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Case Study

Nutrition Care Process in Pediatric Patients with Burn Injury Post Debridement Day 7

Proses Asuhan Gizi Terstandar pada Pasien Anak dengan Luka Bakar Post Debridement Hari 7

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Abstract: *The condition of burn injury can cause disturbances in the body's metabolism, which can ultimately affect the patient's nutritional status. Therefore, in its management, it requires standard nutritional care processes to improve the condition and meet the nutritional needs of the patient. Nurition Care Process was carried out through four stages: assessment, diagnosis, intervention, and regular monitoring and evaluation. This study aimed to implement nutrition care process (NCP) for burn injury patient during the 3-day intervention period. Case study carried on July 2020 to hospitalized patients of Saiful Anwar Hospital. Observations were implemented for 3 consecutive days. Observations included of 4 steps of NCP, Assessment, Diagnosis, Intervention, Monitoring and Evaluation. After the NCP was carried out, the patient's condition improves, accompanied by an incrase in food intake*

Key words: nutrition care process, burn injury, pediatric

1. INTRODUCTION

The occurance of burn injury in children, especially those under the age of 5, is one of the main reasons for trauma. For children with burn injuries, nutritional support is one of the most significant aspects for wound healing, in addition to prevent infection (4). Because severe burns can result in serious metabolic disruptions, nutritional support is very crucial and challenging for burned patients. Increased catabolism and a protracted hypermetabolic state brought on by burn injuries promote muscular atrophy and cachexia. Patients with burns may have metabolic rates that are twice as high as normal; insufficient energy to meet these needs results in poor wound healing, malfunctioning organs, and increased infection risk. It is essential to provide these individuals with adequate nutritional needs assessment and care. The best time, method, quantity, and kind of nutritional support for burn patients are all up for debates. Throughout recovery, specialized, ongoing, and modified nutritional support is required (1).

Another crucial issue according to pediatric patients is about parent's roles in providing food. It becomes important due to determining children's food preferences in the future and also supporting children to eat healthy food (5). The factors

influencing the provision of food to infants include knowledge about healthy foods and the methods of feeding, feeding patterns, and parenting styles (8). The provision of food to children is significantly influenced by socio-demographic factors, such as the number of children in the family. Qualitatively, several factors affect the feeding practices of infants, including knowledge/information about nutrition and food, family support, information sources, and the mother's perception of healthy food (6). The implementation of nutritional care for this patient needs to be carried out using the Nutrition Care Process (NCP), which includes assessment, diagnosis, monitoring, and regular evaluation.

2. METHODS

This was descriptive study with case study approach. This case study conducted in July 2020 on inpatients at Saiful Anwar Hospital Malang using the Nutrition Care Process (NCP) approach. Nutrition Care Process, consisted of Assessment, Diagnosis, Intervention, Monitoring and Evaluation was conducted 3 consecutive days. Assessment data observed and collected include anthropometric data, biochemical data, physical findings, food history and ecological data. Anthropometric data included: arm circumferences, weight, and length. The data is obtained by directly measuring the patient. Biochemical data obtained by studying the patient's medical record particularly the laboratory information. Physical findings and ecological data obtained by observing the patient and studying the patient's medical record. 24-hour recall being used to determine the current eating history, while SQ-FFQ as methods to determine past eating history (1 month ago).

Nutrition Diagnosis is established based on the result of nutrition assessment. Nutrition Diagnosis is determined using Nutrition Care Process Terminology (NCPT). Based on priority of Nutrition Diagnosis, researcher arranged Nutrition Intervention in the form of nutrient delivery with high energy and protein diet, nutrition education as well as coordination with other health provider. Nutrition Monitoring and Evaluation is conducted through observation and interview to the patients and his family. Biochemical data is being monitored through medical record while and physical data monitored directly by observation. Dietary data is collected using 24-h recall while family's knowledge is monitored and evaluate with questions material provided during the education process.

3. RESULTS

Case Overview

Male patient, 28 months diagnosed with a medical condition of Superficial mild dermal burn injury 14% in the incision abdomen and brachial at hot water post debridement Day 7, previously had no medical history and was in good health. On February 29, 2020, the patient was brought to the hospital with the main complaint of blistering on the hand, chest, and thigh due to being scalded with hot water. The patient had undergone a debridement operation and at the time of observation was Day 7 post-debridement. The mother of the patient had received nutrition education but had not yet been able to apply the education given, while the father, who was more cooperative, had never received nutrition education before.

Nutrition Care Process (NCP)

All stages of Nutrition Care Process (NCP) were conducted under the supervision of dietitian who was responsible for handling the patient. At each stage, the data obtained was interpreted, analyzed and validates by the same dietitian. Nutrition Assessment was the first step of NCP that assess anthropometric, biochemical, physical, dietary and also ecological data.

Table 1. Client History Data

Examination	Assesment
	Result
Client History Data (CH)	
Age	28 months
Gender	Male
Race	Java
Date of Hospitalization	February 29, 2020
Examination Date	March 7, 2020
Role in Family	Third child of three siblings
Social Economy	Father worked as factory worker, mother was a housewife
Medical History	The patient MRS was admitted to the hospital on February 29, 2020, with the main complaint of blistering on the hand, chest, and thigh due to being scalded with hot water. • There were symptoms of vomiting, nausea, fever, allergies, or shortness of breath. • The debridement process was carried out on February 29, 2020, which involved the removal of necrotic tissue or dead tissue from the wound and surrounding areas to ensure that healthy tissue is not covered, allowing for maximum wound healing. • The mother of the patient had received nutrition education but had not yet been able to apply the education given, while the father, who was more cooperative, had never received nutrition education before. • At the time of observation, the patient was in Day 7 post-operation debridement condition. • On March 3, 2020, the patient received a transfusion of PRC (packed red cell) 1 bag 80 cc/24 hours. • On March 7, 2020, the patient received a transfusion of TC (Thrombocyte Concentrate) 100 cc.

Table 1 mainly discuss about client history. Patient was male children, 28 months had already got medical treatment (debridement, transfusion of PRC and TC) based on his medical condition. Table 2 shows that the patient had normal nutrition status.

Table 2. Anthropometric Data

Parameter/ Indicator	Assessment	
	Results	Cutoff
Arm Cicumference	15 cm	
Weight	10,5 kg	
Length	86 cm	85-110%
Arm Circumference for age	-0,19 SD **(Normal)**	-2 SD up to + 1 SD
Weight for height	-1,01 SD **(Normal)**	-2 SD up to + 1 SD
Weight for age	-1,40 SD **(Normal)**	-2 SD up to + 1 SD
Height for age	-1,27 SD **(Normal)**	-2 SD up to + 1 SD

Table 3. Biochemical and Physical Data

Parameter	Assessment	
	Results	**Cutoff**
Biochemical Data		
Hb	10,4 g/dL **(low)**	13,4 – 17,7
RBC	$4,1.10^6$/µL	4 – 5,5
WBC	$5,28.10^3$/µL	4,3-10,3
HCT	30,8% **(low)**	40-47
PLT	86.10^3/µL **(low)**	142-424
MCV	75.1 fL **(low)**	80-93
MCH	25,4 pg **(low)**	27-31
MCHC	33,8 g/dL	32-36
Monocyte	7,6% **(high)**	3-6
Eosinophil	0,4%	0-3
Basophil	0,2%	0-1
Neutrophil	44,5%	23-45
Lymphocyte	47,3%	35-65
Albumin	2,55 g/dL	3,5 – 5,5
Physical Data		
GCS	456	456
Respiratory Rate	21	12-29
Pulse	108	60-100
Temperature	36°C	36,1 – 37,2 °C
Score of Pain	2	None

Table 3 shows that patient was anemia due to blood loss causing by debridement procedure. Patients also had low albumin (hypoalbuminemia) as well as thrombocytopenia. The patient's physical/clinical condition was quite good, with pain mainly in the wound area.

Table 4. Dietary Data

Food History (FH)	Assessment			Interpretation
	Results	**Cutoff**	**Intake (%)**	
24hour-Recall Results				
Energy (kcal)	906	1138	79,6	Mild Deficit
Protein (gram)	29,3	31,5	93	Normal
Fat (gram)	24,4	46,3	52,7	Severe Deficit
Carbohydrate (gram)	156,8	170	92,2	Normal
Fluid	1795	1025	175	Normal
SQ-FFQ Results				
Energy (kcal)	1011	1458	69,3	Severe deficit
Protein (gram)	47,7	54,6	87,3	Mild deficit
Fat (gram)	46,4	40,5	103	Normal
Carbohydrate (gram)	98,4	218	45,1	Severe deficit

The patient's food intake from the 1x24-hour recall results, specifically energy intake, ad fat, is known to fall into the category of deficit based on Table 5 above. As per the SQ-FFQ results, there was a deficiency in caloric, carbohydrate intake, and protein intake, but there was an adequate intake of fat. When eating, the patient was mostly fed by the mother. Often, the child was fussy and refuses to eat, and the mother scolded the patient.

The diagnosis is the second stage of the Nutrition Care Process (NCP) that identifies nutrition problems from nutrition study data so that appropriate nutrition interventions can be provided according to the individual's condition. The nutrition

diagnosis assessment on the patient indicates that the patient is experiencing nutrition problems as follows.

1. **NI-2.1** Inadequate oral intake related to decreased appetite, patient was restless sign by 24-hour recall energy, fat and fluids deficit (<80% of patient need)
2. **NI-5.1** Increased protein needs related to burn injury 14%, hypoalbuminemia and anemia sign by low albumin, hemoglobin, hematocrit, MCV, MCH
3. **NB-1.1** Food and nutrition related to knowledge deficit related to patient's parent never had nutrition education sign by parents did not know yet about the increase in food needs, especially protein sources, fluid needs, and balanced eating patterns for children

Nutrition Intervention includes Food and Nutrient Delivery **(ND-1.2)** with the goals are Increase oral food and drink as well as increase protein intake based on patients need. Patient was given high energy high protein food gradually based on patient capability. Dietary recommendations for the patients are as follows:

1. Energy was given as 1138 kcal based on calculations using the Mayes formula (4)
2. Protein was provided in the amount of 3 g/kg actual boy weight, which was 31,5 grams, considering the high protein intake given to children with burns can help increase the body's immune system, aid in wound healing, help replace lost protein through urine or wounds. The recommended protein sources are primarily from animal sources. Additionally, it is preferred to use protein sources to help increase albumin, especially from white eggs (4)
3. Fat was given at 28.9%, which was 46.3 grams, considering that excessive fat intake can cause complications in burn patients, including hyperlipidemia, hypokalemia, hepatic steatosis, increased incidence of infection, and increased post-operative mortality in burn patients (4). Based on the literature studies conducted, the recommended type of fat is omega-3 as an anti-inflammatory agent for patients with burn conditions, however, there is insufficient data on the amount that should be consumed (12).
4. Carbohydrates were given at 60%, which was 170 grams, considering that carbohydrates were given in the range of 55-60% and the calculation of fat intake should be less than 35% of the total energy
5. Fluid was given at 1025 mL, based on calculations using the Holiday-Segar formula used for calculating fluid intake for children. Fluid needs are calculated using the Holiday-Segar formula, considering that the child is already in the recovery phase and has already met fluid needs through fluid resuscitation
6. Glutamine can be given 7.8 grams, which is 25-35% of the total protein needs in a day. In burn patients, glutamine can enhance the body's clinical response to metabolic stress caused by burns (2). Foods containing glutamine include chicken eggs, beef, skim milk, tofu, rice, and corn (15). Some of these foods were available in the hospital menu, such as chicken eggs, beef, tofu, and rice.
7. Vitamin C and E was given 1.5 times the needs based on RDA, which is 60 mg of vitamin C and 9 mcg of vitamin E. There are clinical benefits in reducing oxidative stress and enhancing wound healing when vitamin E and C are given 1.5 - 3 times the RDA needs (12).
8. h. Zinc (Zn) and copper (Cu) are given in amounts as recommended by RDA, which is 3 mg of zinc and 340 mcg of copper. These three minerals are primarily needed for immune benefits and to accelerate wound healing (12).

High energy high protein diet with solid food was given to the patients based on dietary recommendation for burn trauma patients. For nutrition education **(E-1.4)** with bedside teaching was conducted particularly to explain about the diet as well as how much water

should be consumed by the patient. The patient family was also motivated to provide food slowly and not excessively. Several collaborations that have been carried out with doctor, nurse and pharmacist **(RC-1.4)**, among others: explanation regarding the general condition and the development of the patient's disease, daily vital sign check of the patient, oral medication or injection given to the patient, as well as installation and administration of D5% 1000cc/24 hours.

Nutrition monitoring and evaluation was conducted after giving intervention to the patients. The following are the results of the nutrition monitoring and evaluation:

Table 5. Monitoring Evaluation of Biochemical Data

Parameter	Before observation	Day 1	Day 2	Day 3
Biochemical Data				
Hb	10,4 g/dL	-	9,9 g/dL	-
RBC	$4{,}1.10^6$/µL	-	$3{,}9.10^6$/µL	-
WBC	$5{,}28.10^3$/µL	-	$6{,}42.10^3$/µL	-
HCT	30,8%	-	29,3%	-
PLT	86.10^3/µL	-	$114.\ 10^3$/µL	-
MCV	75.1 fL	-	25.4 fL	-
MCH	25,4 pg	-	33,8 pg	-
MCHC	33,8 g/dL	-	15,3 g/dL	-
Monocyte	7,6%	-	8,9%	-
Eosinophil	0,4%	-	1,1%	-
Basophil	0,2%	-	0,2%	-
Neutrophil	44,5%	-	43,9%	-
Lymphocyte	47,3%	-	8,9%	-
Albumin	2,55 g/dL	-	-	-
Physical Data				
GCS	456	456	456	456
Temperature	36	37,7	38	37
RR (respiratory rate)	21	26	24	29
Pulse	108	104	110	110
Urine Output (ml)	900	1300	1150	250
Level of pain	2	2	2	2

There were several data changes, among others: there was a decrease in several data, namely Hb, RBC, HCT, MCV, MCHC, neutrophils, and lymphocytes. Meanwhile, for WBC and platelets (PLT), there was an increase. On the temperature data for day 2, there was a slight increase, so the doctor administered intravenous paracetamol, while the nurse performed compression on the patient. Regarding nutrition, the patient's family was informed to increase the patient fluid intake, specifically to drink more than before, which was about ± 1 bottle of 1500 mL of water per day.

The monitoring and evaluation of the patient's nutritional intake were carried out during the 3-day observation period. Data on food intake was obtained 7 times before the patient's discharge. Nutritional intake monitoring was carried out through direct observation, especially for breakfast and lunch, and also conducted recall for evening meal times. For the next 2 meal times, it was done via phone with the patient's father. Previously, the patient's family were asked for their willingness to have their dietary data collected via phone. This monitoring and evaluation aimed to understand the patient's food and drink intake before and after intervention. The diet provided to the patient was high energy high protein diet. In addition, the patient also received D5% 1000cc/24 hours.

The following is the patient's intake data during the observation period:

Table 6. Patient's Intake of Energy, Macronutrient, Micronutrient and Fluid

Nutrient		Before obsevation	Day 1	Day 2	Day 3
Energy (kkal)	Need	1138	1138	1138	1138
	Intake	736	1172	1340	1034
	Enteral D5%	170	170	170	85
	Total Intake	906	1342	1510	1119
	Percentage	79,6 %	117%	134%	98,3%
Protein (gram)	Need	31,5	31,5	31,5	31,5
	Intake	29,3	49	54,9	58,3
	Percentage	93%	155%	138%	185%
Fat (gram)	Need	46,3	46,3	46,3	46,3
	Intake	24,4	31,5	40,4	40,2
	Percentage	52,7%	68%	87%	86,8%
Carbohydrate (gram)	Need	170	170	170	170
	Intake	106,8	166,8	179,4	102
	Enteral D5%	50	50	50	25
	Total Intake	156,8	216,8	229	127
	Percentage	15%	167%	179%	102%
Fluids (mL)	Need	1025	1025	1025	1025
	Intake	795	995	1200	1000
	Enteral D5%	1000	1000	1000	500
	Total Intake	1795	1995	2200	1500
	Percentage	175%	194%	214%	146
Glutamine (gram)	Need	7,8	7,8	7,8	7,8
	Intake	0,72	0,89	0,91	1,02
	Percentage	9%	11%	18,65%	13%
Vitamin C	Need	60	60	60	60
	Intake	2	12	6,3	13,4
	Percentage	3,3%	20,0%	10,5%	22,3%
Vitamin E	Need	9	9	9	9
	Intake	1,2	1,9	1,7	3,9
	Percentage	13,3%	21,1%	18,9 %	43,3 %
Zinc (Zn)	Need	3	3	3	3
	Intake	2,6	3,5	3,6	3,9
	Percentage	86,7%	116,7%	120%	130%
Copper (Cu)	Need	34	34	34	34
	Intake	0,3	0,4	0,3	0,2
	Percentage	0,9%	1,2%	0,9%	0,6%

4. DISCUSSION

Based on the nutrition screening conducted using both the Strong Kids screening tools and Pediatric Yorkhill Malnutrition Score (PYMS), the patient is at risk of malnutrition. However, the PYMS screening tool, based on research, is considered the most reliable screening tool compared to SGNA (Subjective Global Nutrition Assessment) as the gold standard. Other screening tools compared include STAMP and Strong Kids (17).

Based on the study conducted, the patient's anthropometric status was normal, but there was a decrease in body weight that needs attention. The recommendation given to the patient's family was to meet the patient's food intake with the principle of high

energy and high protein, aiming for the healing process of the wound and can increase the patient's body weight. Hb, HCT, MCV decreases during monitoring could indicate anemia that occurs in burn patients. Anemia that occurs in diseases/critical conditions was anemia that occurs after an acute event experienced by the patient. This condition of anemia can be caused by the inability to produce enough red blood cells to meet the needs (10). If observed, the patient's thrombocyte data showed an increase due to the transfusion of thrombocyte concentrate. Thrombocytopenia can occur due to an inflammatory reaction that causes platelets/thrombocytes to be used extensively because of their role in the coagulation reaction to support hemostasis. Additionally, platelets can be act as inflammatory cells (3).

On the physical/clinical data, there was an increase in temperature (38°C) on March 8, 2020. An increase in temperature in patients with burn injuries can occur as a body's reaction to hypermetabolism. In burn injuries, a period of hypermetabolism can occur over a long duration and can last up to 12 months after the burn occurs. During the hypermetabolic period, inflammation also occurs, which can increase body temperature (16). Related to this, there was an increase in WBC on March 8, 2020, indicating an increase in infection/inflammation occurring in the body.

Nutritional needs become a crucial concern for the patient because the patient has experienced a burn injury that could potentially lead to malnutrition in children. The determination of total calories given to the patient is based on calculations using the Mayes formula. This formula is used by considering:

1. A special calculation formula for children with burn injuries
2. Within the calculation formula, there is a factor that considers the degree of burn injury (%TBSA) The calculation formula for burn patients can use any calculation formula, but it must still be considered regarding the factor of stress for burns (4)

In the calculation, it has been considered to calculate the factor of stress for burns, 1.3, which is the range of burn stress factors 1.25-1.5 (14).

The protein needs are determined based on the range of 1.5-3 g/kg of body weight. Protein is very important in wound healing because it can help increase the body's immune system, aid in wound healing, and help replace lost proteins, whether through urine or wounds (4). The recommended protein sources are primarily from animal sources. Additionally, it is preferred that protein sources help increase albumin, especially from white eggs. Every day for 3 meals, the patient's family should try to increase the intake of animal protein sources, which is 3 servings @ 50-60 grams of animal protein sources. In one day, chicken eggs can be given at least once a day as much as 1 egg (60 grams). Additionally, there is also a need to add food containing glutamine, such as: chicken eggs, beef, skim milk, tofu, rice, and corn (15).

Based on the monitoring evaluation data, there was an increase in the patient's intake. When looking at the energy intake table 6, it was actually sufficient to meet the needs, even exceeding for 2 times the eating time. However, what also needs to be noted was the variation in food and the types of food consumed by the patients. The energy needs could be met with the help of milk. If the patient was not given milk, then the energy intake would not meet the needs. An important point to note is that in sick conditions, what is important is that the energy intake meets the needs. However, when the patient is discharged, this is what needs attention so that the patient's family, especially the father, who given information about food and drink in terms of quantity and type to accelerate the healing of the wound. Parents play a very important role in providing food, so parents must understand what is best to be given

to their child so that they can heal quickly and grow according to the child's age (13).

The patient's need for glutamine could not be reach through food intake because it only fulfills 11% of the total required need. Therefore, it is recommended that glutamine be given through supplementation to meet the expected needs of the burn patient (1).

The fluid was given in 1025 mL, based on calculations using the Holiday-Segar formula, which is used for calculating fluid needs for children. In patients with burn injuries during the acute phase, the fluid needs increase, especially in children due to the small volume of blood circulation. Additionally, burn injuries often result in significant fluid loss, which can cause shock and death (11). However, the patient was in the recovery phase, so the fluid needs calculation used the Holiday-Segar formula for calculating children's fluid needs (14). If further investigated, when comparing the intake of fluids from oral and intravenous sources with urine output, it showed a positive balance. However, it should be noted that when returning home, the support for intravenous fluid administration is no longer available, so the fluid needs must be met through oral intake, and education has already been conducted regarding the amount of fluid the patient needs to consume, especially from beverages

The patient's vitamin and mineral needs prioritize anti-oxidants and those that support wound healing, including vitamin C, vitamin E, zinc (Zn), and copper (Cu) (12). Based on the patient's nutritional intake during hospitalization and during the monitoring evaluation, the results for vitamin C, vitamin E, and copper (Cu) did not meet the needs equivalent to Indonesian recommended dietary allowance. This could be due to the patient having difficulty eating, especially vegetables and fruits, which are sources of anti-oxidants. However, the zinc intake can meet the needs because the food provided to the patient contains sources of zinc, primarily animal protein that the patient is willing to consume. For further, regarding the intake of food sources of anti-oxidants, it is communicated to the patient's family through education after the patient is discharged, which could be fruits like oranges. For sources of copper (Cu), it is recommended to consume peanuts like mung bean. In 100 gram of mung bean consists of 1,52 mg of copper (7).

The education provided is related to the high energy high protein diet and the amount of water the patient needs to consume. During the education process, the patient actively asks questions and is able to explain regarding the high energy high protein diet, especially about food sources that are high in protein. The education method used bedside teaching and discussion. This method involves the patient's family more actively (9).

The education process was also carried out via phone with the patient's father after the patient left the hospital. The researcher presented and reminded the patient's family to provide food sources of protein, especially from animal protein. The sources of glutamine have also been provided to the patient's family. It is also recommended to the family to have the patient consume white eggs to support the need for albumin. The patient's family is advised to buy white eggs from herbal medicine sellers, bread/cake sellers, who may have many white eggs, making them cheaper compared to buying whole eggs.

5. CONCLUSION

The patient was a 2-year-old male child who was admitted to the hospital due to a burn injury on his body from accidentally being splashed with hot tea. The patient's diagnosis was a superficial mild dermal burn injury, 14% in the abdomen and brachial area, post-debridement with hot water, day 7. Based on the study conducted and the confirmation of the nutritional diagnosis, the intervention provided was high energy, high protein diet supplemented with 3 sachets high energy dense liquid food because the patient was restless and had difficulty in eating. The high energy, high protein diet given has been considered through energy calculation, macro and micro nutrients. Additionally, other interventions provided are collaboration and nutrition education for the patient's family. The monitoring and evaluation process was temporarily halted because after 7 meal observations, the patient was discharged, so the nutritional intake monitoring was done via phone to the patient's family.

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