

**RESEARCH ARTICLE****ASSESSMENT OF CONSISTENT EXPOSURE TO GAS FLARES AND RENAL INDICES DURING PREGNANCY: A BASELINE STUDY IN BAYELSA STATE NIGERIA****SOLOMON M UVOH, ARTHUR N.CHUEMERE, OBIA ONYEBUCHI****Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences University of port Harcourt, Rivers State Nigeria.****Corresponding author: Solomon M Uvoh. Faculty of Basic Medical Sciences, College of Health Sciences University of port Harcourt, Rivers State Nigeria.****Orcid:0000-0002-1580-9916****Publication history: Received on 30 July 2021, Accepted on 30 August 2021, Published online 5 September 2021****ABSTRACT:**

This study assess the effect of consistent exposure to gas flares on renal indices of apparently healthy pregnant women exposed to gas flares in their respective communities in Bayelsa State. Out of the two hundred and fifty participants randomly selected, fifty were from non-gas flaring communities that met the inclusion criteria. The renal parameters were obtained from both subjects and analysed using kinetic, enzyme colorimetric, Berthelot methods and statistical packaging for social sciences version 23.0. Findings from the study shows progressive decrease in renal function indices from first trimester to third with the exception of uric acid increasing during the third trimester above first and second trimesters. Categorization of the renal indices of the subjects into duration of exposure to gas flares in their respective communities shows an increased renal parameters of pregnant women from first to third trimesters of pregnancy with a significant p-values (<0.00) and decreased negative percentage difference between duration of short exposure with long duration in years. Renal indices from the different gas flaring communities indicate an increase with Immiringi and Gbarain having the highest uric acid level compared with the control Kolo and Otuagila a non-gas flaring communities. A linear correlation plot of urea and uric acid versus age indicate a positive correlation though weak having correlation coefficient ratio of 0.007 and 0.006 respectively. Findings from this study have shown the toxic effect of gas flares on renal function and subsequent renal dysfunction among residents in gas flaring communities in Bayelsa state.

Keywords: Gas flares, Trimesters, Duration, exposure, renal indices**INTRODUCTION**

Diseases associated with renal dysfunctions are among the most leading causes of complications and death during pregnancy (Depak et al., 2016). Renal and hypertensive diseases during pregnancy increases both mother and infant mortality. Only a few number of these pregnant women received expert management. There is increasing trend of

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adverse pregnancy outcome in Bayelsa state especially resulting from renal diseases. Reports from recent study indicates maternal mortality rate increased from 2 maternal death in every 202 live birth in 2012 to 14 deaths in every 172 live birth in 2018 with cardiovascular and renal disease being highest risk factors in Bayelsa state (Ide et al., 2019).Records from World Health Organization (2016),indicate that about 6.5 million deaths are attributed to the exposure to outdoor air pollution, water, and land related.No much emphasis on the poor quality of air and its relationship to pregnant women in Bayelsa State(Erebi et al., 2013; WHO, 2007; Samuel et al., 1997) kidney increase to about 1cm during pregnancy such as dilation of the ureters, calyces, renal pelvis etc. from the first trimester onward due to hormonal changes and the mechanical obstruction of the renal structures. Micro puncture studies in animals have shown an increase in renal plasma flow to about 50% due to increase in glomerular filtration rate. The urea and creatinine level of pregnant women are slightly lower when compared to non-pregnant women (Baylis 1987).The stimulation of the angiotensin aldosterone system mechanism increased during pregnancy leading to the retention of sodium ions that is mainly due to the interplay that exist between anti natriuretic stimuli and natriuretic that are present during pregnancy (Lindheimer, 1991).During pregnancy, the formation of urine increases slightly than the non-pregnant woman due to increased fluid intake and excretory products load increase: the glomerular filtration rate also contribute to the loss of electrolytes and water in urine. Though tubular reabsorption of sodium is increased resulting in positive sodium balance needed to allow for fetal requirement and increase maternal blood volume. During the third trimester, more water than sodium is retained contributing to the dependent edema (Jessica 2019)

MATERIALS AND METHODS

Research Design.

This is a cross-sectional descriptive qualitative research study with semi structured questionnaires to obtain data's directly from pregnant women who have been exposed to gas flares in their respective communities over a period of time using a systematic sampling method..

Group 1 first trimester

Group 2 second trimester

Group 3 third trimester

Short and long duration of exposure

Non pregnant

Study Location

The pregnant and non- pregnant female participant subjects were interviewed in Government owned hospitals and health centers including some private hospitals / health centers located in gas flaring communities and its environs in Tombia, Gbarantoru, Polaku, and Obunagha. Koroama, Kolo Immiringi and Otuagila communities in Bayelsa State Nigeria.

Inclusion criteria

- ▶ Apparently healthy pregnant subject within the ages of 18 to 50 years
- ▶ Subjects who have spent at least three years and above consistently in gas flaring communities and its environs
- ▶ Informed consent



Exclusion criteria

- ▶ Participants with obvious medical conditions.
- ▶ on antacid therapy, diuretics, new residents and smokers, recent abdominal surgery, less than 18years were excluded from the study.

Study Population

Two hundred apparently healthy pregnant women from different gas flaring communities in different trimesters of pregnancy and One hundred non pregnant women
Ninety from non-gas communities

Gestational Age

The gestational age was calculated using the date of the last normal menstrual period and palpation of the fundal height.

Determination of renal indices

- ▶ Creatinine ($\mu\text{mol/L}$) Agappe Diagnostics (Switzerland GMBH) Kinetic method REF/LOT NO. 29110317, 3911053
- ▶ serum urea Randox urea test kit (United Kingdom) Urease Berthelot method in (mmol/L) reference number UR1068 37ml, UR 1068 110ml
- ▶ Uric Acid (mg/dl) Randox (United Kingdom) uric acid test kits enzymatic colorimetric method.

ETHICAL CONSIDERATIONS

The proposed methodology of this study was approved by the ethical committee of the University of Port Harcourt UPH/CEREMAD/REC/MM62/009
Statistical packaging for social sciences (SPSS) version 23.0 Chicago USA. The results are presented as mean \pm standard deviation and range in parenthesis.

Table 1: Comparison of renal Function test in different trimesters of pregnancy

Parameters	Trimesters of pregnancy					
	1 st trimester	2 nd trimester	% Diff.	3 rd trimester	% Diff	P value
	(n=19)	(n=90)		(n=91)		
Urea (mmol/L)	2.67 \pm 0.99 (0.80-4.80)	2.44 \pm 0.72 (1.40-4.50)	8.61	2.43 \pm 0.95 (1.0-5.20)	8.98	0.00 #
Creatinine ($\mu\text{mol/L}$)	81.74 \pm 21.15 (49.00-122.00)	76.68 \pm 14.27 (50.00-109.00)	6.19	75.27 \pm 20.31 (21.00-140.00)	7.91	0.00 #
Uric Acid (mg/dl)	3.34 \pm 1.29 (1.60-5.30)	2.77 \pm 0.97 (1.00-4.80)	17.06	3.55 \pm 1.31 (1.00-8.00)	-6.28	0.03 #

NB: Results are given as mean \pm standard deviation and range in parenthesis. Green=increase %diff, red =decrease %diff # = Significant



Table 2: Duration of exposure in relation to renal indices during pregnancy

Parameters	Pregnant women			P-value<0.05 significant
	Short (<5yrs) N=96	Long (>5yrs) N=104	%diff	
Urea (mmol/L)	2.40±0.75	2.50±0.98	-4.16	0.00#
Creatinine (µmol/L)	75.84±19.44	76.92±17.80	-1.42	0.02#
Uric acid (mg/dl)	3.23±1.16	3.29±1.32	-1.85	0.00#

NB: Results are given as mean ± standard deviation # significant. Green=increase %diff, red =decrease %diff

Table 3: Comparison of renal indices in different communities during pregnancy

Parameters	Kolo/ Otuagila	Obuna /Polaku	% Diff	Immiringi	% Diff.	Gbarain /Tombia	% Diff	P-value
Uric acid (mg/dl)	3.10±1.42	3.38±1.68	-9.03	3.24±1.28	-4.51	3.60±1.80	-16.12	0.02#
Urea (mmo/l)	2.44±0.14	2.62±0.31	-7.37	2.55±0.68	-4.50	2.65±0.30	-8.60	0.01#
Creatinine (µmol/l)	71.65±18.39	77.22±13.18	-7.77	73.96±13.84	-3.22	82.06±0.42	-14.52	0.02#

NB: Results are given as mean ± standard deviation # significant. Green=increase %diff, red =decrease %diff

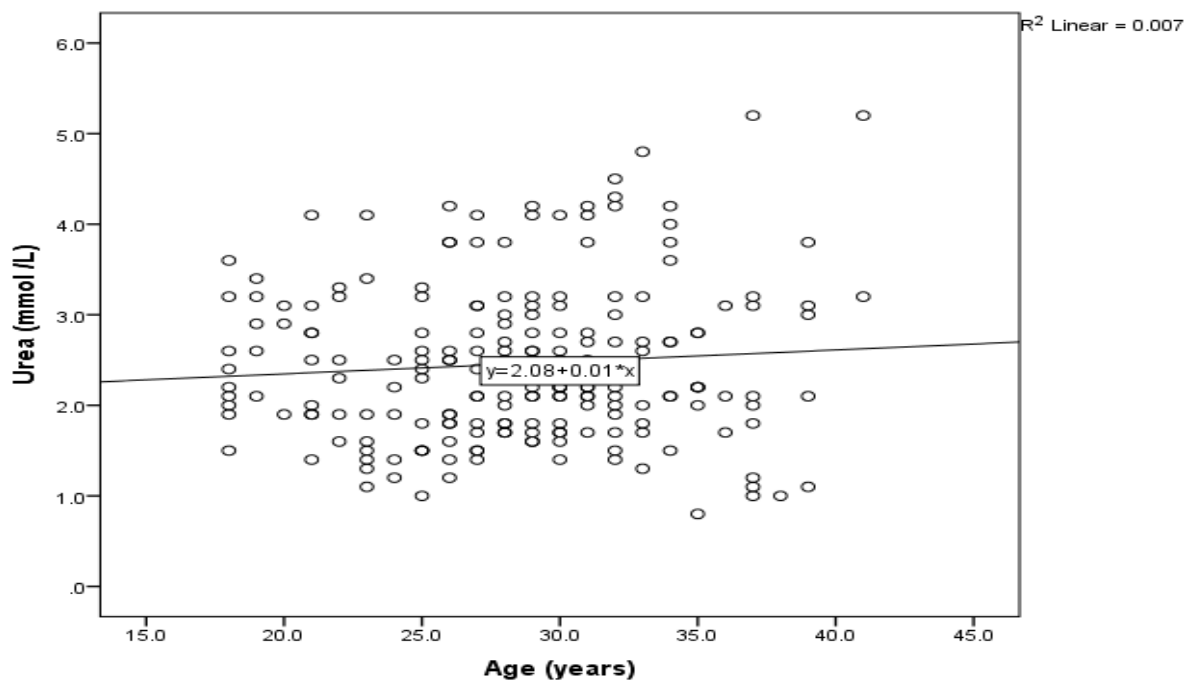


Figure 1: Correlation plot of gestational age versus urea during pregnancy

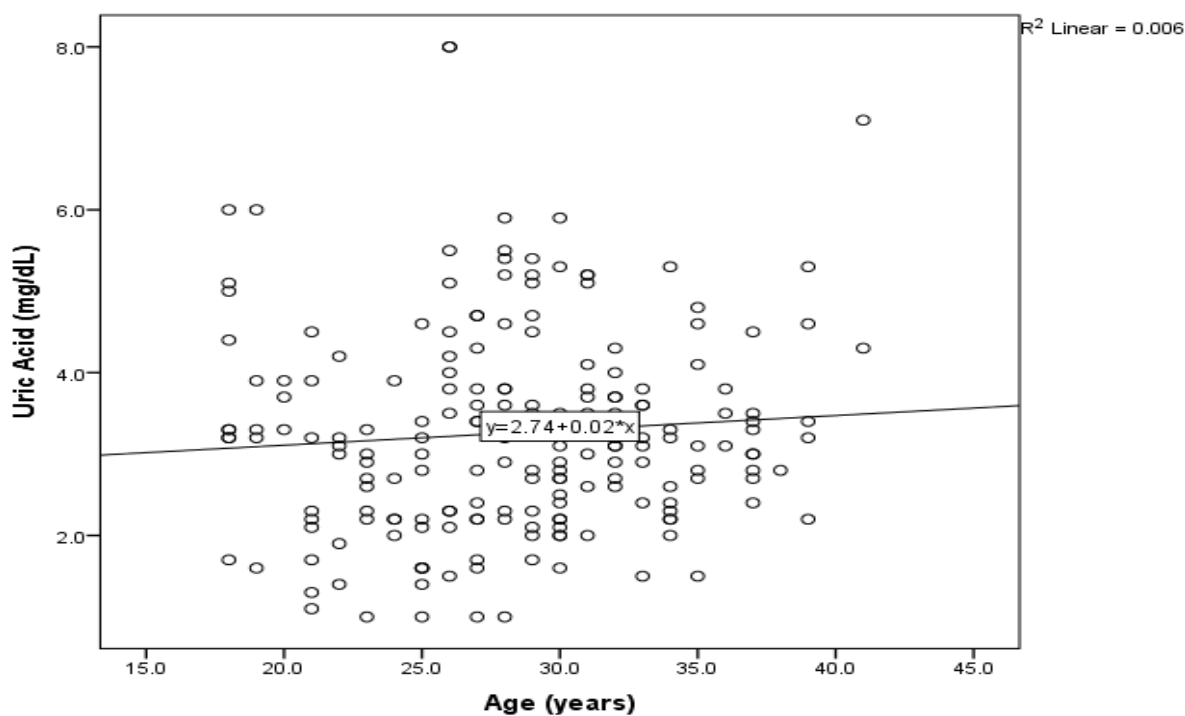


Figure 2: Correlation plot of age versus uric acid during pregnancy



DISCUSSION

The results from the study shows a statistically significant (0.00) progressive decrease in urea and creatinine level during pregnancy in first, second and third trimesters. We observed an increase in serum uric acid level in third trimester (3.55mg/dl) than those in their first (3.34mg/dl) and second (2.77mg/dl) trimesters. The study result is not consistent with Nduka and Okeke,(1986) findings who observed a slight increase in the level of urea and creatinine among African Pregnant women. The study is consistent with Agbecha et al., (2019) who observed an increased serum uric acid level among pregnant women during their third trimester of pregnancy. This may be due to increase blood volume and glomerular filtration rate during pregnancy and thus can be used by clinicians to investigate the genesis of pregnancy induced hypertension among women in Bayelsa State. Results from the study is consistent with the findings of Sama ,(2013) who observed a significant (0.00) decrease in urea, creatinine and uric acid level among apparently healthy pregnant women in Gaza during their first, second and third trimesters. However, our findings disagree with Sama in the level of Uric acid because our results show an increase uric acid level during the third trimester (3.55mg/dl) compared to first (3.34mg/d) and second (2.77mg/dl) trimesters. An elevated serum uric acid is a key factor leading to the development of articular degeneration, gout, atherosclerosis and vascular inflammation (Jessica et al 2015). The serum creatinine concentration decreases toward their third trimesters. Increase in serum creatinine clearance during the second trimester leads to a decrease in its serum concentration but a decrease in its clearance during the third trimester result in its increase within the blood (Kate et al., 2018). Imoru et al., (2016) observed a non-significant difference in creatinine level among pregnant women but we observed from our study a significant difference (0.00) in the creatinine level during pregnancy. Renal indices were higher among pregnant women residents in Gbarain followed by Immiringi in comparison with Kolo being the lowest among pregnant subjects. The reduction in the number of nephron due to prolonged excess heat from gas flares and daily stress resulting in a decrease blood flow to kidney could be the major factor leading to increase renal indices as glomerular filtration rate drop (Oseji, 2011).

CONCLUSION

There was a significant increase in renal indices of pregnant women exposed to gas flares over a prolonged period of time and a decrease in renal function test among the participants in relation to trimesters of pregnancy with a positive correlation in uric acid and urea.

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