



Bowel Management Program for Children with True Fecal Incontinence and Its Efficacy on Their Quality of Life

Wael Mohamed El-Shahat, Amr Ibrahim El-Yasargy, Hesham Qasem, Omar El-ekyaby, Amira Attia, Mohamed Ismail, Amr Mohamed El-Shaer, Khaled Elsayed Sheriff

Pediatric surgery Department, Faculty of Medicine, Zagazig University, Egypt.

Corresponding author: Amr Mohamed El-Shaer, Email: amr.elshaer40@gmail.com

ABSTRACT

Fecal incontinence (FI) resembles a disastrous challenge for those who suffer from it. It frequently makes it more difficult for children to fit in with society, resulting in serious psychological consequences. This study aimed to evaluate the effectiveness of bowel management program (BMP) for patients that have true FI. **Subject & Methods:** This prospective case series was conducted in the paediatric surgery department in Zagazig University hospitals, included 26 children with faecal incontinence after anorectal surgery who divided equally according to type of colon by contrast enema into: Group (A) patients with dilated colon “hypomotile colon” which need large volume and concentrated enema; and Group (B) patients with non-dilated colon “hyper motile colon” which need small volume enema, constipating diet and may need loperamide. **Results:** The average ages of the studied groups were (8.1 ± 1.5) and (7.9 ± 1.1) . Regarding sex, male to female ratio was 4:1. Majority of parents were poorly educated in both groups. There was a highly statistically significant association between the parent education and the easy follow-up visits. There was a statistically significant positive correlation (increase aged was accompanied by increased the amount of saline and glycerin) between the children age and the amount of saline and glycerin. There was a highly statistically significant improvement in all quality-of-life score items as provided by children and parents before and after 3 months of BMP among the hypo and hyper motile colon groups ($p\text{-value} < 0.001$). **Conclusion:** The implementation of BMP after 3 months improves the quality of life of children and their parents in both hyper and hypomotile colon groups.

Key Words: Bowel Management Program, True Fecal Incontinence & Quality of Life.

INTRODUCTION

Fecal incontinence (FI) is defined as involuntary passage of stools into underwear in a child over the age of 4 years which is a devastating problem that affects about 25% of patients born with an anorectal malformation (ARM).⁽¹⁾

Regardless of the different underlying causes of FI (functional or organic), these children have poor quality of life (QoL) and, most often, suffer silently.⁽²⁾

The World Health Organization defines QoL as “the individual’s perception of their position in life in the context of culture and value systems in which they live, and in relation

to their goals, expectations, standards and concerns".⁽³⁾

Clinician must be able to differentiate between pseudo-incontinence and true fecal incontinence. A significant number of patients who appear to suffer from fecal incontinence have what we call "overflow pseudo incontinence". The importance of differentiating between these 2 conditions cannot be overemphasized, mainly because the management of both conditions is radically different, and because the results of the management of the pseudo incontinent patients are spectacularly good.

Patients with true fecal incontinence, who are in our concern, are who lack the ability to have voluntary bowel movements.⁽⁴⁾

Prognosis in terms of bowel control (cloaca with common channel < 3 cm, recto bladder neck fistula), absent sacrum, spina bifida, large sacrococcygeal teratoma or when during Hirschsprung's operation the anal canal was destroyed (usually because the pectinate line was not preserved during the dissection). For both groups, the patients will benefit from the BMP, receiving daily enemas. They need a mechanical way to empty their colon. Laxatives are contraindicated in those cases as they only worsen the incontinence.⁽⁵⁾

Bowel management program (BMP) is an artificial way to keep patients who have true FI clean. It consists of finding, by trial and error, the type of enema (ingredients, concentration, and volume) that can clean the colon, to keep the patient clean, on a 24-hour basis, until he/she receives the next enema so the patient can be socially accepted, attend school, play, and become psychologically adjusted to society.⁽²⁾

The BMP is only a medical and not a surgical treatment. Yet, most pediatricians and gastroenterologists are not familiar with this kind of management, and surgeons are usually "too busy" to perform medical treatments. Therefore, many fecal incontinent patients remain rather abandoned, looking for centers where they can receive the benefit of a well-integrated, comprehensive, bowel management program.⁽⁴⁾

Therefore, the aim of this study is to evaluate the effectiveness of bowel management program (BMP) for patients that have true FI consecutive to operated anorectal malformations, operated Hirschsprung's disease and sacrococcygeal teratoma and to evaluate the impact of implementation of the BMP on the quality of life of children in zagazig university hospital.

PATIENTS AND METHODS

This prospective case series study was conducted in pediatric surgery department in Zagazig University hospitals, Sharkia governorate, Egypt. Assuming the mean total PedsQL was 79.3 ± 3.8 vs 24.4 ± 3.4 Pre vs post program. At 89% power and 95 % CI, the estimated sample was 26 cases that were fulfill the inclusion criteria.

Inclusion criteria:

Patients with true FI after operated anorectal malformation. Patients with true FI after operated Hirschsprung's disease. Patients with true FI due to associated sacrococcygeal teratoma. Patients with true fecal incontinence due to associated tethered cord.

Exclusion criteria:

Patients with pseudo fecal incontinence and patients below age of 4 years old.

Ethical Consideration:

An approval of the study was obtained from Zagazig University Academic and Ethical Committee. Written informed consent of all the participants was obtained. This work has been

carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

• **Steps of performance:**

1-Parents were informed by the study and have a clear discussion about every step and all possible complications.

2 -After getting parents approval to participate in the study, parents and their children were asked to fill “PedsQL questionnaire”

3-Patients were evaluated by history, physical examination, spinal and sacral radiographs to determine for bowel control which depends on :

“type of malformation -sacral ratio - abnormalities of spinal cord- quality of the operation”

4-We was targeting patients with poor prognosis for bowel control above the age of 4 years old.

5-Contrast enema was done to determine type of colon then patients were classified in one of 2 groups:

Group A: patients with dilated colon “hypomotile colon” which need large volume and concentrated enema.

Group B: patients with non-dilated colon “hyper motile colon” which need small volume enema, constipating diet and may need loperamide.

6- We start the 1st week with the patients “trial and error” week during which:

*Children are instructed to administer the enema slowly over 5-10 min, hold the solution in for 5–10 min and then sit on the toilet to evacuate enema for 30-45 min .

*Daily abdominal radiograph was done to be compared and evaluate effect of the enema.

*Patient and parent report was be taken every day.

Based on the previous we were able to adjust the enema whether to increase or decrease concentration of the enema, maybe we need to decrease speed of the solution or warming it.

7- The treatment plan is considered successful when the abdominal radiograph is clear of stool in the rectum and the left colon, and the child has had no soiling.

8-Once we reach a successful regimen; patients were followed up for any symptomatic changes which were performed by clinic at one month, 2–3 months.

9-The patients were asked to have an abdominal x-ray and any other appropriate testing in preparation for the visit.

10-After 3 months from the start of the study parents and their children was asked again to fill “PedsQL questionnaire.”

Statistical analysis:

Data collected and analyzed using Microsoft Excel software then imported into Statistical Package for the Social Sciences (SPSS version 20.0) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean \pm SD. Differences between quantitative independent multiple by ANOVA. For all the above-mentioned statistical tests done, the threshold of significance was fixed at a 5% level (P-value). P value of ≤ 0.05 indicates significant results. P value of ≤ 0.001 indicates highly significant results. The smaller the P value obtained the more significant the results.

RESULTS

The current study showed no statistically significant difference between the two groups regarding age and sex (p -value=0.7 & 0.2 respectively) matched groups. Where the average ages of the studied groups were (8.1 ± 1.5) and (7.9 ± 1.1) ranging from 5 to 12 years. Regarding sex, male to female ratio was 4:1. Majority of parents were poorly educated in both groups (**Table 1**).

Anorectal malformation was the commonest cause of fecal incontinence among both the hypo and hyper motile colon groups followed by operated Hirschsprung's disease then associated tethered cord (**Table 2,3**).

Table (1): Comparing demographic characteristics between the two groups.

<i>Characteristics</i>	Group A <i>No=18 (%)</i>	Group B <i>No=8(%)</i>	<i>T-test</i>
<i>Age</i> <i>Mean \pm SD</i> <i>Median</i> <i>(Range)</i>	8.1 ± 1.5 8 (6-12)	7.9 ± 1.1 7 (5-12)	0.3
<i>Age group</i> <i>5-8 years</i> <i>≥ 8 years</i>	14 (77.8%) 4 (22.2%)	5 (62.5%) 3 (37.5%)	FET
<i>Sex</i> <i>Male</i> <i>Female</i>	14 (77.8%) 4 (22.2%)	6 (75.0%) 2 (25.0%)	FET
<i>Parent education</i> <i>Poorly educated.</i> <i>Well educated</i>	11 (61.1%) 7 (38.9%)	6 (75.0%) 2 (25.0%)	FET

FET=Fischer exact test.

Table (2): Distribution of cases according to the type of fecal incontinence among the hypomotile colon group.

Causes of fecal incontinence	The hypomotile colon group	
	No=18	(%)
Operated anorectal malformation	8	44.4%
Operated Hirschsprung's disease	7	38.9%
Associated sacrococcygeal teratoma	1	5.5%
Associated tethered cord	2	11.1%

Table (3): Distribution of cases according to the type of fecal incontinence among the hyper-motile colon group.

Causes of fecal incontinence	The hypermotile colon group	
	No=8	(%)
Operated anorectal malformation	7	87.5%
Operated Hirschsprung's disease	0	0.0%
Associated sacrococcygeal teratoma	0	0.0%
Associated tethered cord	1	12.5%

Comparing the causes of fecal incontinence among the two groups presented in (Figure 1).

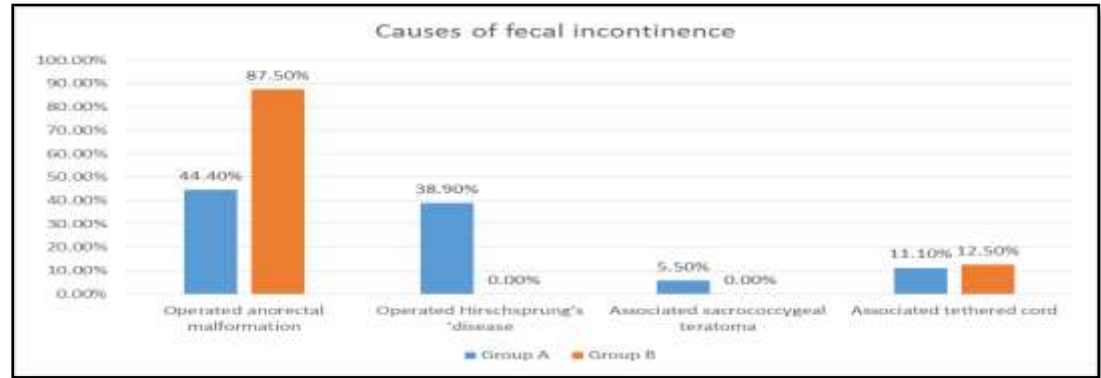


Fig (1): Bar chart for the causes of fecal incontinence among the studied groups.

There was a statistically significant difference in the saline amount between the children with different age groups in both hypo and hyper-motile groups where the children with age ≥ 8 years needed increased amount of saline than children with age ranged from 5 to 8 years. There was a statistically significant positive correlation (increase aged was accompanied by increased the amount of saline and glycerin) between the children age and the amount of saline and glycerin (Figure 2,3).

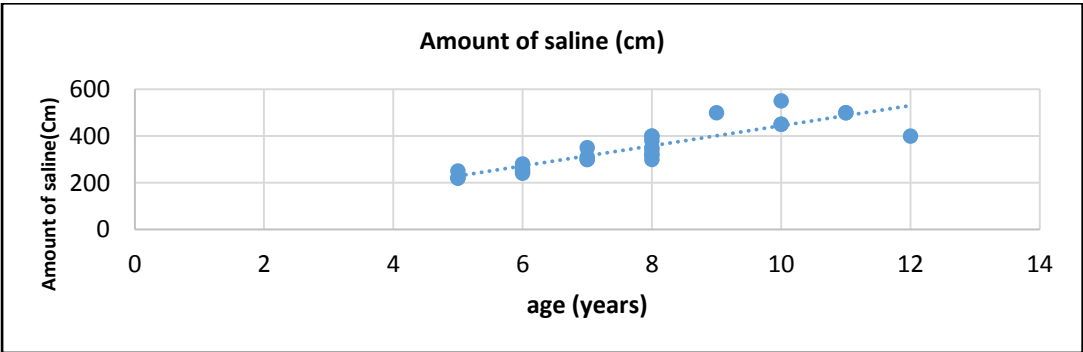


Fig (2): Scatter plot with line chart for the positive correlation between the children age and the amount of saline.

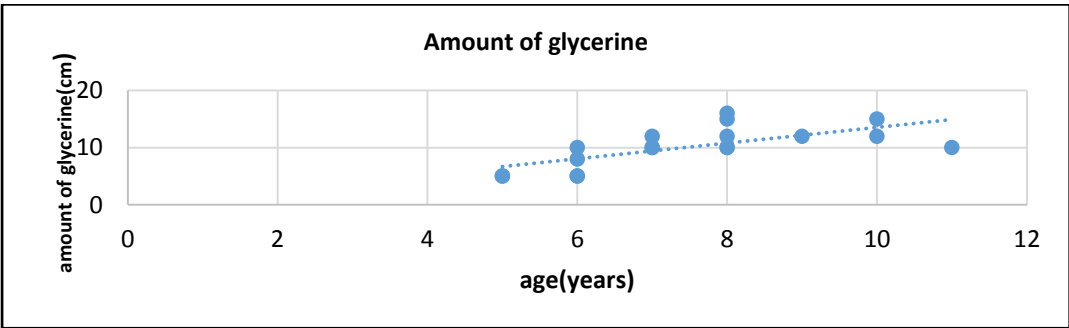


Fig (2): Scatter plot with line chart for the positive correlation between the children age and the amount of glycerin among the hypomotile group.

Regarding the use of loperamide, three cases (37.5%) received 2 pills, two cases (25.0%) received 2 pills, two cases didn't receive constipating drugs and one case (12.5%) received three pills (**Table 4**).

Table (4): the Use of constipating drug “loperamide” the hyper-motile colon group.

The Use of constipating drug “loperamide	loperamide No=8 (%)
No	2 (25.0%)
One pill	2 (25.0%)
Two pills	3 (37.5%)
Three pills	1(12.5%)

There was a highly statistically significant decrease (improvement) in all quality-of-life score items as provided by children before and after 3 months of Bowel Management Program among the hypomotile colon group (p-value<0.001) (**Table 5**).

Table (5): The quality-of-life assessment by questionnaire scores PedsQL 4.0 before and after 3 months of Bowel Management Program as regard to the children of the hypomotile colon group.

<i>Characteristics</i>	Pre-BMP <i>No=18</i> <i>Mean ± SD</i> <i>(Range)</i>	Post-BMP <i>No=18</i> <i>Mean ± SD</i> <i>(Range)</i>	<i>Paired</i> <i>T-test</i>	<i>p-value</i>
<i>Physical function</i>	27.9±0.04 (23-31)	10.2±0.09 (8-13)	6.1	0.001**
<i>Emotional aspect</i>	18.1±0.2 (16-20)	4.4±0.04 (2-6)	5.2	0.001**
<i>Social aspect</i>	18.1±0.03 (16-20)	4.1±0.03 (2-6)	6.3	0.001**
<i>School function</i>	15.2±0.05 (13-18)	5.2±0.1 (3-7)	5.8	0.001**
<i>Total QOL</i>	79.3±3.3 (71-86)	24.4±1.2 (19-33)	11.4	0.001**

**Statistically highly significantly different,

Table (6): The quality-of-life assessment by questionnaire scores PedsQL 4.0 before and after 3 months of Bowel Management Program as regard to the parents of the hypomotile colon group.

<i>Characteristics</i>	Pre-BMP <i>No=18</i> <i>Mean ± SD</i> <i>(Range)</i>	Post-BMP <i>No=18</i> <i>Mean ± SD</i> <i>(Range)</i>	<i>Paired</i> <i>T-test</i>	<i>p-value</i>
<i>Physical function</i>	26.3±0.03 (23-31)	9.1±0.04 (7-11)	18.7	0.001**
<i>Emotional aspect</i>	18.5±0.04 (15-20)	5.2±0.02 (3-8)	15.4	0.001**
<i>Social aspect</i>	18.3±0.02 (16-20)	4.3±0.1 (4-7)	7.9	0.001**

<i>School function</i>	15.8±0.01 (12-19)	4.4±0.04 (4-7)	8.5	0.001**
<i>Total QOL</i>	78.9±2.3 (73-86)	22.9±0.09 (16-28)	13.1	0.001**

**Statistically highly significantly different,

There was a highly statistically significant decrease (improvement) in all quality-of-life score items as provided by parents before and after 3 months of Bowel Management Program among the hypomotile colon group (p-value<0.001) (**Table 6**).

There was a highly statistically significant decrease (improvement) in all quality-of-life score items as provided by children before and after 3 months of Bowel Management Program among the hyper-motile colon group (p-value<0.001) (**Table 7**).

There was a highly statistically significant decrease (improvement) in all quality-of-life score items as provided by parents before and after 3 months of Bowel Management Program among the hyper-motile colon group (p-value<0.001) (**Figure 4**).

Although there wasn't a statistically significant improvement in total score for the quality-of-life before and after 3 months of Bowel Management Program between both groups but the improvement was much more among the hypo- than the hyper-motile colon group from the children and the parents' aspects of view (**Table 8**).

Table (7): The quality-of-life assessment by questionnaire scores PedsQL 4.0 before and after 3 months of Bowel Management Program as regard to the children of the hypermotile colon group.

<i>Characteristics</i>	Pre-BMP No=8 Mean ± SD (Range)	Post-BMP No=8 Mean ± SD (Range)	<i>Paired T-test</i>	<i>p-value</i>
<i>Physical function</i>	29±0.03 (27-31)	10.5±0.09 (9-13)	10.2	0.001**
<i>Emotional aspect</i>	18.4±0.04 (16-20)	6.7±0.05 (5-8)	4.1	0.001**
<i>Social aspect</i>	18.3±0.05 (17-20)	4.9±0.03 (3-7)	5.7	0.001**
<i>School function</i>	16.2±0.03 (13-19)	5.3±0.02 (4-7)	6.3	0.001**
<i>Total QOL</i>	82.1±2.3 (78-87)	27.3±1.1 (25-32)	5.7	0.001**

**Statistically highly significantly different,

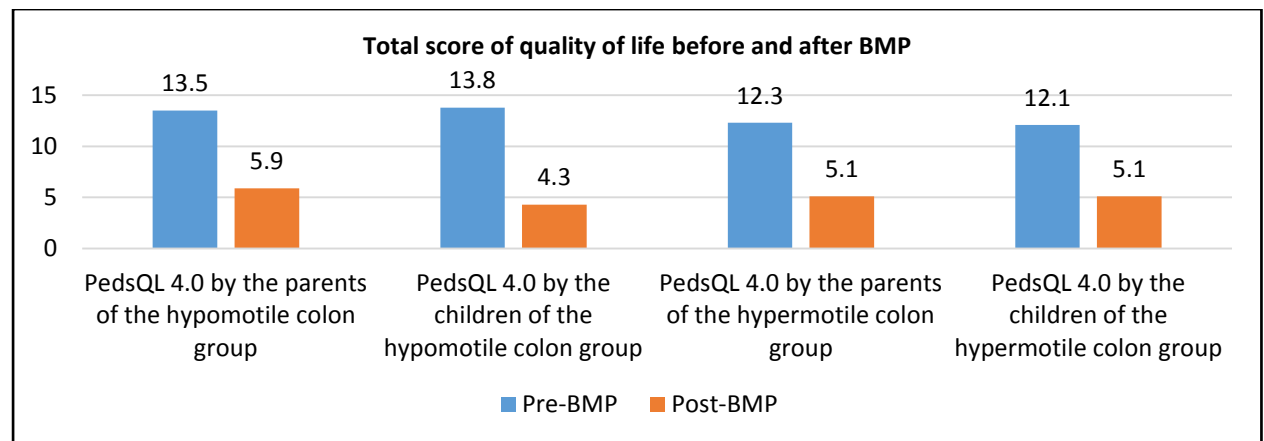


Fig (4): Bar chart for the total quality of life score among the studied groups.

Table (8): Comparing the total score for the quality-of-life before and after 3 months of Bowel Management Program between the two groups.

<i>QOL</i>	Group A No=18	Group B No=8(%)	<i>T-test</i>	<i>p-value</i>
<i>Total QOL by the parents pre-BMP</i>	78.9±2.3 (73-86)	84.2±3.3 (75-94)	1.1	0.2
<i>Total QOL by the parents post-BMP</i>	22.9±0.09 (16-28)	24.3±0.06 (22-26)	2.2	0.3
<i>Total QOL by the children pre-BMP</i>	79.3±3.3 (71-86)	82.1±2.3 (78-87)	1.3	0.2
<i>Total QOL by the children post-BMP</i>	24.4±1.2 (19-33)	27.3±1.1 (25-32)	1.8	0.08

DISCUSSION:

Fecal incontinence resembles a disastrous challenge for those who suffer from it. It frequently makes it more difficult for children to fit in with society, resulting in serious psychological consequences. More children than previously believed are affected by this problem, including those who were born with anorectal malformations, Hirschsprung's disease, spinal cord disorders, or spinal injuries.⁽⁶⁾

The reported rates of FI in children varies from 1.6% to 4.4%.⁽⁷⁾ Children who require surgery for anorectal malformations, Hirschsprung's disease, or spinal issues that can be either congenital or acquired are among the pediatric patients who have true fecal incontinence. Bowel management, a synthetic technique that keeps patients clean, is required for true fecal incontinence patients.⁽⁸⁾

There are several therapeutic approaches for the FI, but with important limitations to its applicability in children and sometimes with significant complications. In this sense, biofeedback and the stimulation of sacral nerves are characterized by being non-invasive; however, require sophisticated equipment, an observer during sessions and the need for a suitable environment outside the home (clinic or hospital). Its functional results are dubious in children.^(9,10)

The Bowel Management Program, developed by Alberto Pena and Mark Levitt for more than 30 years, is inexpensive, can be completed at home, and is simple for their parents to understand. Additionally, 95% of cases result in the success rate (having been clean for 24

hours and abandoning diapers)⁽⁵⁾. Enemas require a significant amount of time from both parents and children^(5,11). Even their complications like colitis or an electrolyte imbalance are much less severe than with the other approaches, that's why we are convinced that bowel management program is considered a method that can dramatically change the quality of life of children suffering from fecal incontinence⁽¹⁾.

According to our study, there was no statistically significant difference between the two groups regarding age and sex (p-value=0.7 & 0.2 respectively) matched groups. Where the average ages of the studied groups were (8.1±1.5) and (7.9±1.1) ranging from 5 to 12 years. Regarding sex, male to female ratio was 4:1. This is in agreement with **Rajindrajith et al.**⁽¹²⁾ who reported that Male: female ratio of fecal incontinence among children varies from 3:1 to 6:1. Additionally, **Shen et al. al.**⁽¹³⁾ reported that FI affects boys more frequently than girls.

Regarding our research, anorectal malformation was the commonest cause of fecal incontinence among the hypomotile, and hyper motile colon followed by operated Hirschsprung's disease then associated tethered cord and lastly sacrococcygeal teratoma. **Colares, et al.**⁽¹⁾ & **Bischoff et al.**⁽¹⁴⁾ found that the majority suffered from FI secondary to surgically corrected anorectal malformation.

Peña and Levitt⁽⁸⁾ clarified that functional defecation disorders affects the majority of patients who undergo an anorectal malformation repair, and all of them have abnormalities in their fecal continence mechanism this in concordance of our results were FI due to operated anorectal malformation was 44.4% in group A and in 87.5% of group B.

According to our results, there was a highly statistically significant association between the parent education and the easy follow-up visits where all children of the highly educated parents had easy follow-up visits. **Halleran et al.**⁽¹⁵⁾ demonstrated that when the carers provide daily care for their children, that contributes significantly to the success of the BMP. **Cushing et al.**⁽¹⁷⁾ confirmed that it is important to consider a multidisciplinary approach that can ensure appropriate education and support of the family beyond the right biomedical regimen. At least one member of such a multidisciplinary team should have expertise in regimen adherence, family functioning, and parent-child interactions to help facilitate the best treatment outcomes.

According to our results, there was a highly statistically significant increase (improvement) in all quality-of-life score items as provided by children and parents before and after 3 months of Bowel Management Program among both groups (hyper motile colon and hypomotile colon groups) (p-value<0.001). That was in agreement with **Colares et al.**⁽¹⁾ reported QoL perception by the parents and children increased on PedsQL4.0 evaluation (p-value<0.01). Additionally, **John et al.**⁽¹⁸⁾ observed Indian children with anorectal malformation and FI submitted to the BMP and observed significant improvement in QoL using the questionnaire prepared by **Bai et al.**⁽¹⁹⁾

Bongers et al.⁽²⁰⁾ studied children with FI, he found that the damaging consequences of soiling are more pronounced in the emotional aspect than in the social one. Our results showed statistically significant improvement in QoL after BMP in all domains including emotional, physical, social and scholar. On the emotional aspect, for example, feelings of fear, sadness and concern were reported as "almost always" present. After treatment, the difficulties were "rarely". In addition to the security provided by avoiding fecal loss, this is in agreement with **Colares et al.**⁽¹⁾ emphasized the value of the psychological aspects.

In terms of physical activity there was marked improvement in physical function before and after 3 months after application of BMB in both groups (p.value was <0.001), this was in agreement with **Miner 2004.**⁽²¹⁾ A possible explanation is that with BMP the perineal pain

during walking and perineal dermatitis went from “often” to “almost never” so that walking became non painful with subsequent return to normal activity.

As for the social aspect, there was marked improvement in emotional upset before and after BMP (p.value<0.001). It was observed that after 3 months of treatment, the children began to get along better with their peers, not being assaulted by negative adjectives, participating in activities once inaccessible, such as how to play ball, jump, and swim. When patients become artificially clean, they came to enjoy the freedom to participate in the games, in full and unconcerned regarding soiling.

As regard school function, there was marked improvement before and after application of BMP in both groups, this improvement was highly statistically significant (p.value <0.001) months of treatment. This was in agreement with **Bai.et al.**⁽¹⁹⁾. At school, frequent absence due to not feeling well or needing to go to hospital was a "frequent" problem. After improvement of FI and abandonment of diapers after BMP there was decrease in absenteeism becoming "almost never". Numerous visits to the emergency room due to malaise were changed into elective appointments.

In our study the improvement in all quality-of-life score items as provided by children and parents before and after 3 months of Bowel Management Program was much more among the hypo- than the hyper-motile colon group from the children and the parents' aspects of view. That was in agreement with **Bischoff et al.**⁽¹⁴⁾ their success rate was higher among the hypo-motile colon group than the hyper motile one. We agree with them that a short or hyperactive colon represents a serious problem for patients with fecal incontinence because bowel management is more difficult to implement in that group of patients. So, we also recommend that for patients with anorectal malformations (ARM) the surgeon must preserve as much colon as possible, particularly in those with a bad functional prognosis type of anomaly. Preserving colon allows for more water absorption capacity and therefore more likelihood to form solid stool. In addition, the characteristic slow transit of the large bowel (as compared with small bowel) is vital for a successful bowel management.

An interesting finding in our study that there was a statistically significant positive correlation (increase aged was accompanied by increased the amount of saline and glycerin) between the children age and the amount of saline and glycerin.

According to our study children in group were challenging for us to reach successful BMP they needed with the tailored enema constipating diet and we used loperamide to achieve a 24h clean child. Three cases (37.5%) received 2 pills, two cases (25.0%) received 2 pills, two cases didn't receive constipating drugs and one case (12.5%) received three pills.

Before the inception of the BMP, there was a line of kids waiting for a treatment. Our children had been managed with different types of enemas, laxatives, and diets. There was no systematic rationale, specially a multidisciplinary participation. Unfortunately, they continuously remained dirty and diapers 'dependent.

The current study extends the literature by providing evidence that tailoring a specific BMP in Egyptian children according to the characteristics of each patient by a dedicated and friendly multidisciplinary team significantly improves QoL of these children and avoid soiling in both groups of cases (dilated and nondilated colon). That's agree with **Cushing, et al.**⁽¹⁷⁾ emphasized the importance of having some awareness of the impairments that children with fecal incontinence and their families are likely to face. Early identification and supportive interventions may prove beneficial at improving the quality of life for the child and his parents.

Our study has a few limitations. The sample size was not large enough, our follow up time was not long enough, and the study was single center study so we cannot do generalization to the data.

We recommend further studies taking large sample size and performing multicentric studies so we can generalize the data.

CONCLUSION:

The current study extends the literature by providing evidence that tailoring a specific BMP according to the characteristics of each patient by a dedicated and friendly multidisciplinary team significantly improves QoL of these children and avoid soiling in both groups of cases (dilated and nondilated colon). It's crucial to be aware of the impairments that children with fecal incontinence and their families are likely to face. Early identification and supportive interventions are beneficial at improving the quality of life for the child and his parents.

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Author contribution: Authors contributed equally in the study.

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