranubhuti	----	----	----	----	----	----	----	----	----	----	----	----
Sharirbhar hrasa	----	----	----	----	----	----	----	----	----	----	----	----
Weight(kg)	42.2	41.1	40.8	39.8	40.7	41.4	42.2	----	41.5	41.5	41	42.3
Mala pravrutti	*Kathin, Durgan dhita* 1/day	----	----	----	1/day		1/day	----	*Samyak*	4-5/ day	----	----
Varamvar Pratishyay	----	----	----	++	----	+	+	----	----	----	----	+
Kantha daha	----	----	----	+++	----	----	----	----	----	----	----	----
Nasa strava	----	----	----	+	----	++	++	+	----	----	----	+

Table 6. Observation of symptoms from date: 20/12/2021 to 17/12/2022.

Symptoms	20/12 /21	8/1/ 21	5/2/ 22	10/3/ 22	30/3/ 22	18/4/ 22	5/5/ 22	3/6/ 22	15/7/ 22	24/8/ 22	17/12/ 22
Agnimandya	----	----	----	----	----	----	----	----	----	----	----
Kshudhita avasthya samaye udara shula	----	----	----	----	----	----	----	----	----	----	----
Klama,Bhrama, Daurbalyata	----	----	----	----	----	----	----	----	----	----	----
Jirna antah jwaranubhuti	----	----	----	+	----	----	----	----	----	----	----
Sharir bhar hrasa	----	----	----	----	----	----	----	----	----	----	----
Varamvar pratishyay	----	----	----	----	----	----	----	----	----	----	----
Kantha daha	----	----	----	----	----	----	----	----	----	----	----
Nasa strava	----	----	----	----	----	----	----	----	----	----	----
Sharir bhar hrasa	----	----	----	----	----	----	----	----	----	----	----
Weight (kg)	42.2	42.2	----	----	41.5	41.5	41.5	42.8	----	----	----
Mala pravrutti	----	----	----	3/day	1/day	*Samyak baddha*	----	----	1/day	----	----

NOTE – 23/04/21: Allopathy medicine taken for Kantha chankramana (throat infection) after suffering from severe gastritis and vomiting. Admitted in hospital for 5 days. 5/8/21: After consuming outside food suffer from Amlapitta (burning in stomach) 16/9/21: After consuming outside food suffer from Aatop (abdominal distantion), Udgar Utpatti (belching) relief in symptoms after having laghu ahar (light diet). 15/7/21 katu ras sevana se vrudhdhi. 10/03/22 Adhika Abhyavaharan paschat dravamala pravrutti.

Table 7. Fecal calprotectin level.

Date	Fecal Calprotectin (µg/g)
BT (18/8/2020)	423
AT (27/8/2021)	<5
AT (24/8/2022)	<5

Table 8. Stool culture test.

	BT (18//8/2020)	AT (27/8/2021)	AT (24/8/2022)
Organism	*E. coli*	No organism	E. coli
Colony count	Moderate	–	Profuse

Table 9. Stool routine and micro.

	BT (17/8/2020)	AT (27/10/2020)	AT (27/8/2021)
Pus cells	5–6	2–4	Absent
Red cells	0–1	Negative	Negative
Ova	*E. coli*	Absent	Absent
Mucus	Absent	Absent	Absent
Bacteria	–	Present	Present

Shatapala Ghrita: It contains *Pippali, Pippali mula, Chavya, Chitraka, Sunthi, Yavakshar,* and *Kshira*. *Panchakola* having *Katu Rasa, Katu Vipaka, Tikshna, Ushna, Ruchikruta, Shreshtha Dipaniya, Pachana, Kaphavata Har, Gulma, Anaha, and Shulaghna* properties. *Yavkshar* has *Laghu, Snigdha, Sukshma, Agnidipana, Vata-Kapha Hara, Shulaghna, Pandu, Arsha, Grahani, Gulma, and Anaha Rogahara*. All having laxative anti-bacterial, anti-microbial, and anti-inflammatory digestive, and appetizing effects [9]. According to *Charaka Acharya Shatapala, ghrita* can be used in *Kaphaja Gulma, Grahani, Pandu, Pliha, Kasa, and Jwara Roga. Ghrita* has the property that *Agni Dipana* stimulates the digestive enzyme [10]. Research on fatty acids in ghee suggests they can improve digestion and support the health of the intestinal wall. Components like butyric acid in ghee also help produce killer T cells in the intestines and boost the immune system [11].

In between the studies carried out, some medicines were given for symptomatic relief in acute conditions like cold and sneezing.

For example, *Eranda Tail* and *Ajamoda* were given to *Nasya* while having symptoms of *Pratishyay.*

Here, after the study of *Samprapti* of this typical condition, it can be observed that instead of giving a certain name to this condition, an attempt has been made for *Samprapti – Ghatak Vichar* and *Samprapti Vightana*. In this, case increased level of calprotectin was observed due to recurrent infection of the gastro-intestinal tract. Here, *Swadishta-Virechaka churna* helps to remove bacterial infestation by increasing. As morbid *Dosha* are expelled out, equilibrium of normal *Dosha* are maintained, increasing the strength of the immune system. In contrast, Shatapala Ghrita forms a protective layer on the mucous membrane of the intestinal wall, increasing its integrity, reducing leucocyte infiltration, and thereby lowering calprotectin levels in the stool.

CONCLUSION

The current study found that there is no such *Ayurvedic* disease that can be fully connected with symptoms and diagnostic tests employed in contemporary medicine. which are done while treating patients. *Shamanarth Shatapala Ghrita* is used to pacify vitiated *Doshas*. It helps to restore equilibrium to the doshas that have become imbalanced. While *Swadishta Virechana* is employed to eliminate aggravated doshas from the body by purgation. Bacterial infection, repeated antibiotic use, junk food consumption, and a sedentary lifestyle can damage the intestinal wall, leading to leukocytes infiltration results increased calprotectin. The case study demonstrated that the pathological condition was

effectively managed using these Ayurvedic treatments, showcasing the efficacy of *Ayurvedic* concepts and medicines in treating complex conditions.

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