Original Research

Evaluation Of The Relationship Between Oxygenation At Visit And The Prognosis Of Patients With Covid 19

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Abstract

Background: Determining the prognosis of the Covid-19 disease is a valuable guide for estimating the probability of recovery, determining the type of care, estimating the required bed, length of hospitalization and discharge of hospitalized patients. Therefore, the present study was conducted with the aim of determining the relationship between oxygenation at the time of visit and the prognosis of patients with covid-19 in Khatam-Al-Anbia Hospital in Zahedan in 2019-2020.

Method: In this retrospective cross-sectional investigation, the study encompassed individuals who were admitted to Khatam-Al-Anbia Hospital in Zahedan owing to the presence of covid-19 during the timeframe of 2019-2020. The data acquisition instrument employed in this study comprised variables such as Age, sex, SPO2 at the time of visit, underlying lung diseases, and the ultimate outcome, which were meticulously gathered and recorded from the patients' medical records. To perform the data analysis, the researchers utilized spss software version 21, employing both descriptive and analytical statistical methods.

Results: A total of 383 patients were subjected to examination, with an average age of 49.46 ± 17.57 years. Of these patients, 201 (52.5%) were male, while the remaining individuals were female. Among the patients, 145 individuals (37.9%) had a medical history of lung diseases. Ultimately, 132 patients (34.5%) were recorded as deceased. It was observed that the average SPO2 level in deceased patients was significantly lower than that of discharged patients ($p<0.001$). Furthermore, the SPO2 readings in deceased patients were consistently lower than those in discharged patients, regardless of age group or gender ($P<0.05$). Notably, the gender of the patients did not exhibit a significant association with their prognosis ($p=0.914$).

Conclusion: Patients who are diagnosed with covid-19 and exhibit low levels of SPO2 are known to have a greater risk of mortality compared to patients who do not present with this condition. This observation holds true across various age groups and genders.

Keywords: Covid-19, Prognosis, Mortality, SPO2.

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Introduction

The year 2019 witnessed the emergence of a novel coronavirus disease, subsequently identified as COVID-19. Initially observed in Wuhan, China in December of that year, it has since proliferated to nearly all corners of the globe (1). While primarily manifesting in the respiratory system, Covid-19 has the capacity to impact various other bodily organs, including but not limited to the kidney, heart, digestive system, and nervous system to varying degrees (2). This particular illness exhibits a broad spectrum of symptoms. However, it has the potential to manifest as either asymptomatic or induce mild, severe, and even highly deleterious symptoms. Certain research studies indicate a deterioration of the illness during the second week of infection. The most prevalent symptoms experienced at the initial stage of the illness include fever (ranging from 72 to 90%), cough (ranging from 64 to 82%), myalgia, weakness, and lethargy (ranging from 11 to 70%), as well as shortness of breath (31%). Less commonly observed symptoms encompass sputum production (28%), headache (8%), hemoptysis (5%), and diarrhea (3%). The illness may also manifest in some patients as a runny nose, nasal congestion, sore throat, and diarrhea. The fever pattern associated with this particular illness has not been definitively elucidated; it may be either prolonged or intermittent (3). Determining the prognosis of this ailment serves as a valuable compass for approximating the likelihood of recovery, ascertaining the appropriate form of care, estimating the requisite bed, duration of hospital stay, and discharge of patients (4). An estimated 15 to 20% of patients admitted to medical facilities exhibit hypoxic respiratory failure along with an oxygen requirement (5). One of the primary culprits behind the mortality rate in covid-19 patients is respiratory damage and insufficient oxygen supply. Oxygen therapy has been proposed as a viable therapeutic approach to address hypoxia associated with Covid-19 (6-7). Hence, the early detection of hypoxemia through the assessment of arterial oxygen pressure and oxygen saturation percentage is of utmost importance (8). The significance of these indicators has been validated in acute patient conditions (9-11). Over the past three years since the disease's onset, numerous investigations worldwide have examined its various facets, aiming to acquire more comprehensive knowledge. Additionally, some researchers have explored the patient prognosis. One such study by Molinero et al. (12) in Spain in 2020 demonstrated that a lower SPO2 during presentation correlated with a more unfavorable prognosis. Similarly, a separate 2020 study conducted by Singer et al. (13) also delved into this matter. Conducted in the United States, the authors examined 4,400 patients with suspected Covid-19. Low SPO2 was significantly associated with the patient's need for ICU admission, the need for mechanical ventilation, and also with the death of the patients. Becerra-Muñoz and colleagues (14) also conducted a study in 2021 to determine the predictors of in-hospital death in elderly patients with Covid-19, where low SPO2 at the time of admission was independently associated with higher mortality of patients. Oxygen therapy is considered as a safe and low-risk intervention and acts as a cornerstone of the treatment of Covid-19. Considering the importance of hypoxemia and its role in managing and determining the prognosis of patients with covid-19. The primary objective of the present investigation was to assess the correlation between the oxygenation levels observed upon initial medical assessment and the long-term outlook for individuals afflicted with the novel coronavirus disease, commonly referred to as COVID-19, who sought medical care at Khatam-Al-Anbia Hospital situated in Zahedan during the years 2019-2020.

Method

This investigation was conducted in a cross-sectional and retrospective manner. The statistical populace of this inquiry encompassed individuals diagnosed with covid-19 who were admitted to Khatam-Al-Anbia Hospital in Zahedan during the

specified timeframe of 2019-2020. Employing the simple random method, sampling was executed. The size of the sample was determined utilizing Cochran's formula for communities of unknown quantity, which amounted to 383 individuals. Inclusion criteria consisted of a positive PCR test for covid-19 and lung involvement evident in the CT scan, displaying a distinctive pattern of covid-19. Conversely, exclusion criteria encompassed the failure to document the requisite information in the patient's medical record. After acquiring the code of ethics "IR IAU.ZAH.REC.1402.008 and receiving the necessary authorization to proceed with the research, the files pertaining to the patients involved in the study were procured from their respective records. The data collection instrument employed in this investigation encompassed various demographic variables such as age, gender, SPO2 levels during the visit, underlying pulmonary conditions, and the ultimate outcome. Subsequently, the collected information was meticulously compiled and documented from the patients' records. Utilizing the SPSS software version 21, a comprehensive data analysis was conducted. Quantitative descriptive data were presented utilizing frequency tables, while qualitative descriptive data were conveyed through the application of central and dispersion indices. The association between qualitative variables was assessed through the utilization of either the Chi-square test or Fisher's exact test. The Independent T-test was employed to draw comparisons between quantitative variables across two distinct groups. It is important to note that in all calculations, significance was determined by a P-value exceeding 0.05.

Results

A total of 383 individuals were enlisted for the investigation, with 210 individuals (equivalent to 52.5%) identified as male and the remaining being female. The mean age of the individuals enrolled in the examination was 49.46 ± 17.57 years. A history of lung diseases was found in 152 individuals (equivalent to 37.9%). Furthermore, the SPO2 status of the individuals during their visit registered at an average of 90.49±5.63. Analyzing the outcome of the individuals participating in the study, it was observed that 138 individuals (equivalent to 34.5%) eventually passed away. The outcomes of the t-test revealed that the average SPO2 level in the deceased individuals was significantly lower compared to those who were discharged (P<0.001) (Table 1).

Table 2 shows the comparison of SPO2 level in male and female patients between good (discharge) and bad (death) prognosis. The results of the t-test statistical test showed that in both female (P<0.001) and male (P=0.001), the average level of SPO2 in deceased patients was significantly lower than discharged patients. Table 3 shows the comparison of SPO2 level between good (discharge) and bad (death) prognosis in patients of different age groups. The results of the t-test showed that in all age groups, the average SPO2 level in deceased patients was significantly lower than discharged patients (P<0.05). Table 4 shows the relationship between the gender of patients and their prognosis. The results of Fisher's statistical test showed that the gender of the patients had no significant relationship with their prognosis (P=0.917).

Discussion

The objective of the present study was to examine the correlation between oxygenation levels upon admission of COVID-19 patients who were hospitalized. The findings of this investigation revealed that individuals with a poor prognosis exhibited significantly lower SPO2 levels compared to those with a favorable prognosis. Moreover, upon segregating the patients based on gender and age groups, a notable distinction in SPO2 levels at admission was observed between individuals with unfavorable and favorable prognoses. These findings suggest that patients of all age groups and both genders who present with low SPO2 levels are more susceptible to unfavorable outcomes and mortality. Additionally, this study explored the association between patients' gender and their prognosis, and

the evidence gathered indicated that there is no discernible relationship between gender and prognosis. The mortality rate among patients hospitalized with covid-19 has exhibited significant variation in multiple studies. This discrepancy appears to stem from variations in the inclusion criteria employed by these studies. Within our own investigation, over one-third of hospitalized patients succumbed to the virus. In Baruah's 2022 study conducted in India, the researchers examined the in-hospital mortality rate of Covid-19 patients, revealing a mortality rate of 10% (15). Similarly, Richardson et al. conducted a study in the United States which found that 20% of patients presented with SPO2 levels below 90% upon admission, and 21% of hospitalized patients ultimately passed away (16). In a systematic review carried out by Goel et al., the authors analyzed 43 studies conducted in 12 countries across various continents. The findings revealed that the European continent had the highest in-hospital mortality rate (22.9%), followed by America (22.23%). In contrast, Asia exhibited a lower in-hospital mortality rate (12.65%) (17). Another study conducted by Mahendra et al. in India reported a 54% in-hospital mortality rate in individuals with severe covid-19 pneumonia (18). Different studies have yielded disparate findings concerning the mortality rate of patients with covid-19 during their hospital stay. Such variance can likely be attributed to the contrasting levels of disease severity among the patient cohorts scrutinized in these studies. In our own investigation, the in-hospital death rate approached approximately 34%, thereby implying the grave condition observed in a majority of the patients under examination. The relationship between the SPO2 levels at admission and patient mortality has been the subject of several studies. These studies consistently show that patients with lower SPO2 levels at the time of admission have a higher mortality rate. For example, Baruah et al. found that 55% of patients who eventually died had an SPO2 level below 95% at the time of presentation. Similarly, Molinero et al.'s study in Spain revealed that deceased patients had a significantly lower mean SPO2 level compared to discharged patients. Additionally, Singer et al. found that patients with lower SPO2 levels not only require hospitalization in the intensive care unit and mechanical ventilation more frequently, but also have a higher mortality rate. The outcomes of these investigations are in alignment with the discoveries of our inquiry, which found that the likelihood of death is greater in individuals with diminished SPO2 levels. Moreover, we also investigated the correlation between SPO2 levels and mortality with respect to gender and age. The outcomes demonstrated that the fatality rate was elevated in patients with low SPO2 levels across various age groups and in each gender category independently. This signifies that regardless of age or gender, a diminished SPO2 level in a patient will indicate a more unfavorable prognosis. With respect to the correlation between gender and patient prognosis, the findings from our investigation indicated that there was no notable distinction between the genders of deceased and discharged patients. However, alternative research studies have reported differing outcomes. For instance, Baruah et al. observed a significantly higher mortality rate in males compared to females (19). Additionally, in the study conducted by Molinero et al. (12), male gender was identified as an independent predictor for a poorer prognosis in patients. Furthermore, Finelli et al., in their examination of over 42,000 patients admitted to a hospital in the United States with a positive Covid-19 test, revealed a significantly higher mortality rate in male patients as opposed to female patients (20). This observation was likewise noted in the investigation conducted by Moreno-Torres et al., carried out in Spain (21). The exact cause for the disparity between the findings obtained in our study and those of other studies cannot be definitively ascertained. This discrepancy might potentially be attributed to the relatively smaller number of samples utilized in our study in

comparison to the aforementioned studies, as a reduction in sample size has the potential to result in a decline in the accuracy of study outcomes.

Strengths and weaknesses:

The primary limitation of the current investigation can be characterized as the singular focus on a specific center and the relatively limited number of participants in comparison to similar research endeavors carried out in alternative nations. Conversely, our study also exhibited notable strengths. To the best of our knowledge, this study represents the initial exploration of the association between admission SPO2 levels and the prognosis of individuals admitted to the hospital due to covid-19, distinguishing between various age groups and genders.

Conclusion:

Patients diagnosed with covid-19 who exhibit low levels of SPO2 experience increased mortality rates when compared to their counterparts. This phenomenon holds true across various age groups as well as different genders.

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Conflicts of interests

None

Ethical considerations:

In this investigation, we made an effort to adhere to the established guidelines of the ethical code, ensuring that the confidentiality of the data contained within the files remained intact. Each phase of the study meticulously adhered to the ethical principles outlined in the Helsinki declaration and gained the necessary approval from the ethics committee of Islamic Azad University, Zahedan branch.

Author contribution:

All authors met the four criteria for authorship contribution based on recommendations of the International Committee of Medical Journal Editors

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Table & Figure:

Table 1: Examining the relationship between oxygenation at the time of visit and the prognosis of patients

	Good prognosis Standard deviation ± mean	Bad prognosis Standard deviation ± mean	P- value
SPO2	4.32±92.53	5.79±86.60	<0.001

* Independent T-test was used to compare two groups

Table 2: Examining the relationship between oxygenation at visit and the prognosis of patients by gender

SPO2	Good prognosis Standard deviation ± mean	Bad prognosis Standard deviation ± mean	P-value
Male	4.48±92.66	6.08±86.34	0.001
Female	4.17±92.39	5.47±86.89	<0.001

* Independent T-test was used to compare two groups

Table 3: Examining the relationship between oxygenation at the time of visit and the prognosis of patients by age group

SPO2	Good prognosis Standard deviation ± mean	Bad prognosis Standard deviation ± mean	P-value
Under 40 years	3.83±93.33	4.86±86.93	<0.001
40 to 59 years	4.60±92.55	6.56±87.10	<0.001
60 to 79 years	4.36±91.11	5.35±86.19	<0.001
80 to 99 years	4.10±91.14	5.81±85.31	0.026

* Independent T-test was used to compare two groups

Table 4: Examining the relationship between gender and the prognosis of patients

Gender	Good prognosis frequency (percentage)	Bad prognosis frequency (percentage)	P-value
Male	137(52.3)	73(52.9)	0.917
Female	125(47.7)	65(47.1)	

* Fisher's test was used to compare the two groups