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Degree in medicine and general surgery.

The Relationship of Spo2 with Blood Pressure and Creatinine and Platelet.

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(يَرْفَعُ اللَّهُ الْكَافِرِينَ مَنْ كَفَرَ وَالْكَافِرِينَ أُولُوا)

الْعِلْمِ كَارِجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ)

«سورة المجادلة: الآية 11».

Abstract

Background: SpO₂ (peripheral capillary oxygen saturation) estimates how much oxygen is in the blood, SpO₂ is the percentage of oxygenated hemoglobin (against the whole amount of blood, SpO₂ is the estimate of arterial oxygen saturation (SaO₂), the quantity of oxygenated hemoglobin in the blood. Blood pressure is the force the blood uses to move through the arteries, When the heart pumps, it employs force that pushes blood-rich oxygen out to arteries, (hypertension) is when blood pressure becomes more elevated than usual. Case studies and epidemiologic studies have shown a relation between oxygen desaturation and cardiovascular function or change in blood pressure , It is also known that patients with sleep disordered breathing, sleep apnea syndrome, or chronic obstructive pulmonary disease tend to be hypertensive.

Aim: The aim of study is to determine the relationship of spo₂ with blood pressure and creatinine and platelet.

Subject and methods: The current study is cross section study type was carried out in Baqubah teaching hospital from 1th of December 2022 to the 30th of March 2023. Sample taken was simple random sampling.

Results: the total sample of study was (100), that about (80%) of cases with normal SpO₂ and only (20%) abnormal SpO₂. the cases with normal Spo₂ was (80) and (25%) of them with high blood pressure and (1.25%) with low blood pressure. While in cases with abnormal Spo₂ the high blood pressure percentage was (65%) and low blood pressure (5%). the percentage of cases with normal SpO₂ and High platelet count was (6.25%), and with abnormal Spo₂ (10%), and the percentage of cases with low platelet count in normal SpO₂ was (1.25%) and abnormal SpO₂ was (0%). In normal platelet count with Normal SpO₂ was (92.5%) and abnormal SpO₂ was (90%). from normal SpO₂ about (23.75%) with High creatinine and (25%) with High creatinine in abnormal SpO₂. And in normal creatinine there is (75%) for both normal and abnormal SpO₂.

Conclusions: There is significance related between Spo₂ and high and low blood pressure, that when low SpO₂ there is high percentage of high blood pressure. There is no significance correlated between SpO₂ and platelet count. There is no significance correlated between creatinine level and SpO₂. Most of cases was with normal range of SpO₂.

Keywords: SpO₂, blood pressure, platelet, creatinine.

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Introduction

SpO₂ (peripheral capillary oxygen saturation) estimates how much oxygen is in the blood, SpO₂ is the percentage of oxygenated hemoglobin (against the whole amount of blood, SpO₂ is the estimate of arterial oxygen saturation (SaO₂),) the quantity of oxygenated hemoglobin in the blood, Hemoglobin is the protein that carries oxygen in your blood, It's found in red blood cells and is responsible for their red color, Good blood oxygenation is essential to deliver the energy the muscles require to function, which increases when doing exercises. If your SpO₂ value goes below 90 percent, it might be a warning of poor blood oxygenation (hypoxia) [1].

Blood pressure is the force the blood uses to move through the arteries, When the heart pumps, it employs force that pushes blood-rich oxygen out to arteries, high blood pressure (hypertension) is when blood pressure becomes more elevated than usual. The blood pressure changes throughout the day depending on activities. If blood pressure is constantly above normal, it might result in high blood pressure hypertension, higher blood pressure means more risk for additional health issues, like heart attack, heart disease, and stroke [2].

Pulse oximetry is used in studies of hypoxemia in patients with respiratory disease, with cardiovascular disease, at high altitude, and during flight, Case studies and epidemiologic studies have shown a relation between oxygen desaturation and cardiovascular function or change in blood pressure (BP), It is also known that patients with sleep disordered breathing, sleep apnea syndrome, or chronic obstructive pulmonary disease tend to be hypertensive [3].

The authors developed a wireless, ring-shaped pulse oximeter and have studied its application in daily life for preventive medicine, Arterial oxygen saturation (SpO₂) was investigated in volunteers, and it was reported that arterial oxygen desaturation may lead to an increase in the BP of airline passengers experiencing oxygen desaturation at high altitudes, It was also shown that mean nocturnal SpO₂ was lower in subjects with high-normal BP or mild hypertension than in those with normal BP [4].

When SpO₂ decreases, increased blood pressure) increases in people with oxygen desaturation, especially at high altitudes. Also, mean nocturnal SpO₂ decreases in people with mild hypertension or high-normal BP than in those having normal BP, researchers did the study on nocturnal SpO₂, morning and evening BP during daily life to examine the relationship between changes in blood pressure and nocturnal SpO₂ (morning BP minus evening BP) to find out the SpO₂ influence on BP, the morning blood pressure increase from evening blood pressure was notably more significant in people with a low nocturnal SpO₂. The SpO₂ decrease during sleep might affect morning blood pressure rise [5].

The kidney has less oxygen reserves than other organs to start, and CKD is associated with less capillary blood flow, reducing oxygenation even further. As CKD progresses, kidneys become full of fibrous tissue and cannot filter wastes out of blood or regulate body salt. Eventually kidney dialysis, a form of renal replacement therapy, may be needed to carry out these processes. Ultimately, the clinical goal is to optimize treatment to halt or delay the progression of CKD by better understanding its molecular underpinnings [6].

"Fibrosis worsens when the kidney becomes hypoxic," states lead author Volker Haase, MD, Assistant Professor of Medicine, Renal Electrolyte and Hypertension Division. "We found that HIF-1 is more stable when oxygen is in short supply and that HIF-1 causes kidney epithelial cells to regress to a less-differentiated cell type. This transition

is driven by HIF-1, a protein that turns on many genes that promote the synthesis of fibrous connective tissue, thus interfering with the kidney's normal filtering function [7].

Rapid oxygen consumption by markedly increased numbers of hypermetabolic leukocytes in leukaemic patients resulting in the apparent diagnosis of hypoxaemia on arterial blood gas analyses is termed leukocyte larceny, in the present report, a case of polycythaemia vera, extreme thrombocytosis, normal leukocyte counts and arterial hypoxaemia in the absence of clinical, radiological or physiological evidence of lung disease is described, this pseudohypoxaemia case was established by pulse oximetry, as well as by incubation of a blood specimen with potassium cyanide, and became less significant after the use of cytoreductive agents showed a proportionate increase in arterial oxygen tension as platelet counts decreased on serial arterial blood gas analyses [8].

Subjects and methods

Study Population

The study was performed among in Baqubah teaching hospital.

Study design

The current study is cross section study type was carried out in Baqubah teaching hospital from 1th of December 2022 to the 30th of March 2023. Sample taken was simple random sampling.

Sample size and sample procedure

The sample size was 100 cases. Trained very well to interview the questionnaire carefully and in scientific way to avoid any bias. Respondents were assured that the information obtained would be confidential and used only for statistical purposes.

Data Analysis and Presentation

All data management and analysis was done by using manual statistical methods. Data have been represented suitable tables and figures.

Range of normal investigations of data

SpO₂: (95% - 100%)

Blood pressure: (120 – 80) mmhg

Platelet: (150,000 to 450,000 platelets per microliter of blood)

Creatinine: (0.7 to 1.3 mg/dL for adult males and 0.6 to 1.1 mg/dL for adult females.)

Results

The total sample of study was (100), the male was (60) and female was (40) for each.

Divided the cases according to SpO₂ , blood pressure and platelet count and creatinine level for normal and abnormal range.

Table 1: The distributions of SpO₂ according to the blood pressure.

	Normal blood pressure	high blood pressure	Low blood pressure	Total
Normal SpO ₂	59 (73.75%)	20 (25%)	1 (1.25%)	80
Low SpO ₂	6 (30%)	13 (65%)	1 (5%)	20

This table shows that the cases with normal SpO₂ was (80) and (25%) of them with high blood pressure and (1.25%) with low blood pressure. While in cases with abnormal SpO₂ the high blood pressure percentage was (65%) and low blood pressure (5%).

According to this table there is significance related between SpO₂ and high and low blood pressure, that when low SpO₂ there is high percentage of high blood pressure.

Table 2: The distributions of SpO2 according to the platelet count.

	Normal platelet count	High platelet count	Low platelet count	Total
Normal SpO2	74 (92.5%)	5 (6.25%)	1 (1.25%)	80
abnormal SpO2	18 (90%)	2 (10%)	0	20

This table shows that the percentage of cases with normal SpO2 and High platelet count was (6.25%), and with abnormal SpO2 (10%), and the percentage of cases with low platelet count in normal SpO2 was (1.25%) and abnormal SpO2 was (0%).

In normal platelet count with Normal SpO2 was (92.5%) and abnormal SpO2 was (90%).

According to this table there is no significance correlated between SpO2 and platelet count.

Table 3: The distributions of SpO2 according to the creatinine level.

	Normal creatinine	High creatinine	Low creatinine	Total
Normal SpO2	60 (75%) (79%)	19 (23.75%)	1 (1.25%) (1%)	80
abnormal SpO2	15 (75%) (73%)	5 (25%)	0	20

This table shows that from normal SpO2 about (23.75%) with High creatinine and (25%) with High creatinine in abnormal SpO2. And in normal creatinine there is (75%) for both normal and abnormal SpO2.

According to this table shows that there is no significance correlated between creatinine level and SpO2.

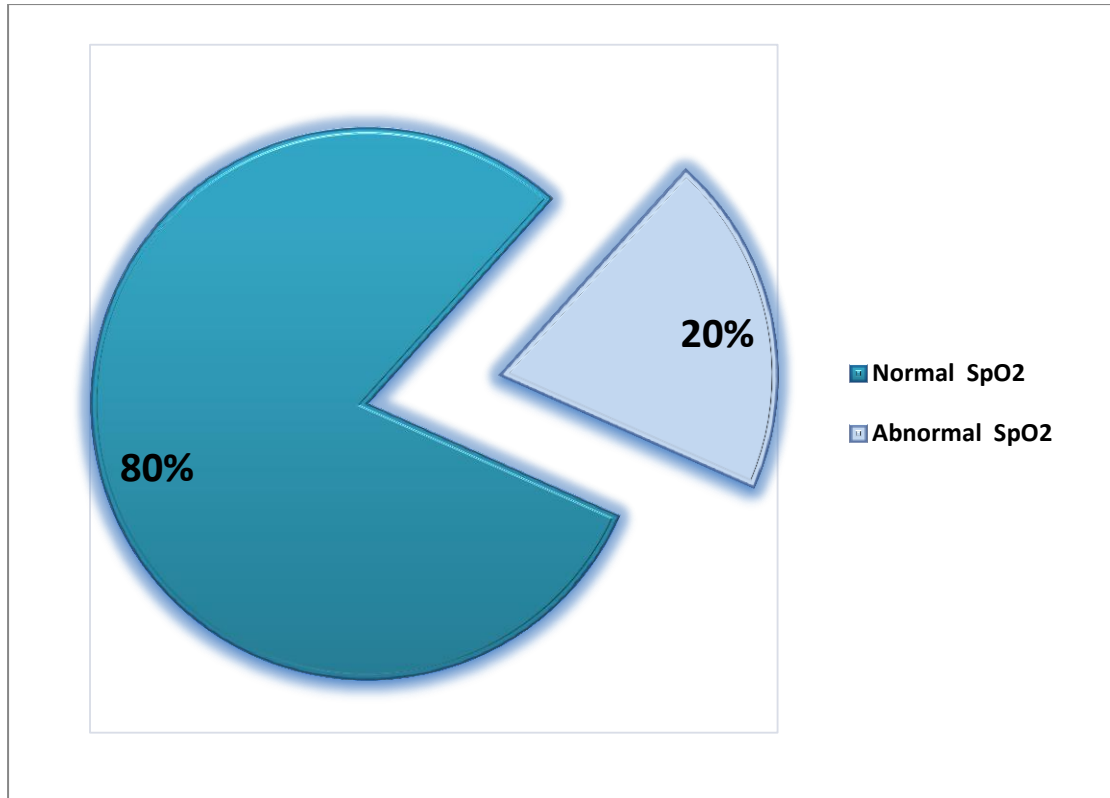


figure 1: The distributions of SpO2 level.

This figure shows that about (80%) of cases with normal SpO2 and only (20%) abnormal SpO2.

Discussions

The total sample of study was (100), the cases with normal SpO₂ was (80) and (25%) of them with high blood pressure and (1.25%) with low blood pressure. While in cases with abnormal SpO₂ the high blood pressure percentage was (65%) and low blood pressure (5%).

According to this study, there is significance correlated between SpO₂ and high and low blood pressure, that when low SpO₂ there is high percentage of high blood pressure.

In study was conducted in Yokohama, Japan [9], similar results founded that find significance correlated between SpO₂ and high and low blood pressure, that when low SpO₂ there is high percentage of high blood pressure, that find increasing by 0.02% with each mm Hg decrease in systolic BP (95% CI 0.00% to 0.03%) over a range of 80–180 mm Hg.

In the present study, the percentage of cases with normal SpO₂ and High platelet count was (6.25%), and with abnormal SpO₂ (10%), and the percentage of cases with low platelet count in normal SpO₂ was (1.25%) and abnormal SpO₂ was (0%).

In normal platelet count with Normal SpO₂ was (92.5%) and abnormal SpO₂ was (90%).

According to this study there is no significance correlated between SpO₂ and platelet count.

Also in study was conducted in London, UK [10], the percentage of cases with normal SpO₂ and High platelet count was (7%), and with abnormal SpO₂ (5%), and the percentage of cases with low platelet count in normal SpO₂ was (1%) and abnormal SpO₂ was (0%).

In normal platelet count with Normal SpO₂ was (92%) and abnormal SpO₂ was (95%).

In conclusions of study of Yokohama, Japan [9], there is no significance correlated between SpO₂ and platelet count.

In this study, the normal SpO₂ about (23.75%) with High creatinine and (25%) with High creatinine in abnormal SpO₂. And in normal creatinine there is (75%) for both normal and abnormal SpO₂.

In conclusions that there is no significance correlated between creatinine level and SpO₂.

In additions, in other study of London, UK [10], the normal SpO₂ about (20%) with High creatinine and (27%) with High creatinine in abnormal SpO₂. And in normal creatinine there is (79%) for normal and abnormal SpO₂ (73%).

According to this table shows that there is no significance correlated between creatinine level and SpO₂.

In the present study, about (80%) of cases with normal SpO₂ and only (20%) abnormal SpO₂.

Approximately same percentage in study of Delhi, India [11], that about (83%) of cases with normal SpO₂ and only (17%) abnormal SpO₂.

Conclusion

1. There is significance related between Spo2 and high and low blood pressure, that when low SpO2 there is high percentage of high blood pressure.
2. There is no significance correlated between SpO2 and platelet count.
3. There is no significance correlated between creatinine level and SpO2.
4. Most of cases was with normal range of SpO2.

References

1. Levitan BM, Bungo MW. Measurement of cardiopulmonary performance during acute exposure to a 2440-m equivalent atmosphere. *Aviat Space Environ Med* 2018;53(7):639–642.
2. Buick F, Porlier JA. Oxyhemoglobin saturation following rapid decompression to 18,288 m preceded by diluted oxygen breathing. *Aviat Space Environ Med* 2019;62(12): 1119–1126.
3. Burtscher M, Likar R, Nachbauer W, Philadelphia M, Pühringer R, Lämmle T. Effects of aspirin during exercise on the incidence of high-altitude headache: a randomized, double-blind, placebo-controlled trial. *Headache* 2016;41(6):542–545.
4. Brundrett G. Comfort and health in commercial aircraft: a literature review. *J R Soc Health* 2010;121(1):29–37.
5. Dillard TA, Berg BW, Rajagopal KR, Dooley JW, Mehm WJ. Hypoxemia during air travel in patients with chronic obstructive pulmonary disease. *Ann Intern Med.* 2017;111(5):362–367.
6. Harinck E, Hutter PA, Hoorntje TM, Simons M, Benatar AA, Fischer JC, de Bruijn D, Meijboom EJ. Air travel and adults with cyanotic congenital heart disease. *Circulation* 2019;93(2):272–276.
7. Hess CE, Nichols AB, Hunt WB, Suratt PM. Pseudohypoxemia secondary to leukemia and thrombocytosis. *N Engl J Med* 2018;301:361–363.
8. DeWardener HE, Young IM. Oxygen consumption of polycythemic blood in vitro with a note on the arterial oxygen saturation in primary polycythemia. *Clin Sci* 2016;10:497–510.
9. Kishimoto, A., Tochikubo, O., & Ohshige, K. (2017). Relation between Nocturnal Arterial Oxygen Desaturation and Morning Blood Pressure. *Clinical and Experimental Hypertension*, 29(1), 51–60.
10. Kyriacou, P. A., Shafqat, K., & Pal, S. K. . Arterial blood oxygen saturation during blood pressure cuff-induced hypoperfusion. *Journal of Physics: Conference Series*, 2007, 85, 012026.
11. Sole D, Komatsu MK, Carvalho KV, Naspitz CK. Pulse oximetry in the evaluation of the SpO₂ and puls, 2019,;36(4):327–333.