American Journal of Sciences and Engineering Research

E-ISSN -2348 – 703X, Volume 4, Issue 6, 2021

Anthropometric Measurements and Growth Evaluation of Infants, whose Admitted at Misurata Maternity and Pediatrics Hospital, Libya

Ayman Balla Mustafa*[1]; Maryam Ismail[2]; Mohamed Abdelmalek[2]; Abdalla Elgenaidi[1]; Emhemed Abukhattala[3]

[1-]*Department of Therapeutic Nutrition, Faculty of Health Sciences, Misurata University, P.O. Box: 2478, Misurata, Libya.*

[2-]*Department of Pediatric, Faculty of Medicine, Misurata University, P.O. Box: 2478, Misurata, Libya.*

[3-]*Department of Life Science, the Libyan Academy, Misurata, Libya.*

Abstract: *An infant's growth pattern may be particularly relevant starting as early as the first months of life, since it may be associated with later health outcomes. Differences in weight and length progression between atopic infants and healthy children are significant from the second month of age onward and become marked in the second 6 months of life. The cross-section and hospital-based study were conducted to assess the growth rate of infants aged from birth up to one-year-old with respecting nutrition risk factors. In addition, to compare anthropometric measurements with gender and medical history of infants. The study was investigated randomly 226 respondents, those who attended Misurata Maternity and Pediatrics hospital from Feb. to Oct. 2020. The questionnaire was structured according to study purposes. Four parts of the questionnaire had compiled, these included basic information, medical history, anthropometric assessments, and biochemical tests. Pearson Correlation was used to evaluate the relationship between variables. The result revealed that more than one-third of infants were stunted, and 12% of them were underweight (less than 5% percentile). Whereas 22% of infants had acute malnourishment, this finding may be correlated with a high risk of morbidity among infants. The majority of participants were infected with respiratory infections, 87%, and chronic diarrhea 22% because. There was an insignificant ($p \geq 0.05$) correlation between gender, birth weight, body weight, common illness, continuation of breastfeeding, and types of formula. The nutrition risks of infants will be threatening child growth and development unless the maternal has committed with initiation and duration breastfeeding and regular follow up with a pediatric nutritionist.*

I. Background

Nutrition has a central influence on growth, especially during the first years of life. Breastfed infants grow faster in their first months and are slightly shorter at 12 months of age, they weigh less and are leaner than formula-fed infants (Koletzko et al, 2009). Breastfeeding influences body composition, breastfed infants gain more fat during the first 6 months and gain more lean mass from 6 to 12 months of age than formula-fed infants. The growth pattern of breastfed infants is likely to play a role in the effects of breastfeeding on long-term health. Breastfeeding protects against respiratory infections, diarrhea, and otitis media and has been associated with higher developmental scores (Gale et al; 2012). Problems in infant nutrition often center on birth weight and the baby's functional abilities. Olsen et al (2005), reported that the growth charts are used to determine whether infants are born small, appropriate, or large for gestational age, thereby assessing the

 Received-13-08-2021, Accepted- 07-09-2021

adequacy of prenatal growth. Infant weight gains averages 20–30 g/day. The normally growing infant follows his or her percentile rank from 6 weeks after birth, and deviations of more than two channels should be promptly investigated. Infants growing outside the 5th and 95th percentiles also merit further investigation. Small-for-gestational-age infants remain shorter and lighter and have smaller head circumferences, while large-for-gestational-age infants grow longer and heavier and have larger head circumferences (Raynor and Rudolf, 2000). Exclusively breast-fed infants gain weight in a different pattern from formula-fed infants; weight gain may slow be concerning length, particularly after the first 6 months. After approximately 6 months, most infants are ready for complementary foods such as baby cereals and strained vegetables which provide key nutrients and introduce the infant to new tastes and textures. An infant who is lovingly and consistently fed when hungry will feel secure and well cared for (Ambrosini et al; 2012). This study was aimed to assess the growth rate of infants in compare nutrition risk factors during study conduction. To compare anthropometric measurements with a medical history and biochemical tests.

II. Materials and methods

Area of study

This study was conducted in maternity and pediatrics hospitals of Misurata. Misurata is a city in the Misurata District in northwestern Libya, situated 187 km (116 mi) to the east of Tripoli and 825 km (513 mi) west of Benghazi on the Mediterranean coast near the cape of Misurata. It is the third-largest city in Libya, after Tripoli and Benghazi. It is the capital city of the Misurata District and has been called the trade capital of Libya. It lies at a longitude is 32 ^{o}.377533" N and Latitude is 15^{o}.092017" E. It located is at 7 meters' height, which is equal to 23 ft. above sea level.

Research Design

This is a hospital-based cross-section study, that is used to assess nutrition status, evaluate growth rate among infants who attended Misurata Maternity and Pediatrics hospital from February 2020 up to January 2021.

Study population

The investigations were targeted infants from birth up to one-year-old. Their mother or co. the patient was informed about the study purpose and importance of the study before beginning the sampling procedure. The study proposal was approved by the Scientific Board of Therapeutic Nutrition Department, and all procedures were followed following the ethical standards of the Misurata University. The study was investigated randomly about 226 respondents, whose attended Misurata Maternity and Pediatrics hospital.

Sampling and data collection

The questionnaire was structured according to study purposes. Four parts of the questionnaire had been compiled, face-to-face interviews of respondents, who were selected randomly in the hospital. The questionnaire was included general information, family history, anthropometric assessment (WFA, HFA, MUAC, HC, CC), and biochemical tests (Hb, Ca). The primary data of blood parameters were collected from patient's files, that the recent results of laboratory tests were taken whereas, others old tests were excluded.

Anthropometric measurements

Growth rate and velocity were observed by using height-for-age percentile (HFA) weight-for-age (WFA), weight-for-height (WFH), chest circumference (CC), and head circumference (HC) for age according to WHO (2010). Mid-upper arm circumference (MUAC) was measured and stipulated according to Robert et al; (2013). The normal growth rate was adopting a range (5% - 90%). Overweight prevalence was defined by a cut-off point greater than 90% of the index. Whereas, the prevalence of undernutrition was estimated at less than 5% of the index. Also, the normal growth of the head was observed by using head circumference and chest

circumference to age centile according to the Centre for Disease Prevention and Control (2009). All data were plotted on the growth chart for measurement and evaluation.

Data quality management

The structured questionnaire was prepared in English and translated into the Arabic language. A pre-test of the questionnaire was done before actual data collection just to check its accuracy, response to analysis, and estimate which time it is needed.

Statistical analysis

The SPSS software, version 18 was used for data analysis. Descriptive statistical methods were represented in the frequency and percent as well as Pie Chart. Pearson Correlation was used to evaluate the relationship between variables. The relationship between the two variables is significant if P-value is less than 0.05.

III. Results and Discussion

General information

This study was performed to assess the anthropometry measurements and nutrition status among infants, those who admitted to Misurata hospital for maternity and pediatric. Figure (1) represents the distribution of study population according to age groups, 1-3 months' age greater frequency, it was percent 41%, 4-6 months' age was percent 39%, while more than 6 months was percent 20%. This is result indicated that almost all infants in this study at the exclusive breastfeeding stage, were less than 6 months old. The child's age is a good factor, that associate with malnutrition, as well as the child's growth and development, it is reflected in the nutrition status of the community.

The data was classifying study population into gender, age, and birth weight, the male infant group was percent 60% (F:135) and the female infant group was percent 40% (F:91). This classification is just assessing growth and development during infancy. Therefore, all respondents weighed at birth. Whose had weighed normal, more than 2.5 kg were 87% percent, and whose had weighed less than 2.5kg were 13% percent. The latter considered as low birth weight as shown in table (1). This finding may be attributed to maternal malnourishment during pregnancy. So some studies stated that low birth weight is becoming a fairly serious problem in developing countries, where pregnant mothers face dietary deficiency. (WHO, 2001).

Anthropometry measurements

As shown in table (2), the anthropometry measurements were done among all respondents in this study, the result revealed that weight for age (WFA) less than the 5^{th} percentile, was percent 12%, the data lied between 5^{th} – 85^{th} percentile, it was percent 79% and more than > 85^{th}, it was 9%. The head circumference measurements were measured according to sex factor, the data recorded that, less than 5^{th} percentile, it was percent 18%, the result lied between 5^{th} - 85^{th} percentile were percent 74%, while the data recorded that more than 85^{th} percentile, it was percent 8%. The length for age (LFA) was measured and compared with reference population in the same gender, the Length of infants, that frequency of less than 5^{th}, it was percent 39% and data that lied between 5^{th} - 85^{th} percentile, it was percent 49%, when a frequency that more than 85^{th} percentile, it was 12%. The measurement of chest circumference for age was done overall infants in the survey, the frequency of the less than 5^{th} percentile, it was percent 8.5%, the frequency lied between 5^{th} -85^{th} percentile, it was percent 76.5% when more than 85^{th} percentile 15%. The present result revealed that 12% of infants were underweight, 39% of infants were stunting, 18% of infants were microcephaly, all of these may be attributed to a deficit in nutrition requirements or illness during infancy, it similar to finding that, potential mechanisms resulting in reduced nutrient intakes relative to nutrient requirements, and the effects of nutrition on the infant growth and development (Mehta et al; 2013). Thus similar to another study reported that, during infancy, the infant has a relationship with the type of food, during milk-feeding, the introduction

of complementary foods and the transition to family foods, can be critical health and development. (Carruth and Skinner, 2002).

It is clear from table (3) the measurements of mid-upper arm circumference. The frequency of Severe Acute Malnutrition (SAM), it was percent 10%, Moderate Acute Malnutrition (MAM), it was 12% percent and that normal level, it was 78% percent, these data indicated that 21% percent of an infant under nourishment state, they may be premature or due to nutrition risk factor. The result of the current study revealed that about 22% of an infant at undernutrition status according to MUAC measurements. MUAC is currently not recommended for use among infants aged below 6 months because of a lack of data on its reliability, measurement in practice, and predictive value for death. (Martha et al; 2012).

The common illness of infants

In figure (2). Respiratory infection is a major common illness among infants in this study, it was 87% percent (F:197), followed by other illness were (F:57) then chronic diarrhea frequency was (F:35), the result revealed that almost all infants, who have admitted to the hospital with respiratory infections. Figure (3) indicates the immunization status, the result indicated that the majority 78% percent of infants had appropriate immunization status than those had improper immunization status 22% percent. Figure (4) illustrates, is a present disease from the past month? So, the majority of infant's 52.5% percent not carried any disease from the previous month, where a little 47.5% percent carried the disease from the previous month. The high proportion of infants who suffered from a respiratory infection and chronic diarrhea may be attributed to poor hygiene during feeding, not get quite of breastfeeding, and poor safety during preparation and handling of child food. It closed to study, the most common causative organism viral 80-90% respiratory viral infection is a major cause of morbidity and mortality in infancy, in particular, is a time of increased disease susceptibility and severity viral infection shapes the development of the infant immune system and its future responses. (John and Jurgen, 2010). In developing countries, poor growth is associated with a greater risk of morbidity and mortality from infectious diseases, mainly lower respiratory infections and diarrhea (Agostonia and Fattore, 2013).

Laboratory assessment

The laboratory test of some blood parameters has been taken from patient files as shown in table (4). The result revealed that, the majority 87% percent of infants with normal hemoglobin level but fewer proportions of an infant with high hemoglobin level than normal, those whose 12% percent while a very little proportions 1% percent with less than normal hemoglobin level. Whereas, that almost infant's 72% percent with normal calcium level but many infant's 24% percent with high calcium level, and very few percent 4% infants with a low level of calcium. Bhutta et al (2008) reported that the multiple micronutrient (MMN) deficiencies continue to account for a substantial number of maternal and child deaths, low birth weight, maternal and child undernutrition, wasting, and stunting as well as delayed child development globally. Iron deficiency anemia (IDA) is the most prevalent form of nutritional anemia. It accounts for approximately half of the global anemia cases and poses an increased risk of maternal and child mortality (Ahmed et al; 2012). The majority of respondents 81% percent were not follow-up, that necessary in monitoring growth velocity and development, just a few respondents 19% percent, whose were follow-up regularly for monitoring growth and health status by physician and nutritionist as shown in Figure (5). This finding agreed to study, the growth as viewed by a pediatric nutritionist perspective is a complex matter, ranging from the early stages of intrauterine development up to adult ages and aging processes (Agostonia and Fattore, 2013).

The correlation between parameters

Table (5) shows that, the correlation of common illness with exclusive BF duration. So the correlation between common illness and length exclusive BF was insignificant ($p \geq 0.05$) for all variables. Also, table (6) was shown

an insignificant (p ≥0.05) correlation between some common illnesses with types of formula has been used. The result presented in table (7), were shown, there were insignificant (p ≥0.05) correlation between gender, birth weight, body weight and continuation of breastfeeding. Also, the correlation between body weight and types of formula. This is confirmed by the p-value of 0.70 and the correlation coefficient of 0.026. This finding is similar to that, although growth in infancy is complex, bottle size may be a modifiable risk factor for rapid infant weight gain and later obesity among exclusively formula-fed infants. (Wood et al; 2016).

IV. Conclusion and Recommendations

Nutritional evaluation relevant to medical history, anthropometry, and some biochemical indices have been included, to identify the nutrition status of infants, those admitted in Misurata hospital for maternity and pediatric. A detailed growth monitoring as a part of the routine nutritional assessment by careful measurement and reference to standard growth charts is appreciated.

The study result demonstrated that the majority of participants were male infants (60%), more than one-third of participants were stunting, and 12% of them were underweight (less than 5% percentile). Whereas, 22% of infants under normal level of mid-upper arm circumference, it may be attributed to high risk of morbidity of infants.

It also the majority of participants, whose were infected with respiratory infections and chronic diarrhea because the bottle of feeding is most used during the complementary feeding period. Therefore, respiratory infection and chronic diarrhea should have prevalence as common illnesses of infants in Misurata City.

The nutrition risks of infants will be threatening child growth and development unless the maternal has committed with initiation and duration of exclusive breastfeeding for babies. The complimentary food must be provided safe handling, balance, iron, and zinc, to establishing good eating habits and food preferences.

V. References

1. Ahmed T, Hossain M, Sanin KI: Global burden of maternal and child undernutrition and micronutrient deficiencies. Ann Nutr Metab 2012;61(suppl 1):8–17.
2. Ambrosini G, Emmett P, Northstone K, Howe L, Tilling K, Jebb S: Identification of a dietary pattern prospectively associated with increased adiposity during childhood and adolescence. Int J Obes (Lond) 2012; 36:1299–1305.
3. Carruth B. R., Skinner J. D. Feeding behaviors and other motor development in healthy children (2_12 months). J Am. Coll. Nutr. 2002 Apr;21 (2):88-96.
4. Gale C, Logan KM, Santhakumaran S, Parkinson JR, Hyde MJ, Modi N: Effect of breastfeeding compared with formula feeding on infant body composition: a systematic review and meta-analysis. Am J Clin Nutr 2012; 95:656–669.
5. Centers for Disease Control and Prevention (CDC) by Grummer-Strawn LM, Reinold C, Krebs NF, Use of World Health Organization and CDC growth charts for children aged 0-59 months in the United States. MMWR Recomm Rep 2010; 59:1.
6. Koletzko B, Shamir R, Ashwell M: Quality and safety aspects of infant nutrition. Ann Nutr Metab 2012; 60:179–184.
7. Koletzko B, von Kries R, Close R, Escribano J, Scaglioni S, Giovannini M, Beyer J, Demmelmair H, Gruszfeld D, Dobrzanska A, Sengier A, Langhendries JP, Rolland Cachera MF, Grote V; European Childhood Obesity Trial Study Group: Lower protein in infant formula is associated with lower weight up to age 2 y: a randomized clinical trial. Am J ClinNutr.2009;89:1836–1845.
8. Martha K Mwangome, a Greg Fegan, a Tony Fulford,b Andrew M Prenticeb & James A Berkley (2012). Mid-upper arm circumference at age of routine infant vaccination to identify infants at elevated risk of death: a retrospective cohort study in the Gambia. Bull World Health Organ 2012; 90:887–894 | doi:10.2471/BLT.12.109009.
9. Mehta NM, Corkins MR, Lyman B, et al. Defining pediatric malnutrition: a paradigm shifts toward etiology-related definitions. JPEN J Parenter Enteral Nutr 2013; 37:460.

10. Olsen IE, Mascarenhas MR, Stallings VA: Clinical assessment of nutritional status; in Walker WA, Watkins JB, Duggan C (eds): Nutrition in Pediatrics. London, Decker, 2005, pp 6–16.
11. Raynor P, Rudolf MCJ: Anthropometric indices of failure to thrive. Arch Dis Child 2000; 82:364–365.
12. Robert D. Lee, David C. Nieman: Nutritional assessment
13. World Health Organization (WHO), (2010). Growth standards are recommended for use in the U.S. for infants and children 0 to 2 years of age.
14. World Health Organization (WHO). The optimal duration of exclusive breastfeeding. Report of an Expert Consultation. Geneva, WHO, 2001.
15. Agostoni C., Fattore g. Growth Outcome: Nutritionist Perspective. Shamir R, Turck D, Phillip M (eds): Nutrition and Growth. World Rev Nutr Diet. Basel, Karger, 2013, vol 106, pp 12–18 (DOI: 10.1159/000342527).
16. Wood Charles T, Asheley C Skinner, H Shonna Yin, Russell L Rothman, Lee M Sanders, Alan M Delamater, Eliana M Perrin. Bottle Size and Weight Gain in Formula-Fed Infants. Pediatrics J., 2016 Jul;138(1): e20154538. DOI: 10.1542/peds.2015-4538. Epub 2016.

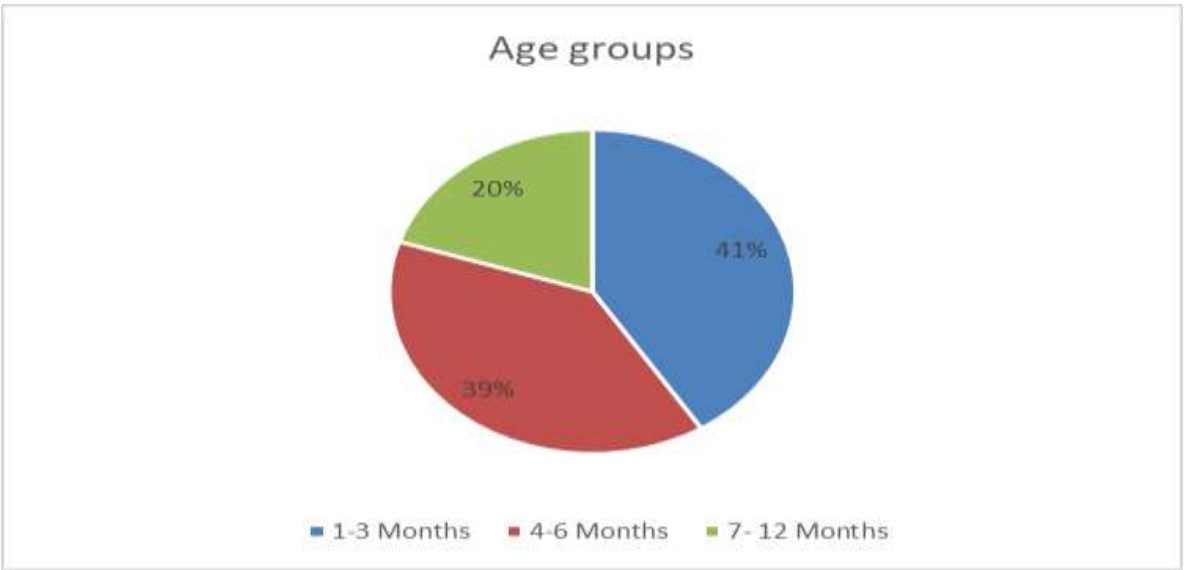

Figure 1. the age groups of the study population.

Table 1. Classification of study population according to gender and birth weight.

Parameters	Group	Frequency	Percent
Gender	Male	135	60%
	Female	91	40%
	Total	226	100%
Birth weight	<2.5 Kg	29	13%
	≥2.5 Kg	197	87%
	Total	226	100%

Table 2. The anthropometry measurements of infants during the survey.

Anthropometry	Index	Frequency	Percent
Weight/age (WFA)	<5th percentile	27	12%
	5th – 85th percentile	178	79%
	>85th percentile	20	9%
	Total	225	100%
Head circumference /age (HCFA)	<5th percentile	41	18%
	5th – 85th percentile	166	74%

	>85th percentile	18	8%
	Total	225	100%
Length/age (LFA)	<5th percentile	88	39%
	5th – 85th percentile	110	49%
	>85th percentile	27	12%
	Total	225	100%
Chest Circumference/age (CCFA)	<5th percentile	19	8.5%
	5th – 85th percentile	172	76.5%
	>85th percentile	34	15%
	Total	225	100%

Table 3. Measurement of Mid-Upper Arm Circumference (MUAC) of the infant.

Parameters	Index	Frequency	Percent
Mid Upper Arm Circumference	SAM	23	10%
	MAM	26	12%
	Normal	174	78%
	Total	223	100%

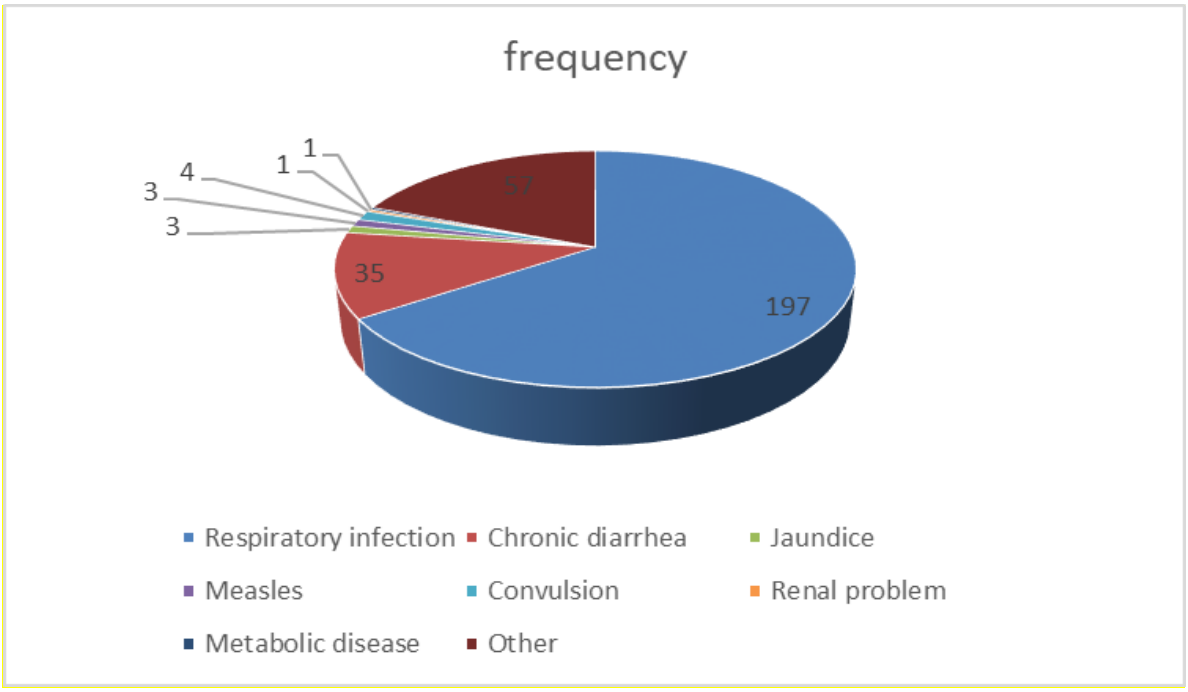

Figure 2. the common illness of infants in the study area

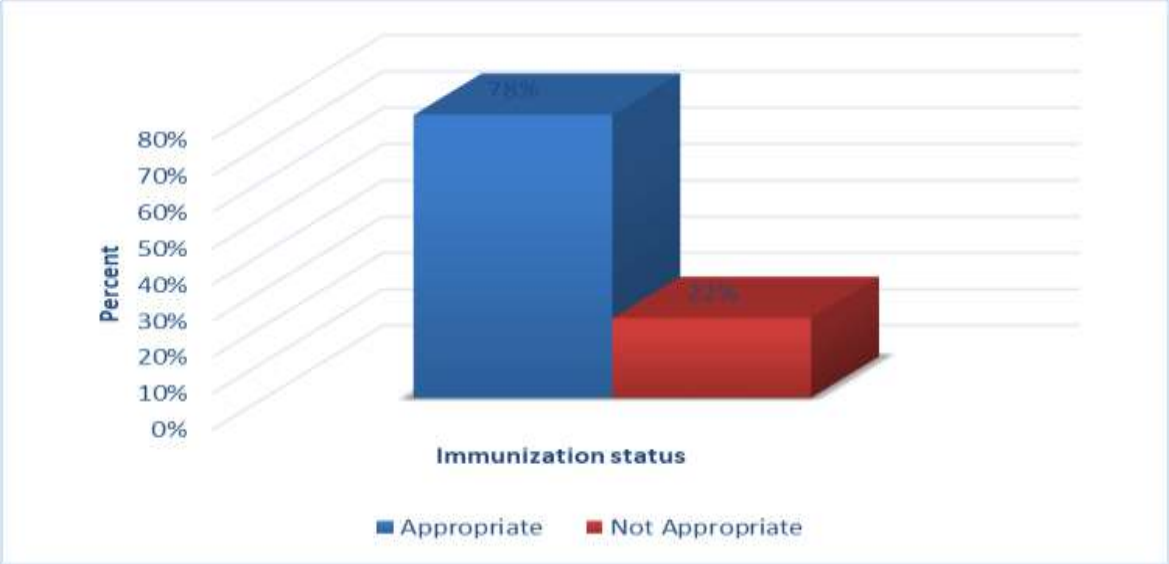

Figure 3. Immunization status of the infant.

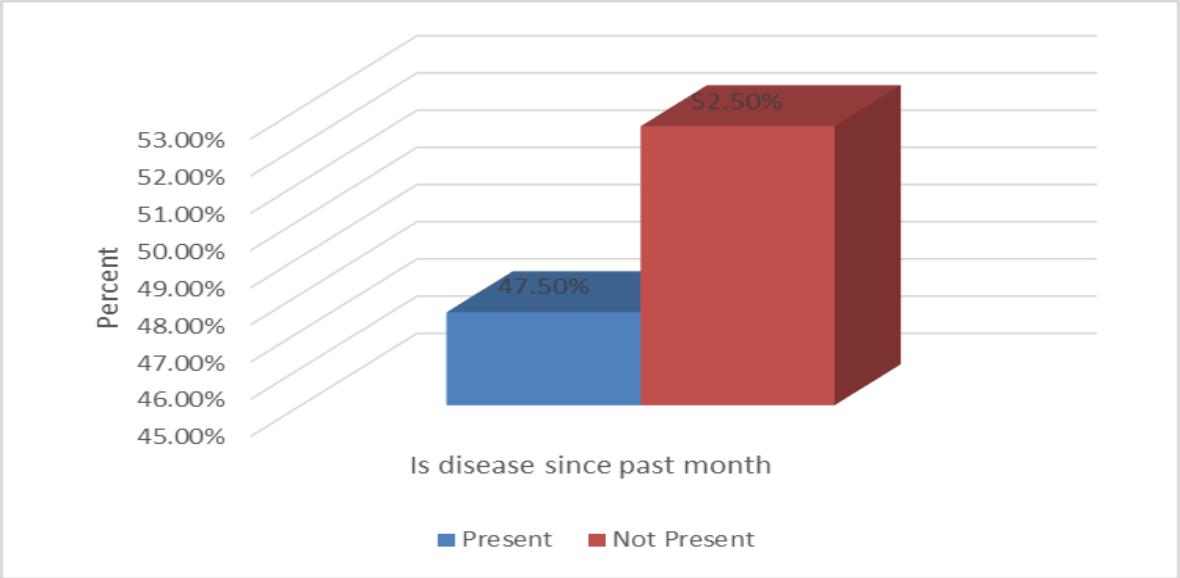

Figure 4. Is illness present in the past month?

Table 4. laboratory tests of hemoglobin and calcium level of infants

Parameters	Index	Frequency	Percent
Hemoglobin level	Less than normal	3	1%
	Normal level	189	87%
	More than normal	25	12%
	Total	217	100%
Total Ca level	Less than normal	7	4%
	Normal level	129	72%
	More than normal	44	24%
	Total	180	100%

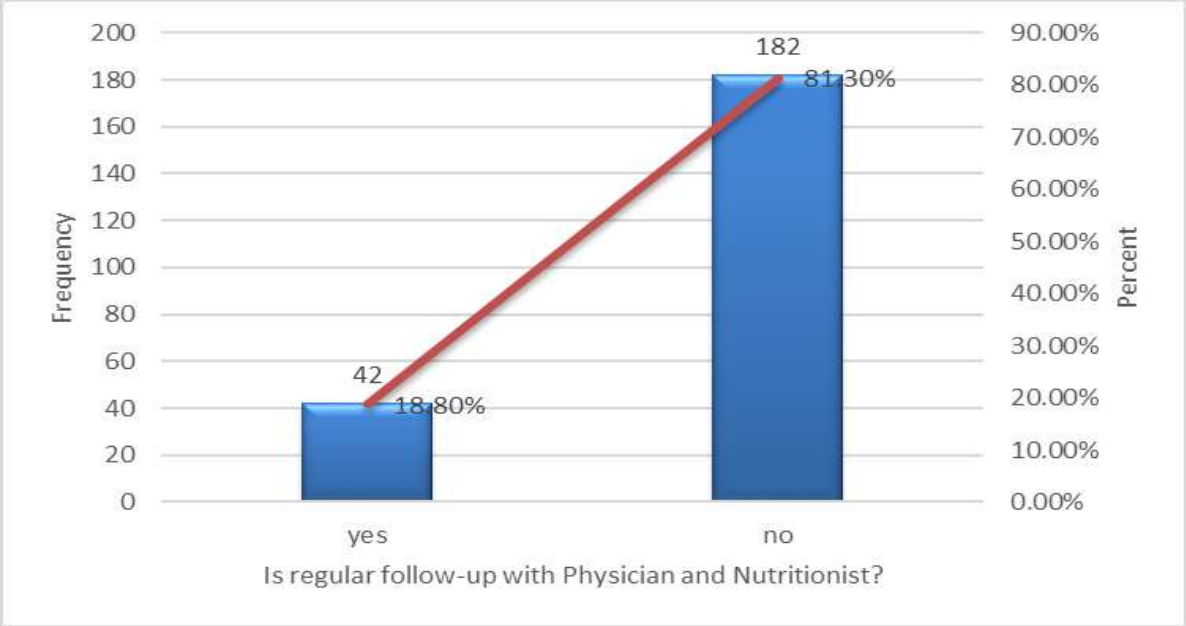

Figure 5. Follow-up regularly with Pediatrician and nutritionist.

Table 5. The correlation between common illness with types of formula has been used.

Correlation-ship	Correlation Coefficient	Sig. (2-tailed)	N
Respiratory infection	-0.122	0.067 n.s	226
Chronic diarrhea	0.032	0.632 n.s	226
Jaundice	-0.092	0.168 n.s	226
Convulsion	-0.106	0.110 n.s	226
Renal problem	0.039	0.556 n.s	226

n.s Non significant

Table 6. the correlation of some common illnesses with exclusive BF duration.

Correlation-ship	Correlation Coefficient	Sig. (2-tailed)	N
Respiratory infection	0.061	0.358 n.s	226
Chronic diarrhea	0.085	0.202 n.s	226
Convulsion	-0.026	0.702 n.s	226
Renal problem	0.013	0.847 n.s	226

n.s Non significant

Table 7. The correlation of birth weight with gender, the continuation of BF, and types of formula

Correlation-ship	Correlation Coefficient	Sig. (2-tailed)	N
Birth weight× Gender	0.045	0.499 n.s	226
Birth weight× Continuation of BF	0.072	0.281 n.s	226
Body weight× Types of formula	0.026	0.70 n.s	226