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Effect of Various Types of Nutrition on wound healing of infant undergoing inguinal hernia Repair

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Abstract: **Merely breastfeeding has been recognized as an effective feeding for the early prevention of infant morbidity and mortality. Immunological and healing properties of breast milk are unique and help healing of the wound. The aim of the study to determine the effect of various types of nutrition on healing of the wound for infant undergoing inguinal hernia repair.**

Subjects and method: quesi experimental research design used in the study. It was conducted at pediatric surgical department at Tanta University Hospital. A convenient sample of 60 infants during their first year of life: they divided into three equal groups: Group 1: who was received breast milk, Group 2: who was received artificial milk and Group 3: received complementary feeding. Three tools used for collection of data: Assessment sheet for infant, Nutritional assessment sheet and wound healing observation schedule. The results revealed that breast-fed infants had sound wound healing, low wound inflammation and fewer gastrointestinal disturbances than infants who taken artificial and complementary feeding. Conclusion infants who taken breast milk exhibited sound healing of the wound more than who received artificial and complementary of feeding. Recommendation in-service training programs should be performed for mothers and pediatric surgical nurses about the benefits of breast feeding during infancy period.

Keywords: **Various types of nutrition - Inguinal hernia- Wound healing.**

1. INTRODUCTION

Infancy period is recognized as the critical period to stimulate child development. Early infancy is a period of many rapid changes. It includes; weight gain in the first six months of life primarily comprises gain in fat, whereas fat-free mass accumulates faster Infancy period is important stage of development that forms the basis for children's future health. During the first year of life, nutrition is essential for growth and development. Infants need adequate calories, protein, and other nutrients to grow which effectively established through breast feeding [(1)]

The World Health Organization (WHO) states that 'breastfeeding is an unequalled source of providing ideal nutrition for the healthy growth and development of infants'. Breastfeeding is essential to infants, parents, and society, and is showed as the biological and social standards for infant. Breast feeding still the optimal source for nutritional support for infant health. Some of health organizations, including the American Academy of Pediatrics (AAP), and the American Medical Association (AMA), recommend breastfeeding as the better choice for newborn and infant. Breastfeeding helps defend against infections, prevent allergies, protect against some of chronic conditions, quick surgical wound healing. . [(2, 3)]

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In United States more than 23,000 infants died in 2013. The leading cause from congenital malformations (which the most of them were treated surgically) considered for 20% of all infant deaths. The most common surgeries in infancy period are congenital hernia especially inguinal hernia & neonatal intestinal obstruction. [4]

Inguinal hernia is common anomalies require surgical intervention in the early years of life. The prevalence of inguinal hernias is nearly 3 to 5% in full term infants and 13% in preterm infants born at less than 33 weeks of gestational age. Inguinal hernias in full term & preterm infants are usually managed shortly after diagnosis to prevent incarceration of inguinal hernia and rapid healing of the wound. [5]

Inguinoscrotal hernia is one of the common congenital anomalies in infancy and childhood period over the world. Delay in diagnosis and management leads to loss of testis function , ovaries or part of bowel to incarceration or strangulation.The childhood inguinal hernias are generally more predominant on the right side and this has been leading to the delay in descent of the right testis.[5]

Right-sided hernias are more common. Boys are affected around 10 times more often than girls; 99% of inguinal hernias in children are of the indirect type. Inguinal hernias described as intermittent, usually reducible, lump in the groin & are painless. Inguinal hernias are not resolve spontaneously and must be repaired surgically shortly after diagnosis on an elective basis. The definitive treatment for inguinal hernia is early operation, a herniotomy. This will decrease risks of incarceration with its attendant complications such as obstruction and strangulation. Surgery, however, should still be arranged as soon as possible in an otherwise healthy infant. Laparoscopic inguinal hernia repair (LIHR) is safe and effective. It helps the surgeon to discover and repair all forms of inguinal hernia. [6, 7]

Wound healing process occurs by interference sequence of events including cellular migration, proliferation and solutes factors such as growth factors, cytokines and matrix contents that act to repair tissue. The healing response can be described in four phases as homeostasis, inflammation, proliferation, and remodeling phase. [8]

Wound healing proceeds rapidly and efficiently in a physiologic environment lead to tissue regeneration and repair. Many factors can impair the process of wound healing. The factors that affect healing of the wound can be classified into local and systemic factors. Local factors are those that directly influence the characteristics of the wound itself, while systemic factors are the overall health or disease states of the infant that affecting ability for wound healing. [9]

Optimal Nutrition is a vital factor to the quality of outcomes following pediatric surgeries and the nurse role is very important to emphasis that the infant receives the needed nutrition according to requirements and to provide supplements according to the surgeon order. [10]

Aim of the study to:

Determine the effect of various types of nutrition on healing of wound for infant undergoing inguinal hernia repair.

Research hypothesis:

Infant who receive breast milk exhibit to be rapid healing of wound than who received artificial and complementary feeding

2. SUBJECTS AND METHOD

Research design

Quesi experimental research design was used in the study.

Setting:

The study conducted at Pediatric Surgical Department at Tanta University Hospital

Subjects:

A convenient sample of 60 infants with inguinal hernia was classified into three groups according to power analysis.

Group (1): Consist of 20 Infants who was received breast milk.

Group (2): Consist of 20 Infants who was received artificial milk.

Group (3): Consist of 20 Infants who was received complementary feeding (breast and artificial milk).

Inclusion criteria:-

Both sexes, full term infant up to one month.

Had inguinal hernia (right, left, and bilateral)

Free from medical problems such as diabetes and heart disease.

Free from associated congenital anomalies.

Tools of data collection:

Three tools were used for data collection:

Tool I: Structure Interview schedule: It was developed by the researcher after reviewing of literature and consisted of three parts:

Part I:-a-Socio-demographic characteristics about the infant such as age, sex, gestational age, birth weight, birth order residence and current weight,

b- Socio-demographic characteristics of the mother such as age, educational level, occupation and family size

Part II: Infant's Food consumption pattern (preoperative and postoperative) such as, the mother feeds' the infant (on demand-on schedule), average feeds number / day, average duration of sucking every feeding in minutes

Part III: Feeding problems: presence of problems such as vomiting, colic, difficult in sucking, swallowing, dryness mouth, oral rash.

Tool II: Nutritional Assessment sheet: It was modified by the researcher after reviewing of literature and reviewed by supervisors. It consisted of four parts:

Part one: Physical assessment of the infants

It was divided into:

- Physiological measurements: as body temperature, pulse and respiration
- Anthropometric measurements schedule was taken on the first day, seventh, fourteenth & 21st post-operative days to assess infants' growth parameters as length, weight, and head, mid arm circumference, chest, abdominal circumference and body mass index. Each measurement was performed according to standard recommended by World health organization (2010)[(11)]
- General appearance assessment which included: Assessment of the infant from head to toe as hair , fontanel's , face , eyes, nose , mouth, teeth , tongue, neck, chest , heart, abdomen, skeletal system and urinary system assessment was done.
- **Part two : Daily intake chart of infant feeding** :It was assessed after starting feeding until discharge such as the number and method of feeding /day was taken and reassessed during follow up at seventh, fourteenth & 21th postoperative days, weight of the infant was taken daily after feeding until discharge.

Part three: Laboratory investigation which included: It was used to assess the following component; Total serum protein, Complete blood count as hemoglobin, red blood cell , white blood cell and Hematocrit. Blood urea and blood glucose level, electrolytes as potassium and sodium.

Tool III: Wound healing observation schedule: It included surgical healing of wound criteria; length of the wound, width of the wound, sound healing, occurrence of wound inflammation, redness , presence of wound discharge and occurrence of wound complications as wound gapping, abdominal burst and /or incisional hernia.

Method

The study was performed through the following steps:

1-An official permission to conduct the study was taken from the responsible authorities.

2- Mothers consent for participation was obtained after explaining the study aim.

3-Ethical consideration: Mothers were informed about the confidentiality of the information taken from them and nature of the study.

4-Content validity: Tools of the study tested for content validity by experts in the field of pediatrics. Modifications were carried out accordingly.

5-Pilot study: A pilot study was carried out before starting the data collection. It was done for tools and the required changes were done accordingly.

6- Study development through using three tools (I,II ,III)

7- Implementation of the study

Each mother and her infant who meet the inclusion criteria of the studied sample were interviewed with the researcher.

- The studied infants were classified according to type of nutrition into three groups: breast feeding group, artificial feeding group who received artificial milk and complementary feeding group who received both breast and artificial milk.
- The field work was carried out through a timeline of nine months from October 2015 to June 2016 .
- The time was taken for filling each sheet ranged from 20-30 minutes that is depending upon the response of the mother and the infant status.
- The mother was asked about socio-demographic and clinical data of the infant.
  - Then the mother was asked about infants' food consumption pattern (preoperative &postoperative).
  - Anthropometric measurements of the studied infants in the three groups were recorded and reassessment during follow up at seventh, fourteenth and 21st days of operation which including; weight , chest circumference head circumference, length ,mid arm circumference, , abdominal circumference and triceps skin fold thickness.
- All the studied infants were subjected to complete physical examination by the researcher observation and asking mother during the first day from infants' operation and reassessment during follow up at seventh, fourteenth and 21st days of operation with special attention to: assessment of face, eyes, mouth, vital signs and gastrointestinal tract.
- The dietary intake was assessed as the type of milk, average numbers of feeding per day and average duration of sucking every feeding was taken. These data were collected by asking the mother, and average of intake was taken after discharge during follow up at seventh, fourteenth and 21st postoperative days.
- Observation sheet was developed to assess healing of the wound using surgical healing of the wound criteria (length, width, sound healing, occurrence of wound redness or inflammation, presence of discharge, occurrence of wound complications.

3. STATISTICAL ANALYSIS

Statistical analysis:

The collected information was organized, tabulated and statistically analyzed using SPSS software (Statistical Package for the Social Sciences, version 16, SPSS Inc. Chicago, IL, USA). Using F value of ANOVA test, Kruskal-Wallis (X 2 values) was calculated. Friedman test was calculated for non parametric data. Significance was adopted at $p<0.05$ for interpretation of results of tests of significance.

Results:

Table (1) Demonstrates percent distribution of the studied infants who received various types of nutrition according to sociodemographic characteristics. It was found that the mean infant age (in months) was 3.71±1.14, 4.07±1.22 and

8.93±1.37 for infants who received breast feeding, artificial feeding and complementary feeding respectively. As regards to their sex, it was noticed that nearly three quarter (75 %, 70 %, 70%) who received various types of nutrition respectively were males, Regarding their birth order, the results revealed that nearly two third (60%,65%,60%) who taken various types of nutrition respectively were among the second infant. Regarding the infant birth weight, it was noticed that mean birth weight was (3366±323.71, 3348±395.28 and 3292±285.77) for infants who received breast feeding, bottle feeding and complementary feeding respectively.

Table (2) Clarifies preoperative pattern of food consumption of infants' received various types of nutrition. It was found that (90%, 75%, and 80 %) of infants' received various types of nutrition respectively feeding on their demand. As regard feeds' number of /day, it was noticed that (70%, 75%, 65%) of the studied infant respectively received 7-10 feeds /day. Moreover, it was observed that (80%, 65%, 70%) respectively of them taken 7-10 minutes of sucking every feeding.

Table (3) Show postoperative physiological measurements regarding temperature, pulse and respiratory rates among the studied infants who received various types of nutrition. It was found that there was no statistical significant difference between infants of the breast and bottle feeding groups regarding change of temperature, pulse and respiratory rate throughout 21 day postoperative. (P value = 0.0001)

Table (4) Demonstrates postoperative anthropometric measurements regarding body weight, length, head and chest circumferences, mid arm, abdominal circumferences and triceps skin fold thickness of the studied infants who received various types of nutrition. It was observed that there was statistical significant difference with (P value = 0.0001) among infants of the three groups during 1st, 7th, 14th and 21st day. Specifically for complementary feeding.

Table (5) Demonstrates postoperative feeding intake of the studied infants who receive various types of feeding. Concerning the duration of sucking, numbers of feeds There was statistical significant difference with (P value = 0.030 &.0001) among infants of the breast and bottle feeding groups respectively. In relation to number of other food intake per day, There was statistical significant difference with (P value = 0.0001) among complementary feed infants during the postoperative follow up.

Table (6) represents Postoperative occurrence of gastrointestinal disturbance (vomiting and diarrhea) among the studied infants who received various types of feeding. The results revealed that 35% among breast fed infants complained from post operative vomiting, out of them (57 %) had 3-4 episodes of vomiting during first 21 day post operative compared to that 30% among bottle fed infants complained from post operative vomiting out of them 83% with episodes 5-6, While 10% among infants of complementary fed group complained from post operative vomiting with 3-4 episodes of vomiting. There was statistical significant difference with (P value = 0.016) among infants of the three groups regarding the number of vomiting episodes.

Moreover, this table showed that there was statistical significant difference with (P value =0.019) among the three groups regarding Occurrence of diarrhea during 21st day. The results also clarified that the only 15% of breast fed infants complained from postoperative diarrhea compared with 40% and 45% among infants of bottle and complementary fed groups respectively.

Table (7) presents laboratory investigation data of the studied infants who received various types of feeding. It was observed that there was statistical significant difference with (P value = 0.015) among infants of the three groups regarding red blood cell count. This table clarified that there was statistical significant difference with (P value = 0.032) among the three groups regarding hemoglobin level.

In relation to white blood cell count, it was noticed that mean values of white blood cell count were (9.35±2.01, 8.50±1.76 and 9.16±1.62) in breast, bottle and complementary fed .The current table also showed that there was statistical significant difference with (P value = 0.0001) among infants of the three groups regarding hematocrite level. As illustrated in figure (15).Concerning total serum protein level, it was observed that mean values of total serum protein were (6.44±0.44, 6.30±0.44 and 6.20±0.41) in breast, bottle and complementary fed infants respectively.

Table (8) demonstrates postoperative wound healing regarding length and width of wound among the studied infants who received different types of feeding. It was noticed that there was statistical significant difference with (P value = 0.007,

0.008, 0.012 and 0.013) among infants of the three groups regarding wound length in the 1st, 7th , 14th and 21st day of follow up.

In relation to the wound width, the result of the study revealed that mean values of wound width among breast fed infants were (0.40±0.15) in the 7th day, which decreased to (0.24±0.13) in the 14th day and decreased to (0.22±0.06) in 21st day. On the other hand, mean values of wound width among bottle fed infants were (0.62±0.23, 0.44±0.15 and 0.27 ± 0.04) and in comparison with (0.65±0.12, 0.45±0.14 and 0.26±0.08) among complementary fed infants in the 7th, 14th and 21st day respectively.

Table (9) showed Postoperative wound healing signs among the studied infants who received various types of nutrition. It was found that there was no statistical significant difference with (P = 0,167) among infants of the three groups regarding sound healing. It was observed that there was statistical significant difference in breast feeding group (P=0, 0001) regarding sound healing of the wound through 7th, 14th and 21st day post-operative. Moreover, it was observed that there was statistical significant difference with (P=0.012) among the three groups regarding wound inflammation. Also, it was noticed that percentage of wound inflammation in 21st day post-operative was the same 20 % in both breast fed infants in comparison with 24% in complementary fed group respectively.

Regarding wound discharge, this table illustrated that only 10% , 15%, and 5% of infants in breast feeding group had wound discharge from some wound sutures in the 7th day, 14th day,21th days post-operative respectively in comparison with (25% , 15% & 5%) (20%, 25%&5%) of infants in both bottle and complementary fed group respectively. Concerning wound gapping, it was evident that, there was no statistical significant difference among the infants of three groups regarding wound dehiscence in respect with that the results revealed that 5% of infants in breast feeding group had wound gapping of some wound sutures in the 14th day post operative in comparison with triple of this percentage (15%) of infants in bottle and 20% in complementary fed group.

Table (1): Percent distribution of the studied infants who received different types of feeding according to sociodemographic characteristics.

Different types of feeding	Group 1 (Breast feeding) (n=20)		Group 2 (Bottle feeding) (n=20)		Group 3 (Complementary feeding) (n=20)	
	No	%	No	%	No	%
Age (months):						
1-<4	11	55%	8	40%	5	25%
4-<7	9	45%	12	60%	0	0
7-<10	0	0	0	0	9	45%
10-12	0	0	0	0	6	30%
Mean ± SD	3.71±1.14		4.07±1.22		8.93±1.37	
Sex:						
Males	15	75%	14	70%	14	70%
Females	5	25%	6	30%	6	30%
Birth order:						
First	4	20%	5	25%	3	15%
Second	12	60%	13	65%	12	60%
Third	2	10%	1	5%	3	15%
Fourth	2	10%	1	5%	2	10%
Gestational age (weeks):						
37-38	4	20%	13	65%	10	50%
39-40	13	65%	7	35%	9	45%
41	3	15%	0	0	1	5%
Birth weight (gm):						
2750-<3000	1		2		0	0
3000-<3750	18		16		20	100%
3750-4000	1		2		0	0
Mean ± SD	3366±323.71		3348±395.28		3292±285.77	

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Table (2): Percent Distribution of the studied infants who received various types of nutrition according to Pattern of Food consumption preoperative

Food consumption pattern preoperative	Group 1 (Breast feeding) (n=20)		Group 2 (Bottle feeding) (n=20		Group 3 (Complementary feeding) (n=20)	
	No	%	No		No	%
Pattern of infant feeding:						
On demand of infant	18	90%	15	75%	16	80%
On schedule/ 2hours	2	10%	5	25%	4	20%
Number of feeds/day:						
1-6	0	0	5	25%	5	25%
7-10	14	70%	15	75%	13	65%
11-13	6	30%	0	0	2	10%
Duration of sucking every feeding in minutes:						
-6	4	20%	7	35%	6	30%
-10	16	80%	13	65%	14	70%

Table (3) :Percent distribution of the studied infants who received various types of feeding according to Physiological measurements postoperative

Physiological measurements	Physiological measurements of the studied infants postoperative (n=60)			F value	P
	Group 1 (Breast feeding) (n=20)	Group 2 (Bottle feeding) (n=20)	Group 3 (Complementary feeding) (n=20)		
	Mean±SD	Mean±SD	Mean±SD		
▪Pulse rate (b/min):					
1st day	138.00±7.90	138.32±5.22	126.60±6.71	24.827	0.0001*
7th day	139.72±6.84	138.32±4.12	127.36±7.07	30.201	0.0001*
14th day	138.80±6.05	137.60±4.37	125.56±6.97	38.571	0.0001*
21th day	138.84±5.34	137.16±3.95	126.44±7.53	33.645	0.0001*
χ^2 value P	8.367 0.039*	7.892 0.048*	6.100 0.107		
▪Respiratory rate(/min):					
1st day	38.12±3.19	36.84±4.36	29.68±3.30	6.542	0.0001*
7th day	39.08±3.08	36.92±3.36	30.20±3.85	6.569	0.0001*
14th day	39.16±2.32	36.16±4.32	29.16±4.13	5.858	0.0001*
21th day	38.84±2.37	35.64±4.13	29.20±3.39	6.024	0.0001*
χ^2 value P	4.936 0.177	4.218 0.239	7.927 0.048*		
▪Temperature:					
1st day	36.94±0.34	37.01±0.36	37.11±0.37	1.456	0.240
7th day	37.22±0.42	37.21±0.41	37.29±0.42	0.278	0.758
14th day	37.21±0.24	37.20±0.32	37.22±0.26	0.012	0.988
21th day	37.26±0.28	37.12±0.33	37.23±0.29	1.678	0.194
χ^2 value P	12.211 0.007*	4.444 0.217	3.431 0.330		

***Significant difference at (P<0.05)**
χ^2 value of Freedman test#χ^2 value of Kruskal Wallis test

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Table (4): Mean distribution of the studied infants who received various types of feeding according to anthropometric measurements postoperative

Anthropometric measurements (Weight &length)	Anthropometric measurements of the studied infants postoperative (n=75)			F value	P
	Group 1 (Breast feeding) (n=20)	Group 2 (Bottle feeding) (n=20)	Group 3 (Complementary feeding) (n=20)		
	Mean±SD	Mean±SD	Mean±SD		
Body weight (kg):					
1st day	6.82±0.97	7.16±0.79	9.12±0.95	46.783	0.0001*
7th day	6.70±1.04	7.01±0.81	8.98±1.03	40.540	0.0001*
14th day	6.72±1.05	6.92±0.89	8.96±1.03	39.045	0.0001*
21th day	6.85±1.02	7.00±0.89	7.00-11.00 9.04±1.04	38.555	0.0001*
χ^2 value P	12.962 0.005*	19.800 0.0001*	9.725 0.021*		
Body length (cm):					
1st day	61.20±2.31	63.00±2.96	69.40±2.60	66.864	0.0001*
7th day	61.20±2.31	63.00±2.96	69.40±2.60	66.864	0.0001*
14th day	61.20±2.31	63.00±2.96	69.40±2.60	66.864	0.0001*
21th day	61.20±2.31	63.00±2.96	69.40±2.60	66.864	0.0001*
Mid arm circumference (cm):					
1st day	17.98±1.57	18.20±0.97	20.60±1.82	23.506	0.0001*
7th day	17.86±1.67	18.02±1.05	20.46±1.95	20.663	0.0001*
14th day	17.90±1.68	17.94±1.12	20.44±1.96	19.971	0.0001*
21th day	18.03±1.63	17.98±1.11	20.52±2.04	19.604	0.0001*
χ2 value P	13.699 0.003*	21.000 0.0001*	8.165 0.043*		

***Significant difference at (P<0.05)**
χ2 value of Freedman test
#χ2 value of Kruskal Wallis test

Table (5): Percent distribution of the studied infants who received various types of nutrition according to feeding intake postoperative

Feeding intake	Group 1 (Breast feeding) (n=20)							Group 2 (Bottle feeding) (n=20)							Group 3 (Complementary feeding) (n=20)						
	7th day:		14th day		21st day		χ^2 P	7th day:		14th day		21st day		χ^2 P	7th day:		14th day		21st day		χ^2 P
	No	%	No	%	No	%		No	%	No	%	No	%		No	%	No	%	No	%	
Duration of suckling every feeding (min):																					
4-6m	2	10.0	0	0	0	0	15.634	12	60.0	7	35.0	5	25.0	6.853	15	75.0	11	55.0	6	30.0	7.023
7-9	16	80.0	15	75.0	6	30.0	0.002*	8	40.0	13	65.0	15	75.0	0.030*	5	25.0	9	45.0	12	60.0	0.134
10-12	2	10.0	5	25.0	14	70.0		0	0	0	0	0	0		0	0	0	0	2	10.0	-
χ^2 P	20.434 0.0001*		30.817 0.0001*		38.278 0.0001*																
Number of feeds / day:																					
4-5	6	30.0	2	10.0	1	5.0	13.548	15	75.0	4	20.0	3	15.0	24.028	12	60.0	8	40.0	6	30.0	6.699
6-7	10	50.0	10	50.0	6	30.0	0.009*	4	20.0	14	70.0	12	60.0	0.0001*	4	20.0	5	25.0	5	25.0	0.147
8-10	4	20.0	8	40.0	13	65.0		1	5.0	2	10.0	5	25.0		4	20.0	7	35.0	9	45.0	-
χ2 P	8.620 0.071		9.902 0.042*		11.712 . 0.020*																
Number of other food intake / day:																					
0	20		100	20	100	20	100	-	20	100	20	100	20	100	-	6	30.0	2	10.0	0	0	74.000
1															-	6	30.0	2	10.0	2	10.0	0.0001*
2																6	30.0	10	50.0	8	40.0	
3																2	10.0	6	30.0	10	50.0	
χ^2 P	- -		- -		21.889 0.001*																

***Significant difference at (P<0.05)**

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Table (6): Percent distribution of the studied infants who received various types of nutrition according to occurrence of gastrointestinal disturbance Postoperative

Complain of vomiting and diarrhea postoperative	Group 1 (Breast feeding) (n=20)		Group 2 (Bottle feeding) (n=20)		Group 3 (Complementary feeding) (n=20)		χ^2	P
	No	%	No	%	No	%		
Complain of vomiting during first 21 day:								
No	13	65%	14	70%	18	90%	2.591	0.274
Yes	7	35%	6	30%	2	10%		
-If yes, number of vomiting episodes:								
3-4	3	43%	1	17%	2	100%	12.16	0.016*
5-6	4	57%	5	83%	0	0		
7	0	0	0	0	0	0		
Complain of diarrhea during first 21 day:								
No	17	85%	12	60%	11	55%	7.958	0.019*
Yes	3	15%	8	40%	9	45%		
-If yes, number of diarrhea episodes:								
2-4	1	33%	1	12.5%	2	22%	6.125	
5-6	2	67%	7	87.5%	6	67%		
8	0	0	0	0	1	11%		

***Significant difference at (P<0.05)**

Table (7): Mean distribution of the studied infants who received various types of nutrition according to laboratory investigation

Preoperative laboratory investigations	Physiological measurements of the studied infants postoperative (n=60)			F value	P
	Group 1 (Breast feeding) (n=20)	Group 2 (Bottle feeding) (n=20)	Group 3 (Complementary feeding) (n=20)		
	Mean±SD	Mean±SD	Mean±SD		
▪Complete blood cell count (CBC):					
-Red blood cell count (*10^6)	4.31±0.24	4.14±0.25	4.13±0.28	4.349	0.016*
-Hemoglobin (gm/dl)	13.16±1.16	12.29±1.13	12.43±1.04	3.580	0.033*
-White blood cell count (WBC) (*1000)	9.35±2.01	8.50±1.75	9.16±1.61	1.132	0.318
-Hematocrite value (%)	41.55±1.31	40.18±1.30	38.46±1.07	38.150	0.0001*
▪Total serum protein (gm/dl)	6.44±0.43	6.30±0.44	6.20±0.40	1.943	0.150

***Significant difference at (P<0.05)**

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Table (8): Mean distribution of the studied infants who received various types of nutrition according to Postoperative wound healing criteria

Postoperative wound healing	Group 1 (Breast feeding) (n=20)	Group 2 (Bottle feeding) (n=20)	Group 3 (Complementary feeding) (n=20)	F value	P
	Mean±SD	Mean±SD	Mean±SD		
▪Wound length (cm):					
1st day	4.61±0.77	5.25±1.59	5.83±0.47	5.226	0.007*
7th day	4.59±0.78	5.23±1.61	5.80±1.49	5.016	0.008*
14th day	4.42±0.81	5.01±1.62	5.59±1.50	4.620	0.012*
21th day	4.30±0.79	4.79±1.51	5.42±1.51	4.522	0.013*
χ^2 value P	64.205 0.0001*	68.057 0.0001*	60.880 0.0001*		
Change of wound length after 21 days	↓0.50-0.00 ↓0.30±0.10	↓3.00-↓0.20 ↓0.46±0.54	↓0.60-0.00 ↓0.40±1.59		
#χ^2 value P	9.923 0.007*				
▪Wound width(mm):				χ^2 value	P
1st day	0.00	0.00	0.00	-	-
7th day	(n=3) 0-0.60 0.40±0.15	(n=8) 0-0.90 0.62±0.23	(n=7) 0-0.90 0.65±0.12	0.430	0.109
14th day	(n=3) 0-0.40 0.24±0.13	(n=7) 0-0.70 0.44±0.15	(n=7) 0-0.70 0.45±0.14	4.971	0.083
21th day	(n=2) 0-0.30 0.22±0.06	(n=4) 0-0.30 0.27±0.04	(n=5) 0-0.40 0.26±0.08	1.228	0.539
χ^2 value P	5.626 0.060	10.000 0.007*	11.273 0.004*		

NB. Zero in wound width means closed or not opened wound
***Significant difference at (P<0.05)**
χ2 value of Freedman test
#χ2 value of Kruskal Wallis test

Table (9):Percent distribution of the studied infants who received various types of nutrition according to Postoperative wound healing signs

Postoperative wound healing Signs	Group 1 (Breast feeding) (n=20)							Group 2 (Bottle feeding) (n=20)							Group 3 (Complementary feeding) (n=20)						
	7th day:		14th day		21st day		χ^2 P	7th day:		14th day		21st day		χ^2 P	7th day:		14th day		21st day		χ^2 P
	No	%	No	%	No	%		No	%	No	%	No	%		No	%	No	%	No	%	
Sound healing:																					
No	0	0	1	5.0	1	5.0	20.973	3	15.0	1	5.0	0	0	9.071	2	10.0	0	0	0	0	6.422
Yes (some sutures)	12	60.0	3	15.0	1	5.0	0.0001*	7	35.0	6	30.0	3	15.0	0.059	7	35.0	9	45.0	6	30.0	0.167
Yes (All sutures)	8	40.0	17	76.0	18	90.0		10	50.0	13	65.0	17	75.0		11	55.0	11	55.0	14	70.0	
χ^2 P	5.124 0.275		3.172 0.529		6.206 0.184																
Wound inflammation:																					
No	7	35.0	13	65.0	16	80.0	21.130	7	35.0	14	70.0	15	75.0	16.065	10	40.0	14	56.0	19	76.0	12.623
Yes (some sutures)	12	60.0	7	35.0	4	20.0	0.0001*	7	35.0	5	25.0	5	25.0	0.003*	11	44.0	11	44.0	6	24.0	0.012*
Yes (All sutures)	1	5.0	0	0	0	0		6	30.0	1	5.0	0	0		4	16.0	0	0	0	0	
χ^2 P	6.889 0.142		5.370 0.251		1.230 0.541																
Wound Discharge:																					
No	18	90.0	17	85.0	19	95.0	3.640	15	75.0	17	85.0	20	100	9.130	16	80.0	15	75.0	19	95.0	6.500
Yes (some sutures)	2	10.0	3	15.0	1	5.0	0.162	5	25.0	3	15.0	0	0	0.010*	4	20.0	5	25.0	1	5.0	0.039*
χ^2 P	1.190 0.551		2.810 0.245		1.027 0.598																
wound gapping:																					
No	18	90.0	19	95.0	18	90.0	0.600	17	85.0	17	85.0	17	85.0	1.190	15	75.0	16	80.0	18	90.0	0.510
Yes (some sutures)	2	10.0	1	5.0	2	10.0	0.742	3	15.0	3	15.0	3	15.0	0.551	5	25.0	4	20.0	2	10.0	0.773
χ^2 P	1.190 0.551		2.182 0.336		1.230 0.541																

***Significant difference at (P<0.05)**

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4. DISCUSSION

American Academy of Pediatrics (2016) reported that inguinal hernia is a common congenital anomalies requiring surgical repair in the childhood period. The occurrence of inguinal hernias is nearly 3% to 5% in full term infants and 13% in preterm infants born at less than 33 weeks of gestational age. It commonly repaired shortly after diagnosis to avoid incarceration of the hernia. [12]

The present study is figuring out that, most of infant with inguinal hernia were male, it may be due to the development and descent of the testes. The testes develop within the abdomen then descend into the scrotum, they pass through the inguinal canal reach the scrotum, and the opening behind it should be close. Failure to close completely results in a hernia with an opening still in the abdominal wall at this point .or it may be owing to that the diagnoses of most of infants with congenital anomalies are more common in boys than girls. This result was in agreement with Shah and Pensi (2013) who found that incidence of congenital anomalies was high in male babies than female. Also it was supported by Tanwani R, et al (2016) who found that 53 children were males and 7 children were females, thus making a male to female ratio of 7.5:1. [13, 14]

Feeding during infancy period is a complex activity requiring efficient coordination between the rhythmic processes of sucking, swallowing, and respiration. It was observed that the number of sucking in the exclusive breastfeeding group and the bottle feeding group, we saw a statically significant difference. In the complementary feeding group of infant, the number of sucking every minute was in the middle of both exclusive feeding and artificial feeding groups. [15]

The present study clarified that breast fed infants had longer duration of sucking than bottle and complementary fed infant. In addition, It was found that more than two third of the breast feeding infants received the highest number of feeds per day than bottle and complementary fed infant , It may be explained on the basis that breastfed infants have less difficulty with digestion of fat than formula-fed infants. Results of the present study were in harmony with **Moral et al (2010)** who mentioned that the bottle-fed infants showed fewer number of feeding and shorter duration of sucking, fewer pauses compared to breast-fed infants. [16]

Breast milk is the healthiest food for young infant and is ideal for optimal growth &development of the central nervous system because it contains nutrients such as n-3 polyunsaturated fatty acids and antibodies. Breast fed infants were at an advantage as far as gross and fine motor skills, body composition, brain development, and were also at lesser risk for future problems, such as obesity and cow's milk allergy and is less likely to be contaminated by bacteria or other non-nutrient substances. Therefore, promotion of merely breastfeeding should be a priority. [17]

This study demonstrated that growth measurements of the breast-fed infants showed low mean values in comparison to length, weight, and head circumference of the artificially fed infants. This may be due to that breast fed infants stop feeding when they're pleased, than formula-fed infants who may be coaxed to terminus the bottle and result in getting more food which lead to increase level of growth,. Also, formula has a different protein composition than breast milk which can cause changes in the body's metabolism and increase body mass index.

This result was incongruent with **Haroldo et al (2013)** who reported that the weight, head circumference, length, and chest circumference of the breast-fed infants showed high mean values in comparison to anthropometric measurement of the artificially fed infants. Exclusive breastfeeding for ≥4 months was associated with a increased in growth measurement.[18]

This study also showed that breast-fed infant returned to their weight during the period of follow up postoperatively after temporary loss in their weight postoperatively contrary to bottle fed infants who experienced more loss of weight and didn't return it quickly. These differences could be explained on the basis that breastfed infant had fats and proteins in breast milk are more easily broken down than the fats and proteins in formula, so they are absorbed and used more quickly, or it may be due to the gastroenteritis that occurs in infants who taken artificially feeding more than infants who taken breast-feeding. This finding was in agreement with **Browne et al (2010)** who reported that Breast milk feeding for twelve weeks after hospital discharge resulted in increased rates of growth during infancy than with unfortified breast milk. [19]

The results of the present study clarified that of breast fed infants had lower gastrointestinal disturbances than bottle and complementary fed infants. It may be owing to the defensive factors and the macrophages in breast feeding that prevent occurrence of gastrointestinal tract infection and protect the intestinal mucous membrane. Also, lack of bottle feed mothers' knowledge, lack of commitment during formula preparation such as excessive dilution of formula and using unsterile techniques such as sterilization of bottle, hand washing and boiling of water increase liability for gastrointestinal disturbance.

This result was in agreement with **Sheela et al (2016)** who mentioned in his study that longer duration of breast feeding were associated with lower diarrheal episodes and longer formula feeding duration was associated with increased risk of diarrhea and concluded that breast fed infants had fewer disturbances in gastrointestinal tract., this result was consistent with **Arthur and Richard (2012)** who reported that any breastfeeding is accompanied with a sixty four percent reduction in the incidence of gastrointestinal tract infections, and this effect taken two months after cessation of breastfeeding. [20, 21]

Results of the present study revealed that there was statistical significant difference among the three groups regarding hemoglobin level. Breast fed infants had increased level of hemoglobin concentrations than infants in both bottle and complementary feeding groups in the first six months of life. It may be due to that anemia in the breastfed infant is uncommon because healthy full term infant has iron preservation at birth enough to last for at least 6 months of life.

This result was in agreement with **Eid. (2017**) who mentioned that iron in human milk is well absorbed as opposed as iron-fortified formula, the high lactose and vitamin C levels in human milk aid the metabolism of iron, Breast milk contains a protein called lactoferrin that attached to any extra iron that the infant doesn't use and also, low hemoglobin levels in infants older than six months may be due to too early given of non-iron rich complementary feeding and inappropriate weaning practices. This result was incongruent with **Kangethe (2015)** who studied anemia among breast feeding infants concluded that fully exclusively breastfed infants are also at risk for lower in hemoglobin concentration. Infants who are breast-fed past six months are at increased risk for anemia later in infancy. [22, 23]

The results of the present study showed that the healing process occurred rapidly with correct manner and clarified that breast-fed infants had high percentage of sound healing during the three times of post operative follow up and lower rates of wound infection than bottle and complementary fed infants. These results may be related to that breast milk rich in antibodies, living white blood cells, immunoglobulin that reach naturally to infants from the mother during the breast-feeding and these antibodies are not present in artificial milk. Also breast fed infants had increased values of blood hemoglobin and serum protein which is needed for sound wound healing. This finding also was in line with **Allam et al (2015)** who mentioned that anti inflammatory substances in human milk play an indirect anti inflammatory role by promoting the growth and distinguish of epithelial barriers which prevent penetration of micro organisms and therefore prevention of infection.[24]

The present study also revealed that breast-fed infants had lower inflammation of the wound than artificially fed and complementary fed infants. It could be attributed to the fact that breast milk contains enough concentrations of all nutritional substances that are essential for healing. It contains growth factors which have magnitude for muscle and cartilage repair characteristics and is needed during proliferation phase of wound healing.

The present study was in agreement with **Ahmed et al (2013)** who stated that very high statistically significant difference was found between occurrence of inflammation of breast-fed and artificially fed infants' wounds after seventh and fourteen postoperative days respectively. The majority of formula feeding infant's wounds were inflamed, while lower than one third of breast milk feeding infants' wounds were inflamed during first follow up. On the other hand nearly half of formula fed infants' wounds were inflamed, while only 8% of breast milk feeding infants' wounds were inflamed during the second follow up. [25]

5. CONCLUSION

Based on the findings of the present study, it can be concluded that Infants who received exclusive breast milk exhibit rapid healing of wound, lower wound inflammation and fewer occurrence of gastrointestinal tract disturbances more than who received artificial and complementary nutrition.

Recommendation:

The findings of the present study recommend:

In-service training programs should be performed for pediatric surgical nurses about the advantages of breast feeding and the needed nutrients for sound wound healing.

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