Evaluate the Distribution of Oxygen Saturation in Asymptomatic Adults and to Find the Effect of Body Mass Index in Oxygen Saturation Values in Aseer Region, Saudi Arabia

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ABSTRACT

Introduction: At high altitudes, high altitude oxygenation improves oxygenation or enriches the body with more oxygen. Low oxygen saturation levels or desaturation of an individual's blood can occur at high elevations. Low atmospheric pressure at high elevations causes this to happen. The extent to which hemoglobin is bound or saturated to oxygen is referred to as oxygen saturation levels.

Methods: In this cross-sectional study, data were collected by the purposely constructed questionnaire. A questionnaire composed of the demographic items and items related to the SpO2, obesity and demographics. A questionnaire was constructed after the series of discussions between the panel of experts this panel was composed of a subject specialist, researcher, language expert. Cronbach alpha of the questionnaire was calculated. The study was conducted in the Aseer region of Saudi Arabia.

Results: Out of total 332 patients, mean (SD) of age DBP, Pulse, RR SBP and SpO2 were 29.5(12.74), 78.94(13.40), 81.03(13.45), 17.93(2.23), 12.8.40(16.43), 95.85(2.74). BMI did not have significant relationship with SpO2.

Conclusion: This must be factored into considerations in ambulatory programs for overweight people, particularly those with heart disease, because it may contribute to angina. Through the development of emphysema, COPD, and chronic bronchitis, smoking is linked to reduced oxygen saturation. Smoking was linked to a drop in SpO2.
Keywords: SpO2, Body mass index, Patients, Risk factors, Saturation

INTRODUCTION

At high altitudes, high altitude oxygenation improves oxygenation or enriches the body with more oxygen. There are three altitude zones, according to the Society of Mountain Medicine (Effects of high altitude on humans):

1500-3500 meters above sea level is considered high altitude (4900-11500 ft.)
3500 -5500 meters above sea level is a very high altitude (11500 to 18000 ft.)
Above 5500 meters above sea level is considered extreme altitude (18000 ft.)[1]

Low oxygen saturation levels or desaturation of an individual's blood can occur at high elevations. Low atmospheric pressure at high elevations causes this to happen. The extent to which hemoglobin is bound or saturated to oxygen is referred to as oxygen saturation levels[2]. Pulse oximeters are non-invasive devices that measure arterial oxyhemoglobin saturation (SpO2), which is represented as SpO2. Hypoventilation, ventilation – perfusion mismatch, right to left shunts, lower diffusion capacity, and reduced oxygen partial pressure in inspired air are all causes of decreased arterial oxygen saturation[3,4].

There is limited knowledge about the distribution of resting SpO2 values in a general adult population. One study applied pulse oximetry in the selection of patients for spirometry in order to diagnose chronic obstructive pulmonary disease (COPD), but was not found useful[4].

Although there is no definite cut-off threshold for aberrant oxygen saturation, several studies employ a SpO2 of 95 %[2]. In COPD patients, a resting SpO2 of 95 % has been observed to predict oxygen desaturation during sleep[3] and exercise[4]. A SpO2 of 95% has also been found as a risk factor for pulmonary problems after surgery. When screening for respiratory failure in COPD, a cut-off value of 92 % has been employed. Lower SpO2 has been found as a risk factor for exacerbations and mortality in COPD patients[5,6].

One published a study on pulse oximetry reference values for children aged 5 days to 24 months residing in Bogota, Colombia, at an altitude of 2640 meters above sea level. They discovered that the data was normally distributed, with a mean (SD) of 93.3 % and 95% confidence intervals (CI) ranging from 93.0 to 93.6 %. At an altitude of 1640 meters above sea level, Bakr et al. examined oxygen saturation of term babies at birth, one hour, and 24-hours. These levels were significantly lower than those at sea level (94.3 % SpO2 at one hour of birth and 95.4 % at 24-hours of delivery), according to the researchers[7-9].

Obesity is linked to an increase in visceral and abdominal fat Both of these factors contribute to greater chest and diaphragm resistance. Obesity boosts inflammatory cytokine levels indirectly, which contributes to

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sleep apnea and low arterial PO2 The usual diaphragmatic breathing gives way to intercostal breathing to lessen the effort required during inspiration, especially in chronic obesity This results in a decrease in tidal volume and an increase in respiratory rate. As a result of the diminished lung perfusion, venous ad mixture develops[10-12].

Obesity was a significant independent contributor to low SpO2, with effects comparable to or greater than other clinically related variables[13]. Obesity has a restrictive effect on lung function, resulting in decreased chest wall compliance, as well as diminished lung volumes and capacities.

Body mass index was found to be inversely linked with SpO2 in an aged group. Obesity was a significant independent cause to low SpO2, with effects comparable to or greater than other clinical variables frequently linked to low SpO2. Obesity has an impact on lung function and oxygen exchange[14,15].

The main aims of these study is to:
To determine the distribution of oxygen saturation in asymptomatic adults and to find the effect of altitude in SpO2 values.

To determine if high altitude may affect SpO2 Values.
To determine the impact of BMI on SpO2 Values.

METHODS

In this cross-sectional study, data were collected by the purposely constructed questionnaire. A questionnaire composed of the demographic items and items related to the SpO2, obesity and demographics. A questionnaire was constructed after the series of discussions between the panel of experts this panel was composed of a subject specialist, researcher, language expert. Cronbach alpha of the questionnaire was calculated. The study was conducted in the Aseer region of Saudi Arabia.

After collection of data, data were coded and entered in the SPSS ver.20 software for analyses descriptive statistics (mean standard deviation, frequencies and %s were computed), to measure the significance differences t-test and chi-square test was used at 5% level of significance Ethical approval was obtained from King Khalid University, Saudi Arabia. The study duration was from January-2021 to April-2021. Data was collected from the patient files visited to the ------- hospital

RESULTS

As per table 1 mean (SD) of age DBP, Pulse, RR SBP and SpO2 were 29.5 (12.74), 78.94 (13.40), 81.03 (13.45), 17.93 (2.23), 12.8.40 (16.43), 95.85 (2.74).

Table 1: Descriptive statistics

	Minimum	Maximum	Mean	Std. Deviation
Age	9.00	95.00	29.5769	12.74359
DBP	23.00	135.00	78.9438	13.40379
Pulse	43.00	129.00	81.0385	13.45313
RR	10.00	25.00	17.9379	2.23387
SBP	86.00	203.00	128.4024	16.43197
SPO2	68.00	100.00	95.8550	2.74099

As per figure 1, 12.1% were obese, 42.3% have normal weight while 38.5% have healthy weight.

As per table 2, we have observed significant differences while comparing BMI with DBP and SBP.

Table 2: Comparision of BMI with other variables

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	DBP	.009	.004	.146	2.362	.019
	SPO2	.022	.015	.076	1.434	.152
	SBP	.008	.003	.162	2.598	.010
	RR	.007	.019	.021	.393	.694
	PULSE	.004	.003	.060	1.116	.265

a. Dependent Variable: BMI

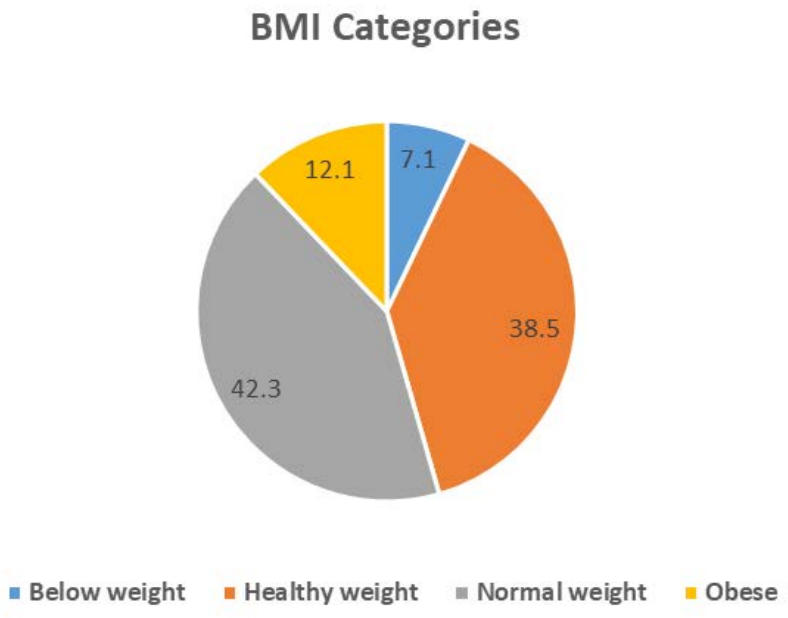

Figure 1: BMI Categories

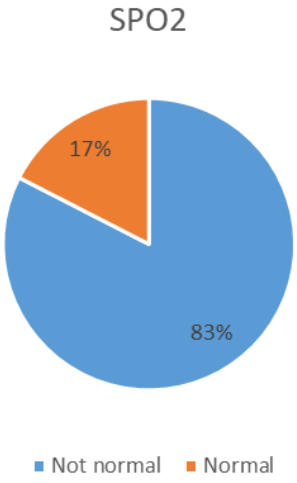

Figure 2:

As per table 3, <BMI and age have significant correlations.

Table 3: Correlations

Correlations								
		Age	**DBP**	**Pulse**	**RR**	**SBP**	**SpO2**	**BMI numeric**
Age	Pearson Correlation	1	.123*	.092	.000	.151**	.060	.324**
	Sig. (2-tailed)		.023	.091	.995	.006	.275	.000
DBP	Pearson Correlation	.123*	1	.086	.054	.508**	.019	.215**
	Sig. (2-tailed)	.023		.116	.321	.000	.724	.000
Pulse	Pearson Correlation	.092	.086	1	.025	-.071	-.120*	.033
	Sig. (2-tailed)	.091	.116		.653	.191	.028	.542
RR	Pearson Correlation	.000	.054	.025	1	.167**	.006	.066
	Sig. (2-tailed)	.995	.321	.653		.002	.908	.225
SBP	Pearson Correlation	.151**	.508**	-.071	.167**	1	.056	.247**
	Sig. (2-tailed)	.006	.000	.191	.002		.305	.000
SpO2	Pearson Correlation	.060	.019	-.120*	.006	.056	1	.041
	Sig. (2-tailed)	.275	.724	.028	.908	.305		.453
BMI	Pearson Correlation	.324**	.215**	.033	.066	.247**	.041	1
	Sig. (2-tailed)	.000	.000	.542	.225	.000	.453	
*. Correlation is significant at the 0.05 level (2-tailed).								
**. Correlation is significant at the 0.01 level (2-tailed).								

As per table 4, BMI categories have significant relationship with gender and cardiac diseases.

Table 4:

		Cardiac diseases	
		No	**Yes**
BMI	Under weight	24	0
	Healthy Weight	130	0
	Overweight	143	0
	Obese	35	6
p	0.044		
		Gender	
		Female	**Male**
BMI	Under weight	0	24
	Healthy Weight	41	89
	Overweight	30	113
	Obese	4	37
p	0.001		

As per table 5, BMI did not have significant relationship with SpO2.

Table 5:

Count				
		SpO2		Total
		Normal	Not Normal	
BMI	Under weight	7	17	24
	Normal weight	46	84	130
	Over weight	41	102	143
	Obese	12	29	41
Total		106	232	338
p=0.660				

As per figure 2, 83% have abnormal SpO2.

As per table 6, Smoking and SpO2 did not have any significant relationship.

Table 6: Smoking history * SpO2

		SpO2		Total
		Normal	Not Normal	
Smoking history	Current smoker	12	39	51
	Never smoked	92	188	280
	Previously smoker	2	5	7
Total		106	232	338
p=0.413				

DISCUSSION

Low oxygen saturation levels or desaturation of an individual's blood can occur at high elevations. Low atmospheric pressure at high elevations causes this to happen. The extent to which hemoglobin is bound or saturated to oxygen is referred to as oxygen saturation levels[5]. The index finger is the most common location for this gadget. In our research we have observed that we did not find any significant relationship between smoking and SpO2, which is in line with previous studies while we have observed significant relationship between high altitude areas with SpO2 values which is match able with other studies[15,16].

In a community-based cohort of seniors who volunteered to take a timed walk, the average resting SpO2 was around 98 percent, with readings rarely falling below 95 percent. No comparable data from a large community-based population is available to our knowledge[17,18].

In this community-based sample, obesity was a significant predictor of hypoxemia. This suggests that the effects of obesity on gas exchange in adults may be underappreciated in comparison to other clinical entities that are commonly associated with hypoxemia (e.g., smoking, heart failure, obstructive pulmonary disease), but have a similar magnitude of association with SpO2 levels (e.g., smoking, heart failure, obstructive pulmonary disease).

Our findings demonstrate that this link exists in a considerably larger older community-based sample, and that it maintains after more thorough adjustment for confounders, such as physiologic cardiac and respiratory function measurements[18,19].

Studies have shown a difference in oxygen saturation between pre-ductal (upper extremity) and post-ductal (lower extremity) sites, with post-ductal sites having lower oxygen saturation. This is congruent with the findings of the current investigation, which showed that mean pre-ductal SpO2 was consistently greater than post-ductal values[20].

CONCLUSION

This must be factored into considerations in ambulatory programs for overweight people, particularly those with heart disease, because it may contribute to angina. Through the development of emphysema, COPD, and chronic bronchitis, smoking is linked to reduced oxygen saturation. Smoking was linked to a drop in SpO2. There was also a weak but substantial link between previous smoking and current smoking. Further we conclude that high altitude, smoking and obesity are the major risks factors for oxygen saturation diseases.

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Competing Interest: None

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