Determinants of COVID-19 Mortality among Hospitalized Adults in Windhoek: A Retrospective Cohort Study

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Abstract

This study aimed to investigate common risk factors for COVID-19 mortality of adult among inpatients in Windhoek. The findings generated by this study were of public health significance, as they guided policies and programs aimed at reducing severe outcomes of COVID-19 cases. 1936 records of all hospitalized COVID-19 cases with comorbidities were enrolled in this retrospective cohort study. The study was conducted on the records captured on the COVID-19 national line list between the periods of January 2021–November 2021. For the purpose of this study, a convenience sampling method was employed. Data was analyzed using IBM SPSS Version 28.0.1.0(142) and generated tables and graphs. Risk ratios were generated using multivariate analyses to carry out logistic regression to identify the association between age, sex, underlying comorbidity and the time of hospitalization. Consequently, risk factors with p values of <0.05 from the multivariate analysis were considered statistically significant. A total of 114 fatalities were reported in this study out of the 1936 records used throughout the study period, and gender had no bearing on mortality chances. Hypertension and cardiovascular disease, which are known to be the major global chronic Non-communicable diseases (NCDs), were identified as the leading contributing risk factor and had contributed 46% to the total deaths. Additionally, the presence of comorbidities was identified as an important risk factor that contributed to COVID-19 mortality. The data had also revealed that clinical case category was a significant risk factor. Those who experienced severe clinical manifestations contributed 50% of all fatalities to the infection.

Keywords: COVID-19, mortality, comorbidity.

1. INTRODUCTION

Beginning in December 2019, in the region of Wuhan, China an acute atypical respiratory infection known to be an infectious disease caused by a new coronavirus strain from the Coronaviridae family, began appearing in humans. It was named COVID-19, a shortened form of coronavirus disease 2019. The disease caused by this virus had spread at a shocking rate around the world, prompting the WHO to declare a pandemic on March 11, 2020. It was believed that many patients infected with COVID-19 developed mild to severe respiratory illnesses that subside without the need for hospital admission. However, the disease can have a severe impact on older people and those with underlying conditions such as diabetes, chronic respiratory diseases, cancer, obesity, and cardiovascular disease, and it can even result in mortality. As of May 26, 2020, more than 5 635 000 people had been reported to have become infected and nearly 350 000 had died from COVID-19 worldwide (Vargas, 2020).

The alarming death rate due to the pandemic prompted researchers around the world to conduct studies in an effort to understand the disease's clinical presentation. A study by Gao et al. (2020) stated that on December 31, 2019, 2 727 cases of pneumonia with an unknown cause were reported in Wuhan, Hubei Province, China. It was believed that all the cases reported were linked to the Huainan Seafood Wholesale Market. On January 7, 2020, the Chinese Centre for Disease Control and Prevention (CCDC) learned of the causal agent from conducting throat swab samples and designated it as

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the World Health Organization titled the virus as COVID-19 (WHO) [2]. Those who suffered from the disease presented clinical signs such as: dry cough, dyspnea, fever, and bilateral lung infiltrates.

Moreover, a study by Sohrabi et al. (2020) indicated that some of the cases who had died due to the virus also died as a result of underlying conditions such as organ failure, septic shock, pulmonary edema, severe pneumonia, and Acute Respiratory Distress Syndrome (ARDS). As of November 22, 2020, Africa, which is known to have a population of 1.3 billion, had noted 2,070,953 cases of COVID-19, of which 49,728 deaths, representing 3.6% of total global deaths [3]. The continent's burdened and weak health systems, limited financing of health care, and challenges posed by existing common diseases such as HIV and tuberculosis make it a concern about how COVID-19 can affect the outcomes of patients [4]. In addition, there are several other factors that may impact and escalate the chances of more deaths to occur due to the COVID-19 pandemic in Africa [4]. These factors include limited testing, which can limit early detection and isolation, thus increased the rate of transmission, which leads to a higher likelihood of death and thus affected the public health measures which could have improved and reduced the rate of infection. It was known that gender, age, and the presence of comorbidities were reported as determinants of severe COVID-19 outcomes, including death for most hospitalized cases. Namibia like other countries, was not exempted from the factors that lead to high COVID-19 mortality. With the purpose of informing targeted approaches that will help manage and improve the outcomes of COVID-19 hospitalized cases, this paper aimed to investigate the common risk factors for COVID-19 mortality among hospitalized adult patients in Windhoek, by describing COVID-19 deaths by person, identifying associated risk factors for COVID-19 that lead to admission, and recommending best practices that will improve the outcome of high risk population.

1.1. Problem Statement

Windhoek is the capital city of Namibia and constitutes most of the population of the country. The city is the shared, trade and industry, civil, and cultural center of the country. According to the Population Projection Report (PPR) from the Namibia Statistic Agency (NSA), Windhoek is estimated to have a population of about 431,000 inhabitants and it is constantly growing due to an influx of people from other towns. The overcrowding and many activities that take place in most areas of the city make it almost impossible to adhere to the regulations of the COVID-19 Pandemic. Since the outbreak of the pandemic in Wuhan city in 2019, the city had contained zero cases until its first imported index case of COVID-19, which was confirmed on March 11, 2020.

1.2. Description of the Problem

COVID-19 mortality among hospitalized patients was linked to age and underlying conditions such as cardiovascular disease, including hypertension, diabetes, chronic obstructive pulmonary disease, obesity, and other chronic illnesses. Regardless of the lack of a clear pathophysiology, the elderly and patients with a number of comorbidities, especially those with diabetes, were reported to have the most severe and worse outcomes. In addition, diabetes and high blood glucose levels were identified as important predictors of morbidity and mortality of individuals infected with a variety of viruses, including SARS-CoV and MERS-CoV (Wu et al., 2021b).

A study by Wu et al. (2021) and other several related studies from China, Italy, and New York City had shown that hospitalized patients were often older and had underlying medical disorders. These investigations also discovered that elderly individuals and those with specific underlying medical disorders were more likely to have poor outcomes. The incidence of underlying medical conditions rose as the severity of infections increased in cases reported to the Centers for Disease Control and Prevention (CDC) by local and state health departments, but conclusions were constrained owing to a paucity of data. After variables such as age and other relevant confounders, the independent association between sex, race, and ethnicity, as well as particular underlying diseases and severe outcomes in COVID-19 patients, remained a question [6]. However, there were limited studies to establish the common risk factors associated with hospitalized adults dying from COVID-19 in Namibia. Therefore, this paper was about countering this gap by investigating COVID-19 mortality and associated common risk factors in Windhoek.

1.3. The Aim of the Study

The study aimed to investigate the common risk factors associated with COVID-19 hospitalized adult patients in Windhoek.

1.4. Research Objectives

- To describe COVID-19 deaths by person (socio-demographic, comorbidity status), place (geographical location and type of health facilities) and time (the trend of case fatalities).
- To identify the most common associated risk factors for COVID-19 that lead to admission in Windhoek.

1.5. Research Questions

- Is there an association between socio-demographic status, presence of comorbidity, type of health facility and time of death for COVID-19 deaths?
- What are the most common associated risk factors for COVID-19 that led to admissions in Windhoek?

1.6. Significance of the Study

The epidemiological data derived from this study was essential to inform targeted approaches that helped to manage and improve the outcomes of hospitalized cases. In addition, the results provided insight to policymakers, health program managers, and clinicians managing COVID-19 cases, particularly those identified to be at high risk of mortality. Moreover, it helped to guide strong preventative methods, informed preparedness, and improve the existing COVID-19 protocols. The results provided substantial data for decision making to improve the health systems relating to service delivery by enhancing the healthcare workforce, essential medicine and medical equipment for quality health care, and functional health information systems for information synthesis for decision-making.

2. LITERATURE

Initially, coronavirus disease was identified in Wuhan, China in December 2019, the novel coronavirus (SARS-CoV-2) had high transmissibility and it was the cause of Coronavirus Disease 19 (COVID-19), a potentially deadly acute respiratory infection [7]. There are several clinical symptoms of COVID-19, but they resemble those of simple flu. Patients can have mild, moderate, severe, or critical illness. Older age and clinical comorbidities, such as hypertension, diabetes, and obesity, are factors associated with evolution to the severe form of COVID-19 and death [8]. According to Shahid et al. (2020), a significant percentage of older American adults have these diseases, putting them at a higher risk of infection.

Moreover, as of April 14, 2020, 1,924,626 cases and 119,625 fatalities were recorded worldwide, implying that COVID-19's overall fatality rate was 6.2 percent [9]. Patients over the age of 60 and those with comorbidities had the highest risk of severe illness and mortality. The case fatality rate was 1.4% for those with cardiovascular disease, 9.2% for patients with diabetes, and 7.6% for people with cancer. According to the study, diabetes is certainly related to increased mortality in 46 fatal instances of SARS-CoV-2, with 84 percent of patients being older than 60. In support of several studies, another study on critically ill older patients with SARS-CoV-2 found that 86% of patients had comorbid conditions such as CKD, congestive heart failure, COPD, and diabetes. This likelihood of having multiple comorbidities places older adults at an even limitless risk of increased mortality from SARS-CoV-2 (Shahid et al., 2020).

Another study indicated between March and April 2020, 2159 patients with laboratory-confirmed COVID-19 were admitted to a hospital, of which 31 were HIV-1 infected (1.4%). The mean age was 60.7 years (range, 23–89 years); 24 (77%) were men and 7 (22.6%) women, and the most common comorbidities were hypertension (67.7%), diabetes mellitus (41.9%), and obesity (33.3%). (Shalev et al., 2020).

A literature review denotes to a wide-ranging study and analysis of literature that speaks a specific topic from recognized and reliable resources [12]. The purpose is to help the researcher avoid unintentional and needless repetition of work. Moreover, it forms a root within which research findings are to be interpreted and it establishes a researcher's familiarity with the existing body of information relevant to the topic [13]. Therefore, this research explores the risk factors for

COVID-19 mortality among hospitalized adult patients in Windhoek, allowing the understanding of the COVID-19 deaths by person, place, and time and realizing the associated risk factors for COVID-19 that lead to admissions in Windhoek.

2.1. COVID-19 deaths by person (socio-demographic, co morbidity status), place (geographical location and type of health facilities) and time.

Several studies to date have shown that this virus causes worse outcomes and a higher mortality rate in older adults and those with comorbidities such as hypertension, cardiovascular disease, diabetes, chronic respiratory disease, and chronic kidney disease (CKD). In a report by Shahid et al. (2020a), patients over the age of 60 and those with comorbidities had the highest risk of severe illness and mortality. Furthermore, this study observed critically ill older patients with SARS-CoV-2 and established that 86% of patients had comorbidity conditions such as CKD, congestive heart failure, COPD, and diabetes. Diabetes is unquestionably linked to increased mortality in 46 fatal SARS-CoV-2 cases, with 84 percent of patients being over 60. Similarly, older patients and those with medical comorbidities are more likely to have severe COVID-19 than HIV-negative people (Gagliardini et al., 2022).

A study by (Huang et al. (2020) detailed that current studies state that people are generally susceptible to COVID-19, and the severity of COVID-19 is positively connected with age and underlying diseases (hypertension, diabetes, cardiovascular disease, etc.), which is similar to the situation with SARS and Middle East respiratory syndrome (MERS) infection. Another study (Sohrabi et al., 2020) discovered that 54.3% of SARS-CoV-2 infected people are men, with a median age of 56 years. A similar study shows an important relationship between sex and mortality due to COVID-19. A recent study showed that males had a higher risk of severe acute respiratory distress syndrome than females, with the mortality rates ranging from 59% to 75%. According to the National Health Commission of China, 35 percent had hypertension, and 17 percent had coronary heart disease. According to the study, the most common comorbidities were hypertension (17 percent to 7 percent [95 percent CI, 14 percent to 22 percent]) and diabetes (8 percent to 6 percent [95 percent CI, 6 percent to 11 percent]), followed by CVD (8 percent to 6 percent [95 percent CI, 6 percent to 11 percent]) and 5 percent to 4 percent [95 percent CI, 4 percent to 7 percent]).

A study was carried out in Spain in which hypertension was the most reported comorbidity in the deceased, accounting for 61.10% and others, respectively (al Saleh et al., 2022). Furthermore, a significant association was also detected between diabetes and mortality. A similar study conducted in Mexico also established a significant association between mortality and diabetes in patients hospitalized with COVID-19. Furthermore, cardiovascular disease, chronic kidney disease, and those with compromised immune systems were linked to an increased risk of death in COVID-19; however, chronic lung disease was not linked to an increased risk of death (Pea et al., 2021).

2.2. Associated Risk Factors for COVID-19 Leading to Admission in Hospitalized Patients

Numerous studies have assessed the risk factors associated with COVID-19 associated mortality. A study carried out in New York by Mikami et al. (2021) demonstrated an increased risk of death from COVID-19 in patients with factors such as older age, sex, and related symptoms. A related retrospective study conducted in Kuwait on 1096 patients admitted, concluded that severe infections are associated with age above 50 years, the presence of underlying conditions such as asthma, and a rise in levels of inflammatory mediators.

COVID-19 can cause severe disease, leading to hospitalization in ICU and potentially death, especially in the elderly with comorbidities. A study was conducted in Evergreen, Washington, on the characteristics and outcomes of 21 critically ill patients with a confirmed COVID-19 diagnosis. This study showed that 71% of these patients required mechanical ventilation and acute respiratory arrest was seen in all of them. Within 72 hours of developing ARDS, 53% of these patients showed increasing severity of respiratory problems, leading to poor short-term outcomes and a higher risk of death. As of March 17, 2020, the mortality rate was 67% in these patients, with 24% critically ill and 9.5% discharged from hospital (Arentz et al., 2020).

To date, there is no definite evidence to determine the relationship between COVID-19 and PLWH. Many studies have failed to demonstrate the risk rate of COVID-19 in those living with HIV compared to those without HIV. However, a number of recent studies have reported higher COVID-19 mortality rates among PLWH as well as higher rates of

hospitalization due to COVID-19. Supporting these claims, the WHO Global Clinical Platform affirmed that HIV happened to be a significant independent risk factor for hospital admissions and hospital mortalities. Consequently, studies from the United Kingdom and France presented substantial morbidity and mortality among black PLWH. Moreover, it was suggested that PLWH may have a high occurrence of severe risk factors including hypertension, diabetes, and are mostly identified to be male. (Gagliardini et al., 2022).

While further study is warranted, previous studies give a clear picture of what different researchers have tried to conclude on risk factors that lead to COVID-19 mortality. However, there is little evidence to support the information. Most studies focused on investigating risk factors associated with COVID-19 mortality in developed countries, which is a clear indication that more studies needed to be done in the setting of developing countries.

3. METHODOLOGY

The study focused on deaths that occurred in hospitals in Windhoek. As of April 11, 2022, COVID-19 infection had affected a cumulative 51,422 individuals from a total of 96,168 samples tested in Windhoek, represented a positivity rate of 53%, since the index case was confirmed. So far, 902 cases succumbed to the disease, giving a case fatality rate (CFR) of approximately 4%. Moreover, among the 838 cases reported to have died in the hospital, 691 had underlying conditions. A range of comorbidities were linked to an increased risk of hospitalization among COVID-19 patients. Several studies have shown that gender, age, and the presence of comorbidities have been reported as determinants of severe COVID-19 outcomes, including death for most hospitalized cases. The proposed study investigated potential risk factors for morbidity of COVID-19 infection among laboratory-confirmed cases in Windhoek, to inform targeted approaches that helped manage and improve the outcomes of COVID-19 hospitalized cases.

3.1. Research Design

Sovacool et al. (2018) describe research design as the structured plan through which chosen methods are systematically applied to achieve the study objectives [17]. The study examined reported COVID-19 cases who were hospitalized and had associated risk factors, among cases reported in Windhoek between the periods January 2021–November 2021 in the national COVID-19 case management line list. The study design was chosen based on its characteristics. The approach of the study allowed the technique of reviewing past patient records to be used to formulate possible associations and investigate potential relationships between common risk factors and outcome for COVID-19 patients.

3.2. Sampling

According to Etikan (2016) convenience sampling is a non-probability approach in which participants are selected based on their practical availability rather than through random selection [18]. Consequently, for the purpose of this study all targeted 1936 reported COVID-19 cases during the period under review were enrolled.

3.3. Sample Size

The cohort study included 1936 reported COVID-19 hospitalized cases captured on the national line list for the period January 2021–November 2021. According to Emerson (2021) convenience sampling technique highlights that convenience sampling is widely adopted due to its cost-effectiveness, time efficiency, and ease of implementation [19]. For this study contributors were readily available and accessible and calculating a sample size with convenience sampling was found to be irrelevant because bias results after the statistical analysis were observed. In addition, Emerson (2020) stated that Convenience sampling is popular because it is not costly, not as time consuming as other sampling strategies, and simplistic hence employing all the 1936 records for the purpose of this study was convenient.

Criteria	Inclusion	Exclusion
1. Laboratory results	Positive results of COVID-19	Negative, inconclusive results or unreported positive results
2. Data sources	The national COVID-19 case management line list.	Any other source of data was excluded
3. Status or Outcome	Cases that were reported to have demised of COVID-19 at health facility by case management	Unreported deaths, cases who demised at home/outside health facility
4. Place of Death	Hospitalized COVID-19 cases at Windhoek health facilities	Deaths that occurred at home or any other environment

Table 1. Inclusions and Exclusion Criteria.

3.4. Data Collection Methods

The data was collected by employing a record review method. The national surveillance COVID-19-line list, which contained data of patients who were diagnosed with COVID-19 and were reported to have been hospitalized during the period between (January 2021 to November 2021) were utilized. The Ethics Coordination subdivision in the Ministry of Health of Namibia approved the protocols of this study and waived the requirement for informed consent. In addition, a checklist tool referred to in annexure 1 was used to validate the records to be reviewed and ensure that they met the proposed criteria, which was of complete records documenting all variables listed:

- Epidemiological demographic patient data
- Laboratory data
- Presence of comorbidities
- Patient outcome

3.5. Data Analysis Methods

The data collected on the line list was reviewed and cleaned for any inconsistencies and analyzed using IBM SPSS Statistics Version 28.0.1.0(142) for windows using descriptive statistical methods and generated table. The Chi-square test (χ^2) was used for comparisons of categorical data. Risk ratios were generated using multivariate analyses to carry out logistic regression to identify the risk factors by person, place, and time. Risk factors with p values of <0.05 from the multivariate analysis were considered statistically significant.

3.6. Ethical Consideration

Ethical practices were applied to ensure no harm or limited harm. The study did not involve the participation of any human subjects. Firstly, before conducting the study, ethical clearance was obtained from the Ministry of Health and Social Services. The principles of anonymity, confidentiality, and autonomy were applied throughout the study. Patient data or health information for this study was de-identified using the principle of anonymity in order not to link outcomes to an individual patient's identity. The data for the study were only accessed by the study investigators, information was stored on access controlled excel files and computers that were protected by user passwords.

3.7. Limitation of the Study

Patients that have succumbed due to COVID-19 at home or anywhere else other than the hospital and were not tested prior to or after will not be included in the study. The study focused on mortality and not morbidity. Patients who were discharged alive from the hospital were not enrolled in the study. Furthermore, records from private health facilities that were not reported to the Ministry of Health and Social Services were not reviewed. Hence, cases that have been managed by private hospitals and who died and were recorded in their records were not included in this study. In addition, all analysis was performed using the existing data which consists of verified laboratory results, reported mortalities who

were identified to have comorbidities from the national COVID-19 line list. Accordingly, the study only included data that was captured with completed variables. Any record that was incomplete was discarded.

4. RESULTS

This research addresses the main objectives of the research by presenting the research findings. These findings are based on the statistical analysis using SPSS Version 28 to identify the common risk factors associated with COVID-19 mortality among adult patients. This section shows the results and risk ratios that were generated using multivariate analyses to carry out logistic regression.

Variable	Category	Dead	Alive	p-value
Sex:	Female	57	1013	0.244
	Male	57	809	
Age:	20–29	3	197	<0.001
	30–39	5	353	
	40–49	18	353	
	50–59	24	374	
	60+	64	545	
Hypertension and Cardiovascular:	No	62	1513	<0.001
	Yes	52	309	
Diabetes:	No	86	1730	<0.001
	Yes	28	92	
Obesity:	No	112	1822	<0.001
	Yes	2	0	
HIV:	No	197	1784	0.005
	Yes	7	38	
Asthma and Lung disease:	No	112	1822	<0.001
	Yes	2	0	
Renal Failure:	No	105	1798	<0.001
	Yes	9	24	
Malignancy:	No	110	1818	<0.001
	Yes	4	4	
Neurological disease:	No	112	1819	0.001
	Yes	2	3	
Liver disease:	No	112	1822	<0.001
	Yes	2	0	
Clinical Case Category:	Critical	15	34	<0.001
	Mild	34	1418	
	Moderate	7	222	
	Severe	58	148	
O2 Therapy:	No	43	1537	<0.001
	Yes	71	185	
ICU:	No	111	1810	0.020
	Yes	3	12	

Table 2.1. Characteristics of adult patients hospitalized for COVID-19 who died or not in Windhoek district, (January 2021–November 2021)

For the reasons given in Table 2.1 above, it was demonstrated that, throughout the research period, gender did not affect a person's risk of dying from COVID-19; rather, it contributed equally to both male and female fatalities, each of which accounted for 50% of the total deaths. Additionally, this study found that aging increased the chance of dying from COVID-19. A total of 64 fatalities were reported among those aged 60 or older, accounting for 56.1% of all deaths that occurred in the Windhoek area during the research period.

The findings in this study had also suggested a high number of deaths among adult patients who were administered with oxygen therapy, total of 71 deaths which contributed 62.3% on COVID-19 deaths, in Windhoek district among the hospitalized patients. In addition to this findings, the study also noted that being on ICU did improve disease outcomes because only 20% of those that were in ICU had died from the virus during this period.

Notably, Diabetes and malignancy, which were reported to be the leading causes of deaths among those hospitalized adults due to COVID-19 by studies carried in China by Wu et al. (2021a) were not the leading causes of death during the period of this study in Windhoek district. Diabetes contributed 24.7% and malignancy 3.5% which were relatively low compared to other risk factors. Moreover, the findings in this study noted 58 deaths due to the severe case category, which had contributed 50.9% deaths among the total hospitalized patients in Windhoek district.

Variable		***Crude Odds Ratio (COR)(95% CI)***	***p-value***	***Adjusted Odds Ratio (AOR)(95% C.I)***	***p-value***
Age Category					
	20–29	*Ref*		*Ref*	*0.044*
	30–39	*0.930 (0.220–0.933)*	*0.922*	*0.995 (0.206–4.820)*	*0.995*
	40–49	*3.348 (0.974–11.509)*	*0.055*	*1.830 (0.454–7.377)*	*0.396*
	50–59	*4.214 (1.253–14.168)*	*0.020*	*1.579 (0.395–6.312)*	*0.518*
	60+	*7.711 (2.395–24.826)*	*<0.001*	*2.956 (0.772–11.320)*	*0.114*
Hypertension and Cardiovascular					
	No	*Ref*		*Ref*	
	Yes	*4.107 (2.785–6.055)*	*<0.001*	*3.891 (2.368–6.392)*	*<0.001*
Diabetes					
	No	*Ref*		*Ref*	
	Yes	*6.122 (3.807–9.847)*	*<0.001*	*3.438 (1.844–6.441)*	*<0.001*
HIV					
	No	*Ref*		*Ref*	
	Yes	*3.017 (1.340–7.039)*	*0.008*	*8.643 (3.258–22.926)*	*<0.001*
Renal Failure					
	No	*Ref*		*Ref*	
	Yes	*6.421 (2.912–14.162)*	*<0.001*	*6.177 (2.321–16.441)*	*<0.001*
Malignancy					
	No	*Ref*		*Ref*	
	Yes	*16.527 (4.079–66.968)*	*<0.001*	*15.791 (2.804–88.940)*	*0.002*
Neurological disease					
	No	*Ref*		*Ref*	
	Yes	*10.827 (1.791–65.459)*	*<0.001*	*26.749 (3.126–228.899)*	*0.003*
Clinical Case Category				*Ref*	*<0.001*
	Mild	*Ref*			
	Moderate	*1.315 (0.576–3.003)*	*0.516*	*0.762 (0.278–2.090)*	*0.597*
	Severe	*16.344 (10.260–25.786)*	*<0.001*	*5.557 (2.257–13.680)*	*<0.001*
	Critical	*18.400 (9.171–36.914)*	*<0.001*	*7.118 (2.313–21.900)*	*<0.001*
O2 Therapy					
	No	*Ref*		*Ref*	
	Yes	*8.905 (5.973–13.275)*	*<0.001*	*1.715 (0.742–3.962)*	*0.207*
ICU					
	No	*Ref*		*Ref*	
	Yes	*4.077 (1.134–14.656)*	*0.031*	*1.096 (0.243–4.948)*	*0.905*

Table 2.2. COVID-19 Mortality Risk Factors in Hospitalized patients in Windhoek District for the period (January–November 2021)

Note: C.I: Confidence Interval, Ref: Reference category.

None of the age groups are relevant, according to Table 2.2. This suggests that age groups were not identified as risk factors for COVID-19 hospitalized patients in the Windhoek District during the selected research period. The hospitalized patients with hypertension and cardiovascular disease had an AOR value of 3.891. According to this, patients with hypertension and cardiovascular disease are three times more likely to succumb from COVID-19 throughout the research period than are patients without these conditions.

Diabetes was shown to be a prominent comorbidity among COVID-19 hospitalized patients. The Diabetes has an AOR value of 3.438. This suggests that in the Windhoek district, individuals with diabetes had a higher risk of dying from COVID-19. HIV has an AOR value of 8.643, making it one of the main co-morbidities. This shows that adult HIV-positive patients have an 8-fold increased risk of dying from COVID-19 compared to HIV-negative adults. Moreover, among hospitalized adults in the Windhoek district, renal failure was one of the frequently occurring risk factors that contributed to COVID-19 deaths with an AOR of 6.117 between January and November 2021. Adult hospitalized patients in the Windhoek district were much more likely to have cancer from January to November 2021. The Malignancy variable's AOR value is 15.791, which indicates that persons with malignancy were 15 times more likely to die from COVID-19 than those without malignancy. Furthermore, neurological illnesses were also revealed to be important. In the Windhoek district, adults with neurological diseases were 26 times more likely to die from the virus than adults without neurological diseases.

In addition to the study findings, Clinical case category was also found to be significant. However, results in table 2.2 implies that Moderate case category was not significant which means that moderate clinical COVID-19 manifestations were not found to be a risk factor for COVID-19 deaths. The severity and criticality of the cases were discovered to be COVID-19 risk factors. Critical case category's AOR was 7.118, while the severe case category's AOR was 5.557.

Table 2.2 shows that O2 therapy and ICU were not significant. Which implies that during the period under study the two categories were not risk factors that contributed to the COVID-19 deaths in Windhoek district.

5. DISCUSSION

This research goes into detail on the findings of the study in relation to the aim, study objectives and research questions. The overall aim of this study was to investigate common risk factors for COVID-19 mortality among hospitalized adult patients in Windhoek. The first objective of this study was to describe COVID-19 deaths by person (socio-demographic, comorbidity status), place (geographical location and type of health facilities) and time (the trend of case fatalities). The second objective was to identify the most common associated risk factors for COVID-19 that lead to admission in Windhoek. Accordingly, seven factors namely Hypertension, Diabetes, HIV, Renal failure, Malignancy, Neurological disease and clinical category were found to be significant risk factors of death in adults with COVID-19 disease. This study confirms the findings made in Kuwait and implies that the existence of underlying disorders is related to the course of the disease.

5.1. Describing COVID-19 Deaths by Person, Comorbidity Status, Place and Time

Contrary to the findings of a research conducted in New York, the findings of this investigation did not demonstrate any relationship between age and sex to be connected with COVID-19 mortality over the study period.

5.2. Identifying the Most Common Associated Risk Factors for COVID-19 that Led to Admission in Windhoek

This study confirmed findings from studies done in Spain that hypertension contributed to 61.1% of deaths and another study conducted by the National Health Commission of China that showed hypertension and cardiovascular disease were the major risk factors that contributed to COVID-19 deaths among hospitalized adults during the study period.

Additionally, diabetes was discovered to be a significant risk factor for the development of the condition. Adult patients with a history of diabetes had an AOR of mortality from COVID-19 that is 3.438 times greater than those without a history of diabetes. This conclusion is consistent with the majority of research conducted to identify the risk variables that affect COVID-19 outcomes, including those by Shahid et al. (2020) and Sohrabi et al. (2020) [3, 10]. Although theories were put out, the pathophysiology associated with this risk factor is still not fully understood. Therefore, it is thought that diabetes

patients' immune systems are changed by their abnormally low blood sugar levels, which causes them to have slower immune system responses and leaves them more vulnerable to the virus than healthy individuals.
Table 2.1 of this study's findings demonstrates how a considerable portion of COVID-19 hospitalized patients' deaths were caused by their use of oxygen treatment. The cause of this result is still a mystery to scholars. Along with the results of this study, HIV and AIDS have an AOR value of 8.643, which indicates that PLWH are 8 times more likely to die from COVID-19 than persons without HIV. Among the Windhoek district, HIV was discovered to be considerable and connected to COVID-19 fatalities in adult hospitalized patients. Some of the causes of this result may be related to the high prevalence of severe risk factors in PLWH, the majority of which contribute to the course of the disease. However, prior research did not provide conclusive proof of a connection between PLWH and COVID-19.
The study also demonstrated that being seriously and critically ill were significant. The AOR for being dangerously unwell was 7.118, and 5.557 for being very ill, which agrees with earlier research done in Wuhan, China. Clinical COVID-19 symptoms are related to how COVID-19 patients who are hospitalized fare.
These results are consistent with a research conducted in Evergreen, Washington, which concluded that having COVID-19 patients in an intensive care unit improved their prognosis.

6. CONCLUSION

Finally, the study has demonstrated that the following risk variables, such as the presence of comorbidities, Clinical case category, O2 treatment, and ICU, were linked to the deaths of COVID-19 adult hospitalized patients in the Windhoek region between January and November 2021.

7. RECOMMENDATIONS

- Since the study evidently had proven that ICU administration improves the disease outcome, the researchers recommended that the Ministry of Health and Line stakeholders increase ICU facilities.
- Strengthen awareness campaigns on preventative measures in Windhoek district.
- The Ministry of Health and Line stakeholders to formulate and implement a special care plan for patients that have the comorbidities identified in this study as common risk factors.
- The Ministry of Health and Social Services is encouraged to capacitate all pillars responsible for outbreak data collection, analysis dissemination and use with all relevant resources for quality data and effective usage.
- Training of data managers should be an essential asset for the Ministry of Health and line stakeholders to eliminate discrepancies and encourage collection of important patient data needed for analysis to assess disease outcomes.

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