IOSR Journal Of Pharmacy And Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 16, Issue 5 Ser. II (Sep. –Oct. 2021), PP 25-29
www.Iosrjournals.Org

Study of Lipid profile in broilers and local chickens in Korhogo, Côte d'Ivoire

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Abstract:
Background*: Serum biochemical profiles of chickens provide valuable information for the evaluation of health status which reflects many metabolic alterations of organs and tissues. This study investigated the lipid profile levels of broilers and local chickens for consumption in the city of Korhogo.*
Materials and Methods*: To do this, a venous blood sample was taken from 83 seemingly healthy chickens, including 43 local chickens and 40 chickens for lipid assessment.*
Results*: The results indicated that, the mean triglycerides and VLDL values in local chickens were higher in females than in males with a significant difference (P < 0.001). Similarly, in broilers, the mean values of cholesterol and LDL-C were higher in females than in males with a significant difference (P<0.001). Comparing the mean of lipid parameters between strains, cholesterol and LDL-C were higher in broilers than in local chickens with a significant difference(P<0.001).*
Conclusion: *Lipid parameters varied from local chickens to broilers and also according to sex suggesting a standard setting of blood lipid parameters in chickens in Côte d'Ivoire.*
Key Word*: Lipid, Profile, Local Chicken, broilers, Korhogo.*

Date of Submission: 09-10-2021 Date of Acceptance: 23-10-2021

I. Introduction

Poultry play an important place in the human diet. It produces a relatively cheap meat of good dietetic quality, rich in protein and low in fat (Sahraoui *et al*., 2019). However, because of intensive breeding programs aimed at increasing the body weight of chickens and especially broilers, excess fat is observed in animals on modern farms nowadays. This excess fat is becoming a major concern for both poultry producers and consumers (Tohala, 2010). Consumers tend to limit the consumption of fatty meat because it is considered to have an adverse effect on human health (cholesterol phobia) (Regar, 2019). The lipid profile that is the indicator of fat, has not been sufficiently explored in local chickens in tropical regions.

Several studies have found that many bloods biochemical parameters differ from broilers to chickens in parts of the world (Kokore *et al*., 2021a, 2021b, Masud Alam *et al.*, 2020, Subhadarsini Mohanty and Silpa, 2020, Dutta *et al*. 2013). Is the same true for the lipid profile?

There is little information on the normal values of the lipid profile of different strains of chickens in Côte d'Ivoire. This information, in addition to being useful for diagnosis and livestock management, could also be used in breeding programs, for the genetic improvement of local chickens (Kral and Suchy, 2000). Hence, this study investigated the lipid profile levels of local chickens and broilers in Korhogo, Côte d'Ivoire.

II. Material And Methods

Study Sites and Population

The experiment was carried out from August 2021 to September 2021 in the Department of Korhogo situated between 5°16 and 6°16 of longitude West, and at latitude 8°32 and 10°20 North in the northern Côte d'Ivoire. A total of 83 seemingly healthy chickens, including 43 local chickens (21 male and 22 female) and 40 broilers (22 male and 18 female) of different ages, were selected for the studies. The average age of local chickens was 8.70 ± 0.27 months and of broilers 40.7 ± 0.44 days. All chickens came from Korhogo and its surrounding localities. The broilers were all of the Cobb 500 strain. This is a descriptive cross-sectional study of chickens intended for consumption at the Korhogo poultry market.

Collection and Analysis of Blood Sample

In each bird, a venous blood sample is taken from the jugular vein in heparinized tubes in the morning between 7:00 and 9:00 am. These blood samples, placed in a cooler with ice, are transported to the laboratory of Peleforo GON COULIBALY University Health Centre in Korhogo for the performance of biochemical tests. Before they were centrifuged at 3000 rpm for 5 minutes and the serum was aliquoted into micro bowls and was stored at -20°C until further analyses. Individual serum samples were analyzed for total cholesterol, triglycerides, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very low-density lipoprotein (VLDL) using the kit package BIOSYSTEMS® S.A.

Statistical analysis

For statistical analysis, the data were entered and analyzed on STATISTICA software (Windows version 7.1). The mean values of the different biochemical parameters in the birds were compared using the non-parametric Mann Whitney U test. The level of significance was reported at less than $P < 0.05$.

Ethics

Experimental procedures and protocols used in this study were approved by ethical committee of Health Sciences, University Peleforo GON COULIBALY (Korhogo/Côte d'Ivoire). These guide lines were in accordance with the internationally accepted principles for laboratory use and care. Then, this study was approved by the Ministry of Animal Production and Fishery Resources in the Republic of Côte d'Ivoire.

III. Result

The results of this study show highly significant differences between serum lipids in different group of chicken. Table 1 & 2 summarizes the means and standard error on the mean (SEM) of serum lipid values of the local chicken and broiler respectively. Regarding local chickens, mean triglyceride and VLDL values were higher in females than in males with a very highly significant difference ($P<0.001$). In broilers, on the other hand, mean cholesterol and LDL-C values were higher in females than in males with a very highly significant ($P < 0.001$) and significant ($P < 0.05$) difference, respectively.

Table 1: Mean values of lipid parameters in local chickens

Blood parameters	Total Population n=43			Male n=21			Female n=22			p Value
	Mean ± SEM	Min	Max	Mean ± SEM	Min	Max	Mean ± SEM	Min	Max	
Triglycerides (g/L)	0.82 ± 0.01	0.66	1.02	0.76 ± 0.01	0.68	0.91	0.88 ± 0.02***	0.66	1.02	0.00
Cholesterols (g/L)	1.62 ± 0.02	1.32	1.93	1.65 ± 0.03	1.46	1.93	1.59 ± 0.04	1.32	1.89	0.20
HDL (g/L)	0.46 ± 0.01	0.26	0.65	0.44 ± 0.02	0.26	0 .65	0.48 ± 0.01	0.28	0.58	0.06
LDL (g/L)	0.99 ± 0.03	0.69	1.41	1.06 ± 0.04	0.76	1.41	0.93 ± 0.04	0.67	1.19	0.05
VLDL (g/L)	0.16 ± 0.00	0.13	0.20	0.15 ± 0.00***	0.13	0.18	0.18 ± 0.00	0.13	0.20	0.00

n: Total number of each subjects group; SEM: Standard error of mean; Min: Minimum; Max: Maximum; HDL: High Density Lipoprotein; LDL: Low Density Lipoprotein; VLDL: Very Low-Density Lipoproteins; ***: Statistically different for $p < 0,001$.

Table 2: Mean values of lipid parameters in broilers

Blood parameters	Total Population n=43			Male n=21			Female n=22			p Value
	Mean ± SEM	Min	Max	Mean ± SEM	Min	Max	Mean ± SEM	Min	Max	
Triglycerides (g/L)	0.78 ± 0.01	0.67	0.98	0.77 ± 0.01	0.69	0.83	0.80 ± 0.01	0.70	0.98	0.31
Cholesterols (g/L)	1.72 ± 0.02	1.46	1.90	1.67 ± 0.03	1.48	1.88	1.78 ± 0.02***	1.64	1.90	0.00
HDL (g/L)	0.47 ± 0.02	0.11	0.78	0.48 ± 0.02	0.28	0.63	0.46 ± 0.04	0.11	0.78	0.26
LDL (g/L)	1.09 ± 0.03	0.90	1.39	1.03 ± 0.04	0.75	1.23	1.16 ± 0.03*	0.89	1.39	0.03
VLDL (g/L)	0.16 ± 0.00	0.13	0.19	0.15 ± 0.00	0.13	0.17	0.16 ± 0.00	0.14	0.19	0.31

n: Total number of each subjects group; SEM: Standard error of mean; Min: Minimum; Max: Maximum; HDL: High Density Lipoprotein; LDL: Low Density Lipoprotein; VLDL: Very Low-Density Lipoproteins; *: Statistically different for $p < 0,05$, ***: Statistically different for $p < 0,001$.

Table 3 shows the comparison of the different lipid parameters in chickens. Cholesterol levels were higher in broilers compared to local chickens with a very highly significant difference ($P < 0,001$). Similarly, mean LDL values were significantly higher in broilers ($P < 0.001$). The comparison by sex between chicken strains, indicated in broiler females, higher mean values of cholesterol and LDL than in local chicken females with a very highly significant difference ($P<0.001$). In contrast, triglyceride and VLDL levels in female local chickens were significantly ($P<0.05$) higher than in female broilers. There was no significant difference in the males of the two groups of chickens.

Table 3: Comparison of mean lipid parameters in chickens

Blood parameters	**Local chickens N=43**			**Broilers N=40**		
	Total Population n=43	**Male** n=21	**Female** n=22	**Total Population** n=40	**Male** n=22	**Female** n=18
	Mean ± SEM	**Mean ± SEM**	**Mean ± SEM**	**Mean ± SEM**	**Mean ± SEM**	**Mean ± SEM**
Triglycerides (g/L)	0.82 ± 0.01	0.76 ± 0.01	0.88 ± 0.02#	0.78 ± 0.01	0.77 ± 0.01	0.80 ± 0.01
Cholesterols (g/L)	1.62 ± 0.02	1.65 ± 0.03	1.59 ± 0.04	1.72 ± 0.02***	1.67 ± 0.03	1.78 ± 0.02###
HDL (g/L)	0.46 ± 0.01	0.44 ± 0.02	0.48 ± 0.01	0.47 ± 0.02	0.48 ± 0.02	0.46 ± 0.04
LDL (g/L)	0.99 ± 0.03	1.06 ± 0.04	0.93 ± 0.04	1.09 ± 0.03***	1.03 ± 0.04	1.16 ± 0.03###
VLDL (g/L)	0.16 ± 0.00	0.15 ± 0.00	0.18 ± 0.00#	0.16 ± 0.00	0.15 ± 0.00	0.16 ± 0.00

N & n: Total number of each subjects group; SEM: Standard error of mean; Min: Minimum; Max: Maximum; HDL: High Density Lipoprotein; LDL: Low Density Lipoprotein; VLDL: Very Low-Density Lipoproteins; *: Statistically different for $p < 0.05$; ***: Statistically different for $p < 0.001$; #: Statistically different for $p < 0.05$; ###: Statistically different for $p < 0.001$.

IV. Discussion

Poultry meats are appreciated by the consumer and recommended by dietitians because they are low in fat and yet well-endowed with unsaturated fatty acids (LESSIRE, 2001). This study, which assessed the lipid profile in broilers and chickens, showed an average of the triglyceride and VLDL levels in local chickens (0.82 ± 0.01 g/l) and broilers (0.78 ± 0.01 g/l) within the international ranges (0.20 to 1.50 g/l). It did not vary significantly by strain. In contrast, triglyceride levels were significantly higher in females than in males of local chickens. This result is consistent with the work of Larbier and Leclercq (1992), which showed that females are generally fatter than males for the same species and age.

The concentration of VLDL reflects the availability of plasma triglycerides and thus the susceptibility to fattening (Whitehead and Griffin, 1982). Since the de novo synthesis of fatty acids in birds occurs primarily in the liver, the growth of fat tissue and subsequent fattening is dependent on the availability of plasma triglycerides, which are transported as components of lipoproteins by VLDL (Dominique, 1997). Because VLDL concentrations in the chickens in this study are within the reference standards, they will not be exposed to excessive fattening.

Triglycerides and VLDL are lower than those obtained by Bogusławska-Tryk *et al*. (2016), Sahraoui *et al*. (2019), Masud Alam *et al*. (2020), Zohreh *et al*. (2010) in broilers and by Ramesh *et al*. (2009) in layers.

On the other hand, these rates were higher than in the work of Daneshyar *et al.* (2011), Gheisari *et al.* (2017), Karadağoğlu *et al.* (2020), Okpogba *et al*. (2019), Regar *et al*. (2019) and Tohala (2010) also in chickens. According to Krasnodębska-Depta and Koncicki., 2000, the fattening status of poultry carcasses varies according to the bird species, sex and age of the bird, but also according to the nutritional characteristics of the food ingested, which would explain this difference.

Cholesterol is one of the most controllable risk factors for heart disease, heart attacks and strokes. It is the cause of cardiovascular disease, which is one of the main causes of disability and premature death (Kristal-Boneh *et al.*, 1999). Control of its level in food and feed is of great importance. General cholesterol levels in the chicken population are within the reference standards in this study. The rate for local chickens in our study was higher than that obtained by Messabhia, 2016 in a population of local chickens in Algeria and Iriyanti *et al.* (2014) who conducted their experiments on local populations in Indonesia.

Cholesterol was significantly higher in broilers than in local chickens. This finding is contrary to the work of Dutta *et al.* (2013) that recorded the highest cholesterol levels in its indigenous population compared to the industrial strain that had the lowest level.Low cholesterol levels in local chicken populations may be the result of hyperactivity and agility in these populations, resulting in increased demand for energy metabolites **(**Almeida *et al.*, 2006**)**. These Hypo-cholesterol populations represent a great interest in human nutrition as sources of lean meat.

Cholesterol levels in female broilers are higher than those in the local chicken population in agreement with Bahman *et al.* (2011), which found that the industrial strain exceeds the farm population in cholesterol levels.

LDL levels were significantly higher in broilers than in local chickens, as was cholesterol levels. This finding is consistent with literature. LDL are the major transporter of cholesterol from the liver to body tissues, so serum LDL levels are affected by cholesterol levels (Hasanuddin and Yunianto, 2013). Local chickens are therefore more recommended for feeding because they have less HDL ("bad cholesterol"). LDL levels are well above those of HDL in the study population as the literature indicates. High density lipoproteins represent the large fraction of cholesterol in the blood of birds (Peebles *et al.*, 1997).

V. Conclusion

In conclusion, there were significant statistical differences observed between serum triglyceride, cholesterol, LDL and VLDL levels in local chicken and broilers. Mean triglycerides and VLDL values were higher in females than in males with a very highly significant difference.

Contribution of Authors

All the authors contributed equally. They read the final version, and approved it for the publication.

Conflict of Interest

The authors declare that they do not have conflict of interest.

Acknowledgments

We wish to thank Dr GBOGBO Moussa for his excellent technical assistance.

References

[1]. Sahraoui N., Moula N., Bensnoussi A., Taibi A., Achour D., Saifi H., Guetarni D. and Hornick J. L. Impact de *Yucca schidigera* sur les paramètres plasmatiques lipidiques et le rendement du poulet de chair. Agrobiologia. 2019; *9*(1) :1435-1438.

[2]. Tohala S. H. The relationship between blood lipid profile and performance of broilers fed two types of finisher diets. Iraqi Journal of Veterinary Sciences. 2010; 24(2):87-91.

[3]. Regar M. N., Tulung B., Londok J. J. M. R., Moningkey S. A. E. and Tulung Y. R. L. Blood lipid profile of broiler chicken as affected by a combination of Feed restriction and different crude fiber sources. IOP Conf. Ser.: Earth Environ. 2019 ; Sci. 387 012053, doi :10.1088/1755-1315/387/1/012053.

[4]. Kokoré A.B., Kamagate S., Bleyere N.M. et YAPO A.P. Hematological profile of broilers and local chickens in Korhogo, Côte Ivoire. International Journal of Agriculture, Environment and Bioresearch. 2021a; 6(2):14-23.

[5]. Kokoré A.B., Bleyere N.M., Kamagate S. et YAPO P.A. (). Blood Biochemical Parameters Exploration in Broilers and Local Chickens in Korhogo, Côte d'Ivoire. American Journal of Medical Sciences and Medicine. 2021b; 9(2):82-86.

[6]. Masud A., Mohammad O. U., Syeda U. F. M., Mohammad S. I. Broiler and indigenous chickens: a comparison through biochemical parameters, International Journal of Sustainable Agricultural Research. 2020; 7(4):228-233.

[7]. Subhadarsini M. and Silpa M. G. Comparative Haematology and Biochemical Parametrs of Indigenous And Broiler Chicken. 2020. International journal of scientific & technology research. 2020;9(04):972-979.

[8]. Dutta R. K., Islam M. S. and Kabir Md. A. Haematological and biochemical profiles of gallus indigenous, exotic and hybrid chicken breeds (*gallus domesticus*) from Rajshahi, Bangladesh. Bangladesh J. Zool.2013;41(2): 135-144.

[9]. Kral I. and Suchy P. Haematological studies in adolescent breeding cocks. Acta Vet. Brno. 2000 ; 69 :189-94.

[10]. Lessire M. Matières grasses alimentaires et composition lipidique des volailles, INRA Prod. Anim. 2001 **;** 14 (5):365-370.

[11]. Larbier M. and Leclercq B**.** Nutrition et alimentation des volailles. INRA Editions, Paris, 1992**;**352p.

[12]. Whitehead C. C. and Griffin H. D. Plasma lipoprotein concentration as an indicator of fatness in broilers: effect of age and diet. Br. Poult. Sci. 1982; 23:299-305.

[13]. Dominique H. Lipoprotein Metabolism and Fattening in Poultry. The Journal of Nutrition. 1997**;** 127(5):805S–808S.

[14]. Bogusławska-Tryk M., Piotrowska A., Szymeczko R., Burlikowska K. and Głowińska B. Lipid Metabolism Indices and Fatty Acids Profile in the Blood Serum of Broiler Chickens Fed a Diet with Lignocellulose. Brazilian Journal of Poultry Science. 2016; 18(3):451-456.

[15]. Zohreh K., Parvaneh K., Solmaz C. et Soheila K.N. Comparative study of serum lipid profile in chicken, ostrich, cattle, and sheep. Comp Clin Pathol. 2010; 21:259-263.

[16]. Ramesh A., Manegar A., Shambulingappa B.E and Ananda K. J. (). Study of Lipid Profile and Production Performance in Layers as Influenced by Herbal Preperations Abana™ and Garlic Paste. Veterinary World. 2009; 2(11) :426-428.

[17]. Daneshyar M., Alizadeh G.M., Bayeghra F.S., Farhangpajhoh F. and Aghaei M. Effects of dietary turmeric supplementation on plasma lipoproteins, meat quality and fatty acid composition in broilers. South African Journal of Animal Science. 2011 ; 41(4) :420-427.

[18]. Gheisari A., Fosoul S.S.A.S., Pourali S., Esfahani E N. and Mohammadrezaei M. Blood lipid metabolites and meat lipid peroxidation responses of broiler chickens to dietary lecithinized palm oil. South African Journal of Animal Science. 2017;47(4):527-553.

[19]. Karadağoğlu Ö., Şahin T., Ölmez M., Yakan A. et Özsoy B. Changes in serum biochemical and lipid profile, and fatty acid composition of breast meat of broiler chickens fed supplemental grape seed extract. Turkish Journal of Veterinary and Animal Sciences. 2020; 44:182-190.

[20]. Okpogba A.N., Amah A.K., Ogbodo E.C., Ujowundu F.N., Odeghe O.B., Analike R.A., Amah U.K., Oguaka V.N., Wopara I. and Modo E.U. Assessment of lipid profile levels of chickens (Gallus gallus domestica) exposed to factory sites in Nnewi, Anambra State, South Eastern Nigeria. J Diagn Pathol Oncol. 2019; 4(2):107-109.

[21]. Krasnodębska-Depta A. et Koncicki A. Physiological values of selected serum biochemical indices in broiler chickens. Medycyna Weterynaryjna. 2000; 56:456-460.

[22]. Kristal-Boneh E., Coller D., Froom F., Harari G., Ribak J. The association between occupational lead exposure and serum cholesterol and lipoprotein levels. Am J Publ Health. 1999 ; 89(7) :1083-1087.

[23]. MESSABHIA M. Caractérisation phénotypique et profil biochimique de quelques souches locales de poules. Mémoire de Magistère en sciences vétérinaires. Institut Des Sciences Vétérinaires. Algérie.2016 ; 181p.
[24]. Iriyanti N., Santosa R. and Rachmawati W.S. Blood profile and performance of Native Chicken with functional feed. International Journal of Poultry Science. 2014. 13(11):645-651.
[25]. Almeida J.G., Vieira S.L., Gallo O.R.A. et Olmos A.R. Period of incubation and post hatching holding time influence on broiler performance. Revista Brasileira de Ciência Avícola. 2006; 8:153-158.
[26]. Bahman A.H., Alireza T. and Siamak A.R. Comparative Study on blood profiles of Indigenous and Ross-308 Broiler breeders. Global Veterinaria. 2011; 7(3):238-241.
[27]. Hasanuddin S. et Yunianto V. D. (2013). Blood Lipid Profile of Broiler Chickens Fed a Step-Down Protein with Addition of Lime Juice as an Acidifier. JITP. 2013;3(1):11-17.
[28]. Peebles E.D., Cheaney J.D., Brake J.D., Boyle C.R. et Latour M.A. Effects of added dietary lard on body weight and serum glucose and low-density lipoprotein cholesterol in randombred broiler chickens. Poultry Science.1997; 76 :29-36.

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