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SYSTEMATIC REVIEW

Children and Adolescents with Irritable Bowel Syndrome: Treatment and Management

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Abstract: ***Background*:** Irritable bowel syndrome (IBS) is a disorder that causes stomach pain in children and adolescents. It may also impact one's quality of life. IBS is linked to gastrointestinal issues such as diarrhoea and constipation. Despite the identification of several potential pathophysiological pathways, the aetiology of IBS remained unknown.

***Objective*:** The aim of this paper is to discuss the diagnosis, pathogenesis, case studies and treatment of Irritable bowel syndrome in children and adolescents.

***Methods*:** This systematic review covered relevant papers from the previous ten years that were accessible in Science Direct, Elsevier, NCBI, and Web of Science related to the pathophysiology and function of pharmacological drugs such as antidepressants, antispasmodics, prokinetics, and antibiotics in children with irritable bowel syndrome.

***Results*:** Only a few prospective therapy techniques have been investigated in children, and even fewer of those have been demonstrated to be effective. This article presents case studies including 50-59 children, which demonstrate a favourable acceptable impact that is more effective than a placebo in terms of reducing symptoms and improving the overall quality of life in children who have irritable bowel syndrome. Furthermore, the majority of the pathophysiological explanations and treatment options discussed are based on adult studies. These major issues arose when treating paediatric IBS, and they must be addressed in order to properly treat children with IBS. Trials that focus on many combinations of pharmacological and non-pharmacological therapies seem to be more helpful.

***Discussion*:** In recent years, a number of systematic reviews have been conducted to evaluate the efficacy of medication treatments in children for IBS; however, the dependability of these systematic reviews needs to be further investigated owing to the various experimental designs and levels of evidence used. This article highlights paediatric therapy options, including pharmaceutical medications such as antidepressants, antispasmodics, prokinetics, and antibiotics. The goal is to alleviate IBS symptoms while also enhancing the quality of life for children with this illness.

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1. INTRODUCTION

Irritable bowel syndrome (IBS) is a common functional gastrointestinal illness characterized by persistent, recurring stomach pain and discomfort, as well as changes in bowel habits. Rome IV defined irritable bowel syndrome as a functional bowel condition characterized by recurring abdominal discomfort linked with defecation or a change in bowel habits. Disrupted bowel habits (constipation, diarrhoea, or a combination of the two) [1]. According to the most common stool pattern, IBS sufferers can be divided into four basic subtypes: IBS with constipation (IBS-C), IBS with diarrhoea (IBS-D), IBS with mixed bowel habits (IBS-M), and unclassified IBS (Table **1**) [2].

Irritable bowel syndrome (IBS) is a prevalent digestive illness that impacts children and teenagers' lives. IBS often appears as stomach discomfort and is linked with bowel disturbances such as diarrhoea, and constipation in this popula-

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Table 1. Different kinds of irritable bowel syndrome.

IBS with Diarrhoea (IBS-D)	IBS with Constipation (IBS-C)	IBS with Mixed Bowel Habits or Cyclic Pattern (IBS-M)
Stools that are loose more than 25% of the time and solid less than 25% of the time.	Hard stools more than 25% of the time and watery stool less than 25% of the time.	More than 25% of the time, both hard and soft stool.
Men have a higher prevalence of this condition.	Men have a higher prevalence of this condition.	-

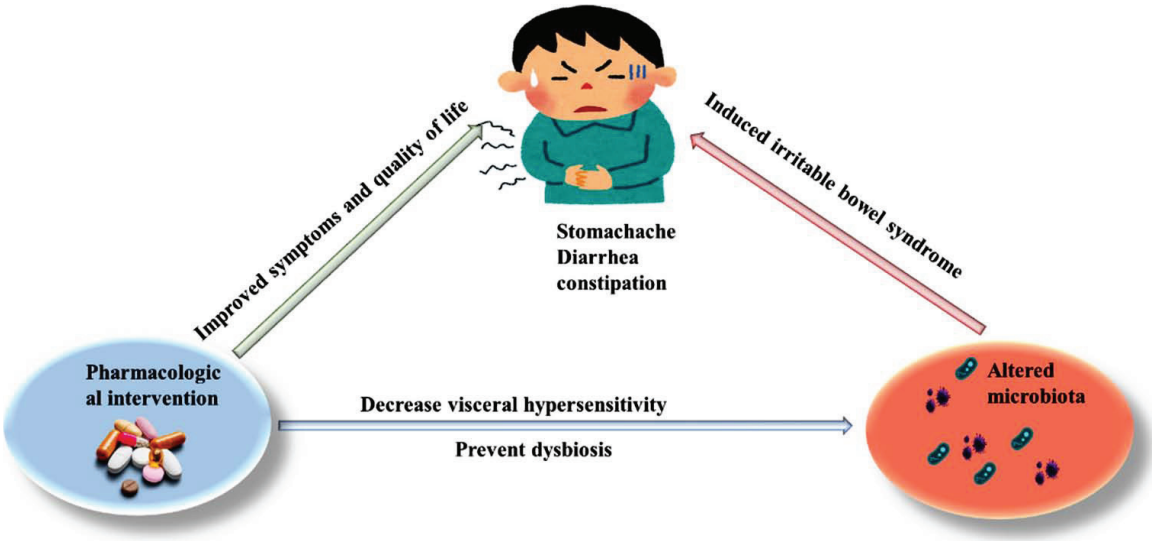

Fig. (1). Causes of irritable bowel syndrome. (*A higher resolution / colour version of this figure is available in the electronic copy of the article*).

tion. IBS may be severe and have a substantial influence on the standard of living of young sufferers, resulting in lower school-attendance rates and higher healthcare costs. In children and adolescents, the estimated prevalence of IBS-related stomach discomfort varies from 8% to 17% and 13% to 38%, respectively [3]. Many elements are linked in the aetiology, which is unknown. Understanding the pathophysiology of IBS is critical since novel pharmacological treatments are starting to target IBS's well-recognized pathophysiologic mechanisms. Gastrointestinal mobility, visceral sensitivity, post-infectious response, brain-gut connections, alterations in faecal microbiota, bacteria overpopulation, food allergy, and intestinal swelling are all related to the development of IBS (Fig. **1**).

The reported problems associated with these mechanisms, include stomach-ache, gas, diarrhoea, and constipation. Medical care for these particular issues has emphasised symptomatic relief [4]. A significant amount of serotonin is found in enterochromaffin cells, which are found in the stomach or intestine, and perform a vital role in the regulation of the peristaltic reflex and sensory relays in the gastrointestinal tract [5]. It is supported by the evidence suggesting the 5-hydroxytryptamine (5HT) system is dysfunctional in people with irritable bowel syndrome. Those suffering from constipation-predominant IBS (IBS-C) have a lower plasma serotonin release, whereas those suffering from diarrhoea-predominant IBS (IBS-D) have a higher plasma serotonin release [6]. Both IBS and ulcerative colitis have been shown to have a deficiency in 5-hydroxytryptamine (5-HT) signalling, with a decrease in normal mucosal serotonin and serotonin transporter immunoreactivity in both diseases [7].

2. STUDY RATIONALE

The purpose of this article is to present an up-to-date description of the therapeutic possibilities for paediatric IBS and to provide recommendations for management techniques. A good diagnosis of irritable bowel syndrome (IBS) in children who have persistent stomach discomfort is required. It focuses on the drug that is involved as well as the action mechanisms that are involved in it. In addition, there is a short discussion of the case studies that are included in the article as shown in Fig. (**2**).

3. OBJECTIVE

This review contains various research articles and systemic articles from the previous ten years that were available in Science Direct, Elsevier, NCBI, and Web of Science. These papers were related to the pathophysiology and function of pharmacological drugs such as antidepressants, antispasmodics, prokinetics, and antibiotics as well as case studies in children with irritable bowel syndrome.

4. MATERIALS AND METHODS

4.1. Study Design

Considering a large number of therapies for IBS in children and the availability of numerous systematic reviews that

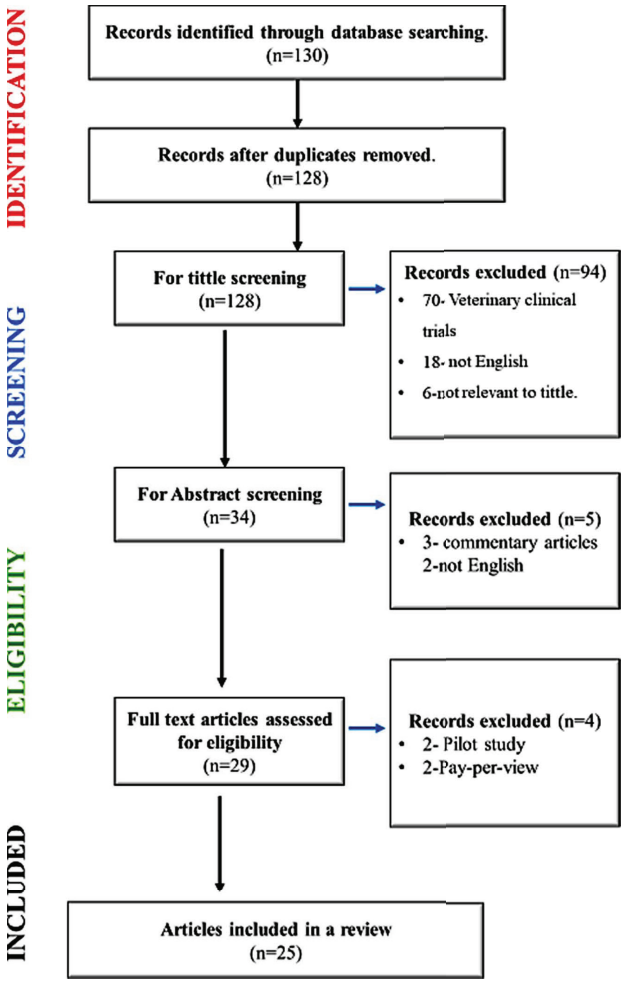

Fig. (2). Flow chart of screening process.

examined the efficacy of these interventions were included, this review was to assess the credibility of published systematic reviews on the efficacy or effectiveness of pharmacological treatments for IBS in children. We will go through the findings of systematic reviews in depth. We included systematic studies comparing pharmaceutical therapies to placebos.

4.2. Inclusion Criteria

Satisfy Rome IV criteria (IBS-C, IBS-D).

Children ages 2-12 years.

4.3. Exclusion Criteria

Use of Antibiotics Within the Previous 2 Months.

Hypersensitivity To Rifaximin.

History of diabetes, thyroid disease, intestinal surgery, connective tissue disease.

5. CLINICAL MANIFESTATIONS OF IRRITABLE BOWEL SYNDROME

A variety of Gastrointestinal problems might be present, in children with IBS characterised by persistent stomach discomfort as well as irregular stool patterns (Fig. **3**).

Additional symptoms include: diarrhoea, constipation, diarrhoea that alternates with constipation, gas, mucus in the stool, vomiting, and some children also experience weight loss [6].

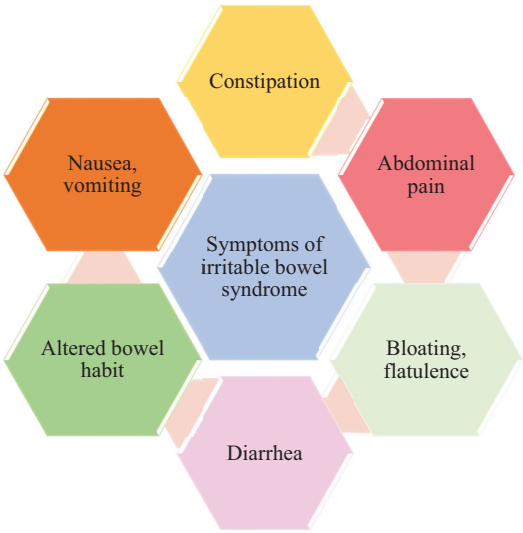

Fig. (3). Clinical manifestations of irritable bowel syndrome in children. (*A higher resolution / colour version of this figure is available in the electronic copy of the article*).

6. PREDISPOSING FACTORS FOR IBS

IBS in children is thought to be caused by a range of variables that have been presented as possible risk factors over the years. Identifying and avoiding specific predisposing variables, on the other hand, is a key problem in the therapy of this disorder (Fig. **4**).

6.1. Gender

Gender has not been identified as a distinct causative factor of IBS in any of the investigations that have been undertaken so far. A significant occurrence of IBS in females has been found in several studies [9, 8].

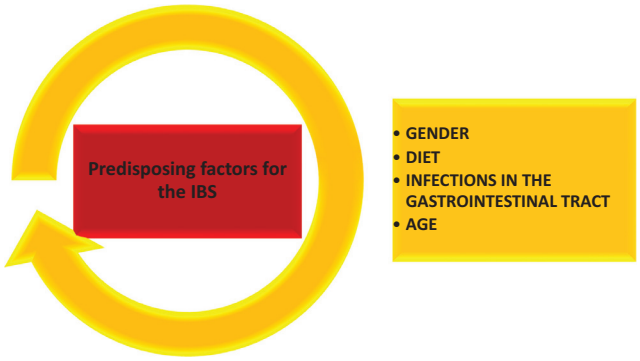

Fig. (4). Predisposing factors of irritable bowel syndrome in children. (*A higher resolution / colour version of this figure is available in the electronic copy of the article*).

6.2. Age

Various investigations have shown a greater frequency of IBS in children around the ages of 8 and 12 years, with the prevalence decreasing with increasing age [9-12]. The fact that IBS prevalence rates decline with age is most likely attributable to the fact that IBS resolves spontaneously with time.

6.3. Diet

Gastrointestinal diseases such as IBS are often linked to the use of certain dietary products like carbohydrates and fats [13, 14]. There is also some data to support that eating more spicy and fried foods increases the risk of IBS [15, 16]. Numerous investigations have displayed a correlation between food allergies and IBS in children.

The idea that some foods aggravate IBS symptoms is the basis of the elimination diets developed by the Cambridge group in the 1990s, which concentrated on avoiding poorly absorbed carbohydrates in order to reduce intestinal gas production [17]. This technique was developed into a more empirical approach in which patients began by removing foods that were widely reported to induce symptoms. Dairy goods, cereals, citrus fruits, potatoes, tea, coffee, alcohol, additives, and preservatives were among them. The diets consisted mostly of fresh meat, fish, rice vegetables, and goat, sheep, or soy milk. However, these studies give a list of often-discovered dietary intolerances. More recent studies of patients' opinions of which foods produced symptoms revealed similar overlapping lists that change by country, no doubt due to dietary differences. According to one Swedish poll, 84 percent of IBS patients identified at least one meal that aggravated their symptoms (Table **2**).

Table 2. Foods that were often recognized as causing symptoms.

Onions	35%
Milk	32%
Coffee	24%
Chocolate	28%
Butter	25%
Eggs	23%

These included dairy products (49%), beans/lentils (36%), apples (28%), flour (24%), and plum (23%), as well as biogenic amine-rich meals such as wine (31%), salami (22%), and cheese (20%), with 52 percent reporting fried/fatty foods in general [18]. According to a population-based survey in Norway, IBS sufferers avoided 2.5 food items on average. This includes 35% who avoided milk, 14% who avoided cheese, 16% who avoided legumes, 24% who avoided onions, 10% who avoided wheat flour, 26% who avoided coffee, and 12% who avoided beer [19].

6.4. Infections of the Gastrointestinal Tract

A person's previous experience of gastroenteritis is a well-recognized contributor to the progression of IBS in both children and adults [9, 12, 20, 21]. According to a meta-analysis, the overall frequency rate of IBS among individuals who had previously had infectious gastroenteritis was 9.8 percent, and it was just 1.2 percent in control.

7. DIAGNOSIS OF IRRITABLE BOWEL SYNDROME IN CHILDREN

In order to diagnose IBS, there is no special test. As a result, gathering a thorough patient history as well as observing clinical symptoms continues to be highly essential for diagnosis. It is determined if someone has IBS by following the Rome III criteria and Rome IV criteria. These criteria are used to evaluate symptom clusters related to a wide range of functional gastrointestinal illnesses, particularly IBS [22-24] (Table **3**).

8. PATHOGENESIS IN CHILDREN

In adults and children with IBS, a lot of research has been performed, and a huge number of putative pathophysiological pathways have been proposed (Fig. **5**).

8.1. Visceral Hypersensitivity

Visceral hypersensitivity is characterized as an enhanced perception of mechanical triggers applied to the bowel which seems as pain and discomfort [25]. When it comes to the etiology of IBS, the most essential aspect is visceral hyper-

Table 3. Rome III and rome IV diagnostic criteria for IBS.

ROME III DIAGNOSTIC CRITERIA FOR IBS
ABOMINAL PAIN OR DISCOMFORT ON A REGULAR BASIS ≥3 DAYS PER MONTH IN THE PREVIOUS THREE MONTHS RELATED WITH ≥2 OF THE FOLLOWING
• Pain or discomfort eased after defecation
• Onset interaction with a change in the frequency of stool
• Onset interaction with a change in stool form, (appearance) alternating between diarrhea and constipation
ROME IV DIAGNOSTIC CRITERIA FOR IBS
RECURRENT ABDOMINAL DISCOMFORT ON AT LEAST ONE DAY PER WEEK FOR AT LEAST THREE MONTHS, CORRELATED WITH TWO OR MORE OF THE FOLLOWING CRITERIA
• Related to defecation
• Associated with a change in the frequency of stool
• Associated with a change in the form (appearance) of stool

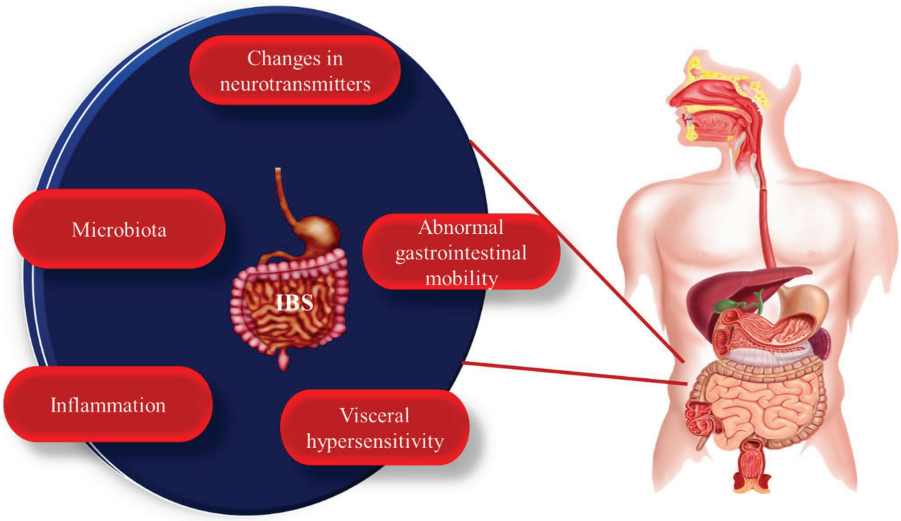

Fig. (5). Pathogenesis of irritable bowel syndrome in children. (*A higher resolution / colour version of this figure is available in the electronic copy of the article*).

sensitivity. In one paediatric investigation, researchers discovered that patients with IBS and functional abdominal discomfort had a lower rectal sensory pain tolerance [26].

According to the findings of another research conducted in children with IBS, stomach discomfort is related to altered perception of visceral sensations as well as hypersensitivity [27]. Many additional paediatric studies [28-30] have revealed similar findings, which are consistent with this one. Additionally, research in adults has shown a reduced rectal pain threshold in persons with IBS [31]. Numerous factors have been linked to the progression of visceral hypersensitivity, including stressful events, gastrointestinal infections, changes in the intestinal microbiota, swelling, immunological responses, food, and genes [28, 32, 33] and have been linked to the condition (Fig. **6**).

8.2. Microbiota

IBS sufferers' gut microbiome varies from that of healthy ones., with an elevated Firmicutes/Bacteroides ratio, a higher concentration of faecal Ruminoccus torque-like phenotypes and low microbial diversity, with a rise in the specific types of bacteria (Enterobacteriaceae, Veillonella, Dorea) and a decrease in others (Bifidobacterium, Collinsella, Clostridiales) [34, 35]. The proportion of Haemophilus parainfluenza in the intestines of children with IBS is much higher [36-38]. Experiments with germ-free mice and IBS sufferers' gut microbiome indicated increased visceral sensitivity, abnormal gastrointestinal movement, and increased intestine permeability, implying that gut microbiota may have a harmful function [39]. Other investigations have shown a link between changes in short-chain fatty acid synthesis by intestinal bacteria and the progression of symptoms in diarrheal IBS [40].

8.3. Changes in Neurotransmitters (5 HT) and Receptors

Variations in serotonin have now been found as an essential part in the aetiology of IBS in a large number of evidence [41]. 5-hydrodytryptamine (5-HT) is a vital chemical

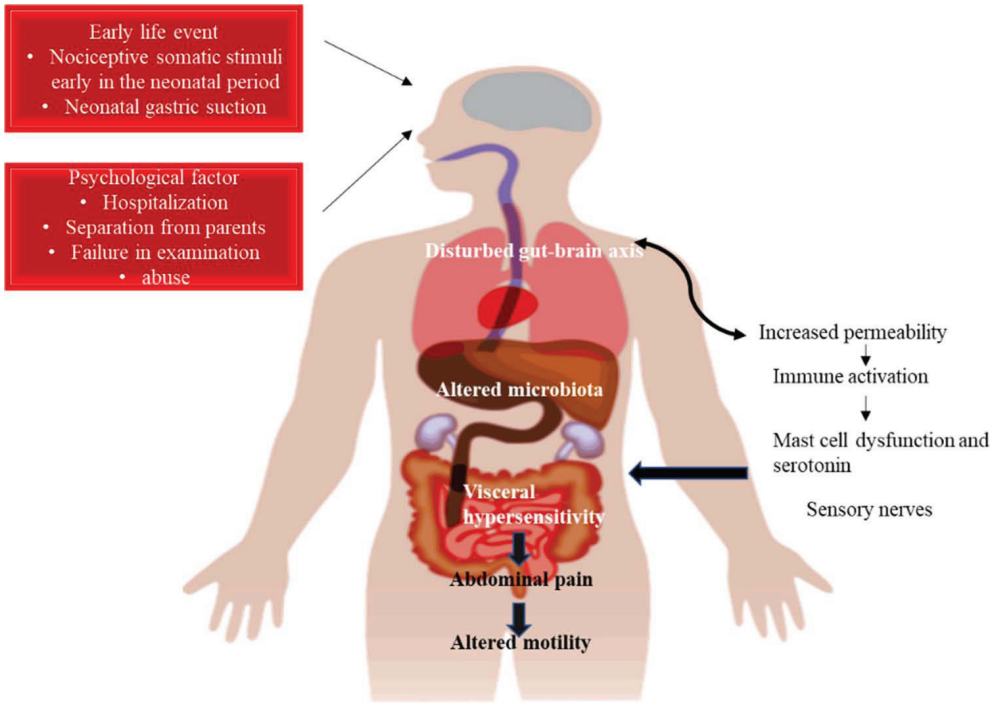

Fig. (6). Visceral hypersensitivity in irritable bowel syndrome. (*A higher resolution / colour version of this figure is available in the electronic copy of the article*).

messenger in enteric neurons and a paracrine signalling molecule released by enterochromaffin (EC) cells in the intestinal mucosa [42].

This improves brain and gastrointestinal function [43] and has been linked to bloating, nausea, and vomiting [44, 45]. Modifications in serotonin levels have been linked to central nervous system illnesses like anxiety and depression, as well as certain mental problems [46].

The serotonin transporter (SERT), which is a highly selective transporter, removes serotonin from the brain. It has been shown that SERT receptor gene polymorphisms are related to irritable bowel syndrome [47-49]. EC cell counts, as well as the production and absorption of 5-hydrodytryptamine (5-HT) are also considered to be important in the progression of IBS [46].

9. GASTROINTESTINAL MOTILITY

IBS is associated with disturbances in myoelectrical activity [50-53], gastric motility [54-59] and accommodation [60, 61], as well as intestinal and colonic transit [56, 62-64], in persons with IBS. IBS has several symptoms, one of which is small bowel dysmotility. According to several studies, IBS patients who experience constipation more often have slow small intestinal transit, while IBS patients who experience diarrhoea more frequently have quick small intestinal transit. In a Taiwanese investigation, small bowel transit as determined by non-invasive hydrogen breath tests in the fasted state revealed delayed transit in IBS patients with constipation as their primary symptom and rapid transit in IBS patients with diarrhoea as their primary symptom [65] in patients suffering from IBS and other FAPDs. Few studies have found a link between motility abnormalities and stress [66]. It has been proposed that stress might cause changes in the central aminergic network including serotonin and noradrenaline, which is thought to play an essential role in the pathogenesis of IBS, particularly in the top-down paradigm. However, no definite link has been shown between motility problems and IBS symptoms in children. As a result, it is unclear whether the identified gastrointestinal motor abnormalities are a cause of IBS or an effect of IBS [67].

Other variables, such as diet, influence gastrointestinal motility. Many studies have found that the presence of undigested food may indicate that food is moving too quickly through the digestive tract and is not being properly digested. It is more prevalent in those who have irritable bowel syndrome with diarrhoea. This condition is characterized by an overly sensitive colon [68].

10. IRRITABLE BOWEL SYNDROME IN CHILDREN: MANAGEMENT AND MEDICATION

Whenever an IBS diagnosis has been made, the next difficult challenge for a doctor is determining the most effective way to treat the complaints. The objective of any IBS therapy aims to enhance a child's standard of living, relieve discomfort, and control the uniformity and regularity of stools. To start, it is important to make sure the patient understands the diagnosis, provide stress-relief measures, and tell them there is nothing very wrong.

For this reason, a multidisciplinary approach to treating IBS in children is very important. This is because there are so many factors that could be at play in the development of IBS [69].

Table 4. Different classes of drugs used in the management of irritable bowel syndrome.

ANTI-SPASMODIC			
Treatment	Dosage	Age	Negative effect
Dicyclomine	20-40mg qid	≥ 18 y	Urinary retention, palpitation
Hyoscyamine	0.62-0.125 mg q4h	2-12y	Headache, Hallucination
Loperamide	1mg tib 2mg bid	2-5y 6-8 y	Cramps, dizziness
ANTI-DEPRESSANT			
Amitriptyline	0.2-0.5 mg/kg	N/A	Sedation
ACID-SUPPRESSANT			
Famotidine	0.5mg/kg qd	<3 mo.	Nausea, vomiting, arrhythmia
Ranitidine	2-4mg/kg qb -bid to max 150-300 mg	1 mo-16 y	Headache, palpitation
Omeprazole	5 mg	<10kg	N/A
PROKINETIC			
Lubiprostone	8mcg bid	≥18 y	Diarrhea, flatulence, headache

10.1. Pharmacological Interventions

Insufficient data exists to suggest that pharmaceutical treatments are effective in providing symptomatic alleviation [70]. A condition of imbalance within the enteric and central nervous systems is thought to be responsible for functional abdominal discomfort and IBS. This state is associated with changes in sensation and mobility, as well as possible changes in immune system activity. Bidirectional brain-gut connections, which are called the "brain-gut axis", are important to understand in order to come up with effective pharmaceutical treatments for FGIDs [71]. Various classes of pharmacologic medicines may treat a person with irritable bowel syndrome (IBS), depending on their mechanisms of action. Antispasmodics, antidepressants, acid suppressants, prokinetic drugs, and antibiotics are a few examples (Table **4**).

10.2. Antispasmodic

Antispasmodic medications may be beneficial in the therapy of IBS with predominant diarrhoea. The use of compounds having both anticholinergic and preventing spasms, especially of smooth muscle qualities, such as dicyclomine and hyoscyamine, for the treatment of gastrointestinal discomfort symptoms in paediatric sufferers has been shown to be successful. Antispasmodics work by reducing the excessive contraction and mobility of the gastrointestinal (GI) muscles that cause diarrhoea.

Dicyclomine actively works on gastrointestinal smooth muscle to provide antispasmodic responses, and it also acts on muscarinic receptors to create anticholinergic effects. Dicyclomine is a prescription medication. Dicyclomine should not be given to babies under the age of six months. However, no data on the drug's safety profile in people under the age of 18 have been reported. As a result, dicyclomine should only be used on individuals over the age of 18. Tachycardia, disorientation, hallucinations, difficulty peeing, thirst, perspiration, and hot and dry skin are some of the negative effects.

Children higher than 2 years of age should be treated with hyoscyamine if they have IBS. Heart palpitations, headaches, hallucinations, reduced perspiration, and mydriasis are some of the negative consequences of hyoscyamine [72].

Other antispasmodic drugs like drotaverine, mebeverine, or trimebutine are also used. IBS can be successfully treated with anti-spasmodic medications, especially mebeverine, according to a recent meta-analysis by Mart'nez-Vazquez and colleagues on 27 trials [73]. Mebeverine is a relaxant for smooth muscles that also has anticholinergic action. Recent meta-analyses demonstrated that antispasmodics, such as mebeverine, are superior to placebo in the treatment of people with irritable bowel syndrome. There have only been a few studies done to investigate the efficacy of antispasmodics in the treatment of children FGIDs [74]. The other meta-analysis on trials of mebeverine for IBS likewise indicated that this medication is well tolerated with no significant side effects [75]. The findings of this study on the adverse effects of mebeverine in children are comparable to those of studies on this medicine and other antispasmodics in adults [74, 75]. Mebeverine has been shown to be generally safe in children, with no major side effects.

10.3. Antidepressants

Antidepressants were seen to be efficacious in the management of IBS in children [76, 77]. It has been demonstrated that the tricyclic antidepressant amitriptyline is beneficial at modest doses. The success of amitriptyline in the treatment of IBS is attributed to its modulatory activities on different gastrointestinal chemical messengers, especially nore-

pinephrine, acetylcholine, and histamine, among others. In addition, amitriptyline functions on the norepinephrine and 5-hydroxytryptamine (5-HT) receptors to lower nociceptive sensation; at the muscarinic receptors to influence their anticholinergic potential, delaying gastrointestinal emptying duration and curing diarrhoea while worsening constipation; and on the histamine receptors to minimise acid production, thereby alleviating indigestion. A rare but significant side effect is cardiac arrhythmia induced by QT-interval prolongation, which necessitates ECG monitoring and sedation. This may be prevented by administering the medicine before going to bed [78].

10.4. Acid Suppressants

The use of acid-suppressing drugs in children, such as histamine2 blockers and proton pump inhibitors (PPIs), has long been standard practise in the management of stomach discomfort in children. The medication famotidine has been used to treat stomach discomfort related to dyspepsia, while there have been no trials conducted specifically on paediatrics with IBS. Ranitidine is sometimes given as an alternative. Headaches, dizziness, constipation, and diarrhoea are some of the complications of this medication [79].

Omeprazole, a proton pump inhibitor (PPI), is suggested for children and teenagers [80]. Abdominal discomforts, diarrhoea, flatulence, vomiting, and headache are some of the possible adverse events. Esomeprazole, lansoprazole, pantoprazole, and rabeprazole are all medications that may be used instead of omeprazole.

10.5. Prokinetic Drugs

Prokinetic drugs, which enhance gastrointestinal movement *via* a variety of mechanisms, are used to treat constipation associated with IBS [81]. Erythromycin also helps to enhance gastric transit speed by acting on the mobility receptor agonist erythromycin. Pain and dyspepsia may be alleviated by using 1 to 2 mg/kg/dose orally three to four times per day for 1 to 2 weeks. But there are no trials that particularly confirm the use of erythromycin in paediatric sufferers with IBS. It is believed that lubiprostone, a type 2 chloride channel activator, causes electrolyte and fluid production in the small intestine as well as stimulation of colonic movement [82]. IBS sufferers who have constipation have been allowed to use Lubiprostone in teenage IBS sufferers that are above the age of 18, according to the FDA. The suggested dosage is 8 mcg twice a day with meals, delivered in divided doses. In individuals with hepatic impairment, the timing of administration should be reduced to once daily. According to the manufacturer, lubiprostone can cause abdominal distention and discomfort, diarrhoea, gas, headaches, and a lot of other things.

10.6. Antibiotics

Infections in the gastrointestinal tract, especially in children and adolescents, have been linked to IBS. When it comes to children and teenagers, a longer period of gastrointestinal illness raises the chance of developing irritable bowel syndrome. According to the findings of a meta-analysis, there is a causal relationship between acute gastrointestinal infection and the frequency of IBS in small kids and adolescents. However, it is hypothesised that the disorder is associated with higher intestinal permeability and leakage, mucosal swelling, as well as the alteration in the intestinal microbiota, which together contributes to GI mucosal-wall abnormalities [83]. Antibiotics should not be used on a regular basis by children with post-infection IBS because they could become resistant to antibiotics and it can be hard to find the right one, especially if there is no evidence of bacterial overgrowth in the small intestine.

10.7. Stimulant Laxatives

Stimulant laxatives have been linked to increased stomach discomfort and tachyphylaxis, among other things. If it is determined that long-term medication is essential, laxative medication with polyethylene glycol (PEG) could be a preferable treatment choice for IBSC [84].

10.8. Anti-diarrheal

Anti-diarrheal medications have a specific function and should only be used in children who have diarrhoea as their primary IBS complaint (IBSD). Regulation of peristalsis and intestinal production occurs as a consequence of the action of loperamide, an opiate analogue, which works by activating inhibitory presynaptic receptors in the enteric nervous system. Loperamide was shown to be useful in lowering diarrhoea in IBS sufferers in research done on adults [85], but not in alleviating the sensations of abdominal discomfort.

10.9. Serotonin

In the gastrointestinal system, it is essential for the regulation of gastrointestinal mobility, perception, and production. In accordance with recent findings, plasma 5-HT levels are lower in IBS sufferers who have constipation, and are higher who have diarrhoea, particularly those who have postprandial symptoms, according to the researchers. Because of this, there has been significant importance of these receptors as potential treatment options for IBS. It is anticipated that the 5-HT4 receptor agonists would increase gastrointestinal propulsion and will be beneficial in the treatment of constipation-predominant IBS. The 5-HT3 receptor antagonists delay gastrointestinal transit and lessen visceral sensation, which could be beneficial in patients with diarrhoea-predominant IBS [86].

11. CASE STUDIES

The below case studies indicate the effectiveness and tolerability of pharmacological intervention in irritable bowel syndrome therapy (Table **5**).

12. DISCUSSION

A large number of children are suffering because of the intestinal and extra-intestinal symptoms of IBS. However, very little is recognized of its pathophysiology and treat-

Table 5. Case study of different drug show efficacy in the treatment of IBS.

Case Study	Result	References
1. In a randomized, double-blind, placebo-controlled crossover trial done in seven pediatric gastroenterology departments, researchers investigated the efficacy of VSL#3(probiotic capsule) in a group of adolescents and teens with IBS.	It was concluded that VSL#3 (probiotic capsule) is both acceptable and more beneficial than a placebo in alleviating symptoms and enhancing the overall quality of life in children with IB. A number of 59 children participated in the trial.	[87]
2. In this double-blind, placebo-controlled interventional-based study showed Rifaximin therapy for small intestinal bacterial overgrowth in children with irritable bowel syndrome.	A total of fifty (50) children with irritable bowel syndrome (IBS) were included in the study in a systematic way. Rifaximin was shown to be efficacious and safe in the treatment of SIBO and the alleviation of IBS symptoms in children.	[88]

ment. Novel studies using modern technology, as well as treatment trials concentrating on several combination therapies, are more likely to be effective in understanding and treating paediatric IBS. There are some limitations that must be taken into account when interpreting this review. The treatment given in this review aims to reduce the IBS symptoms and enhance the quality of life in children. Trials that concentrate on several combinations of pharmacological and non-pharmacological interventions are likely to generate higher benefits. In the future, consideration needs to be given to the development of potential preventative measures for irritable bowel syndrome (IBS) in children.

CONCLUSION

IBS is a frequent FGID in children worldwide. A high percentage of children are affected by the intestinal and extra-intestinal symptoms of IBS, which interfere with their ability to lead a normal life. However, little is known about the exact aetiology of this illness, as well as how to treat it.

The most important factor in successfully managing IBS in children is the amount of time spent discussing and comforting the children and his or her parents. When considering therapy, it is necessary to discuss both the anticipated advantages and any possible harmful effects to the family before initiating the treatment. IBS does not cause significant harm to the digestive system or result in the development of major diseases such as cancer, as some people believe. While there is currently no cure for IBS, there are therapies available, including pharmacological and non-pharmacological options, that help in improving the problems of irritable bowel syndrome.

LIST OF ABBREVIATIONS

EC = Enterochromaffin

GI = Gastrointestinal

IBS = Irritable Bowel Syndrome

PEG = Polyethylene Glycol

PPIs = Proton Pump Inhibitors

CONSENT FOR PUBLICATION

Not applicable.

STANDARDS OF REPORTING

PRISMA guidelines and methodology were followed.

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None.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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SUPPLEMENTARY MATERIAL

PRISMA checklist is available as supplementary material on the publisher's website along with the published article.

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