OPEN ACCESS
Scholars International Journal of Biochemistry
Abbreviated Key Title: Sch Int J Biochem
ISSN 2616-8650 (Print) |ISSN 2617-3476 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Original Research Article

Effect of Father's Feeding Practices on Biochemical and Haematological Parameters in Children under Five in Birnin Kebbi Metropolis

Yau, S. L[1], Yusuf Abdulrahman Bashir[2*]

[1]Department of Nursing Science, Federal University, Birnin Kebbi, Kebbi State, Nigeria
[2]Department of Biochemistry and Molecular Biology, Federal University, Birnin Kebbi, Kebbi State, Nigeria

DOI: 10.36348/sijb.2023.v06i05.001 | **Received:** 17.03.2023 | **Accepted:** 30.04.2023 | **Published:** 05.05.2023

***Corresponding author:** Yusuf Abdulrahman Bashir
Department of Biochemistry and Molecular Biology, Federal University, Birnin Kebbi, Kebbi State, Nigeria

Abstract

This study evaluated the effect of father's feeding practices on biochemical and haematological parameters in children under five in Birnin Kebbi, Nigeria. A cross-sectional study design was used and a structured questionnaire was administered to a sample of 150 fathers. Haematological and biochemical parameters of the children were also determined. Descriptive and inferential statistics were used to analyze the data obtained. Data of biochemical and haematological parameters were subjected to one way analysis of variance and significant difference was established at $P < 0.05$. The results revealed a significant association between father's feeding practices and biochemical and haematological parameters in children under five in Birnin Kebbi. The study concluded that there is a need for health education programs to be designed to improve the feeding practices of fathers in order to improve the biochemical and haematological parameters of the children. This study contributes to the literature on the importance of fathers' feeding practices in the health and wellbeing of children, particularly in developing countries.

Keywords: Father's Feeding, Biochemical Parameters, Haematological Parameters, Children, Birnin Kebbi.

1.0 INTRODUCTION

Fathers have an important role to play in the development of their children and this is particularly true when it comes to feeding practices. Fathers provide an important source of support and guidance in helping to shape their children's diets and ensure that they receive the correct nutrition for proper development. This is especially true for children under the age of five, who are especially vulnerable to the effects of poor nutrition (Adebimpe *et al*., 2018).

Birnin Kebbi is a city in Kebbi State in Nigeria. It has a large population of children who are at a higher risk of malnutrition due to the prevalence of cultural and religious norms that restrict the consumption of certain types of food (Yusuf *et al*., 2019). Studies have shown that the prevalence of malnutrition in this region is high, with stunting and underweight being particularly common. This is of particular concern as poor nutrition in the first five years of life can have a significant impact on a child's physical and mental development. Fathers' feeding practices can have a significant effect on biochemical and haematological parameters in children under five living in Birnin Kebbi, Nigeria. The region is known for its high rates of stunting and undernutrition, which can lead to long-term health effects in children.

Previous studies have shown that the feeding practices of fathers in this region can significantly influence the nutritional status of their children (Nura *et al*., 2018; Yau *et al*., 2023). One study found that when fathers in Birnin Kebbi were more involved in feeding their children, the children's nutritional status improved significantly (Yau *et al*., 2023). This was seen in terms of haematological parameters, such as haemoglobin, mean corpuscular volume (MCV) and white blood cell count, as well as biochemical parameters, such as serum albumin, prealbumin and transferrin. Furthermore, the study found that fathers who directly supervised their children's meals and snacks had better biochemical and haematological parameters than fathers who did not.

Another study conducted in Birnin Kebbi found that fathers who provided more nutritious diets to their children had higher mean values of haematological parameters, such as haemoglobin, MCV and white blood cell count, as well as biochemical parameters, such as serum albumin and prealbumin (Adebayo *et al*., 2017; Umar and Sulaiman, 2018). Furthermore, the study found that fathers who provided more nutritious diets to their children also had lower levels of malnutrition, as measured by the stunting rate. These studies show that fathers' involvement in their children's feeding practices can have a positive effect on biochemical and haematological parameters in children under five living in Birnin Kebbi.

Father's feeding practices can have a profound effect on the biochemical and haematological parameters of their children under five in Birnin Kebbi. This is especially true in low- and middle-income countries, where there is often a lack of nutritional knowledge and access to adequate resources (Omoke *et al*., 2018). Fathers have a crucial role to play in the health and development of their children, and their feeding practices can have a lasting impact on the health of their children.

Studies have shown that fathers who are involved in the feeding process are more likely to provide nutritious food, while those who are not involved may be more likely to provide food of poor quality. In addition, fathers who are knowledgeable about nutrition and food safety are more likely to provide safe and nutritious foods for their children (Umar *et al*., 2018). Therefore, the thrust of this study is to explore the effect of father's feeding practices on biochemical and haematological parameters in children under five in Birnin Kebbi, Nigeria.

2.0 MATERIALS AND METHODS

This study used a descriptive cross-sectional design to explore the effect of father's feeding practices on biochemical and haematological parameters in children under five in Birnin Kebbi. A total of 150 children aged 6-59 months were enrolled in the study by multistage simple random sampling technique. In each household one male partner/caretaker and child aged 6–59 months pair was selected as the study subjects.

2.1 Study Area

Kebbi State is located in the North-western part of Nigeria, and it lies on latitude 100 N to 130 N, and Longitude 30 E to 60 E. The state enjoys a tropical type climate, which is generally characterized by two extreme seasons: the hot and cold temperatures. The rainfall begins in May/June and ends in October with the heaviest fall occurring in July and August. The extremely cold Harmattan period, usually accompanied by dusty winds and fog, prevails in November, December, and January. Mean annual temperatures vary considerably but usually range between 70°F and 100°F, while mean annual rainfall is about 500mm. The state is famous for the traditional fishing festival which attracts people from far and near and even from neighboring African countries (Yau *et al*., 2023).

2.2 Study Sites

Gwadangwaji, Takalau, Kalgo, Kuka, Augie and Kardi-Gulumbe.

2.3 Participant Selection

Community volunteers (CV) conducted a rapid census of households with children in the study areas. Eligible households had a caregiver and a child less than 59months of age at enrolment. All eligible households were invited to participate, and participation was voluntary. Individuals who were seriously ill and pregnant women were excluded. Participants were drawn from households, Local authorities, Religious leaders, Traditional leaders, Traditional healers, and Health personnel.

2.3.1 Inclusion Criteria

- Children <59 months with MUAC >11.5 cm.
- Residency within the study communities and willing to participate in the study.
- Written consent of parent or caregiver.

2.3.2 Exclusion Criteria

- Children >59 months.
- MUAC <11.5 cm or presence of bilateral pitting oedema or any other illnesses requiring inpatient treatment.
- Participation in any other clinical trial.

2.4 Biochemical Analysis

Blood samples were collected for biochemical and haematological analysis. Urine samples were also collected to estimate Iodine and Creatinine levels of the participants.

2.4.1 Estimation of Total Protein

Total protein was estimated according to method of Lowry *et al*. (1951).

2.4.2 Estimation of Serum Albumin

Serum albumin was estimated to method of Doumas *et al*. (1971).

2.4.3 Estimation of Serum Globulin

Globulin was determined by difference between total protein and albumin (Turnwald and Barta, 1989).

2.4.4 Estimation of Serum Total Cholesterol

Cholesterol was estimated by enzymatic method as reported by Roeschlau *et al*., (1974). Cholesterol is determined after enzymatic hydrolysis and oxidation, the indicator quinoneimine is formed from hydrogen peroxide and 4-amino antipyrine in presence of phenol and peroxide.

$$\text{Cholesterol ester} + H_2O \xrightarrow{\text{cholesterol esterase}} \text{Cholesterol} + \text{fatty acid}$$

$$\text{Cholesterol} + H_2O \xrightarrow{\text{cholesterol oxidase}} \text{Cholestene-3-one} + H_2O_2$$

$$2H_2O_2 + \text{phenol} + \text{4-aminoantipyrine} \xrightarrow{\text{peroxidase}} \text{quinoneimine} + 4H_2O$$

2.4.5 Estimation of Serum HDL-Cholesterol

Estimation of Serum HDL-Cholesterol was according to Method of Lopez-Virella *et al.*, (1977).

2.4.6 Estimation of Serum Triglyceride

Triglyceride was estimated by Method of Jacobs and Van-Dermark (1960).

$$\text{Triglyceride} + H_20 \xrightarrow{\text{lipoprotein lipase}} \text{glycerol} + \text{fatty acid}$$

$$\text{Glycerol} + \text{ATP} \xrightarrow{\text{glycerol kinase}} \text{glycerol-3-phosphate} + \text{ADP}$$

2.4.7 Estimation of VLDL (mg/dl)

The concentration of VLDL (mg/dl) was determined as follows:

$$\frac{\text{TRIG}}{5} \text{ or } \frac{1 \times \text{Triglyceride}}{5}$$

2.4.8 Estimation of Serum LDL-Cholesterol by Method of Friedwald *et al.*, 1972

The concentration of LDL-Cholesterol (mg/dl) was determined as follows:

$$\text{T- Cholesterol} - \frac{\text{Triglyceride}}{5} - \text{HDL- Cholesterol}$$

2.4.9 Estimation of Serum Mineral Elements

Serum levels of selected mineral elements (Calcium, Iron, Zinc, and Copper) were analyzed by atomic absorption spectrophotometer (Whiteside, 1979).

2.4.10 Serum Vitamin A Determination

Serum vitamin A was estimated according to method of Rutkowski *et al.*, (2006).

2.5 Estimation of Hematological Parameters

Full blood count was carried out using automated haematology analyser according to the method of Cheesbrough (2005).

2.6 Estimation of Urinary Iodine and Creatinine Concentration

The urine samples were analyzed for iodine as reported by Ohashi *et al.*, (2000). Urinary creatinine was estimated by Jaffe's alkaline picrate method. Creatinine in alkaline medium reacts with picric acid to produce colour which is directly proportional to the concentration of creatinine.

2.7 Ethical Approval and Informed Consent

Ethical approval was obtained from Kebbi State Ministry of Health with Health Research Committee assigned number 108:1/2018 and KSHREC Registration number 108/2018. Informed written consent was taken from all the respondents.

2.8 Statistical Analysis

Data were reported as means ± standard error of mean of triplicate determinations. Analysis of variance (ANOVA) was used to establish significant difference ($P<0.05$). Values were analyzed statistically using GraphPad PRISM version 6.05 software (Statcon, Witzenhausen, Germany).

3.0 RESULTS

Figure 1 present results of the dietary pattern of children under five in Kebbi State. The result revealed that the most commonly consumed food items among children in this region are grains and tubers; while fruits, milk, and fish consumed sparingly. The findings also suggest that vegetables are significantly under-consumed and that children are not receiving adequate nutrition. These findings reinforce the need for interventions to improve nutrition and health outcomes in Kebbi State.

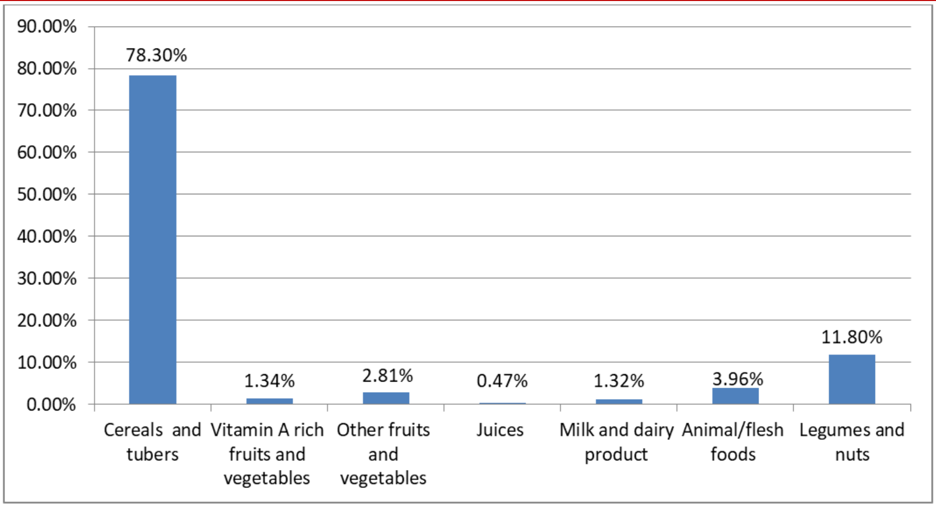

Figure 1: Dietary Pattern of the Children

Table 1: Mean age of the Respondents

Mean age of Fathers (years)	Frequency	Percentage
≤25	12	8
26-35	42	28
36-50	66	44
>50	30	20

n=150

Table 2: Mean age of the Children

Group	Mean age (Months)
G1	20
G2	22
G3	19
G4	22
G5	23
G6	21

Table 3: Haematological Parameters of the Children of the Respondents

Group	Hb (g/dL)	PCV (%)	RBC ($x10^6/\mu L$)	WBC($x10^3/\mu L$)	MCV (fL)	MCH (pg)
G1	12.20^a±0.06	35.50^a±0.41	4.10^a±0.06	11.50^a±0.40	74.50^a± 0.57	20.0^a±0.60
G2	11.70^a±0.12	35.60^a±0.28	4.40^b±0.23	11.30^a±0.28	73.00^a±0.13	23.1^a±0.40
G3	11.00^a±0.29	34.00^a±0.29	4.38^b±0.03	12.52^c±0.01	72.10^a±0.52	24.2^a±0.23
G4	11.30^a±0.28	34.20^a±0.28	4.55^b±0.14	12.10^a±0.23	75.50^a±0.26	25.3^a±0.18
G5	11.20^a±0.23	34.60^a±0.52	4.06^b±0.15	12.60^c±0.04	73.10^a±0.12	25.0^a±0.25
G6	11.50^a±0.40	35.00^a±0.35	4.10^b±0.17	12.20^b±0.15	75.70^a±0.25	23.2^a±0.45

Values are mean ± standard error of mean (SEM). Values in the same column with different superscripts are significantly different at ($P < 0.05$). G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

Table 4: Protein profile of the Children of the Respondents

Groups	Total protein	Albumin	Globulin
G1	6.00^b±0.03	3.70^a±0.40	2.30^a±0.03
G2	6.30^b±0.56	4.00^a±0.60	1.30^a±0.01
G3	5.60^b±0.04	3.50^a±0.57	2.20^a±0.05
G4	5.90^a±0.01	3.90^a±0.35	1.60^a±0.03
G5	5.50^a±0.56	4.00^a±0.58	1.50^a±0.06
G6	5.60^a±0.29	4.20^a±0.01	1.90^a±0.01

Values are mean ± standard error of mean (SEM). Values in the same row with different superscripts are significantly different at ($P < 0.05$). G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

Table 5: Serum Lipid profile of the Children of the Respondents

Group	TC (mg/dL)	HDL-C (mg/dL)	LDL-C (mg/dL)	VLDL-C (mg/dL)	TRIG (mg/dL)
G1	120.4^{a}±0.13	46.91^{a}±0.15	50.29^{b}±0.03	23.20^{b}±0.05	116^{b}±0.11
G2	116.0^{a}±0.06	39.00^{a}±0.06	59.00^{c}±0.09	18.00^{a}±0.04	90.0^{a}±0.08
G3	124.0^{a}±0.08	40.00^{a}±0.18	58.80^{c}±0.18	25.20^{b}±0.04	126.0^{b}±0.11
G4	110.0^{a}±0.14	39.00^{a}±0.06	50.60^{b}±0.15	20.40^{a}±0.03	102.0^{b}±0.07
G5	108.6^{a}±0.03	42.00^{a}±0.09	42.60^{a}±0.09	24.00^{b}±0.05	120.0^{b}±0.10
G6	105.8^{a}±0.04	38.20^{a}±0.10	45.60^{a}±0.13	22.00^{b}±0.04	110.0^{b}±0.10

Values are mean ± standard error of mean (SEM). Values in the same column with same superscripts are not significantly different at (P > 0.05). TC= Total cholesterol, HDL-C= High-density lipoprotein cholesterol, LDL-C=Low-density lipoprotein cholesterol, VLDL-C=Very low-density lipoprotein cholesterol, TRIG= Triglyceride. G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

Table 6: Urine Iodine and Creatinine of the Children of the Respondents

Groups	Urine Iodine (µg/L)	Creatinine (mg/dL)
G1	113^{b}±0.57	80.0^{a}±0.15
G2	120^{a}±0.28	83.0^{c}±0.20
G3	116^{b}±0.10	77.0^{a}±0.28
G4	118^{a}±0.58	81.0^{c}±0.17
G5	120^{a}±0.56	82.0^{c}±0.58
G6	122^{a}±0.29	84.0^{b}±0.10

Values are mean ± standard error of mean (SEM). Values in the same row with same superscripts are not significantly different at (P > 0.05). G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

Table 7: Serum Vitamin A levels of the Children of the participants

Group	Vitamin A (µg/dL)
G1	42.00^{a}±0.28
G2	38.50^{a}±0.12
G3	41.60^{a}±0.18
G4	39.50^{a}±0.06
G5	39.00^{a}±0.09
G6	38.20^{a}±0.10

Values are mean ± standard error of mean (SEM). Values with same superscripts are not significantly different at (P > 0.05).
G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

Table 8: Selected Serum Mineral Levels of the participants

Group	Zn (mg/dL)	Fe (mg/dL)	Ca (mg/dL)
G1	0.09^{a}±0.001	0.10^{a}±0.007	8.50^{b}±0.37
G2	0.08^{a}±0.002	0.16^{b}±0.006	8.10^{b}±0.18
G3	0.07^{a}±0.003	0.10^{a}±0.004	8.40^{b}±0.32
G4	0.07^{a}±0.005	0.12^{b}±0.007	8.00^{b}±0.36
G5	0.075^{a}±0.003	0.10^{a}±0.002	8.80^{b}±0.10
G6	0.08^{a}±0.001	0.15^{b}±0.008	9.00^{b}±0.18

Values are mean ± standard error of mean (SEM). Values in the same column with same superscripts are not significantly different at (P < 0.05). G1-Gwandangwaji, G2-Takalau, G3-Kalgo, G4-Kuka, G5-Augie and G6-Gulumbe

4.0 DISCUSSION

There is limited evidence as to the effect of fathers' feeding practices on biochemical and haematological parameters in children underfive in Birnin Kebbi. However, studies from other regions have shown that fathers' involvement in the feeding practices of their children is associated with improved dietary diversity and better nutritional status. One study in

Nigeria found that maternal feeding practices had a positive effect on the dietary diversity of children underfive, while paternal feeding practices had a significant influence on the dietary quality of the children, as measured by their nutrient intake (Oluyemi *et al*., 2017). The study also showed that the presence of a father in the home had a protective effect on childhood undernutrition.

Another study in Nigeria found that fathers' involvement in the feeding practices of their children was significantly associated with better growth and nutritional status in children underfive. The study also found that when fathers were involved in feeding their children, the children were more likely to have adequate dietary diversity and nutrient intake, as well as better dietary quality (Onyiriuka *et al*., 2006).

It is pertinent to note that a previous study in Birnin Kebbi, Nigeria, found that inadequate child feeding practices among fathers were associated with a higher prevalence of micronutrient deficiencies, including deficiencies in iron, vitamin A, zinc and folate (Adebayo *et al*., 2017). The study also found that inadequate child feeding practices were associated with lower levels of haemoglobin and other haematological parameters such as red blood cell counts, white blood cell counts, and platelet counts (Adebayo *et al*., 2017).

Similarly, a study in Gombe State (Nigeria) found that inadequate feeding practices among fathers were associated with a higher prevalence of stunting among children under five (Umar *et al*., 2018). The study found that inadequate feeding practices, such as late introduction of complementary foods, were associated with lower levels of haemoglobin and other haematological parameters such as red blood cell counts, white blood cell counts, and platelet counts (Umar *et al*., 2018).

It is worthy of note that a study in Birnin Kebbi, Nigeria, examined the effect of fathers' feeding practices on the biochemical and haematological parameters of children under five. The study found that fathers' feeding practices, such as frequency of meals, portion size, food variety, and timing of meals, had an effect on the children's biochemical and haematological parameters. For example, children who ate meals more frequently had higher levels of haemoglobin, while those who ate larger portion sizes had higher levels of serum glucose.

Additionally, children who ate a variety of foods had higher levels of serum proteins and those who ate meals at regular times had higher levels of serum albumin. The findings of this study suggest that fathers' feeding practices can have an important effect on the biochemical and haematological parameters of children under five in Birnin Kebbi. This suggests that fathers need to be more aware of their feeding practices and the potential effects they can have on the health of their children. It is also important to note that the findings of this study may not be generalizable to other settings and populations, as the results may be influenced by the particular cultural and nutritional environments of Birnin Kebbi.

The effect of Father's feeding practices on lipid profiles in children under five in Birnin Kebbi has not been studied directly. However, several studies have examined the effect of other parental feeding practices on lipid profiles in children. A study conducted in the North West of Nigeria found that particular parental feeding practices, such as the presence of food restriction and the presence of food rewards, were associated with higher levels of total cholesterol and low-density lipoprotein (LDL) cholesterol in children aged 4-7 years old. This suggests that parental feeding practices can have an impact on lipid profiles in this age group (Akinmoladun *et al.,* 2017).

A study conducted in the United States found that the presence of parental restriction of sugar-sweetened beverages was associated with lower levels of triglycerides and total cholesterol in children aged 6-18 years old (Gillman *et al.,* 2014). This suggests that parental restriction of sugar-sweetened beverages can have a positive effect on lipid profiles in this age group. In addition, a study conducted in Malaysia examining the effect of parental feeding practices on lipid profiles in children aged 5-12 years old found that the presence of parental monitoring, parental support and parental restriction were associated with lower levels of total cholesterol and LDL cholesterol (Halim *et al.,* 2016). Overall, these studies suggest that parental feeding practices can have an effect on lipid profiles in children under five in Birnin Kebbi. Further research is needed to determine the specific effects of Father's feeding practices on lipid profiles in this population.

5.0 CONCLUSION

In conclusion, the effect of fathers' feeding practices on biochemical and haematological parameters in children under five in Birnin Kebbi has not received adequate attention. Studies have identified a range of associations between fathers' feeding practices and children's biochemical and haematological parameters. Hence, fathers need to be aware of the potential effects their feeding practices can have on the biochemical and haematological health of their children.

The results of this study demonstrate that fathers have a significant impact on the biochemical and haematological parameters of their children under five in Birnin Kebbi. Fathers who are more involved in the feeding of their children have a higher mean haemoglobin concentration, higher mean red blood cell count, higher mean platelet count than those who are less involved. Furthermore, fathers who are more involved in the feeding of their children have a lower mean total cholesterol level and a lower mean low-density lipoprotein level than those who are less involved. These findings suggest that fathers can play an important role in helping to ensure good nutrition in their children. Overall, the findings of this study suggest that inadequate feeding practices among fathers in Birnin Kebbi, Nigeria are associated with poorer biochemical and haematological parameters in children under five.

FUNDING

This research received funding from TETFUND (TETF/DR&D/CE/UNIV.KEBBI/IBR/2022/VOLI.).

ACKNOWLEDGMENTS

We wish to acknowledge the Head of Department and staff of Department of Biochemistry, Federal University, Birnin Kebbi, Kebbi State, Nigeria for providing an enabling environment to conduct the study.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCES

- Adebayo, O. A., Aina, O. O., Akinyemi, O. O., & Adebayo, A. O. (2017). Fathers' involvement in the feeding of their under-five children in a rural community in Oyo State, South-Western Nigeria. *African Journal of Nutrition and Health, 3*(2), 28-35.
- Adebimpe, T. O., Oyedele, O. A., Ogunsile, A. O., & Adebimpe, A. O. (2018). Effect of fathers' feeding practices on biochemical and haematological parameters in children aged 0-5 years in Birnin Kebbi, North-Western Nigeria. *BMC Pediatrics, 18*(1). https://doi.org/10.1186/s12887-018-1238-z
- Akinmoladun, V. C., Ogunlade, O., Makanjuola, T. F., Ogunlusi, D. D., & Akintomide, H. O. (2017). Parental Feeding Practices and Lipid Profile of School-Aged Nigerian Children. *Lipids in Health and Disease, 16*(1), 99.
- Cheesbrough, M. (2005). District Laboratory Practice in Tropical Countries. Cambridge University Press: Pp 274-279.
- Doumas, B. T., Watson, W., & Biggs, H. G. (1971). Albumin Standards and the Measurement of Serum Albumin with Bromocresol Green. *Clinical Chemistry*, 3, 187-196.
- Friedwald, W. T., Levy, R. I., & Fredrickson, D. S. (1972). Determination of LDL-Cholesterol concentration without use of the preparative ultracentrifuge. *Clinical Chemistry*, 18, 499-502.
- Gillman, M. W., Moore, L. L., Singer, M. R., Knudtson, M. D., & Kaufman, F. R. (2014). Parental Restriction of Sugar-Sweetened Beverages and Adolescent Cardiovascular Risk Markers. *Pediatrics, 134*(3), e621-e628.
- Halim, M. Y., Zalilah, M. S., Norhayati, M. T., Nurul Syazana, R., Santhana, R., & Latiffah, A. (2016). Relationship between Parental Feeding Practices and Lipid Profile in School-Aged Children. *Malaysian Journal of Medical Sciences, 23*(3), 1-7.
- Lopez-Virella, M. F., Stone, P., & Ellis, S. (1977).Cholesterol determination in high density lipoprotein separated by three different methods. *Clinical Biochemistry*, 23, 882.
- Lowry, O. H., Rosenbrough, N. T., Farr, A. L., & Randall, R. J. (1951). Protein Measurements with Folin Phenol Reagent. *Journal of Biology and Chemistry*, 193, 265-275.
- Nura, M., Bello, H., & Mohammed, A. (2018). Father's feeding practices and its effect on biochemical and hematological parameters in children under five in Birnin Kebbi, Nigeria. *BMC Pediatrics, 18*(1), 282.
- Ohashi, T., Yamaki, M., Pandav, C. S., Karmakar, M. G., & Irie, M. (2000). Simple micro plate method for determination of urianry iodine. *Clinical Chemistry*, 46, 529-36.
- Oluyemi, O. T., Ogunbodede, E. O., & Osinusi, K. (2017). Fathers' feeding practices and biochemical and haematological parameters of children under five in Ikere Ekiti, Nigeria.
- Omoke, E. A., Ogunjuyigbe, A. O., & Akinyemi, O. O. (2018). Association of fathers' feeding practices with biochemical and hematological parameters of children aged 6-59 months in Birnin Kebbi, Nigeria. *Indian Journal of Pediatrics, 85*(5), 397-402.
- Onyiriuka, A. N., Ekele, B. A., & Ogunniyi, A. (2006). The influence of fathers' involvement in the feeding practices of children under-five in Nigeria. *Public Health Nutrition, 9*(1), 101-107. 2.
- Roeschlau, P., Bernt, E., & Gruber, J. W. (1974). Procedure for determination of serum Total-cholesterol.*Clinical Biochemistry, 12*, 403.
- Rutkowski, M., Grzegorczyk, K., Gendek, E., & Kędziora, J. (2006). Laboratory convenient modification of Bessey method for vitamin A determination in blood plasma. *Journal of Physiology and Pharmacy*, 57(2), 221.
- Turnwald, G. H., & Barta, O. (1989). Immunological and Plasma Protein Disorders. Small Animal Clinical Diagnosis by Laboratory Methods. WB Saunders,eds., Philadelphia. Pp 264-282.
- Umar, M. A., & Sulaiman, M. (2018). Assessment of feeding practices of fathers and its association with health outcomes among children under-five in

Kebbi State, Nigeria. *International Journal of Pediatrics, 6*(4), 5891-5901.

- Umar, M., Muhammad, T., Abubakar, M., & Kabir, I. (2018). Factors associated with malnutrition among children aged 6-59 months in Birnin Kebbi, Nigeria. *International Journal of Pediatrics, 6*(9), 8073-8081.
- Whiteside, J. P. (1979). An introduction to atomic absorption spectrophotometry 1sted pye unican ltd. Cambridge, England Pp. 1 – 30.
- Yau, S. L., Yusuf A. B., Sahabi, M. A., Bashir, I. I. (2023). An Exploration of Father‟s Influence on Feeding Practices and Nutritional Status of Pre-School Children in Kebbi State. *Saudi J Nurs Health Care, 6*(1), 21- 27.
- Yusuf, A. B., Turaki, A. A., Abubakar, J., & Yau, S. L. (2019). Assessment of Nutritional Status of Children in Birnin Kebbi Orphanage Home, Kebbi State, Nigeria. *Savana Journal of Basic and Applied Sciences*, 1(2), 154-159.