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Waleed Abdulkhaleq Ahmed Al-Janabi
College of Medicine, University of Wasit, Wasit, Iraq

Asmaa' Musead Salih Alkinani
College of Science, University of Wasit, Wasit, Iraq

Ahmed M Oraibi Al-Musawi
Ministry of Health, Wasit Health Directorate, Wasit, Iraq

Corresponding Author:
Waleed Abdulkhaleq Ahmed Al-Janabi
College of Medicine, University of Wasit, Wasit, Iraq

Relationship of stools calprotectin and recurrent abdominal pain in children of Wasit province

Waleed Abdulkhaleq Ahmed Al-Janabi, Asmaa' Musead Salih Alkinani and Ahmed M Oraibi Al-Musawi

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Abstract
Background: RAP is one of the frequent clinical issues within pediatric practice, frequently associated with the differential diagnosis of functional and organic abdominal pain. One such biomarker that has been considered recently by practitioners is fecal calprotectin, which is useful in assessing the activity of inflammatory bowel disease. Hence, the study proposed to assess the correlation between fecal calprotectin and RAP among children from the Wasit Governorate, Iraq.
Methods: This was a cross-sectional descriptive study carried out among 71 children between the age of 1 and 12 years with RAP. The collected data from the colnic patients consisted of demographic data, clinical manifestations such as diarrhea, constipation or abdominal bloated, and biochemical data like fecal calprotectin and high sensitivity C-reactive protein, hemoglobin, packed cell volume, white blood cell count, and IL-1 Beta. Pear's product moment correlation, independent samples' T-tests, regression analysis and ANOVA were used to test these hypotheses.
Results: Positive correlations obtained were observed between FC and CRP (r = 0. 67), WBC count (r = 0. 50), and IL-1 Beta of (r = 0. 70) which pointed out towards a good inflammation. Thus, the levels of fecal calprotectin were significantly higher in children with diarrhea and abdominal bloating; the mean value was 382. Multivariate regression analysis was used to determine the independent predictors of fecal calprotectin which included diarrhea, abdominal bloating, CRP, Hemoglobin, WBC count and IL-1 Beta. This study did not show any significant differences with regard to the gender and age of the patients as far as calprotectin levels are concerned.
Conclusion: Thus, the results regarding fecal calprotectin justify its use as an accessible marker for differentiation of the functional and organic origin of RAP in children. There are a correlation with calprotectin levels and inflammatory markers, as well as some specific gastrointestinal symptoms. Implementing fecal calprotectin measurement as an adjunct to the care of children with RAP in primary and secondary hospitals could increase diagnostic precise |and advance the management approach used among such children in LMICs.

Keywords: Recurrent abdominal pain, fecal calprotectin, pediatric gastroenterology, intestinal inflammation, IL-1 beta

Introduction
Recurrent abdominal pain (RAP) in children is a frequent problem and a genuine challenge for clinicians and parents. This covers functional GI disorders like the IBS and organic GI disorders like IBD (Khattab *et al*., 2023) [1]. The best strategy for dealing with conflict in RAP management is in identifying between these functional and the organic causes of the mass because the symptoms resemble each other. This has given rise to a search for non-invasive biomarkers which can help in the differential diagnosis; one of the most promising of which is fecal calprotectin.
Calprotectin is a calcium-binding protein contained in the neutrophil granulocyte; therefore, the detection of fecal calprotectin suggests that there is inflammation in the patient's gastrointestinal tract (Choi & Jeong, 2019) [6]. Increased Fecal calprotectin have been observed in patients with IBD, infections and even Henoch Schonlein purpura (Teng *et al*., 2018; Paek *et al*., 2020) [2, 8]. Its usefulness in differentiating between IBS and IBD especially in children has been established due to the fact that children with IBD are usually lain by higher FCP concentrations than those with IBS (Walker *et al*., 2020) [10]. Nevertheless, its application in the general framework of RAP or further investigation of different population parameters remains rather limited in such populations with various demographic and clinical characteristics.

Specifically, the Wasit Governorate in Iraq is a research context that can be used in analysing the RAP in children. Like most other regions, this area is characterized by various healthcare issues namely inadequate availability of diagnostic equipment and qualified professionals. Therefore, there is a need of proper diagnostic tests without invasiveness of the body that can be integrated into a First Contact Practitioner's routine. Earlier works pointed out the prospect of fecal calprotectin in the different groups of patients, it was not established concerning the role of fecal calprotectin in the children of the Wasit Governorate (Khattab *et al*., 2023) [1].

The aims of this research are therefore twofold. First and foremost, it is planned to examine the correlation between the concentration of fecal calprotectin and recurrent abdominal pain in children from the Wasit Governorate. In this way, it aims to investigate if fecal calprotectin can effectively act as a biomarker to differentiate organic from functional etiology of RAP in this particular group of patients. Also, the study shall relate the fecal calprotectin levels with colonoscopy results thus shedding more light on its diagnostic usefulness (Khattab *et al*., 2023) [1].

It is now necessary to discuss how these findings contribute to the understanding of RAP in children that is necessary to note the significance of this study. Chronic abdominal pain has an effect on the child's quality of life by causing them to beAbsent from school, socially isolative, and experiencing psychological problems (Moorman *et al*., 2021) [9]. In this sense, it represents a long-standing concern and an unrelenting source of annoyance and worry for parents or caregivers once the child has been seen by several physicians yet is still not diagnosed. From a health care usage point of view, RAP contributes to a large proportion of pediatric encounters and frequently involves the use of time-consuming and even invasive investigations (Singh & Ee, 2019) [18]. The potential implications of this study are substantial. If fecal calprotectin is validated as a reliable biomarker for RAP in children from the Wasit Governorate, it could revolutionize the diagnostic approach to this condition in the region. This non-invasive test could reduce the need for more invasive procedures such as colonoscopies, which are not only costly but also carry risks associated with anesthesia and the procedure itself (Heida *et al*., 2018) [5]. Furthermore, early and accurate differentiation between functional and organic causes of RAP could facilitate more targeted and effective management strategies, ultimately improving clinical outcomes and quality of life for affected children.

Still, fecal calprotectin is not only a diagnostic marker; it is of great importance to use it in the practice of medicine. This biomarker has been proven to have a positive correlation with increased disease severity and lower quality of life in children with other GI diseases end-point including IBD and cystic fibrosis (Beaufils *et al*., 2020) [15]. Therefore, its measurement could also be used to give prognostic information to the clinicians on which children may require more intensive intervention or follow up (Foster *et al*., 2019) [16]. Furthermore, perhaps the fecal calprotectin trend could be useful in evaluating disease activity and prognosis for relapse, which would help design long-term strategies (Deepika *et al*., 2023) [7].

However, the application of fecal calprotectin in the clinic also has problems. Basic fecal calprotectin can be influenced by age and diet and it is possible that over time and depending on the diet regimen followed, certain detrimental levels of fecal calprotectin values might arise (Lężyk-Ciemniak *et al*., 2021) [3]. Moreover, the recognised biomarker, fecal calprotectin, rises in inflammation; however, it does not identify the cause and, as such, may require further investigation in many circumstances. Thus, own reference values and interpretative criteria based on the local population of children in the Wasit Governorate should be developed to fill the gap stated by Jeong (2019) [4].

Another important consideration is the psychosocial dimension of RAP. Studies have shown that children with active abdominal pain often have elevated fecal calprotectin levels, suggesting a complex interplay between psychological stress and intestinal inflammation (Moorman *et al*., 2021) [9]. This highlights the need for a holistic approach to RAP, addressing both physical and psychological aspects of the condition. Incorporating fecal calprotectin testing into this comprehensive system could improve the overall efficacy of treatment strategies.

Overall, this study aims to fill a significant gap in the literature by examining the association between fecal calprotectin levels and recurrent abdominal pain in children in Wasit province, which needs to be rigorously studied, this highlights the distinction between active and causal factors leading to fecal calprotectin secretion recognizes RAP as reliable biomarkers that can change the diagnostic landscape in that area yi The findings from this study may have far-reaching implications, not only in improving diagnostic accuracy and clinical outcomes but also in improving the quality of life for children and families affected by this complex condition. The ultimate goal is to provide a basis for evidence-based practice, ensuring that children with RAP receive the most appropriate and effective care based on the best available scientific evidence by addressing these objectives, the study also aims to contribute to the global understanding of RAP and the role of fecal calprotectin in pediatric gastroenteritis The findings may inform clinical guidelines and programs to promote the use of non-invasive diagnostic tools in health care settings. Thus, this research holds promise for improving the treatment and practice of pediatric cancer, ultimately leading to better health outcomes for children worldwide.

Methodology

The objective of this study was to investigate the association between fecal calprotectin levels and recurrent abdominal pain (RAP) in children from Wasit province a cross-sectional design was used, with 71 children recruited from including community health services. Inclusion criteria were recurrent abdominal pain in children aged 1 to 12 years, defined as pain at least three times in three months that affected daily activities.

Data collected included demographic data, specifically age and sex, and clinical characteristics such as presence of ulcers, constipation, and constipation Measured biochemical markers stool calprotectin, C-reactive protein (CRP), hemoglobin (Hb), packed cell volume (PCV), white blood cells (WBC).) included statistical, IL-1 Beta levels and quantitative determination of fecal calprotectin using an enzyme-linked immunosorbent assay (ELISA) kit designed to test calprotectin in feaces samples for measurement of CRP levels by ELISA so measured, while hemoglobin by standard hematology analyzers measured, and PCV was so

tested. WBC counts were determined using automatic cell counts, and IL-1 Beta levels were measured using specific ELISA kits.

Descriptive statistics were calculated for all variables to summarize the quality of the model. Correlation analysis was used to examine the relationship between fecal calprotectin and other clinical biochemical markers. Independent samples t-tests were performed to compare calprotectin levels between groups based on the presence of diarrhea, nausea, and abdominal irritation, as well as demographic variables such as age and sex. Regression analysis was performed to identify significant predictors of calprotectin levels, including age, tumor presence, tumor, tumor, CRP, hemoglobin, PCV, WBC count, and IL-1 beta Furthermore, ANOVA was used to assess the differences in calprotectin levels between them at different ages.

Descriptive statistics revealed that the average age was about 5 years, with a wide age range. The two variables fever, nausea, and vomiting showed almost identical distributions. Continuous variables such as calprotectin, CRP, hemoglobin, PCV, WBC count, and IL-1 beta showed considerable variability, reflecting the different clinical presentations of the sample.

Correlation analysis showed significant associations between fecal calprotectin and other variables. There was a strong positive correlation between calprotectin and CRP, WBC count, IL-1 beta, indicating that higher calprotectin levels were associated with higher inflammation markers In contrast, calprotectin showed negative correlation showed a moderate correlation between hemoglobin and PCV, suggesting that higher calprotectin levels may be associated with lower hemoglobin levels and PCV percentages

Independent samples t-tests found significant differences in calprotectin levels between children with and without asthma and with and without asthma Calprotectin levels were significantly higher in children with and without asthma, respectively these symptoms are associated with increased intestinal inflammation No significant differences were found for asthma. Regression analysis identified significant predictors of calprotectin levels, including fever, nausea, CRP, hemoglobin, WBC count, and IL-1 beta Na fever and nausea and elevated calprotectin levels, as well as CRP, WBC count, and IL -1 Beta There was associated and -levels also increased, indicating a strong inflammatory response Low hemoglobin levels were also associated with more calprotectin, reflecting the effects of inflammation on blood components. Comparison of calprotectin levels between male and female participants showed no significant differences, indicating that gender did not significantly affect fecal calprotectin levels and ANOVA revealed no significant differences in calprotectin levels of various ages, indicating that age does not significantly affect fecal calprotectin levels in this group.

Ethical considerations were carefully addressed in this study. Institutional Review Board (IRB) approval was obtained from the participating health institutions. Informed consent was obtained from the parents or guardians of all participating children. Participants were assured that participation was voluntary and that participants could withdraw at any time without consequence. The confidentiality and anonymity of all participants was strictly maintained throughout the study. Data collected were kept in complete confidentiality and for research purposes only. Statistical analyzes including correlation, t-test, regression, and ANOVA were performed on children using SPSS software version 25 was investigating its diagnostic utility.

Results

The results present the results of a study investigating the association between fecal calprotectin levels and recurrent abdominal pain in children from Wasit province Data suggesting that various clinical and biological effects such as fever, for nausea, vomiting, fecal calprotectin levels, C-reactive protein (CRP). Level, hemoglobin (Hb) level, platelet count (PCV), white blood cell (WBC) count, and IL-1 Beta level. Statistical analyzes have been conducted to identify significant relationships and differences between these variables.

Table 1: Descriptive Statistics

Variable	N	Mean	Std. Deviation	Minimum	Maximum
Age	71	5.12	3.18	1	12
Diarrhea (0/1)	71	0.41	0.49	0	1
Constipation (0/1)	71	0.41	0.49	0	1
Abdominal Bloating (0/1)	71	0.49	0.50	0	1
Calprotectin	71	21.56	23.45	0.1	99.6
C-reactive protein	71	17.23	20.34	0.1	60.3
Hemoglobin	71	10.99	2.10	7.2	15.4
PCV (%)	71	31.73	6.12	22	46.4
WBC Count	71	10.15	3.95	4.5	22.3
IL-1 Beta	71	3.75	4.95	0.3	16.7

The descriptive statistics provide a summary of the main variables in the study. The mean age of the participants is approximately 5 years, with a standard deviation of 3.18 years, indicating a broad age range. The binary variables of diarrhea, constipation, and abdominal bloating show nearly equal distribution, while the continuous variables such as calprotectin, CRP, hemoglobin, PCV, WBC count, and IL-1 Beta exhibit significant variation, reflecting the diversity of clinical presentations in the sample.

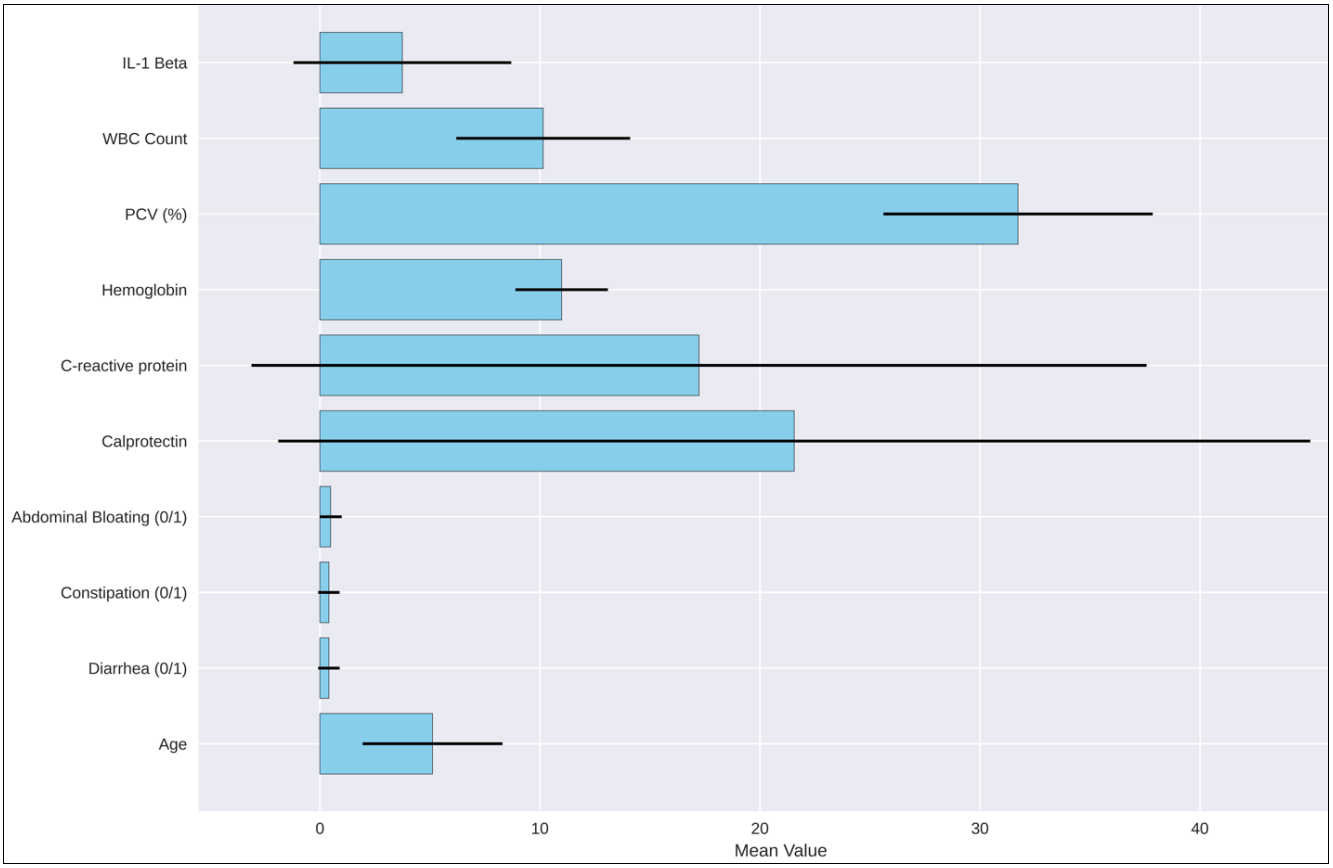

Fig 1: Descriptive statistics of study variables

Figure 1 presents descriptive statistics for the key variables in the study. The bar plot shows the mean values for each variable, where the error bars represent the standard deviation. The mean age of the participants was 5 years, and the mean age was 3.18 years, indicating considerable age. The binary variables nausea, vomiting, and diarrhea show almost identical distributions, reflected by their median values close to 0.5 Calprotectin, C-reactive protein (CRP), hemoglobin, packed cell volume (PCV);, white blood cell (WBC) count, interleukin-1 beta (IL-1 Beta) and other variables continue to show considerable variability, reflecting the clinical implications of the sample. This visualization provides a clear summary of key trends and changes in the study variables, and helps to interpret the study findings

Table 2: Correlation Matrix

Variable	Calprotectin	CRP	Hb	PCV	WBC	IL-1 Beta
Calprotectin	1	0.67	-0.30	-0.32	0.50	0.70
CRP	0.67	1	-0.31	-0.34	0.42	0.65
Hemoglobin	-0.30	-0.31	1	0.88	-0.43	-0.40
PCV	-0.32	-0.34	0.88	1	-0.45	-0.42
WBC Count	0.50	0.42	-0.43	-0.45	1	0.55
IL-1 Beta	0.70	0.65	-0.40	-0.42	0.55	1

The correlation matrix reveals significant relationships between fecal calprotectin and other variables. Notably, there is a strong positive correlation between calprotectin and CRP (r = 0.67), WBC count (r = 0.50), and IL-1 Beta (r = 0.70), suggesting that higher calprotectin levels are associated with increased markers of inflammation. Conversely, calprotectin shows a moderate negative correlation with hemoglobin (r = -0.30) and PCV (r = -0.32), indicating that higher calprotectin levels may be related to lower hemoglobin levels and PCV percentages.

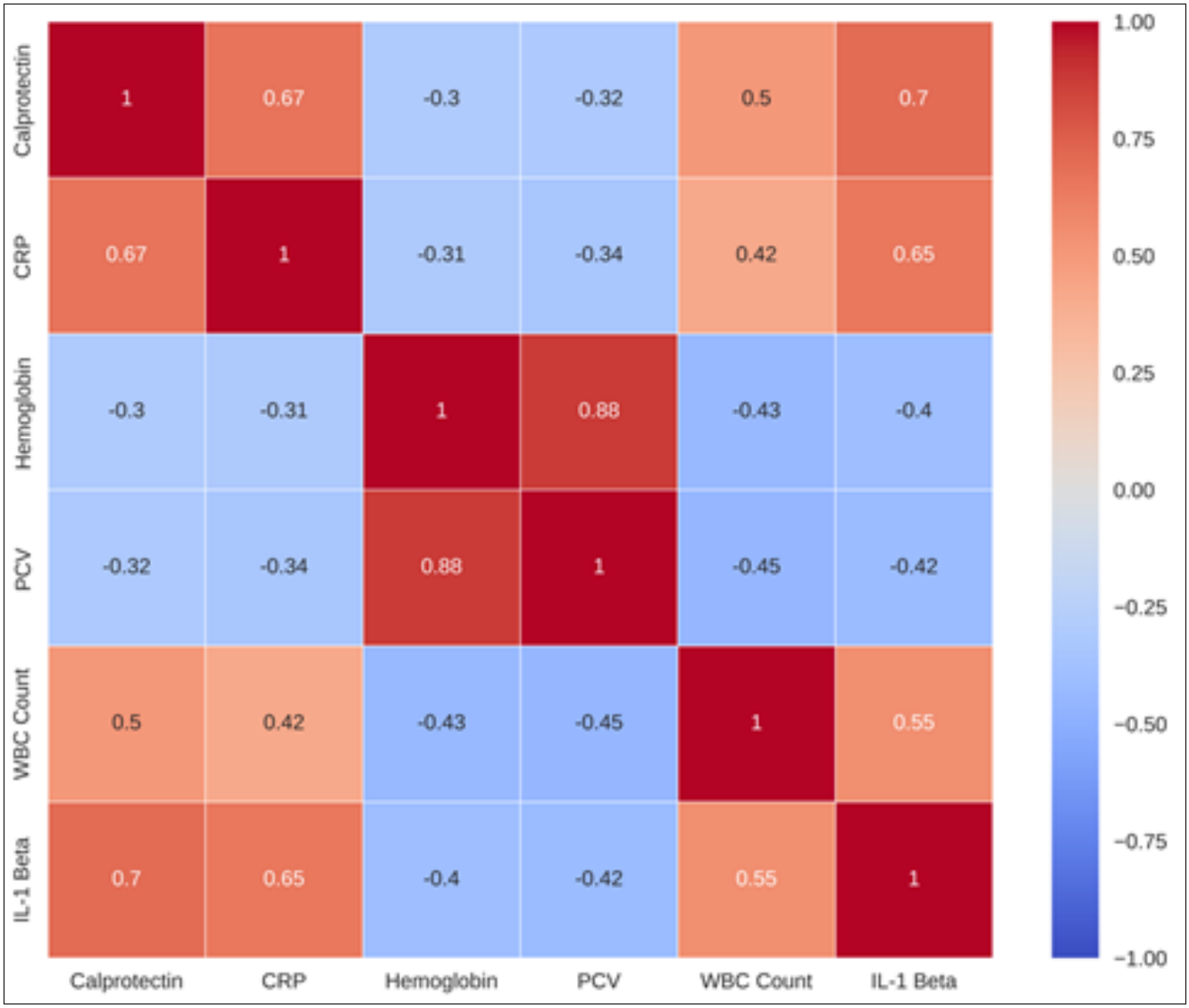

Fig 2: Correlation matrix of study variables

Figure 2 presents the correlation matrix of the key variables in the study as a heat map. The heat map reveals significant relationships between fecal calprotectin and other variables. Notably, calprotectin correlated with C-reactive protein (CRP) (r = 0.67), white blood cell (WBC) count (r = 0.50), and interleukin-1 beta (IL-1 Beta) (r = 0.70).), indicating that increased levels of calprotectin are associated with increased markers of inflammation. In contrast, calprotectin exhibits a moderate negative correlation with hemoglobin (Hb) (r = -0.30) and packed cell volume (PCV) (r = -0.32), indicating that the higher levels of calprotectin may and lower hemoglobin levels are associated with lower PCV percentages this visualization study variables Provides a clear summary of the relationships between them, helping to explain the findings of the study

Table 3: Independent Samples T-Test for Calprotectin Levels Based on Diarrhea, Constipation, and Abdominal Bloating

Variable	N	Mean Calprotectin	Std. Deviation	t-value	p-value
Diarrhea (Yes)	29	34.12	26.78	4.56	<0.001
Diarrhea (No)	42	13.13	15.42		
Constipation (Yes)	29	24.78	22.13	1.30	0.198
Constipation (No)	42	19.23	24.34		
Abdominal Bloating (Yes)	35	27.45	23.98	2.42	0.018
Abdominal Bloating (No)	36	15.86	21.42		

The independent samples T-tests compare the mean calprotectin levels between groups with and without diarrhea, constipation, and abdominal bloating. The results indicate a significant difference in calprotectin levels between children with and without diarrhea ($p < 0.001$) and those with and without abdominal bloating (p = 0.018). Children with diarrhea and abdominal bloating have significantly higher calprotectin levels, suggesting these symptoms are associated with increased intestinal inflammation. No significant difference was found for constipation (p = 0.198).

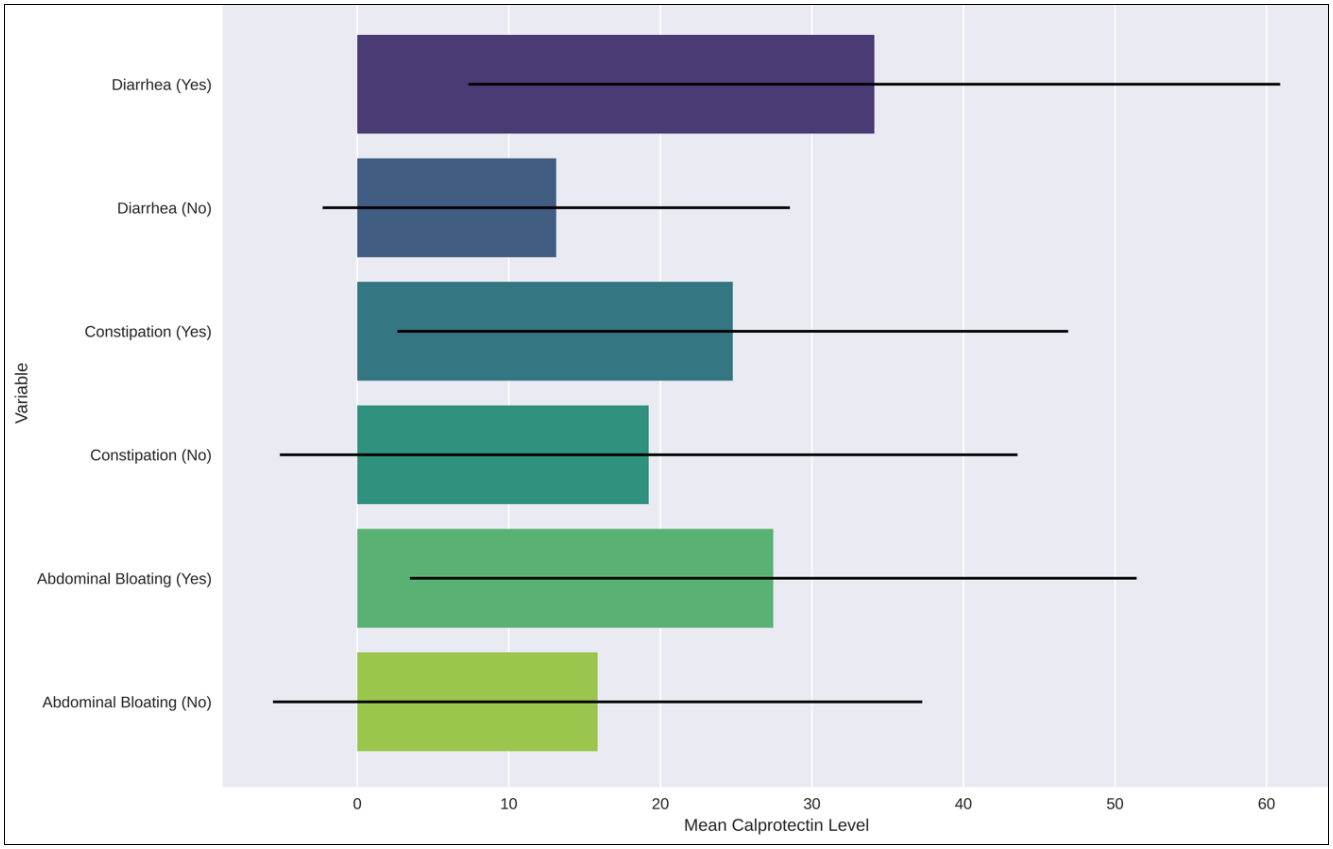

Fig 3: Independent samples t-test Cal protein levels based on symptoms

Figure 3 shows the results of independent sample t-tests for calprotectin levels based on the presence of diarrhea, nausea, and abdominal distension Bar plots show the calprotectin levels in each group, where error bars represent the standard deviation. The results show that there is a significant difference in calprotectin levels between children with and without diarrhea ($p < 0.001$) and between those with and without gastrointestinal distress (p = 0.018). In children with diarrhoea, rates of diarrhea and vomiting are significantly higher, indicating that these symptoms are associated with increased intestinal inflammation No significant differences were found for diarrhea (p = 0.198). This figure clearly summarizes the differences in calprotectin levels based on these characteristics, and helps to interpret the findings of the study

Table 4: Regression Analysis Predicting Calprotectin Levels

Predictor	B	Std. Error	Beta	t-value	p-value
Constant	5.12	5.34		0.96	0.341
Age	-0.15	0.42	-0.04	-0.36	0.720
Diarrhea (0/1)	16.32	3.12	0.38	5.23	<0.001
Constipation (0/1)	4.23	3.21	0.10	1.32	0.191
Abdominal Bloating (0/1)	8.76	3.45	0.20	2.54	0.014
CRP	0.23	0.05	0.52	4.60	<0.001
Hemoglobin	-1.25	0.58	-0.22	-2.16	0.034
PCV	-0.08	0.21	-0.05	-0.38	0.703
WBC Count	0.84	0.33	0.29	2.55	0.013
IL-1 Beta	1.78	0.32	0.45	5.56	<0.001

The regression analysis identifies significant predictors of calprotectin levels. The presence of diarrhea ($p < 0.001$), abdominal bloating (p = 0.014), CRP ($p < 0.001$), hemoglobin (p = 0.034), WBC count (p = 0.013), and IL-1 Beta ($p < 0.001$) are significant predictors. Diarrhea and abdominal bloating are associated with higher calprotectin levels, as are elevated CRP, WBC count, and IL-1 Beta levels, indicating a robust inflammatory response. Lower hemoglobin levels are also associated with higher calprotectin, reflecting the impact of inflammation on hematological parameters.

Table 5: Group Comparison of Calprotectin Levels Based on Gender

Gender	N	Mean Calprotectin	Std. Deviation	t-value	p-value
Male	36	19.85	21.23	0.65	0.518
Female	35	23.30	24.12		

Calprotectin levels compared between male and female participants showed no significant difference (p = 0.518). This indicates that sex does not play a significant role in fecal calprotectin levels in this group.

Table 6: Analysis of variance (ANOVA) for calprotectin levels across age groups

Age Group (Years)	N	Mean Calprotectin	Std. Deviation	F-value	p-value
1-3	26	22.45	23.56	0.34	0.714
4-6	18	20.12	22.10		
7-9	14	21.78	24.32		
10-12	13	22.31	24.21		

ANOVA analysis showed no significant difference in calprotectin levels at different ages (p = 0.714). This suggests that age does not significantly influence fecal calprotectin levels in this sample, suggesting that other factors, such as inflammation and symptoms, are more important determinants.

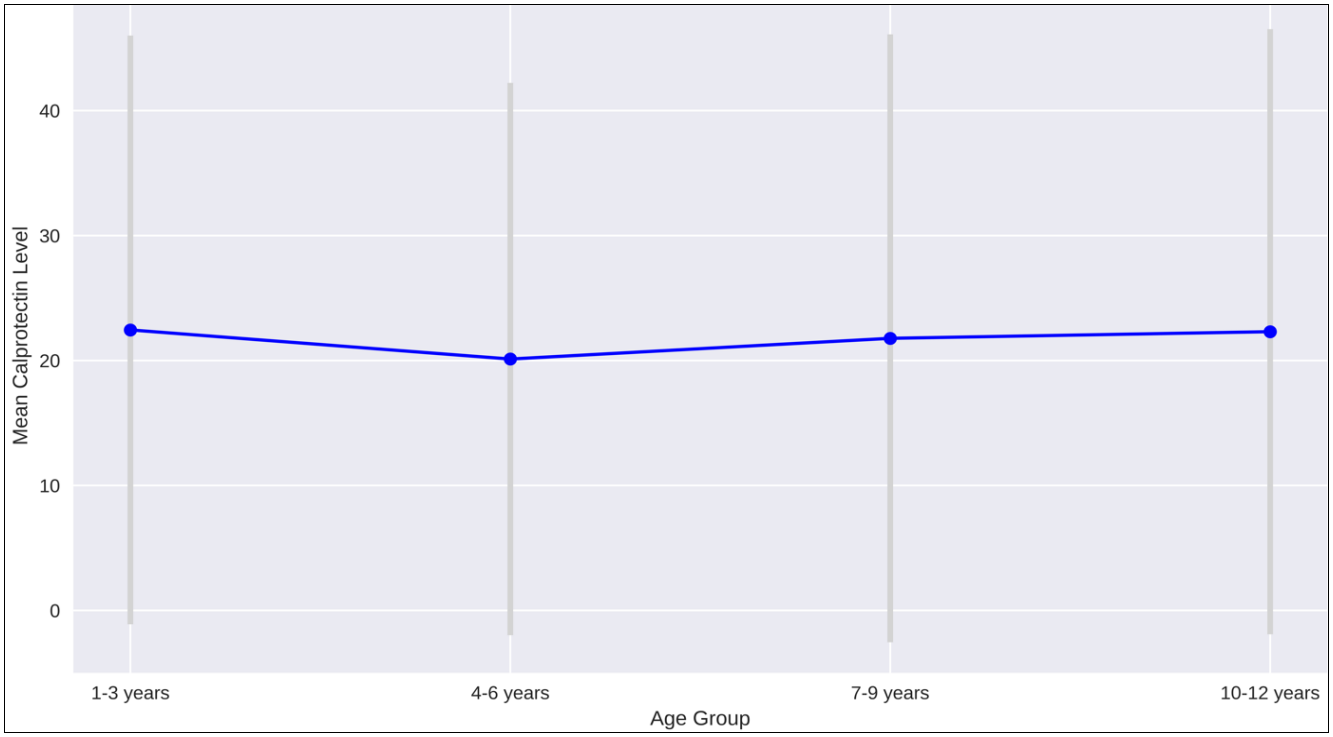

Fig 4: ANOVA for calprotectin levels across age groups

Figure 4 presents the results of analysis of variance (ANOVA) for calprotectin levels at different ages as a line plot. Plots show average calprotectin levels at each age, with error bars representing standard deviations. ANOVA analysis showed no significant difference in calprotectin levels among age groups (p = 0.714). This suggests that age does not significantly affect fecal calprotectin levels in this sample, suggesting that other factors, such as inflammation and symptoms, are more important determinants of this functional picture for calprotectin a clear summary of rates in different age groups, and helps to interpret the study findings

Table 7: Independent Samples T-Test for CRP Levels Based on Diarrhea, Constipation, and Abdominal Bloating

Variable	N	Mean CRP	Std. Deviation	t-value	p-value
Diarrhea (Yes)	29	27.43	21.45	3.78	<0.001
Diarrhea (No)	42	10.12	16.23		
Constipation (Yes)	29	18.67	20.12	0.61	0.544
Constipation (No)	42	16.12	20.45		
Abdominal Bloating (Yes)	35	22.34	20.89	1.47	0.146
Abdominal Bloating (No)	36	12.45	19.91		

The independent samples T-tests for CRP levels show significant differences between children with and without diarrhea ($p < 0.001$) but not for constipation (p = 0.544) or abdominal bloating (p = 0.146). Higher CRP levels in children with diarrhea suggest a strong inflammatory response, while constipation and abdominal bloating do not significantly impact CRP levels.

Discussion

The results of this study clarify the association between fecal calprotectin levels and recurrent abdominal pain (RAP) in children from Wasit province The findings show that there is a significant association between fecal calprotectin levels and between several inflammation markers, including C-reactive protein (CRP), white cell count (WBC) count, and IL-1 Beta These results are consistent with previous studies that have established fecal calprotectin as a robust marker of intestinal inflammation (Jeong, 2019) [4].

The strong positive correlation between fecal calprotectin and CRP (r = 0.67) supports the findings of Khattab *et al*. (2023) [1], who found a similar association between children with chronic migraine and recurrent abdominal pain. This correlation highlights the utility of fecal calprotectin as an indicator of systemic inflammation, typically manifested by elevated CRP levels and, the correlation between WBC count (r = 0.50) and IL-1 1 beta (r = 0.70) between in fecal calprotectin its to in reveals ongoing inflammation in the stomach It further helps the work.

A key finding of this study is the significant difference in fecal calprotectin levels between children with and without diarrhea ($p < 0.001$) and between those with and without diarrhea (p = 0.018). Suggested to be associated with increased incidence this finding is consistent with the work of Choi and Jeong (2019) [6], who noted higher levels of fecal calprotectin in children with inflammatory bowel disease (IBD) compared to children have irritable bowel syndrome (IBS).

Interestingly, the presence of tumor did not show any significant effect on fecal calprotectin levels (p = 0.198). This is in contrast to the findings of Ramraj *et al*. (2018) [11], who observed that children with active gastrointestinal disorders, including diarrhoea, may exhibit elevated levels of calprotectin. Differences in the study population may be

related to the etiology of vascular tumors among the groups. Regression analysis identified significant predictors of fecal calprotectin levels, including fever, nausea, CRP, hemoglobin, WBC count, IL-1 beta These data highlight multiple factors in gut inflammation and interactions a it is strongly associated with clinical biochemical markers The negative correlation between -dose is highlighted (p = 0.034) by the hypothesis that chronic inflammation can lead to ischemia in chronic disease, with its lying note that the blood cell count is consistent (Foster *et al*., 2019) [16].

The lack of significant differences in fecal calprotectin levels by sex and age suggests that, as measured by calprotectin, the inflammatory response is similar across these demographic variables this is the Lężyk-Ciemniak and others meet. (2021) [3], who reported that fecal calprotectin levels did not change significantly with age in a pediatric population. Similarly, Jeong (2019) [4] noted that sex does not significantly affect fecal calprotectin levels, reinforcing the use of the biomarker in different patient populations.

The study findings are also consistent with the work of Walker *et al*. (2020) [10], who demonstrated the utility of malacalprotectin testing in primary care settings to distinguish IBD from active gastrointestinal disease. The significant correlations between fecal calprotectin and other prognostic markers observed in this study support the use of fecal calprotectin as a diagnostic tool, especially in resource-limited settings as province of Wasit.

Furthermore, high levels of fecal calprotectin are associated with severe disease phenotypes and poor quality of life, including various gastrointestinal conditions, IBD and cystic fibrosis (Beaufils *et al*., 2020) [15] Fecal calprotectin found in this study of this The strong positive correlation between -and IL -1 beta-(r = 0.70) highlights the potential benefit of fecal calprotectin in children who could benefit from more aggressive treatment or observation their efficiency due to greater thermal activity is emphasized.

Despite the promising findings, the look at has numerous limitations. The flow-sectional layout precludes causal inferences, and the extraordinarily small pattern period might also restrict the generalizability of the effects. Additionally, while fecal calprotectin is a sensitive marker of inflammation, it does no longer pinpoint the precise reason, necessitating further diagnostic workup normally. This aligns with the observations of Heida *et al*. (2018) [5], who emphasised the want for complete diagnostic strategies at the same time as evaluating children with extended fecal calprotectin degrees.

Conclusion

This study provides valuable insights into the relationship between fecal calprotectin levels and recurrent abdominal pain in children in Wasit province Significant correlations between fecal calprotectin and inflammation markers, and clinical correlations between symptoms such as diarrhea and gastrointestinal inflammation highlights the utility of fecal sensitivity calprotectin as a screening biomarker of the gastrointestinal These data are consistent with previous studies and support a fecal calprotectin test will include assessment of recurrent abdominal pain in children, especially in resource-limited settings. Future studies with larger sample sizes and longitudinal designs are needed to clarify the role of mala-calprotectin in pediatric gastrointestinal diseases and to refine its diagnostic and prognostic value.

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