

EVALUATION OF WHEAT BRAN INTAKE IN TREATMENT OF INFANT AND CHILDHOOD CONSTIPATION

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ABSTRACT

Objectives: The aim of the study was to evaluate the intake of bran and the bowel habit (BH) of constipated children advised a diet containing wheat bran.

Patients and Methods: Bran intake and BH of 51 children with functional constipation defined by the “Boston criteria” were obtained at visit 1 (V1) and at 3 follow-up visits (V2–V4) with median interval of two weeks conducted at Bab-Elshaeria university hospital through the period from May 2017 to December 2017. At each follow-up visit, the BH in the previous 2 weeks was recalled, with questions about frequency, consistency of stool, possible complications (recurrent abdominal pain, enuresis, nonstructural urinary tract infections, and/or fecal soiling) and possible effects of Bran overconsumption (flatulence, abdominal pain/distension, and diarrhea) was obtained.

Results: Median age (range) was 4.75 years (1.12–8.33years); Bran intake and the BH rate significantly increased at V2 and remained higher than at V1 through V2 to V4. 44children accepted bran through visits, at which median bran intake was 20 g/day. Children had significantly higher bran intake at V2 to V4 at which they had improved BH than at those at which they presented unimproved BH. Bran acceptance was associated with improved BH. At the last visit 44 children presented improved BH (86%).

Conclusions: High bran intake is feasible in constipated children and contributes to amelioration of constipation.

Key Words: bowel habit, children, constipation, wheat bran.

INTRODUCTION

Constipation is a common problem in children worldwide. Identified risk factors for constipation are

equally distributed in both developed and developing countries. Constipation affects the quality of life of affected children and

their parents (**Mugie SM et al., 2011**).

A majority of children do not have an identified organic etiology and are diagnosed as having functional constipation (FC). FC is characterized by infrequent bowel movements, hard and/or large stools, painful defecation, and fecal incontinence, and is often accompanied by abdominal pain (**Dehghani SM et al., 2015**).

Increase in dietary fiber (DF) intake is widely recommended as a first treatment step for childhood constipation (**Chao HC et al., 2008**).

However, sustained compliance with treatment is considered difficult and there are conflicting data about its role in maintenance therapy (**Baker SS et al., 2006**).

In theory, insoluble fiber is better for laxation than soluble fiber. and wheat bran, a predominantly insoluble fiber with high pentose content (**Cummings JH 2001 & Maffei HVL 2004**).

In fact, wheat bran has been shown to ameliorate the bowel habit (BH) of constipated adults (**Badiali D et al., 1995**) and has

been included in the American Gastroenterological Association recommendations. This recommendation, however, has also been disputed (**Brandt LJ et al., 2005**).

Rarely have diets including wheat bran been advocated for children (**Leung AKC et al., 1996**). Therefore, rare information about its acceptance and effect in children with constipation is available (**Chao HC et al., 2008**).

Taking into account the widespread high prevalence of childhood constipation, affordable, feasible, and effective dietary recommendations are necessary. (**Morais MB & Maffei HVL 2000**). Wheat bran is cheap, can be mixed into usual foods (**van den Berg MM et al., 2006**).

AIM OF THE WORK

The aim of the study was to evaluate the intake of bran and the bowel habit (BH) of constipated children advised a diet containing wheat bran.

PATIENTS AND METHODS

Fifty one children with chronic functional constipation were followed prospectively up to 2 months. The study was conducted

in Bab El-sha'aria hospital outpatient clinic. Follow-up visits occurred at intervals relative to V1: 12 to 25 days (V2), >30 to 40 days (V3), >45 to 60 days (V4).

➤ **Inclusion criteria:**

- Age more than 1 year.
- Cases with functional constipation for more than 2 months according to “Boston criteria” for diagnosis.

➤ **Exclusion criteria:**

- Patients with secondary constipation such as drug related constipation, cow milk allergy and other organic causes.
- Those with family history of celiac disease.
- Those meeting the criteria for Irritable bowel syndrome.

Method: All cases were subjected to the following:

➤ **History taking:**

The medical history focused on the child's bowel habits, Details about the onset of symptoms, duration of symptoms and dietetic history.

➤ **Bowel Habit Evaluation**

Constipation was defined according to the slightly modified

“Boston criteria” as the presence of 2 or more of the items for at least 2 months: passage of hard scybalous/pebble-like/cylindrical deeply cracked stools; straining or painful defecation; large stools that may clog the toilet; less than 3 stools per week (Hyams J et al., 2002) ; presentation as a possible complication (recurrent abdominal pain, enuresis, nonstructural urinary tract infections, and/or fecal soiling, the latter defined as the involuntary passage of stool due to rectal impaction).

Structural, metabolic, or endocrine causes of constipation were excluded when necessary.

➤ **Clinical Examination:**

Besides assessing weight and height, the physical examination primarily consists of abdominal examination, inspection of the perianal region, examination of the lumbosacral region, and neurological examination.

Abdominal examination mainly focuses on detection of a palpable fecal mass. During perianal inspection, we check for anatomic abnormalities, perianal feces, fissures, scars, and erythema.

➤ **Treatment**

Wheat bran in the form of powder recommended in approximate amounts: 10 to 20 g/day for infants aged 1 to 2 years, and 20 g/day for older children. Bran was added to a humid constituent of the food, or it was used in the proportion of 1 bran: 2 refined flour to prepare bread, desserts, cakes and pancakes (Maffei HV & Vicentini AP., 2011).

➤ **Follow up**

At each follow-up visit, the BH in the previous days was recalled, with questions about the items listed in definition and possible effects of bran overconsumption (flatulence, abdominal pain/distension, and diarrhea) were obtained. The BH was considered improved when the proportion of scybalous/pebble-like stools and/or the frequency of straining/pain at defecation at least halved and stool frequency increased from <3 to >3/week, or from 3 to 5/week to >5 to 7/week

Statistical analysis

1. History on 1st visit:

Comparison between numerical data was performed using unpaired t test while comparison between before and after bran intake within the same group was performed using paired t test. Comparison between categorical data was performed using Chi square test. SPSS computer program (version 20) was used for data analysis.

Data were statistically described in terms of mean ± standard deviation (± SD) or number (%). Difference in variables was expressed by P value (≤ 0.05 is significant and > 0.05 is non-significant).

RESULTS

Demographic data:

This study included 51 patients, their mean age ± SD equals 57 ± 43 (months). 31 males (60.8%) and 20 females (39.2%).onset of constipation being during first year of life in 29 (56.8%) and duration of constipation was median 2.44 ys

Table (1): History on 1st visit.

		N	percent
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Bran acceptance	no	45	88.2%
	yes	6	11.8%
Frequency of bowel habits /week	<3	30	58.8%
	3-5	21	41.1%
Consistency of stool	separate hard lumps	39	76.4%
	lumpy sausage like	12	23.5%
Painful defecation	no	2	3.9%
	yes	49	96.1%
Retentive fecal soiling	no	15	29.4%
	yes	36	70.6%
recurrent abdominal pain	no	34	66.7%
	yes	17	33.3%
enuresis	Age < 5 ys.	33	64.7%
	no	14	27.5%
	yes	4	7.8%
Symptoms of UTI	no	46	90.2%
	yes	5	9.8%
		N	percent
Appetite (1st Visit)	good	41	80.4%
	poor	10	19.6%
weight gain (1st Visit)	adequate	42	82.4%
	inadequate	9	17.6%
Family history of constipation	negative	44	86.3%
	positive	7	13.7%
Other complaints	CHD*	3	5.8%
	Thalassemia	2	3.9%
	BA**	2	3.9%
	no	48	86.2%

*CHD: congenital heart disease

**BA: bronchial asthma

2. Examination on the 1st visit:

Table (2): Examination on the 1st visit.

		N	percent
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Pallor, jaundice, cyanosis, edema or dehydration (1st Visit)	no	43	84.3%
	pallor	6	11.8%
	pallor and jaundice	2	3.9%
Organomegally (1st Visit)	HSM	2	3.9%
	no	49	96.1%
Palpable fecal masses (1st Visit)	no	43	84.3%
	yes	8	15.7%
Anal fissure (1st Visit)	no	41	80.4%
	yes	10	19.6%
Chest problems (1st Visit)	BA*	2	3.9%
	no	49	96.1%
Heart problems (1st Visit)	CHD**	3	5.9%
	no	48	94.1%

*BA: bronchial asthma.

**CHD: congenital heart disease.

Effect of wheat bran on bowel habit

1. Bran acceptance:

Table (3): Bran acceptance.

Bran acceptance	no	yes	P-value
(1st Visit)	45 88.2%	6 11.8%	0.01 (Significant)
(2nd Visit)	10 19.6%	41 80.4%	
(3rd Visit)	7 13.7%	44 86.3%	
(4th Visit)	8 15.7%	43 84.3%	



Figure (1): Bran acceptance

So, as shown in **Figure 2** there was marked improvement of bran acceptance throughout follow up visits.

2. Consistency of stool:

Table 4: Consistency of stool

Consistency of stool	Hard	Lumpy	Soft	p-value
(1st Visit)	39	12	0	0.03 (Significant)
(2nd Visit)	17	20	14	
(3rd Visit)	12	14	25	
(4th Visit)	7	11	33	

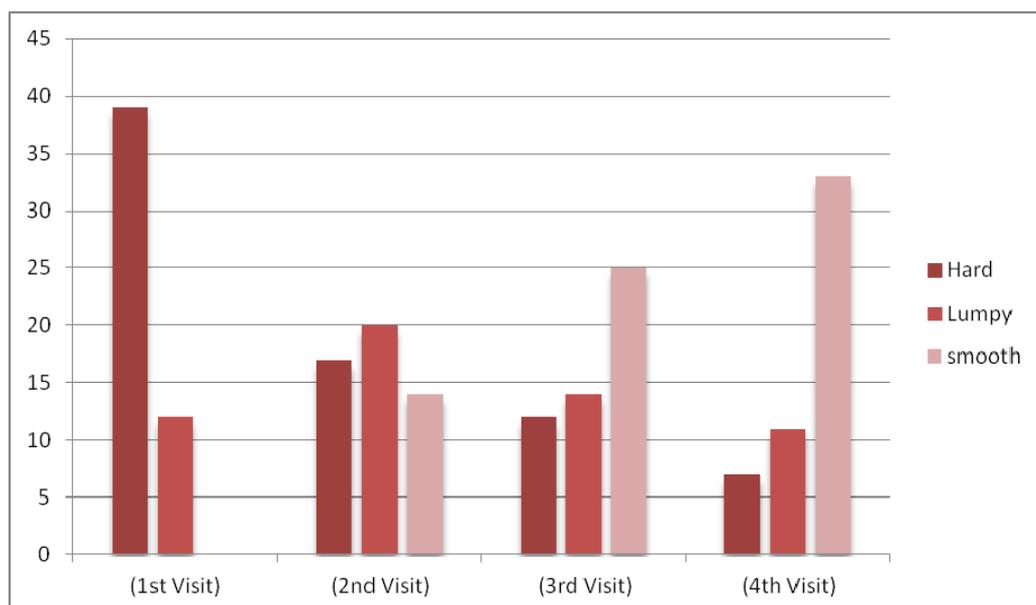


Figure (2): Consistency of stool

There was significant improvement of stool consistency from the 1st visit to the 2nd visit and from the 2nd to the 3rd visit and continued improvement to the 4th visit.

3. Frequency of bowel habits /week (presented as categorical variable)

Table (5): Frequency of bowel habits /week.

Frequency of bowel habits /week	1 - 3	4 - 7	> 7	p-value
(1 st Visit)	39	12	0	0.05 (Significant)
2 nd	13	34	4	
3 rd	12	33	5	
4 th	7	33	11	

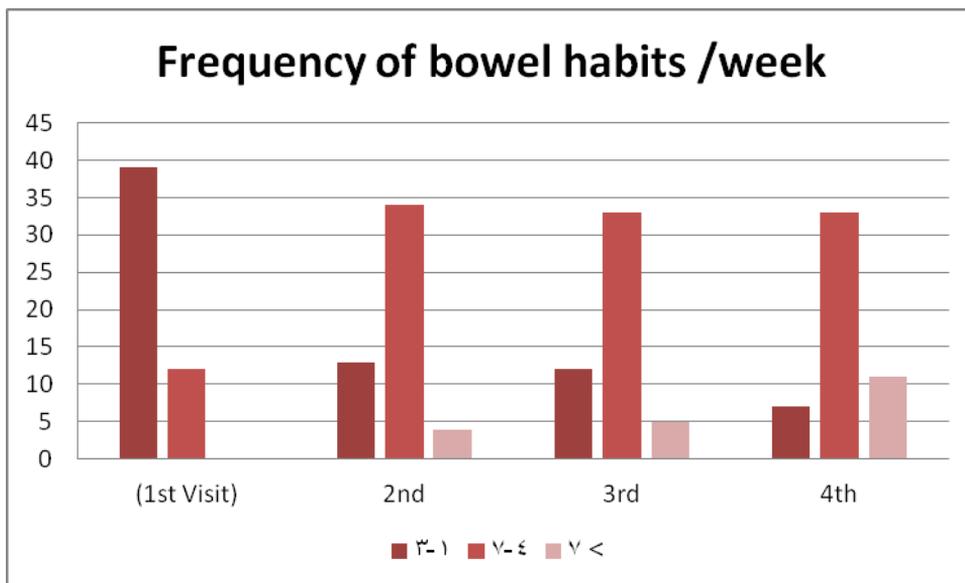


Figure (3): Frequency of bowel habits /week

There was significant improvement of Frequency of bowel habits /week from the 1st visit to the 2nd visit and continued improvement to the 4th visit.

4. Painful defecation:

Table (6): Painful defecation.

Painful defecation	No	Yes	p-value
(1st Visit)	2	49	0.049 (Significant)
(2nd Visit)	25	26	
(3rd Visit)	35	16	
(4th Visit)	44	7	

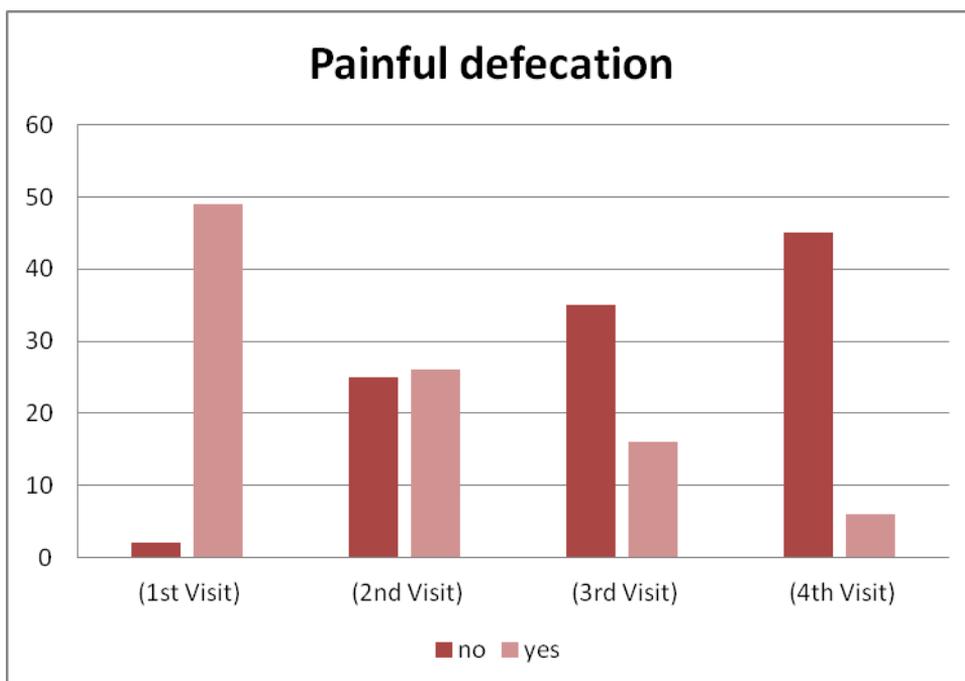


Figure (4): Painful defecation

So, as shown there was Significant improvement of pain during defecation throughout follow up visits.

5. Recurrent abdominal pain:

Table (7): Recurrent abdominal pain.

Recurrent abdominal pain		Count	%	p-value
(1st Visit)	no	34	66.7%	0.17 (Non-Significant)
	yes	17	33.3%	
(2nd Visit)	no	38	74.5%	
	yes	13	25.5%	
(3rd Visit)	no	42	82.4%	
	yes	9	17.6%	
(4th Visit)	no	46	90.2%	
	yes	5	9.8%	

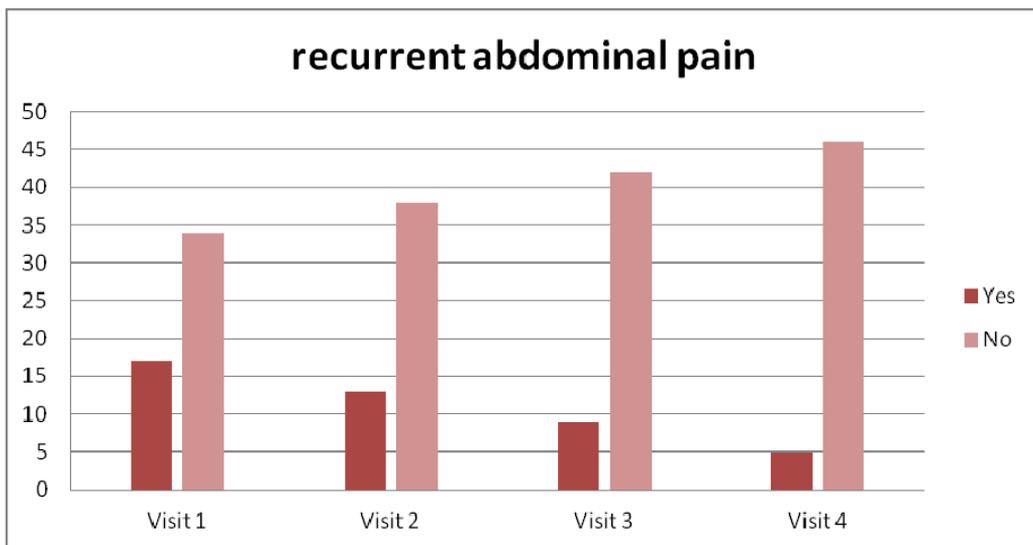


Figure 5: Recurrent abdominal pain

So, as shown there was no Significant improvement of Recurrent abdominal pain throughout follow up visits.

6. Retentive fecal soiling

Table (8): Retentive fecal soiling

Retentive fecal soiling	no		Yes		p-value
	Count	Percentage	Count	Percentage	
(1st Visit)	15	29.4%	36	70.6%	0.038 (Significant)
(2nd Visit)	28	54.9%	23	45.1%	
(3rd Visit)	35	68.6%	16	31.4%	
(4th Visit)	42	84.3%	9	15.7%	

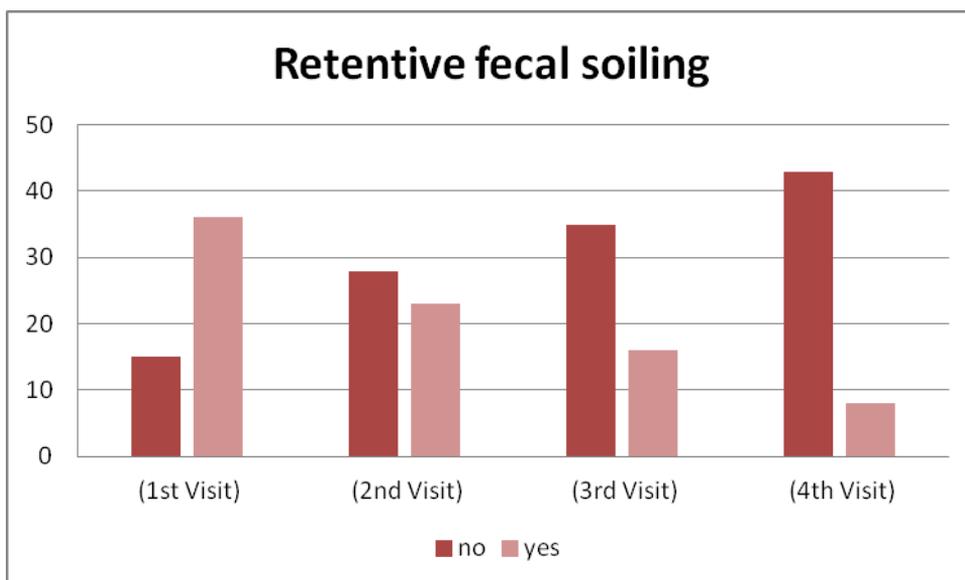


Figure (6): Retentive fecal soiling

7. Symptoms of UTI:

Table (9): Symptoms of UTI

Symptoms of UTI	no		yes		p-value
(1st Visit)	46	90.2%	5	9.8%	0.67 (Non-Significant)
(2nd Visit)	45	88.2%	6	11.8%	
(3rd Visit)	47	92.2%	4	7.8%	
(4th Visit)	47	92.2%	4	7.8%	

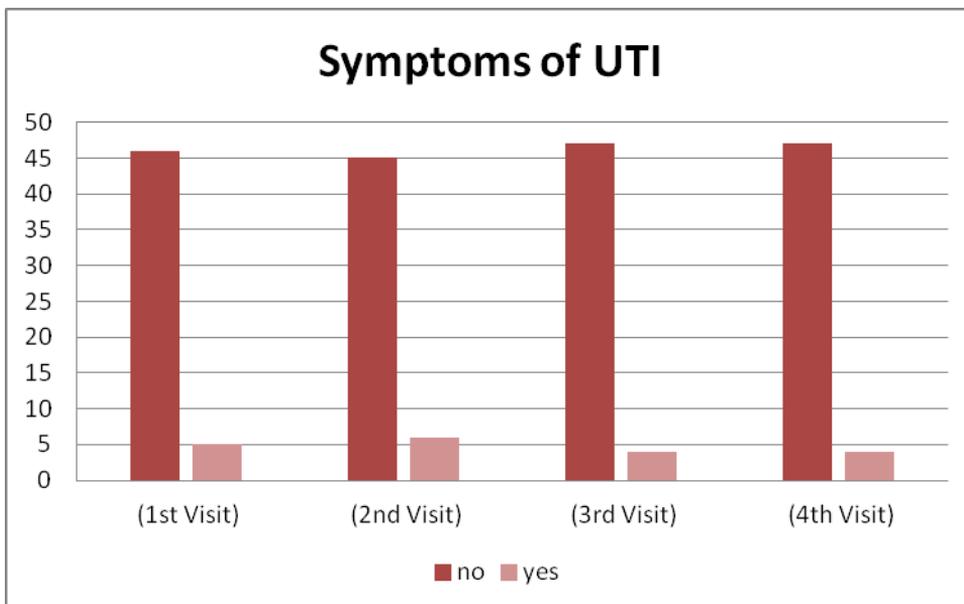


Figure (7): Symptoms of UTI

8. Possible complications of bran overconsumption:

Table 10: Possible complications of bran overconsumption

Complication	(1 st Visit)	(2 nd Visit)	(3 rd Visit)	(4 th Visit)
Diarrhea	no	no	no	no
Abdominal distention	no	no	no	no
Flatulence	no	no	no	no

DISCUSSION

Increase in dietary fiber (DF) intake is widely recommended as a first treatment step for childhood constipation (Olness K and Tobin J. 1982-Chao HC et al. 2008). In theory, insoluble fiber is better for

laxation than soluble fiber (Cummings JH. 2001, Maffei HVL. 2004), and wheat bran, a predominantly insoluble fiber with a high pentose content, seems better than cocoa husk, whose main component is cellulose (Cummings JH. 2001).

The median age of the children admitted to our study was 57 months. The onset being during the first year of life in 29 of the 51 patients enrolled in the study (56.8%). **Speridiaño PGL et al.** found that the initial age for the onset of constipation corresponded to the first year of life in 21 of the 25 patients enrolled in the study (84%). (**Speridiaño PGL et al. 2003**). **Maffei and Vicentini** found that onset being during the first year of life in (52%) (**Maffei and Vicentini 2012**).

The clinical features of our patients with chronic functional constipation were similar to those described in the literature (**Benninga MA et al. 1996 and Loening-Baucke V 1996**). and showed male predominance (60.8%) with exception that the median duration of constipation was 29 months in our study. Closely similar to **Maffei and Vicentini** Who found that duration of constipation for the 25 children with overt symptoms was median 24 months (**Maffei and Vicentini 2012**)

In this study the children studied had severe constipation, as indicated by the presence of many complications, a long clinical course, and previous treatment failures, total cases were 51 cases from which 44 cases (86.2%)

accepted bran throughout visits, bran acceptance was continuous for 40 cases and intermittent for 4 cases. 7 cases (13.7%) never accepted bran. These results are in accordance with previous studies (**Olness K and Tobin J. 1982-McClung HJ et al., 1993-Chao HC et al., 2008**) and contradict the usual impression of bad compliance **Mooren GC et al. and Speridiaño PGL et al.** showed that sustained compliance with treatment is considered difficult (**Mooren GC et al. 1996 and Speridiaño PGL et al. 2003**) and **Baker SS et al. 2006** also found that there are conflicting data about the role of bran in maintenance therapy of functional constipation (**Baker SS et al., 2006**).

In this study, frequency of bowel habits per week and stool consistency in children who accepted bran were significantly improved from V1 throughout follow up visits and no improvement in children who didn't accept bran this was agreed with **Badiali D et al.**, who reported that Bran treatment was more effective than placebo in improving bowel frequency and oro-anal transit (**Badiali D et al., 1995**). also **Tse PWT et al. 2000** found that Relief of constipation and a significant reduction in the usage of laxatives was demons-

trated by increasing fibre intake (*Tse PWT et al., 2000*). *Yang J et al.*, found that Dietary fiber intake can obviously increase stool frequency in patients with constipation but it does not obviously improve stool consistency (*Yang J et al., 2012*).

However *Mooren GC et al.*, reported that changes in fibre intake had no effect on colonic transit time or cure (*Mooren GC et al., 1996*).

In our study 49 child (96%) presented with painful defecation at V1, this symptom was significantly improved as regard only 7 cases (13.7%) presented with painful defecation at the last visit. This finding agrees with the study done by *McClung HJ et al., 1993* who found that, 79% of cases that received high dietary fiber containing bran showed significant improvement of painful defecation (*McClung HJ et al., 1993*).

Our study showed that the BH was significantly better already at V2, improvement being consistent for most children. Thus, at follow-up visits at which children presented with improvement and bran intake were each significantly higher than at visits of children with un-improved BH .

One must also consider that Bran intake recommendations for children are based on an estimate for healthy children, and constipated children may require more DF, at least for some time after starting treatment. However, *Tabbers et al.*, reported that evidence does not support the use of fiber supplements in the treatment of functional constipation (*Tabbers et al., 2014*).

Symptoms that could be attributed to adverse effects of excessive bran intake can be mistaken for those of constipation complications, and therefore interpretation can be difficult when they occur simultaneously with un-improved BH. Because the cited symptoms were not present when there was improvement, which was associated with high bran intake, one can infer that adverse effects were rarely present or even absent.

Overall results at the last visit can be considered good, because 86.2% of the children accepted bran, and 82.3% presented BH improvement.

The significantly higher bran intake at visits with BH improvement than at those with BH un-improvement indicates that bran inclined the balance toward insoluble fiber, which is important for laxation.

CONCLUSION

A DF-rich diet containing bran is a feasible and cheap tool for treating constipated children in everyday clinical attendance. However, frequent reinforcements to ensure adherence to the diet are necessary. Bran acceptance significantly contributed to high DF intake and each significantly contributed to amelioration of constipation.

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تقييم استخدام نخالة القمح في علاج الإمساك عند الأطفال

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الإمساك من المشاكل الشائعة بين الأطفال في كل المجتمعات وعلى كل المستويات، ومن الصعوبة تحديد وصف دقيق لمعنى كلمة الإمساك، لكن التغيير الذى يحدث في عدد مرات التبرز أو في كمية البراز، وكذلك حدوث ألم مع الإخراج، الإمساك أيضا يمكن أن يشير إلى صلابة البراز كل هذه الحالات يطلق عليها إمساك ويعتبر الطفل الذى يُخرج أقل من ثلاث مرات في الأسبوع مريضاً بالإمساك المزمن. وفى بعض حالات الإمساك المزمن يحدث التبرز اللاإرادي، وهو من مضاعفات الإمساك عند الأطفال. وأسباب الإمساك كثيرة جداً وقد تكون عضوية أو وظيفية؛ حيث لا يوجد سبب عضوى واضح.

نخالة القمح هي عبارة عن القشرة الخارجية للقمح، وتتميز بوجود العديد من الفوائد التي يمكن الحصول عليها عند استخدامها، بالإضافة إلى قيمتها الصحية الكبيرة، ودورها الفعال في علاج الكثير من الأمراض التي قد يصاب بها الإنسان، وذلك لاحتوائها على نسب عالية من الألياف الطبيعية التي لا يمكن أن يتم هضمها بواسطة إنزيمات الهضم داخل جسم الإنسان، وهي تمتلك قدرة عالية على امتصاص كمية كبيرة من الماء الموجود في جسم الإنسان، وعلى الرغم من هذه الفوائد إلا أنها لا تُعطى أية أهمية من قبل الغالبية العظمى من الأشخاص

تهدف هذه الدراسة إلى تقييم استخدام نخالة القمح في علاج الإمساك الوظيفي عند الأطفال

تم عمل هذه الدراسة علي ٥١ طفل من المترددين علي العيادات الخارجية بمستشفى باب الشعرية الجامعي التابعة لجامعة الأزهر في الفترة من مايو ٢٠١٧ إلى ديسمبر ٢٠١٧ وتم أخذ تاريخ مرضي وعمل فحص عام وموضعي وفحص شرجي للطفل ونصح الأهل بإعطاء نخالة القمح بكميات تتراوح من ١٠ إلى ٢٠ جم يوميا ومتابعة الطفل دوريا خلال الزيارات المتكررة لمعرفة تأثير استخدام نخالة القمح في علاج الإمساك عند هؤلاء الأطفال.

في هذه الدراسة كان متوسط عمر الأطفال ٥,٤ سنوات ٣١ ذكر و ٢٠ أنثى ووجد أن معدلات قبول الأطفال لنخالة القمح وكذلك معدلات التبرز قد زادت من الزيارة الأولى إلى الزيارة الأخيرة حيث وجد أن ٤٤ طفل قد تقبلوا نخالة القمح خلال الزيارات المختلفة بمعدل حوالي ٢٠ جم يوميا. ووجد أن الأطفال الذين تقبلوا نخالة القمح خلال الزيارات المختلفة قد تحسنت لديهم أعراض الإمساك في حين عدم تحسن الأطفال الذين لم يتقبلوا نخالة القمح. في الزيارة الأخيرة وجد أن ٤٤ طفل قد تحسنت لديهم أعراض الإمساك.

استنتجت هذه الدراسة قابلية استخدام نخالة القمح في علاج الإمساك الوظيفي عند الأطفال حيث أنها تؤدي الي تحسين أعراض الإمساك الوظيفي كما انها لا تؤدي الي أية أعراض جانبية غير مرغوبة.