ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

A COMPARATIVE ANALYSIS OF BODY MASS INDEX BETWEEN GAS FLARING AND NON –GAS FLARING COMMUNITIES IN SOUTHERN IJAW LOCAL GOVERNMENT AREA OF BAYELSA STATE, NIGERIA

Ogoun, Timipa Richard
Department of Human Anatomy, Bayelsa Medical University, Yenagoa, Bayelsa State, Nigeria.

Corresponding Author: Dr. Ogoun, Timipa Richard. Senior Lecturer, Head, Department of Human Anatomy, Bayelsa Medical University, Yenagoa, Bayelsa State, Nigeria.

Article DOI: https://doi.org/10.36713/epra10581
DOI No: 10.36713/epra10581

ABSTRACT

Body Mass Index [BMI] is a measures of adiposity of a person with respect to his or her body weight and height. The comparison of BMI between Gas flaring and Non-gas flaring communities in Southern Ijaw Local Government Area was the aim of this study. Weight and height were measures from 1000 adult volunteered subjects (550 male and 450 females) within the ages of 18-45 years from Five [5] gas flaring communities viz; Oporoma, Tebidaba, Ogboinbiri, Peremabiri, Koluama and Five [5] Non-Gas flaring communities such as Ekowe, Nangi-Ama, Anyama, Oweikorogha and Amassoma. Height was taken as the participant was asked to stand erect with barefoot and a measuring tape was placed from the heel to the head vertex. Weight was taken from the subject standing on the weighing balance. Body Mass Index [BMI] was calculated as; weight[kg] /height [m^2].The results of the mean height of the Gas flaring communities is 5.60±0.03 for males and 5.24±0.01 for females. Weight is 69.15±0.94 and 64.86±1.38 for male and female and BMI of 24.61±0.83 for males and 26.0±0.97 for females. The mean height for males and females Non-gas flaring communities are 5.65±0.03 and 5.92±0.46, weight of 65.28±0.79 and 61.49±1.29 and with a BMI of 22.18±0.34 and 22.54±0.52 for males and females. 20% of the males and 23.8% of the females of Non-gas flaring Southern Ijaw people are overweight and obese. 30.2% of the males and 38.9% of the females of Gas flaring Southern Ijaw people are overweight and obese. The inhabitant of Southern Ijaw Local Government area are prone to stroke, cardiovascular diseases, high blood pressure, diabetes mellitus and other associated overweight and obese problems. They should exercise regularly, reduce high calories foods, frequent health and medical check-ups, Government and Multinational companies should stop gas flaring.

KEY WORDS: ***Gas Flaring, Non-Gas flaring, overweight and obese.***

INTRODUCTION

The scientific study of the measurements and proportions of the human body has been use to evaluate and predict anomalies and to proffer health solutions. One of such bodily measurements is the Body Mass Index[BMI] used in predicting obesity, overweight, normal weight , underweight. Obesity, over weight and underweight has been striking problems in the world today. Body Mass Index [BMI] is the measurement of body fat based on height and weight regardless of sex.(Ogoun *et al.* 2022). Obesity is a major health problem, and there is an increasing trend of overweight and obese individuals in developing countries (Innocent *et al.* 2013). Being overweight or obese is known to contribute significantly to morbidity and mortality rates in various countries around the world. Body Mass Index (BMI) is a measure of adiposity and has been used in many countries for assessment overweight and obesity (Nwaiwu and Ibe 2014). The prevalence of obesity is increasing and is recognized as risk indicator of cardiovascular disease in adulthood.

Overweight is defined as a body weight that exceeds the acceptable weight for a particular person, based on the individual's age, height and/or frame size (Kuczmarski and Flegal 2000). Abnormal BMI (underweight, overweight and obesity) were more frequent in female than male young adult Nigerians and that BMI is an important cardiometabolic parameter (Oluwadare and Muritala, 2015).

Globally, gas flaring caused 350 million tonnes of CO2 emissions in 2018. In addition to climate change, this burning practice also has other negative consequences for humans (e.g., respiratory problems) and the environment (Jordy *et al.* 2021). Gas flaring is one of the most challenging energy and environmental problems facing the world today whether regionally or globally. It is a multi-billion dollar waste, a local

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

environmental catastrophe and a global energy and environmental problem which has persisted for decades (Ismail and Umukor, 2012). The World Bank has estimated that the annual volume of associated gas being flared and vented is about 110 billion cubic meters (bcm), which is enough fuel to provide the combined annual natural gas consumption of Germany and France. Flaring in Africa (37 bcm in 2000) could produce 200 Terawatt hours (TWh) of electricity, which is about 50 percent of the current power consumption of the African continent and more than twice the level of power consumption in Sub-Saharan Africa with the exception of the Republic of South Africa). Flaring is a high-temperature oxidation process used to burn combustible components, mostly hydrocarbons, of waste gases from industrial operations. Gas flaring is the combustion of associated gas produced with crude oil or from gas fields (Kahforoshan 2008). The health impacts of air pollution spreads across a wide area, and those who rely on locally produced food whether from their own production or bought at market, risk contamination. Odjugo *et al* ., 2009 studied the effect on gas flaring on maize yield size and concluded that, the sand content of the soil, pH, bulk density, air and soil temperatures increased toward the flare site. For optimum yield of maize within the Niger Delta where gas flaring is taking place and recommended that maize must not be cultivated within 2 km of the bund wall of the flare sites was made. The findings showed that there is indeed a correlation between environmental variables resulting from gas flaring and the development of certain ailments found in individuals residing in such area. Aside from effects on the environment/host communities, animals, plant life, and human health, gas flaring also impact grossly on the economics of a nation, in terms of the loss of funds and revenue which it could have realized if it had conserved gas instead of flaring same. Nigeria provides an appalling example of such a loss. Oil companies in Nigeria flare an estimate 2.5 billion cubic feet of gas every day and this action, amounts to the loss of revenue, estimated at 2.5 billion US dollars yearly (Collins and Oshodi, 2010). The US Environmental Protection Agency (EPA) has also stated that exposure to benzene causes acute leukemia and a variety of other blood related disorders in humans. World Bank Information on the adverse effects of particulate matter, suggests that gas flaring from Bayelsa alone, would likely cause on a yearly basis, 49 premature deaths, 4960 respiratory illness among children and 120 asthma attacks(Collins and Oshodi, 2010). The most common cause of Thyroid cancers is radioactivity. Thyroid cancers have an elevated median rate ratio in those geographic areas with extensive flaring operations(Argo,2002). The Canadian Public Health Association posited that, environmental contaminants have also been related to endocrine dysfunction, immune dysfunction, reproductive disorders and autoimmune rheumatic diseases. Gas flaring causes surrounding communities to suffer from increased health risks including premature deaths, respiratory illnesses, asthma and cancer. Adebayo and Jemina 2010, result showed the effect of gas flaring on blood parameters includes a reduction in white blood cell counts among mice exposed to 8-h daily of gas flaring when compared to control mice. The red blood cells also showed varied abnormalities such as stacked erythrocytes (rouleaux formation), crenated (spicule) cells and teardrop cells (dacrocytes). The detection of the increasing level of eosinophil's in the blood of mice exposed to gas flares was observed to be indicative of a degenerative disease condition and usefulness as a good marker of pollution for monitoring, and early detection of adverse effects of gas flares was recommended. Histopathological examination of the lungs of exposed mice revealed distortions in the segmental bronchus and alveoli of the respiratory organ, with interspersed brown pigments and polymorphonuclear cells, which were absent in the controls. Hence, the need to assess the BMI of Gas flaring communities in Southern Ijaw Local Government Area of Bayelsa State.

MATERIALS AND METHODS

Materials used includes camera, weighing balance, notebooks, pen, measuring tape.

STUDY TYPE

This cross-sectional study entails 1000 adult volunteered subjects (550 male and 450 females) within the ages of 18-45 years.

STUDY LOCATION / DURATION

This research was conducted in specific areas and communities in Southern Ijaw Local Government Area of Bayelsa State of Nigeria. Five [5] gas flaring communities viz; Oporoma [Town hall], Tebidaba [Open groun], Ogboinbiri [Town hall], Peremabiri [Town hall], Koluama [Open ground] and Five [5] Non-Gas flaring communities such as Ekowe [UAC playground], Nangi-Ama [Town hall], Anyama [School field], Oweikorogha [Town hall] and Amassoma [Town hall]. The study lasted from 20TH March, 2022 to 10th of June, 2022.

DATA COLLECTION TECHNIQUE AND PROCEDURES

Convenient sampling technique done and data was collected randomly from these communities under study.

1. Height : Height was taken as the participant was asked to stand erect with barefoot and a measuring tape was placed from the heel to the head vertex and readings taken in feet.
2. Weight: Weight was taken from the subject standing on the weighing balance and readings taken in kilograms.
3. Body Mass Index [BMI]: BMI was calculated as; weight[kg] /height [m^2].

Inclusion Criteria

1. All subjects/participants were indigenes of these aforementioned communities in Southern Ijaw Local Government Area.
2. Subjects were free from deformities

Exclusion criteria

1. Deformed subjects were excluded
2. Non- indigenes from these communities were excluded

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

ETHICAL MEASURES

Permission to conduct this research was obtained from the authorities [Paramount Rules, Youth Leaders] these communities before the research commenced. The participants were enlightened on the purpose of the research.

In addition, verbal informed consent was sought from the volunteered subjects before the commencement of measurement preceedures.

STATISTTICAL ANALYSIS

The obtained data was computed and analyzed using Statistical Package for Social Sciences[SPSS] version 20.0 software. The statistical tools such as Mean, Standard Deviation, Standard Error, Z- Test were used to analyze data. P- value less than (0.05) was considered as significant.

Fig 1: Measurement of Body Weight in Gas Flaring Community

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

Fig 2: Gas flare

RESULTS

The data collected from this research were statistically analyzed and results are displayed in the various tables.

TABLE 1: MEAN VALUES OF ANTHROPOMETRIC PARAMETERS

S/N	SEX	HEIGHT [ft.]	WEIGHT [kg]	BODY MASS INDEX [kg/m^2]
GAS FLARING COMMUNITIES	M	5.60±0.03	69.15±0.94	24.61±0.83
	F	5.24±0.01	64.86±1.38	26.0±0.97
NON-GAS FLARING COMMUNITIES	M	5.65±0.03	65.28±0.79	22.18±0.34
	F	5.92±0.46	61.49±1.29	22.54±0.52

Keys: All values are in Mean ±SEM.

The mean height of the Gas flaring communities is 5.60±0.03 for males and 5.24±0.01 for females. Their weight is 69.15±0.94 and 64.86±1.38 for male and female. The result also shows the mean BMI of Gas faring communities as 24.61±0.83 for males and 26.0±0.97 for females respectively [Table 1]. The mean height for the Non-gas flaring communities are 5.65±0.03 and 5.92±0.46 with mean male and female weight of 65.28±0.79 and 61.49±1.29. The mean BMI of the Non- gas as flaring communities are for males and females is 22.18±0.34 and 22.54±0.52 [Table 1].

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

TABLE 2: Z-Test for Significance Difference Between Males and Females of Non-Gas Flaring Communities.

S/N	PARAMETER	CALCULATED "Z"	TABULATED "Z"	INFERENCE
1	HEIGHT	0.411	1.96	P>0.05
2	WEIGHT	2.59	1.96	P<0.05**
3	BMI	-0.57	1.96	P>0.05

Key: **= Statistically Significant

TABLE3: Z-Test for Significance Difference Between Males and Females of Gas Flaring Communities.

S/N	PARAMETER	CALCULATED "Z"	TABULATED "Z"	INFERENCE
1	HEIGHT	5.39	1.96	P<0.05**
2	WEIGHT	2.57	1.96	P<0.05**
3	BMI	-1.09	1.96	P>0.05

Key: **= Statistically Significant

TABLE 4: Z -Test for Significance Difference Between Males of Non-Gas Flaring and Gas Flaring Communities.

S/N	PARAMETER	CALCULATED "Z"	TABULATED "Z"	INFERENCE
1	HEIGHT	1.15	1.96	P>0.05
2	WEIGHT	-3.10	1.96	P<0.05**
3	BMI	-2.69	1.96	P<0.05**

Key: **= Statistically Significant

TABLE 5: Z -Test for Significance Difference Between Females of Non-Gas Flaring and Gas Flaring Communities.

S/N	PARAMETER	CALCULATED "Z"	TABULATED "Z"	INFERENCE
1	HEIGHT	0.47	1.96	P>0.05
2	WEIGHT	-1.80	1.96	P>0.05
3	BMI	-3.15	1.96	P<0.05**

Key: **= Statistically Significant

TABLE 6: BMI PERCENTILE CUT-OFF WITH REFERENCE WHO 1999.

CATEGORY	SEX	UNDER WEIGHT	NORMAL WEIGHT	OVER WEIGHT	OBESITY CLASS I	OBESITY CLASS II	OBESITY CLASS III
W.H.O.	M/F	≤18	18-24.9	25-29.9	30		
NON-GAS FLARING COMMUNITIES	M	13%	67%	17%	3%		
	F	19.8%	61.4%	11.9%	8.9%	2%	1%
GAS FLARING COMMUNITIES	M	7.9%	65.5%	18.7%	7.9%	1.4%	2.2%
	F	6.7%	55.6%	13.9%	13.9%	1.4%	9.7%

Keys: M=Male F=Female.
BMI of 18.5- 24.9 pose low cardiovascular diseases
BMI of 25-29.9 pose moderate risk cardiovascular diseases
BMI of 30-34.9 pose a high risk to cardiovascular diseases
BMI of 35-39.9 and ≥ 40 pose very high risk of cardiovascular diseases (WHO report).

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

DISCUSSION

Body mass index is a diagnostic tool used for the identification of complications and illnesses associated with human body weight. The results of this present study have shown that there is no significant difference between the mean height of the males and females (5.65±0.03 and 5.92±0.46) of the Non-gas flaring Communities ($p>0.05$). But there is significant difference in the mean weight of the males and females(65.28±0.79 and 61.49±1.29) of the Non-gas flaring Communities ($p<0.05$).There is no significant different in the mean BMI of the males and female (22.18±0.34 and 22.54±0.52) of the Non-gas flaring Communities ($p>0.05$) as displayed in (tables 2). There is statistical significant difference ($p<0.05$) in the mean height and weight within the gas flaring Communities between the males and the females (5.60±0.03 and 5.24±0.01 for height)and (69.15±0.94 and 64.86±1.38for weight). There is contrast to this finding in the mean BMI of the gas flaring communities with no difference in mean between the males and females (24.61±0.83 and 26.0±0.97) ($p<0.05$) as shown in (table 3).

As a comparative study, the results of the present study have shown that there no significant difference in height between the male aborigines of Gas flaring and Non-gas flaring communities in Southern Ijaw Local Government area ($p>0.05$). There exist statistically significant difference in weight and BMI between the males of the Gas flaring and Non-gas flaring Communities ($p>0.05$). The males of the Gas flaring communities possess higher weight and BMI than their Non-gas flaring counterparts (tables 1and 4).

Concurrently, there is no significant difference in the female body height and weight between Gas flaring and Non-gas flaring of Southern Ijaw aborigines. The females in the Gas flaring communities possesses a higher BMI than their Non- gas flaring female counterparts ($p<0.05$).

With reference to the World Health Organization (WHO 1995 and 2000) reports on BMI percentile cut-off (table 6), 13% of the male and 19.8% of the females of the Non-gas flaring Southern Ijaw indigenes have low weight (of the females in the ≤18) hence pose a low risk of cardiovascular disease. About 67% of the males and 61.4% of the Non-gas flaring Southern Ijaw indigenes have normal BMI value. 17% males and 11.9% of the females of the Non-gas flaring Southern Ijaw indigenes are overweight. 3% of the males and 8.9% are obese of the Non-gas flaring Southern Ijaw aborigines. In addition 2% and 1% of the Non-gas flaring Southern Ijaw female aborigines are in the obese class II and III. With reference to (table 6) 7.9% of the males and 6.7% of the females of the people living in the Gas flaring communities pose a low BMI with a low risk to cardiovascular diseases. 65.5% of the males and 55.6% of the people living in the Gas flaring communities have normal BMI. 18.7% of the males and 13.9% of the indigenes of the Gas flaring communities are overweight. About 7.9% of the males and 13.9% of the females indigenes of the Gas flaring communities are in the obese class I, 1.4% of both the males and the females and the obese class II and 2.2% of the males and 9.7% of the females fall into obese class III.

In summation, 20% of the males and 23.8% of the females of Non-gas flaring Southern Ijaw people are overweight and obese. 30.2% of the males and 38.9% of the females of Gas flaring Southern Ijaw people are overweight and obese. This result corroborates the findings of Ogoun et al., 2022; that the Ekowe aborigines both males and females; Ikianbiri males and Nangi-Ama females are more likely predisposed to coronary heart diseases, stroke, diabetes mellitus, heart attack and amongst other illnesses due to the high BMI as they age gradually. As reported by Innocent et al., 2013 that obesity is a major health problem, and there is an increasing trend of overweight and obese individuals in developing countries. Being overweight or obese is known to contribute significantly to morbidity and mortality rates.

CONCLUSION

Body Mass Index (BMI) is a non- invasion identification tool to weight associated problems such as stroke, coronary heart disease, high blood pressure, diabetes mellitus and amongst others. The inhabitant of Southern Ijaw Local Government area are prone to stroke, cardiovascular diseases, high blood pressure, diabetes mellitus and other associated overweight and obese problems which might be as a result of gas flaring activities in the Southern Ijaw environ. I therefore recommend that, the aborigines should exercise regularly, reduce high calories foods, frequent health and medical check-ups, Government and Multinational companies should stop gas flaring which have shown some degree of effect on the people living in Southern Ijaw due to variations in their weight and BMI.

ACKNOWLEDGEMENT

I sincerely appreciate TETFund for creating the financial enablement by sponsoring this research. In addition, I thank the Chiefs, Community Leaders and Youth bodies, and all the participants of the aforementioned communities for their moral support and making this research crises free.

FUNDING: Tertiary Education Trust Fund [TETFund]

REFERENCES

1. *Ogoun Timipa Richard, Tobia Pere-ere Sarah , Itunuoluwa Deborah Adekoya (2022). Body mass index assessment of ekowe, ikianbiri and nangi-ama indigenes of Bayelsa State, Nigeria. International Journal of Advances in Medicine ;9(2):71-75.*
2. *Innocent I, Abali, C., Collins J., Kenneth A., Miracle E. Ejiji I., Okechukwu S. and Efosa O (2013). Prevalence of overweight and obesity in adult Nigerians- a systematic rewiew; Diabetes metab synddrobes, Vol.: 6; Pp: 43-47.*
3. *Nwaiwu O., and Ibe B. (2014). Body Mass Index of children aged 2 to 15years in Enugu, Nigeria; Nigerian journal of pediatrics, (41)3:194.*
4. *Kuczmarski R. J. and Flegal K.M. (2000). Criteria for definition of overweight in transition: background and*

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 8| Issue: 6| June 2022|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2022: 8.205 || ISI Value: 1.188

recommendation for the United State. American Journal of Clinical Nutrition, 72, pp.1074-81.

5. *Oluwadare O, and Muritala A.A. (2015). Pattern and Prevalence of Underweight, Overweight and Obesity amongst Young Adult Nigerians. American Journal of Biomedical and life Sciences, Volume 3, Issue 2, Pages: 12-15*
6. *Jordy Mottea, Rodrigo A.F. Alvarengaa, Joris W. Thybautb, Jo Dewulf. (2021). Quantification of the global and regional impacts of gas flaring on human health via spatial differentiation Environmental Pollution. Volume 291, 118213.*
7. *Ismail, O. Saheed and Umukor Ezaina (2012). Global Impact of Gas Flaring . Energy and Power Engineering, 4, 290-302.*
8. *World Bank (2000/2001). "Regulation of Associated Gas Flaring and Venting. A Global Overview and Lessons from International Experience," World Development Report, Washington.*
9. *Kahforoshan, D., Fatehifar, E., Babalou, AA., Ebrahimin,AR., Elkamel A. and Soltan mohammadzade J.S. (2008). "Modelling and Evaluation of Air pollution from a Gaseous Flare in an Oil and Gas Processing Area," WSEAS Conferences in Santander, Cantabria, 23-25 September.*
10. *Odjugo P.AO. and E. J. Osemwenkhae E.J.(2009). "Natural Gas Flaring Affects Microclimate and Reduces Maize (Zea mays) Yield," International Journal of Agriculture & Biology, Vol. 11, No. 4, pp. 408-412.*
11. *Collins C. and Oshodi, O. (2010). "Improper Abandonment of Oil," Nigerians in America. http://www.nigeriansinamerica.com/articles/4403/1/Impro per-Abandonement-Of-Oil/Page1.html.*
12. *United States Environmental Protection (USEPA) (1993). "Stationary Point and Area Sources," Compilation of Air Pollutant Emission Factors, 5th Edition, Vol. 1.*
13. *Argo J. (2002). "Unhealthy Effects of Upstream Oil and Gas Flaring," Save Our Seas and Shores (SOSS), Nova Scotia.*
14. *Canadian Public Health Association, "Background to 2000 Resolution No. 3: Gas Flaring," Canadian Public Health Association 2000 Position Paper, 2000.*
15. *Adebayo Otitoloju & Jemina Dan-Patrick (2010). Effects of gas flaring on blood parameters and respiratory system of laboratory mice, Mus musculus,. The Environmentalist volume 30, pages340–346.*
16. *World Health Organization (2000). Defining the Problem of Overweight and Obesity. InWorld Health Organization. Obesity: preventing and managing the global epidemic: report of a WHO Consultation. Geneva. 241-3.*
17. *World Health Organization (1995). Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee"854 (854):1-452.*