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Assessment of IL-8 and CBC in people working in LPG stations in Najaf Province

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***Abstract*---**A comparative cross-sectional study was conducted on LPG stations workers in Najaf City, Iraq from December 2021 to January 2022. In which workers exposed liquefied petroleum gas (LPG) were compared with individuals who were not exposed (control group). The LPG gas plant workers were all males who work between 8 am to 2 pm daily. A total of eighty-eight (88) subjects took part in this study (control groups, n= 38 and workers, n=50) their mean age of workers 32.04 ± 1.289 years and for control 33.39 ± 1.680 years. In this study, and the mean Body Mean Index (BMI) of workers (27.30 ± 0.4479), and for control (27.87± 0.8296). The result showed a significant (P<0.05) and clear increase in the level of interleukin-8 of workers (1.538±0.4359pg/ml) compared to the control group (0.4138±0.02580 pg/ml). The current study, after conducting a statistical analysis of physiological blood tests, showed a significant (P< 0.05) and clear decrease of red blood cells(RBC), blood platelets(PLT), hemoglobin(HGB), and the percentage of hematocrit(MCT%), as it reached 4.930 ± 0.07 x10^6 cell/ml, 198.2 ± 7.8 x10^3cell/ml , 15.05 ± 0.17 g/dl, and 46.04 ± 0.41% respectively Compared to the control group (5.213 ± 0.06 x10^6 cell/ml, 222.8 ± 9.1 x10^3cell/ml, 15.72 ± 0.13 g/dl, and 49.14 ± 1.64% respectively). The study also showed a significant increase (P<0.05) of white blood cells (WBC) and the percentage of lymphocytes(LYC %) among workers who inhaled gas at gas filling stations, which reached 7.346 ± 0.21 x10^3 cell/ml and 36.35 ± 1.09 %, respectively, compared to the control group (6.652 ± 0.15 x10^3 cell/ml and 32.20 ± 1.7% respectively). The study concluded that physiological blood parameters and interleukin-8 may be indicative of one over the other in influencing lung capacity among workers in gas filling stations.

***Keywords*---** IL-8, CBC, LPG.

Introduction

The various solid and gaseous pollutants that pollute the air cause serious health effects because one third of deaths occur due to exposure to air pollutants. Pollutants have both acute and chronic effects on organ systems, deposition in tissues, and long- and short-term effects on the human body. The majority of evidence points to effects on respiratory, cardiovascular, and inflammatory diseases and diseases that affect the blood. The critical evaluation investigated the effects on subjects at risk and triggering diseases classified as physiological and psychiatric and their effects (E, 2021). It results from the following major pathophysiological changes in the lungs Chronic infection, caused by inhaling smoke or other substances that irritate the bronchi and bronchioles. The chronic infection seriously deranges the normal protective mechanisms of the airways, including partial paralysis of the cilia of the respiratory epithelium (Hall & Hall, 2020) . The Factors Affecting Rate of Gas Diffusion Through the Respiratory Membrane, one can apply the same principles to diffusion of gases through the respiratory membrane. Thus, the factors that determine how rapidly a gas will pass through the membrane are the following: (first) the thickness of the membrane. (Second) the surface area of the membrane. (third) the diffusion coefficient of the gas in the substance of the membrane. and (fourth) the partial pressure difference of the gas between the two sides of the membrane (Nicod, 2005).

LPG plant workers are exposed to a number of these hydrocarbon in fuel vapors during dispensing and gases emanating from vehicle exhausts. In the LPG work stations (Jo et al., 2013). It is obvious that LPG attendants in filing stations, drivers of gasoline trucks, service station attendants and refinery workers are more susceptible to the harms of LPG due to chronic work-related exposure (B.N. et al., 2020). Biogas is a mixture of gases mainly hydrocarbon and carbon dioxide used in domestic cooking (Austin, 1984). The normal ingredients for LPGa mixture of propane (C3H8) and butane (C4H10) gas. The LPG is stored as a liquefied gas under pressure at ambient temperature. The percentage composition of the mixture depends upon the season, as a higher percentage of propane is kept in winter and the same for butane in summer (Thompson, 2015). Liquefied petroleum gas (LPG) is produced as a by-product of the oil and gas refinery process or obtained during the natural gas production process. LPG is conceivably hazardous if mishandled, and therefore promotion of good safety practices in its retail is key. There's therefore need for simple practical advice on eliminating or reducing the risks associated with LPG cylinder retailing (Nyabuto et al., 2020). Assessment of hazards posed by LPG bottling plant operations to the environment and business continuity is critical for regulatory agencies, current LPG plant operators and intending operators (Olamigoke, 2019). Cytokines, their signals and their migration into the bloodstream, are indicative of many diseases (such as infertility, kidney failure, etc.) (Al-Msaid & Al-Sallam , 2018 ; Al-Masaoodi, et al., 2019 ; AL-Sallami & Al-Shimerty , 2021). Interleukin-8 (IL-8) is a pro inflammatorychemo-kine associated with the promotion of neutrophil chemo-taxis and degranulation(Waugh & Wilson, 2008). Here is considerable evidence to suggest that the recruitment and activation of inflammatory cells in the lung contributes significantly to the pathophysiology of pulmonary diseases. IL-8 and related chemokines are found at elevated concentrations in the circulation and in

the lungs of patients with different pulmonary diseases, Recent preclinical data indicate that inhibition of IL-8 may have beneficial effects in pulmonary disease that are not linked to inhibition of neutrophil recruitment (Hay & Sarau, 2001).

Materials and Methods

Fifty samples collected from males workers at the LPG gas station their mean age (32.04 ± 1.289) years in Najaf Province, Iraq. And thirty eight samples collected volunteers of males as a control group their mean age (33.39 ± 1.680) year which had no exposed to gas LPG. Five ml of venous blood was collected from all participants and then we divided the sample into 1 ml into tubes containing EDTA for CBC (measured by automated hematological equipment using Aboot TDX analyzer -U.S.A), 3.5 ml into a gel tube and centrifuged to separate the serum and stored in deep freezer until analyze biomarker (IL-8, its measured by ELISA technology). Lung capacity was estimated by spirometer and statistical analysis was performed using Graph Pad Prism V.5 programs for Data are expressed as mean ± SE (standard error). Using unpaired T- tests to compare between groups (Workers & control) and Mega- state with Excel programs for correlation among all the studied significant standards for workers only.

Results and Discussion
Hematological parameters

The results in table 1 and figures(from1to7) revealed significant difference (P-value<0.05) decreased with the mean± SE of RBCs, HGB, PLT as well as MCT [(RBC), (4.930 ± 0.07 x10^6 cell/ml)], [(HGB) (15.05 ± 0.17 g/dl)] [(PLT) (198.2 ± 7.8 x10^3cell/ml)] [(MCT) (46.04 ± 0.41%)]), of the workers in gas filling stations as compared with control groups [(RBC) (5.213 ± 0.06 x10^6 cell/ml)], [(PLT) (222.8 ± 9.1 x10^3cell/ml), [(HGB)(15.72 ± 0.13 g/dl)], and [(MCT) (49.14 ± 1.64%)]. These results are in agreement with the study of (Sardah *et al.*, 2013).They found that changes in hematological parameters tests and a significant decrease in HB, RBCs, MCT, in all workers compared with control group because of the long working period and the constant exposure and inhalation of volatile gas by workers in filling stations.Also The present study showed a significant effect of LPG exposure on the hematological laboratory tests of the LPG workers as compared with controls and non agree with other studies of subjects exposed to natural gas . It should be noted that there are very limited published data about the effects of long-term environmental exposure to LPG on hematological and bio- chemical parametersof different petroleum products (Saadat et al., 2004; Ukaejiofo et al., 2006).

Lung Capacity and functions

Lung capacity was estimated and measured by performing an exhaled examination of the lung using a lung capacity test device (spirometer), for workers and control group. With the availability of a portable spirometer was performed in the workplace and with appropriate training detection of the presence or absence of lung disease, measurement of lung impairment, monitoring of the effects of occupational exposure / exposure workers to LPG at the gas station. Spirometry for workers and control group was carried out as follows. N Forced expiratory

volume in one second (FEV1). N Forced vital capacity (FVC), the maximum amount of air that can be exhaled when inflated as fast as possible N Vital capacity (VC) .The results in table (1) shows significant difference at (p-value<0.05) to the workers the LPG gas station [(485.9 ± 19.90)l/min]and for control group [(382.8 ± 14.48) l/min] Scientific studies in different settings showed similar results as our study, especially concerning health complaints related to respiratory system efficiency (Sirdah*et al.*, 2013). These health-related complaints of LPG workers are likely to be due to the pharmacological effect of LPG. Inhalation of gaseous propane (the major component of LPG) is known to cause dizziness, nausea, vomiting, confusion, hallucinations and a feeling of euphoria (Wu et al., 2003). Our results also agree with to the results obtained from other settings for LPG Two autopsy cases of men who died while connecting a liquefied petroleum gas (LPG). Their blood concentrations of propane (the main content of LPG) were higher. The cause of death after exposure of LPG has generally been considered to be asphyxia from hypoxia. The large differences in the blood propane levels found here and reported in the literature, however, suggest that direct toxic effects of propane poisoning may be the cause of death in some cases. ((Fukunagaa & Yamamoto, 1996;Sugie et al., 2004).

Interleakin-8 biomarker

The results in table (1) shows significant (p-value<0.05) increase with mean± SE of IL-8 to the workers [(1.538 ± 0.4359)(pg/ml)] as compared with control group[(0.4138 ± 0.02580)(pg/ml)].From others study have shown IL-8, an 8.5-kD potent chemo-attractant and activator of neutrophils, is released by bronchial epithelial cells in response to a variety of inflammatory stimuli and revealed highpositive correlation between serum IL-8 and Lung inflammatory (McElvaney et al., 1992). Interleukin 8 (IL-8) is a pro-inflammatory cytokine that has a role in neutrophil activation and has been identified within the pathogenesis and progression of this disease. The crucial role of IL-8 in lung inflammation and disease pathogenesis might suggest IL-8 as a possible new therapeutic target to efficiently modulate the hyper inflammatory response(Cesta et al., 2022). Numerous observations have established IL-8 as a key mediator in neutrophil-mediated acute inflammation due to its potent actions on neutrophils. However, several lines of evidence indicate that IL-8 has a wide range of actions on various types of cells, including lymphocytes, monocytes, endothelial cells, and fibroblasts, besides neutrophils. The discovery of these biological functions suggests that IL-8 has crucial roles in various pathological conditions such as chronic inflammation and cancer (Mukaida, 2003). from others studies have shown in pulmonary diseases Resist in-like molecule β (RELMβ) can promote the expression of the inflammatory cytokines IL-8 and IL-1β in bronchial epithelial cells of patients with Chronic obstructive pulmonary disease (COPD) and exert inflammatory effects. RELMβ may be a potential target for the treatment of COPD (Che et al., 2021). According to the available international published work, no other studies or tests have been performed to know the effect of LPG on IL-8 biomarker. But through research and published studies, it was shown that IL-8 has a direct relationship with inflammatory effects, especially with infections that affect the respiratory system.

Table 1: Biochemical and hematological parameters in workers compared with the control

Parameters	Mean ± SE		p-value
	Workers n=50	Control Group n=38	
Age (year)	32.04±1.289	33.39±1.680	0.5167
Working period (years)	7.760±0.7562	7.763±0.8824	0.9978
(BMI)	27.30±0.4479	27.87±0.8296	0.5266
IL-8 (pg/ml)	1.538±0.4359*	0.4138±0.02580	0.0274
Lung capacity (l/min)	485.9 ± 19.90*	382.8 ± 14.48	< 0.0001
RBC (x10^6 cell/ml)	4.930 ± 0.07 *	5.213 ± 0.06	0.0152
HGB g/dl	15.05 ± 0.17 *	15.72 ± 0.13	0.0043
HCT (%)	46.04 ± 0.41 *	49.14 ± 1.64	0.0424
PLT (x10^3cell/ml)	198.2 ± 7.8 *	222.8 ± 9.1	0.0427
WBC (x10^3 cell/ml)	7.346 ± 0.21 *	6.652 ± 0.15	0.0145
LYM %	36.35 ± 1.09 *	32.20 ± 1.7 %	0.0364

*significant difference at P<0.05.

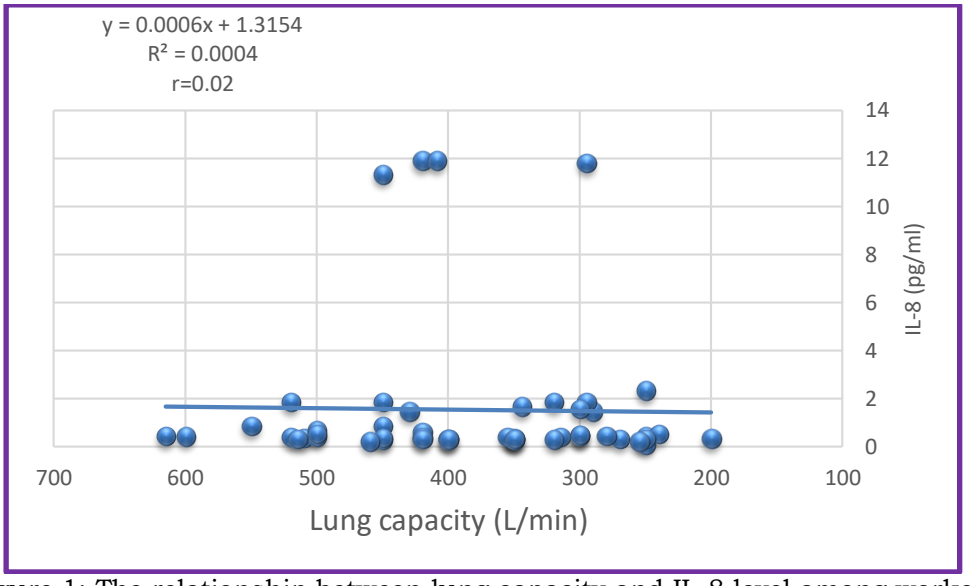

Figure 1: The relationship between lung capacity and IL-8 level among workers who inhale gas at gas filling stations with lung capacity.

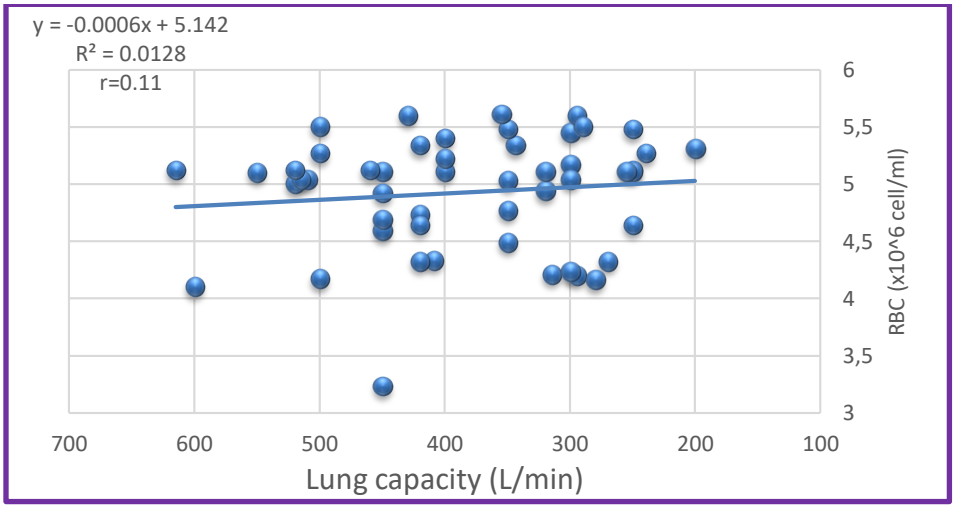

Figure 2: The relationship between lung capacity and RBC level among workers who inhale gas at gas filling stations with lung capacity

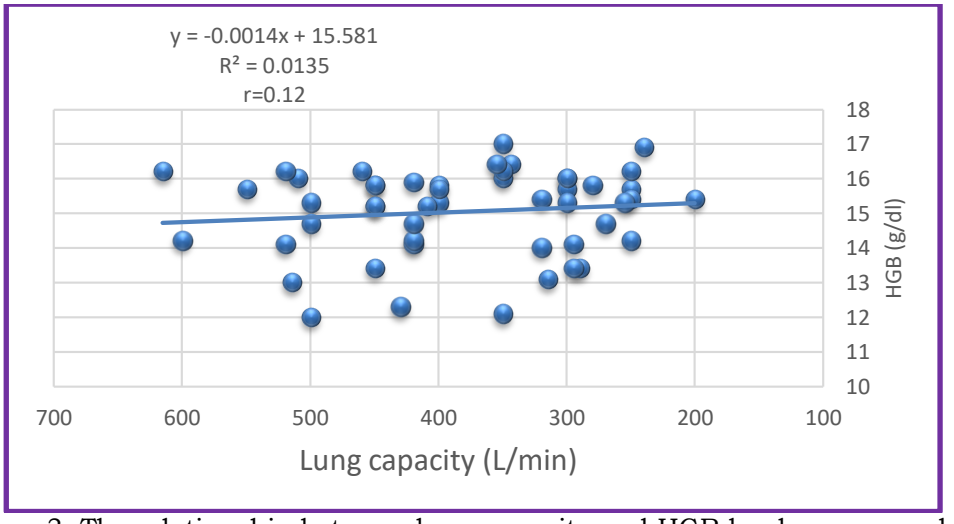

Figure 3: The relationship between lung capacity and HGB level among workers who inhale gas at gas filling stations with lung capacity.

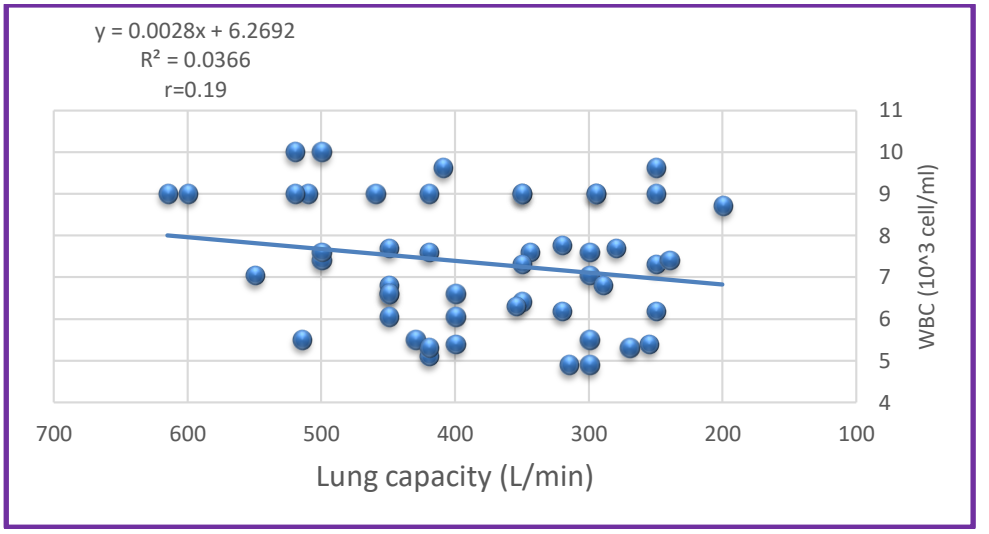

Figure 4: The relationship between lung capacity and WBC level among workers who inhale gas at gas filling stations with lung capacity.

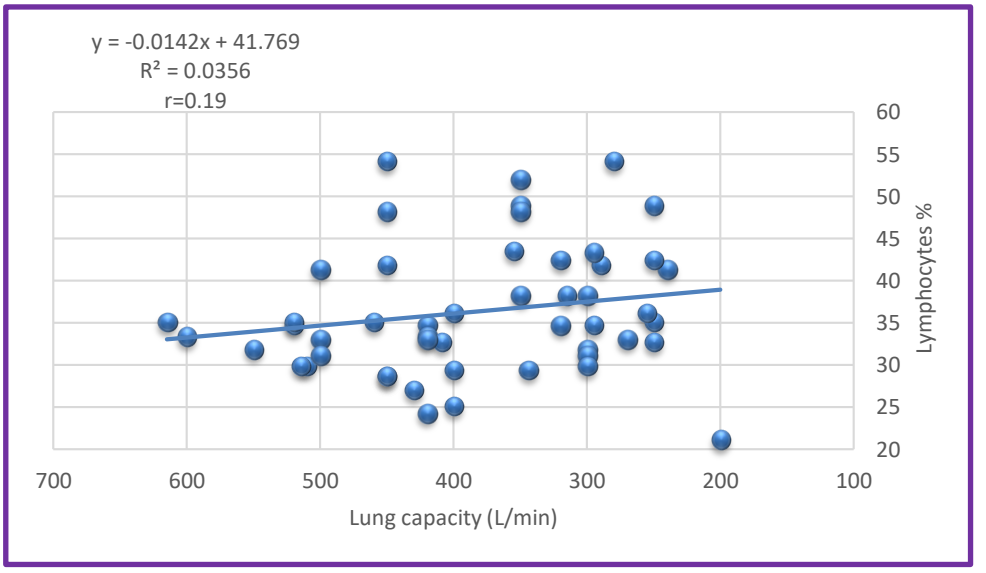

Figure 5: The relationship between lung capacity and LYC% level among workers who inhale gas at gas filling stations with lung capacity.

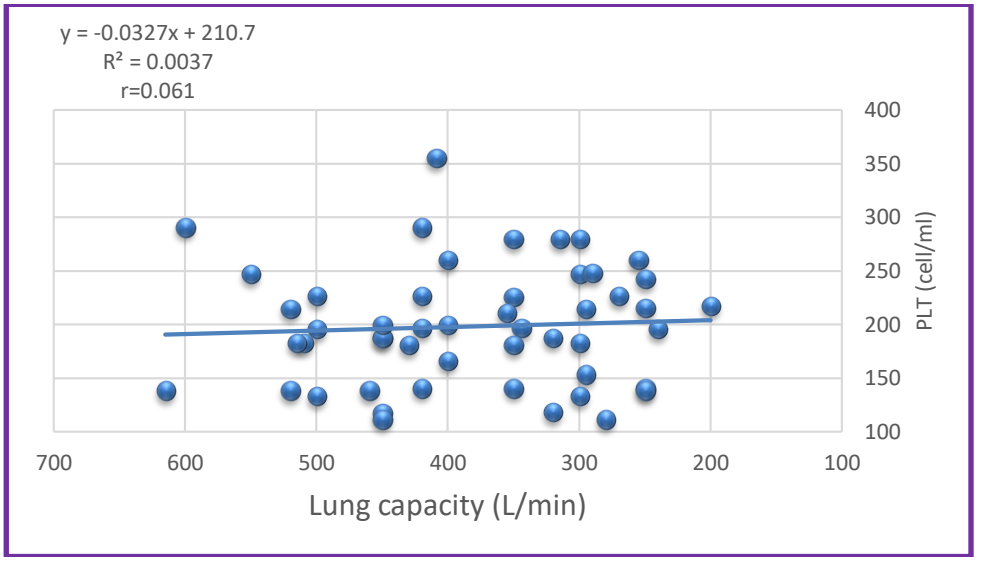

Figure 6: The relationship between lung capacity and PLT level among workers who inhale gas at gas filling stations with lung capacity.

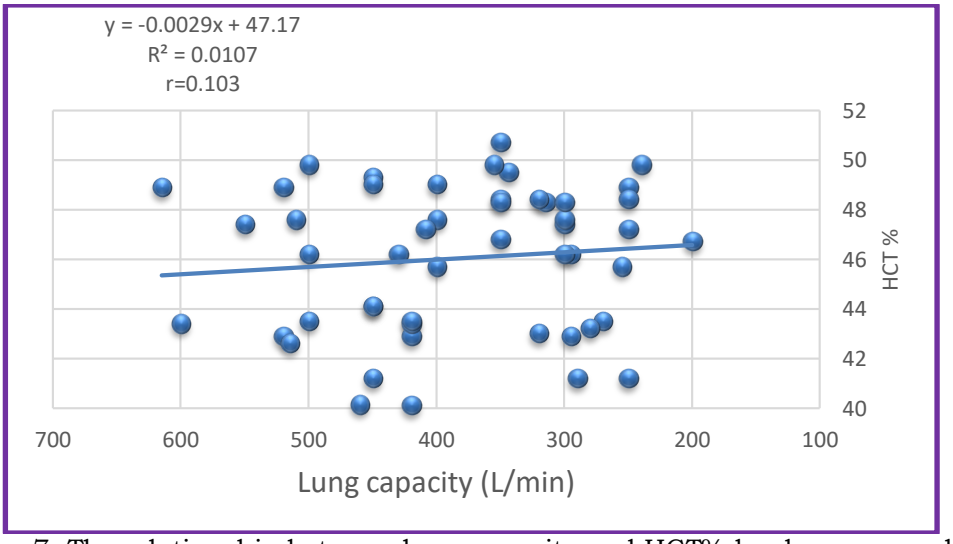

Figure 7: The relationship between lung capacity and HCT% level among workers who inhale gas at gas filling stations.

Conclusion

Physiological blood parameters and interleukin-8 may be indicative of one over the other in influencing lung capacity among workers in gas filling stations.

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