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Evaluation of Liver Markers, Kidney Markers, Electroyte Panel and Protein Profile in Pump Attendants Exposed to Petrol Fumes from Selected Filling Stations in Ihiala, State, Nigeria

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Abstract:- Environmental hazard in a work place is an inevitable experience especially when it has to do with working in a filling stations where volatile and combustible substances like petrol, diesel and kerosene are dispensed via PMS and other channels of distribution or outlets and in the process pollute or saturate the air with hydrocarbons. Individuals working in a petrol station pose different risk of exposure to these xenobiotics that enter the body via different means (inhalation, ingestion and skin or eye contact) and could be detrimental to the body system resulting to death if not properly handled. This research was aimed at assessing some biochemical indicators of occupational hazard in fuel pump attendant from selected service stations in Ihiala, Anambra state. A total of eighty apparently healthy subjects (40 males and 40females) aged between 28-35 years volunteers participated in the study. Each gender was further categorized into two groups of 20 each for control (unexposed workers) and exposed pump attendants respectively. The pump attendants that volunteered for this study had spent an average of 5-6 years on the job. Blood samples were collected from the volunteers with their informed consent and selected biochemical parameters such as liver function test (ALP, AST ALT), kidney function test (urea, creatinine and uric acid), protein profile (total protein and albumin), and electrolyte levels were investigated using standard methods. The result of the investigations showed that urea and creatinine level of exposed female pump attendants (5.80±0.02 mg/dl and 82.50±2.15 mg/dl)were significantly higher (P<0.05) than unexposed female pump attendants (5.00±0.45mg/dl and 58.00±0.11 mg/dl respectively). Serum sodium (Na^+) electrolyte levels of exposed male and female exposed pump attendant (143.00±1.05 and 141.00±1.25 mmol/L respectively) were significantly higher (P<0.05) compared to Na^+ electrolyte levels in male and female unexposed workers (138.00±0.14 mmol/L and 139.50±2.11 mmol/L respectively) while the chloride ion level in male and female pump attendants were higher compared to male and female unexposed workers. Alanine transaminase and aspartate transaminase (ALT and AST) levels of male and female exposed pump attendant were higher than that in male and female unexposed pump attendant. Petroleum fumes are therefore environmental pollutants that could have serious consequences on biochemical parameters in petroleum product exposed individuals. Therefore, health Safety and Environmental training is recommended for petrol station workers on regular basis to improve their safety and create awareness on the dangers inherent associated with filling station workers exposed to petrol fumes.

Keywords:- *PMS, Hazard, Liver Parameters, Kidney Parameters, Protein Profile, Electrolyte Panel.*

I. INTRODUCTION

Petroleum are gotten from fossil fuels, sedimentary rocks and exist in a crude form. They are naturally occurring yellowish-black liquid mixture of mainly hydrocarbons, and is found in geological formations. They have similar chemical and physical properties and their commercial value is high owing to their scarce nature and great importance to humans (U.S energy information). Petroleum have different uses which are beneficial to man and can be processed into various forms which include: Petrol, diesel, jet fuel, kerosene, paraffin, heavy fuel, liquefied gases (LPG), and petrochemical feedstock.

Petrol (or gasoline) is a volatile and highly combustible liquid mixture primarily used for internal combustion of machines (Micyus*et al.*, 2005; Lewne*et al.*,2006). Individuals that have a greater risk of exposure to petroleum vapor include: filling-station workers, service station attendants, drivers of gasoline trucks and refinery workers (Periago and Prado, 2005). The volatile nature of petrol products make them most abundant in the atmosphere each time it is dispensed, especially at filling stations and depots. People are vulnerable to gasoline fumes during fueling and refueling at gas stations, but the filling station workers are more in jeopardy by virtue of the nature of their work Gupta and Dogra, (2002).

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A petrol station is a facility that sells fuel and engine lubricants for motor vehicles. Gasoline pumps are used to pump gasoline, diesel, compressed natural gas, LPG, liquid hydrogen, kerosene, alcohol. Fuel (like methanol, ethanol, butanol, propanol), biofuels (like straight vegetable oil, biodiesel), or other types of fuel into the tanks within vehicles and calculate the financial cost of the fuel transferred to the vehicle. Besides gasoline pumps, one other significant device which is also found in petrol stations and can refuel certain (compressed-air) vehicles is an air compressor, although generally these are just used to inflate car tires.

Many filling stations provide stores, which may sell petroleum related product like engine oil, a pump for dispensing kerosene situated at one side; another pump for dipensing diesel on the other side; in some cases, a mini mart store for selling grocery items, such as: alcoholic, beverages, tobacco products, lottery tickets, soft drinks, snacks, coffee, newspapers, magazines.. Some also sell propane or butane and have added shops to their primary business. Conversely, some chain stores, such as supermarkets, discount stores, warehouse, or traditional convenience rooms, have been found in a fuel station.

However, the most category of people affected are those who are occupationally exposed to fumes emanating from petroleum product (Smith *et al.,* 1993). Also (Patrick and Iwuanyawu *et al.*,2011) reported that frequent petrol fumes could possibly cause adverse effects on the kidney and impair liver functions. Many of the harmful effects seen after exposure to gasoline are due to the components in the gasoline mixture, such as benzene, ethane and methane etc. Inhaling small amounts of gasoline vapors can lead to nose and throat irritation,headaches, dizziness, nausea, vomiting, confusion and breathing difficulties. Some effects of skin contact with gasoline include rashes, redness, and swelling. Allergic reactions (hypersensitivity) have been reported but these are rare occurrences Maresky and Grobler (1993).

Occupational hazard in petrol-filling station have been recognized for many years as one of contributing factor that negatively affect workers, resulting to diseases and still a major problem in all part of the world. The numbers of cases and types of occupational diseases are increasing in both developing and industrialized countries (Saponaro., 2009).

Ihiala is a city in Nigeria located in the Southern part of Anambra state and within the region known as igbo land which is domiciled in the southeast geopolitical zone of Nigeria with a population of about 87,796 people. The estimated number of filling stations involved in this studies was 10 filling stations and the ranges of workers employed was between the ranges of 5-10 pump attendants respectively.

II. MATERIALS AND METHODS

The equipments utilized are those of the Department of Biochemistry, ChukwuemekaOdumegwuOjukwu University, Uli; Professor John I. Ihedioha Foundation for Education and Research on Health (FERH) Laboratory and Spring Board Research Laboratory, Awka. They were adjusted and were in a decent working state. Some of the equipment used for the analysis includes the following:

Weighing balance	S. Mettler, USA
Centrifuge	Model: 80-2, Jenalab Medical, England
Microhaematocrit centrifuge	Hawksley, England
Microscope	Olympus, Germany
Incubator	Newlife Lab. Incubator; Model: NL-9052, England
Refrigerator	Thermocool
UV-Spectrophotometer	Spectrumlab 23A, Health Medical Equipment, England
Water bath	Gallenkamp, England
Microcapillary tube	Marienfeld, Germany
Automatic pipette	Superfit Equip, Ames
Laboratory Tally counter	Clay Adams, New Jersey
Haemocytometer set	Contains an improved Neubauer counting chamber and diluting pipettes (Hawksley, England).
Microhaematocrit reader	Hawksley, England.

➢ *Chemicals and Reagents*

The chemicals and reagents utilized were from British Drug House (BDH), England, Germany, Dermstadt, May and Baker, England, Sigma Aldrich, USA, and Quimica Clinica Applicada (QCA) HDL test pack (QCA, S.A. Spain).

III. METHODOLOGY

A. Experimental Design

Forty (40) apparently healthy male and female pump attendants (volunteers) between 20 to 40years of age were selected from ten different filling stations (four each in the ratio of 1:1) located in Ihiala based on gender, age, length of service and number of hours of exposure per week. Also forty (40) apparently healthy individuals (non petrol pump attendants) without prior exposure to petroleum hydrocarbon and within the same age range volunteered as control.These data were gathered using a structured questionnaire. Blood samples were collected from the volunteers.

B. Ethical Clearance:

Ethical consideration was obtained from Ethical committee of NnamdiAzikiwe teaching hospital (NAUTH) before embarking on this study. Permission was obtainedin writing from the managements of various petrol stations to make use of their staff and facilities in this study. Also written informed consent were obtained from all the volunteers that participated in this study after explaining the purpose of the

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study to them and confidentiality of the data from the study was assured.

C. Sample Collection

The blood samples from both pump attendants and non-pump attendants used as control were collected through a vein puncture and allowed to clot, centrifuged and the serum separated from the cells and stored in a refrigerator prior to analysis while those used for while blood count/ differential count were collected using EDTA vials.

IV. DETERMINATION OF LIVER MARKER ENZYMES

A. Determination of Alanine Amino Transferase (ALT)

The ALT was assayed using the method of Reitman and Frankel (1957) as outlined in Randox Kit.

➢ *Principle*

ALT was measured by monitoring the concentration of pyruvate hydrazone formed with 2, 4-dinitrophenylhydrazine. The colour intensity was measured against the blank at 540nm.

B. Determination of Aspartate Aminotransferase (AST)

The AST was determined using the method of Reitman and Frankel (1957) as outlined in Randox Kit.

➢ *Principle:*

AST is measured by monitoring the concentration of oxaloacetate hydrazone formed with 2, 4-dinitrophenylhydrazine. The colour intensity is measured against the blank at 546nm.

C. Determination of Alkaline Phosphate (ALP)

Alkaline phosphate (ALP) was determined using Randox kit as recommended by Deutsche Gesellschaft fur KlinischeChemmie (GSCC).

➢ *Principle:*

The principle of this method is based on the reaction involving serum alkaline phosphate and a colourless substrate of phenolphthalein. The ALP hydrolyses phenolphthalein monophosphate giving rise to phosphoric acid and phenolphthalein which at alkaline pH values, turn pink that can be determined spectrophotometrically.

D. Determination of Serum Bilirubin

Jendrassik-Grof strategy for the *in vitro* assurance of absolute bilirubin in serum or plasma (Doumas*et al,* 1973), utilizing the Quimica Clinica Applicada (QCA) Bilirubin test pack (QCA, Spain) was applied.

➢ *Procedure:*

Aliquot (0.2 ml) of sulfanilic corrosive arrangement (Reagent A) was put into a test tube. One drop of sodium nitrite (Reagent D) was added trailed by the option of 1 ml of caffeine arrangement (Reagent B) and 0.05ml of the serum test. It was blended and permitted to represent 10 minutes at room temperature. At that point 1 ml of tartarate arrangement (Reagent C) was added, blended and permitted to represent 5 minutes at room temperature. Absorbance was perused at 578nm against the substance of clear. Clear arrangement was comprised of: all substance and steps above without adding sodium nitrite (Reagent D) for example 0.2ml sulfanilic corrosive.

➢ *Calculations:*

$$\mu moltotalBilirubin/L = Absorbanceofsamplex\ 43.2\ x\ 17.1$$

al Bilirubin/L=Absorbance of sample x 43.2 x 17.

V. KIDNEY FUNCTION TEST METHODS

A. Determination of Serum Creatinine

Modified Jaffe method for the *in vitro* determination of creatinine in serum, plasma or urine (Blass *et al*., 1974), using the Quimica Clinica Applicada (QCA) Creatinine test kit (QCA, Spain).

A working reagent composed of equal volumes of Reagent A and Reagent B (Alkaline solution and Picric acid solution) was prepared. For each serum sample, 0.1ml of the sample and 1.0ml of the working reagent was placed in a clean test tube. This was mixed properly and transferred into a cuvette in which absorbance was read at the 20th and 80th second against a working reagent blank at 546nm. For standard, same treatment was applied.

➢ *Procedure:*

$$\text{Serum creatinine } (\mu mol/L) = \frac{\text{Change in absorbance (80th – 20th sec.) of sample}}{\text{Change in absorbance (80th – 20th sec.) of standard}} x\ 2\ x\ 88.42$$

eatinine (µmol/L)= Change in absorbance 80th – 20thsec.of sample /Change in absorbance 80th – 20thsec.of standard x 2 x 88.42 **Equation 3.1**

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B. Determination of Urea in Serum

Modified method of Berthelot-Searcy for the *in vitro* determination of urea in serum (Fawcet and Scott, 1960; Searcy *et al*, 1967), using a QuimicaClinicaApplicada (QCA) Enzymatic urea test kit (QCA, Spain).

➢ *Procedure:*

Reagent A (Urea/salicylate) was prepared by dissolving one vial of the urea-salicylate in 100 ml of deionized water while reagent B (Alkaline hypochlorite) was prepared by mixing/diluting the alkaline hypochlorite supplied in 500 ml of deionized water. Test tubes labelled sample, standard and blank was assembled and 1 ml of Reagent A was added to each. This was followed by the addition of 0.01 ml of serum/plasma sample to the test tubes labeled sample and 0.01 ml of standard to the two test tubes labeled standard. It was mixed and incubated for 5 minutes at room temperature after which 1.0 ml of reagent B was added to all the test tubes, incubated again for 5 minutes at room temperature and absorbance read at 578 nm against a blank.

➢ *Calculation:*

The mmol urea/L is obtained using the formula:

$$mmol\ urea/L = \frac{Absorbance\ of\ sample}{Absorbance\ of\ standard}\ x\ 40\ x\ 0.357$$

a/L=Absorbance of sample/Absorbance of standard x 40 x 0.357 **Equation 3.2**

- *Calculation:*

$Totalprotein\ (g/dl) = \frac{Absorbanceofsample}{Absorbanceofstandard}\ x$ 5oprotein (g/dl)=Absorbance of sample/Absorbance of standardx 5 **Equation 3.3**

Conversion; the result was converted to S1 units as follows: $gprotein/dlx\ 10.0\ = gprotein/L$n/dl x 10.0 =g protein/L

➢ *Determination of Serum Albumins*

Bromocresol green method for the in-vitro determination of albumin in serum/plasma was adopted (Doumas*et al*., 1971; Doumas and Peters, 1997).

- *Principle:*

Albumin ties to bromocresol green color in an appropriate cushion making a change in the color's pinnacle assimilation frequency. The expansion in absorbance is perused at 630nm (territory 620 to 640nm) which is corresponding to the egg whites fixation (Doumas*et al*., 1971; Doumas and Peters, 1997).

- *Procedure:*

Clean test tubes were named appropriately (test, standard and clear) and 2.5 ml (2500 µl) of bromocresol green (Reagent A) additional to all the test tubes (the two examples, guidelines and clear). An amount of 0.01 ml (10 µl) of the serum test was added to the example test tube while 0.01 ml (10 µl) of the Standard (Reagent B) added to test tube marked norm. It was blended and permitted to remain at room temperature for 5 minutes. Absorbance was perused at 630 nm utilizing a spectrophotometer or 620 nm utilizing a colorimeter against the bromocresol green clear.

C. Determination of Protein Profile

➢ *Determination of Serum Total Proteins*

Direct Biuret method for the '*in vitro*' determination of total protein in serum or plasma was adopted (Lubran, *et al*., 1978).

- *Principle:*

Protein and peptides of serum respond with antacid copper tartrate answer for give a violet shaded complex. The power of the last shaded complex is estimated colorimetrically at frequency of 540nm and is relative to the centralization of the complete protein present in the serum test under test (Lubran, 1978).

- *Procedure:*

Series of clean test tubes were organized and named likewise. Likewise two spaces and two principles were named in like manner. A 1.2 ml of Buiret (Reagent A) was added to all the test tubes (tests, norms and clear) trailed by the option of 0.024ml (24 ul) of the serum to the example test tube. Same amount, 0.024ml (24 ul) of Reagent B (standard) was added to test tubes named standard and permitted to remain at room temperature for 10 minutes. Absorbance was perused at 540 nm against a Biuret clear.

- *Calculation:*

$Albumin\ (g/L)\ = \frac{Absorbanceofsample}{Absorbanceofstandard}\ x\ 5\ x\ 10.0$(g/L) = Absorbance of sample/Absorbance of standard x 5 x 10.0 **Equation 3.4**

➢ *Determination of Serum Globulin*

Globulin levels were obtained by subtracting the quantity of albumins from that of total proteins.

➢ *Statistical Analysis*

Statistical analysis were carried out using the Statistical Package for Social Sciences (SPSS) version 19.one way analyses of variance were adopted for comparison, and the results were subjected to post hoc test using least square deviation (LSD). $p<0.05$ were considered significant for all the results. The results obtained were expressed as mean ±SD of triplicate determinations.

VI. RESULTS

A. Demographic Features of the Study Participants

The population of exposed workers in filling stations that were used as case studies during the evaluation of the attendants. It was discovered that the ratio of male to female was 1:1 and most of them were just secondary school or college graduates.

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Table 1: Demographic Features of the Study Participants

Participants	Ave. Age of participants	No of hours of Exposure	No of years of service	Ave exposure per wk	Systemic illness
EMPA	32.56 ± 2.03	9.50± 1.20	5.6yrs	6	Nil
EFPA	30.28 ± 1.02	8.40 ± 2.15	6.4yrs	6	Nil
UMW	28.52± 2.01	Nil	Nil	Nil	Nil
UFM	27.15± 1.45	Nil	Nil	Nil	Nil

Exposed male pump Attendant EMPA (n=20), Exposed female pump attendant EFPA (n=20), Unexposed male worker UMW (n=20), Unexposed female worker UFW (n=20)

B. Liver Maker Enzymes in Exposed Petrol Station Workers and Unexposed Workers

The result of liver function test was showed in table 6.The results showed that AST levels in male and female exposed petrol pump attendants (10.50±0.02 and 11.50±0.03 iu/l sequentially) were remarkably higher (P<0.05) compared to AST levels of male and female unexposed pump attendant (7.00±0.01 and 7.00±0.02 iu/l sequentially). ALT level of male and female (10.50±1.25 and 10.00±0.02 iu/l sequentially) exposed pump attendant were remarkably higher (P<0.05) than male and female unexposed pump attendant (8.00±0.03 and 8.00±1.12 iu/l sequentially).ALP levels of male exposed petrol pump attendant was highest compared to male unexposed pump attendant while ALP of female unexposed pump attendant was higher than exposed attendant. Total bilirubin level of male and female unexposed workers (11.32±1.05 and 10.40±0.02 iu/l sequentially) were remarkably higher (P<0.05) compared to male and female exposed pump attendants (9.75±0.01 and 10.10±0.02 iu/l).This trend was the same for conjugated and unconjugated bilirubin.

Table 2: Liver Maker Enzymes in Exposed Petrol Station Workers and Unexposed Workers

u/l	AST	ALT	ALP	T.BIL	C.BIL	UNBIL
EMW	10.50± 0.02 ^{b}	10.50 ±1.25^{a}	30.00 ±4.15^{a}	9.75 ±0.01^{c}	2.35 ±0.01^{a}	7.40 ±0.24^{d}
EFW	11.30 ±0.03^{a}	10.00 ±0.02 ^{b}	28.50 ±0.02^{c}	10.10 ±0.02^{b}	2.25±0.01^{c}	7.85 ±1.24^{c}
UEMW	7.00 ±0.01^{c}	8.00 ±0.03^{c}	25.0 ±2.00^{d}	11.32±1.05 ^{b}	2.32±0.02^{a}	9.00 ±1.01^{a}
UEFW	7.00 ±0.02^{c}	8.00 ±1.12^{c}	32.0 ±1.02 ^{b}	10.40 ±0.02^{a}	2.20 ±0.11^{c}	8.20 ±0.25 ^{b}

Values are Mean ± SD of triplicate determination Values within the same column bearing the same superscript letters are not remarkably different at P < 0.05

C. Kidney Function Parameters in Exposed Petrol Station Workers and Unexposed Workers

The result of kidney function parameters in exposed petrol station workers and unexposed workers was showed in table 2.The result showed that urea and creatinine level of exposed female pump attendants (5.80±0.02 mg/dl and 82.50±2.15 mg/dl)were remarkably higher (P<0.05) than unexposed female pump attendants (5.00±0.45mg/dl and 58.00±0.11 mg/dl sequentially) while urea level of exposed male pump attendants(4.85±0.01 Mg/dl) was significantly higher than unexposed male pump attendant (4.65±0.01 Mg/dl) uric acid level of exposed male pump attendants (412.00±2.32mg/dl) was higher than unexposed male pump attendants.

Table 3: Kidney Function Parameters in Exposed Petrol Station Workers and Unexposed Workers

Mg/dl	Urea	Creatinine	Uric acid
EMW	4.85 ± 0.03^{c}	62.00 ± 1.20 ^{b}	412.00 ± 2.32^{a}
EFW	5.80 ± 0.02^{a}	82.50 ± 2.15^{a}	207.50 ± 9.32^{d}
UMW	4.65 ± 0.01^{d}	60.00 ± 0.00^{c}	317.00 ± 1.65^{b}
UFM	5.00 ± 0.45 ^{b}	58.00 ± 0.11^{d}	294.00 ± 1.82^{c}

Values are mean ± SD of triplicate determination (n=20)
Values within the same column bearing the same superscript letters are not noticably different at P < 0.05

D. Serum Electrolyte Levels in Exposed Petrol Station Workers and Unexposed Workers.

Results of serum electrolyte in male and female exposed and unexposed petrol pump attendant was shown.The result showed that sodium (Na^{+})electrolyte levels of exposed male and female exposed pump attendant (143.00±1.05 and 141.00±1.25 mmol/L sequentially) were noticably higher (P<0.05) compared to Na^{+} electrolyte levels in male and female unexposed workers (138.00±0.14 mmol/L and 139.50±2.11 mmol/L sequentially). Serum potassium (K^{+})levels of male and female exposed pump attendants (3.50±0.02 mMol/L and 3.80±0.01 mMol/L sequentially) were remarkably higher (P<0.05) compared to male and female unexposed workers (3.30±0.02 mMol/L and 3.70±0.03 mMol/L).The chloride ion level in male and female pump attendants were higher compared to male and female unexposed workers. This trend is the same for bicarbonate ion except for bicarbonate ion level of female exposed pump attendants (20.00±1.10mMol/L) which was slightly lower than that of exposed female pump attendants (21.00±0.02 mMol/L).

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Table 4: Serum Electrolyte Levels in Exposed Petrol Station Workers and Unexposed Workers

Mmol/l	Na.	K.	Cl.	HCO_3
EMW	143.00 ± 1.05[a]	3.50 ± 0.02 [c]	105.00 ± 1.35[d]	21.00 ± 0.10[a]
EFW	141.00 ± 1.25[b]	3.80 ± 0.01[a]	104.00 ± 2.20[c]	20.00 ± 1.10 [b]
UMW	138.00 ± 0.14[d]	3.30 ± 0.02[d]	101.00 ± 1.17[a]	20.00 ± 1.10 [b]
UFW	139.50 ± 2.11 [c]	3.70 ± 0.03[b]	103.00 ± 1.26 [b]	21.00 ± 0.02[a]

Values are mean ± SD of triplicate determination
Values within the same column bearing the same superscript letters are not noticably different at P < 0.05

E. Serum Protein Profile of Exposed Petrol Station Workers and Unexposed Workers

The result of serum protein of male and female exposed and unexposed pump attendant shown in **Table 5** reveals that the total protein of unexpected male and female workers (62.00±1.02 g/dl and 73.00±2.05 g/dl) were noticably higher P(< 0.05) compared to the male and female pump attendant (72.00±1.01 and 75.00±2.00 g/dl) sequentially .The globulin level of male and female exposed pump attendant (41.00±0.21 and 35.00±0.18 g/dl respectively) were noticably higher P(< 0.05) compared to male and female unexposed workers (25.00±0.36 and 34.00±1.25 g/dl respectively).The albumin level of male exposed pump attendant (37.00±2.01 g/dl) was higher than the unexposed male workers(31.00±0.21 g/dl) while the female unexposed pump attendant (40.00±0.23 g/dl) was higher compared with exposed female pump attendants(39.00±1.04g/dl)

Table 5: Serum Protein Profile of Exposed Petrol Station Workers and Unexposed Workers

g/dl	Total Protein	Albumin	Globulin
EMW	62.00 ± 1.02[d]	37.00 ± 2.01[c]	25.00 ± 0.36[d]
EFW	73.00 ± 2.05 [b]	39.00 ± 1.04[b]	34.00 ± 1.25[c]
UMW	72.00 ± 1.01[c]	31.00 ± 0.21[d]	41.00 ± 0.21[a]
UFM	75.00 ± 2.01[a]	40.00 ± 0.23[a]	35.00 ± 0.80 [b]

Values are mean ± SD of triplicate determination Values within the same column bearing the same superscript letters are not remarkably different at P < 0.05

VII. DISCUSSION

From the research analysis done on these subjects, it assessed the effects of petrol fumes on the biochemical parameters of occupationally exposed male and female pump attendants. Exposure to petroleum caused a remarkable change in the action of several enzyme in liver and kidney biomarkers.From the research findings, increased level of urea and creatinine in male and female exposed pump attendant may indicate renal pathology. This is in accordance to the report of Bartimaeus and Jacobs (2003); which signalled that routine exposure of petrol or its products over a long period of time could cause nephrotoxicity in motor mechanics occupationally exposed to them. Serum uric acid level was significantly high in petroleum pump attendant. The increase in Electrolyte levels (Na^+, K^+. CL^- and HCO3$^-$) in serum of petrol pump attendants compared with unexposed workers in this research concurs with (Emeji *et al.*,2015) who reported an increase in electrolyte levels in petroleum pump attendants in Owerri. The increase could be as a result of interaction of the constituents of petroleum vapour or its metabolites with the renal tissues resulting to impairment of the renal function. (Uboh *et al*.,2005) reported that exposure of petroleum pollutants (such as fuel fumes, kerosene vapour and gasoline) is a predisposing factors to the impairment of the kidney functions. Electrolytes Sodium ion (Na^+) chief extracellular cation and chloride (CL^-) chief extracellular anion, and potassium (K^+) intracellular cation and bicarbonate (HCO_3^-) intracellular anion) is of great importance in controlling the nerve impulse and muscle functions, acid-base balance, blood pressure and homeostasis. The instability or fluctuations in the concentration of serum electrolytes levels may cause electrolyte imbalance and disruption of body homeostasis. This may lead to biochemical dysfunction of the kidney, and other body organs resulting to a diseased state.

Electrolytes such as Na^+, K^+, CL^- and HCO_3^- are the important mediators of several physiological functions. The concentrations of electrolyte in the body is regulated by different hormones most of which are secreted by kidney and the adrenal gland (Thomas, 2013).

Finally, enzymes are biological indicators used in evaluating specific functions and cell damage. Estimation of liver biomarkers such as: bilirubin levels and serum enzyme activities are of great importance in detecting hepatocellular dysfunction. An increase in these biomarkers may indicate liver disease, which may be due to hepatocellular damage, or due to increased levels toxins in blood (Cheesbrough, *et al*., 1999). From the result of this study, there was an increase in the activities of Alanine amino transferase (ALT), Aspartate amino transferase (AST) and Alkaline phosphate (ALP) of male and female pump attendants exposes to petrol vapour were higher when compared to the control unexposed workers. This is in agreement with the earlier report by Nwanjo and Ojiako (2007) who reported degenerative changes in renal and hepatic functions after exposing rats to light and heavy petrol vapour. The observed increase in the levels of liver diagnostic parameters in this study might be possibly due to toxic effects on the membranes of liver cells where petroleum hydrocarbons or carbon-containing compounds may have been converted into free radicals or activated metabolites during their oxidation. There was low

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level of ALP in female exposed attendants than female unexposed control. This is in line with research conducted by Nwanjo and Ojiako (2007). ALP is an enzyme mostly found in the cells lining in the biliary ducts of the liver, if there is an obstruction in the bile duct, ALP may leak into blood stream and ALP levels in plasma will rise. Therefore low levels of ALP in petrol station attendants indicated absence of bile duct obstruction. These free radicals and other toxic metabolites cause lipid peroxidation and damage of hepatic cell membrane, causing the release of liver enzymes in the serum. Apparently, no remarkable change was observed in bilirubin level of exposed male and female petrol pump attendant when compared to non exposed workers. No significant difference exist between the total bilirubin, conjugated and unconjugated bilirubin.

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