OBSERVATIONAL AND CORRELATIONAL STUDIES ON THE EFFECTS OF INDUSTRIAL CEMENT DUST ON TERTIARY INSTITUTION STUDENTS' HEALTH STATUS AND ACADEMIC OUTPUT

[1]Adebesin, A.A.
Department of Mechanical Engineering
The Federal Polyechnic, Ilaro,
Ogun State, Nigeria.
akeem.adebesin@federalpolyilaro.edu.ng

[2]Olayiwola, J.O
Department of Computer Engineering,
The Federal Polytechnic, Ilaro, Ogun
State, Nigeria
oluwabukola.olayiwola@federalpolyilaro.edu.ng

Corresponding author: akeem.adebesin@federalpolyilaro.edu.ng

Abstract

Cement dust discharge is a major phenomenon in all cement manufacturing environment and the velocity of travel of cement dust is unquantifiable in terms of its rate of deposit and change in the aesthetic look of all materials upon which the cement dust settles. The effects of effluents released by these industries are a major causes of air pollution with its toll effects on the environment and a social problem which leads to a multitude of adverse effects on human health and standard of human life especially that of Polytechnic students at Gateway Polytechnic, Itori and Federal polytechnic Ilaro respectively. A clinical investigation and reconnaissance surveys of how students frequently visit the four primary health centres within the study areas were carried out and clinical data were collected on the various nasal and lung related diseases that students suffer from. The result of the analysis showed that there were substantial increase in the level of particulate matter emitted from these industries into the atmosphere. The consulting record shows that 85% of the students suffer from nasal related diseases such as cold, cattahr, cough, asthma, hard breathing etc. thus having a negative effect on their academic output and this is in sharp contrast to the global best practices for education. The primary findings that this paper provides will help to focus on the harmful effect of studying in a dusty environment hence the dire need to provide more health care centres equipped with the state of the art facilities so as to meet the medical needs of the teeming students' populace.

Keywords: Industrialization, employment, pollution, student, ecosystem, human- health, sustainable- environment.

1.0 INTRODUCTION

Globally, every developing nation is striving towards attaining industrialization so as to boost their Gross Domestic Product (GDP) vis -a -vis increased foreign earnings but air pollution is a major problem associated with increase in the number of manufacturing industries so as to meet both domestics needs of the teeming populace. The pollution effluents of factories into the atmosphere tends to have an adverse effect on human health and the environment where people lives; dust settles on plants and roof of buildings etc. According to Aurora et al..(1991); studied the atmospheric transport diffusion of dust and they x- rayed the wind velocity profile and diffusion coefficient in a delayed dust removal environment. The dust emission was from a line source

and the trio were monitoring the dry deposition on the ground with respect to time; the accumulated dust was then packed and fractional step method was used in the computation of the air pollutant concentration.

Lin et al..(1996) examined the atmospheric diffusion of dust from multiple sources with special interest in the wind speed and eddy diffusivity. Their study provided an analytical solutions for many boundary condition types with the application of Green's function concept to solve three dimensional analytical solutions within the region of interest. Konglok et al..(2002) demonstrated the use of finite difference method in solving two dimensional advection- diffusion equation with a point source. Finite difference was explicitly used to analyze the developed equations and the advection mode of diffusivity was determined. Venkata et al.. (2003) studied the primary and secondary pollutant sources and then developed a time- dependent model for approximating the concentration from point source while they asserted the wind velocities and eddy diffusion coefficients are the realistic value, Crank Nicholson's implicit finite difference technique and upwind difference scheme was applied to the diffusion term. Pochai, N (2011) studied the smoke dispersion from one and two point sources with obstacle domain and their developed model was used to calculate the air pollution in two dimensional space and one dimensional time by using the finite element method and finite difference method respectively.

2.0 METHODOLOGY

An econometric study of the dust velocity of travel was considered for these three institutions selected: Crescent University, Ayetoro Road (ANLG), Gateway Polytechnic, Itori (EWLG) and The Federal Polytechnic, Ilaro (YSLG) respectively.

Hypothesis 1

H_0: There is no significant relationship between industrial dust emitted and academic performance of tertiary institution students residing within these LGAs

H_1: There is significant relationship between industrial dust emitted and academic performance of tertiary institution students residing within these LGAs.

Hypothesis 11

H_0: There is no significant relationship between industrial dust emitted and health status of tertiary institution students residing within these LGAs

H_1: There is significant relationship between industrial dust emitted and health status of tertiary institution students residing within these LGAs.

2.1 Data Presentation, Analysis and Interpretation

A total of 120 structured questionnaires were prepared and distributed among tertiary institutions in the three Local Government Areas (LGAs). Four health centres were randomly selected based on their proximity to the multiple sources of dust and accessibility to students and their frequency for medical cares. A total of 105 filled questionnaires were recovered from the respondents and medical records unit of the three local government areas: Ewekoro- 35; Yewa South- 36 and Abeokuta North- 34.

Table 1: Does learning in a dusty environment causes nasal disorders?

Alternatives	**Respondents from Yewa South LGA**	**Respondents from Ewekoro LGA**	**Respondents from Abeokuta North LGA**	**Percent %**
Strongly Agree	16	17	13	43
Agree	14	12	15	39
Disagree	2	3	2	7
Indifferent	4	3	4	11
Total	36	35	34	100

Source: Field Survey, 2021

From table 1, it could be seen that 43% of the students strongly agreed, 39% agreed, 7% disagreed while 11% were indifferent that there are health challenge associated with learning in a dusty environments.

On local government basis, 36 students responded in Yewa South, 35% respondents in Ewekoro, 34 respondents in Abeokuta North Local Government areas respectively responded to the questionnaires administered.

Table 2: Does industrial dust emitted affect academic performance of tertiary institution students?

Alternatives	**Respondents from Yewa South LGA**	**Respondents from Ewekoro LGA**	**Respondents from Abeokuta North LGA**	**Percent %**

Strongly Agree	19	13	11	43
Agree	13	16	13	42
Disagree	4	4	2	10
Indifferent	2	2	1	5
Total	35	35	27	100

Source: Field Survey, 2021

Table 2 showed that 39% respondent representing various local government areas strongly agreed, 43% agreed. Summarily 85 percent of the students agreed that dust emission from industrial sites are responsible for the frequent visits to school clinics and other health centres within their localities. However, 10% of the students disagreed while 5% were indifferent to the questions.

3.0 RESULTS

3.1 Testing of Hypothesis

The acceptance or rejection of a hypothesis is based on a result of the sample taken from each population hence the dire need to calculate the relationship between the two variables by using correlation coefficient techniques in order to know and show how they are related.

X represents responses

Y represents percentages

Z represents the respondents

Hypothesis 11

This hypothesis was designed for this research work to know whether industrial dust emitted causes nasal disorder and affect students' academic performances.

Table 3 was designed to test this hypothesis correlation coefficient for hypothesis

Z	**X**	**Y%**	**XY**	**X^2**	**Y^2**

Strongly Agree	39	38	1482	1521	1444
Agree	47	44	2086	2209	1936
Disagree	12	11	132	144	121
Indifferent	7	7	49	49	49
Total	105	100	3731	3923	3550

Source: Field Survey, 2021

Applying the correlation formula:

$$R_{x-1} = \frac{\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2} - \sum X^2][N\sum Y^2 - (\sum Y)^{2c}}$$

$$= \frac{4(3731) - (105)(100)}{\sqrt{[4(3923) - (105)^2][4(3550) - (100)^2]}}$$

$$\frac{14{,}924 - 10{,}500}{\sqrt{[15{,}692 - 11025][14{,}200 - 10{,}000]}}$$

$$\frac{4{,}424}{\sqrt{(4{,}667)(4{,}200)}} = \frac{4{,}424}{\sqrt{19{,}601{,}400}}$$

$$\frac{4{,}424}{4{,}427.35}$$

r =0.9992

4.0 DISCUSSION

From the correlation theory, the correlation coefficient, r is the degree of linear relationship existing between two or more variables hence the correlation values always lie between -1 and 1 inclusive i.e. ($-1 \leq r \leq 1$). Table 2 shows that 43% of the respondents strongly agreed while 42% of the respondents agreed in the three LGAs respectively both totaling 85%.

5.0 CONCLUSION

This study attempted capturing the effect of velocity of travel of industrial dusts and its toll effects on students' health within the LGAs covered vis- a- vis their academic performance and it could be deduced that there exists a high / strong positive relationship between industrial dusts emitted causing nasal disorder and affecting students' academic performances since our calculated correlation coefficient **r = 0.9992**.

ACKNOWLEDGEMENT

We acknowledge the support and assistance of Dr. Tunde Jesusina- Medical Director Federal Polytechnic, Ilaro School Clinic, Corper Blessing of medical records unit, Mrs. Ogunmosun of Oke - Ela health centre, Dr. Famiwaiye of Ayetoro Garage health centre, Matron Adebiyi of Wasimi health centre and Matron Orelaja of Itori Health centre for their timely responses in the collation of students' medical records and questionnaire administration.

REFERENCES

Agarwal, M and Tandon, A (2010); "Modelling of the urban heat island in the form of Mesoscale wind and of its effect on air pollution dispersal, Applied Mathematics Modelling. Journal of Simulation and Computation for Engineering and Environmental Systems 34(9): 520- 2530.

Akinbo, R. Y. & Fagoyinbo, I. S (2013) Statistical Theory, Wale Prints, Somolu, Lagos State.

Arora, U, Gakkhar, S and Gupta, R.S (1991) Removal model suitable for air pollutants emitted from an elevated source, Journal of applied mathematics modelling 15(7): 386- 389

Konglok, S.A. & Tangmanee, S. (2007). A k-model for simulating the dispersion of sulfur dioxide in a tropical area; Journal of Interdisciplinary Mathematics; 10(6): 789-799.

Kouglok, S.A. & Tangmanee, S. (2002). Numeral Solution of Advection-Diffusion of an Air Pollutant by the fractional step method "Proceedings of the 3rd National symposium on Graduate Research, Na Konratchasrima, Thailand.

Lin, J.S. & Hildemann (1996). Analytical solutions of the atmospheric diffusion equation with multiple sources and height – dependent wind speed and eddy diffusivities; Journal of Atmospheric Environment, 30(2): 239-254.

Pochai, N. (2011). A finite element solution of the mathematical model for smoke dispersion from two sources. World Academic of Science, Engineering and Technology, International Journal of Mathematical Computation, Physical, Electronics; 5(12): 1968 -1972.

Sanin, N. & Montero, G. (2007). "A finite difference model for air pollution simulation", Journal of Advances in Engineering Software, 38(6): 358-365.

Venkatachallapa, M, Khan, S.K. & Kakamari, A. G. (2003). Time dependent mathematical model of air pollution due to area source with variable wind velocity and eddy diffusivity and chemical reaction, 69(2): 745-758.