Assessment the Relation between Introduction of the Solid Foods and Napkins Rash Occurrence in Children below Two Years Old.

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Abstract:

Background: Baby feeding went in to two phases; the 1St phase when the baby is on milk usually up to 4-6 months, in the 2nd phase the milk is not enough so the addition of the solid diets is recommended. Napkins rash is common complaint of the nursing mother and infant which may be due to solid diets.

The aim of the study: Is to evaluate whether the early introduction of solid diets to infant has any rule in increasing or decreasing the occurrence of napkins rash.

Patients and Methods: A convenient sample hospital based study was done on children between 4-24months who start solid diets, to evaluate the role of introduction of the solid diets on occurrence of the napkins rash. Each group evaluated by prepared questionnaire.

Results: The total number of the study cases are (52) cases, (22) male and (30) female and the results of this study were: Most of the cases were female (57.7%), between 13-24 months (50%), from the rural areas (71.2%), on the solid diet and bottle feeding (40.4%), normal (weight 57.7% and height 94.2%), with very early introduction of the solid foods between ages 4-6 months (61.5%). Most of the cases with recurrent napkins rash (51.9%) were used readymade napkins (48.1%), were on the bottle feeding and the solid diets (19.2%) (not significant), with very early introducing solids to their diet (28.8%) (not significant), female about (32.7%) (significant). And were from the rural areas (26.9%) (significant).

Conclusion: The study concluded that early introduction of the solid foods has no significant effect in occurrence of the napkins rash.

Keywords: Napkins rash, Dermatitis, Solid foods.

Introduction:

Nutrition is essential for normal growth and development, thus, careful attention to the nutritional needs of children, especially during 1st year of Life when brain growth is rapid, is necessary to permit children to develop to their full potential [(1)]. Caloric Requirements for new born are approximately 90-100 cal/ kg/ day**.** Researches have showed that breast fed-infants consume about (7-10%) fewer calories than their formula-fed peers. Between 3-9 months of age, all infants consume (10%) a fewer calorie than in the 1st 3 months, or between 9-12 months of age, energy expenditure is lower in breast-fed infant than in formula fed infants, but the reason remain unclear [(2)]. To approximate the composition of human milk, the diet of infant should contain (40-60%) of total calories from carbohydrate, (7-11%) of total calories from protein, and (10-55%) of total calories from fat [(3)]. Fat and cholesterol should not be restricted in infancy [(4)].

Introduction of solid foods is recommended at approximately 4-6 months of age. The first solid food should include iron-fortified Infant cereal mixed with breast milk or iron-fortified infant formula, or juices initially; new baby foods should be added one at a time so signs of intolerance (skin rashes, diarrhea, or wheezing) can be associated with offending food [5].

Contact dermatitis is of 2 types; allergic or primary irritant, allergic contact dermatitis occurs only in individuals who have been sensitized to an allergen after repeated exposure. Delayed type hypersensitivity occurs, resulting in an acute eczematous process with erythema, vesicles, weeping and crusting [6]. Primary irritant caused by the substance that is irritating to any one exposed to this substance frequently causes burning after exposure [7], some of the more common causes of irritant dermatitis in children include saliva, urine and stool [7]. Diaper dermatitis is a common problem in infants and most commonly is a form of irritant contact dermatitis. The dermatitis is caused by irritation from urine and feces, typically affecting the perianal region and the buttocks while spacing the protected groin folds [8]. Secondary infection by Candida Abidance or bacterial pathogens may complicate diaper dermatitis as well [9]. There is some research that shows that children with atopic eczema may absorb food in their gut differently to other children. This is why some may experience reactions to foods and is another goodreason to delay the introduction of solids until at least 6 months of age [10].

Patients and Methods:

A convenient sample hospital based study was done on children between 4-24 months of age who started solid diet, attending the pediatric outpatient department at Salahaden General Hospital during the period from 1st of January to the last of August 2017 selected randomly; these cases were attending the hospital for different reason. Before attending the study, a written acceptance was taken from directorate of the hospital and oral acceptance from the parents. Each case included in the study was assessed by prepared questionnaire that include name, age, sex, residence, type of feeding, type of napkins rash...etc.

Weight was assessed by UNICEF digital scale to nearby 0.1gram; length was assessed by studio-meter to nearby 0.1centimeter. Each case was examined for weight and length to diagnosis patient with malnutrition. Each case included in the study was assessed for history of occurrence of the napkins rash. Recurrent attacks were defined as more than 3 attacks per 6 months [6].

The time of introduction of solid diet were divided into very early (4-6 months), early (6-12 months) and late (> 12 months) [6]. Each patient was assessed for presence of diarrhea, any history of urinary tract infection (it is considered only if it's proved by culture) and examined for any chest manifestation.

Inclusion Criteria; Children older than 4 months, and less than 2years who starts the solid diets. Exclusion Criteria; Children under 4 months and older than 2 years, patients with history of chronic diarrhea, patients with chronic use of antibiotics, patients not start solid diet yet.

Statistical Analysis; the results of study presented by tables and figures, and then analyzed by ANOVA system to assess Chisquare, P .value <0.05 consider significant.

Results:

The total number of the cases that included in this study was 52 cases, 22 males and 30 females. Most of the cases included in this study were female (57.7%) figure (1). Most of them were from the rural areas (71.2%) figure (2).

Most of the study cases were between 13-24 months (50%) was female (34.6%) was shown in the table (1).

The table (2) shows most of the cases were on the solid diets and bottle feeding (40.4%); while (57.7%) of the study cases have normal weight table (3).

Most of the cases were normal length (94.2%), was shown in table (4).

Most of the cases included in this study were with very early introduction of solids to their diet (61.5%) and most were female (38.5%) was shown in table (5).

Most of the cases with recurrent napkins rash were used readymade napkins (48.1%) was shown in table (6).

Most of the cases with recurrent napkins rash (51.9%) were female (32.7%) was shown in table (7).

In this study, most of the cases with recurrent napkins rash (51.9%) were from the rural areas (26.9%) was shown in table (8).

The table (9) shows most of the cases with recurrent napkins rash (51.9%) were on (bottle feeding &solid diets) (19.2%).

Most of the cases with recurrent napkins rash (51.9%) were with very early introduction of solids to their diet (28.8%) was shown in table (10).

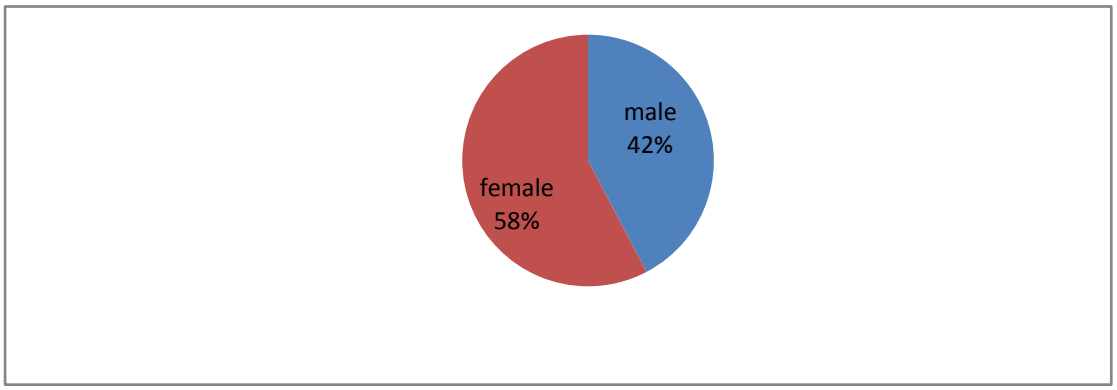

Figure (1): distribution of the study cases according to the sex.

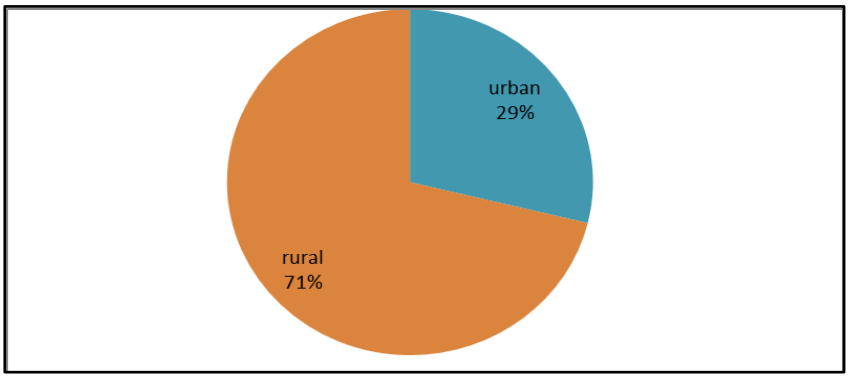

Figure (2): Distribution of the study cases according to the residence.

Table (1): Distribution of the study cases according to the age in regard to the sex.

Age(month)	Male	Female	Total
4-6	10(19.2%)	6(11.5%)	16(30.8%)
7-12	4(7.7%)	6(11.5%)	10(19.2%)
13-24	8(15.4%)	18(34.6%)	26(50%)
Total	22(42.3%)	30(57.7%)	52(100%)

Table (2): Distribution of the study cases according to type of the feeding in regard to the sex.

Type of feeding	Male	Female	Total
Solid diet &breast feeding	5(9.6%)	7(13.5%)	12(23.1%)
Solid diet& bottle feeding	11(21.2%)	10(19.2%)	21(40.4%)
Solid diet& Mixed feeding	6(11.5%)	10(19.2%)	16(30.7%)
Solid diet only	0	3(5.8%)	3(5.8%)
Total	22(42.3%)	30(57.7%)	52(100%)

Table (3): Distribution of the study cases according to the weight in regard to the sex**.**

Weight	Male	Female	Total
Less than 3rd percentile	12(23.1%)	10(19.2%)	22(42.3%)
Normal weight	10(19.2%)	20(38.5%)	30(57.7%)
More than 97thpercentile	0	0	0
Total	22(42.3%)	30(57.7%)	52(100%)

Table (4): Distribution of the study cases according to the length in regard to the sex.

Length	Male	Female	Total
Less than 3rd percentile	1(1.9%)	2(3.8%)	3(5.8%)
Normal length	21(40.4%)	28(53.8%)	49(94.2%)
More than 97th percentile	0	0	0
Total	22(42.3%)	30(57.7%)	52(100%)

Table (5): Distribution of the study cases according to time of introduction of the solid diets in regard to the sex.

Time	Male	Female	Total
Very early	12(23.1%)	20(38.5%)	32(61.5%)
Early	9(17.3%)	8(15.4%)	17(32.7%)
Late	1(1.9%)	2(3.8%)	3(5.8%)
Total	22(42.3%)	30(57.7%)	52(100%)

Table (6): Distribution of the study cases according to type of the napkin's used in regard to type of the napkins rash.

Type of napkin's rash	Readymade	Clothes	Total
Recurrent rash	25(48.1%)	2(3.8%)	27(51.9%)
Not recurrent rash	10(19.2%)	1(1.9%)	11(21.2%)
No rash	13(25%)	1(1.9%)	14(26. 9%)
Total	48(92.3%)	4(7.7%)	52(100%)

Table (7): Distribution of the study cases according to type of the napkins rash in regard to the sex.

Type of napkin's rash	Male	Female	Total
Recurrent rash	10(19.2%)	17(32.7%)	27(51.9%
Not recurrent rash	8(15.4%)	3(5.8%)	11(21.2%
No rash	4(7.7%)	10(19.2%)	14(26. 9%
Total	22(42.3%)	30(57.7%)	52(100%)

X2=5.6/correlation=0.3/P-value=0.062/significant relation.

Table (8): Distribution of the study cases according to type of the napkins rash in regard to the residence.

Type of napkin's rash	Urban	Rural	Total
Recurrent rash	13(25 %)	14(26.9%)	27(51.9%)
Not recurrent rash	1(1.9%)	10(19.2%)	11(21.2%)
No rash	1(1.9%)	13(25%)	14(26.9%)
Total	15(28.8%)	37(71.2%)	52(100%)

X^2=10.2/correlation=0.4/P-value=0.006/significant association.

Table (9): Distribution of the study cases according to type of the feeding in regard to type of the napkins rash.

Type of napkin's rash	Solid diet & breast feeding	Solid diet & bottle feeding	Solid diet & mixed feeding	Solid diet	Total
Recurrent rash	9(17.3%)	10(19.2%)	8(15.4%)	0	27(51.9%)
Not recurrent rash	1(1.9%)	5(9.6%)	3(5.8%)	2(3.8%)	11(21.2%)
No rash	2(3.8%)	6(11.5%)	5(9.6%)	1(1.9%)	14(26.9%)
Total	12(23.1%)	21(40.4%)	16(30.8%)	3(5.8%)	52(100%)

X^2=7.5/correlation=0.36/P-value=0.2/not significant.

Table (10): Distribution of the study cases according to time of introduction of the solid diets in regard to type of the napkins rash.

Type of napkins rash	Very early	Early	Late	Total
Recurrent rash	15(28.8%)	10(19.2%)	2(3.8%)	27(51.9%)
Not recurrent rash	7(13.5%)	3(5.8%)	1(1.9%)	11(21.2%)
No rash	10(19.2%)	4(7.7%)	0	14(26. 9%)
Total	32(61.5%)	17(32.7%)	3(5.7%)	52(100%)

X2=1.9/correlation=0.18/P-value=0.7/ not significant.
Very early: 4-6months age.
Early: 6-12months age.
Late: >12months age.

Discussion:

During 1st 6 months of life, milk provides up to (100%) of the nutritional requirements for the baby. Proper nutrition in infancy is essential for normal growth and development [(11)]. Healthy nutrition is especially important during the first 6 months of life [(12)].

After 6 months the milk is not enough, constitute only (60%) of the nutritional requirement so the addition of the solid diet is recommended that is the 2nd phase [(13)]. Napkins rash is a common complaint of the nursing mother [(14)]. There are many causes of the napkins

rash including milk and food allergy due to solid diet [14]. In this study most of the cases were female this supported by Yuonne E. chiu, who showed that female suffers more napkins rash than male [15], this may be due to: more delicate skin type of the female, which is usually dry that lead to increased trans-epidermal water loss with resultant increase of antigen absorption [16], also may be due to the sample size that attained the outpatient clinic was mostly female. In contrast to the study done by Kranke et al and Mostaf et al [17, 18], who reported male preponderance. In this study most of the cases were in age between 13-24 months, this approximate with the results of Mostaf, according to that, the age group range from 8-23 months [18], on the other hand, the age group in this study was higher than the results of the Jordan et al. [19], which was 9-12months this may be due to exclusion of other causes of diaper dermatitis, lack of sanitary environment, and the habit of introducing citrus fresh juice and soups that decrease PH of the stool, that lead to irritation of the genito-anal region and recurrent dermatitis. In this study most of the cases were within normal growth for the infants suffering from diaper rash that was supported by the work of Massarano A.A. et al, who claimed that the growth of the infant with diaper dermatitis appears to be normal [20], that may be related to the fact that the infant taking normal calories from the breast milk, cow's milk and solid foods [21], although, those may lead to increase stool acidity and further development of napkins rash [22]. This study shows that most of the cases were from the rural areas, that may be due to using less protective ointments or creams, bad quality napkins and less dependence on the healthy multilayered napkins [23], because of lack of information's about it, and higher costs that the family not able to cover. In contrast, Yuonne E. chiu shows that, the higher preponderance in the urban areas and high socioeconomic classes, due to higher industrial pollutions [15].

In this study most of the cases were on the bottle feeding and solid foods. Napkins rash is more among bottle feed babies than breast feed babies, although the obtained results were not significant. The reason why bottle feed is more liable for napkins rash, is that it decreases the stool PH so make the stool acidic that irritate the around skin while the breast milk less likely to develop moderate to severe diaper dermatitis [24, 25]; because it increases PH, make the stool more alkaline with decrease incidence of napkins rash. Adverse reactions to cow's milk are frequent in the first year of life. Cow's milk allergy was more common cause of recurrent perianal inflammation this may be indirectly supported with the work of Doganci and cengizlier [26], who claims the increased incidence of diaper dermatitis among cow's milk users.

In this study most of the cases were very early introduce solid's to their diet which increase the napkins rash as citrus juice, by increasing the acidity of the stool that lead to occurrence and recurrence of the rash, cow's milk can cause napkins rash, if the child suffering from lactose intolerance that increase the acidity of the stool [27]. Early introduction of the solid foods leads to increase the incidence of the food allergy; food allergy might manifest as napkins dermatitis [28]. Anne Zutavern et al showed that for the prevention of atopic diseases it is recommended, to delay introduction of solid food, until 6months of age [29]. Although, this study

found un significant correlation between early introduction of the solid foods and napkins rash; further studies needed to increase the total number of the cases.

In this study most of the cases were on readymade napkins, readymade napkins have higher incidence in the occurrence of napkins rash than homemade clothes, that's probably related to wide range quality of napkins that depend on the cost, the double layer is coasty, while some bad qualities have got low coast, that most of families depend on because of their income. In contrast to Baer E.L. et al who postulated that disposable diaper reduce the severity of diaper rash by about (42-48%), who showed that homemade diaper has higher incidence than disposable one due to increased contact time with the skin [(30)].

In this study most of the cases suffers from recurrent napkins rash , that was supported by the Royal pharmaceutical society of Great Britain [(31)], this might be related to the ignorance about the proper feeding habits, the use of bad quality napkins with less frequent napkins care so the child stay with wet napkins for long period of time, also the use of potent corticosteroids that was not prescribed by doctors which may lead to the thinning of the skin so antigens trigger skin reaction in lower concentration and shorter period of time [(32)].

Stephen Kownachi related recurrence of the napkins rash to the facts that babies skin thickness is about half the thickness of the adult's skin, also to the fact that the napkins rash can be aggravated by ammonia which is released when the baby's urine is broken down by the bacteria from the stool and in turn irritates the skin, also keeping nappy too tight may keep wetness closer to skin. In the same way, using wipes may cause recurrence and worsening of the rash as some contains additives like antiseptics, which will lead to recurrence of the rash, one more time again as the baby is growing the amount of solid's in his diet increase, this lead to more frequent waste and more nappy rash recurrence as there is more enzymes that irritates the skin, finally, the application of too much creams on the skin may lead to a thin layer on nappy that prevents or decreases the absorption ability of the nappy that will lead to both recurrence and unresponsiveness of the rash [(33)].

Conclusion:

The study concluded that early introduction of solid diet has no significant effect in the occurrence of napkins rash.

Recommendations:

According to this study we recommend to:

1. Educate the young or uneducated mothers to introduce solid foods at 4-6 months of age.
2. Educate the mothers to use good quality napkins if possible, that absorbs irritants perfectly, change the napkins frequently to decrease the contact time of the irritants with the skin,allow skin to dry completely before putting on another diaper, and place the baby on an open cloth diaper during naptime.

References:

[1]. Hall R. and Carroll E.," infant feeding, reviews composition of breast milk and formulas and offers recommendations", *Pediatrics*, 2014, vol. 21: pp.191-199.

[2]. Cynthia G., David M., "Is breast truly best? Estimating the effects of breastfeeding on long term child health and

wellbeing", social science and medicine, 2014, vol. 109: pp. 55-65.
[3]. Kelleher D. and Duggan C.," Breast milk and breast feeding in the 1990s.Curr. Opin", *Pediatrics,* 1999, Vol. 11: pp.275-280.
[4]. Loughlin H., etal." Early termination of breast feeding: Identifying those at risk", *Pediatrics*, 1985, Vol.75: pp.508-513.
[5]. Hervada A. and Newman D. "Weaning: Historical perspectives Practical recommendations and current controversies. Curr. Probl", *Pediatrics,* 2015, Vol. 22: pp.223-240.
[6]. Burks A.A.," Atopic dermatitis and food hypersensitivity reactions. *J. Pediatri*.1998, Vol 132: pp.136.
[7]. Mortz C. and Andersen K.," Allergic contact dermatitis in children and adolescents". *Contact Dermatol*, 1999, vol. 41: pp.121-130.
[8]. Kuiters G.," Allergic contact dermatitis in children and young adults. Arch". *Dermatol,* 2013, Vol. 127: pp.1558-1563.
[9]. Kalish R.," Recent developments in the pathogenesis of allergic contact dermatitis". Arch. *Dermatol,* 2015, Vol. 127: pp. 1558-1563.
[10]. Bultrani V. J.," A review 0f pathogenesis with up-to-date clarification of the role of T cells, Langerhans' cell, and adhesion molecules. The clinical spectrum of atopic dermatitis", *Allergy Clin. Immunol*.1999, vol. 104: pp.87-98.
[11]. Saha, Moni R.; Ryan, Kath; Amir, Lisa H. "Postpartum women's use of medicines and breast feeding practices: a systematic review". International Breast feeding Journal.2015, 10(1).
[12]. FenglianXu ˚; Qiu, Liqian; Binns, Colin W; Liu, Xiaoxian, "Breastfeeding in China: a review". International Breastfeeding Journal.2009, 4 (1): 6.
[13]. Reeves, Elizabeth A., and Cheryl L. Woods-Giscombé. "Infant- Feeding Practices among African American Women: Social-Ecological Analysis and Implications for Practice." Journal of Transcultural Nursing, 2015, Vol. 26: no. 3, pp. 219.
[14]. Lind, Jennifer N.; Cria G. Perrine; Ruowei Li; Kelley S. Scanlon; Laurence M. Grummer-Strawn, "Racial disparities in access to maternity care practices that support breastfeeding—United States, " Morbidity and Mortality Weekly Report. Centers for Disease Control and Prevention. 2014, 63 (33): 725-728.
[15]. Karen J Marcdante, Robert M. K liegman. Nelsons Essentials of Pediatrics, Philadelphia: Elsevier, 2015, 25: 188, pp.650-656.
[16]. Paller A.S., "Immunodeficiency syndromes", in Text Book of Pediatric Dermatology, Harper J., Oranje A. and Prose N., Eds.,1997, pp. 351-354.
[17]. Kranke B., Trummer M., Brabek E., Komericki P., Turek T.D., And Aberer W., "Etiology and causative factors in perianal dermatitis: results of a prospective study in 126 patients", Wiener Klinische Wochenschrift,2016, Vol. 118: no.3-4, pp. 90-94.
[18]. Mostaf W.S., Arnaout H.H., and Lawindi M.I., "An Epidemiological Studyof perianal dermatitis", Pediatric Dermatology, 1997, vol. 14: no.5, pp.351-354.
[19]. Jordan W.E, Lawson K.D., Berg R.W., Franxman J.J, and Marrer A.M., "Diaper dermatitis: frequency and severity among a general infant population", Pediatric dermatology, 1986, Vol.3: No.3, pp.198-207.
[20]. Massarano A.A., Sally Hollis, Devlin J., and David T.J. "Growth in Atopic Eczyma", Archives of Disease in Childhood, 1993, Vol. 68: pp.677-679.
[21]. Hodhod M.A., Hamdy A.M., Deeb M.T., and Elmaraghy M.O., "Cow's Milk Allergy Is a Major Contributer in Recurrent Perianal Dermatitis of Infants", International scholarly Research Network,2013, Vol. 11: No. 3, pp. 6-9.
[22]. Prasad HR, Srivastava P, Verma KK. Diaper dermatitis an over view, *inclian J. Pediatr*, 2013, 70(8): 635-677.
[23]. Gozen D, Caglar S, Bayraktar S, Atici F. "Diaper dermatitis care of newborns human breast milk or barrier cream",

Journal clinical nursing, 2014, Vol.23: pp. 515-516.
[24]. Blume P. U., Hauser M., Lunnemann L., "Prevention of diaper dermatitis in infants", Pediatric Dermatology, 2014, Vol.31: pp. 413- 415.
[25]. Ravanfar P., Wallace J.S., Pace N.C., "Diaper dermatitis: A review and update", Current Opinion Pediatrics, 2012, Vol. 31: pp. 19-22.
[26]. Doganci T. and Cengizlier R., "Role of cow's milk allergy in children with chronic constipation", The Tukish Journal of Pediatrics, 2007, Vol.16: pp. 8-12.
[27]. Host A., "Frequency of cow's milk allergy in childhood" Annals of allergy and immunology, 2012, Vol. 89: No. 6, pp. 33-37.
[28]. Host A., Koletzko B., Dreborg S. et al, "Dietary products used in infants for treatment and prevention of food allergy", Arch Dis Children,1999, Vol.81: pp. 80-84.
[29]. Zutavern A., Brockow I., Schaaf B., von Berg A., Diez U., Borte M Et al. Timing of solid food introduction in relation to eczema, asthma, allergic rhinitis, and food and inhalant sensitization at the age of 6 years: results from the prospective birth cohort study LISA. Pediatric; 2008, 121: 44–52.
[30]. Baer E.L., Davies M.W., Easterbrook K.J., "Disposable nappies for preventing napkins dermatitis in infants ", Cochrane Database, Syst. Review, 2016, vol. 19: pp.43-55.
[31]. Ralf J.J., "The Royal Pharmaceutical society of Great Britain", British National formulary, 1992, no.23, pp.393.
[32]. Bath F.J., Jenkinson C., Humphreys R., Williams H.C., "Dietary supplements for established atopic eczema", Cochrane Database of Systematic Reviews, John Wiley &Sons issue.2013,2, No. 52, pp. 5-7.
[33]. Stephen Kownachi, Eessential facts about nappy rash –health care and safety made for mums, primary care. *Dermatology society jornal* 2015, 3, pp. 82-85.