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**Moringa Oleifera Treatment Prevents Crude Oil Tainted Diet Imposed Toxicity in Rats****Achuba F.I.<sup>1\*</sup>, Ubogu L.A.<sup>2</sup>, Ekute B.O.<sup>3</sup>**

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**Abstract**

Previous researches have documented the health and nutritional benefits of Moringa tree. The aim of this study was to evaluate the health benefits of *Moringa oleifera* leaves toward protecting against hydrocarbon- adulterated diet-related effects on Wistar albino rats. Rats were mobilized and fed hydrocarbon adulterated diet that was pre-treated with ground Moringa leaves. Liver, kidney and cardiovascular disease indices were determined and values evaluated relative to rats fed diet without hydrocarbon. Significant ( $p < 0.05$ ) hepatic derangement occasioned by changes in liver function enzymes and protein profile were observed. Similarly, kidney impairment markers were observed to be significantly altered by hydrocarbon tainted feed and significant ( $p < 0.05$ ) change in lipid levels that predisposes subjects to atherosclerosis. Generally, *Moringa oleifera* leaf powder in diet positively modulated the values of both liver, kidney and atherosclerotic markers close to values in control rats. This study establishes the protective effect of *Moringa oleifera* complemented diet against hydrocarbon-induced harmfulness.

**Keywords:** Liver, Kidney, Hydrocarbon, Moringa, Lipid profile, Protein profile

**Introduction**

In addition to contaminated food and water and through oil pollution, so many people in Southern Nigeria are exposed to hydrocarbon noxiousness by occupation and use in traditional medicine practices (Patrick- Iwuanyanwu et al., 2011; Ita and Udofia, 2011; Odjegba and Sadiq, 2002; Orisakwe et al., 2000). The health impacts of petroleum and related substances are vast in

literature (Achuba and Ogwumu, 2014a; Adegoke et al., 2012; Uboh et al., 2012; Patrick-Iwuanyanwu et al., 2011; Achuba and Otuya, 2006; Achuba et al., 2005). Some of these toxicological imports include compromising of the structural architecture of some organs in animals (Achuba 2018a; Achuba and Nwokogba, 2015b; Achuba and Ogwumu, 2014b) and alteration of oxidative enzymes (Achuba, 2018b)

*Moringa oleifera* is important medicinally (Otitoju et al., 2014; Ujah et al., 2013; Anwar et al., 2007). It has antibiotic, anti-inflammatory, hypocholesterolemic, anti anaemic and hypoglycaemic actions as well as protection against toxicant-induced organ damage (Chatterjee et al 2013; Ujah et al., 2013; Al-Said et al., 2012; Saalu et al., 2012). The intent of this study was to evaluate the protective capability of *Moringa oleifera* augmented diet against the toxicological aspects of hydrocarbon tainted diet.

**Materials and Methods****Materials**

Bonny light hydrocarbon was got from Department of Petroleum Resources, Port Harcourt, Nigeria. Moringa leaves are products of moringa tree in Abraka and were identified by the Department of Botany, Delta State University, Nigeria. Male albino rats were obtained from the Department of Anatomy, Delta state University, Abraka. The experimental rats were kept in clean cages for acclimatization for two weeks on grower's feed and water. Thereafter the weights were taken and the weights ranged between 130 – 175g. Reagents were analytical grade and standard kits

## Methods

Twelve rats were pooled into a group and five groups were constituted as follows: Rats in group 1 were fed diet devoid of any treatment, which serve as the control. Rat in group 2 were given feed treated with 5g Moringa per 100g of feed. Rats in group 3 were given hydrocarbon tainted feed (5m oil crude/100g of feed). Rats in groups 4 and 5 were fed with hydrocarbon contaminated growers feeds (5ml/ 100g of feed) which were treated with 5g and 10 g Moringa per 100g of feed, respectively. Water was made available *adlibitum* to the rats in all the groups. The experiment lasted for four months and during the exposure period, feeds for all the groups were prepared on a daily basis and unconsumed feeds were discarded. At the end of four months, the rats were sacrificed under chloroform anaesthesia and blood samples were collected from the vena cava into sample bottles and kept at -4°C.

Randox kit (Randox Laboratories, UK) was used to assay for all the biochemical parameters except bicarbonate that was determined by titration. Sodium and potassium ions were assayed by means of flame photometer Model 410 (Sherwood Scientific, UK) and calcium ion by Cayman assay kit (Cayman Chemical, U.S.A.). The level of globulin was estimated based on difference between total protein and albumin and low-density lipoprotein (LDL) was

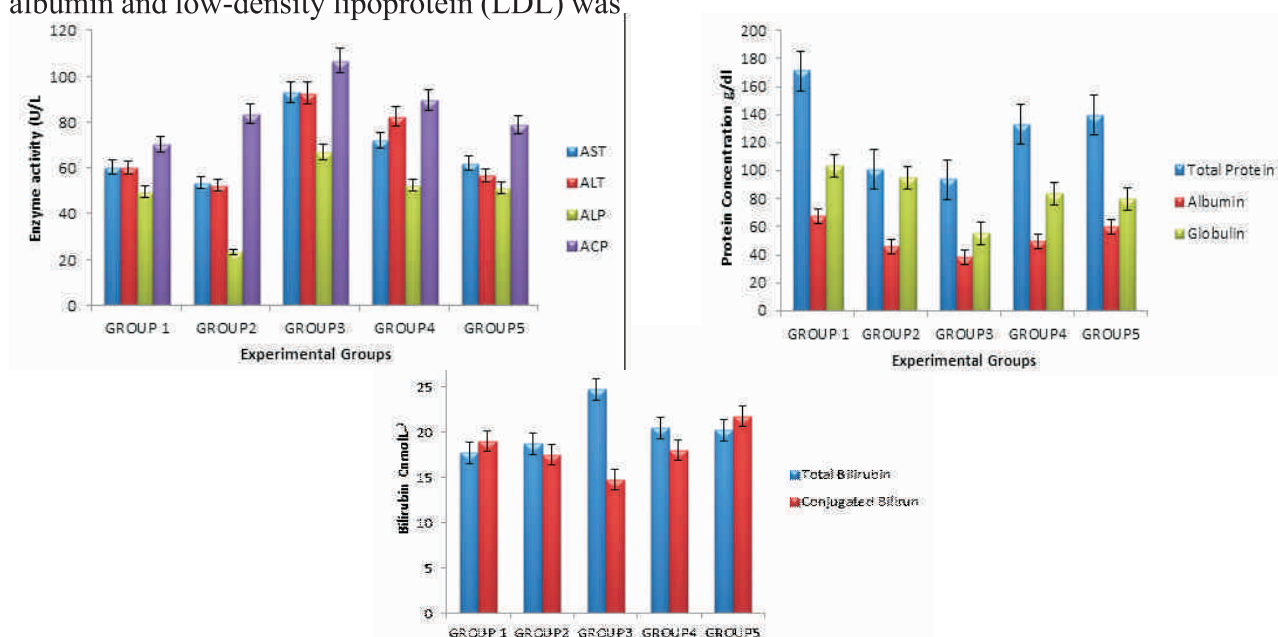
evaluated using the equation:  $LDL = \frac{TC - TAG}{2.2} - HDL$ .

## Statistical Analysis

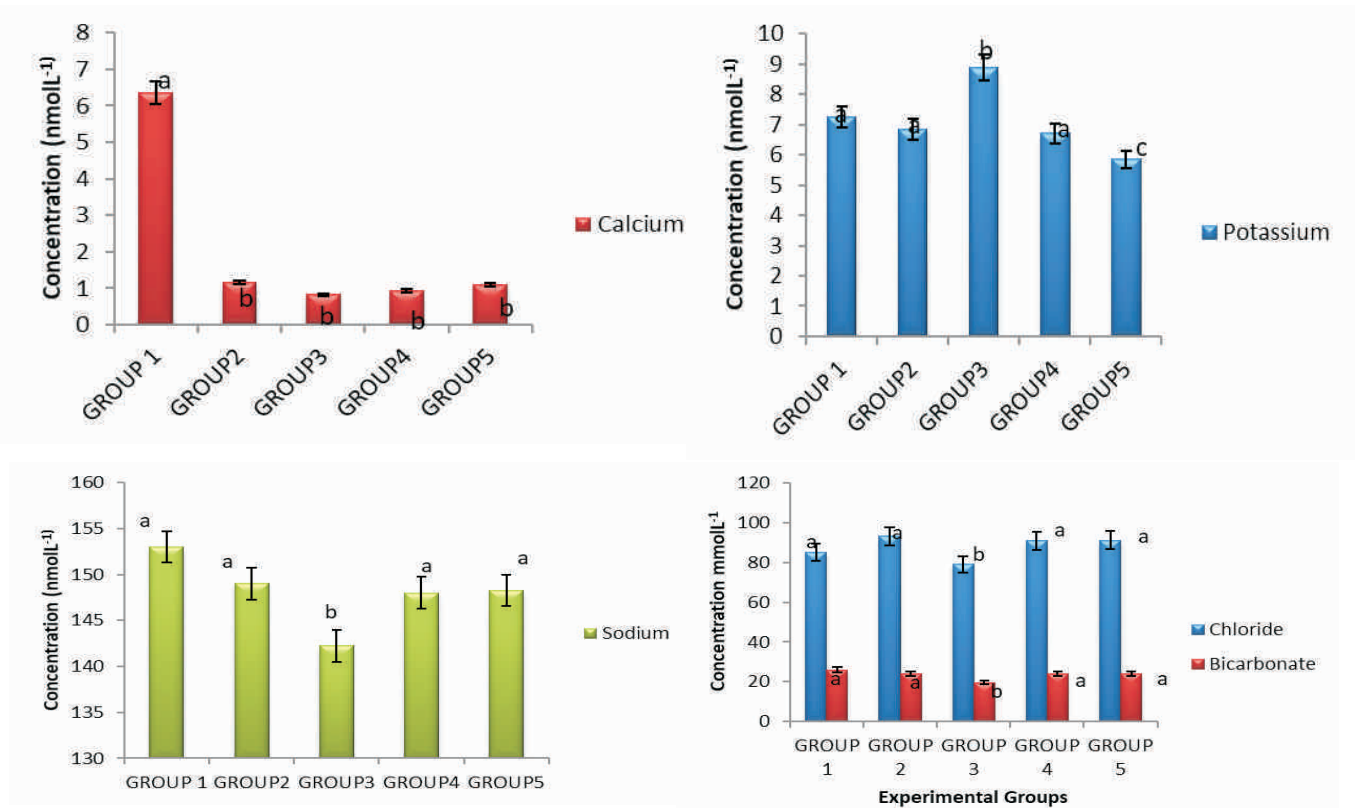
All data were analyzed using Analysis of variance (ANOVA) and significant difference between treatments was set at 5% confidence limit ( $p \leq 0.05$ ).

## Result

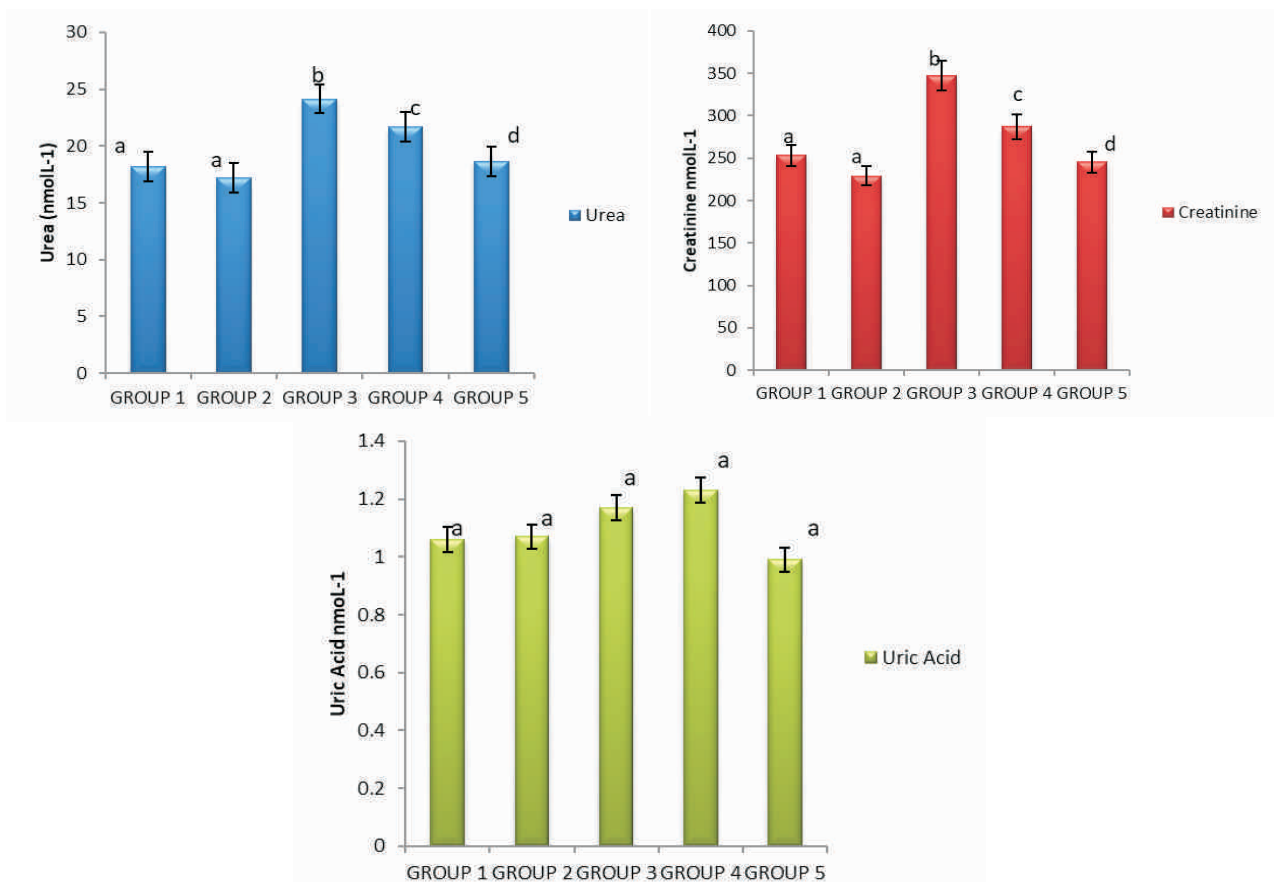
Liver function enzymes in rats fed hydrocarbon tainted feed was significantly ( $p < 0.05$ ) exacerbated (Figure 1) but addition of *M. oleifera* leaf in the adulterated diet significantly ( $p < 0.05$ ) enticed a drop in the activities of these enzymes compared to the level in control rats. Hydrocarbon tainted diet significantly ( $p < 0.05$ ) altered the protein profiles but treatment of the diet with *M. oleifera* leaf significantly ( $p < 0.05$ ) tended to restore levels of serum proteins to normal in comparison to levels in rats devoid any treatment (Figure 1) Incorporation of *M. oleifera* into hydrocarbon adulterated feed was able to restore values of most of the kidney function markers to the values observed in rats fed hydrocarbon tainted feed (Figures 2A and 2B). The alterations in lipid profiles imposed by hydrocarbon tainted diet was reversed by treatment of hydrocarbon adulterated diet with *M. oleifera* leaf powder (Figure 3).



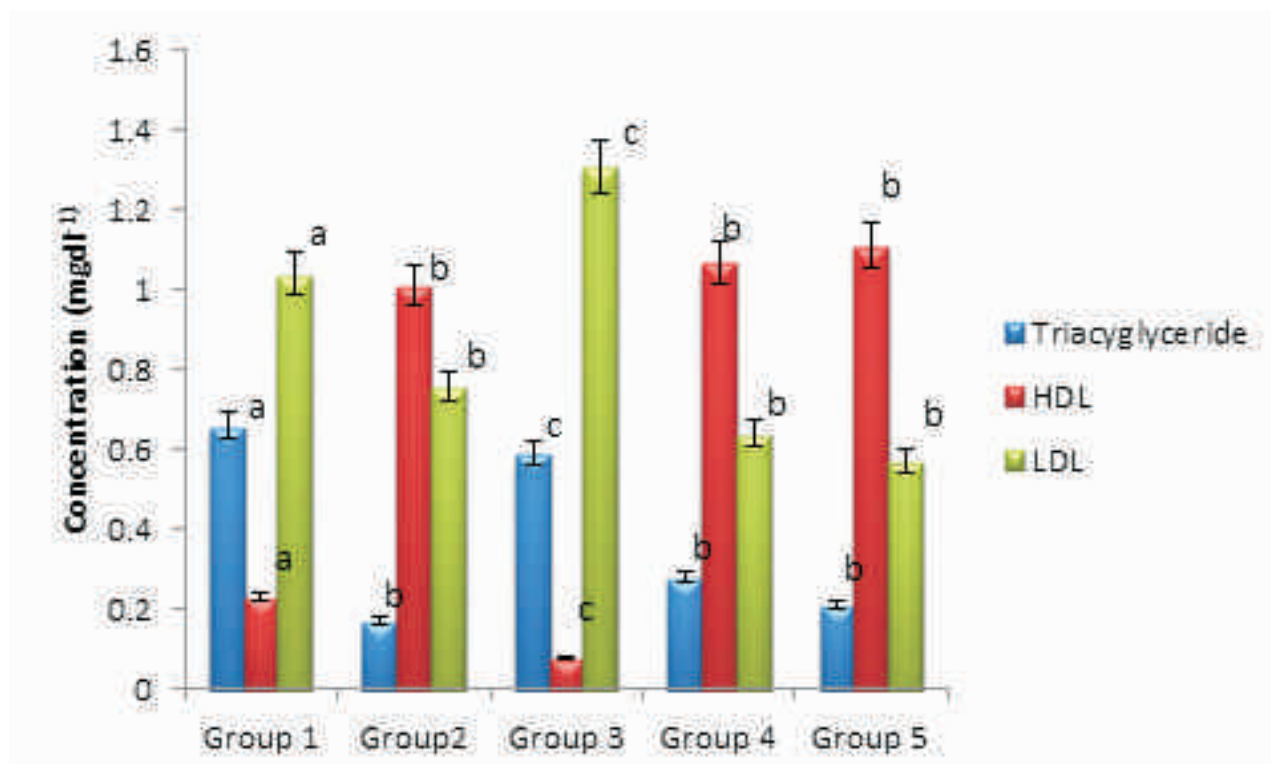
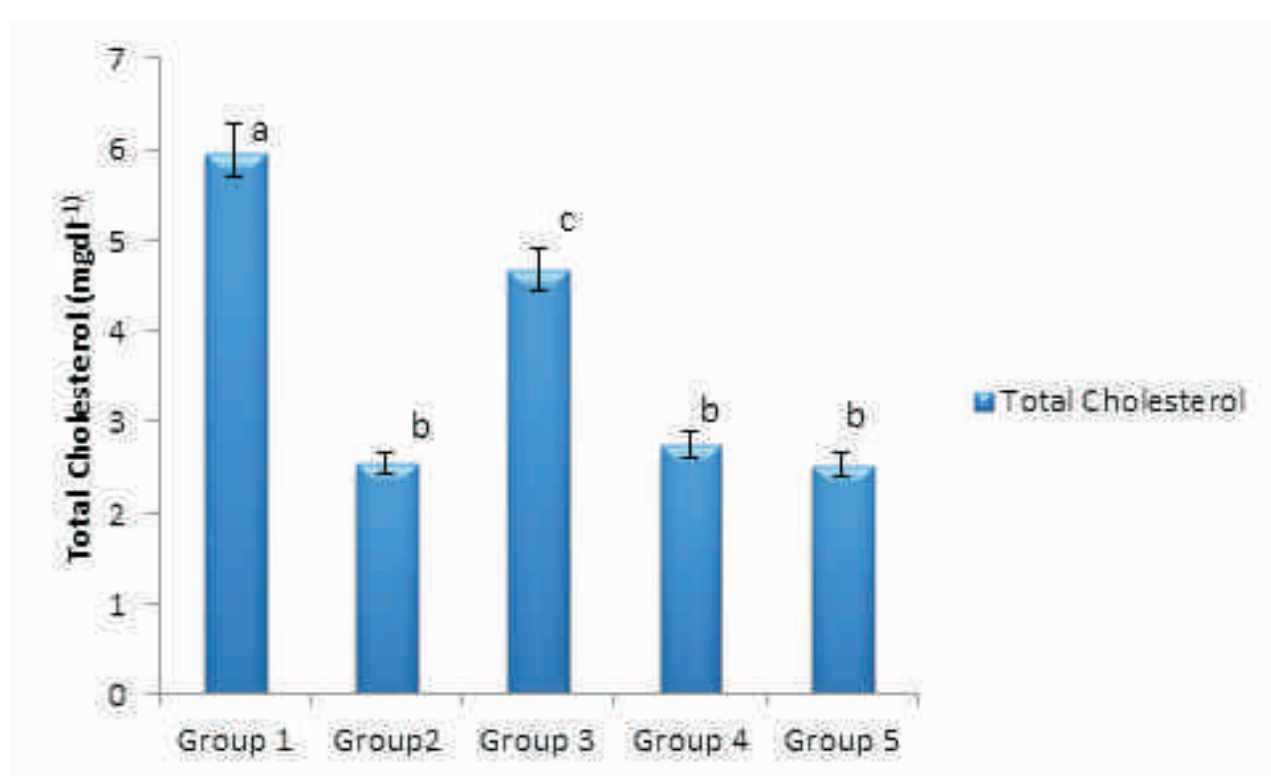
**Figure 1: Moringa leaf powder treatment of crude oil tainted diet modulates serum liver function markers**



**Fig 2A: Moringa leaf powder treatment of crude oil tainted diet modulates serum kidney function markers**



**Figure 2B: Moringa leaf powder treatment of crude oil tainted diet modulates serum kidney function markers**



**Figure 3: Moringa leaf powder treatment of crude oil tainted diet modulates lipid profile of rats**





## Discussion

The liver and the kidney are two important organs in animal physiology because the two organs work synergistically to complete cycle of biotransformation and discharge of harmful substance (Mckee and Mckee, 1999). Therefore, it is imperative to undertake the evaluation of the capacity of *Moringa oleifera* to offer protection in the midst of hydrocarbon mediated insults on the two organs. We observed an increase in serum levels of liver function enzymes due to cellular leakage of these enzymes from compromised liver structural integrity (Figure 1) is in tandem with many results in literature (Okpoghono *et al.*, 2018; Achuba and Nwokogba, 2015; Achuba and Ogwumu, 2014; Ujowundu *et al.*, 2011, 2012). In addition, a decrease in liver associated serum proteins was also observed (Figure 2) thus, giving weight to liver damage due to petroleum tainted diet. In line with liver enzymes, previous authors had similar results of decreased serum protein levels which was predicated on decreased liver synthesis of these protein due to availability of toxicant in the liver cell environment (Ujowundu *et al.*, 2011; Sunmonu and Oloyede, 2007; Cheersbrough, 2006; Ovuru *et al.*, 2004). Most importantly, this study equally corroborated the work of Al-said *et al.* (2012) and Saalu *et al.* (2012) on the prevention of toxicant insults by *Moringa oleifera* which effected decrease in the activities of liver function enzymes, an indication of restoration of hepatocytes ultrastructure (Figure 1). Many authors have documented *M. oleifera* as a rich source of antioxidant substances, which may be responsible for the potency as an antidote for hydrocarbon linked effect (Saalu *et al.*, 2011). Similar protection by plant-based material such as palm oil (Achuba, 2018a ; Achuba and Ogwumu, 2014); honey (Achuba and Nwokogba, 2015); *Monodora myristica* (Okpoghono *et al.* 2018); *Vernonia amygdalina* (Achuba, 2018b) are available in literature. The restoration of the activities of the hepatic enzymes by *M. oleifera* regardless of intake of hydrocarbon contaminated diet by the rats is attributable to the plant ability to stabilize the cell membrane and thus prevents enzyme leakages (Ekam *et al.*, 2012; Saalu *et al.*, 2012).

Like the liver, the integrity of the kidney was also compromised. We observed a significant ( $p < 0.05$ ) increase in serum kidney function markers (Figure 3). This information agrees with previous reports (Achuba and Nwokogba, 2015; Achuba and Ogwumu, 2014 [Ovuru *et al.*, 2004]). However, addition of *M. oleifera* to the rats feed prevented hydrocarbon induced kidney damage. In fact, addition of *M. oleifera* leaf to hydrocarbon-contaminated diet improved kidney function markers in a close semblance with those values in control rats. Similar preventive potentials of plant derived materials against organ damage was recently documented (Achuba, 2018b).

Consumption of hydrocarbon can lead to cardiovascular disorders which are associated with oscillations in lipid metabolism (Ujowundu *et al.*, 2011; Achuba and Otuya, 2006). In our study, we observed fluctuations in the triglycerides and lipoproteins of subjects (Figure 3). However, and interestingly too, the incorporation of *M. Oleifera* into the diet resulted in significant restoration of lipid profile close to control values (Figure 4). The hypolipidaemic action of *M oleifera* was earlier reported (Chaterjee *et al.*, 2013; Mehta *et al.*, 2007). *M. oleifera* improved the lipid status of rats due to its antioxidant properties (Saalu *et al.*, 2011). The injurious provoking dispositions of hydrocarbon had been associated with free radical generation and improvement of lipid profile by antioxidants vitamins (Ufot *et al.*, 2018; Achuba and Otuya, 2006). In fact, the lipid profile of rats given *M. oleifera* was better than the rats without any treatment (Figure 4).

## Conclusion

In conclusion, data in this study indicates that, treatment of hydrocarbon tainted diet with *M. oleifera* could prevent organ damages and predisposition to cardiovascular disease in rats.

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