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Effect of Some Nut Extracts and Ginger on the Lipid Profile of Hepatitis B Infected Mice

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Authors' contributions

This work was carried out in collaboration between both authors. Author GBB designed the study and every other part of the study was carried out by both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: The determination of the effect of the tiger nut, coconut, coconut &tiger nut milk and ginger extract on the lipid profile of HBV infected mice
Study Design: The study was conducted using adult mice of which some where infected with hepatitis B virus while some which were not infected, served as control.
Place and Duration of Study: The study was carried out at the Rivers State University animal house and the study lasted for 2 months.
Methodology: Adult healthy mice were grouped into five (5). The groups 2 to 5 mice were infected with HBV and the infection was confirmed using HBsAg rapid kit after which those in groups, 3, 4 and 5 were given the extracts. The blood samples of the mice were collected and analyzed.
Results: The results showed that the TC, TG, HDL, LDL and VDL for the group1mice which were not inoculated had mean values of 4.63mmol/l,1.82mmol, 1.79mmol/l, 3.43mmol/l, 0.85mmol/l. The

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group 2 had mean values of 4.9mmol/l, 2.31mmol/l, 1.72mmol/l, 4.1mmol/l, 0.92mmol/l. The third group given the tigernut and ginger extract showed mean values of 4.7mmol/l, 2.04mmol/l, 1.9mmol/l, 3.83mmol/l, 0.63mmol/l. The fourth group given the coconut and ginger extract had mean values of 4.6mmol/l, 1.97mmol/l, 1.74mmol/l, 3.75mmol/l, 0.9mmol/l respectively. While the fifth group given the combination of coconut, tiger nut and ginger extract had mean values of 5.09mmol/l, 2.04mmol/l, 1.59mmol/l, 4.4mmol/l and 0.93mmol/l respectively.

Conclusion: The tigernut and coconut individual extract with ginger, had positive impacts with the coconut extract with ginger having a better impact on the lipid profile of the infected mice.

Keywords: Coconut; ginger; HBV; lipid profile; tigernut.

1. INTRODUCTION

Liver disease which occurs world-wide has become a burden in both mortality and morbidity globally with age, sex, region or race not withstanding [1]. World-wide, hepatitis B and C viral infections, environmental carcinogens, alcohol abuse, and fatty liver disease, are the main risk factors for liver cancer and hepatic carcinoma (HCC) [2]. HBV infected patients in 2015 died due to chronic hepatitis, cirrhosis, and hepatocellular carcinoma, and other liver-related complications, and the infection has been found to cause epidemics in most parts of Asia and tropical African countries.[3]

The hepatitis B virus (HBV) which is a human hepadna virus causes acute and chronic hepatitis and hepatocellular carcinoma [4].

Lipid profile or lipid panel is a panel of blood tests that serves as an initial broad medical screening tool for abnormalities in lipids, such as cholesterol and glycerides [5]. The immune response to the virus in the hepatocytes, is responsible for the hepatitis and liver damage [6] and the chronic surge of pro-inflammatory cytokine surge the characteristics of most chronic hepatitis B infection, which has the ability to change plasma lipid distribution[7] generally The increase of lipogenesis and very low density lipoprotein (VLDL) production are caused by most pro-inflammatory cytokines, leading to an increase in the circulating LDL levels in serum [8].

Since ancient times, herbal- or plant- based medicine has served as a platform for the prevention and the cure of diseases and to date many more constituents of these natural sources are yet to be explored. This enlightened many scientists to find out newer compounds from the herbal source to treat many infectious diseases and also have potential benefits to the society[9]. Herbal medicine is one of the oldest forms of medicine known to man and therefore could be considered as one of the forerunners of modern pharmaceutical trade hence some modern drugs are synthesized from plants and plant derivatives [10]

Ginger (*Zingiber officinale*) which is a spice with a pungent, aroma, has been commonly used around the world for many years as a food and medicinal recipes[11] Due to its various bioactive compounds such as tannins, flavonoid, glycosides, etc. ginger has been isolated from the different parts of the plant which were analyzed pharmacologically [12]. Gingerol and shogaol which are two of the bioactive ingredients found in ginger have been discovered to possess antioxidant, anti-cancer, anti-inflammatory, and lipid-lowering activities with the ability to protect the liver [13]. A few mice studies have disclosed that Ginger supplement has been disclosed by a few mice study to suppress liver carcinogenesis by clearing free radical formation and by reducing lipid peroxidation [14].

Tiger-nut (*Cyperus esculentus*) which belongs to the family, *Cyperaccae,* is widely consumed (raw or fried) in many parts of East and West Africa countries as a source of energy, carbohydrate and protein (Umar *et al.,* 2014) [15] and rich in vitamins, minerals, digestive enzymes such as amylase, catalase and lipase as well as in phytochemicals and antinutritional factors such as tannins, phytic acids, saponins, glycosides, steroids [16]. Tiger-nut milk which is a refreshing drink with many health benefits is reported to affect lipidemia through reducing the level of Low Density Lipoprotein (LDL), and increases, High Density Lipoprotein [17]. Chukwuma *et al.* [18] reported that tiger-nut milk are found to be good in preventing arteriosclerosis, and can help prevent heart problems, thrombosis as well as activate blood circulation.

Coconut milk which is the liquid obtained through manual or mechanical force of coconut meat [19], contains essentially high amount of protein, amino-acid, water, sugar, fat, vitamins and minerals [20]. Coconut milk contains significant

amount of fat, but unlike other nuts, it provides fat that is mainly in the form of medium chain saturated fatty acid [MCSFA] that is abundant in particular lauric acid [21] and is converted in the body into a highly beneficial compound called Monolaurin and anti-viral and anti-bacterial that destroys a wide variety of disease causing organisms[22].

HBV has been discovered to cause dyslipidemia in infected patients which has been linked with cardiovascular diseases and other related diseases capable of causing mortality among infected patients. Also, the use of conventional medication has been connected with side effects, hence, the reason for this study.

2. MATERIALS AND MATERIALS

2.1 Study Design

The study was conducted in a space of 2 months at the animal house of the Rivers State University, Port Harcourt, Nigeria. The study was conducted to determine the effect of coco nut, tiger nut milk and ginger extract on the lipid profile of HBV infected mice. Adult mice were purchased and allowed to adjust for two weeks. The animals were divided into five (5) groups, of which each group was made up of six (6) animals and were inoculated with Hepatitis B virus and allowed the virus to replicate in the mice for a month during which the mice received their respective diets, The animals in group one, were not infected with the virus thereby serving as the negative control. The mice in group two to five that were inoculated with the virus were confirmed to be infected with the virus using a highly sensitive rapid kit to test for the presence of the HBsAg which indicated an ongoing infection in the mice.

Tiger nut, coconut and ginger were purchased from the market, washed, crushed, their juice extracted. Group 2 animals served as the negative control and no intervention was administered to them. While the mice in group 3 were given the tigernut and ginger extract, group 4 mice were given coconut and ginger extract and the group 5 mice were given a combination of tigernut, coconut and ginger extract orally for two weeks after which the rats were euthanized using chloroform.

2.2 Sample Collection

Blood samples were taken from the animals and put into plain sample bottles (non anticoagulant bottles) and sera were obtained from it by allowing it to stand for 2hrs at room temperature followed by centrifugation at 2000rpm. The serum was used to determine the lipid profile level.

2.3 Assessment for Lipid Profile

Enzymatic and-point method was used for the determination of the cholesterol level, the triglyceride was determined after enzymatic hydrolysis with lipases. For the HDL, the precipitant method was used, while the Friedwald equation method was used tin determining the LDL.

2.4 Statistical Analysis

The statistical analysis was done using the STATA 20. Package and the significant difference was determined with ANOVA.

3. RESULTS

Result showing the effect of the virus on the various lipid profile and the effect of the various interventions on the altered lipid profile of the animals. The mean value for Total Cholesterol in each group was 4.43±O.21mmol/L, 4.9±0.46 mmol/L, 4.7±0.87 mmol/L, 4.6±0.26 mmol/L, 5.09±0.59 mmol/L for groups A, B, C, D and E respectively, with a P value of 0.061.

The mean value for the Triglyceride in each of the group was 1.82±0.23 mmol/L, 2.31±0.44 mmol/L, 2.04±0.40 mmol/L, 1.97±0.41 mmol/L, 2.04±0.27 mmol/L for groups A, B, C, D and E respectively, with a P value of 0.601.

The HDL mean value for each group was 1.79±0.24 mmol/L, 1.72±0.46 mmol/L, 1.9±0.39 mmol/L,1.74±0.33 mmol/L, 1.59±0.02 mmol/L for groups A, B, C, D and E respectively, with a P value of 0.604.

LDL mean values for each of the groups were 3.43±0.37 mmol/L, 4.1± 0.49 mmol/L, 3.83±0.42 mmol/L, 3.75± 0.46 mmol/L, 4.4± 0.13 mmol/L for groups A, B, C, D and E respectively, with a P value of 0.247.

The mean values for the VLDL were, 0.85±0.11 mmol/L, 0.92±0.21 mmol/L, 0.63±.56 mmol/L, 0.9±0.19 mmol/L and 0.93±0.13 mmol/L for groups A, B, C, D and E respectively, with a P value of 0.968.

4. DISCUSSION

According to Wang et al.[5], lipid profile or lipid panel is described as a panel of blood tests that serves as an initial broad medical screening tool for abnormalities in lipids, such as cholesterol and glycerides which can be used to identify certain genetic diseases and can determinecardiovascular disease risks. Also, dyslipidemia has been discovered as one of the possible metabolic abnormalities associated with liver diseases[7].

Dyslipidemia, according to Pappan and Rehman [23], has been defined as the imbalance of lipids such as cholesterol, LDL. HDL, Triglyceride and VLDL has been described as one of the common risk factors for the most prevalent and fatal non communicable diseases, cardiovascular diseases, cancer etc [24]. Ginger extract and its biologically active compounds, especially gingerol and shogaol, which has the ability for lipid-lowering activities with hepatoprotective effects[10].

From the analysis carried out in this study as shown in Table 1, the group B mice that were infected with the HBV and served as the positive control, had higher mean values of 4.9±0.36mmol/L of TC, 2.31±0.44 mmol/L of triglyceride, 1.72±0.1 mmol/L of HDL, 4.1±0.49 mmol/L of LDL and 0.92±0.21mmol/L of VLDL when compared to the group A mice which were not infected with the virus and served as negative control which had mean values of 4.63±0.21mmol/L of TC, 1.82±0.23mmol/L of triglyceride, 1.79±0.03mmol/L of HDL, 3.43±0.37mmol/L of LDL and 0.85±0.11mmol/L of VLDL The result showed that the presence of the virus resulted in an increase in the level of the Total cholesterol, Triglyceride, Low density lipid and the Very low density lipid with a decrease in the High density lipid. This agrees with the finding from the work done by Quaye et al.[25] in which there was detection of increase in the TC, Trigly, LDL,VLDL and a decrease in the level of HDL in patients infected with HBV compared with those who were not infected, showing that HBV, has a negative impact on the lipid profile and can predispose infected patients to cardiovascular related disease as stated by Kwateng [7].

The mice that were treated with tigernut milk and ginger, in group C, showed mean values of 4.7±0.87 mmol/l, 2.04±0.40mmol/l, 1.9±0.39 mmol/l, 3.83±0.42 mmol/l and 0.63±0.56 mmol/l respectively, showing a positive impact through the decrease in the level of TC, Trigyl, LDL and VLDL with an increase in the level of the HDL when compared to the group A mice which served as the control. This agrees with the medicinal properties of tigernut from the work reported by Gambo et al.[12] indicating that it contributes to the reduction of Low Density Lipoprotein (LDL), and increases, High Density Lipoprotein (HDL) of which Chukwuma *et al.*[13] reported that it has been found to be good in preventing arteriosclerosis, and can help prevent heart problems, thrombosis as well as activate blood circulation.

The result gotten in the group D, to which coconut milk with ginger was given, showed a result of 4.6±0.25mmol/L for the TC, 1.97±0.41mmol/L for the Trigyl, 1.74±0.33mmol/L for the HDL, 3.75±0.46mmol/L for the LDL, and 0.9±0.19mmol/L for the VLDL. This showed a positive result in the lipid profile level, with an increase in the HDL and a decrease in the TC, Trigyl, LDL and VLDL. This conforms with the finding from the research carried out by Ekanayaka et al.[26] which showed an increase in the HDL and a decrease in LDL.

In the group E mice to which the combination of tigernut milk, coconut milk and ginger was given, there was a positive result only in the Trigyl level, showing a decrease when compared with the group B which was infected, with a result of,2.04 mmol/L. The other variables were negatively impacted with an increase in the levels of the TC, LDL and VLDL with results of 5.09±0.59mmol/L, 4.4±0.7mmol/L and 0.93±0.13 mmol/L respectively and a decrease in the HDL with a result of 1.59±0.02 mmol/L.

Table 1. Lipid profile mean values for the various groups

	TC (mmol/l)	TG (mmol/l)	HDL (mmol/l)	LDL (mmol/l)	VDL (mmol/l)
Group A	4.63±0.21	1.82±0.23	1.79±0.03	3.43±0.37	0.85±0.11
Group B	4.9±0.36	2.31±0.44	1.72±0.1	4.1±0.49	0.92±0.21
Group C	4.7±0.87	2.04±0.40	1.9±0.39	3.83±0.42	0.63±0.56
Group D	4.6±0.25	1.97±0.41	1.74±0.33	3.75±0.46	0.9±0.19
Group E	5.09±0.59	2.04±0.27	1.59±0.02	4.4±0.7	0.93±0.13
P Values	0.061	0.601	0.604	0.247	0.968

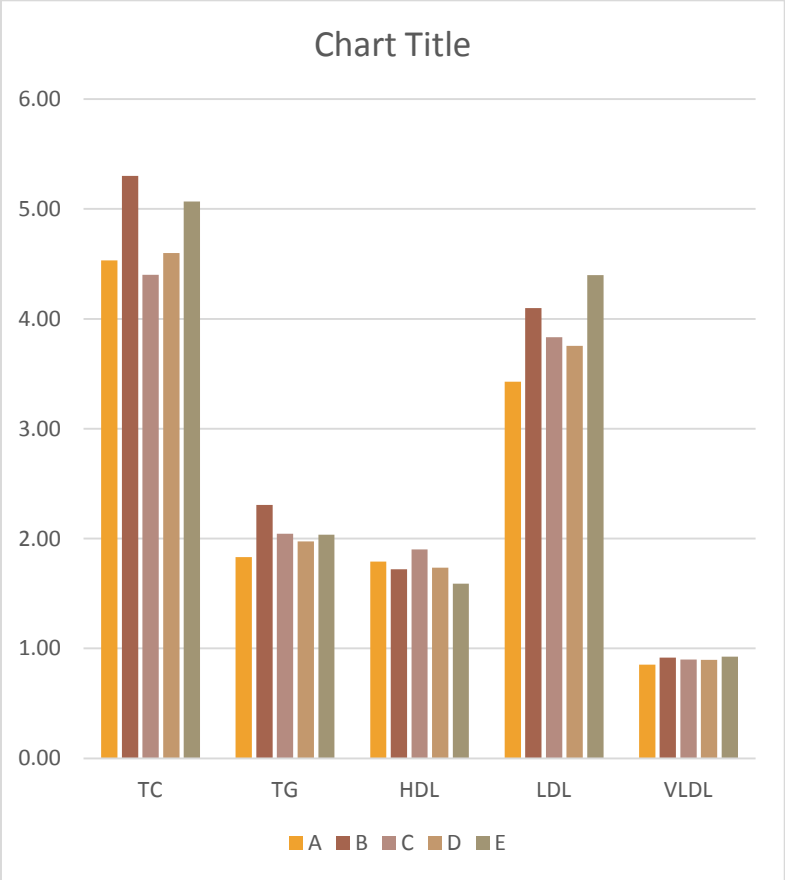

Fig 1. Lipid Profile mean value graph

5. CONCLUSION

From the work done as shown in Fig. 1 where the results of the various interventions were compared, it was discovered that both tigernut milk with ginger and coconut milk with ginger when taken individually, both had positive impact on the lipid profile of the animals that were infected with the HBV since they were able to lower the TC, Trigyl, VLDL levels and increased the HDL level when compared to the infected animals that were not given any intervention. While the combination of the tigernut milk and coconut milk with ginger, had a negative impact on the lipid profile of the animals, since they increased all the bad lipids, except the Trigyl and lowered the HDL which is the good lipid, suggesting that this intervention can predispose patients infected with HBV to dyslipidemia and the various diseases associated with it.

ETHICAL APPROVAL

This was obtained from the institutional animal care protocol of the River State University, Port Harcourt, Rivers State, Nigeria in adherence with the ethical standards laid down by the Principles of laboratory animal care (NIH publication No 85 – 23, revised 1985). All experiments were examined and approved by the appropriate ethics committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lozano RM, Naghavi K, Foreman S, Lim K, Shibuya V. (2012) Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study. Lancet. 2010;380:2095-2128.
2. Plummer M, de Martel C, Vignat J, Ferlay J, Bray F, Franceschi S. Global burden of cancers attributable to infections in 2012: A

synthetic analysis. The Lancet Global Health. 2016;4(9):e609-e616.
3. WHO. Hepatitis B: Fact sheet; 2018. Accesson July 18, 2018
Available:http://www.who.int/news-room/fact-sheets/detail/hepatitis-b
4. Robert H, Kruszon-Moran D, Ly KN, Huges E, Iqbal K, Jikes RB, Holmesberg D. Prevalence of chronic hepatitis B virus (HBV) infection in US households: National Health and Nutritional Examination Survey (NHANES).,1988 – 2012. Hepatology. 2016;63(2):388–397.
5. Wang S, Shi XL, Feng M, Wang X, Zhang ZH, Zhao X, Ding YT. Puerarin protects against CCl4-induced liver fibrosis in mice: possible role of PARP-1 inhibition. International Immunopharmacology. 2016;38:238-245.
6. Tan A, Koh S, Bertoletti A. Immune response in Hepatitis B virus infection. Cold Spring Harb Pespect Medicine. 2015;5980:a021428.
7. Kwarteng JK. Changes in serum lipids and other biochemical indices associated with liver damage in chronic Hepatitis b infection. Kumasi, Ghana: University of Science
and Technology (KNUST); 2013:54–63.
8. Targher G, Marra F, Marchesini G. Increased risk of cardiovascular disease in non-alcoholic
fatty liver disease: Causal effect or epiphenomenon? Diabetologia. 2008;51:1947–1953.
9. Yadav D. Chauhan PS, Mishra M, Kwak M. Potential Benefits of *Cucurbita ficifoilla*: An updated review.prog. Nutr(Internet). 2020;22(3).
10. Ogunmefun OT, Ekundayo EA, Ewhenodere FA. Phytochemical screening and antibacterial activities of tectonnagrandis L.F. (Teak) leaveson microorganism isolated fromdecayed food samples. Tropical plant research. 2017;4(3):376–382.
DOI: 10.22271/tpr.2017.v4.13.049
11. Li H, Liu Y, Luo D, Ma Y, Zhang J, Li M, Yang K. Ginger for health care: An overview of systematic reviews. Complementary therapies in medicine. 2019;45:114-123.
12. Omoya FO, Akharaiyi F. (2017) Mixture of honey and ginger extract for
antibacterial assessment on some clinical isolatesint. Research Journal of Pharmaceuticals. 2012;02(05):127-132.
13. Nwozo SO, Osunmadewa DA, Oyinloye BE. Anti-fatty liver effects of oils from *Zingiber officinale* and *Curcuma longa* on ethanol-induced fatty liver in rats. Journal of Integrative Medicine. 2014;12(1):59-65.
14. Yusof Y, Ahmad N, Das S, Sulaiman S, Murad N. Chemopreventive efficacy of ginger (*Zingiber officinale*) in ethionine induced rat hepatocarcinogenesis. African Journal of Traditional, Complementary and Alternative Medicines. 2009;6(1).
15. Umar ZD, Bashir A, Raubilu SA. Study On bacteriological quality of kunun aya (Tigernut Juice) sold at umaru musa yar'adua university (umyu) campus, Katsina. International Journal Of Environment. 2014;3(2):87–97.
16. Kayode RM, Joseph J K, Adegunwa M O, Dauda AO, Akeem SA, Kayode BI, et al. Effects of addition of different spices on the quality attributes of tiger-nut milk (*Kunun-Aya*) during storage**.** Journal of Microbiology, Biotechnology and Food Science. 2017;7(1):1-6.
17. Gambo A, Da'u A. Tiger nut (*Cyperus esculentus*): Composition, products, uses and health benefits a review. Bayero Journal of Pure and Applied Science . 2014;7(1):56-61.
18. Chukwuma ER, Obiama N, Christopher OI. The phytochemical composition and some biochemical effect of nigerian tiger nut (*Cyperus esculentus*) Tuber. Pak J Nutr 9. 2010;(7):709-715.
19. Narataruksa P, Pichitvittayakarn W, Heggs PJ, Tia S. Fouling behavior of coconut milk at
pasteurization temperatures J. Appl. Therm. Engr. 2010;30:1387-1395.
20. Brennan D. Health benefit of coconut milk and coconut cream, nourish by WebMD; 2020.
21. Effiong GS. Characterization and chemical composition of coconut water and coconut milk. J Pure Appl.sc. 2003;6:26-32.
22. Parmar PT, Singh AK, Borad SG. Coconut (*Cocos nucifera*) springer nature singapore pte ltd. 2021. Tanwar B, Goyal A. (eds.). Oilseeds: Health Attributes and Food Applications; 2021. Available:https://doi.org/10.1007/978-981-15-4194-0_7
23. Pappan N, Rehman A. Dyslipidemia. StatPearls Publishing; 2022.
24. Habte ML, Beyene EA, Feyisa TO. Dyslipidemia and Endocrine Disorder. In

(Ed.). Management of Dyslipidemia. IntechOpen; 2021.

25. Quaye O, Amuzu BG, Adadey SM, Tagoe EA. Effect of Hepatitis B virus (HBV) Infection on Lipid Profile in Ghanaian Patients**.** Virology: Research and Treatment. 2019;10:1–5.

26. Ekanayaka RAI, Ekanayaka NK, Perera B, De Silva PGSM. () Impact of a traditional dietary supplement with coconut milk and soya milk on the lipid profile in normal free living subjects. Journal of Nutrition and Metabolism. 2013;2013:11. Article ID 481068.

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