Nutritional Status of Children 0 – 23 Months in Tsafe Local Government Area of Zamfara State, Nigeria Nutritional Status of Infant and Young Children

***Tsebam John[1,2], Owolabi Olumuyiwa Adeyemi[1], Musa Muawiya Abarshi[1] and Atawodi Sunday Eneojo[3]**

[1]*Department of Biochemistry, Ahmadu Bello University, Zaria, Nigeria*

[2]*Afomdabo Nutrition Consulting firm, Lokongoma Phase 2, Lokoja Kogi State.*

[3]*Department of Biochemistry, Federal University, Lokoja, Nigeria*

[*]**Corresponding author:** johntsebam@gmail.com Phone number: +2348033915787

ABSTRACT

Background: *Adequate nutrition is essential to the growth and development of children. The North-West region of Nigeria is the most affected in the country with Zamfara State having the worst malnutrition problem in the region.*

Objective: *The aim of this research was to assess the nutritional status of infants and young children (0 to 23 months) in Tsafe LGA of Zamfara State.*

Methods: *A cross-sectional study was carried out among 256 randomly selected infant and young children. Anthropometric indices (weight, length and MUAC) were measured using WHO method. Biochemical and haematological parameters were determined using semi-auto Analyzer (SURECHEM) and hemosmart gold hemoglobin test strip respectively; Zinc, Iron and Calcium was assessed using Atomic Absorption Spectrophotometry.*

Results: *The anthropometric results revealed that 40.3%, 41.7% and 22.2% of the children studied are wasted, underweight and stunted respectively. The result also revealed larger proportion of children deficient in calcium (86.7%), iron (51.2%) and zinc (60.2%).*

Conclusion: *This study indicates that high level of childhood micronutrient deficiencies in Tsafe LGA could be one of the contributors to the poor nutritional status. Government intervention is urgently needed by way of empowerment, provision of food supplements and enlightenment campaigns.*

Keywords: Nutritional status, Anthropometry, Infant and young Children, Micronutrients, Zamfara State.

Doi: https://dx.doi.org/10.4314/njns.v45i2.20

INTRODUCTION

Malnutrition is one of the principal underlying causes of death for many children in the world contributing to more than one third of under-five deaths globally. Nutrition that is adequate is crucial for the growth and development of children. The first one thousand days of life, beginning from conception to age of 2 years is very important for optimal health, growth, intelligence quotient (IQ), physical, mental and cognitive development. However, this period is often marked by acute malnutrition and micronutrient deficiencies that interfere with optimal growth. In addition, illnesses such as diarrhea and acute respiratory infections become common among children (1,2).

Globally, it is estimated that under-nutrition is responsible, for at least 35% of deaths in children less than five years of age (3). Studies have consistently shown that the peak for growth faltering, micronutrient deficiencies and common childhood illnesses occurs from birth up to 2 years of age (2,4,5). Nutritional status is an important determinant of maternal and child health (6,7). An estimated 32%, or 186 million, children below five years of age in developing countries are stunted and about 10%, or 55 million, are wasted (8). Under-nutrition is also directly or indirectly a major cause of disability preventing children who survive from reaching their full development potential. Under nutrition in children is still highly prevalent in low-income and middle-income countries and results in significantly increased maternal and child mortality and morbidity (4).

The importance of breast feeding for mothers and infants cannot be overemphasized as it reduces the risk of morbidity and mortality from infectious diseases such as diarrhoea, and pneumonia (9). Appropriate complementary food to children aged 6 months and above help to fill dietary gaps that breast feeding alone can no longer meet (10).

To emphasise the importance of child feeding, the World Health Organization (WHO) and United Nations Children Fund (UNICEF) jointly developed the Global Strategy for Infant and Young Child Feeding (IYCF) in 2023 (10). The WHO's 2023 recommendations for complementary feeding advise introducing complementary foods at 6 months of age while continuing breastfeeding, emphasizing a diverse diet including animal-source foods, fruits, vegetables, legumes, nuts, and seeds. They also stress the importance of avoiding foods high in sugar, salt, and trans fats, and providing accurate information and support through healthcare systems and community programs (10).

The Sub-Saharan Africa has a high prevalence of stunting, low weight-for-age and acute malnutrition (11). The nutritional status of Nigerian children showed that 32.9% were stunted, 5.3% were wasted while 19.4% were under-weight. According to the survey, In Zamfara state, 57.5% were stunted, 28% under-weight and 11.2% were wasted. National nutrition health survey reported that in Nigeria, North-West region is the most affected in the country with Zamfara state having the worst malnutrition problem in the region (12, 13).

The nutritional status of the infants mainly depends on feeding practices in the community (14). Appropriate feeding practices helps in child survival growth and development (2,4,10). Inadequate breastfeeding is a key factor for under nutrition in infants and was estimated to be responsible for 800,000 child deaths annually worldwide in 2023 (12).

A child born in Nigeria has 30 times more likelihood of dying before the age of five years than children born in industrialized and developed countries (15). Therefore, attention needs to be refocused on the promotion of household level feeding practices that are beneficial to the survival of children and caregivers in Nigeria most especially the Northern part in order to meet the commitment of Nigeria to the United Nations Sustainable Development Goals (SDG 2: Zero Hunger)

The aim of this research was to assess the Nutritional status of infants and young children (0 to 23 months) in Tsafe LGA of Zamfara state, Nigeria.

MATERIALS AND METHODS

Study Materials

The materials used for the study include Seca weighing scale and length board, MUAC tape, cuvette hemosmart, sterile labeled containers

Study Design

A cross-sectional study of children 0 – 23 months was carried out in the study area.

Study Area

This study was carried out in Tsafe Local Government of Zamfara state, Nigeria. Its headquarters is in the town of Tsafe at 11°56′00″N 6°54′00″E /11.93333°N 6.90000°E. It has an area of 1772 km² and a population of 266,929 at the 2006 census. The age group distribution of the population in the local government area shows that children are the highest with 49 % distribution (16). Figure 1 below shows the map of Zamfara state with all the local government areas.

Study Population

Children from 0-23 months. Apparently, Healthy Children between the ages of 0-23 months of both sexes. Children that are sick requiring hospitalization were excluded from the study.

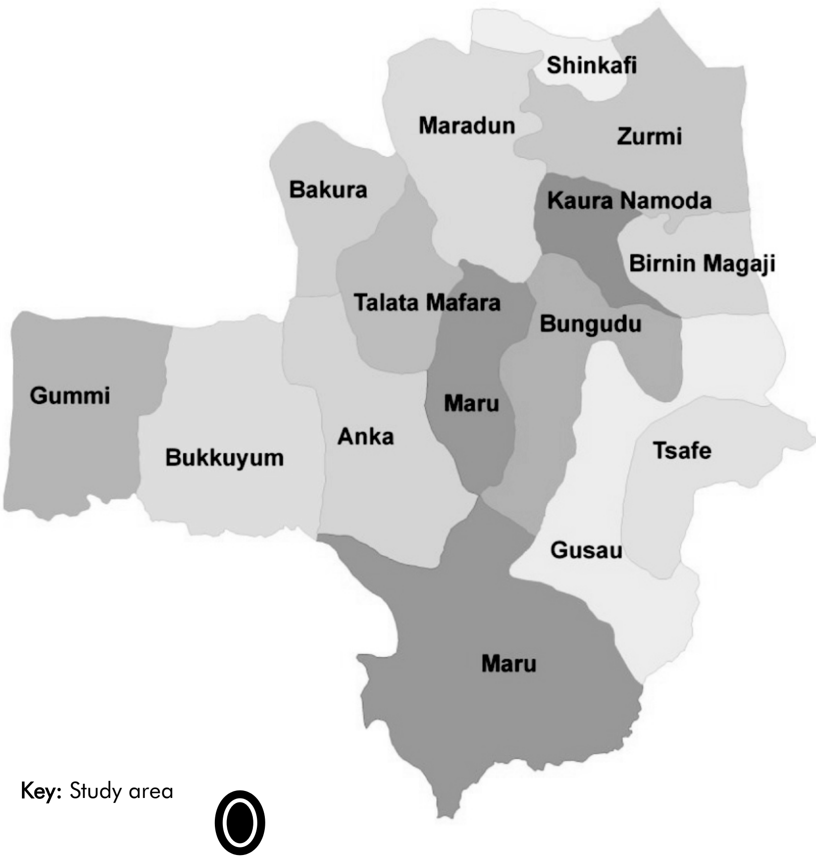

Figure 1: Map of Zamfara State Showing All the Local Government Areas
Source: National Population Commision (16).

Sample Size

The sample size was determined according to the formula below:

$$N = \frac{Z^2 P(1-P)}{D^2}$$

Where N = Sample size,

Z = Z statistic at 95 % level of confidence (1.96)

P = Reported prevalence of breast feeding in Zamfara is 0.17 (13).

d = Maximum tolerable limit of error (5 % or 0.05)

$$N = \frac{1.96^2 \times 0.17\,(1-0.17)}{0.05^2} = 216.8$$

Adjusting for design effect and non-response rate at 5% (17), the total sample size of approximately 256 children less than 24 months was used to represent the whole population.

Sampling Technique

Cluster sampling method was used for the study. The survey used a list of Enumeration Areas (EAs) prepared for the 2006 Population Census. Each locality was subdivided into census Enumeration Areas (EAs). The primary sampling unit (PSU) was referred to as a cluster on the basis of EAs from the 2006 EA census frame. The sample was selected using a two-stage cluster design as described below (18).

First Stage Sampling Procedure: Cluster Selection

Cluster sampling technique using ENA for SMART software was employed to list of cluster and population. A total of 30 PSU (clusters) were randomly selected from the LGA sample frame according to the probability proportional to size (PPS) method with the support from National Population Commission.

Second Stage Sampling Procedure: Household Selection

The second stage of sampling consisted of selecting households within each cluster by using systematic random sampling method. The determination of the total number of households in the cluster by conducting a household listing through detailed sampling technique was carried out and a total number of eight (8) households were selected from each cluster. In a household, healthy children between 0-23months were sampled. A total of 256 children were sampled.

Anthropometric Measurements

Anthropometric measurements were taken by the methods described (19,20). Children (in light clothing) were weighed by UNICEF SECA scale, and recumbent length was measured in centimeters to the nearest 0.1cm using an infantometer. The Z-scores outcome was used as children nutritional status according to WHO criterion on basis of height-for-age, weight-for-height and weight-for-age for stunted, wasted and underweight, respectively. Children with low weight for height (wasted) from 0-23 months were further screened with the MUAC tape.

Blood Sample Collection and Preparation

Blood sample (3 ml) was collected from children between 0-23 months by venipuncture and dispensed into sterile, labeled, containers containing no anticoagulant (21). The Samples were conveyed to the Laboratory where the serum was separated from the plasma using a centrifuge, the serum was then passed through various processes as follow.

Micronutrients Determination

Micronutrient (Ca, Iron, and Zn) were determined with atomic absorption spectrophotometer (AAS) –Buck 200 using a direct method as described by Kaneko (22).

The atoms of the element, when aspirated into the AAS, vaporized and absorbed light of the same wavelength as that emitted by the element when in the excited state. The amount of light absorbed in the flame is proportional to the concentration of element in the sample.

Atomic absorption spectrophotometric measurement of plasma trace elements concentrations was done using atomic absorption spectrophotometer (AAS). Samples were thawed and 1:20 dilution made with 0.1N HCl. Diluted samples were aspirated directly into AAS for analyses.

Working standard solutions was prepared by diluting the stock standard with 0.1N HCl and the required part per million (ppm) used for the standardization of the corresponding trace elements.

Protein and Albumin Determination

Semi-auto Analyzer (SURECHEM) was used to determine the serum concentration of Protein and Albumin spectrophotometrically (23).

The assay conditions were: wavelength 630nm, cuvette: 1cm light path, temperature: 15-25°C. The blank contained 1000 μl of reagent (R1), the standard contained 1000 μl of R1 and 5 μl of calibrator, the sample contained 1000 μl of R1 and 5 μl of sample. The reaction mixture was mixed and incubated for five (5) minutes at room temperature. The absorbance (A) of the samples and calibrator were read against the blank. The colour was stable for one hour at room temperature (15-25°C).

$$\text{Albumin}\ (g/di) = \frac{(A)\text{sample} \times 5(\text{calibrator concntration})}{(A\ \text{Standard})}$$

$$\text{conversion factor: } \frac{g}{dl} = \frac{(A)\text{sample} - (A)\text{sampleblank} \times 5(\text{calibrator concntration})}{(A)\text{standard}}$$

Conversion factor μg/dl x 0.179 = μmol/L.

Reference value

Male: 65-175 μg/dl Female: 50-170 μg/dl

Packed Cell Volume and Hemoglobin Determination

Hemoglobin and PCV were determined using hemosmart. A machine that immediately give the haemoglobin and pack cell volume right on the field (24).

The code card was inserted to code card port. The screen then displayed the current code number being used.

Principle: HemoSmart GOLD Hemoglobin Test Strip uses electrochemical biosensor technology for quantitative hemoglobin measurement in blood. A small drop of capillary, venous, or arterial blood applied to the strip triggers an electrochemical reaction with the strip's reagents, generating a signal proportional to hemoglobin concentration. This signal is measured by the HemoSmart GOLD meter, which displays the hemoglobin level. The system is designed for accuracy and precision, making it essential for diagnosing and managing anemia.

Procedure: HemoSmart GOLD Hemoglobin Test Strip was inserted into the meter with the blood sample reaction zone facing up. The test strip contact points were inserted all the way into the meter. The test strip bottle was closed immediately after the strip was taken.

If the meter entered the main mode, it was ensured there was no error message. But where there was error message, the test strip was discarded and the entire process was repeated. The flashing blood drop and test strip icons on upper-left side of the meter was allowed to display on the screen. The haemoglobin and pack cell measurement were noted and taken.

Data Analysis

The questionnaires were coded and analyzed. Microsoft Excel and SPSS version 25 were used for data entry and analysis. The results are expressed as frequencies and percentages.

Ethical Approval

Ethical clearance for this study was obtained from Zamfara State Ministry of Health (ZSHREC02062018). Informed consent was obtained from the community leader of the communities used for the study. Also, verbal consent was obtained from the subjects that were willing to participate in the study

RESULTS

Levels of Malnutrition among the Children in the Study Area

Tables 1 and Table 2 show percentage of stunting, wasting and underweight and Table 2 shows occurrence of stunting by age based on Height-for-Age Z-Scores. The percentage children who are wasted was 40.3%. Moderate wasting was 27.8% while severe wasting 12.5%. The percentage of underweight was 41.7% moderate underweight 27.8% and severe underweight 13.9%. On stunting, the percentage was 22.2% moderate stunting was 9.7% while severe stunting was 12.5%. The study revealed that, 22% of the children were stunted 12% were severely stunted while 10% were moderately stunted. This is significantly high ($p<0.05$) because the study was centered on 0-23 months. The various classification for the stunting, wasting and underweight is on the basis of revealing the severity of the level of malnutrition.

Protein, Albumin, Haemoglobin, PCV and some Minerals Status of Children 0-23 months in Tsafe LGA of Zamfara State

The result as presented in Table 3 reveals larger

Table 1: The Proportion of Stunting, Wasting, and Underweight among Children (0-23m) in Tsafe LGA of Zamfara state Nigeria

Proportion of acute malnutrition (wasting) based on weight-for-height z-scores (and/or oedema) and by Sex			
Indicators	ALL	Boys	Girls
Malnutrition	112 (40.3 %)	59(47.2 %)	53(33.3 %)
Moderate malnutrition (<-2 z-score and >=-3 z-score, no oedema)	80 (27.8 %)	48 (30.6 %)	32 (25.0 %)
Severe malnutrition (<-3 z-score and/or oedema)	64 (12.5 %)	36 (16.7 %)	28 (8.3 %)
Proportion of underweight based on weight-for-age z-scores by sex			
Malnutrition	110 (41.7 %)	60 (44.4 %)	(50) 38.9 %
Moderate malnutrition	(100) 27.8 %	(40) 25.0 %	(60) 30.6 %
Severe malnutrition	(46) 13.9 %	(36) 19.4 %	(10) 8.3 %
Proportion of stunting based on height-for-age Z-scores and by Sex			
Stunting (<-2 z-score)	158 (22.2 %)	109(33.3 %)	49(11.1 %)
Moderate stunting (<-2 z-score and >=-3 z-score)	37(9.7 %)	37(19.4 %)	0(0.0 %)
Severe stunting (<-3 z-score)	61(12.5 %)	33(13.9 %)	28(11.1 %)

number of children deficient in calcium (86.7%), iron (51.2%) and Zinc (60.2%). Furthermore, 77.7% of the children were deficient in Haemoglobin and 80.9% were deficient in pack cell volume (PCV). From the sampled children, 60.5% had normal total protein while 48.4% had normal albumin (3.8-5.4g/dl) (25).

Table 2: Proportion of Stunting by Age based on Height-for-Age Z-Scores

Age (months)	6-17	18-29	30-41	42-53	54-59
Severe stunting (<-3 z-score)	15 (8.5%)	24 (33.3%)	0 (0%)	0 (0%)	0 (0%)
Moderate stunting (>= -3 and <-2 z-score)	15 (8.5%)	15 (22.2%)	0 (0%)	0 (0%)	0 (0%)
Normal (> = -2 z score)	147 (83.0%)	40 (44.4%)	0 (0%)	0 (0%)	0 (0%)
Oedema	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 3: Protein, Albumin, Haemoglobin, PCV and some Minerals Status of Children 0-23 months

Elements	Indicators	Frequency	Percentage (%)
Zinc* (10.2g/dl)	Normal	102	39.8
	Low	154	60.2
Iron** (110-270mcg/dl for 0- 4months and 30-70mcg/dl for 5-23 months	Normal	48.8	48.8
	Low	51.2	51.2
Calcium (8.8-10.6g/dl)	Normal	13.3	13.3
	Low	86.7	86.7
Albumin (3.8-5.4g/dl)	Normal	48.4	48.4
	Low	51.6	51.6
Total protein (4.1 -7.0g/dl)	Normal	155	60.5
	Low	101	39.5
Hemoglobin***	Normal	57	22.3
	Low	199	77.7
PCV (36.1-44.3%)	Normal	49	19.1
	Low	207	80.9

PCV: Packed cell volume
*10.2g/dl (25)
**110-270mcg/dl for 0- 4months and 30-70mcg/dl for 5-23 months
***(17-22g/dl); <11g/dl in children = anemic in children

DISCUSSION

Malnutrition in children is caused by inadequate feeding, child care and disease. It is a major public health problem throughout the developing world including Nigeria (26). Malnutrition is one of the principal underlying causes of death for many children in the world contributing to more than one third of under-five deaths globally (27). Wells *et al*. (28) has published that stunting can lead to serious functional complications, such as lower mental development, reduced work capacity in adulthood and increased obstetric risk. The study revealed that, 22% of the children were stunted 12% were severely stunted while 10% were moderately stunted. This is significantly high because the study was centered on 0-23 months. The proportion of wasting was 43% while that of the underweight was 42%.

From the results obtained from this research, there is need to strengthen nutrition education focusing on their nutrition (29) as this can aid in tackling the reported high proportion of malnutrition indices observed (30). Underweight is reversible and reflect either acute or chronic malnutrition (31). This study revealed that 20.7% of children under two are underweight. This is higher compared to the findings of the study done in Aydin province of Turkey which showed a prevalence of 4.8% for underweight (32).

The overall finding revealed that 23.8% of males and 17.1% of females were underweight even though there was no significant association between sex and underweight. This is similar to the underweight prevalence in Ghana reported by UNICEF in 2008 as 18.3% and 17.1% for boys and girls respectively. The proportions of underweight was 34.1%, stunting was 31.8% and wasting was 27.1% among children aged 13-23 months. This confirmed the study done in India by (33) where the proportion of underweight was 45.5% and stunting was 81.8%. Stunting and underweight were found to be highest among children aged 13-24 months.

CONCLUSION

In conclusion, the nutritional status of children (0–23months) in Tsafe Local Government Area of Zamfara State, Nigeria revealed poor nutritional status with high percentage of wasting, underweight and stunting children; and larger number of children deficient in calcium, iron, Zinc, haemoglobin and PCV deficiency.

Recommendation

It is therefore recommended that Sustainable Development Goals (SDG), Government and other partners should intensify efforts in promoting children nutrition, feeding practices, and addressing nutrition specific and nutrition related issues in the state. Government intervention is urgently needed by way of financial support, provision of food supplements and enlightenment campaigns.

REFERENCES

1. Inzaghi, E., Pampanini, V., Deodati, A., and Cianfarani, S. (2022). The effects of nutrition on linear growth. *Nutrients*, *14*(9), 1752.
2. USAID. (2011). *Behavior Change Interventions and Child Nutritional Status: Evidence from the Promotion of Improved Complementary Feeding Practices*. Will Belington: USAID, 2011.
3. Kassie, G. W., and Workie, D. L. (2020). Determinants of under-nutrition among children under five years of age in Ethiopia. *BMC Public Health*, *20*, 1-11.
4. Black, R., Victora, C.G., and Walker, S.P., (2013). Maternal and Child Undernutrition and Overweight in Low-Income and Middle-Income Countries. *Lancet*, 382:427–451
5. Tang, M. N., Adolphe, S., Rogers, S. R., and Frank, D. A. (2021). Failure to thrive or growth faltering: Medical, developmental/behavioral, nutritional, and social dimensions. *Pediatrics in Review*, *42*(11), 590-603.
6. Waghmare, H., Chauhan, S., and Sharma, S. K. (2022). Prevalence and determinants of nutritional status among women and children in Pakistan. *BMC Public Health*, 22(1), 766.
7. Caulfield, L.E., de Onis, M., and Blossner, M. (2004). Undernutrition as an Underlying cause of Child Deaths Associated with Diarrhea, Pneumonia, Malaria, and Measles. *American Journal of Clinical Nutrition*; 80:193–8.
8. Bahl, R., Frost, C. and Kirkwood, B.R. (2005). Infant feeding patterns and risks of death and hospitalization in the first half of infancy: multicentre cohort study. Bull World Health Organ, 83:418–26 [PMC free article]y. *Eur. J. Clin. Nutr.*, 58(9):1290-6.
9. Oei, J. L., BG, P. F., Dani, C., Serena, C., Clemenza, S., Mecacci, F., ... and Perrone, S. (2020). Global pandemics, the mother and her infant: learning from the past to help the future. *Neonatology. Cham, Switzerland: Springer*, *10*, 978-3.

10. World Health Organization. (2023). WHO Guideline for complementary feeding of infants and young children 6–23 months of age (2023). https://dairynutrition.ca/en/nutrition-and-health/infants-and-children/who-guideline-complementary-feeding-infants-and-young-children-6-23-months-age-2023.
11. Amadu, I., Seidu, A. A., Duku, E., Frimpong, J. B., Jnr, J. E. H., Aboagye, R. G., ... and Ahinkorah, B. O. (2021). Risk factors associated with the coexistence of stunting, underweight, and wasting in children under 5 from 31 sub-Saharan African countries. *BMJ open*, *11*(12), e052267.
12. WHO/UNICEF. (2023). Global Breastfeeding Scorecard 2023. https://www.unicef.org/media/150586/file/Global%20breastfeeding%20scorecard%202023.pdf
13. National Nutrition Health Survey (NNHS). 2015.
14. Schuster, R. C., Butler, M. S., Wutich, A., Miller, J. D., Young, S. L., Household Water Insecurity Experiences Research Coordination Network (HWISE RCN), ... and Workman, C. (2020). "If there is no water, we cannot feed our children": The far reaching consequences of water insecurity on infant feeding practices and infant health across 16 low and middle income countries. *American Journal of Human Biology*, *32*(1), e23357.
15. Anigo, K. M., Ameh, D. A., Ibrahim, S. and Danbauchi, S., (2009). Infant Feeding Practices and Nutritional Status of Children in North Western Nigeria. *Asian Journal of Clinical Nutrition,* 1, 12-22. doi: 10.3923/ajcn.2009.12.22
16. National Population Commission (NPC). [Nigeria]., (2010), Population Distribution by Sex, local Government area, States and senatorial Districts. NPC: Abuja
17. Awando, J.A., Ongus, J.R., Ouma, C. and Mwau, M. (2013). Seroprevalence of Anti-Dengue Virus 2 Serocomplex Antibodies in Out-Patients with Fever visiting Selected Hospitals in Rural Parts of Western Kenya in 2010-2011: A Cross-Sectional Study. *The Pan African Medical Journal. 16:73*
18. Turner, D. P. (2020). Sampling Methods in Research Design. *Headache: The Journal of Head and Face Pain*, *60*(1).
19. Cogill, B. (2001). Anthropometric Indicators Measurement Guide. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington DC,
20. Hossain, M.I, Wahed, M.A. and Ahmed, S. (2005). Increased Food intake after the Addition of Amylase-Rich Flour to Supplementary Food for Malnourished Children in Rural Communities of Bangladesh. *Food Nutrition Bulletin*. 26: 323-329
21. Erdogan, B., and Ozdemir, A. A. (2021). The effect of three different methods on venipuncture pain and anxiety in children: distraction cards, virtual reality, and Buzzy® (randomized controlled trial). *Journal of Pediatric Nursing*, *58*, e54-e62.
22. Kaneko, N. (1999). Effect of millipede Parafontaria tonominea Attems (Diplopoda: Xystodesmidae) adults on soil biological activities: A microcosm experiment. *Ecological Research*, *14*, 271-279.
23. Silverman, R. B. and Zieske, P. A. (1986). Identification of the amino acid bound to the labile adduct formed during inactivation of monoamine oxidase by 1-phenylcyclopropylamine. *Biochemical and biophysical research communications*, *135*(1), 154-159.
24. Enculescu, M. (2021). Changes in the Haematological Profile of Romanian Black and Spotted Dairy Calves. *Scientific Papers: Series D, Animal Science-The International Session of Scientific Communications of the Faculty of Animal Science*, *64*(1).
25. Farag, A. M., Mohamed, A. S. and Darwish, H. (2018). Impact of vascular endothelial growth factor on prognosis of patients with hepatocellular carcinoma treated with angiotensin-converting-enzyme inhibitors. *African Journal of Biological Sciences*, *14*(2), 70-89.
26. Taslim, N. A., Farradisya, S., Gunawan, W. B., Alfatihah, A., Barus, R. I. B., Ratri, L. K., ... and Nurkolis, F. (2023). The interlink between chrono-nutrition and stunting: current insights and future perspectives. *Frontiers in Nutrition*, *10*.
27. Suryawan, A., Jalaludin, M. Y., Poh, B. K., Sanusi, R., Tan, V. M. H., Geurts, J. M., and Muhardi, L. (2022). Malnutrition in early life and its neurodevelopmental and

cognitive consequences: a scoping review. *Nutrition Research Reviews*, *35*(1), 136-149.
28. Wells, J. C., Sawaya, A. L., Wibaek, R., Mwangome, M., Poullas, M. S., Yajnik, C. S., and Demaio, A. (2020). The double burden of malnutrition: aetiological pathways and consequences for health. *The Lancet*, *395*(10217), 75-88.
29. Philippe, K., Chabanet, C., Issanchou, S., and Monnery-Patris, S. (2021). Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France:(How) did they change? *Appetite*, *161*, 105132.
30. Suzan, Ö. K., Kaya, Ö., Kolukısa, T., Koyuncu, O., Tecik, S., and Çınar, N. (2023). Water consumption in 0-6-month-old healthy infants and effective factors: A systematic review. *Biomédica*, *43*(2), 181-199.
31. Lawrence, R. M., and Lawrence, R. A. (2022). Normal Growth, Growth Faltering, and Obesity in Breastfed Infants. In *Breastfeeding* (pp. 298-325). Elsevier.
32. Theodorah, D. Z. and Mc'Deline, R. N. (2021). The kind of support that matters to exclusive breastfeeding: a qualitative study. *BMC Pregnancy and Childbirth*, *21*, 1-8.
33. Sharifzadeh, G., Mehrjoofard, H., and Raghebi, S. (2010). Prevalence of Malnutrition in Under 6-Year Olds in South Khorasan, Iran. *Iran J Pediatr*.; 20(4):435-41. PMID: 23056743; PMCID: PMC3446098.