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IMPACT OF GAS FLARES ON ANTHROPOMETRIC INDICES OF PREGNANT AND NON PREGNANT WOMEN IN SELECTED GAS FLARING COMMUNITIES IN BAYELSA STATE NIGERIA

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ABSTRACT

This study determined the blood pressures (mmHg), weight (kg),height (m),and body mass index (kg/m²) using the square of the height to divide the body weight of the apparently healthy pregnant women between the ages of eighteen to fifty years in some gas flaring communities in Bayelsa state Nigeria. Two hundred apparently healthy pregnant women and one hundred non-pregnant women were randomly selected as participants for this study using weight height, palpatory and auscultatory methods. The results from this study indicate a significant increase (0.00) in the weight and body mass index in the non-pregnant (66.95kg, 25.9kg/m²) and (67.25kg, 26.28kg/m²) among pregnant group. A significant (0.00) increase in the body mass index and weight of the pregnant group according to their trimesters of pregnancy was a clear indication of maternal blood volume and tissue growth during pregnancy. There was a decrease in the mean values of the non-pregnant and pregnant group weight and body mass index with regards to duration of exposure to gas flares in Bayelsa state. The results also indicate decreased height among the pregnant exposed to gas flares over a long period of time compared with short duration of exposure. The result from this study has shown that gas flares affect height, weight, and body mass index of both non pregnant and pregnant women in Bayelsa state.

KEYWORDS

Body mass index, weight, height, gas flares, Anthropometric

INTRODUCTION

The increase in maternal body mass index during pregnancy contribute immensely to the adverse effect outcome related with eclampsia, pre-eclampsia commonly known as toxemia of pregnancy, pre-term delivery, caesarean section, induction of labor etc. (Yazdani *et al.,* 2012).The stature of non-pregnant women body mass index that are within a child bearing age contribute greatly to the wellbeing of the mother and her offspring that is to say,the anthropometric parameters of women prior to pregnancy have relevant implications for the mothers health during pregnancy (Michael *et al.,* 2018),(Rumi *et a*l., 2012,Kareen *et al.,* 2016).Researchers from the school of public health and the University of California USA observe that exposure to excess natural gas flares is attributed to about 50% risk of preterm delivery when compared to women who have not been exposed to gas flares (Julia Rosen, 2020).

The United State National Academic (1990) proposed that weight gain during pregnancy should be based on the maternal body mass index before pregnancy i.e. a woman with a body mass index of 19.8-24.9kg/m^{2}should be expected to have an increase weight gain of 25-3 I b, less than <19.8kgm^2 should have an increased weight gain of 28 -40Ib.The chart for maternal at different pre-pregnancy body mass index subjects groups gives a background information of women and fetus that are at risk with adverse health effects during pregnancy. (Santos *et al.,* 2018). Santos *et al* was able to conclude in his research study that weight gain patterns during pregnancy are most likely related to pre-pregnancy body mass index. Adolescent pregnancy in the world has become a global public health problem due to the negative outcome resulting from gestational weight gain such as gestation hypertension, pre-eclampsia including adverse neonatal outcome (Reyna *et al.*,2018) (Reyna *et al.,* 2018).Healthy pregnant mothers with normal weight of 18.5-24.9kg/m prior to pregnancy are expected to have a weight gain of about 11.3kg-16kg (25 -35 pounds) *ie* 1kg to 1.5kg during the first trimester and 1.5-2kg during the second trimester monthly till birth. The overweight (25-29.kg) and the obese (>30kgm^2) gains 7-11.5kg (15-25 pounds) and 5-9kg (11-20 pounds) extra respectively. Though younger adults are expected to gain more weight due to increase tissue growth (Amos, 2019) (http:*llmeslineplus.gov.ency.pat*)

MATRIALS 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 exposed to gas flares in their respective communities over a period of time compared with non- pregnant women in Bayelsa state Nigeria.

Location of Study

The pregnant and non- pregnant participant were interviewed in Government owned hospitals and health centers including some private hospitals / health centers located in gas flaring communities and its environs in Yenagoa, Ogbia, local government area of Bayelsa State Nigeria.

Study Population

A total of two hundred pregnant and one hundred non- pregnant women were randomly selected from Tombia, Obuna, Polakau, Okolobiri, Immiringi etc. as research subjects for the study. The subjects must have lived in their respective communities consistently within Bayelsa State for at least three years and above.

Sample and Sampling Technique; Random sampling method was used to obtain the parameters from both subjects studied

Sources of Data; Primary.

Methods of Data Collection/ instruments

Weight and Height Measurement

The weight of the subjects were measured using Camry mechanical bathroom scale (China) Calibrated in Kilograms with model number BR912, with light clothing and shoes removed. The height was measured using a calibrated meter rule in meters with shoes removed and a ten centimeter ruler to level hairs in the occipital region down to the skin of the head with their back facing the wall. The body mass index was calculated using the square of the height in meters to divide the weight in kilograms (Kg/m^2) using Quite let index

The body mass index was classified according the world health organization below

Gestational Age

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

WHO CLASSIFICATION of BMI (2011)

	WHO		CDC	10M
Underweight	$<3^{RD}$	$<5^{TH}$	<18.5	
Normal weight	$3^{rd}<85^{th}$		$5^{th}<85^{th}$	18.5-24.9
Over weight	$85^{th}<97^{th}$	$85^{th}<95^{th}$	25.0-29.9	
Obese	$>97^{th}$	$>95^{th}$	>30.0	

RESULTS

Table1: mean values for non-pregnant and pregnant group.

Parameters	Non-Pregnant (Control) (N= 100)	Pregnant (Test) (No = 200)	Significance (P<0.05)
Age (years)	29.05±5.52	29.63±6.83	0.41 Not significant
Weight(kg)	66.95±12.42	67.25±14.19	$0.00_{\#}$
Height (m)	1.61±0.06	1.59±0.07	0.18 Not significant
BMI (kg/M^2)	25.9±5.59	26.28±5.17	$0.00_{\#}$

NB: Results are given as mean ± standard deviation and range in parenthesis. # = Significant

Table 2: Anthropometric data of the non-pregnant and pregnant group according to trimesters

Parameters	Non-Pregnant (No = 100)	Pregnant			P= value ≤ 0.05
		1st Trimester (n=19)	**2nd Trimester (n=68)**	**3rd Trimester (n=113)**	
Age (year)	29.05±5.52 (18-50)	29.95±6.84 (20-43)	28.66±6.89 (18-41)	30.15±7.32 (18-50)	0.00#
Height (m)	1.61±0.06 (1.42-1.76)	1.58±0.07 (1.42-1.68)	1.61±0.06 (1.48-1.75)	1.59±0.07 (1.26-1.76)	0.38 not significant
Weight(kg)	66.95±12.42 (38-112)	64.68±19.46 (38-104)	68.01±14.73 (45-120)	67.22±12.86 (45-101)	0.00 #
BMI (kg/M^2)	25.93±4.59 (17.26-41.55)	25.50±6.43 (18.5-38.20)	26.15±5.07 (18.97-41.87)	26.49±5.5.03 (16.26-41.21)	0.00 #

NB: Results are given as mean ± standard deviation and range in parenthesis.# = Significant

Table 3; Duration of Exposure to gas flares of non-pregnant and pregnant group

Parameters	Non-pregnant Control group		Pregnant (Test) group		Significant p-value
	Short (<5yrs N=36	Long (>5yrs N=64	Short <5yrs N=96	Long >5yrs N=104	<0.05
Height (m)	1.59 ± 0.06	1.61 ± 0.05	1.60 ± 0.07	1.59 ± 0.05	0.00#
Weight (kg)	67.83 ± 12.55	66.45 ± 12.41	68.16 ± 14.47	66.40 ± 13.93	0.02 #
BMI (kg/m^2)	26.72 ± 5.05	25.48 ± 4.28	26.55 ± 5.20	26.02 ± 5.14	0.36 not significant

NB: Results are given as means ± standard deviation and range in parenthesis # = significant

Table 4: Relationship between body mass index and blood pressure in pregnant subject

BMI(kg/m^2) BP**(mmHg)**	<18. 5 Underweight (n=3)	18.5-24.9 Normal (n=84)	25.0-29.9 Overweight (n=70)	>30 obese (n=43)	Anova significant (p<0.05)
SBP	138. ±30.40	112.15±14.20	114.34±11.10	121.23±15.68	0.00 #
DBP	77.50±0.0	67.58±11.51	67.09±9.21	74.64±13.72	0.00 #
MAP	97.83±12.49	82.44±11.68	82.84±8.93	90.17±13.45	0.00 #

Pulse (bpm)	90.50±13.43	83.20±10.91	85.81±11.03	85.61±10.45	0.35 not significant
Pulse pressure	61.00±26.87	45.78±10.06	47.18±8.87	46.64±10.54	0.01#

NB: Results are given as means± standard deviation. #=significant

Table 5: Relationship between age and body mass index in non-pregnant and pregnant subjects

BMI(kg/m²)	Underweight (<18.5)		Normal (18.5-24.9)		Overweight (25.0-29.9)		Obese (>30)		Total number	
Age (years)	Non-Pregnant No.(%)	Pregnant No.(%)	Non-Pregnant No(%)	Pregnant No.(%)	Non-Pregnant No.(%)	Pregnant No.(%)	Non-Pregnant No.(%)	Pregnant No.(%)	Non-Pregnant No.(%)	Pregnant No.(%)
<21	2(0.66)	-	3(1)	14(4.66)	2(0.66)	2(0.66)	-	3 (1)	7(2.33)	19(6.33)
21-30	2(0.66)	2(0.66)	27(9)	53(17.66)	18(6)	38 (12.66)	1(0.33)	23(7.66)	48(16)	116(38.66)
31-40	-	1(0.33)	20 (6.66)	17 (5.66)	8(2.66)	29 (9.66)	7(2.33)	16(5.33)	35(11.66)	63(21)
>40	3(1)	-	3(1)	-	2(0.66)	1(0.33)	2 (0.66)	1(0.33)	10(3.33)	2(0.66)
Prevalence No. (%)	7(2.33)	3 (0.99)	53 (17.66)	84(28)	30(10)	49 (16.33)	10 (3.33)	43(14.33)	100 (33.33)	200 (66.67)

DISCUSSION

The mean values for Weight, Height, and Body Mass index of the general study population was 67.2kg, 1.60m, and 26.16kg/m² respectively with a mean age of 29.43 years. However, Comparism of the mean values of the non-pregnant with the pregnant group exposed to gas flares indicate a mean weight of 66.95kg as against their pregnant counterpart 67.25kg with a p-value of 0.00. The body mass index of the non-pregnant (25.9kg/m²) was significantly (p-value 0.00) lower than the pregnant group (26.28kg/m²). More so, the result shows (2.33%) of the non-pregnant and (0.99%) pregnant group as underweight, 17.66% and 28% as normal, 10% and 16.33% as overweight while 3.33% and 14.33% as obese in relation to age. This result is contrary to OKPU *et al* (2019) who observed a body mass index of 44.18% of pregnant women as underweight, 12.1% normal, 22.8% overweight and 20.3% as obese in Bayelsa State. Though his report was not directly focused in gas flaring communities but these women are consistent residents in Bayelsa state.

The study also showed a significant (0.00) values of gradual increase in the weight and body mass index of the pregnant group according to their trimesters of pregnancy compared with the non-pregnant group. Though we observed a slight decrease in weight among the pregnant women in their

third trimesters (67.22kg) as against those in their second trimester (68.01kg).The developing fetus contribute approximately 25%, amniotic fluid 6% for the baby's circulation, placenta 5%, expansion in blood volume 10%, and changes in maternal hormones with others factors could result in about 1kg weight gain among pregnant women during their first trimester and the rest gain during the last two trimesters. This explains the reason behind the difference in weight of a non-pregnant and the pregnant subject's anthropometric indices. On the other hand weight gain at term is approximately 62% water, 30% fats and 8% protein though with some considered variations (Hytten and Leitch, 1971) (Hytten, 1980; Susana.2018).A similar body mass index of 20.73kg/m², 20.33kg/m², 21.82kg/m² and 19.38kg/m² was also observed by (Kabiru and Atiku, 2012) among pregnant women in their first, second, and third trimesters compared with their non-pregnant counterpart in Kano state Nigeria. Suggested weight gain during pregnancy indicates that underweight, normal weight and overweight women prior to pregnancy are expected to have a weight gain of not less than 4kg during pregnancy (IOM /NRC, 2009), (Shahma *et al.,* 2012) compared to non pregnant. Findings from Ebud *et al* (2020) research study indicate a prevalence rate of 40.6% under nutrition among pregnant women in Northern Ethiopia. Our findings of 2.33% and 0.99% underweight among non-pregnant and pregnant though low but remain inconsistent with their percentage values.

CONCLUSION

The weight and body mass index of the pregnant subjects was significantly (p= 0.00) higher than the non-pregnant subjects. There was a decrease in the weight and body mass index of both pregnant and non-pregnant subjects exposed to gas flares over a long duration compare to short duration exposures with adverse consequences such as depression of the immune system, low birth weight, preterm delivery and vulnerability to other diseases. The prevalence of underweight, overweight and obese in relation to their age among the non-pregnant and the pregnant subjects was (2.33%) and (0.99%),(10%) and (16.33%),(3.33%) and (14.33%) with a normal percentage body mass index of (17.66%) in non-pregnant and (28%) in pregnant subjects.

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