Comparative Study Of The Prevailing Illness In Ibeno And Its Environs In Akwa Ibom State Linked To Overload Of Air Quality Parameters

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Abstract: The impacts of gas flaring on health at Ibeno, Eket, Onna, Esit Eket and Umudike were investigated measuring air quality parameters, The results showed that the mean concentration of air parameters value were below FEPA and USEPA National air quality standards with exception of carbon monoxide which exceeded the limit of 35 ppm in March at Ibeno. Concentration of air parameters at Umudike showed a similar trend to that of study locations at Eket, Ibeno, Esit Eket and Onna. The values also decreased drastically during wet season. Statistical analysis of the data showed some correlations between CO, NH_3 and pneumonia in Esit Eket and a reduced correlation with respiratory tract infection (RTI). The result also indicates that one is likely to be infected by pneumonia when the volume of CO in air increases. It shows that when the volume of NO_2 increases, the tendency for one to be RTI infected is reduced. Another variable in this equation that affect RTI is CO. The result also shows if all other explanatory variables in this equation are kept constant a 216% increase in CO will cause1% increases in the chance of one to be infected with pneumonia in the research areas.

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1. Introduction

Air pollution has been identified as one of the most critical environmental problems confronting the Niger delta Area. The continual change of concentrated levels of certain substances in the environment is due mainly to man's activities. The adverse health effects associated with air pollution may be attributable to short-term (a few minutes to 24 hours) exposure or long-term (months to years or decades) exposure, and different pollutants may have widely different exposure–response characteristics. An extensive literature has been reviewed, for example, WHO, (2000, 2003, 2006, 2005); Maynard, (2004); Efe, (2006); Curtis et al., (2006) demonstrated the associations between exposure to the classical pollutants and ill-health endpoints such as increased hospital admissions for respiratory, cardiovascular disease and congestive heart failure, increases in asthma attacks, increases in acute bronchitis and decreased lung function. The long-term health effects of exposure to particulate matter (PM) are associated with shortening of life expectancy, increased rates of bronchitis and reduced lung function; the separate effects of long-term exposure to SO_2, NO_2, O_3 and CO are less certain, but studies have demonstrated, variously, associations with decreased lung function, increased bronchitis symptoms and increased prevalence as well as exacerbation of asthma (Brunekreef and Holgate, 2002; Maynard, 2004; Kyle et al., 2002).

The human health effects of poor air quality are far reaching, but principally affect the body's respiratory system and the cardiovascular system. Individual reactions to air pollutants depend on the type of pollutant a person is exposed to, the degree of exposure, the individual's health status and genetics (Janice, 2002). Increased levels of fine particles in the air are linked to health hazards such as heart disease (Molles, 2005) altered lung function and lung cancer. A survey was carried out on the health conditions of populations' resident and working in the Niger Delta communities (Ana and Sridhar, 2009). A study by the University of Birmingham has shown a strong correlation between pneumonia related deaths and air pollution from motor vehicles (Milton, 2005).

Carbon monoxide is a poisonous gas which reduces the oxygen carrying capacity of blood, leading to blood poisoning and subsequent death. In lower concentrations, it strains the heart and causes nausea, fatigue and dizziness and reduces visual sensitivity in the dark. There are different oxides of Nitrogen such as Nitrous (N_2O), Nitric oxide (NO) and Nitrogen dioxide (NO_2) during combustion at high temperatures such as in gas flaring. Nitric oxide reacts in the presence of Oxygen to form Nitrogen dioxide which is toxic. High concentration of suspended particulate matter (SPM) can aggravate respiratory and cardiovascular diseases. SPM can in addition corrode materials, soil panted surfaces, and damage plant leaves and reduces visibility. SPM can also cause carcinogenesis and premature mortality.

The monitoring of air pollutants in ambient air has received substantial attention over the past several years because they are among the major pollutants which significantly affect the chemistry of the atmosphere and human health (Wu et al., 2003). However, this study revealed overload of air quality parameters and comparative study of the prevailing illness in Ibeno and Its Environs in Akwa Ibom State.

2. Material and Methods

Study area

Ibeno, Eket, Onna and Esit Eket as the main study area are located in the Niger Delta region of Nigeria. Ibeno is located at Latitude 04^0 33' N and Longitude 08^0 00' E, Eket is located at Latitude 04^0 38' N and longitude 07^0 56' E, Onna is located at 04^0 37' N and Longitude 07^0 51' E, Esit Eket is located at Latitude 04^0 39' N and longitude 08^0 03' E. This area experiences a tropical climate consisting of rainy season and dry season. Onshore south-westerly winds are experienced throughout the year, due to the maritime location of the study area. Umudike in Abia state were chosen as the control location for this study.

Sample Collection.

Air parameters were sampled from March 2007 to November 2007 with the months of March, April , October and November representing dry season and May to September representing rainy Season . Rain water samples were also collected and stored in refrigerators until analyzed within 48 hours of collection. The sampling locations were labeled; Eket, Esit Eket, Ibenno, Onna and Umudike (Control sample).

Determination of air quality parameters

Crowcon Gasman Monitors were used for the determination of the ambient concentration of air parameter in each location. It operates by gas diffusion through an air filter into the sensors which is fitted directly under the air filter. The concentration of air parameters is then displayed on the output meter. The instrument is calibrated before use and was moved from one site to the other between the hours of 8 am to 12 pm.

Determination of health impacts:

Health data were collected from various health centers and hospitals from the study area. The impact of air parameters on study locations were analyzed using regression as the statistical tool.

3. Results

Table 1. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from January to March, 2006.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	674	71	NR	0
Onna	618	64	5	NR
Umudike	NR	23	87	NR
Ibeno	565	NR	25	NR
Esit Eket	623	32	7	NR

NR: Not Recorded

Table 2. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from April to June, 2006.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	729	63	NR	0
Onna	629	65	4	2
Umudike	NR	26	55	NR
Ibeno	407	NR	18	NR
Esit Eket	642	58	4	NR

NR: Not Recorded

Table 3. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from July to September, 2006.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	690	53	NR	0
Onna	695	55	3	0
Umudike	NR	46	81	NR
Ibeno	527	NR	39	NR
Esit Eket	415	36	2	NR

NR: Not Recorded

Table 4. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from October to December, 2006.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	759	54	NR	0
Onna	676	58	3	2
Umudike	NR	2	80	1
Ibeno	410	NR	16	NR
Esit Eket	449	41	6	NR

Table 5. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from January to March, 2007.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	1549	46	4	1
Onna	1007	48	7	1
Umudike	NR	67	68	NR
Ibeno	526	NR	39	NR
Esit Eket	576	81	8	NR

NR: Not Recorded

Table 6. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from April to June, 2007.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	1142	13	0	0
Onna	907	12	0	2
Umudike	NR	41	73	NR
Ibeno	410	NR	11	NR
Esit Eket	719	40	3	NR

NR: Not Recorded

Table 7. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from July to September, 2007.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	1626	14	0	0
Onna	1637	21	4	0
Umudike	NR	72	111	1
Ibeno	403	NR	24	NR
Esit Eket	455	21	2	NR

NR: Not Recorded

Table 8. Total number of consulted patients and number of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from October to December, 2007.

Location	Number of cases			
	Total no	Pneumonia	RTI	Asthma
Eket	1476	31	0	0
Onna	627	33	10	1
Umudike	NR	39	92	NR
Ibeno	304	NR	17	NR
Esit Eket	492	38	4	NR

Table 9. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from January to March, 2006.

Location	Total no	Pneumonia	RTI	Asthma
Eket	674	10.53	NR	0.00
Onna	618	10.36	0.81	NR
Umudike	NR	NR	NR	NR
Ibeno	565	NR	4.42	NR
Esit Eket	623	5.14	1.12	NR

NR: Not Recorded

Table 10. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from April to June, 2006.

Location	Total no	Pneumonia	RTI	Asthma
Eket	729	8.64	NR	0.00
Onna	629	10.33	0.64	0.32
Umudike	NR	NR	NR	NR
Ibeno	407	NR	4.42	NR
Esit Eket	642	9.03	0.62	NR

NR: Not Recorded

Table 11. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from July to September, 2006.

Location	Total no	Pneumonia	RTI	Asthma
Eket	690	7.68	NR	0.00
Onna	695	7.91	0.43	0.00
Umudike	NR	NR	NR	NR
Ibeno	527	NR	7.40	NR
Esit Eket	415	8.67	0.48	NR

NR: Not Recorded

Table 12. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from October to December, 2006.

Location	Total no	Pneumonia	RTI	Asthma
Eket	759	7.11	NR	0.00
Onna	676	8.58	0.44	0.30
Umudike	NR	NR	NR	NR
Ibeno	410	NR	3.90	NR
Esit Eket	449	9.13	1.34	NR

NR: Not Recorded

Table 13. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from January to March, 2007.

Location	Total no	Pneumonia	RTI	Asthma
Eket	1549	2.97	0.26	0.06
Onna	1007	4.77	0.70	0.10
Umudike	NR	NR	NR	NR
Ibeno	526	NR	7.41	NR
Esit Eket	576	14.06	1.39	NR

NR: Not Recorded

Table 14. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from April to June, 2007.

Location	Total no	Pneumonia	RTI	Asthma
Eket	1142	1.14	0.00	0.00
Onna	907	1.32	0.00	0.22
Umudike	NR	NR	NR	NR
Ibeno	410	NR	2.68	NR
Esit Eket	719	5.56	0.42	NR

NR: Not Recorded

Table 15. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from July to September, 2007.

Location	Total no	Pneumonia	RTI	Asthma
Eket	1626	0.86	0.00	0.00
Onna	1637	1.28	0.24	0.00
Umudike	NR	NR	NR	NR
Ibeno	403	NR	5.96	NR
Esit Eket	455	4.62	0.44	NR

NR: Not Recorded

Table16. Total number of consulted patients and percentage of patients treated for pneumonia, respiratory tract infections (RTI) and asthma in the studied locations from October to December, 2007.

Location	Total no	Pneumonia	RTI	Asthma
Eket	1476	2.10	0.00	0.00
Onna	627	5.26	1.59	0.16
Umudike	NR	NR	NR	NR
Ibeno	304	NR	5.59	NR
Esit Eket	492	7.72	0.81	NR

NR: Not Recorded

Table 17. Model summary for pneumonia

Station	NO_2	H_2S	SO_2	HCN	SPM	Cl^-	CO	NH_3
Eket	NE	-	NE	NE	NE	NE	-	NE
Onna	NE	NE	NE	NE	NE	-	+	NE
Esit Eket	NE	NE	NE	NE	NE	NE	+	+
Umudike	NE	NE	NE	NE	NE	NE	NE	NE

R^2 = 1.00, R = 1.00, Dependent variable: pneumonia, NE = No effect

Table 18. Model summary for respiratory tract infection (RTI)

Station	NO_2	H_2S	SO_2	HCN	SPM	Cl^-	CO	NH_3
Umudike	-	NE	NE	NE	NE	NE	-	NE
Ibeno	NE	NE	NE	NE	NE	NE	-	-
Onna	NE	-	NE	NE	NE	NE	-	NE
Esit Eket	NE	NE	NE	NE	NE	NE	+	+

R^2 = 1.00, R = 1.00, Dependent variable: RTI, NE = No effect

Table 19. Model summary for Asthma

Station	NO_2	H_2S	SO_2	HCN	SPM	Cl^-	CO	NH_3
Umudike	NE	NE	NE	NE	NE	NE	NE	NE
Ibeno	NE	NE	NE	NE	NE	NE	NE	NE
Onna	NE	-	NE	NE	NE	NE	+	NE
Esit Eket	NE	NE	NE	NE	NE	NE	NE	NE

R^2 = 1.00, R = 1.00, Dependent variable: Asthma, NE = No effect

4. Discussions

In Esit Eket, from the result in table 17, it could be observed that our R^2 value is 1.00. This implies that the above mention variables of NH_3 and CO accounted for pneumonia in the research area. The co-efficient of NH_3 is positive. This implies a positive relationship between NH_3 and pneumonia. This means that when the NH_3 increases it volume in the air the probability for one to catch pneumonia in the research area is very high. From the equation, it could be observed that the co-efficient of CO is positive, implying a positive relationship between the presence of CO and the tendency of one getting pneumonia. The result also indicates that one is likely to be infected by pneumonia when the volume of CO in air increases. The result also shows if all other explanatory variables in this equation are kept constant a 216% increase in CO will cause1% increases in the chance of one to be infected with pneumonia in the research area.

In Eket, the R coefficient of 1.00 shows that the correlation between the dependent variable of pneumonia and the independent variables of Cl^- and CO is 1 (table 17). The R^2 coefficient of 1.00 revealed that proportion of variance between the dependent variable and the independent variable is 100%. It implies that Pneumonia is 100 % caused by CO in the study area. From the equation, it could be observed that the coefficient of Cl^- is negative, indicating a negative relationship between the Cl^- and Pneumonia in the research area. The coefficient of CO is positive indicating that there exists a positive significant relationship between CO and pneumonia infection in the study area. The result indicates that when all other explanatory variable in this equation are held constant a 1 % increase in the number of persons affected by pneumonia will be caused by 14.9% increase in the volume of CO in the air. In Onna, The result in table 17 shows that the R-value is 1.00. It shows that there exists a correlation between the dependent variable of pneumonia and the independent variables of H_2S and CO which is negative. Also the R^2 value of 1.00 revealed that, the percentage of variance of the dependent variable accounted for by the independent variable is 100%. The coefficient of H_2S is negative indicating that there is an inverse relationship between the dependent Variable and the independent variable.

Regression analysis for respiratory tract infection (table 18) in Onna indicates that the R-value of 1.00 in the equation which shows that the correlation between the dependent variable RTI and the independent variables of H_2S and CO has a strong positive relationship. Also the R^2 value of 1 indicates that the variance in the dependent variable accounted for by the independent variable is 100%. This implies that RTI in the area has an inverse relationship with H_2S and CO.

In Umudike, from the result in that table 18, it could be observed that our R^2 value is 1.00. This implies that the above mention variables of NO_2, and

CO are 100% accounted for Respiratory tract Infection (RTI) in the research area. The coefficient of NO_2 in this equation is negative, implying that there exist a negative relationship between NO_2 and the likely hood getting RTI. It shows that when the volume of NO_2 increases, the tendency for one to be RTI infected is reduced. Another variable in this equation that affect RTI is CO. The coefficient of CO in this equation is negative indicating an inverse relationship between the presence of CO and tendencies have RTI. In Ibeno, It could be observed from table 18 that the R-value is 1.00. It shows that there exists a positive correlation between the dependent variable of RTI and the independent variables of HN_3, and CO. Also the R^2 value of 1.00 revealed that, the percentage of variance of the dependent variable accounted for by the independent variable is 100%. The coefficient of NH_3 is negative showing an inverse relationship between RTI and NH_3. The coefficient of CO in the equation is also negative indicating that RTI will varies inversely proportional to the variation in CO. In Esit Eket, the result in table 18 revealed that the R-value is 1.00. This shows that there exists a positive correlation between the dependent variable of RTI and the independent variables of NH_3, and CO. Also the R^2 value of 1.00 revealed that, the percentage of variance of the dependent variable accounted for by the independent variable is 100%. The coefficient of NO_2 in this equation is positive showing that there exists a positive relationship between NO_2 and RTI in the research area. The coefficient of H_2S is negative indicating that there is a negative relationship between H_2S and RTI. It shows that when the volume of H_2S in air decreases RTI prevalent rate in the area will likely increase. The coefficient of Cl^- is negative showing that RTI will likely increases as Cl^- decreases its volume in air. The coefficient of NH_3 is positive revealing that as the volume of NH_3 in the area under study increase, the tendency for RTI to increase is high. The coefficient of CO in the equation is positive indicating RTI the tendency to be infected with RTI is very high when the volume of CO increases in the air. It shows from the equation that if all other explanatory variables in this equation are held constant, a 9.3 % increase in CO will cause a corresponding 1 % increase in RTI in Esit Eket. In Onna, the result in table 19 shows that the R-value is 1.00. It shows that there exists a positive correlation between the dependent variable of asthma and the independent variables of H_2S and CO. Also the R^2 value of 1.00 revealed that, the percentage of variance of the dependent variable accounted for by the independent variable is 100%. The coefficient of H_2S is negative indicating that there is a negative relationship between H_2S and the tendency for one to be infected with asthma. It shows that when the volume of H_2S in air increases the tendency for one to be asthma infected decreases. The coefficient of CO in the equation is positive indicating that the asthma rate is directly proportional to the variation in CO. It shows from the equation that if all other explanatory variables in this equation are held constant, a 16.4% increase in the volume of CO will cause a corresponding 1 % increase in the prevalent asthma rate in Onna.

Conclusion

Regression of air parameters on health shows that some positive correlation exits between carbon monoxide and ammonia, on respiratory tract infection at Esit Eket carbon monoxide and ammonia also has a positive correlation with pneumonia in Eket. A negative correlation was obtained on carbon monoxide and respiratory tract infection at Ibeno which shows that there are some other factors responsible for respiratory tract infection at Ibeno. Also negative correlation was obtained between NO_2, CO at Umudike on respiratory tract infection.

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