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Efficacy of acacia Senegal on peristomal skin problems in children with colostomy

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Abstract

Background: Colostomies are common in pediatric surgical practice. Peristomal skin complications affect 6%–96% of children. This study aimed to evaluate the efficacy of Acacia Senegal on peristomal skin problems in children with colostomy.

Subjects and method: Quasi experimental research design was utilized in the current study.

Setting: 60 children with colostomy from the pediatric surgical unit in Assiut University Children Hospital were included. Two tools were used which included a structured questionnaire for personal data of children and their mothers and Ostomy Skin Tool to assess the condition of peristomal skin complications.

Results: 6.7% & 13.3% of children in the Acacia group had severe peristomal skin problems in the first month and the second month compared to 40% & 66.7 in the control group while at the third month, 20% of children in the Acacia group had severe peristomal skin problems compared to 83.3% in the control group.

Conclusion: Acacia Senegal gum powder has beneficial effect on decreasing the severity of peristomal skin problems. Therefore, it is recommended that other peristomal skin care modalities should be used by the staff especially natural products such as acacia.

Keywords: Acacia, Children, Colostomy, Complications, Peristomal skin

Introduction

Colostomy is a stoma of the colon with the aim of diverting feces and flatus. It is the most common stoma used in children. The cause of colostomy may be either congenital or acquired. Congenital indications are more common and include high anorectal anomalies and hirschsprung's disease. Acquired indications include bowel perforation, severe perineal traumas, post-trauma paralysis, and to protect distal anastomoses such as coloanal anastomosis of pull-through procedures (Amir *et al.*, 2016) [3]. According to the National Cancer Institute in Egypt (NCI) (2016) [20], approximately 2400 child had undergone colostomy through the year 2015.

There are numerous and frequent common complications following construction of large bowel stomas. Despite improvements in surgical methods, surgical morbidity and complication rates are still high. Earlier studies have shown complication rates vary between 6 and 59% (Formijne *et al.*, 2012) [8]. The incidence of complications after colostomy is reported to be between 10% to 74 % (Bakal *et al.*, 2015) [4] and according to Simmi, (2018) [25] the incidence varies from 6% - 96%. Complications may occur immediately after surgery or late, months or years to appear. Early complications (within first three months) include wound infection, abscess, fistula, retraction, bleeding and small bowel obstruction. Late complications (after first three months) include a para-stomal hernia, prolapse, stricture and severe skin excoriation.

Keeping the peristomal skin intact proves to be a challenge for the patients, their caregivers, and the health care team. Peristomal skin complications affect 18%–73% of patients. Complications range from mild irritation to full thickness ulcerations leading to pain, anxiety, and may significant social isolation related to the pouching system leaks. Common postoperative complications usually occur within the first two weeks of the creation of the stoma. Peristomal skin complications can also present as late complications, months or even years after the initial surgery (Landman, 2016) [15].

Acacia Senegal (Acacia gum or Arabic gum) is using as skin barrier to lower rates of peristomal skin problems. It is a natural gum consisting of hardened sap from a variety of Acacia trees. Acacia Gum is primarily sourced from Acacia Senegal trees which are found

In warm or tropical climates all over the world. It is native to semi-desert regions of Sub-Saharan Africa, as well as Oman, Pakistan, west coastal India. It has a variety of uses in skin care, cosmetics, food, topical pain relief for irritated skin, promotes healing and promotes oral health (Pervez *et al.*, 2016) ^[23].

Pediatric nurse plays an important role in stoma care as pre-operative education and counseling, postoperative teaching and emotional support, empty and changing pouching system, describing diet and fluid guidelines, recognizing signs of potential complications, as well as monitoring medications, managing gas and odor, teaching patient to seek assistance if experiencing the changes in output, skin and stoma complications. In addition to discharge planning, outpatient follow up and ongoing rehabilitation care to children and their families (Hockernberry & Wilson, 2015) ^[12]. Specially trained ostomy nurses may assist patients by not only treating complications of the stoma, but just as importantly, by helping the patients take good care of their stoma, and maintain a good fit of the products they use (Sarkut *et al.*, 2015) ^[24].

Significance of the study

Peristomal skin conditions are common complications among ostomy patients. Depending on the type of stoma created, peristomal skin ailment rates of 30% to 60% have been reported in prospective studies (Erwin & Stricker, 2011) ^[7]. Standard peristomal skin care is not always adequate for preventing peristomal problems. Numerous approaches are available to prevent or treat peristomal skin complications as different material can be used for peristomal care as petrolatum jelly, glycerin hydrogel based wound dressing and Acacia Senegal gum; Review of literatures does not show much literatures regarding different modalities of care for peristomal skin. Many studies supported the idea that acacia has anti-inflammatory properties on skin so the researcher conducted the current study to evaluate the effectiveness of Acacia Senegal gum on peristomal skin complications in children with colostomy.

Aim of the study

The study aimed to evaluate the efficacy of Acacia Senegal on peristomal skin problems in children with colostomy.

Research Hypothesis

Children with colostomy who exposed to acacia Senegal gum peristomal skin care would have lower of peristomal skin problems, such as discoloration, erosion and tissue overgrowth in compare to those with the routine care.

Subjects and Method

Research Design

A quasi experimental research design was utilized in the current study.

Setting

This study was conducted in the Pediatric Surgery Unit and Pediatric Surgery clinic at Assiut University Children Hospital.

Subjects

A convenience sample of (60) children with colostomy were included in the study. They were divided into two groups; a

study group and a control group (30 children for each group).

Tools

Two tools were used to fulfill the objectives of this study

Tool (1): A structured interview questionnaire

It included two parts as follows:

- Personal characteristics and clinical data of the child include child's age, sex, birth order, body weight, previous hospitalization, indications and complications of colostomy during hospitalization.
- Personal characteristics of mother as age, occupation, level of education, residence, and number of children in the family.

Tool (2): Ostomy Skin Tool (OST)

It is a standardized assessment tool that adopted from Martins *et al.* (2014) ^[18] to help health care professionals in assessing and evaluating the condition of peristomal skin reliably and accurately. The OST facilitates consistent monitoring and reassessment of the skin and helps to monitor the effect of local or systemic treatments. It consists of standardized descriptions of three characteristic domains of the abnormal peristomal skin: Discoloration (D), Erosion (E) and Tissue overgrowth (T). The Ostomy Skin Tool considers both the percentage of the peristomal skin (area) affected under the adhesive barrier and its severity.

The score of area is assigned between 0 and 3 by the size of affected area for example

Regarding discoloration

- (0 Score) = normal skin (absence of any visible change and damage to epidermis) if there is no discoloration then the skin is healthy.
- (1 Score) =if a discoloration is less than 25%, a point of reference is same in erosion and tissue overgrowth).
- (2 Score) = a discoloration is between 25% and 50%, a point of reference is same in erosion and tissue overgrowth).
- (3 Score)= if a discoloration is more than 50%, a point of reference is same in erosion and tissue overgrowth).

The score of severity is assigned between 0 and 2 for DET as following

1- Severity of discoloration

- (0 Score) =if the area of discoloration score is 0, the skin is normal.
- (1 Score)= slight redness or other discoloration of the peristomal skin. (2 Score) =deep red or highly macerated skin potentially causing further complications.

2- Severity of erosion

- (0 Score) =If the area of erosion score is 0. (1 Score)= damage to the top layer of the skin (the epidermis). (2 Score) = damage to dermis causing excessive moisture or bleeding.

3- Severity of tissue overgrowth

- (0 Score) =If the area of overgrowth score is 0. (1 Score) = tissue overgrowth that interferes with application of the adhesive
- (2 Score) = tissue overgrowth that interferes with

application of the adhesive and causes bleeding and / or pain.

- In a situation where a large area of skin with low severity includes a small area with a high severity, the highest severity should always be scored even though the area is small.
- The score of each domain is a range from (0-5). The combined score, or DET score, is in the range from 0–15 where 0 represents normal skin and 15 the worst combination of severity and extent. Introducing three levels of severity ‘mild’ (DET<4), ‘moderate’ (DET≥4<7), and ‘severe’ (DET≥7).
- DET Ostomy Skin Tool has documented a content validity index of 0.99 and demonstrated a high internal consistency reliability with a satisfactory Inter-observer consistency (0.80) (Harputlu & Özsoy, 2017).

Method of data collection

- An official approval letter was obtained from the dean of the Faculty of Nursing, Assiut University to the director of the pediatric Surgery unit at Assiut University Children Hospital to collect the necessary data for this study.
- Formal parent’s consent for participation of their children in the study was obtained after explaining the aim and nature of the study; the parents were informed that the obtained information would be used only for the purpose of this study.

A pilot study

- It was carried out on 10% of the children (6 children) to test the clarity, the applicability of the tools and to estimate the time needed to fulfill each sheet and no modifications were needed and they were included in the study.
- The validity of the first tool was established by five experts in the pediatric surgery and nursing field. The content validity index was 0.94 and the internal consistency was 0.7.

Field of work

- This study was carried out through a period of one year from (end of November 2017 to December 2018). The researcher followed the two groups at second day, eighth day, one month, two months and three months post-operative follow-up according to the planned visits schedule.
- Children who were assigned to control group received the routine care in hospital and home. In the Acacia group, the researcher interviewed mothers and caregivers to introduce herself and to explain the nature and purpose of the study.
- Then, the researcher collected the personal characteristics of the children and their parents to fulfill tool one. The time needed for each interview ranged from 20-25 minutes according to the response of the participant mothers.
- The researcher used Acacia Senegal gum powder as a skin barrier for prevention and treatment of peristomal skin disorders in children who were assigned to Acacia

group. The researcher used 2.5 gm Acacia Senegal gum powder. This dose of acacia is guided by (Hosseinpour *et al.*, 2012) ^[13] in a previous study.

- The researcher weighted powdered Acacia with her own electronic scale. Mothers used teaspoon to measure acacia after ensuring of the exact amount by the researcher and they were informed to use the same spoon every time of colostomy care.
- 10 ml pure hot water was measured by measuring cup and what was equivalent as a soup spoon and a syringe (10 ml). After resolving, and then cooling at room temperature, the skin around the stoma was cleaned with warm water, and then, a thick layer of gelatinous gum was used to cover the peristomal skin. The same technique was applied twice daily.
- The intervention technique was taught to mothers or caregivers of the child to apply it during hospitalization and after returning home. The researcher ensured that mothers knew the places which sell acacia (powder or to crushed it) if they need it.
- The researcher helped mothers with prepared acacia that was enough until the next visit (in small bottles or small sachets). The bottle contained 50 gm for ten days (3 bottles for one month visit) and the sachet contained 35 gm for one week.
- The researcher assessed the size of the area affected (Discoloration, Erosion and Tissue overgrowth) (DET) domains and calculated the score based on the Ostomy Skin Tool (OST) scale.
- The severity in each of the three domains was assessed by using the definitions and photographs in (OST) scale. (DET) scores were summed and classified into mild, moderate and severe. These clinical observations and assessment were done in each follow- up planned visits schedule.
- After discharge, a follow-up of the child was done in the pediatric surgery outpatient clinic on the basis of prior agreement between the researcher and mother or caregiver of the child and in cooperation with the clinic two nurses (by calling when ostomy children come to the clinic).

Ethical Considerations

Written informed consent was taken from by parents of each child participating in the study and they are secured that data will be confidential and used only for the research purpose. The parents had the right to withdraw from the study at any time during the study without any effect on the care provided for their children.

Statistical analysis

Data entry and data analysis were done by using SPSS program (Statistical Package for Social Science) version 19. Data were presented as numbers, percentages, means and standard deviations. Chi- square test and fisher exact test were used to compare qualitative data. Independent samples t-test was used to compare quantitative variables in case of parametric data and Mann-Whitney test was used to compare between quantitative variables in case of non-parametric data. Correlation coefficient (r) was used to study the correlation quantitative variables.

Results

Table 1: Distribution of the studied children according to their personal data

Item	Acacia group (n= 30)		Control group (n= 30)		P-value
	No.	%	No.	%	
Child gender:					0.791
Male	12	40.0	11	36.7	
Female	18	60.0	19	63.3	
Child age (years):					0.767
< 1 year	7	23.3	3	10	
1-<3 years	14	46.7	19	63.3	
3-<6 years	5	16.7	7	23.3	
≥ 6 years	4	13.3	1	3.3	
Mean ± SD	2.97 ± 3.19		2.44 ± 2.41		
Birth order:					0.505
First	9	30.0	11	36.7	
Second	11	36.7	13	43.3	
Third or more	10	33.3	6	20.0	
Residence:					0.284
Urban	13	43.3	9	30.0	
Rural	17	56.7	21	70.0	
Body weight (Kg):					0.602
<10 kg	12	40.0	14	46.7	
10 -<20 kg	14	46.7	14	46.7	
20- < 30 kg	4	13.3	2	6.7	

Table 2: Distribution of the children's mothers in the studied groups according to their personal data

Item	Acacia group (n= 30)		Control group (n= 30)		P-value
	No.	%	No.	%	
Mother age:					0.317
< 25 years	8	26.7	9	30.0	
25 - < 35 years	12	40.0	16	53.3	
≥ 35 years	10	33.3	5	16.7	
Mother occupation:					0.243
Housewife	20	66.7	24	80.0	
Employee	10	33.3	6	20.0	
Mother education:					0.222
Educated	21	70.0	25	83.3	
Uneducated	9	30.0	5	16.7	
No. of children:					0.035*
1 – 2	14	46.7	22	73.3	
3 or more	16	53.3	8	26.7	

*Statistical significant difference (p<0.05)

Table 3: Relation between mean score of area and severity of discoloration domain among children in the studied groups by visits

Discoloration domain	Acacia group		Control group		P-value
	Mean ± SD		Mean ± SD		
Visits after colostomy	Area	Severity	Area	Severity	
Two days	0.90 ± 0.31	0.00 ± 0.00	1.00 ± 0.00	0.00 ± 0.00	**A: - ***S: -
Eight days	1.50 ± 0.51	1.17 ± 0.38	2.00 ± 0.37	1.53 ± 0.51	A: 0.000* S: 0.003*
One month	1.60 ± 0.56	1.17 ± 0.38	2.87 ± 0.35	1.93 ± 0.25	A: 0.000* S: 0.000*
Two months	1.60 ± 0.56	1.60 ± 0.56	2.87 ± 0.35	2.87 ± 0.35	A: 0.000* S: 0.000*
Three months	1.53 ± 0.57	1.53 ± 0.57	2.87 ± 0.35	2.87 ± 0.35	A: 0.000* S: 0.000*

* Statistical significant difference (p<0.01) ** A= Area ***S= Severity

Table 4: Relation between mean score of area and severity of erosion domain among children in the studied groups by visits

Erosion domain	Acacia group		Control group		P-value
	Mean ± SD		Mean ± SD		
Visits after colostomy	Area	Severity	Area	Severity	
Two days	0.40 ± 0.50	0.00 ± 0.00	0.57 ± 0.50	0.00 ± 0.00	**A:- ***S: -
Eight days	1.17 ± 0.59	0.00 ± 0.00	1.97 ± 0.67	0.00 ± 0.00	A:0.001* S: -
One month	1.23 ± 0.73	1.03 ± 0.56	2.57 ± 0.57	1.87 ± 0.35	A:0.000* S: 0.000*
Two months	1.27 ± 0.74	1.27 ± 0.74	2.60 ± 0.56	2.60 ± 0.56	A: 0.000* S: 0.000*
Three month	1.20 ± 0.71	1.20 ± 0.71	2.60 ± 0.56	2.60 ± 0.56	A: 0.000* S: 0.000*

Table 5: Relation between mean score of area and severity of over growth domain among children in the studied groups by visits

Over growth domain	Acacia group		Control group		P-value
	Mean ± SD		Mean ± SD		
Visits after colostomy	Area	Severity	Area	Severity	
Two days	0.00 ± 0.00	0.00 ± 0.00	0.13 ± 0.35	0.00 ± 0.00	**A: - ***S: -
Eight days	0.30 ± 0.47	0.30 ± 0.47	0.30 ± 0.47	0.37 ± 0.61	A: 1.000 S: 0.868
One month	0.40 ± 0.62	0.33 ± 0.62	0.40 ± 0.62	0.40 ± 0.48	A: 1.000 S: 0.857
Two months	0.37 ± 0.56	0.33 ± 0.48	0.40 ± 0.62	0.40 ± 0.62	A: 0.929 S: 0.857
Three month	0.40 ± 0.56	0.33 ± 0.48	0.40 ± 0.62	0.40 ± 0.56	A:0.874 S:0.722

* Statistical significant difference (p<0.01) ** A= Area ***S= Severity

Table 6: Comparison between ostomy skin problems total score among children in the studied groups at (2nd) day after colostomy

OST	Acacia group (n= 30)		Control group (n= 30)		P-value
	No.	%	No.	%	
Mild	22	73.3	20	66.7	0.573
Moderate	8	26.7	10	33.3	
Severe	0	0.0	0	0.0	

* Statistical significant difference (p<0.05)

Table 7: Comparison between ostomy skin problems total score among children in the studied groups at (8th) day after colostomy

OST	Acacia group (n= 30)		Control (n= 30)		P-value
	No.	%	No.	%	
Mild	15	50.0	8	26.7	0.054*
Moderate	14	46.7	16	53.3	
Severe	1	3.3	6	20.0	

* Statistical significant difference (p<0.05)

Table 8: Comparison between ostomy skin problems total score among children in the studied groups at one month after colostomy

OST	Acacia group (n= 30)		Control group (n= 30)		P-value
	No.	%	No.	%	
Mild	12	40.0	1	3.3	0.000*
Moderate	16	53.3	17	56.7	
Severe	2	6.7	12	40.0	

* Statistical significant difference (p<0.01)

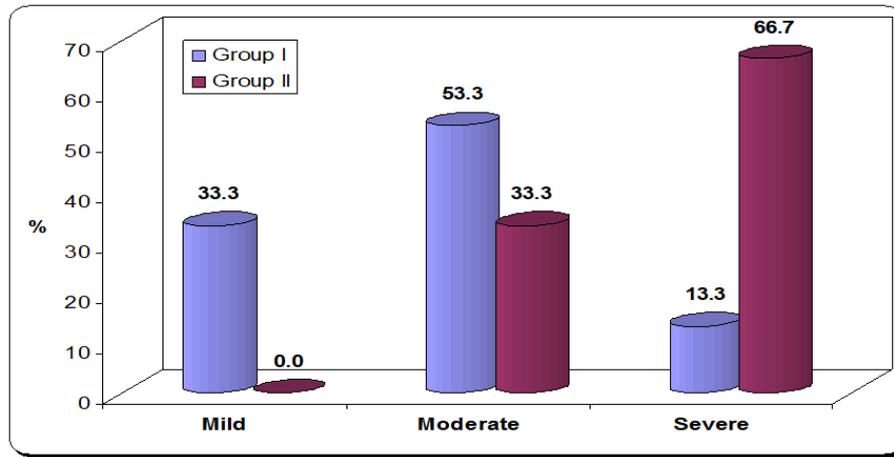


Figure 1: Comparison between ostomy skin problems total score among children in the studied groups at two months after colostomy

Table 9: Ostomy skin problems total score among children in the studied groups at three months after colostomy

OST	Acacia group (n= 30)		Control group (n= 30)		P-value
	No.	%	No.	%	
Mild	6	20.0	0	0.0	0.000*
Moderate	18	60.0	5	16.7	
Severe	6	20.0	25	83.3	

* Statistical significant difference (p<0.05)

Table 10: Relation between Ostomy Skin Tool total score and mothers' education and occupation in the Acacia group at the first month after colostomy

	First month						P-value
	Mild		Moderate		Severe		
	N.	%	N.	%	N.	%	
Mother education:							0.014*
Educated	2	9.5	14	66.7	5	23.8	
Uneducated	1	11.1	1	11.1	7	77.8	
Mother occupation:							0.048*
Housewife	2	10.0	8	40.0	10	50.0	
Employee	1	10.0	7	80.0	1	10.0	

* Statistical significant difference (p<0.05)

Table 11: Relation between Ostomy Skin Tool total score and mothers' education and occupation in Acacia group at the second and the third month after colostomy

Item	Second month						P-value
	Mild		Moderate		Severe		
	No.	%	No.	%	No.	%	
Mother education:							0.006*
Educated	2	9.5	15	71.4	4	19.0	
Uneducated	1	11.1	1	11.1	7	77.8	
Mother occupation:							0.086
Housewife	2	10.0	8	40.0	10	50.0	
Employee	1	10.0	8	80.0	1	10.0	

* Statistical significant difference (p<0.05)

Table (1) shows that, the number of female children was (60%) in the acacia group compared to (63.3%) of them in the control group. Regarding age, less than half (46.7%) of children in the acacia group compared to (63.3%) in the control group were in (1-<3 years) of age group. About 37% of children in Acacia group were in second birth order compared to (43.3%) of them in the control group. According to residence more than half of children in the Acacia and control groups came from rural areas (56.7%vs70% respectively).

Table (2) shows that two fifths (40 %) of mothers in the acacia group, their age ranged from (25 - < 35) years

compared to (53.3%) in the control group. More than two thirds of the studied mothers in both groups were educated and house wives (70%vs 83.3% & 66.7% vs80%) among the acacia group and the control group respectively. More than half (53.3 %) of mothers in the acacia group, had three or more children compared to (26.7%) of them in the control group.

Table (3) demonstrates that there were high statistical significant differences between the studied groups in discoloration domain (area and severity) with p value (<0.000) at one month, two months and three months visits after colostomy.

Table (4) demonstrates that there were high statistical significant differences between acacia group in erosion domain (area and severity) with p value (<0.000) at one month, two months and three months visits after colostomy.

Table (5) shows that there were no statistical significant differences among children in studied groups regarding overgrowth domain, through follow-up visits.

Table (6) illustrates that there was no statistical significant difference among the acacia and the control groups regarding ostomy skin problems at the 2nd day after colostomy.

Table (7) represents that there were statistical significant differences among children in studied groups regarding ostomy skin problems total score at the (8th) day after colostomy. The minority (3.3%) of children in the acacia group had severe skin problems compared to (20%) of children in the control group.

Table (8) indicates that there were statistical significant differences among children in the studied groups regarding ostomy skin problems total score at one month post-operative. The minority (6.7%) of children in the acacia group had severe total score of ostomy skin problems compared to two fifths (40%) in the control group.

Figure (1) shows that more than half (53.3%) of children in the acacia group had moderate total score of ostomy skin problems compared to one third (33.3%) in the control group at two months post-operative. 13.3% of children in the acacia group had severe total score of ostomy skin problems compared to two thirds (66.7%) of children in the control group.

Table (9) demonstrates that there were high statistical significant differences among children in the studied groups at three months after colostomy. One fifth (20%) of children in the acacia group had severe total score of ostomy skin problems compared to (83.3%) of children in the control group.

Table (10) indicates that there were statistical significant differences between Ostomy Skin Tool total score and mother's education and occupation at first month after colostomy. (23.8%) of educated mothers had children with severe problems compared (77.8) in uneducated mothers. Half of housewives mothers; their children had severe ostomy skin problems compared to (10%) in employed mothers.

Table (11) shows that there were statistical significant differences between Ostomy Skin Tool Total Score and mother's education at the second month after colostomy. There was no a statistical significant difference between Ostomy Skin Tool Total Score and mother's occupation. (19.0% Vs 77.8% respectively) of mothers had children with severe ostomy skin problems with p- value 0.006.

Discussion

Colostomy is surgical exteriorization of part of the colon to the anterior abdominal wall. Anorectal malformation and hirschsprung's disease are the most common indications for colostomy in children. The treatment of peristomal skin complications is an essential health management issue that requires on-going management following the creation of colostomy (Chidi *et al.*, 2018) [6]. Acacia Senegal powder helps to protect the peristomal skin by increasing the adhering characteristics of the pouching system in colostomy. Acacia gum has been reported to be used internally for the treatment of inflammation of the intestinal

mucosa, and externally to cover inflamed surfaces (Ali, 2018) [2].

This study suggested Acacia as a novel protection for peristomal skin. Topical application of Acacia gum powder as skin barrier twice daily in colostomy care was effective in reducing peristomal skin problems in children. It helped peristomal skin to keep its integrity and positively decreased the severity of skin inflammation. The findings of the current study showed that there was a high statistical significant lower mean score of DET (discoloration, erosion and tissue over growth) in follow up visits of three months after colostomy among children in the acacia group compared to the control group who received the routine care in hospital and home. This result was consistent with Housseinpour, (2012) [13] who reported that there was a statistically significant difference in peristomal skin problems rate in groups of children who had Acacia Senegal barrier and showed lower and less severe inflammation rates.

The current study revealed that children in the Acacia group showed lower severity of peristomal skin problems that was apparently decreased. This was consistent with Tam *et al.*, (2014) [27]; who stated that in the systematic review and meta-analysis of randomized controlled trails comparing interventions for peristomal skin care, infants who received the Acacia Senegal barrier exhibited lower and less severe inflammation rates one month after surgery than infants in the zinc sulfate ointment group.

The results of this study were consistent with Ali, (2018) [2] who reported that the topical application of Acacia gum powder for skin lesions of two cases of severe malnutrition (kwashiorkor), demonstrated a dramatic, rapid healing of these skin lesions. These results were also consistent with Kumar *et al.*, (2015) [14] who used different agents and evaluated their role in peristomal skin care, i.e. petrolatum jelly, glycerin hydrogel, and Acacia Senegal. The role of Acacia was found to be good with inflamed, excoriated and ulcerative skin in comparison to other modalities. They suggested gum Acacia as a potential agent for peristomal skin care.

The results of the present study showed that almost all children had peristomal problems (DET) whose severity ranged from mild to severe according to ostomy skin tool. This was supported by Agarwal & Ehrlich, (2010) [1] who reported that as the skin is slightly acidic (with a pH of 4.0 to 5.5), and because both urine and feces are slightly alkaline, leakage of either can cause skin erosion.

Probably it was due to improper care for colostomy and non-availability of colostomy bags, so most families due to financial problems used cotton and pieces of cloths instead of colostomy bags as an alternative way but it caused some problems such as leakage that increased the risk of skin complications especially in children with diarrhea.

The results of this study were in consistence with Mollitt *et al.*, (2008) [19] and Nicholas, (2008) [21] who discussed peristomal skin inflammation as the most common complication in most children with stoma. They were also consistent with Goldberg *et al.*, (2010) [10] and Lister *et al.*, (2010) [17] who found that complications of infection, discoloration, erosion and granulation tissue occur frequently and are likely to be a cause of asking more care for children with stoma causing more stress and financial burden.

There was a highly statistically significant difference

between the acacia group and control group of children in discoloration domain (area and severity) at (eighth day, one month, two months and three months) visits after colostomy. It may be due to the continuous adhesion and removing of the adhesive skin barrier or its paste alternatives, this result was supported by the results of Gaber *et al.*, (2018) ^[9] about the perfect effect of the anti-inflammatory role of acacia on discoloration and skin inflammation.

Skin erosion was a major complication in colostomy creation. This has been due to constant exposure of the skin to the fecal matter, fungal infections and enzymatic digestion of the skin (Stelton *et al.*, 2015) ^[26]. The effective action of the anti-inflammatory properties of Acacia was observed clearly on erosion. Using acacia gum powder as a skin barrier showed managing and preventing erosion severity. Severity may damage to the top layer of the skin or damage to the dermis, thus causing excessive moisture or bleeding (Lawrence *et al.*, 2015) ^[16].

After one month of using acacia, the occurrence of erosion (area and severity) in the Acacia group was effectively decreased to half incidence rate that occurred in the control group with a highly statistically significant difference. Moreover, at three months after colostomy, Acacia still had the effect on erosion (area and severity) rate that decreased more than in the first month. In contrast, in the control group erosion (area and severity) rate increased throughout follow-up visits.

This result is in agreement with the result of Kumar *et al.*, (2015) ^[14] who showed that acacia had a more perfect effect on skin erosion than other modalities. Erosion mostly occurred due to non-application of a colostomy bag, non-availability of good colostomy care by mothers. Although using Acacia as skin protector was enough to manage erosion in many children, more attention was needed to avoid worse prognosis. The non-availability of colostomy bags due to high cost and improper application of bags (if available) were the major problems in the study.

The occurrence of tissue overgrowth, which is reported as a type of hyperplasia, in both groups was almost the same in both groups during the follow-up period. There was no statistically significant difference between the Acacia group and the control group through follow-up visits. This may be explained by the fact that tissue overgrowth interfered with the application of the adhesive barrier (bags, cotton or pieces of cloths) and caused bleeding and some pain with discomfort to children. It created difficulty in managing colostomy care because of the bleeding tendency. This result agrees with Park *et al.* (2011) ^[22] who reported that tissue overgrowth was not commonly observed in the study group. It frequently occurs in urostomy with less common complications in ileostomy or colostomy.

Our results demonstrated that mother's education was an important factor in reducing the severity of peristomal skin problems. Education helps mothers to understand the needs of their children and to apply proper colostomy care with more attention of complications to prevent its occurrence that make them more worried about their future.

The review of literature does not include much literature regarding the comparison between modalities of care for peristomal skin. Different natural materials for peristomal care can be used, but the role of Gum Acacia was found to be better with peristomal skin problems in colostomy than other modalities. Based on the results of the study, Acacia

gum is the perfect option for mothers who believe in nature and its products which are characterized by effectiveness in peristomal skin care in children with colostomy. In addition, it is easily prepared and cost effective especially for low socioeconomic status people, particularly in developing countries.

Conclusion

Based on the results of the present study, it can be concluded that

Children with colostomy who exposed to acacia Senegal gum peristomal skin care had lower peristomal skin problems, such as discoloration, erosion and tissue overgrowth in compare to those with the routine care. There was a positive correlation between ostomy skin tool total score and child's birth order, mother's age and number of children.

Recommendations

Based on the results of the present study it can be recommended that

- Additional randomized studies with larger samples are needed to confirm and disseminate the results of this study about acacia effect on peristomal skin problems in children with colostomy.
- Other peristomal skin care modalities should be used by the staff especially natural products such as acacia which has been known for decades to decrease skin problems and with the support of evidence-based practice to these materials.
- Activating and enhancing the role of nurses in the health education to parents based on scientific knowledge in pre-operative education (assuring and counseling) and postoperative teaching about colostomy care.
- Training nurses to use the ostomy skin tool to assess and monitor the condition of peristomal skin problems accurately.

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