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Evaluation Of Renal Parameters Among Market Women Using Local Lamp (CO2) In Orja-Oba Area Ibadan, Nigeria

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Abstract:

***Introduction:** Carbon monoxide (CO) is a poisonous gas produced as a result of incomplete combustion of organic materials. The source of CO production includes gasoline and diesel power generating sets, burning of charcoal and local lamp.*

***Method:** The study was aimed to evaluate kidney parameters among market women using local lamp. A total of 200 participants were recruited for the study, with 100 as subjects and 100 control. Blood sample was collected and assayed for renal parameters (urea, creatinine, potassium, sodium, chloride and bicarbonate). Results obtained were analyzed with statistical package for social sciences (SPSS) version 20.*

***Result:** The study showed that there was a significant increase in Urea level $P<0.01$ (100%), creatinine level $P<0.01$ (77%), potassium $P<0.05$ (65%), chloride $P<0.01$ (52%) and bicarbonate $P<0.01$ (58%) of the test group when compared to the control. However, there was no significant difference in the sodium of the test group when compared to control. There was relationship of (age, frequent use of local lamp, and duration of local lamp usage) by the market women which is the subject when compare to the non-market women which is the control.*

***Conclusion:** In conclusion, carbon monoxide exposure through local lamp usage has a side effect on the renal function parameters.*

***Keywords:** Kidney, Renal, Market, Women, Carbon monoxide (CO), Local Lamp*

I. INTRODUCTION

Carbon monoxide (CO) is a colorless, odorless gas that is toxic to humans and insoluble in water. The density of carbon monoxide is somewhat lower than that of air. CO is produced through incomplete combustion of carbon-containing fuels, as well as natural processes and halomethane biotransformation within the human body. External exposure to extra carbon monoxide can cause minor symptoms, while exposure to larger quantities can cause death. Carbon monoxide is produced endogenously in the human body in modest amounts (Konkani *et al*., 2020). Carbon monoxide is absorbed through the lungs, and the amount of carboxyhaemoglobin in the blood at any given time is determined by a number of factors. The carboxyhaemoglobin content of the blood will be primarily determined by the concentrations of inspired carbon monoxide and oxygen when in equilibrium with ambient air (Delvau *et al*., 2018). If equilibrium is not reached, the carboxyhaemoglobin concentration will be affected by the length of exposure, pulmonary ventilation, and the carboxyhaemoglobin present prior to inhalation of contaminated air. Carbon monoxide reacts with myoglobin, cytochromes, and metalloenzymes such cytochrome c oxidase and cytochrome P-450, in addition to haemoglobin. The health implications of these reactions are unknown, but they are expected to be less significant at ambient exposure levels than the gas-haemoglobin reaction (Delvau *et al*., 2018).

Carbon monoxide is extremely dangerous, deadly, and toxic to living things. As a result, it is critical to prevent the spread of such hazardous and fatal poisonous gas by increasing awareness of its causes and ways to reduce the risk of exposure. It rapidly interacts with haemoglobin in the human body to generate carboxyhaemoglobin. Carbon monoxide is also created endogenously in small levels. Carbon monoxide poisoning is still one of the main common causes of unintentional and suicidal poisonings, resulting in a substantial number of deaths each year in both the developed and developing worlds (Kinoshita *et al*., 2020). People are exposed to carbon monoxide in a variety of microenvironments while traveling in motor cars, working at employment, visiting metropolitan sites with combustion sources, or cooking and heating with household gas, charcoal, or wood fires, as well as in tobacco smoke, during their daily activities. The majority of people's carbon monoxide exposures occur in vehicles and indoor surroundings (Ribeiro *et al*., 2018).

Few studies have found a link between carbon monoxide poisoning (COP) and acute kidney injury (AKI) in terms of kidney outcomes (Chen *et al*., 2016; Pan *et al*., 2019). Although the majority of these patients recovered completely from AKI, the condition was closely linked to eventual mortality or neurological complications. Acute carbon monoxide poisoning (CMP) has been linked to the development of chronic renal impairment in certain recent investigations. Furthermore, there is insufficient information on renal function in patients with acute CMP who do not have acute kidney injury. Case studies in individuals with overt acute renal failure make up the majority of the published literature on acute CMP-related renal injury (Kim *et al*., 2019).

The incidence of CO poisoning does not differ between sexes, whilst mortality is double in men. It is the leading cause of lethal poisoning in Nigeria today, especially among domestic generator users. It causes the accidental deaths of up to over 1000 families annually as a result of inhalation and a much larger number in other parts of the country due to lack of adequate education on the poisonous fumes emitted from these generators, equipment and other vehicles. Human health can be jeopardized by exposures of 100 parts per million of carbon monoxide or more. According to a study published by Kinoshita *et al*.,)2020), about 30% of persons with severe carbon monoxide poisoning experiences death. After enough inhalation of carbon monoxide, poisoning ensues (Kinoshita *et al*., 2020). Although research has not established the adverse effect of CO generated from local lamp on some vital organs of its users in Nigeria, this study is focused on the evaluation of kidney parameters among market women using local lamp (carbon monoxide) in Ojaoba area of Ibadan, Oyo State, Nigeria.

II. MATERIALS AND METHODS

STUDY AREA: The samples was collected from market women in Ibadan market, Oyo state after obtaining an ethical approval from Lead City University Research Ethics Committee Ibadan, Oyo state and an informed consent from the study participants.

MATERIALS: The materials used include; Centrifuge, Ion selective electrode (ISE), methylated spirit, lithium heparin bottle, cotton wool, hand gloves, needles and syringes, automatic micropipette, pipettes tips, tonique, spectrophotometer.

REAGENTS: Reagents used for this study include Randox urea kit and creatinine randox urea kit,

STUDY DESIGN: This study was a cross sectional study

STUDY POPULATION: A total number of 100 market women using local lamp (test) and 100 market woman who do not use local lamp (control) was recruited from different market in Ibadan metropolis, Oyo state, Nigeria.

SAMPLE SIZE CALCULATION: The sample size for this study was obtained using the formula as described by (Charan & Biswas, 2013). However, sample size of convenience for this study was 200. 100 subjects was used as control and 100 subjects served as test subject.

ETHICAL CONSIDERATION: Ethical clearance was obtained from Lead City University Research Ethics Committee Ibadan, Oyo State. Individual subject that participated in this research was duly informed about the project and consent approval was obtained from such individuals.

DATA COLLECTION: Copies of the questionnaires was be administered containing comprehensive questions relating to the participants' demography, knowledge of, attitude towards and belief about effect of using local lamp on their health status. Due to the level educational background among the market women, questionnaire was be prepared in English, Yoruba and Hausa language so that participants were free to choose the language with which they wish to be interviewed.

SAMPLE COLLECTION: Two-third of the lithium heparin was filled with blood. The sample was centrifuged at 2500 r.p.m. Then the plasma was separated and analysed for electrolyte, urea and creatinine.

STATISTICAL ANALYSIS: The Data obtained from the biochemical analysis was analyzed with Statistical Package for Social sciences (SPSS) version 20. The data was expressed in mean ± standard error of mean (SEM). The difference among the means was analyzed by one-way student-t-test and p-values < 0.05 will be considered statistically significant.

III. RESULT

CARBON MONOXIDE EXPOSURE AND RENAL PARAMETERS

Table 1 shows the mean comparison of urea, creatinine and electrolyte parameters (sodium, potassium, chloride and bicarbonate) between the test subjects and the control. There was a statistical difference (increase) in the mean value of urea, creatinine, potassium, chloride and bicarbonate of the test group when compared to the control ($P < 0.05$). However, there was no significant difference in the mean value of sodium of the test group, when compared to control.

Table 2 revealed the socio-demographic status of the study subjects. In term of age, the majority of the study subjects are between the age of 41-50 (32%), followed by age 31-40 (30%), followed by age 21-30 (18%), followed by age 51-60 (14%) and 60 years and above (6%). In term of marital status, majority of the study subjects are married (69%), followed by single (14%), followed by widowed (11%), and divorced (6%). In term of ethnicity division, majority of the study subjects are Yoruba (99%), followed by Igbo of (1%). In term of religion, the majority of the study subjects are Islam (65%), followed by Christian (33%) and traditional religion (2%).

Parameters	Test	Control	P-value
Urea	48.12±6.98	24.33±5.69	0.000*
Creatinine	1.49±0.33	0.97±0.19	0.000*
Sodium	146.16±2.49	139.10±2.07	0.243
Chloride	107.02±2.06	103.42±3.58	0.003*
Potassium	5.21±0.57	4.01±2.05	0.002*
Bicarbonate	29.11±1.12	25.45±3.67	0.002*

Data presented as mean ± standard deviation
** significant at p<0.05, P < 0.01*

Table 1: Mean ± standard deviation of electrolyte, urea and creatinine parameters

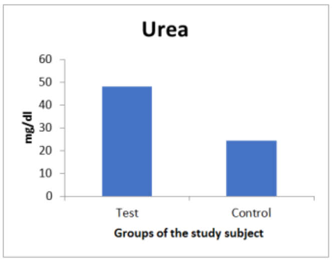

Figure 1: Mean distribution of urea in the study

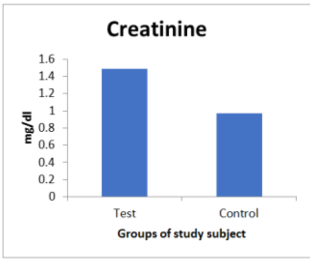

Figure 2: Mean distribution of creatinine in the study

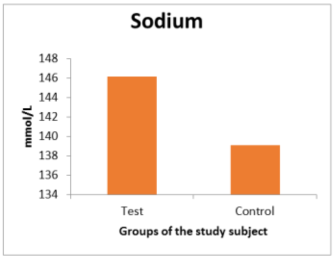

Figure 3: Mean distribution of sodium in the study

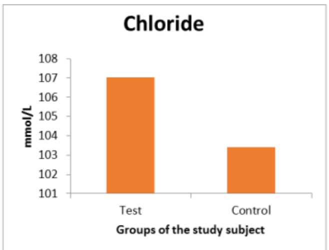

Figure 4: Mean distribution of chloride in the study

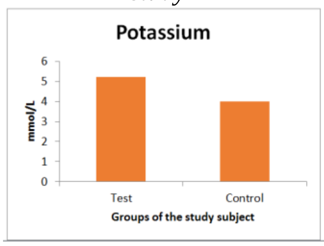

Figure 5: Mean distribution of potassium in the study

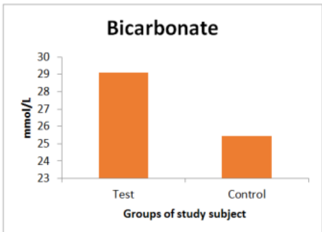

Figure 6: Mean distribution of bicarbonate in the study

Parameter	Test		Control	
Age	Frequency	Percentage %	Frequency	Percentage %
21-30	18	18.0	22	22.0
31-40	30	30.0	36	36.0
41-50	32	32.0	28	28.0
51-60	14	14.0	1	1.0
>60	6	6.0	13	13.0
Total	100	100	100	100
Marital status				
Single	14	14.0	4	4.0
Married	69	69.0	70	70.0
Divorced	6	6.0	18	18.0
Widowed	11	11.0	8	8.0
Total	100	100	100	100
Ethnicity				
Igbo	1	1.0	5	5.0
Yoruba	99	99.0	95	95.0
Total	100	100	100	100
Religion				
Islam	65	65.0	52	52.0
Traditional	2	2.0	0	0.0
Christian	33	33.0	48	48.0
Total	100	100	100	100

Table 2: Distribution of socio-demographic status of the study participants

CORRELATION BETWEEN AGE AND RENAL PARAMETERS

Table 3 shows the correlation of age in relation to sodium among the study subjects. There was no significant correlation between age and sodium among the study subjects ($p=0.938$, $\chi2=0.800$).

Table 4 shows the correlation of age in relation to chloride among the study subjects. There was no significant correlation between age and chloride among the study subjects ($p=0.242$, $\chi2=5.477$).

Table 5 shows the correlation of age in relation to potassium among the study subjects. There was no significant correlation between age and potassium among the study subjects ($p=0.825$, $\chi2=1.508$).

Table 6 shows the correlation of age in relation to bicarbonate among the study subjects. There was no significant correlation between age and bicarbonate among the study subjects ($p=0.649$, $\chi2=2.476$).

Table 7 shows the correlation of age in relation to urea and creatinine among the study subjects. There was no significant correlation between age and urea ($p=0.660$, $\chi2=2.445$), age and creatinine ($p=0.112$, $\chi2=7.502$) among the study subjects.

Parameter	Sodium status				
Age	Abnormal	Normal	Total	χ2	P-value
21-30	12	6	18	0.800	0.938
31-40	20	10	30		
41-50	21	11	32		
51-60	9	5	14		

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>60	5	1	6
Total	67	33	100

Data presented as mean ± standard deviation
** significant at p<0.05*

Table 3: Correlation of age in relation to sodium among the study subjects

Parameter	Chloride				
Age	Abnormal	Normal	Total	χ2	P-value
21-30	13	5	18	5.477	0.242
31-40	14	16	30		
41-50	19	13	32		
51-60	10	4	14		
>60	5	1	6		
Total	61	39	100		

Data presented as mean ± standard deviation
**significant at p<0.05*

Table 4: Correlation of age in relation to chloride among the study subjects

Parameter	Potassium				
Age	Abnormal	Normal	Total	χ2	P-value
21-30	8	10	18	1.508	0.825
31-40	13	17	30		
41-50	17	15	32		
51-60	7	7	14		
>60	4	2	6		
Total	49	51	100		

Data presented as mean ± standard deviation
**significant at p<0.05*

Table 5: Correlation of age in relation to potassium among the study subjects

Parameter	Bicarbonate				
Age	Abnormal	Normal	Total	χ2	P-value
21-30	8	10	18	2.476	0.649
31-40	14	16	30		
41-50	10	22	32		
51-60	4	10	14		
>60	2	4	6		
Total	38	62	100		

Data presented as mean ± standard deviation
**significant at p<0.05*

Table 6: Correlation of age in relation to bicarbonate among the study subjects

Parameter	Urea				
Age	Abnormal	Normal	Total	χ2	P-value
21-30	16	2	18	2.415	0.660
31-40	27	3	30		
41-50	30	2	32		
51-60	14	0	14		
>60	6	0	6		
Total	93	7	100		
Parameter	**Creatinine**				
Age	**Abnormal**	**Normal**	**Total**	**χ2**	**P-value**
21-30	10	8	18	7.502	0.112
31-40	24	6	30		
41-50	26	6	32		
51-60	13	1	14		
>60	4	2	6		
Total	77	23	100		

Table 7: Correlation of age in relation to urea among the study subjects

CORRELATION BETWEEN FREQUENCY OF OCCURRENCE AND RENAL PARAMETERS

Table 8 shows the correlation of frequent use of local lamp in relation to sodium and chloride among the study subjects. There was no significant correlation between frequent use of local lamp and sodium (p=0.502, χ2=4.338), frequent local lamp and chloride (p=0.331, χ2=5.753) among the study subjects.

Table 9 shows the correlation of frequent use of local lamp in relation to potassium and bicarbonate among the study subjects. There was no significant correlation between frequent use of local lamp and potassium (p=0.430, χ2=4.886), frequent local lamp and bicarbonate (p=0.263, χ2=6.467) among the study subjects.

Table 10 shows the correlation of frequent use of local lamp in relation to urea and creatinine among the study subjects. There was no significant correlation between frequent use of local lamp and urea (p=0.996, χ2=0.378), frequent local lamp and creatinine (p=0.167, χ2=7.808) among the study subjects.

	Sodium				
Frequent use of local lamp	Abnormal	Normal	Total	χ2	P-value
Always	6	5	11	4.338	0.502
Sometimes	61	28	89		
Total	67	33	100		
	Chloride				
Frequent use of local lamp	**Abnormal**	**Normal**	**Total**	**χ2**	**P-value**
Always	6	5	11	5.753	0.331
Sometimes	55	34	89		
Total	61	39	100		

Table 8: Correlation of frequent use of local lamp in relation to sodium and chloride among the study subjects

	Potassium				
Frequent use of local lamp	Abnormal	Normal	Total	χ2	P-value
Always	4	7	11	4.886	0.430
Sometimes	45	44	89		
Total	49	51	100		
	Bicarbonate				
Frequent use of local lamp	**Abnormal**	**Normal**	**Total**	**χ2**	**P-value**
Always	2	9	11	6.467	0.263
Sometimes	36	53	89		
Total	38	62	100		

Table 9: Correlation of frequent use of local lamp in relation to potassium and bicarbonate among the study subjects

	Urea				
Frequent use of local lamp	Abnormal	Normal	Total	χ2	P-value
Always	10	1	11	0.375	0.996
Sometimes	83	6	89		
Total	93	7	100		
	Creatinine				
Frequent use of local lamp	**Abnormal**	**Normal**	**Total**	**χ2**	**P-value**
Always	6	5	11	7.808	0.167
Sometimes	71	18	89		
Total	77	23	100		

Table 10: Correlation of frequent use of local lamp in relation to urea and creatinine among the study subjects

CORRELATION BETWEEN DURATION OF EXPOSURE AND RENAL PARAMETERS

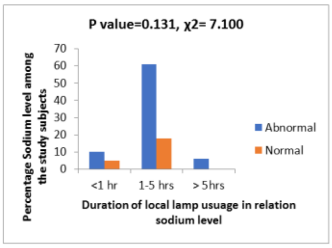

Figure 7: Correlation on duration of local lamp usage

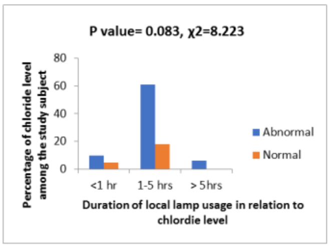

Figure 8 Correlation on duration of local lamp usage in relation to sodium level in the study in relation to chloride level in the study

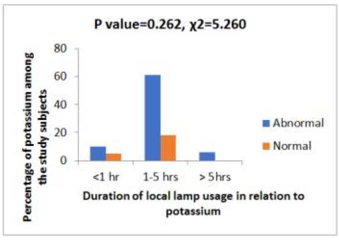

Figure 9: Correlation on duration of local lamp usage

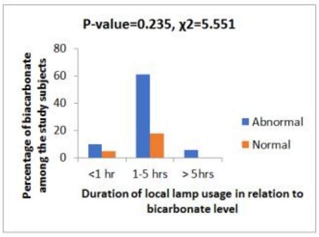

Figure 10: Correlation on duration of local lamp in relation to potassium level in the study usage in relation to bicarbonate level in the study

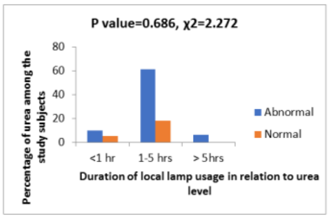

Figure 11: Correlation on duration of local lamp usage in relation

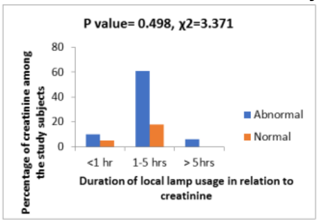

Figure 12: Correlation on duration of local lamp to urea level among the study subjects usage in relation to creatinine level in the study

Figure 7 depicts no significant correlation between duration of local lamp usage and sodium level among the study subjects (p=0.131, $\chi2$=7.100). Figure 8 shows no significant correlation between duration of local lamp usage and chloride level among the study subjects (p=0.083, $\chi2$=8.223). Figure 9 revealed no significant correlation between duration of local lamp usage and potassium level among the study subjects (p=0.262, $\chi2$=5.260). Figure 10 shows no significant correlation between duration of local lamp usage and bicarbonate level among the study subjects (p=0.235, $\chi2$=5.551). Figure 2.11 shows no significant correlation between duration of local lamp usage and urea level among the study subjects (p=0.686, $\chi2$=2.272). Figure 2 depicts no significant correlation between duration of local lamp usage and creatinine level among the study subjects (p=0.498, $\chi2$=3.371).

IV. DISCUSSION

Carbon monoxide (CO) remains a poisonous non-irritant gas produced by incomplete combustion of organic materials due to insufficient oxygen supply (Agoro *et al*., 2019). Sources of CO include burning of materials containing hydrocarbons, cooking with firewood among others. It is often common among the general population both in western world and developing countries but there are certain occupational groups who carry a greater risk of exposure to this gas due to their occupation (Umahi-Ottah *et al*., 2022). The workers that use fire wood, gasoline, diesel power generator servicing workshop and local lamps (market women) fall into this category. Biochemical investigations are used extensively in medicine both in relation to diseases that have an obvious metabolic basis and those in which biochemical changes are a consequence of the disease e.g. renal failure (Simsek *et al*., 2020). The mechanisms of action depict carbon monoxide diffusing quickly across the alveolar and capillary membranes once it reaches the lungs; haemoglobin has a 200–250-fold affinity for carbon monoxide compared to oxygen (Barn *et al*., 2018). It can easily pass through the placental membranes. Carbon monoxide interacts with one of the haem proteins in a reversible manner. Around 80–90% of ingested carbon monoxide binds to haemoglobin, reducing the blood's oxygen-carrying ability. Carbon monoxide concentration in breathed air, exposure time, and alveolar ventilation are the most critical factors in determining COHb levels. The COHb concentration rises rapidly at the outset of an exposure to a fixed dose of carbon monoxide, levels off after 3 hours, and reaches a constant state after 6–8 hours (Barn *et al.*, 2018).

The socio-demographic pattern of age in this study shows that the highest percentage of age was between 41-50 years (32%). This was contrary to a similar study carried out by Ntaji et al., (2010) who reported an average age of 24 years on knowledge of CO exposure. In another similar study carried out by Abbey *et al*., (2022), majority of his research participated 357 (72.86%) were in the age category of 25-34 years; that was followed by 103 (21.02%) at 35-39 years of age on maternal exposure to CO in the first trimester of pregnancy in the core Niger Delta. This study depicts the highest percentage of age of those who uses local lamps are elderly women and most are married considering their marital status with respect to their age followed by single, widow and divorced. In term of ethnicity diversity among the study subjects, majority of the subjects are Yoruba (99%) followed by Igbo (1%). This outcome is expected because the study was carried out in south western part of Nigeria, dominated by Yoruba tribe. Also, in term of religion, most of the study subjects' practices Islam (65%), followed by Christianity (33%) and traditional religion (2%). The highest percentage of study subject that practices Islam in this study could be attributed to the location where study subjects are recruited which happens to be densely populated by Muslim.

In this present study, we evaluated kidney parameters among market women using local lamp in Oja Oba market area of Ibadan, Oyo state. There was a significant increase in the mean value of urea, creatinine, potassium, chloride and bicarbonate of the test group when compared to the control. However, there was no significant difference in the mean value of sodium of the test group when compared to the control. A report revealed an increase in the concentration of serum urea and creatinine as the duration of exposure to CO increases (Solomon *et al.*, 2017). This outcome is similar to our result from this present study that depicts significant increase in urea and creatinine. This work confirms the results from the study conducted by Eni-yimini (2020) at the department of biochemistry, Federal university of Otuoke, Yenagoa, Bayelsa State, Nigeria who discovered elevated urea levels including other renal parameters amongst smokers. At the Osaka university and national for child health & development centre, there was an increased urea level when rat was exposed to carbon monoxide experimentally; this is strongly in agreement with his present research.

Wei et al., also witnessed an increase in the levels of urea and creatinine amongst patients in the hospital records exposed to carbon monoxide environment between the year 2000 and 2013. A recent study by Pan *et al.* (2019) reported that approximately 18% of patients with carbon monoxide poisoning (COP) developed poor outcomes, which was defined as having sequelae, being bedridden, or death. In this group, patients renal function test depicts blood urea nitrogen (BUN) and serum creatinine levels were significantly higher on arrival (Pan *et al.*, 2019). This outcome corroborates with serum urea and creatinine level of this present study. Findings on chronic carbon monoxide exposure, as shown by Solomon *et al.* (2017) revealed that chronic intoxication of CO has the propensity of creating electrolyte imbalances. He stated further in his findings that serum sodium concentration was significantly increased proportionately to the increase in the duration of CO exposure. However, this negated our findings. According to Zengin *et al.*, (2013) and Kim *et al.*, (2019), an unusual cause of rhabdomyolysis through acute carbon monoxide poisoning may present clinical conditions such as hyperkalemia, hypocalcemia, and increased AST, LDH, and aldolase activities. Their report on potassium is consistent with the findings from our study which depicts significant increase in potassium level (hyperkalemia) of the test subjects when compared to the control.

In our study, we observed a significant increase in the bicarbonate level of study subjects using local lamp. This means exposure to CO through local lamp usage among the study subjects could be a contributory factor to increase in HCO_3 resulting into metabolic alkalosis and chloride depletion (Gillion *et al.*, 2019). The difference in the outcome of our study on electrolyte could be attributed to duration of the exposure and the source of exposure to carbon monoxide. The primary pH buffer system in the body is the bicarbonate (HCO_3) and carbon dioxide (CO_2) chemical equilibrium system. However, any alteration or disturbance of this physiological process will cause imbalance (Brinkman & Sharma, 2018).

In a study carried out on prognostic factors of carbon monoxide poisoning in Taiwan by Pan *et al.*, (2019). It was reported that there was a significant increase in the serum bicarbonate level of non-poor outcome (22.88±0.18) when compared to poor outcome (20.63±0.43) study subjects. This outcome is similar to our result when we compared the bicarbonate level of the test subjects (29.11±1.12) to the control group (25.45±3.67).

In our present result, there was a significant increase in the serum chloride level of the test subject when compared to the control. According to Chandrasekhar *et al.*, (2019), the kidneys are responsible for the maintenance of total body chloride balance. The majority of the filtered chloride is reabsorbed with sodium during transport through the first portion of the tubule, the proximal tubule. Conditions causing an elevation of the serum chloride concentration and a concomitant elevation of the serum sodium concentration result primarily from disorders associated with loss of electrolyte-free fluids (pure water loss) as seen in increased sodium level of the study participants.

Regarding the correlation between age and sodium level that was assessed in this study, 67% out of 100 study subject had abnormal sodium status level, and 33% had normal sodium level, however, there was no significant correlation between age and sodium ($p=0.938$, $\chi2=0.800$). In term of chloride level of the test subjects, 61% had abnormal chloride level, and 39% normal chloride level with no significant correlation with age ($p=0.242$, $\chi2=5.477$). For potassium level, 49% of the test subjects had abnormal potassium level, and 51% had normal potassium level with no significant correlation with age ($p=0.825$, $\chi2=1.508$). Also, bicarbonate level of the test subject depicts 38% abnormal, and 62% normal with no significant correlation with age ($p=0.649$, $\chi2=2.476$). Electrolyte remains important ions in the body by maintaining cellular homeostasis in physiological state. However, alteration of the electrolyte level in the body could cause fatigue, headache, muscle spasm, increased heart beat among others (Pohl *et al.*, 2013).

Renal function markers are used for the diagnosis and management of renal diseases. The most commonly used renal function markers are urea, creatinine, and uric acid. An increase in the concentration of these markers indicates possible renal abnormalities (Eni-yimini, 2020). In this There was no correlation of age with urea ($p=0.660$, $\chi2=2.445$), and creatinine ($p=0.112$, $\chi2=7.502$).

Regarding the correlation between the frequent use of the local lamp with electrolyte, urea, and creatinine parameters, this study depicts no significant correlation between frequent use of local lamp and sodium ($p=0.502$, $\chi2=4.338$), chloride ($p=0.331$, $\chi2=5.753$), potassium ($p=0.430$, $\chi2=4.886$), bicarbonate ($p=0.263$, $\chi2=6.467$), urea ($p=0.996$, $\chi2=0.378$), and creatinine ($p=0.167$, $\chi2=7.808$) respectively. Furthermore, regarding the correlation between duration of local lamp usage with electrolyte, urea, and creatinine parameters, this study depicts no significant correlation between duration of local lamp and sodium ($p=0.131$, $\chi2=7.100$), chloride ($p=0.083$, $\chi2=8.223$), potassium ($p=0.262$, $\chi2=5.260$), bicarbonate ($p=0.235$, $\chi2=5.551$), urea ($p=0.686$, $\chi2=2.272$) and creatinine ($p=0.498$, $\chi2=3.371$) respectively.

V. CONCLUSION

The study revealed the alterations in some of the biochemical parameters of the test subject when compared to the control group. We observed a statistically significant increase in the mean value of urea, creatinine, potassium, chloride, bicarbonate of the test group when compared to the control. However, there was no significant difference in the mean value of sodium of the test group, when compared to control. There was correlation between the age of participants, frequent use of local lamp and duration of local lamp usage versus biochemical parameters.

There is need for the introduction of a unified air quality assessment and also a universal human biomonitoring of the impact of CO on the general population. This will go a long way identifying those regions that are worse affected and women that are most at risk of the exposure. The market women also exposed to carbon monoxide from the local lamp are tenable to high dosage to vehicle exhausts along the roads closest to their market, this could be reduced or eliminated by introduction of good roads and vehicle policies adoption by the government.

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