A cohort study to compare banana leaves dressing with conventional dressing for children with burn wounds at Bugando Medical Centre, Mwanza, Tanzania 2021

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Abstract

Background: Globally burns among children are a public health concern. Banana leaf dressings or Conventional dressing materials may be used to dress burn wounds children. The study aimed to explore the outcomes of burn wounds dressed using banana leaves and conventional dressing materials respectful.

***Methods*:** Hospital-based cohort study design conducted at Bugando Medical Center Burn Unit. Non-probability convenient sampling method with a sample size of 35 pediatric patients with burn wounds for each group of convectional dressing methods and banana leaf dressings was reached. Stata program Version 13 was used to analyze data.

***Results*:** A total of 70 children; 1 to 18 years, with a median age of 4 and interquartile range [IQR: 1-17] years were enrolled in the study. Thirty-five were dressed with Banana leaf the other 35 were dressed with conventional materials. Results showed that Banana leaf dressing was associated with; less pain (aOR = 0.2, 95% CI: 0.1 – 0.5, *p–value* <0.001), less medication use (aOR = 3.0,95% CI: 1.1 – 8.7, *p – value* 0.02) and good satisfaction (aOR = 85.6, 95% CI: 3.3 – 219, *p – value* <0.001) respectful during dressing change compared to conventional dressing method. However, no difference was observed between the length of hospital stay and the dressing method chosen.

***Conclusions*:** Although there is no evidence of a dressing method that is best for burn wounds. This study shows that Banana leaf dressing is convenient in terms of having fewer pain experiences and that it can be locally obtained in areas where the banana plant is easily available. We recommend the use of banana leaf dressings for burns moreover, enlightenment of the public on the intervention and prevention of burns among children.

Keywords: *Banana leaf dressing, Conventional dressing, Burns, wound*

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Introduction

Burns among children are a public health problem globally. According to WHO report in 2016, burns caused deaths to almost 250,000 and disability-adjusted life approximated to 18 million. Majority of these occur in developing countries (Low and middle income countries) *(Tyson et al., 2013)*. Burns represents a stressful experience among children and care takers. Among under 5 children burn injuries is the second cause of accidental death worldwide *(Okoro, Igwe and Ukachukwu, 2009)*.

Burn injuries among children are the major cause of admission in paediatric surgical ward at Bugando Medical Centre, hence contributing significantly to high morbidity and mortality *(Phillipo L. Chalya et al., 2011)*. Burns may cause devastating consequences to children such as alteration in nutrition status, pain during dressing removal, wound healing complications, costs for dressing methods prolonging hospital stay *(Rimoy, Premji and Matemu, 2008)*.

Different types of dressing methods are known for their benefits; such as reducing the number of hospital days stay, pain relief and comfort level, easy application and removal, frequency of change requirement, less cost and patients' satisfaction *(Okoro, Igwe and Ukachukwu, 2009)(Wasiak et al., 2013)*. These key outcomes have not been studied at Bugando hence the need for our current study.
Burn wounds are dressed by different types of materials such as conversional dressing materials; which include enzymatic dressings, hydrocolloids, alginates, hydrogels, and many others or banana leaf dressings *(Agarwal et al., 2009)*. The primary aims of dressing of any wound are to shorten the healing period and minimizing any undesired consequences *(Agarwal et al., 2009)*.

For many years banana leaves have been used as part of an ancient practice in some countries. Recently some studies have assessed the properties of banana leaves in relation to wound healing *(Agarwal et al., 2009)*. Since it is well known that, burn wound dressing materials must have a barrier function to microorganisms, a moist environment at the wound interface, nontoxic, non-allergenic, non-adherent, with non-sensitizing properties *(Agarwal et al., 2009), (Antony et al., 2014)*.

Most of these properties are possessed in modern dressing materials. However, their use is limited in developing countries because they are expensive *(Agarwal et al., 2009), (Antony et al., 2014)*. On the other hand BLD is associated with less pain during dressing changes and results in rapid epithelization than Vaseline gauze *(Gore and Akolekar, 2003a)(Gore and Akolekar, 2003b)(Calderon and Rola, 2003)*. Additionally, It allows exudates to drain from the wound, its wax surfaces prevent the dressing from adhering to the wound and most importantly they are less expensive *(Gore and Akolekar, 2003) (Gore and Akolekar, 2003) (Guenova et al., 2013)*.

Dressing removal is easier in BLD than conventional dressing method because of its non-adherent properties and significantly contribute to less healing time compared to conventional methods *(Calderon and Rola, 2003)*. Patients are more satisfied with BLD than conventional method because it has less pain, less expensive and significantly contribute to less healing time *(O et al., 2011)*. Currently there is no evidence of a dressing material that is best for burn wound dressing among children *(Barnea, Weiss and Gur, 2010)*. The aim of this study was to compare BLD and CDM in the healing process focusing on pain and comfort, length of hospital stays and satisfaction of parents/care takers with pediatric patients using the two types of dressing materials. We compared the use of BLD and CDM among pediatric patients with burn wounds to see if there were differences on the average length of hospital stay, comfort and pain levels as well as clients' satisfaction. The study provided evidence related to the best wound dressing methods for pediatric patients with burn wounds in the study setting, Tanzania and for other related settings in sub–Saharan Africa.

Materials and methods

Study area

The study was conducted at Bugando Medical Center Burn Unit, which was officially incepted in 2015 for the purpose of providing special and comprehensive care to patients who sustained burn injuries. The burn unit has 30 bed capacity which are used by adults and pediatrics clients. Paediatric patients occupy more than 70% of bed capacity. BMC is one of the four largest referral hospitals in Tanzania which is in the Mwanza city Northern west. The hospital has a bed capacity of 1000 patients and serves as a referral centre for tertiary specialist care. The catchment population is 13 million people from Mwanza, Mara, Kagera, Shinyanga, Tabora and Kigoma regions.

Study Design, Sampling and Participation

The sample size for this study therefore was 70 and it was a hospital-based cohort study whereby data were collected retrospectively for the period of six months. Nonprobability convenience sampling was used due to limited time, budget and workforce to conduct the research. The sample size was calculated using Sample Size Calculator for prospective cohort study in comparing the two methods (Banana Leaf Dressing and Convention Dressing Materials) for this study. The outcome study population being, means of the two samples. A confidence level of 95% was determined with the power of probability of 80%, and hypothesized difference of 10 and the population variance of 1,000 *(Leahy, 2015)*. Precaution was taken to ensure that participants are not enrolled twice. A master sheet was used to cross check participants accepting and those declining to participate into the study.

Data collection, Management and Analysis

Information was collected retrospectively through sorting record from BMC burn unit discharge book register whereby identified paediatric patients with burn wounds were short listed. There after their records were further traced in their files at BMC medical record department. Here paediatric patients dressed with banana leaves dressings and those with conventional dressing materials for 5 years prior to the study period were retrieved from BMC medical records. The retrieved data from records had encompassed length of hospital stay, percentages of burn wound and reviewing wound healing process in daily ward round report from nurses and clinicians documentations in a file. Data for client satisfaction and pain and comfort level was collected by phone interview from caretakers / parents. Verbal consent was sought from the samples' care takers / parents prior to the study as indicated in methodology.

Data analysis

Data were entered into a computer using Excel 2013, cleaned and exported to STATA Version 13 and analyzed. Descriptive statistics, frequency and percentage distribution was computed to analyze the variables of sample characteristics for age, gender, care takers, place of residence, source of referral, nutritional diet, family ability to supply food, source of burn, pain during dressing removal, client satisfaction and cost for wounds dressing. Mean, median, standard deviation and interquartile range (IQR) used to describe the scores of wound healing process on Banana Leaf Dressing among patients compared to those conventional dressing materials. These included child age and sex variables. Chi – square test (x^2), logistic regression were used to determine association between dressing methods and various categorical variables. The 95% confidence interval was determined and predictors with *p – value* of less than 0.05 was considered statistically significant.

Ethical consideration

Ethical clearance for this study was sought from the joint Catholic University of Health and Allied Sciences (CUHAS)/ Bugando Medical Centre (BMC) research ethics and review committee (CREC). Ethical clearance number CREC/374/2019 was given. Permission to conduct the study sought from the Director of Bugando Medical Centre, head of the department of surgery and finally from the medical record department who gave permission to access information from pediatric patients' records those who were treated at the BMC Burn Unit. Parents, guardian or informants were requested to accept verbal informed consent for the study on behalf of the pediatric patients. They were assured that the information collected would be maintained under strict confidentiality.

Results

Social demographic characteristics of pediatric patients with burn wounds

A total of 70 children from Bugando Medical Centre participated in the study. Of these, there were 42 (60%) and 28 (40%) female and males respectively with a median age of 4 years (interquartile range of 1 to 17 years). Majority 44 (63%) were in age group from 1- 4 years, most children, 49 (70%) were taken care of by their mothers, 45 (64%) were residing in districts of Mwanza region. The most of patients 40 (57%) were referral from public health facilities. There were 64 (91%) families that were able to supply nutritious diet to their children during hospital stays for treatment (Table 1).

Table 1: Social demographic characteristics of pediatric patients with burn wounds (N=70)

Variables	Frequency (n)/Median	Percent (%)/IQR
Age	4	1 – 17
Gender		
Male	28	40
Female	42	60
Age group (Yrs.)		
1 – 4	44	63
5 – 10	23	33
11 – 18	3	4
Care takers		
Mother	49	70
Father	17	24
Others	4	6
Residence		
Mwanza	45	64
Other regions	25	36
Source of Referral		
Public HC	40	57
Private HC	8	12
Self	22	31
Nutrition diet provided by		
Hospital	2	3
Home	7	10
Both	61	87
Family ability to provide diet		
Able	64	91
Not able	6	9

Key: HC – Health Centre; No – Number; % - Percentage; YRS – Years; IQR – Interquartile range

Dressing method and age in groups

Although the choice of banana leaf dressing method is slightly higher among 1 – 4 age group and least from 11 – 18 age group; no statistically significant difference observed between choice of burn wound dressing method and age of the children (figure 1).

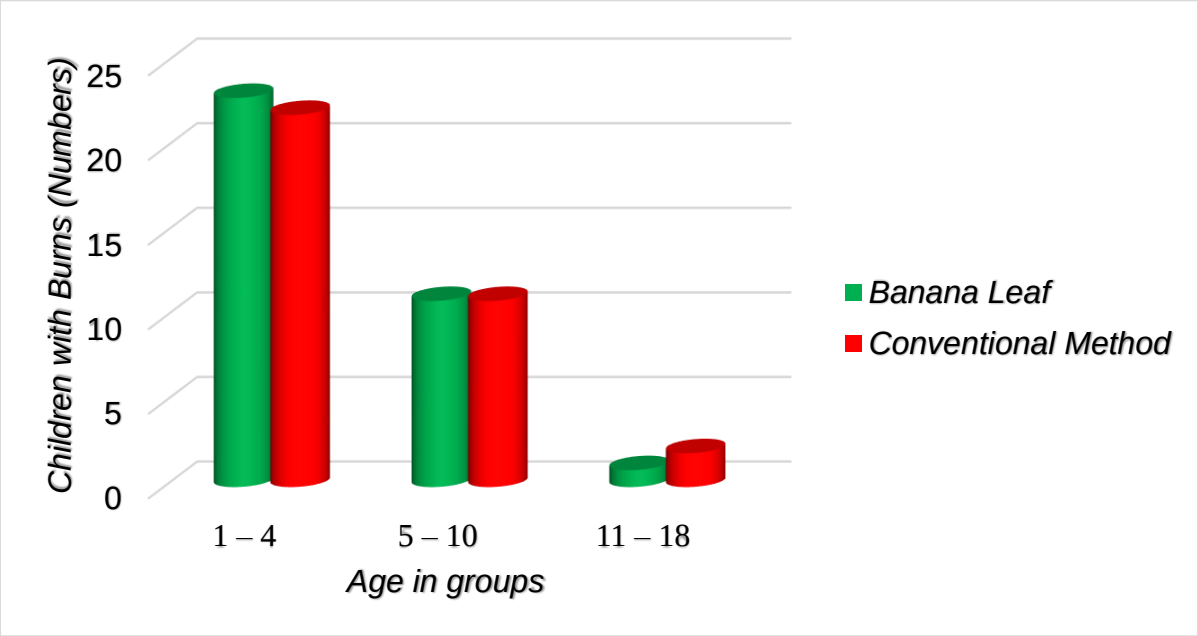

Figure 1: Choice of Dressing Method by age in groups among pediatric patient with burn wounds at BMC

Factors associated with choice of Dressing Method among pediatric patients with burn wounds at BMC.

There was no statistically significant on gender difference between male and female participants regarding the wound dressing method. Moreover, no statistically significant difference observed between choice of burn wound dressing method and Age of the child, Child's relation to caretaker and Source of Burn. In multivariate analysis after adjusting for all variables (p – value < 0.05) from the univariate regression analyses; nutrition supply was found to be associated with choice of dressing method. Pediatric children with burn who received nutrition supply from home were more likely (aOR = 3.7, 95% CI: 1.3 – 17.0, p – value 0.01) to be dressed by banana leaf than pediatric children with burn who received nutrition supply from hospital (Table 2).

Table 2: Factors associated with choice of Dressing Method among pediatric patients with burn wounds at BMC (N=70)

Variables	Dressing Method Opted									
	Banana Leaf		Conventional		Crude OR			Adjusted OR		
	No	(%)	No	(%)	OR (95% CI)		*P – Value*	OR (95% CI)		*P – Value*
Gender										
Male	14	50.0	14	50.0	1.0					
Female	21	50.0	21	50.0	1.0	0.4 – 2.6	1.00	1.1	0.3 – 4.8	0.81
Age in groups (yrs.)										
1 – 4	23	51.1	22	48.9						
5 – 10	11	50.0	11	50.0	1.1	0.4 – 2.9	0.93	0.6	0.2 – 2.5	0.50
11 – 18	1	33.3	2	66.7	2.1	0.2 – 24.7	0.55	5.9	0.1 – 274	0.35
Nutrition Supply										
Hospital	2	18.2	9	81.8						
Home	33	55.9	26	44.1	5.7	1.1 – 28.7	**0.02**	3.7	1.3 – 17.0	**0.01**
Child's relation to caretaker										
Mother	26	53.1	23	46.9						
Father	8	46.1	9	52.9	1.3	0.4 – 3.8	0.66	0.9	0.2 – 4.2	0.89
Others	1	25.0	3	75.0	3.4	0.3 – 34.8	0.31	4.6	0.2 – 108	0.33
Source of Burn										
Electricity	15	48.4	16	51.6						
Scald liquid	3	50.0	3	50.0	0.9	0.2 – 0.9	0.94	2.4	0.3 – 22.3	0.41
Hot Object	11	61.1	7	38.9	0.6	0.2 – 0.6	0.39	0.3	0.02 – 2.8	0.26
Firewood	6	40.0	9	60.0	1.4	0.4 – 4.9	0.59	2.1	0.3 – 13.2	0.43

Key: BMC – Bugando Medical Centre; CI – Confidence Interval; No – Number; OR – Odds Ratio; % - Percentage; YRS – Years

Pain level, hospital stays, Pain Management and Parents or guardian satisfaction with banana leaf dressings compared to conventional dressing materials among pediatric patient with burn wounds at BMC (N=70)

In multivariate analysis after adjusting for all significant variables (*p – value* < 0.05) from the univariate regression analyses; pain during dressing removal, level of pain during wound dressing, pain management and satisfaction of parents / guardians with dressing method were found to be associated with banana leaf dressing method.

Pediatric patients with burn who were dressed by banana leaf were less likely (aOR = 0.2, 95% CI: 0.1 – 0.5, *p – value* <0.001) to feel pain than pediatric patients with burn who were dressed by conventional methods. Compared to slight and moderate level of pain, severe pain was most likely to be felt by pediatric patients with burn who were dressed by Conventional method (*p – value* <0.001).

Furthermore, pain medication was strongly associated with dressing method of choice. Pediatric patients with burn who were dressed by banana leaf had 3 fold (aOR = 3.0,95% CI: 1.1 – 8.7, *p – value* 0.02) to receive no medication during dressing than pediatric patients with burn who were dressed by conventional method.

Again, pediatric patients with burn who were dressed by banana leaf had good satisfaction with dressing method of choice as compared to their counterpart (aOR = 85.6, 95% CI: 3.3 – 219, *p – value* <0.001). However, no difference was observed between length of hospital stay and dressing method chosen (Table 3).

Table 3: Pain level, hospital stays, Pain Management and Parents or guardian satisfaction with banana leaf dressings compared to conventional dressing materials among pediatric patients with burn wounds at BMC (N=70)

Variables	Dressing Method Opted									
	Banana leaf		Conventional		Crude OR			Adjusted OR		
	No	(%)	No	(%)	OR (95% CI)		*P – Value*	OR (95% CI)		*P – Value*
Pain during dressing removal										
Yes	21	40.4	31	59.6						
No	14	77.8	4	22.2	0.2	0.1 – 0.7	**<0.001**	0.2	0.1 – 0.5	**<0.001**
Level of Pain during wound dressing										
Slight	10	90.9	1	9.1						
Moderate	24	64.9	13	35.1	5.4	0.6 – 47.1	0.125	5.4	0.6 – 47.1	0.125
Severe	1	4.6	21	95.4	209.5	11–369.6	**<0.001**	209	11 – 369.6	**<0.001**
Pain Management										
Given	7	32.8	15	68.2						
Not Given	28	58.3	20	41.7	3.0	1.1 – 8.7	**0.04**	3.0	1.1 – 8.7	**0.02**
Duration of Hospital stay (Days)										
< 11	7	58.3	5	41.7						
11 – 20	2	66.7	1	33.3	0.7	0.1 – 10.0	0.79	0.2	0.1 – 6.2	0.29
21 – 30	7	70.0	1	30.0	0.6	0.1 – 3.5	0.57	0.5	0.1 – 5.6	0.63
>30	19	42.2	26	57.8	1.9	0.5 – 7.0	0.32	1.9	0.3 – 11.9	0.50
Satisfaction of parents/ guardians with dressing method										
Not Satisfied	4	66.7	2	33.3						
Average	3	75.0	1	25.0	0.7	0.1 – 11.3	0.77	1.0	0.1 – 23.5	0.99
Good	2	11.8	15	88.2	14.9	1.5 – 141.8	**0.02**	85.6	3.3 – 219	**<0.001**
Excellent	26	60.5	17	39.5	1.3	0.2 – 7.9	0.77	3.0	0.3 – 28.5	0.32

Key: BMC – Bugando Medical Centre; CI – Confidence Interval; No – Number; OR – Odds Ratio; % - Percentage; YRS – Years

Discussion

This is the first study on banana leaf dressings to patients with burn wound compared to convention dressing methods at Bugando Medical Centre, Mwanza, Tanzania. In our study, the median age of enrolled children was younger and most of them were females compared to a study conducted at BMC in Northern Tanzania 2011 that found majority of children who sustained burn injuries were male toddlers and accounted for 45.9% of all burn cases *(Phillipo L Chalya et al., 2011)*.

Similar studies had indicated that children between 1 year and 4 years constituted the majority of burn sufferers *(Senarath-Yapa and Enoch, 2009),(Burd and Zeng, 2021)*. The injuries caused by burns represent an extremely stressful experience and constitute a major concern in the pediatric population with respect to morbidity and mortality. Moreover, in this study the majority of the children's care takers were mothers and their places of residence were districts of Mwanza region.

Although burns were common in children, most of these happen at their residence and are largely preventable *(Van Niekerk, Rode and Laflamme, 2004)*. In this study banana leaves dressing for

children with burn wounds were compared to convention dressing methods which had been reported to be superior in outcomes of the wound healing process as reported by studies *(Ali, Abou and Bayumi, 2015)*.

Pain and improved comfort during wound dressing changes

In our study level of pain and improved comfort during dressing changes to paediatric patient with burn wounds was found to be minimal as BLD is completely non adherent compared to CDM which cause more pain and trauma when removed from the wound bed during dressing change because of its adherent properties. Furthermore, Banana leaves have wax surfaces that prevent the dressing from adhering to the wound and allow exudates to drain from wound due to slits made or cracks occurring in the leaves during the preparation process.

This study is comparable to the study done in India, whereby patients felt more pain with CDM dressing removal than with BLD removal. In all of these scores the differences observed were statistically significant with p-value <0.001 *(Das et al., 2005)(Das et al., 2005)*

Average length of hospital stays for a pediatric patient with burn wounds

Banana leaf dressing and conventional dressing methods were parallel in average length of hospital stay (ALOS) since no statistically significant difference noted. This is contrary to previous study done at Bugando Medical Centre in Mwanza; where the ALOS was 22.12 ± 16.62 days (Phillipo L Chalya *et al.*, 2011). In their study treatment of burn wound parameters were conservative (CDM) only.

The difference could be explained by the treatment parameters paediatric patients underwent. Additionally, in their study *Chalya P. L., et al;* scald was the main type of burn among children. Patients who sustained this type of burn has significant shorter length of hospital stay by fact that scald injury causes superficial burns which heal fast with no surgical intervention and therefore these patients have short hospital stay. In our study hot objects was the main leading type of burn among children which might affected the healing process.

Parents or guardian satisfaction with dressing materials used

The study showed that parents / guardians were more satisfied with BLD used to dress wound of their children as compared to CDM with p value < 0.001, which is statistically significant since BLD dressing materials are affordable, feasible, attainable, sustainable and safe to them. In addition, they are less expensive, even when required over a long period of healing time.

These findings agree with study done at Mumbai in India by *Gore M. A .,et al* on Evaluation of banana leaf dressing for partial thickness burn wounds. Department of Surgery LTMG Hospital and LTM Medical College Sion which strongly recommended the use of BLD in management of partial thickness burn wound as is cheap, suitable, effective, very simple and can be easily taught and learned *(Gore and Akolekar, 2003)*.

Conclusion

The study shows that children aged 4 years and below are commonly affected with burn. Although there is no evidence of a dressing that is best for all patients or all type of burn wounds and at all stages of healing process. This study shows that Banana Leaf Dressing for children with burns is convenient in terms of having less pain experiences and that it can be locally obtained in areas where banana plants are easily available. However, Banana leaf dressing and conventional dressing methods are parallel in average length of hospital stay (ALOS) since no statistically significant difference noted.

We recommend that there is need for more public health enlightenment on the prevention and initial intervention of burns in children. Moreover, Ministry of Health Community Development Gender Elderly and Children, Tanzania to encourage use of banana leaf dressings for burns. Additionally, further studies on its mechanism and use are needed.

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Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed equally to proposal writing, data collection, data analysis and writing of the manuscript.

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