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**Childhood constipation as an emerging public health problem**

Rajindrajith S *et al*. Public health impact of childhood constipation

**Shaman Rajindrajith, Niranga Manjuri Devanarayana, Bonaventure Jayasiri Crispus Perera, Marc Alexander Benninga**

**Shaman Rajindrajith,** Department of Paediatrics, Faculty of Medicine, University of Kelaniya, Thalagolla Road, Ragama 11010, Sri Lanka

**Niranga Manjuri Devanarayana,** Department of Physiology, Faculty of Medicine, University of Kelaniya, Thalagolla Road, Ragama 11010, Sri Lanka

**Bonaventure Jayasiri Crispus Perera,** Consultant Paediatrician, Asiri Hospital, Kirula Road, Narahempita 10100, Colombo, Sri Lanka

**Marc Alexander Benninga,** Department of Paediatric Gastroenterology and Nutrition, Emma Children’s Hospital, Academic Medical Centre, Meibergdreef, 1105 AZ Amsterdam, The Netherlands

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**Correspondence to: Shaman Rajindrajith, MD, FRCPCH, PhD, Senior Lecturer in Paediatrics**, Department of Paediatrics, Faculty of Medicine, University of Kelaniya, Thalagolla Road, Ragama 11010, Sri Lanka. shamanr0@lycos.com

**Telephone:** +94-112-957900

**Fax:** +94-112-958339

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**Abstract**

Functional constipation (FC) is a significant health problem in children and contrary to the common belief, has serious ramifications on lives of children and their families. It is defined by Rome criteria which encourage to use multiple clinical features for diagnosis. FC in children has a high prevalence (0.7%-29%) across the world, both in developed and developing countries. The biopsychosocial risk factors like psychological stress, poor dietary habits, obesity and child maltreatment are commonly identified predisposing factors for FC. FC poses a significant healthcare burden on already overstretched health budgets of many countries in terms of out-patient care, in-patient care, expenditure for investigations and prescriptions. The complications are common and range from minor psychological disturbances, to lower health related quality of life. FC in children also has a significant impact on families. Many paediatric clinical trials have poor methodological qualities and drugs proved to be useful in adults, are not shown to be effective in relieving symptoms of children. A significant proportion of inadequately treated children progress to adults with similar symptoms. All these factors show that constipation is a potentially growing public health problem across the world with a significant medical, social and economic impact. This article highlights potential public health impact of FC and possibilities of overcoming this by concentrating on modifiable risk factors rather than expending resources on high cost investigations and therapeutic modalities.

**Key words:** constipation; public health; Risk factors; prevention

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**Core tip:** Constipation is a common worldwide problem in children. Identified risk factors for constipation are equally distributed in both developed and developing countries. Constipation affects quality of life of affected children and their parents. It also poses challenge to existing healthcare systems by incurring significant expenditure. All these factors indicate that childhood constipation is emerging as a significant public health problem. Attention to careful toilet training, encouraging correct dietary habits, and creating an environment safer for children would be able to curtail the public health impact.

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**Introduction**

Functional constipation (FC) is a common worldwide disorder in children. Available data show that its prevalence is higher in the South Asian region and South America, than in any other part of the world[1]. The rapidly changing socio-cultural and political factors such as urbanization, increasing levels of psychological stress, poor parenting skills, civil unrest and child maltreatment, render a large number of children vulnerable to develop constipation (Figure 1)[2]. In that context, childhood constipation is threatening to become a major public health problem across the world.

The possible repercussions are alarming. Although it is not linked to mortality directly, constipation leads to poor health related quality of life (HRQoL), poor school performances and consequently to deficiencies in education[3]. Clinical care of these children is not optimal due to a lack of understanding of the underlying pathophysiological mechanisms and selecting appropriate therapeutic options. Children who are inadequately cared for are at a risk of developing both physical and psychological complications leading to a heavy burden on already overstretched health budgets[3]. All these factors demand that more attention should be focused on this important malady. Despite these facts, public health authorities have not paid sufficient attention to childhood constipation.

In this documentation we review the current data on epidemiology, predisposing factors, healthcare burden, and effects of constipation on the child and the family to support our hypothesis that functional constipation is a major public health problem.

**Childhood constipation and health**

Healthy childhood is not the mere absence of disease but is a vibrant state of health, characterized by physical, mental and social wellbeing, which helps to achieve childhood growth, development and potential according to the genetic makeup and socio-cultural determinants[4]. During the last few decades, child health indices have shown great improvements including the controlling of major communicable diseases through immunization, about 50% reduction in child and neonatal mortality and significant numbers of countries achieving the Millennium Development Goals[5,6]. However, a new set of challenges are emerging. They consist of diseases of multi-factorial aetiologies such as bronchial asthma, obesity, substance abuse and functional gastrointestinal disorders (FGDs).

FGDs in children are a set of clinical entities characterized by, recurrent vomiting, chronic recurrent abdominal pain, and, disturbed defecation without identifiable structural, anatomical or biochemical anomalies.

FC has high prevalence rates across many parts of the world[1,7]. It also weighs in as a significant healthcare burden, more than many other common childhood diseases[8]. It is clearly shown that the HRQoL of children with constipation is low[9]. Precise mechanisms of FC are not well understood and therapeutic options are limited to few drugs and surgical procedures.

**Definitions leading to misunderstandings of childhood FC**

To date there is no global consensus regarding the definition of constipation in children. Some researchers prefer to use single symptoms such as difficulty in passing stools to define FC[10,11]. Whereas several authorities define FC in children as a combination of different symptoms; the Iowa criteria, PACCT criteria, Rome II criteria, Rome III criteria, and recently the Rome IV criteria. Clearly there is no uniformity in these definitions[12-16] (Table 1). Therefore, epidemiological research based on such heterogeneous criteria have provided a blurred epidemiological picture of FC. When comparing the Rome II with the Rome III definitions for FC on the same population, Devanarayana *et al*[17] have shown a change of 3 fold in prevalence of FC, using these different Rome criteria (1.4% with Rome II and 4.4 with Rome III. In a clinic based chart review, Burgers *et al*[18] noted that the Rome III criteria are more sensitive to diagnose FC than Rome II in older children. Contrary to these findings, a study from Thailand found that the Rome II criteria diagnoses FC more effectively than Rome III in young children in whom features of faecal retention are more prominent[19]. Although Rome III criteria state presence of abdominal/rectal faecal mass as one of the diagnostic criteria, it is extremely difficult to use this criterion in epidemiological studies due to many constrains. Some have suggested that elimination of this criterion would not make a major difference in the diagnosis of constipation[18,19]. These factors, however leave researchers in a dilemma to choose the proper criteria to use in epidemiological and clinic based surveys.

The current understanding of the definition among clinicians is also not optimal leading to poor acceptance and utilization. In a recent study, van Tilburg and co-workers have shown that most paediatric gastroenterologists working in 2 centres in the US have a poor understanding and utilization of the Rome criteria[20]. They showed major discrepancies when using a Rome questionnaire based diagnosis and actual clinical diagnosis[20]. Another study reported that approximately 80% of general practitioners had no knowledge of the existence of the Rome criteria to diagnose FGDs[21]. In a survey of paediatric care providers in Saudi Arabia, it was noted that only 60% of clinicians were aware of Rome criteria for the diagnosis of FC[22]. Therefore, it is imperative to redefine childhood FC with a consensus archetype agreed by healthcare professionals living in different parts of the world.

**Overlapping diagnoses and symptoms**

Paediatric researchers have shown that a child with FC may suffer from other FGDs simultaneously. A study from the United States found that only 19% of their patients with a FGD qualified for a single diagnosis when using the Rome III criteria[20]. In another study, 29% and 5% had two and three Rome III diagnoses respectively[23]. With such common overlapping, it is sometimes difficult and quite arbitrary to separate FC from other FGDs.

**Epidemiology**

The worldwide prevalence of childhood FC is rising. Studies from the United States have found that 10% of children and adolescents are suffering from chronic constipation[24]. Studies from Europe showed prevalence rates ranging from0.7% among infants and young children in Italy to 15% among children in Greece[25-28]. Although it is commonly believed that constipation is more prevalent in the Western world, the recent epidemiological data suggest otherwise. Two studies from Brazil revealed disturbingly high prevalence rates of over 20% of constipation in 1 to 10 year olds[11,29]. Prevalence rates of FC in Ecuador, Colombia, and El Salvador are 11.8%, 13% and 10% respectively[30-32]. More worrying data are emerging from newly developed economies of Asia. In Taiwan, around one third of children in elementary schools are suffering from FC[33]. In Hong Kong and South Korea FC has been reported in 12% to 28% of the children, indicating that constipation is a problem in Asia as well[34-36]. Similarly, developing nations in Asia, like Sri Lanka has also noted that 7% to 15% of their school children are suffering from FC[37]. These data underscore the magnitude of the disease burden and the public health threat it poses for the future.

**High prevalence of predisposing factors**

***Stress***

Predisposing factors for constipation are highly prevalent in many parts of the world (Table 2). Psychological stress is a well-established entity that predisposes children to develop FC. In a school based survey in Sri Lanka, it was noted that home and school related psychological stress predispose children to develop FC[38]. Inan *et al*[39]*,* also showed that physical or psychological trauma, siblings with health problems and those with other personal health problems lead to the development of FC. In the current competitive life, circumstances force parents to leave their children with grand-parents, domestic helpers or day care centres for long hours. This may have a negative impact on the development of regular bowel habits and good toilet routines. Furthermore, factors such as spending long hours to complete homework and lack of sleep, have also been suggested as possible risk factors to develop FC in children[34].

Civil unrest, domestic political disturbances and warfare are known to be associated with FGDs. Internal displacement, hunger, poverty, lack of basic needs including toilet facilities are inevitable consequences of a full scale civil war. In this context a study from Sri Lanka, reported a higher prevalence of FC in children living in war affected zones[40]. Klooker *et al*[41]*,* also noted that children exposed to the Second World War have a higher tendency to develop IBS as adults. Although the exact mechanisms are not entirely evident, it is possible that under such circumstances, stress mediated alteration of both the brain-gut axis as well as the hypothalamo-pituitary-adrenal axis contribute to the development of abnormal colonic and rectal function, leading to the development of constipation or IBS[42].

***Parental rearing style***

A Dutch study has s shown that older children with parents having high autonomy scores had considerably lower defecation frequency than children with parents scoring in the reference group. Furthermore, higher frequency of faecal incontinence was noted when parents scored high on the autonomy scale and self-pity scores[43].

***Dietary factors***

It is well known that dietary factors predispose children to develop FC. Dietary fibre is in the forefront of this. It is recommended that diet of children should contain significant amounts of fibre [age (years) + 5 g/d]. Several studies have clearly pointed out the association between diets low in fibre and the development of FC[26,34,35,39]. Inconsistent data exist about the association between cow milk protein allergy and the development of FC[44]. Iacono *et al*[45] found that 68% of children with FC improved with cow’s milk elimination diet. All of them developed features of FC when milk was reintroduced. Similarly, a study by Dahr *et al*[46] also suggest the possibility of cow’s milk protein allergy and refractory constipation. However, novel data contradict these findings. Checking the association between cow’s milk allergy and FC in an unselected population, an Italian study noted the prevalence of atopy was similar in children with FC and controls and elimination diet did not help in children with FC[47]. Another prospective study using Rome III criteria to diagnose FC in infants, to study the association between cow’s milk allergy and FC, could not recruit adequate numbers from a large paediatric population indicating lack of association[48]. Cow’s milk restriction is a common practice in children with FC. However, cow’s milk is a commonly available source of protein and restricting it without proper evidence would deprive children from a balance diet.

***Fast food and physical activity***

Consumption of “fast food”, such as fried ingredients as meat and fish, is becoming increasingly common practice. It has been shown that consumption of ‘junk food’ is associated with constipation[34]. A Chinese study has noted that children and adolescents who consume fast food items have a higher predilection to develop FGDs[49]. Lack of physical activity has been shown to be another risk factor to develop lower defecation frequency and FC[39,50,51].

***Obesity***

Obesity is a global pandemic[52]. . Data from the Asian subcontinent on obesity is alarmingly high[53-55]. Several studies have shown that obesity is associated with FC. It was found that, in a paediatric gastroenterology clinic, obesity was a risk factor to develop FC[56]. Another study from the USA, conducted in a general paediatric clinic, also reported that obese children have a higher predilection to develop FC[57]. Furthermore, Dutch children with morbid obesity have a higher prevalence of constipation[58]. However, a recent community based study from Colombia found no such association[31].

***Abuse***

Child maltreatment is another global social welfare problem. In the developed world, 4%-16% of children are physically abused, 5%-10% are sexually abused and 10% are psychologically deprived or neglected[59]. In the developing world prevalence data are even worse as 83% are psychologically abused and 64% are physically abused[60]. A Sri Lankan study, reported an association between physical, psychological or sexual abuse and constipation[61]. In addition, children with constipation and a history of abuse have more severe bowel symptoms and higher somatization scores[61].

Child maltreatment leads to severe psychological stress to the child. Stress might lead to permanent alteration in gastro-intestinal motility, visceral sensitivity, alteration of autonomic function and hypothalamo-pituitary-adrenal dysfunction[62]. Studies among adults have noted that patients with FGDs and a history of abuse have abnormal functional magnetic resonance imaging including activation of anterior mid-cingulate and posterior cingulate cortex with deactivation of supra-ungual region of the anterior cingulate cortex[63-66]. These changes could be long lasting and lead to long standing suffering, extending into adult life.

***Familial predisposition***

A study from Iran showed that mothers of children with constipation have a higher tendency to have similar problems[67]. Another study found that parents (*p* < 0.0001) and siblings (*p* = 0.009) of children with constipation have a higher predilection to suffer from constipation[68]. However, until now linkage studies, association studies and direct gene sequencing have failed to identify mutations in specific genes associated with FC[69].

**Psychological co-morbidities**

The role of psychological and emotional components in the aetiology of FC remains a matter of debate. Some will argue that emotional problems are the result of FC, others believe that they play an important role in the aetiology. Using the child behavioural checklist a Dutch study has noted that these children indeed have a number of abnormal behavioural traits[70]. Other studies showed that these children do have certain abnormal personality traits and have a higher tendency to have anxiety disorders[71,72]. These factors might affect their social and family life in an adverse manner. It has been shown that anxiety is associated with a 184% increase in total medical costs and 348% of in-patient costs when compared to depression that had a 97% increase in total medical costs[8]. Therefore, it is apparent that co-morbid psychiatric conditions lead to the incurrence of higher medical costs, and enlarging the public health repercussions.

However, in many of these patients these behaviour problems are mild and disappear after adequate treatment[70]. Referral to a mental health service might be only useful in patients with social withdrawal, a low self esteem, and depressive behavior due to their defecation disorder.

**Associated symptoms of constipation**

As a result of infrequent defecation many of these children suffer of faecal incontinence, abdominal pain, anal fissures, enuresis and urinary tract infections. Faecal incontinence (FI) is the result of rectal faecal stasis and is reported in approximately 80% of children with FC[73]. These children have a smell of faeces surrounding them which could lead to rejection by peers and teachers at school. This, may directly or indirectly predispose to child maltreatment. At home parents and other family members believe that children may be soiling intentionally toupset others, to get attention, because they are stressed or because they have emotional problems[74]. This may result in anger and aggression towards children with FI and may end up with disharmony in the family. Moreover children with constipation associated FI have lower self-esteem and poorer quality of life than children with constipation alone[75-77]. The Avon longitudinal study found an array of psychological problems among children with FI including separation and generalized anxiety, social phobias, depression and oppositional defiant disorders [78].

The coexistence of FC and urinary tract disorders, including urinary incontinence, lower urinary tract dysfunction and recurrent urinary tract infection is well established[79]. It has been suggested that rectal distention in the constipated child puts direct pressure on the posterior bladder wall. This pressure is thought to lead to bladder overactivity or mechanical compression of the bladder with trigonal irritation, posterior bladder wall invagination, bladder neck and urethral obstruction or distention[80].

**Poor Health Related Quality of Life**

HRQoL is an important concept that incorporates the patient perspectives of illness experience and functional status related to a medical condition. Published studies are consistent in showing impairment in HRQoL in adults and children with constipation and is not different from organic diseases like peptic ulcer disease, inflammatory bowel disease or liver disease[77,81-83].Noteworthy is that, children with constipation with faecal incontinence have even poorer HRQoL compared to children with constipation alone[77]. Bakker *et al*[84] illustrated that children with constipation have persistent fatigue with significant school absenteeism. It is important to highlight that impairment of school functioning could lead to a vicious cycle of psychological stress due to pressures from school, peers and even parents, aggravating symptoms of constipation. These factors in turn lead to poor education outcomes in children with constipation.

**Effect on families**

Many believe that a mild disease like constipation does not affect the family. However, a study from Milwaukee, interviewing children with constipation and their parents, reported that these parents expressed their feelings as “mad, angry, worried, upset, nervous and embarrassed”[85]. Chinese data on the family impact of chronic constipation, showed that parents of children with FC have poor HRQoL and constipation had a significant negative impact on parental communication, family functioning, family daily activity and relationships. Parents of children with FC also noted to have constant worries about their children[86].

**Healthcare burden and medical costs**

Healthcare burden and medical costs of a disease are good indicators that help to understand its public health perspective. Although it is difficult to precisely calculate all direct and indirect medical costs, a large body of literature from the United States has analysed this problem.

In a birth cohort study on young children, Chitkara *et al*[87] found that the incident medical visits for constipation were the highest for all gastrointestinal diseases. Compared to other common diseases such as childhood asthma and migraine, children with constipation demand and need more medical attention even as much as 7 times higher than asthma and 3 times higher than migraine[88]. Studying subjects of a birth cohort (5-21 years) in Minnesota United States, it was found that more children and young adults with constipation visited the emergency department, outpatient clinics and needed in-ward care compared to controls. Although the estimated inpatient cost is similar, the outpatient cost for children with constipation is higher than controls[8].

In a cross sectional study using an Expenditure Panel Survey Database, it was noted that children with constipation used more health services than children without constipation. It has been estimated that the federal government spent an additional 3.9 billion/year for caring for children with constipation[88]. In another study from the US Park *et al*[89] studied the KID database (kids inpatient sample database) which includes discharge patterns from 44 states of the country. Authors noted that the number of children hospitalized with constipation has risen by 112% from 1997 to 2009. In addition, the cost of inpatients care for constipation has increased by 221.5% during the same period without significant increase of the length of stay in the hospital. Corban *et al*[90] reported a study in which they have analysed the national emergence department sample records for emergency room visits for faecal impaction and found a sizeable percentage (10.5%) of child of all age ranges present to emergency units across the United States with faecal impaction.

Similarly, in Australia (Victoria region), the mean annual in-patient cost was 5.5 million dollars for children with constipation as the primary diagnosis[91]. Even though, further data from other countries are needed to have a clearer idea, these data indicate that constipation is a costly medical condition and a large chunk of public funds is being spent on children with constipation.

**Screening for organic diseases**

The traditional bio-medical paradigm always demands a linear cause for a particular disease. Therefore, it is common to investigate children with constipation for “organic diseases”. Disorders which are commonly thought to be associated with chronic constipation are hypothyroidism, coeliac disease, hypercalcaemia, lead poisoning, and Hirschsprung disease. Although it has been shown that constipation is rather an uncommon clinical presentation of hypothyroidism and the majority of patients with hypothyroidism have normal bowel habits, it is still a common practice for many clinicians to investigate children for thyroid dysfunction[92].

In a retrospective cohort study, Chogle and Saps[93] studied 7472 children diagnosed to have constipation. The numbers screened for coeliac disease, hypothyroidism, hypercalcaemia and lead poisoning were 1731, 2332, 4651 and 3, respectively. The total costs for these tests were 4.7 million United States dollars with a mean charge for investigating one patient being $1014. Only 2 (0.08%) children, diagnosed to have hypothyroidism, had constipation as the presenting feature. Twelve out of 14 children with hypothyroidism had growth faltering, abdominal pain, vomiting or a combination of these features, in addition to constipation[93]. These facts clearly indicate that the majority of children with organic diseases show other abnormalities during clinical evaluation. Although this study highlighted the money spent on investigating children with FC, it also shows the low prevalence of diseases that most clinicians consider as an organic cause responsible for constipation.

The North American and European Societies of Pediatric Gastroenterology, Hepatology and Nutrition guideline and the guideline from the National Institute for Clinical Excellence (NICE) in the United Kingdom recommends that routine laboratory testing for hypothyroidism, coeliac disease, and hypercalcaemia and the routine use of an abdominal radiograph in children with constipation in the absence of alarm symptoms is not indicated[94,95].Furthermore these guidelines clearly illustrated that other invasive tests such as rectal biopsy, ano-rectal manometry, and barium studies serve no purpose in the day-to-day clinical management[94]. These tests are costly and incur a substantial drain on the healthcare systems.

**Poor research outcomes**

The patho-physiological mechanisms underlying constipation are not straightforward and are often entangled in bio-psycho-social factors. In younger children stool withholding due to pain and fear contributes to the development of constipation in at least 50% of the cases. In older children, at least in a subset (25%), slow transit constipation is detected[96]. It had been shown that children with slow transit constipation have low levels of vasoactive intestinal peptide and substance P in their colonic musculature[97]. Histological evaluation of colonic specimen of children with slow transit constipation has shown abnormalities suggestive of generalized abnormalities in interstitial cells of Cajal, enteric nerves or musculature[98,99]. In addition, poor toilet training, psychological difficulties, child maltreatment and dietary factors may interact with each other in a complex manner, contributing to the development of constipation. This multi-factorial nature leads to our inability to develop a clear biological lead or a marker for constipation.

Methodological aspects of clinical trials of constipation are not all that satisfactory. In a systematic review, Pijpers *et al*[100] have studied the methodological qualities of currently available clinical trials, up to 2008, using the Delphi Guideline. They found methodological shortcomings in the majority of studies including no concealment of treatment allocation (61%), lack of homogeneity in control and treatment arms (71%), no blinding of assessors (57%), and no intention-to-treat analysis (75%). The overall methodological quality score was 4.8 out of a total possible maximum of 10 and only 36% studies had a score of over 6 points[100]. The studies included also had significant variability and poor definition for treatment success. Most of the commonly used drugs such as lactulose, senna and bisacodyl have not been tested in proper randomised controlled trials in children. Even the clinical studies of newly found popular drugs such as polyethylene glycol cannot be pooled to generate quality evidence as researchers have used a number of different preparations in children (PEG, PEG with electrolytes, *etc.*).

This poses a major challenge in clinical practice as clinicians struggle to choose drugs. Poor pharmacological interventions lead to inadequate therapeutic response and considerable amounts of suffering in children with severe constipation.

In addition, some of the clinical trials conducted in children with constipation using novel therapeutic agents which work well with adults, have shown disappointing results. A recent study on prucalopride in children with constipation showed no efficacy compared to a placebo[101]. It is possible that different pathophysiological mechanisms are operating in children with predominant stool withholding, leading to poor efficacy of these drugs in children. No published clinical trials are available to assess efficacy of other drugs such as lubiprostone and linaclotide which are shown to be effective in adults. The public health challenge that both clinicians and researchers are facing is how to encourage further investment from both governments and private partners, on children with constipation, as the results are disappointing from their point of view.

Finally, almost all clinical trials and consensus guidelines on the management of constipation are from the Western hemisphere. This despite the fact that the dietary patterns, the living and environmental conditions are completely different in many parts of the world and therefore cannot be compared with the Western life style. In addition, there could be genetic variations in metabolism of drugs that may eventually lead to poor response. Paediatricians and paediatric gastroenterologists from especially Asia and Africa should be challenged to perform more research in this area and contribute in the understanding of FC in children.

**Progression to adulthood**

The general belief that FC is self-limiting is not supported by several long-term follow-up studies. A systematic review found that only approxi­mately 50% of all children with constipation followed for 6–12 mo after therapy were doing well without laxa­tives[102]. Bongers *et al*[103] followed 401 Dutch children with constipation for more than 10 years and showed that good clinical outcomes, despite intensive treatment strate­gies, were achieved only by 80% of patients at 16 years of age. In this study, poor long-term clinical outcomes were associated with older age at onset, longer delay between symptom onset and first visit to subspecialty clinic, and lower defecation frequency at study entry. Another study reported that a history of childhood constipation was a predictor of IBS in adulthood[104].

**The way forward with a novel approach**

Families should be provided with guidance and recommendations about prevention, early recognition, and early intervention of constipation in children (Figure 2) Poor toilet training is a well-known reason to predispose children to develop constipation[105-108]. Presence of hard stools and painful defecation during toilet training could lead to withholding and delay the completion of toilet training[107]. Raising public awareness on proper toilet training is the first step in preventing constipation. . Furthermore training parents and children to have a healthy balance diet with normal recommended amount of fibre and avoiding consumption of ‘junk food’ is another important step[34,94,95]. Lifestyles with proper dietary habits and regular physical activity would help in the long run in reducing the risk of constipation[51,95]. It is imperative to understand that, in the current competitive, society, parents are forced to work more and spend less time with their children[34]. Parental attention, attachment, correct parenting styles and helping children to develop desirable core lifestyles setting an example of healthy way of living, are equally valuable[43]. In addition, relieving psychological stress created by the competitive nature of current schools by providing more educational opportunities for children, caring for them and providing more safe pathways in the society would be another useful step in prevention and minimizing related suffering attributable to childhood constipation.

**Conclusion**

In the last decade a significant progress had been made in understanding the pathophysiology and treatment of childhood constipation. However, much needs to be done during the next decade to minimize the public health impact of FC. Prevalence studies performed in rural and nonrural areas specially in Africa are lacking and need to be performed to understand the magnitude of the problem and identify risk factors in these parts of the world. Focusing away from the traditional hospital based interventions, preventive studies using toilet training, training healthcare professionals to recognize features of constipation early and coaching correct dietary habits and life style at community level need to be performed to identify much simpler and pragmatic approaches to prevent childhood constipation. Alternative to the popular approach of conducting sophisticated investigations and clinical trials in tertiary care centres, clinicians and researchers should be challenged to perform clinical trials in primary and secondary care settings where most of these children are being cared for. While concentrating on developing novel drugs, older and cheaper drugs such as bisacodyl, senna and lactulose should be evaluated in clinical trials as these drugs could minimize the healthcare expenditure. Clinical trials of new drugs should also be conducted in traditionally non-western countries, where prevalence of constipation is growing and possibly have variation in their response. Clinicians, researchers and public health authorities need to join hands in this campaign in view to prevent the growing global public health problem of childhood functional constipation.

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**Figure 1 Potential factors that contribute constipation to emerge as a public health issue.**

**Figure 2 Preventive strategies of childhood constipation.**

**Table 1 Rome II, Rome III and Rome IV definitions of functional constipation in children**

|  |
| --- |
| **Rome II criteria (infants and young children)** |
| At least 2 wk of:Scybalous, pebble-like, hard stools for a majority of stools orFirm stools two or less times/week; andThere is no evidence of structural, endocrine, or metabolic disease. |
| **Rome III criteria (Children and adolescents)** |
| Diagnostic criteria1 must include two or moreof the following in a child with a developmental age of at least 4 years with insufficient criteria for diagnosis of IBS:Two or fewer defecations in the toilet per weekAt least one episode of faecal incontinence per weekHistory of retentive posturing or excessive volitional stool retentionHistory of painful or hard bowel movementsPresence of a large faecal mass in the rectumHistory of large diameter stools which may obstruct the toilet |
| **Rome IV criteria (Children and adolescents)** |
| Must include 2 or more of the following occurring at least once per week for a minimum of 1 mo with insufficient criteria for a diagnosis of irritable bowel syndromeTwo or fewer defecations in the toilet per week in a child of a development age of at least 4 yrAt least 1 episode of faecal incontinence per weekHistory of retentive posturing or excessive volitional stool retentionHistory of painful or hard bowel movementsPresence of a large fecal mass in the rectumHistory of large diameter stools which may obstruct the toiletAfter appropriate evaluation, the symptoms cannot be fully explained by another medical condition. |

1Criteria fulfilled at least once per week for at least 2 mo prior to diagnosis.

**Table 2 Recognized risk factors of childhood constipation**

|  |
| --- |
| **Psychological stress**Home relatedSchool related |
| Siblings with health problems |
| Not living with either parentsLow social class |
| Poor child rearing stylesDietary problems |
| Diet low in fibres |
| Cow’s milk protein Not having regular meals with parentsConsumption of junk food |
| Childhood obesity |
| Child maltreatmentPhysical abuseSexual abuseEmotional abuse |
| Civil unrest (exposure to war) |