

A CROSS SECTIONAL STUDY ON MALNOURISHED CHILDREN WITH DERMATOSIS AND THEIR NUTRITIONAL MANAGEMENT

Husna Wali¹, Huma Islam¹, Sajid Wahab⁶, Habban Ullah², Omama Ahmad¹, Syed Umair Shah⁵, Nazaka Ali Shah⁴, Umair Khan³

1. Department of Human nutrition, Women University Mardan.
2. Bachelor of Medicine and Bachelor of Surgery, Sargodha medical college, Sargodha.
3. Department of Food Science, The University of Agriculture Peshawar KPK Pakistan.
4. Department of Human Nutrition, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan.
5. Department of Food Science and Technology, Abdul Wali Khan University Mardan, Pakistan.
6. Department of Agriculture, The University of Agriculture Peshawar KPK Pakistan.

ABSTRACT

Introduction Malnutrition is a silent emergency. Severe Protein Energy Malnutrition (PEM) affects 23% of the pediatric population worldwide. Malnutrition leads to Nutritional Dermatitis which is a condition that affects the skin, nails, hairs and glands. Skin disorders are one of the major health problems in pediatric age. **Objective** The aim of this study is to study various cutaneous features of Nutritional Dermatitis in Children and their Nutritional Management. **Methodology** This cross-sectional study was conducted at medical teaching institute Khyber teaching hospital Peshawar to find out the nutritional status of malnourished children with dermatosis and their management. A total of 102 children were extensively assessed over a period of 3 months. Preliminary data of children regarding age, sex, feeding history, complementary feeding, dietary history, demographic history and anthropometric measurements were recorded. All the children were examined thoroughly for the presence of a cutaneous feature of dermatosis. The collected data was analyzed through SPSS. Results of this study showed that the majority of the children were in the age group of 6-12 months. Most of the subjects were female. About 66% of babies were formula fed and complementary feeding started between the age of 6-12 months. About 32 % of children were preterm / low-birth-weight and about 63% were multiparous mothers. approximately 56% families from lower socioeconomic status. and the majority of the mothers were illiterate. The cutaneous features observed were hair changes (96%), nail disorders (86%), pigmented skin (90%), sunken eyes (88%), dehydration (70%) and oedema (68%). The most caoutanus features seen were hair hangs and pigmented skin.

Key Words: Malnutrition, Dermatitis, Nutritional management, Cutaneous features

INTRODUCTION

The World Health Organization (WHO) has reported hunger and related malnutrition as the greatest single threat to the world's public health. Malnutrition is a silent emergency (Addi *et al.*, (2022). Malnutrition was defined as "a subacute or chronic state of nutrition, in which a combination of varying degrees of under or over nutrition and inflammatory activity has led to changes in body composition and diminished function" (Zhang *et al.*, 2022). Most nutritional deficiencies affect children. The first symptom of nutritional insufficiency frequently cutaneous appearance includes PEM, Essential amino acid deficiency, Vitamin A deficiency, Pellagra, Scurvy, Zinc deficiency and biotin deficiency (Lekwuttikarn *et al.*, 2018) Malnutrition is the major cause of Nutritional Dermatitis, micronutrients and macronutrients deficiencies are two categories of nutritional Dermatitis (Nosewicz *et al.*, 2022). Ayaya *et al.* stated that Malnutrition is still one of the leading causes of morbidity and mortality in developing countries and according to kilic *et al.* Severe PEM affects 23% of the pediatric population worldwide. Among the developing countries Pakistan has the highest rate of Malnutrition. According to the National Nutrition Survey 50 % of the children were anemic, 33 % were wasted. Globally about 155 million children were stunted

and wasted (Zaheer *et al.*, 2023). Children with Malnutrition have a higher chance of dying, (Gogran *et al.*, 2023). Globally the rates of malnutrition in children under five years of age decreased. However, an estimated 149 million (22 percent) were stunted, 45 million (6.7 percent) were wasted, and 39 million (5.7 percent) were overweight. Progress was made towards 2030 targets on stunting, while childhood overweight was worsening (Khan *et al.*, 2023). Protein-energy malnutrition (PEM) is a series of diseases due to malnutrition of all micronutrients, including marasmus, intermediate state of kwashiorkor -marasmus and kwashiorkor (Zhang *et al.*, 2022). Marasmus is a clinical syndrome which occurs due to the severe scarcity of calories and other nutrients. It is characterized by the depletion of the fat stores under the skin, muscle wasting and an absence of edema. (Mehraj *et al.*, 2021). Kwashiorkor's name is taken from the Ghana means "illness of Children". Kwashiorkor is also known as Edematous Malnutrition and it refers to the lack of protein, vitamins and essential minerals (Sharadha *et al.*, 2023). Marasmus is severe wasting, severe wasting in the presence of edema is characterized by marasmus kwashiorkor and kwashiorkor is Malnutrition with oedema (Addi *et al.*, 2023).

Protein -energy Malnutrition contributes to 60 % of the total million deaths of children under 5 years (Glara *et al.*, 2021). In Asia the prevalence of protein -energy Malnutrition is about 70%. Millennium Development Goals (MDG) report depicts the ratio of one in every five children suffering from PEM. (Bhatti *et al.*, 2021). Globally an estimated 45 million children under 5 years were wasted and 85 million were underweight (kerac *et al.* 2021; UNICEF, WHO and World Bank Group 2021). Child wasting was defined as weight-for-height Z-score (WHZ)<-2, weight-for-length Z-score (WLZ)<-2, Mid Upper Arm Circumference (MUAC)<125 mm, and/or bilateral oedema, and underweight was defined as weight -for-age Z-score (WAZ) <-2 (Wetch *et al.*, 2023). One of the main determinants of PEM is the adolescent pregnancy that leads to child Malnutrition (Wetch *et al.*, 2023). Complications during pregnancy and childbirth are leading causes of death (WHO2023). For adolescent mothers such stressors can lead to poor physical and mental health, effects feeding practices and care for their children (Hentschet *et al.*, 2022; WHO, UNICEF and World Bank Group 2018). Another cause of PEM is inappropriate Feeding practices and maternal health. The frequency, amount and energy density of feeding play a vital role to combat child Malnutrition. Maternal depression also leads to child Malnutrition (Chee Din *et al.*, 2023). Maternal and child health is challenging due to poor resources, food insecurity, environmental risks and accessibility to medical services, maternal health is affected when the quality and quantity of food is compromised (Khan *et al.*, 2023). LBW is one of the highest predictors of infant and child mortality. LBW and maternal sociodemographic factors are directly proportional to each other (Aini *et al.*, 2023). The Food and Agriculture Organization of United States FAO has recently launched a report on the "**The state of food security and Nutrition in the world 2022**"and has reported that there is an obvious increase in the prevalence of food security. About 2.3 billion world population in the year 2021 were food insecure (Khan *et al.*, 2023). Pakistan, a country with low to middle income addressed issues regarding food insecurity. Food insecurity affects 48% of Pakistan population (Khan *et al.*, 2023). Skin disorders are one of the major health problems in the pediatric age group which are associated with significant morbidity (Gandhi *et al.*, 2022). Dermatitis is a condition that affects the skin, nails, hairs and glands. The term does not include skin conditions involving inflammation. Another term for dermatitis is cutaneous condition. Skin is the largest gland and can be easily affected by many of the documented

conditions. Skin is made up of three layers named as epidermis, the dermis and the subcutaneous tissues. Dermatitis is a condition which may involve changes in any of these skin layers (Christine Case -Lo 2017). Dermatitis led by kwashiorkor is characterized by lesions that look like paint lifting up and about to peel off; that's why it is called Flaky paint Dermatitis (Vijayasankar *et al.*, 2023). One of the biggest public health problems is Severe Acute Malnutrition (SAM) (Boro *et al.*, 2023). The clinical forms of severe acute malnutrition (SAM) in children aged 6 to 59 months are nonoedematous malnutrition (marasmus), indicated by a weight-for-height z-score (WHZ) ≤ -3 , and/or oedematous malnutrition (kwashiorkor), indicated by bilateral pitting oedema. As marasmic kwashiorkor (oedema with WHZ score ≤ -3), both conditions are compatible. Children with kwashiorkor disease (KD) present with oedema of the limbs and face, discoloured, brittle hair, enlarged liver, skin lesions, and are frequently lethargic with a low appetite, in contrast to children with marasmus, who are severely emaciated with a skeletal look and frequently alert and hungry. Hyper-pigmented fractured patches with hypo-pigmented areas underneath are among the skin lesions associated with kwashiorkor. It is a desquamating skin disorder, and in extreme cases, ulceration and open skin lesions that resemble burns may develop. (Bublitz *et al.*, 2023). The most common form is atopic dermatitis and acrodermatitis enteropathica mostly occur in children. Atopic dermatitis (AD) is a common inflammatory Dermatitis in children worldwide. Many nutritional factors, including the type of maternal diet during pregnancy, the duration of breastfeeding, the epicutaneous exposure of allergenic food proteins in the first few years of life, the timing of the introduction of complementary foods, the supplementation of vitamins and probiotics/prebiotics during prenatal and early life, have been assessed as potential targets for the prevention of atopy. Guidelines recommend eating fatty fish or taking LCPUFA supplements during pregnancy to reduce AD in the offspring (Trikamjee *et al.*, 2021). Also, AD is associated with an increased risk of infections and autoimmune diseases (Yang *et al.*, 2023). Acrodermatitis is a genetic disorder characterized by diarrhea and skin lesions around the mouth or anus and hair loss. It was first described by Danbolt and Closes in 1942. It is due to the defect in malabsorption of the Zinc by the intestinal cells. Also, it is associated with the mutation in SLC39A4 gene that encodes for the zinc transporter protein ZIPA (Alwadan *et al.*, 2023). AE can be congenital and more common in infants during the first period of life. The disorder can be inherited by an autosomal recessive manner. It is caused by inadequate zinc uptake, malignancy, Malnutrition, high fiber diet and malabsorption syndromes such as cystic fibrosis (Proli *et al.*, 2023).

Zinc (Zn) follows Iron (Fe) as the second most abundant metal in the human body and an essential component in the diet (Dong *et al.*, 2023). Zinc is an important micronutrient found in food such as flesh sources, pulses and cereals responsible for development of living organisms also plays a vital role in gene expression and other physical processes. It is important for boosting Human immune system and its deficiency causes hair loss, memory loss and skin disorders (Ozturk *et al.*, 2023). It is thought that healing skin lesions was improved only after the intake of oral supplementation of Zinc (Sztupecka *et al.*, 2023). Dermatological diseases are the most common diseases worldwide (Bonamigo *et al.*, 2023). The immature epidermis of preterm infants increased the permeability to pathogens. Antimicrobial peptides (AMPs) are present on the surface of human skin which provides an essential role in the integrity of the microbes (Humberg *et al.*, 2023). The skin microbiome comprises several species of microorganisms. Any imbalance

in these microorganisms can cause several health disorders like Acne, atopic dermatitis and psoriasis (Haseebduddin *et al.* 2022).

OBJECTIVES

- To study various cutaneous features of Nutritional Dermatoses in Children
- . To find the prevalence of malnourished children with Dermatoses.Z

METHODS AND MATERIALS

3.1 Location of the Study

This study was conducted at the medical teaching institute, Khyber Teaching hospital Peshawar, Pakistan. Data was collected from the Stabilization Centre of Pediatric Ward. This hospital-based study was conducted from 1 March 2023 to 30 May 2023. In this unit qualified Clinicians and nutritionists provide nutritional care to the patients.

3.2 Sample Selection

Children suffering from PCM were admitted in the stabilization center for proper management with the following signs and symptoms e.g., Retarded growth, anemia, oedema, diarrhea, vomiting, hair changes, thin and wasted muscles, ear changes, dehydration, and dermatitis respectively. The collected data of 100 samples suffering from Protein Calorie Malnutrition with dermatosis. At the time of admission in the hospital their history of age, sex, feeding history, start of complementary feed, medical history, last diet intake, Dietary history and demographic history and socio-economic conditions are recorded.

3.3 Data collection Methodology

Data regarding the following indicators was collected:

1. Anthropometric assessment
2. Biochemical assessment
3. Clinical assessment
4. Dietary assessment

3.3.1 Anthropometric Assessment

Anthropometric assessment of children includes the physical measurement of height/length, weight and z scores. (Weight for height/length) of the patient.

3.3.1.1 Weight

Weight of the child shows the nutritional status of children. Weight was measured by using the pediatric scale (Appendix 2) for children. Scale was first calibrated to zero and then weight was measured in kilograms after removing heavy clothes from a child. The child was placed on the center of the scale as and reading was noted.

3.3.1.2 Height/Length

On the basis of the child's age and ability to stand, the height of the child is measured. Recumbent length is measured if a child is less than two years old. Length board also called infant meter (appendix 2) is used for measuring child's length in centimeters. The children were placed on the board with their head against the fixed end of the board, shoulders and back were flat and at the center of the board and feet were straight towards the moveable end.

Height is measured in standing upright position. Height will be measured for children of aged two years or older.

3.3.1.3 Weight for Height Z-Score

If a child has <-3 SD Z-score (appendix 3) then he or she was taken as severely malnourished. If the child had <-2 SD then it would be moderately malnourished. -1 SD is considered as normal child.

3.3.2 Biochemical Assessment

Right after admission random blood sugar (RBS) and hemoglobin level are checked by finger and heel prick.

3.3.3 Clinical Assessment

It includes complete physical examination of the samples such as changes in eyes, ears, mouth, hair, face etc.

3.3.4 Dietary Assessment

There are three most common methods of dietary assessment but however a 24 hours dietary recall method was used in SC of children A ward. In this method the patient's mother is asked to recall the kind and amount of food and beverages consumed in the last 24 hours. The amounts are estimated in common household measures or servings. i.e., cups, glasses, bowls etc. Calories present in daily intake food are calculated along with the required calories of the patient. Both taken and required calories are then compared and then further nutritional counseling is given if required.

3.4 Medical History

A medical history is a record of a patient's condition, present and past. It was basically a detail of illnesses and any surgery the patient may have undergone. It also contains as much information as you can get about any pain, discomfort or other medical issues the patient may be experiencing.

3.5 Nutritional Management

Following are the WHO protocols used within the SC of pediatric ward:

3.5.1 WHO Protocols for Malnourished Child

3.5.1.1 Hypoglycemic and its Management

Hypoglycemia and hypothermia usually occur together and are signs of infection. Treatment for hypoglycemic starts with a mixture of sugar and water given orally or through NG tubes. After that start F 75 feed for two hourly day and night

Frequent feeding is important in preventing both conditions.

3.5.1.2 Hypothermia and its Management

If the child is hypothermic, keep him/her warm, cover with cloth, blanket or ask the mother to keep the child in her lap close to her and take the temperature two hourly until it rises to >35.5 °C. Hot water bath is another solution for hypothermia. Fill the water bag with hot water and place the child above it until the temperature rises to 37°C.

3.5.1.3 Dehydration and its Management

It is difficult to estimate dehydration status in severely malnourished children using clinical signs alone, so assume all children with watery diarrhea may have dehydration. Children should be given ReSoMal 5 ml/kg body weight every 30 mins for 2 hours orally or through an NG tube. During treatment rapid respiration and pulse rates should slow down and the child should begin to pass urine.

To prevent dehydration when a child has continuous watery diarrhea keep feeding with F 75 (Formula Milk appendix 4). Replace stool losses with ReSoMal, 50-100 ReSoMal should be given after every loose stool. If a child is on breastfeed, encourage continuing breastfeeding.

Yogurt therapy is also one of the cures for diarrhea and for prevention of dehydration. 1 or 2 spoons of yogurt is given before, after meal or during feed.

Mashed banana and yogurt are also given.

Khichdi and yogurt are mixed and given.

3.5.1.4 Correct Electrolyte Imbalance

All severely malnourished children have excess body sodium even though plasma sodium may be low (giving high sodium loads will kill). Deficiencies of potassium and magnesium are also present and may take at least two weeks to correct. Edema is partly due to these imbalances. Do NOT treat edema with a diuretic.

3.5.1.5 Correct Micronutrient Deficiencies

Iron, Vitamin A deficiency is common among them, although iron should not be given initially the child has a good appetite and starts gaining weight because giving iron in infection can make the infection worse, iron is not given when a patient is having diarrhea.

In case of Zn deficiency dermatitis problem is created in this condition skin and hair color changes. For this zinc oxide paste is applied on the skin. Zinc oxide powder and Vaseline are mixed in 1:3 amounts and are applied on skin 3-4 times a day.

One tablet of folic acid is given to the patient on the first day of admission and half tablet is given daily for a month.

Dermatitis

It is a skin condition in which skin becomes dry and inflamed. In severe malnutrition it is more common in children with oedema. A child with severe dermatitis was given a mixture made from zinc oxide and petroleum jelly. There are three grades of dermatitis. + Mild discoloration or a few rough patches of skin (appendix 5) ++ Moderate multiple patches on arms and/ or legs. +++ Severe flaking skin, raw skin, fissures (openings in the skin).

Edema

It is the retention of fluid in the body. There are three grades of edema.

+ mild both feet (appendix 5)

++ Moderate both feet, plus lower legs, hands, arms and face

+++ Severe All over the body

Eye Infection

Children with eye infections were given red and blue capsules of vitamin A containing drops according to age. Vitamin A is given on day 1 (for age > 12 months, give 2,00,000 IU, red in color) (for age 6-12 months, give 1,00,000 IU, blue in color) (for age 0-5 months give 50,000 IU) vitamin A is not given to the patients when they are having oedema but in case of eye problems then vit A is given despite having oedema. Mega dose of vit A is given in severe eye conditions 1 capsule of vitA which is 2,00,000 UI is given on first day then on third day and on the fourteen day it is given.

Anemia

Children with malnutrition always suffer from anemia. Children with Hb less than 4g/dl were transfused blood. While those Hb above than 4g/dl were given folic acid in order to prevent severe anemia. On the very first day of admission mothers were asked to give one complete tablet to the child. While half of the tablet is given for the rest of the days.

3.5.1.6 Treat/Prevent Infection

In severe malnutrition the usual signs of infection, such as fever, are often absent, and infections are often hidden. Measles vaccine if child is > 6m and not immunized (delay if the child is in shock)

3.5.1.7 Cautious Feeding

First three days after admission in SC are in the stabilization phase. In these days the patient is given therapeutic milk i.e.; F-75 for stabilization according to the patient's weight. The feeding formula used is F-75 which promotes recovery of normal metabolic function and nutrition electrolyte balance. During the stabilization phase, diarrhea should gradually diminish and edematous children should lose weight. Monitor the amounts offered and left over, vomiting, frequency of watery stool and daily body weight. If a child is on breast fed encourage breast feeding to be continued to make sure that child is breastfed every 2 hours. Milk based formula such as F 75 contains 75 kcal/100 ml and 0.9g protein/100 ml. This phase is completed in 3 days. During the stabilization phase, diarrhea should gradually diminish and oedema should subside.

3.5.1.8 Catch Up Growth

In the rehabilitation phase there is no medical complication and reasonable appetite. This phase promotes rapid weight gain of >10g/kg/d. In this phase F 100 (appendix 4) is given containing 100 kcal/100 ml and 2.9g protein/100ml. it is given after 2, 3 and 4 hourly. F 75 is replaced with F 100 but with the same amount.

Weight of the child is measured every morning.

<5g/day: poor weight gain

5-10g/day: moderate weight gain

>10g/day: good weight gain

3.5.1.9 Sensory Stimulation and Emotional Support

In malnutrition there are chances of delayed mental and behavioral development so children must be provided with care and love, cheerful environment, physical activity when the child is well, maternal involvement like comforting, feeding, play etc.

3.5.1.10 Follow Up

Advice parents to bring child for regular follow up

Ensure vaccinations are given

Ensure vit A is given every 6 months

Guide parents about complementary feeding.

3.5.1.11 Discharge Criteria

Discharge criteria for all infants and children are 15% weight gain and no sign of illness. Mother knows how to prepare appropriate foods and to feed the child. Follow up plan is discussed and understood.

3.6 Statistical Analysis

Data was analyzed by SPSS.

RESULTS AND DISCUSSIONS

This cross-sectional study was carried out at the medical teaching institute, Khyber Teaching Hospital Peshawar Pakistan. Data was collected from the stabilization center of the Pediatric ward to evaluate the proportion of malnourished children with Dermatitis. The study from the collected data gives the following results.

4.1 Socio demographic characteristics of the subjects

The socio demographic data of the subjects shows that out of 102 most of the subjects (39.2%) were of the age group of 6-12 years followed by (34.3%) were in the age group of more than one year. while others (7.8%) were in the age group of less than 6 months respectively. Majority of the subjects (61.8%) were girls and (34.3%) were boys as shown in the figure 4.1. In the type of feeding, formula milk yields a high percentage (64.7%) as compared to breast milk (35.3%) as shown in the figure 4.2. High percentage (68.6%) of the subjects were born premature, while about (31.4%) were born preterm as shown in the figure 4.3. The corresponding data shows the highest percentage (54.9%) Of the subjects having lower socioeconomic status while middle and upper yields (28.4%) and (16.7%) Percentage. Most of the mothers were illiterate (69.6%) and about (30.4%) were educated as shown in the figure 4.4. Most of the subjects having parity with multiparous (38.2%) and (38.2%) were primiparous as shown in table 4.1.

The present study conducted that a total number of 102 subjects were recruited where 38.2% were male and 61.8% were female which shows the greater prevalence in females as compared to male. This study resembles the work of Raksha *et al.*, 2023 which is a hospital based cross sectional study which includes 364 of total Children consists of about 52.5% female and 47.5% male. In our study most of the subjects were in the age group of 6-12 months followed by more than one year this study resembles to prospective study of chatproedprai and wanankul 2008, conducted at king chulalongkorn Memorial hospital which shows infants were aged between 1 month and 1 year of average 5.4+3.3 months. In our study most of the children were formula fed and started complementary feeding in the age of 6-12 months and children born term is about 68.6% also most of the families belong to lower socioeconomic class 54.9%. Maternal illiteracy is about 69.6% and among 102 children 63 (61.8%) were born to multiparous mothers. This study resembles the work of pandit *et al.*, 2020 on nutritional Dermatoses among malnourished children in a tertiary care center. Which shows that complementary feeding started age the age

of 6-12 months with a percentage of about 56%the term babies' percentage was just 4 % and family belonging to lower Socioeconomic class was about 41%and maternal illiteracy was about 43%.and about 70% were born multiparous mothers.

Table 4.1 Socio demographic characteristics of the subjects:

Variables	Categories	Frequency	Percentage
Age of the subjects	< 6 months	8	7.8%
	6-12 months	40	39.2%
	1 year	19	18.6%
	>1 year	35	34.3%
Gender	Female	63	61.8%
	Male	39	38.2%
Type of feeding	Breast feeding	36	35.3%
	Formula feeding	66	64.7%
Start of complementary feeding	<6 months	30	29.4%
	6-12 months	53	52.0%
	>12 months	19	18.6%
Maturity of birth	Pre term	32	31.4%
	Term	70	68.6%
Socioeconomic status	Upper	17	16.7%
	Middle	29	28.4%
	Lower	56	54.9%
Mother education	Educated	31	30.4%
	Illiterate	71	69.6%
Parity	Primipara	39	38.2%
	Multiparous	63	61.8%

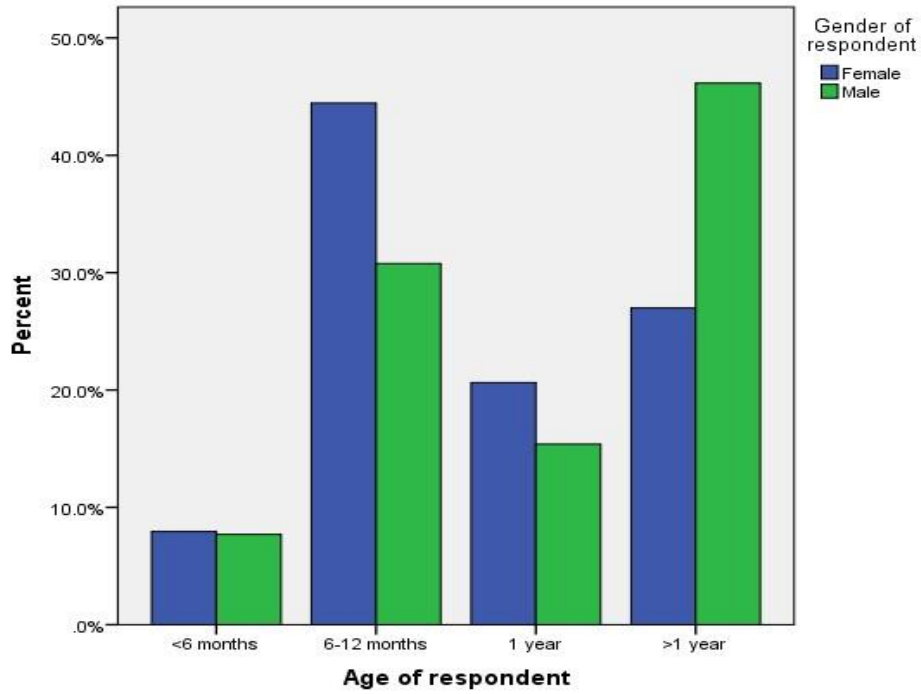


Figure 4.1 Age and Gender of the subjects

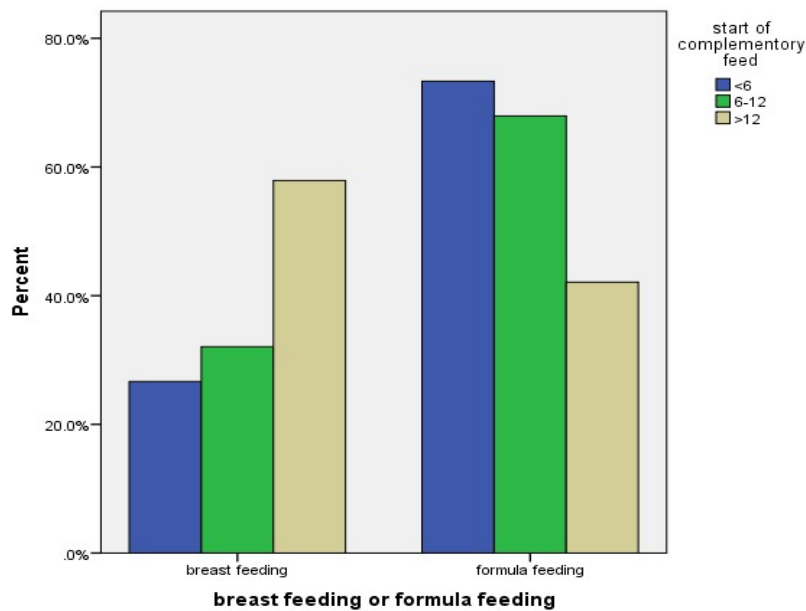


Figure 4.2 Breast feeding and start of complementary feeding of the subjects

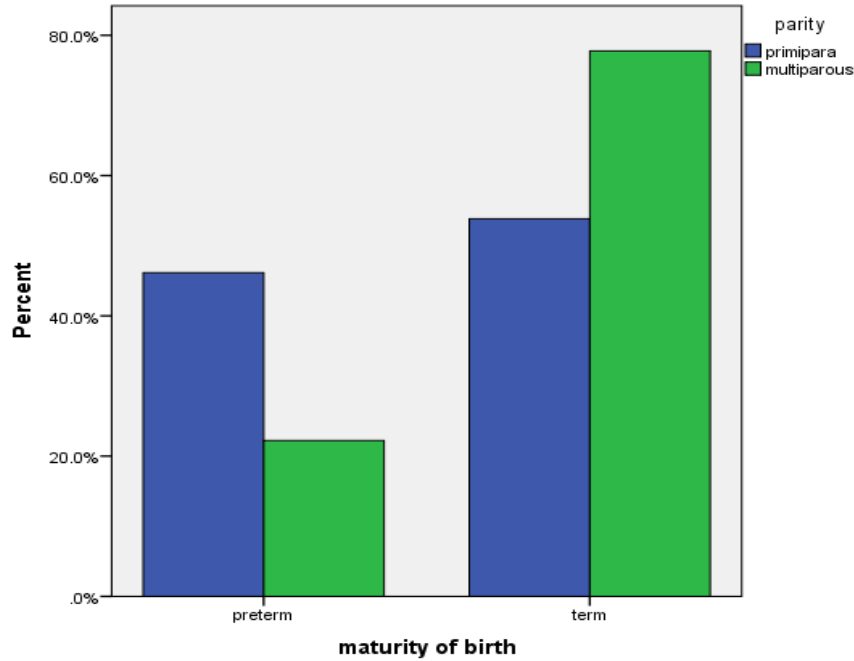


Figure 4.2 Parity and Maturity of birth of the subjects

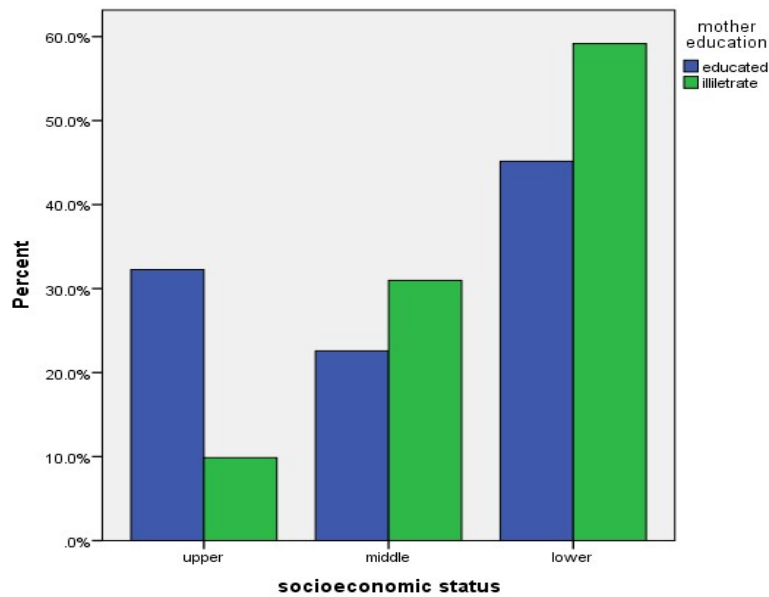


Figure 4.4 Socio economic status and mother education

4.2 Anthropometric characteristics of the subjects

The anthropometric characteristics of the subjects shows that the mean height of the subjects was 6.90- 3.56. and the mean weight on admission is 6.90+2.03 while the mean weight on

discharge is $6.51 + 2.04$. The z-score of $<-3sd$ shows that the subjects were severely Malnourished with a high percentage of 63.7%. Z-score of $<-2sd$ shows the moderate malnourished subjects with a percentage of 21.6% while the z-score of $-1sd$ is considered as normal with a percentage of 14.7% as shown in the table 4.2 and figure 4.2. This work resembles the study of Ambreen *et al.*, (2021) On the socio-economic determinants of Malnutrition which shows the z score for the age group of 7 months to 36 months is 31% to 26%.

Table .4.2 Anthropometric measurements of the subjects.

Variables		Frequency	
Height		69.33+13.56	
Weight	Weight on admission	6.90+2.03	
	Weight on discharge	6.51+2.04	
Z-score	<-3sd	65	63.7%
	<-2sd	22	21.6%
	-1sd	15	14.7%

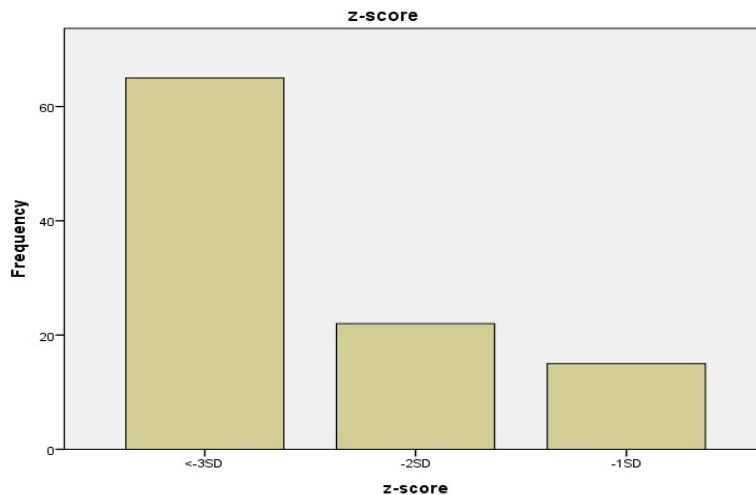


Figure 4.5 Z-Score of the subjects

4.3 Pattern Of Dermatitis

The cutaneous features of Dermatitis on malnourished children shows that out of 102 subjects most of the children have hair color changes with a highest percentage of 94.1% (96). Majority of the subjects having nails changed 84.3% (86). And the second highest percentage of 90.2% were the Pigmented skin subjects. Most of the subjects have sunken eyes about 86.3% (88) and about 68.6% (70) subjects have dehydrated bodies as shown in the figure 4.6. The oedema comprises three categories namely Grade, Grade B, and Grade C. The highest percentage 66.7% (68) of the subjects fall in Grade C showing the severity all over the body. While oedema involves both feet, legs, hands, arm, and face show a percentage of 24.5% (25) and the Grade+ shows mild both feet with a percentage of 8.8% (9) as shown in the table 4.3 and figure 4.7. This study resembles the work of Agarwal et al, 2023 on the pattern of noninfectious pediatric Dermatitis at tertiary care centers in Gujarat which include the children under 22 years and shows the most common with higher prevalence is Pigmentary disorders of about 70.9% Percent. In contrast to the study of Gujarati et al., 2021 conducted at tertiary care hospital with a total of 505 children, the Pigmentary disorders was about 19% and the hair disorders was about 3% such show less prevalence as compared to our study.

Table 4.3 Pattern of dermatosis

Variables		Frequency	Percentage
Hair changes	Yes	96	94.1%
	No	6	5.9%
Nail disorder	Yes	86	84.3%
	No	16	15.7%
Pigmentation	Yes	90	90.2%
	No	10	9.8%
Sunken eyes	Yes	88	86.3%
	No	14	13.7%
Dehydration	Yes	70	68.6%
	No	32	31.4%
Oedema	Grade +	9	8.8%
	Grade ++	25	24.5%
	Grade +++	68	66.7%

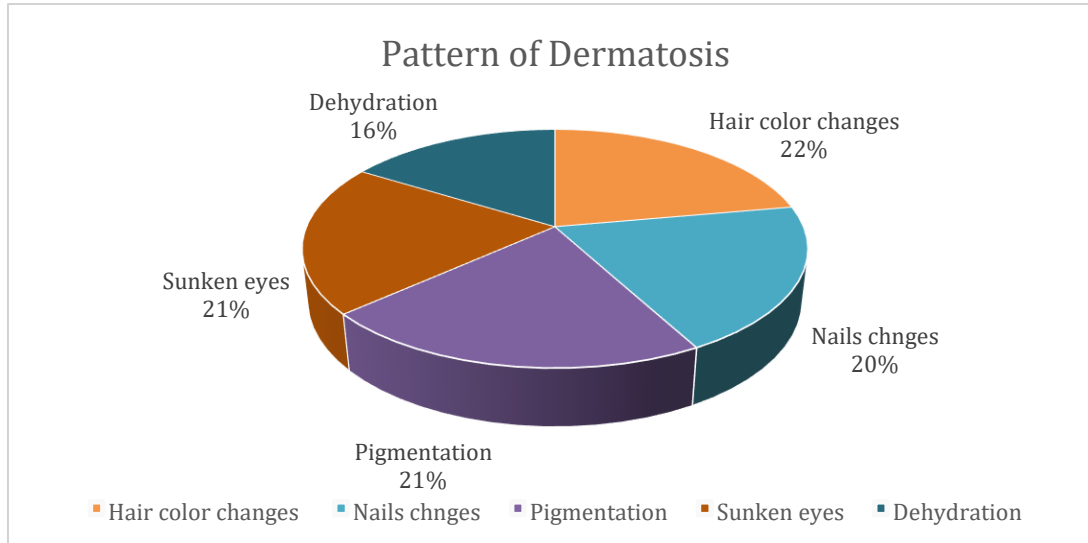


Figure 4.6 Pattern of Dermatitis of the subjects

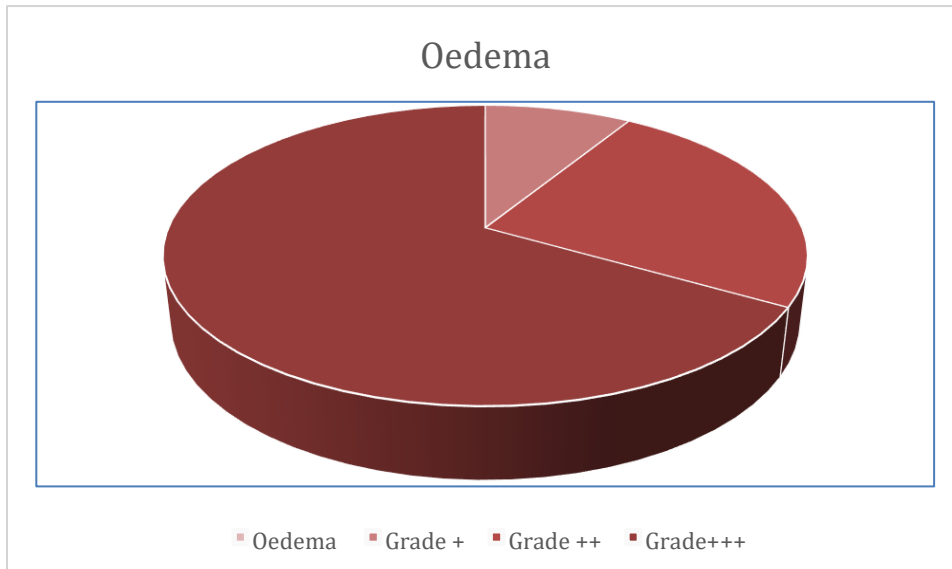


Figure: 4.7 edema of the subjects

CONCLUSION

The aim of this study was to find the prevalence of Malnutrition linked with Dermatosis. The present study concluded that Malnutrition with Dermatosis was more in girls as compared to boys, in the age group of 6-12 months, which were fed by formula feeding with a start of complementary feeding in the age group of 6-12 months. Low social economic status and low mother education were the main factors to contribute Malnutrition. Our findings shows that most of the multiparous children were severe malnourished with a z-score of <-3sd. Hair color changes and pigmentation are common cutaneous findings followed by Sunken eyes, Nails

changes and dehydration among malnourished children attending the care center. Dermatoses are mainly associated with Oedema of grade+++.

REFERENCES

- Chudzicka-Strugała, I., Gołębowska, I., Brudecki, G., Elamin, W., & Zwoździak, B. (2023). Demodicosis in Different Age Groups and Alternative Treatment Options—A Review. *Journal of Clinical Medicine*, 12(4), 1649.
- Shahzeen, S., Wasif, H. M., Mahmood, K., Ali, M., Hussain, S., & Maqsood, S. (2022). Clinical Pattern and Frequency of Pediatric Dermatoses at Social Security Teaching Hospital, Lahore. *Pakistan Journal of Medical & Health Sciences*, 16(05), 942-942.
- Tariq, H. (2022). Pattern of Dermatological disorders in Paediatric patients of Faisalabad. *Journal of Pakistan Association of Dermatologists*, 32(1), 131-135.
- Chen, Y. F., Lu, H. C., Hou, P. C., Lin, Y. C., Onoufriadi, A., McGrath, J. A., ... & Hsu, C. K. (2022). Plasma metabolomic profiling reflects the malnourished and chronic inflammatory state in recessive dystrophic epidermolysis bullosa. *Journal of Dermatological Science*, 107(2), 82-88.
- P. Vijayasankar and Kaliaperumal Karthikeyan (2022). Flaky Paint Dermatoses in Kwashiorkor. *The Am. J. Trop. Med. Hyg.* 106(1) 3
- Ramesh Aravamuthan, Sampath Vadivelu, Shabari Arumugam and Mukesh Mithran J. (2020) An overview of scalp dermatoses in a tertiary care institute. *Int. J. Dermatol.* 6(3) 304-312
- Asma Khalid and Tariq Mehmood (2012) spectrum of pediatric dermatosis and seasonal variation.
- Low, D. W., Jamil, A., Md Nor, N., Kader Ibrahim, S. B., & Poh, B. K. (2020). Food restriction, nutrition status, and growth in toddlers with atopic dermatitis. *Pediatric dermatology*, 37(1), 69-77
- P. Vijayasankar and Kaliaperumal Karthikeyan (2022). Flaky Paint Dermatoses in Kwashiorkor. *The Am. J. Trop. Med. Hyg.* 106(1) 3
- Ollech, A.S. Paller, L. Kruse, B. Kenner-Bell, S. Chamlin, A. Wagner, L. Shen, R. Yousif, L.C. Balmert, A.J. Mancini (2020). Pigmented purpuric dermatosis in children: a retrospective cohort with emphasis on treatment and outcomes by J. Eur. Acad. Dermatol. Venereal. 34(10) 2402-2408 Rajeshwari, K. A., Geetha, M., & Kiran, B. (2020). Prevalence and spectrum of pediatric dermatoses in school children: comparing hospital and school in rural Bangalore. *Int. J. Res.* 6(6), 1.
- Khan, M., Park, L., & Skopit, S. (2023). Management Options for Linear Immunoglobulin A (IgA) Bullous Dermatoses: A Literature Review. *Cureus*, 15(3).
- Hafeez, A., Rani, S., Faisal, B., Maheshwari, P. K., & Shaikh, A. H. (2022). Frequency of Different Dermatoses Presented at OPD in Sir Syed Hospital Qayoomabad. *Pakistan Journal of Medical & Health Sciences*, 16(05), 764-764.
- Dastoli, S., Nisticò, S. P., Morrone, P., Patrino, C., Leo, A., Citraro, R., ... & Bennardo, L. (2022). Colchicine in managing skin conditions: A systematic review. *Pharmaceutics*, 14(2), 294.
- Ahsan, U., Zaman, T., Rashid, T., & Jahangir, M. (2010). Cutaneous manifestations in 1000 Pakistani newborns. *Journal of Pakistan Association of Dermatologists*, 20(4), 199-205.
- Zhang, X., Zhang, L., Pu, Y., Sun, M., Zhao, Y., Zhang, D., ... & He, S. (2022). Global, Regional, and National Burden of Protein–Energy Malnutrition: A Systematic Analysis for the Global Burden of Disease Study. *Nutrients*, 14(13), 2592.
- Mehraj, M., Feroz, F., Sri, R. M., & Ravichandran, S. (2021) Harmful effects of malnutrition and possible sustainable solution.
- Addi, H., Reddy, Y. T., & Gandla, N. Study Of Prevalence Of Protein Energy Malnourishment In Children Of 1 To 5 Years Age. *European Journal of Molecular & Clinical Medicine (EJMCM)*, 9(08), 2022.
- Randhwan, S. R., & Gawade, G.H. (2023) Some Information about Kwashiorkor-“Edematous Malnutrition”.
- Glara, A. F., Sureka, A., Girija, N. S., & Vennila, K. Pharmacological Review on Panchamutti Kanji (Porridge) Fighting the Malnutrition in Children.
- Khan, Z., & Ali, A. (2023). Global Food Insecurity and Its Association with Malnutrition. *Emerging Challenges in Agriculture and Food Science*, 2.
- Kumar, N., Gupta, S., Gupta, U. K., Gupta, S., Gupta, P. K., & Gupta, V. (2023). PREVALENCE OF PROTEIN ENERGY MALNUTRITION IN CHILDREN 1-5 YEARS OF AGE IN PERIPHERAL REGION OF JAMMU-A CROSS SECTIONAL STUDY. *Int J Acad Med Pharm*, 51), 176-178.
- Bhatti, Z. I., Nawaz, K., & Ali, M. (2021). Prevalence and determinants of Protein Energy Malnutrition (PEM) among children under five years of age in rural communities of Lahore, Pakistan. *The Professional Medical Journal*, 28(01).
- Zaheer, A., Qurrat-ul-Ain, A. B., Sharif, A., & Naseer, D. (2023). Malnutrition in Children of Growing Age and the Associated Health Concerns. one health perspective In: Abbas RZ, Saeed NM, Younus M, Aguilar-Marcelino L and Khan A (eds), *One Health Triad*.
- Gogra, L., Fallah, J., Muchee, T., & Bourne, P. A. (2023). An Evaluation of Nutritional Status and Dietary Diversity of Under-five Children in Kroo Bay Community, Western Area Urban, Freetown, Sierra Leone.
- Welch, C., Wong, C. K., Lelijveld, N., Kerac, M., & Wrottesley, S. V. (2023). Adolescent pregnancy is associated with child undernutrition: systematic review and meta-analysis. *medRxiv*, 2023-05.
- Chee Din, M. A., Mohd Fahmi Teng, N. I., & Abdul Manaf, Z. (2023). Maternal depression and child feeding practices: Determinants to malnutrition among young children in Malaysian rural area. *Women's Health*, 19, 17455057221147800.
- Aini, Y. N., & Kurniawan, F. E. (2023). The Maternal Sociodemographic Determinants of Low Birth Weight in Indonesia. *KEMAS: Jurnal Kesehatan Masyarakat*, 18(4).
- Gandhi, J., Agrawal, S., Gupta, S., Verma, K., Mohite, A., & AGRAWAL, S. (2022). Pattern of Papulosquamous Disorders in Children: A Clinico-Epidemiological Study. *Cureus*, 14(1).

AUTHORS

First Author – Husna Wali B.Sc. (Hons), Department of Human nutrition, Women University Mardan.

Second Author – Huma Islam, B.Sc (Hons), Department of Human nutrition, Women University Mardan.

Third Author – Sajid Wahab, B.Sc. (Hons), Department of Agriculture, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan

Fourth Author – Habban Ullah, MBBS, Bachelor of Medicine and Bachelor of Surgery, Sargodha,medical,college,Sargodha.

Fifth Author – Omama Ahmad, B.Sc. (Hons), Department of Human Nutrition, Women University Mardan.

Sixth Author – Syed Umair Shah, M.Sc. (Hons), Department of Food Science and Technology, Abdul Wali Khan University Mardan, Pakistan.

Seventh Author – Umair Khan, M.Sc. (Hons), Department of Food Science and Technology, The University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan