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Assessment of selected biochemical parameters among food hawkers along the streets of Yenagoa Bayelsa State, Nigeria

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Abstract

This study was aimed on assessment of selected biochemical parameters among food hawkers along the streets of Yenagoa, Bayelsa State, Nigeria. Five milliliter of blood specimen was collected from fifteen food hawkers with ≤ 5 years working experience (experimental group one), ≥ 5 years working experience (experimental group two) and nonfood hawkers (control group) respectively into lithium heparin anti-coagulated bottles. Thereafter alanine aminotransferase, aspartate aminotransferase, urea, creatinine and C-reactive protein were measured quantitatively. The mean values of volunteers in experimental group one showed no statistically significant difference ($p > 0.05$) in alanine aminotransferase (7.46 ± 1.02), aspartate aminotransferase (7.02 ± 0.86), urea (7.70 ± 1.29) and creatinine (70.44 ± 3.54) as compared with the control group (7.42 ± 0.98), (6.98 ± 0.82), (7.65 ± 1.28) and (70.40 ± 3.52) respectively, but there was a statistically significant difference ($p < 0.05$) in C-reactive protein (17.40 ± 1.98) when compared with the control group (2.70 ± 0.70). However, the mean values of food hawkers in experimental group two showed statistically significant difference ($p < 0.05$) in all the measured biochemical parameters 27.70 ± 2.98 , 21.40 ± 2.06 , 15.50 ± 2.02 , 110.70 ± 3.74 , 29.42 ± 3.20 as compared with that of the control group 7.42 ± 0.98 , 6.98 ± 0.82 , 7.65 ± 1.28 , 70.40 ± 3.52 , 2.74 ± 0.70 . The volunteers in experimental groups one and two showed 13% -27% and 53% -80% abnormal values of the measured biochemical parameters respectively as compared with that of the control group. In conclusion, alanine aminotransferase, aspartate aminotransferase, urea, creatinine and C-reactive protein may be altered in food hawkers with ≥ 5 years working experience. It is therefore recommended that food hawkers in this category should go for hepatorenal and inflammatory biochemical parameters checkup occasionally in any registered and licensed Medical Laboratory Facility.

Keywords: Food hawkers; Biochemical parameters; Assessment; Yenagoa; Bayelsa State; Nigeria

1. Introduction

Hawkers otherwise known as peddlers or costermonger are vendors of merchandise that are transported easily. They are known to sell inexpensive goods, handicrafts, or food items either stationary or mobile, this they do by loud cries or chants and conduct banter with customers so as to attract their attention which in turn enhance their sales. Hawking has become a global concern particularly in Nigeria where it is estimated that 20 to 30 million people are food hawkers [1]. This profession arose in Nigeria as a result of the need to solve societal problems such as unemployment, poverty, consumer goods accessibility, inflation, unstable families, poor school performance, large family size, peer group influence and poor parental care

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[2]. However, poverty has been attributed to be the major factor responsible for hawking Food hawkers are exposed to some hydrocarbons like gasoline, kerosene and mineral spirits as well as polycyclic aromatic hydrocarbons which are chemical compounds that contain only carbon and hydrogen and composed of multiple aromatic rings with the simplest being naphthalene which has two aromatic rings and three-ring compounds anthracene and phenanthrene [3], carbon monoxide which is a colourless and odourless gas that is produced as a result of incomplete burning of organic matter [4] and occurs from motor vehicles, heaters or cooking equipment that run on carbon based fuels. It primarily causes adverse effects by combining with haemoglobin to form carboxy-haemoglobin thus preventing blood from carrying oxygen with the additional effect on myoglobin and mitochondrial cytochrome oxidase. Its poisoning leads to symptoms such as headache, weakness, dizziness, vomiting, chest pain etc [5] nitrogen dioxide (NO₂) are fine and ultrafine particles which are particulate matter $\leq 0.1\mu\text{m}$ or 100nm in diameter. These particles exposure which is considered to be respiratory particles that are deposited in the lungs is through inhalation [6,7] which are obtained from vehicle exhaust emissions in their day-to-day hawking. Exposure to these pollutants which varies globally [8] may poses danger to their health such as respiratory diseases, cardiovascular disorder, liver disorder and renal disorder [9].

In spite of these adverse health implications, the prevalence of food hawking is still on the increase. It is based on this that this study which is aimed on assessment of selected biochemical parameters among food hawkers along the streets of Yenagoa, Bayelsa State, Nigeria was embarked on

2. Material and methods

2.1. Study area

This study was carried out in Yenagoa, Bayelsa State, Nigeria.

2.2. Ethical clearance

This study which got the ethical approval from the ethical committee of Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria was carried strictly in compliance with the Principle of Helsinki declaration of 1975 as revised in 2008. Oral informed consent was obtained from all the recruited volunteers who were made to know the reason why their blood specimens were needed for this research.

2.3. Scope of experimental design

This study was carried out on forty-five (45) apparently healthy volunteers who were randomly recruited and subsequently categorized into three (3) groups as shown:

2.3.1. Control group

This group consisted of fifteen (15) apparently healthy nonfood hawkers within the age range of 25- 45 years.

2.3.2. Experimental group one

This group consisted of fifteen (15) apparently healthy food hawkers with ≤ 5 years working experience within the age range of 25-45 years.

2.3.3. Experimental group two

This group consisted of fifteen (15) apparently healthy food hawkers with ≥ 5 years working experience within the age range of 25-45 years.

2.4. Sample collection

Five (5) milliliters blood specimens were collected from each of the volunteers (control and experimental groups) via a syringe and dispensed into lithium heparin anti-coagulated bottles respectively. The blood specimens in each bottle was mixed carefully to ensure homogeneity and prevention of blood coagulation and thereafter spun for 10 minutes at 2500 revolution/minute using Gulfex medical and scientific macro centrifuge model 800D England. The separated plasma was then aspirated into plain bottles using a Pasteur pipette.

2.5. Laboratory Procedures

All reagents were commercially purchased and the manufacturers' standard operational procedure (SOP) were strictly adhered to

2.5.1. Measurement of alanine aminotransferase

This was measured in accordance with the colorimetric method as described by Emmanuel TE using reagents manufactured by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom [10].

2.5.2. Measurement of aspartate aminotransferase

This was measured in accordance with the colorimetric method as described by Emmanuel TE using reagents manufactured by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom [10].

2.5.3. Measurement of urea

This was measured in accordance with the Urease-Berthelot's method as described by Emmanuel TE using reagents manufactured by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom [10].

2.5.4. Measurement of creatinine

This was measured in accordance with the Jaffe reaction as described by Emmanuel TE using reagents manufactured by Randox Laboratories Limited, 55, Diamond Road, Crumlin County, Antrim, BT294QY United Kingdom [10].

2.5.5. Measurement of C-reactive protein

This was measured in accordance with the Latex turbidimetry method as described by Emmanuel TE using Spin react Diagnostic kit manual, Spain [10].

2.6. Statistical analysis

The result of this study were expressed as mean and standard deviation, while the differences between the volunteers (control and experimental groups) were assessed using the students 't' test. The results were considered statistically significant at $p < 0.05$.

3. Results and discussion

Food hawkers are individuals that are prone to chemical toxicity from air pollutants and dust due to their routine movements. They are regularly exposed to different dust, air pollutants and different toxic chemicals as they go about hawking.

Table 1 Biochemical parameters of the control group as compared with that of the experimental group with ≤ 5 years working experience (experimental group one)

Parameters	Control group (n=15)	Experimental group (n=15)	p-value	Remarks
ALT (U/I)	7.42 \pm 0.98	7.46 \pm 1.02	$p > 0.05$	NS
AST (U/I)	6.98 \pm 0.82	7.02 \pm 0.86	$p > 0.05$	NS
Urea (mmol/l)	7.65 \pm 1.28	7.70 \pm 1.29	$p > 0.05$	NS
Creatinine (μ mol/L)	70.40 \pm 3.52	70.44 \pm 3.54	$p > 0.05$	NS
CRP (mg/l)	2.74 \pm 0.70	17.40 \pm 1.98	$p < 0.05$	S

KEYS: values are in mean \pm S.D., ALT=Alanine aminotransferase, AST=Aspartate aminotransferase, CRP= C-reactive protein, NS= Not statistically significant, S= Statistically significant, n = Numbers of volunteers

In this study, comparison was made between the mean values of selected plasma biochemical parameters such as aspartate aminotransferase, alanine aminotransferase, urea, creatinine and C-reactive protein in food hawkers with ≤ 5 years working experience (experimental group one) and ≥ 5 years working experience (experimental group two) respectively with those that are not food hawkers (control group).

The results as shown in Table 1 revealed that food hawkers with working experience of ≤ 5 years (experimental group one) revealed no statistically significant differences ($p > 0.05$) in the mean values of alanine aminotransferase, aspartate aminotransferase, urea and creatinine as compared to that of the control group respectively, while the mean value of C-reactive protein showed statistically significant difference ($p < 0.05$) as compared with that of the control group which may be suggestive of systemic inflammatory disorder which had led to the release of interleukin 6 as well as other cytokines that had in turn triggered the synthesis and subsequent elevation of C-reactive protein in the blood of the food hawkers. This however is as established in the study.

The results of the selected biochemical parameters in nonfood hawkers (control group) as compared with food hawkers with ≥ 5 years working experience (experimental group two) along the streets of Yenagoa, Bayelsa State, Nigeria are as shown in Table 2

Table 2 Biochemical parameters of control group compared with that of the experimental group with ≥ 5 years working experience (experimental group two)

Parameters	Control group (n=15)	Experimental group (n=15)	P-value	Remark
ALT(U/l)	7.42 \pm 0.98	27.70 \pm 2.98	p<0.05	S
AST(U/l)	6.98 \pm 0.82	21.40 \pm 2.06	p<0.05	S
Urea(mmol/l)	7.65 \pm 1.28	15.50 \pm 2.02	p<0.05	S
Creatinine(μ mol/l)	70.40 \pm 3.52	110.70 \pm 3.74	p<0.05	S
CRP (mg/l)	2.74 \pm 0.70	29.42 \pm 3.20	p<0.05	S

KEYS: values are in mean \pm S.D., ALT=Alanine aminotransferase, AST=Aspartate aminotransferase, CRP= C-reactive protein, NS= Not statistically significant, S= Statistically significant, n = Numbers of volunteers

The results showed that food hawkers with ≥ 5 years working experience (experimental group two) revealed statistically significant difference ($p < 0.05$) in the mean values of alanine aminotransferase, aspartate aminotransferase, creatinine, urea and C-reactive protein as compared with that of the control group respectively.

The significant elevations ($p < 0.05$) of alanine aminotransferase and aspartate aminotransferase as established in these food hawkers is presumed to be linked with damage to the liver as a result of the prolonged exposure to environmental toxins such as lead, cadmium etc during hawking which may have injured the liver with subsequent leakage of these enzymes into the plasma. The significant elevations ($p < 0.05$) of urea and creatinine as established in the food hawkers with ≥ 5 years working experience is presumed to be linked with kidney disorder which may be due to prolonged exposure to various environmental toxins such as lead and cadmium that are capable of organ damage and subsequent failure. The establishment of significantly elevated ($p < 0.05$) C-reactive protein in the food hawkers with ≥ 5 years working experience may be associated with the inhalation of environmental toxic chemical substances which may have led to systemic inflammation with the resultant release of interleukin 6 and other cytokines that had triggered the synthesis and subsequent elevation of C-reactive protein in the blood of the food hawkers.

The results showed that the mean values of plasma alanine aminotransferase, aspartate aminotransferase, urea, creatinine and C-reactive protein in food hawkers with ≥ 5 years working experience were significantly elevated ($p < 0.05$) when compared with that of the control group

The percentage of volunteers in both experimental group one and experimental group two with abnormal values of the measured biochemical parameters as compared with the control group are as shown in Table 3.

The results showed that the percentage of subjects with abnormal values in plasma concentrations of alanine aminotransferase, aspartate aminotransferase, urea, creatinine and C-reactive protein were higher in experimental group two than experimental group one as compared with the control group.

As shown in Table 3, 13% - 27% of volunteers with ≤ 5 years working experience (experimental group one) revealed abnormal values in the various measured biochemical parameters as compared to the control group, while 53% - 80% of volunteers with ≥ 5 years working experience (experimental group two) revealed abnormal values in the various measured biochemical parameters as compared with the control group. This significant percentage values as seen in

experimental group two when compared with that of experimental group one may be suggestive of the prolonged hawking for ≥ 5 years with the associated exposure to environmental toxins.

Table 3 Percentage of volunteers in groups one and two respectively with abnormal values of measured biochemical parameters as compared with the control group

Parameters	Reference ranges	Control group (n=15)	Experimental group one (n=15)	Experimental group two (n=15)
ALT (U/l)	Up to 12.0	0(0)	3(20%)	10(67%)
AST (U/l)	Up to 12.0	0(0)	3(20%)	10(67%)
Urea (mmol/l)	1.7-9.1	0(0)	2(13%)	8(53%)
Creatinine ($\mu\text{mol/l}$)	53-97	0(0)	2(13%)	8(53%)
CRP (mg/l)	≤ 6.0	0(0)	4(27%)	12(80%)

KEYS: ALT=Alanine aminotransferase, AST=Aspartate aminotransferase, CRP= C-reactive protein, n = Numbers of volunteers

4. Conclusion

In conclusion, this research work has shown that continuous exposure to toxins and air pollutants by food hawkers with ≤ 5 years working experience may trigger inflammatory disorders, while exposure to toxins and air pollutants by food hawkers with ≥ 5 years working experience may trigger hepato-renal and inflammatory disorders.

Recommendation

Based on the findings from this research it is recommended that:

Food hawkers with ≥ 5 years working experience should go for plasma alanine aminotransferase, plasma aspartate aminotransferase (liver function test), plasma urea, plasma creatinine (renal function test) and plasma C-reactive protein (inflammatory disorder biomarker) test intermittently in any registered and licensed Medical Laboratory Facility in order to ascertain the status of their liver, kidney and lungs.

Compliance with ethical standards

Acknowledgments

We acknowledged with thanks all the volunteers.

Disclosure of conflict of interest

The authors declare no conflict of interest.

Statement of ethical approval

This study was carried in line with the Principle of Helsinki declaration of 1975 as revised in 2008. Oral informed consent was got from the apparently healthy recruited volunteers who were made to understand why their blood specimens were needed for this research work. Besides ethical approval was obtained from the ethical committee of Niger Delta University, Wilberforce Island, Bayelsa State, Nigeria.

Statement of informed consent

Oral informed consent was obtained from all the apparently healthy volunteers that were recruited for this research work.

Author's contributions

Emmanuel Tonbra Egoro initiated this research work and was responsible for its title, aim, experimental design, analyses of the biochemical parameters as well as the design of the tables while Emmanuel Sunday Oni and Otaraku Oye were responsible for the statistical analysis as well as the results and discussion. Annabel Awele Idama was responsible

for the verbal consent as well as approval from the apparently healthy volunteers, collection of their blood specimens, separation of the plasma samples, labeling of these samples, collation of literature review for the research work and editing the references. Finally all the Authors proof read the work before it was submitted for publication.

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