CAPITAL UNIVERSITY OF SCIENCE AND TECHNOLOGY, ISLAMABAD

Relationship of ABO Blood Group, Diabetes and Age with Severity of COVID-19 among Swat, KPK Population

by

Suliman

A thesis submitted in partial fulfillment for the degree of Master of Science

in the

Faculty of Health and Life Sciences
Department of Bioinformatics and Biosciences

2021

Dedicated to ***ALLAH Almighty***, ***Hazrat Muhammad (PBUH)*** *and my brother Dr. Luqman Hakim who has been a constant source of motivation and encouragement during the challenges and supporting me spiritually throughout my life.*

CERTIFICATE OF APPROVAL

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Acknowledgement

I humbly thank to **Allah Almighty**, the Merciful and most Beneficent who best owed his innumerable blessings upon mankind, one of which is knowledge a distinction for mankind. I offer my gratitude to the Holy Prophet Muhammad (PBUH) who preached us to seek knowledge for the betterment of mankind in particular and other creatures in general.

I am deeply indebted to my supervisor **Dr. Arshia Amin Butt** , Assistent Professor, Department of Bioinformatics and Biosciences, Faculty of Health and Life Sciences, Capital University of Science and Technology Islamabad (CUST), Pakistan. Her guidance, continuous encouragement and productive criticism throughout my study have helped me in completion of my thesis. I am grateful to **Dr. Arshia Amin Butt**, Department of Bioinformatics and Biosciences, Faculty of Health and Life Sciences, Capital University of Science and Technology Islamabad (CUST), Pakistan for her kind cooperation to provide re search facilities. I would like to extend my appreciation to those colleagues, who have helped me in any possible way during my MS-degree. I wish to express my heartfelt appreciation to my sweet friends specially Dr. Shafiullah, Mr. Shakirullah & Mr. Muhammad Maaz. Finally, to the most special persons I have in my life, who have always present for my help. My beloved brother who have always been there for me, I am thankful for every moment.

Thanks to all.

(Suliman)

Abstract

The world has encountered to a new viral disease called the COVID 19 (Coronavirus disease) in December 2019. The disease originated in the land of China and spread across all over the world with an adverse impact on the human health, economy of the country, and social interactions. Similar conditions appeared in 2001 and 2014 but they did not cause severe damage to the people,s health and the economy of the world. COVID-19 is an international concern across the world research has been done on various aspects of COVID-19 and some of the most important aspect are various variables such as blood group, diabetes and age. COVID-19 has become an international issue, and our local communities, particularly smaller cities like Swat, have been a victim of COVID-19. The high prevalence of COVID-19 during the pandemic and their variables(blood group, diabetes, and age)were chosen for research. Coronavirus is a single strand RNA particle belonging to the family of Coronaviridae, found in different species of birds, snakes, bats, and other mammals. which causes moderate to severe symptoms such as high temperature, dry cough, difficulty in breathing, loss of smell and taste. The aims and objective of the study are to find the Relationship of prevalence rate among the population of Swat in comparison to the following three factors: ABO blood group distribution, diabetes, and Age. A data acquisition form has been designed for this purpose. Different questions were asked about the age, gender, and other condition of the patient. Furthermore, patients were asked about blood group and other illnesses such as hypertension, diabetes, asthma, etc; Data were collected from hospitals, specifically from the corona ward, in district Swat. Data were analyzed with excel 2010 and SPSS (16.0). The total number of respondents was 500. There were 197 laboratory-confirmed cases, 124 were suspected and 179 were not detected. Diabetics patients with COVID-19 were 147. The teenage group was 1 case positive, young age was 33, middle age was 69, and old was 94. The blood type that was most common in COVID patients the blood group B (63) lower group were O (15). The findings of the current research indicate that Although blood group B may play a role in increasing susceptibility to the disease, COVID-19 infection can be very defensive in the blood group O. Old age people were more prone to

infection than young ones. Diabetic patients are more frequently vulnerable than non-diabetics.

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Abbreviations

ARDS	Acute Respiratory Distress Syndrome
ACE2	Angiotensin Converting Enzyme 2
CLD	Chronic Liver Diseases
DNA	Deoxy Ribo Nucleic Acid
DKA	Diabetic Ketoacidosis
HDU	High Dependency Units
HHS	Hypermolar Hyperglycemic Syndrome
MERS-CoV	Middle East Respiratory Syndrome coonavirus
PHEIC	Public Health Emergency of International Concern
PCR	Polymerase Chain Reaction
ROS	Reactive Oxygen Species
RNA	Ribo Nucleic Acid
SARS-CoV	Severe Acute Respiratory Syndrome Coronaviruses
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronaviruses-2
SPSS	Statistical Package for the Social Sciences
TMPRS2	Trans Membrane Protease Serine 2
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

Chapter 1

Introduction

1.1 Background

From December 2019 onwards, a new pandemic of infectious diseases has started across the world. WHO named the viral disease Corona Virus Infectious Disease (COVID-19) [1]. Several cases of pneumonia of unknown etiology were confirmed by the China Health Authority to the World Health Organization (WHO) in Wuhan City, Hubei Province, Central China. Since December 8, 2019, cases have been reported and some patients have worked or resided in the neighborhood of the Huainan Seafood Wholesale Market, while other early cases have not been in contact with this market [2]. WHO detected a novel coronavirus in a patient swab sample on January 7, 2020 [3].This microorganism was later called Acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Community of Coronavirus Experts [4]. The infection is referred to by the WHO as coronavirus disease 2019 (COVID-19). As of 30th January, 7736 confirmed cases and 12,167 suspected cases were reported in China and 82 confirmed cases have been identified in 18 other countries [5]. On the same day, WHO declared the SARS-CoV-2 pandemic to be a public health emergency of international concern (PHEIC) [6]. According to the National Health Commission of China, the death rate for reported cases in China as of 4th February, 2020 was 2.1% [7].

1.2 Corona Virus

Coronavirus is a group of enclosed 50-30 positive sense single stranded RNA viruses belonging to the family of Coronaviridae, found in different species of birds, snakes, bats and other mammals. Avian species like birds and chicken may have the possibilities of respiratory tract infection or in cows and pigs may cause enteritis. Humans may be get infection with different strains of previously known coronaviruses like 229E, OC43, NL63 and HKU1. They produce symptoms like rhinorrhea, mild cough (upper respiratory infection) or severe cough, tracheitis, bronchitis (lower respiratory tract infection). If we look through different technique such as celestron microscopy and tomographic to the structure of Corona, its size is 125 nm having spherical shape with club shaped spikes [9].

1.3 COVID-19 Symptoms

Covid-19 is a life threatening entity whose most frequent signs include cough, insomnia headache, dyspnea, musculoskeletal symptoms (fatigue, joint pain and myalgia), dysgeusia, and gastrointestinal symptoms [10, 11]. A study has been reported at COVID-19 patients 72.7% of participants had evidence of interstitial pneumonia. Some showed fatigue (53.1%), dyspnea (43.4%), joint pain, (27.3%) and chest pain (21.7%) [12].

A study was conducted in Wuhan, china two cases were investigated with COVID-19 with symptoms fever, cough, and dyspnea secondary to pneumonia areas checked with a real-time fluorescence polymerase chain reaction examination and presented with standard CT findings [13, 14]. These cases have developed with respiratory weakening and elevated serum D-dimer content.

It is extremely important to follow prophylactic steps to prevent venous thromboembolism in admitted patients. In this situation respiratory deterioration with the other clinical signs of venous thrombosis would raise the suspicion of pulmonary embolism.

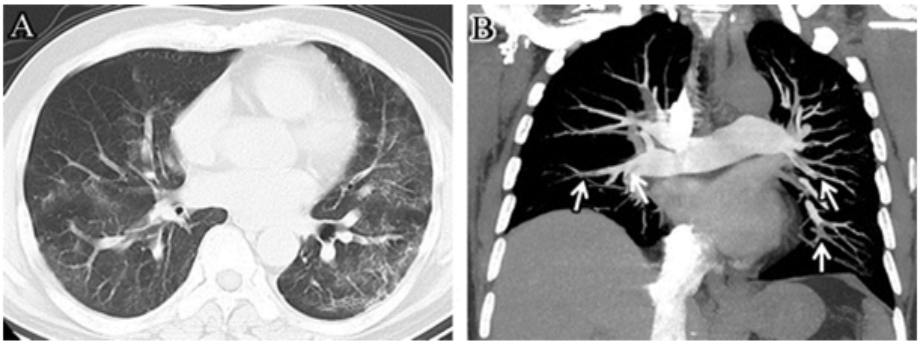

FIGURE 1.1: Pateint of COVID-19 having Pneumonia with Age 57 year. (A) On Day 10 CT Showing Ground Glass Opacities at Periphery. (B) Angiography of Arteries at Lungs Showing Filling Defects [13].

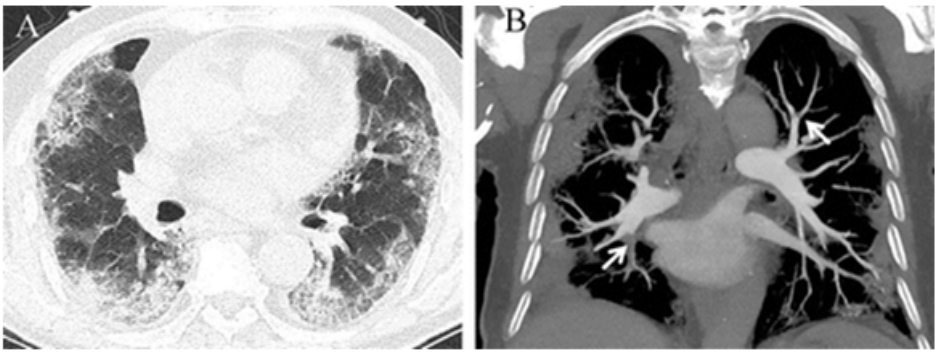

FIGURE 1.2: Patient of COVID-19 having Pneumonia with age 70 year.(A) On Day 2 CT Showing Ground Glass Opacities with Consolidation. (B) Angiography of Arteries at Lungs Showing Filling Defects [14].

Another investigation shows different sign and symptoms. Symptoms included fever (70 percent; 431/617), cough (39 percent; 233/599), nausea / vomiting (32 percent; 179/564) and shortness of breath (30 percent; 173/570) (fig 1.3)

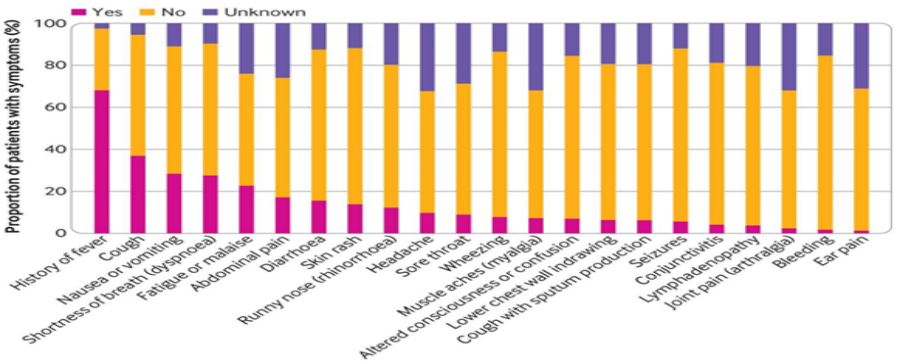

FIGURE 1.3: Proportion of Patients Presenting with Each Symptom [11].

1.4 Precautions

As suggested in the present data the infection of COVID-19 spreads among individuals through respiratory droplets and interaction courses. The droplets transmission occurs where an affected COVID-19 person is coughing or sneezing openly in public or other surrounding environment. This enhances the risk of getting the virus by normal persons through mucosae (mouth and nose) or conjunctiva (eyes). Similarly the transmission may take place through fomites nearby the infected person. The COVID-19 virus can transfer the surfaces and objects used by the infected person to others through direct contact with the infected person or indirectly. It involves the presence of microbes inside the nucleus of the droplet, which are usually known to be particles smaller than 5 μm in diameter.

That arises from the evaporation of large number of droplets or present in dust particles. They can live in the air for a long time and be transmitted for distances of about 1 m to humans. World Health Organization recommends precautionary measures to control the transmission of COVID-19 disease among people i.e. Use of Face masks, Sanitizers, Gloves etc [15]. The propagation of COVID-19 is not well described, but is possibly related to SARS, which has been transmitted through contact, droplet and airborne paths [16]. It is present in the lower and upper respiratory tract. Latest experiments have shown that seasonal COVID is more frequently released in aerosols than in droplets [17]. Currently there is no vaccine discovered to prevent the COVID-19, but the Scientist investigated that virus can have transmitted from person to person, so precautionary measures should need to be followed to avoid the spread of the disease. It is suggested for droplet precaution there must be 1to 2 meter [18, 19].

As the COVID-19 is a life treating and continuously spreading throughout the world. Different countries are doing research work on COVID-19, they compare different parameter of COVID-19 with various variable factors like other countries Pakistan is also the victim of COVID-19. There is a need to work in the hilly area, of Pakistan like Swat, is a district of Khyber pakhtunkhwa. It is hilly area, most of the people are not aware and also Swat is different from other parts of world in

culture, weather and trends of many other usual diseases that's why I chose this specific region for this study to compare with already existing data.

1.5 Problem Statement

COVID-19 is extremely infectious disease reported to have multiple implications and manifestations when compared to changing habitats, life style, gene pole and environmental factors. Despite being an International concern our local areas especially smaller cities like Swat are still being ignored by the researchers. Swat population with their unique attributes and high prevalence of COVID-19 during pandemic were selected for study.

1.6 Aims and Objectives

The objectives of this research are to study the:

- Prevalence of COVID-19 in Swat population during first wave of pandemic.
- Relationship of prevalence rate with ABO blood group, diabetes and age among population of Swat.

Chapter 2

Literature Review

2.1 Viruses

The virus is an infectious agent that lives only within cells of a living organism [20]. It is a submicroscopic agent and have effect on all forms of life like virus infect every living body including animals, plants, bacteria and arechaea [21]. Almost 6000 virus species or more are analyzed in detail [22] and millions of types of viruses as well.

Viruses can be observed in every ecosystem on the earth, and are in great numbers. When infection occurs, the host cell replicates thousands of duplicate versions of the original virus.

Outside the infected cell or in the course of infecting the cell, viruses are in the form of individual particles or virons consisting of (1) Genetic material of a long DNA or RNA molecule that helps to encode the structure of the proteins in which the virus acts (2) Protein coat that covers and preserves the genetic material and often (3) An outer envelope of the cell is lipids.

The shape of all these viruses differs from basic helical to icosahedral forms. Many virus species are so small and can only be seen by an optical microscope so their size is one hundredth the size of most bacteria.

2.2 Corona Virus and its Genome

The genome of coronavirus comprises of 30,000 nucleotides. It is encoded with four structural proteins, nucleocapsid (N) protein membrane (M), spike protein (S) and other non-structural proteins (Snsp). The capsid protein can be found in the membrane, and the capsid contains N-protein or N-capsid connected to the positive strain of RNA, It would have the responsibility to control human cells and turn them into virus factories. The Genetic material (RNA) of Coronavirus is covered with N-protein that contributes in its replication and transcription. The N-terminal of the N protein, which is linked to the MHV and IBV genomic RNAs, is responsible for viral replication and replication One of the main open-ended research issues is the development of a successful drug targeting to avoid or inhibit a link between the N-terminal of the N-protein and simple positive RNA strands that can avoid viral replication of the virus [23]. It has been stated that two large groups of theophylline and pyrimidine compounds could be RNA inhibitors linking to the N-terminal domain of coronavirus N-protein. This opens new doors for in vitro validation. Several of the M proteins can be located at the viral surface and are considered to be the key operators of corona virus assembly, while the S protein is translated on the surface. It binds the virus to host cell surface receptors and combines between host cell surface receptors to allow the virus to access the host cell surface [24]. The E-protein consists about 76 and 109 amino acids and a small proportion of the virus particles. It plays a major role in the permeability of the host cell membrane, the interaction between the host cell virus and the virus assemblies [25]. Lipid coverage covers genetic material. Ham Agglutinin - Stress Dimer (HE) has been placed on a viral level. Protein (HE) may be involved in viral entry, but not necessarily for transcription. However, it is the most common protein in natural host cell infections [26]. State of the art Cyro = EM experiments have demonstrated the full structure of the spike (S) protein in the vicinity [27]. This glycoprotein consists of three equivalent chains of 1,273 amino acids made from two distinct protein domain regions: The two components s1 and s2 referred to cell recognition and viral and cell membrane

fusion, respectively.

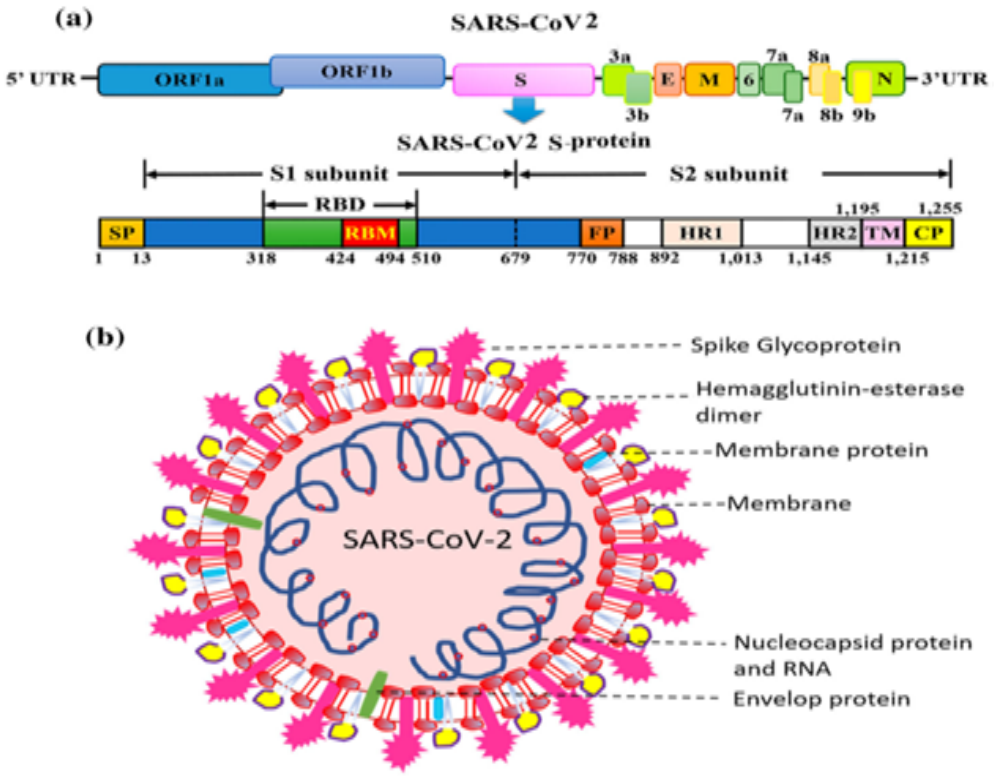

FIGURE 2.1: Graphic Illustration of the S Protein Genome Organization and the Functional Domains of COVID-19 [27].

2.3 Properties of the COVID-19 and the Disease Phenotype

SARS corona virus 2 (SARS-CoV-2), a virus which is a agent of COVID-19, is a current beta corona virus. (with a large RNA) that shares 80 percent of the sequence similarity with the previous SARS outbreak in 2003. The coronavirus surface have many spike glycoproteins (s) which consist of homotrimers protruding far from the surface of virus, that give it a halo like shape. The spike s protein allows the virus to engage its target cell reporter, angiotensin converting enzyme 2 (ACE2) (figure 2.2). There are two subunits of s protein, S1 and S2 which facilitate the internalization of the target cell. Due to many characteristics of

SARS-CoV-2 which make a more potent infection virus than SARS-Cov. Perhaps the most important receptor binding domain SARS-Cov-2 preserved the entire structure of the SARS-Cov binding domain, which included 8 of the 14 residues being absolutely similar. However, the three- dimensional form of the SARS-Cov-2 binding site shows that it is much more compact. Increased binding stability and hence increased ACE2 binding interactions [28].

The second difference is that SARS-COV-2 has a polybasic (furin) (site into which the increasing incidence of S1 / S2 protein is inserted at the border. This furin binding site is very rare and it improve the ability of the cells to internalize into the cells and it shares features with recent extremely pathogenic viruses, including avian influenza. In general, RNA viruses are prone to higher mutation rates. Viruses are expected to mutate during the epidemic. In order to facilitate their transmission viruses tend to adopt to local environment. If track changes on the basis of geography and time it will help us in the better analysis of the disease pathogenesis. Clinical phenotype variation and its molecular epidemiology [29].

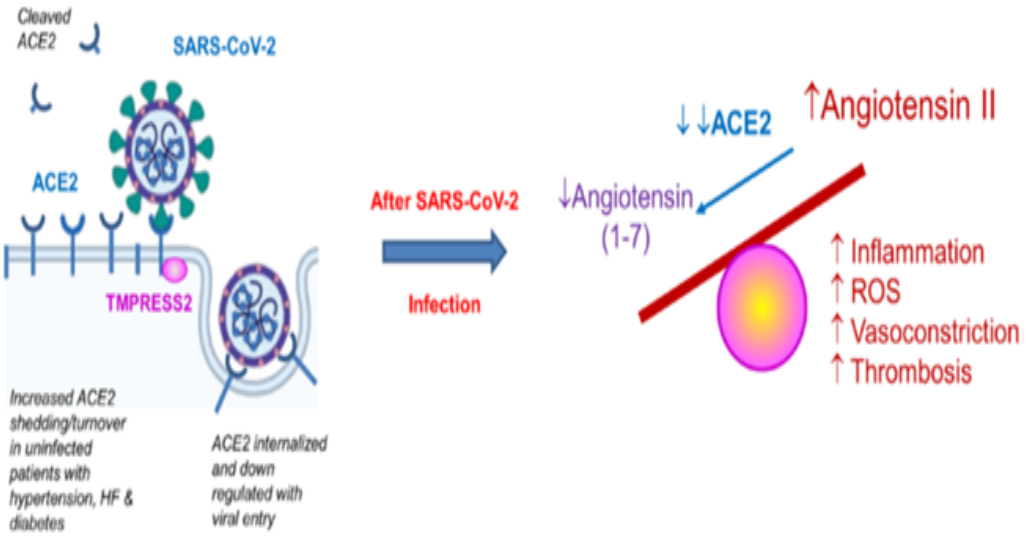

FIGURE 2.2: SARS-Cov-2 Uses the ACE2 as a Internalization Receptor, that is Promoted by TMPRSS2 Protease. ACE2 is normally increased in a body but when SARS-Cov-2 enter to the lungs its decreases while Angiotensin 2 elevated as a result inflammation vasoconstriction and thrombosis occurred [28].

2.4 Mechanism of Corona Virus Entry into Cell

Coronavirus can enter human body cells through an amazing mechanism explains as; the spike (S) protein of coronavirus attaches the special receptors found on several human cells, containing in the lungs called angiotensin converting enzyme 2 (ACE2) receptors, that allow virus to enter the cells. The host proteases trypsin and furin performing the proteolytic cleavage of Coronavirus S protein among the S1 and S2 subunits, whose sites are located on the boundary. The separation of the S2 domain at the S20 site takes place at a later point For the release of fusion peptides. This phenomenon triggers the binding process of the membrane. Antibody research can find molecular levelling sustenance that can manipulate the organisational content of the binding region that is present in the receptor of the angiotensin-converting enzyme 2. The provided procedure could thus ruse a therapy to obstruct the entry of the virus. Human cells can absorb the virus by endocytosis, where, unlike other viruses, COVID-19 exhibits a special 3-step process involving membrane fusion; mediated configuration in glycoprotein Spike (S) and receptor binding; cathepsin L proteolysis by intracellular proteases; and the third step is to activate further membrane fusion pathways within endosomes. [30]. After that, the endosome releases the virus to the cytoplasm, where the proteasomes continue to uncoat viral nucleocapside (N), that hydrolyzes endogenous proteins and is also able to degrade exogenous proteins such as the nucleocapsid protein SARS [31] . Li, 2016, an additional two-step mechanism suggested that the virion binds to The target target cells receptor via its S1 subunit on the surface and the host proteases are attached to the Spike and then the fusion of the host target membrane virus via the S2 subunit at low pH is expected [32]. Lastly, a single stranded RNA, the genetic material of the virus, is completely released into the cytoplasm, where replication and transcription processes take place to form a replication-transcription complex (RTC), which is composed of non-structural proteins (nsp) encoded in the viral genome. The complex of replication-transcription is alleged to be an induced double membrane structure in cytoplasm infested cells [33]. In the open, reading frame 1a / b (ORF 1a / b), the positive RNA genome

can be converted into replica proteins. Through using the ,genome as a template, these proteins created full-length negative sense RNAs, and the sense RNAs then act as a template to generate additional full-length genomes. In the cytoplasm, M, S and E (structural viral proteins) are produced, introduced into the endoplasmic reticulum and then moved to the intermediate ERGIC (endoplasmic reticulum-Golgi) compartment. The N protein also creates nucleocapsids through the encapsidation of repeated genomes in cytoplasm, resulting in the shifting of self-assembly inside the ERGIC membrane into new virions. In order to infect the other cells, the new virions packaged in smooth walled vesicles are now secreted by the exocytosis process. The tension of viral development in the endoplasmic reticulum, meanwhile, eventually contributes to necrosis of the cells.

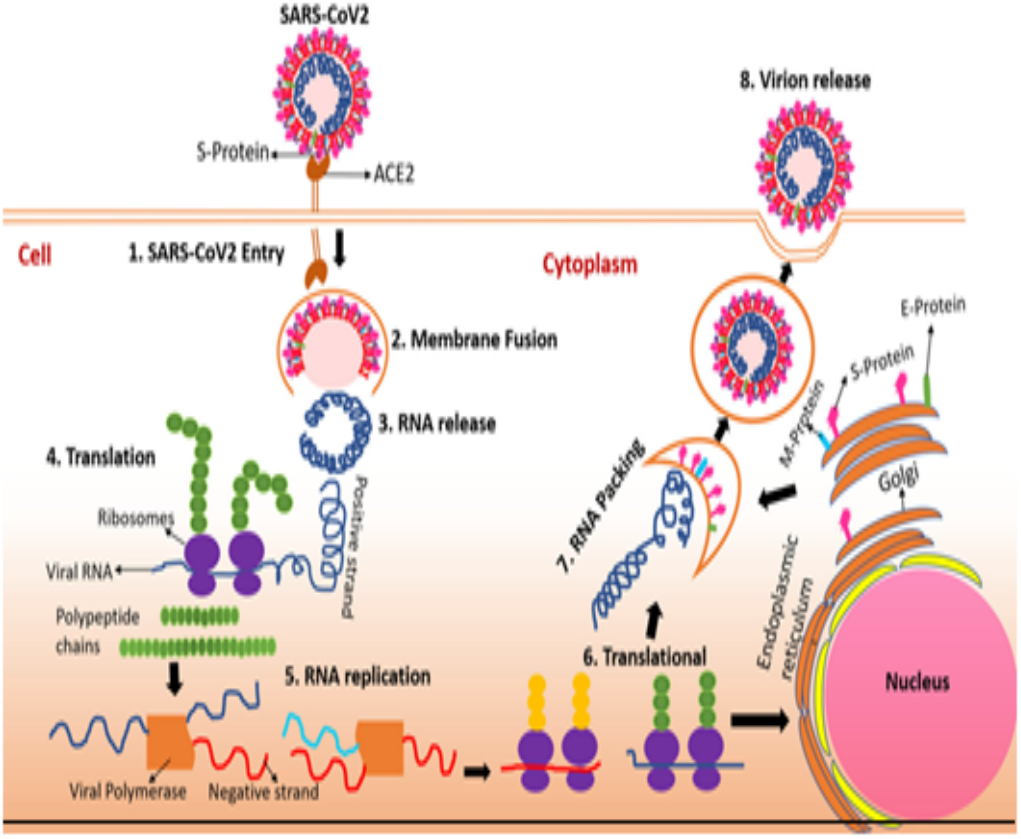

FIGURE 2.3: Mechanism of Corona virus Entry [31].

2.5 Role of Angiotensin Converting Enzymes

It plays a very important role while in binding with COVID-19. It is also revealed that the spike protein of SARS-2 is more sensitive to ACE2. Cells lacking ACE2 are not binding with the COVID-19, only those cells are, which have ACE2 [34]. The entry of SARS-CoV-2 into cells can depend on Angiotensin Converting Enzymes 2 but, ACE2 considered to be protecting against acute pulmonary damage. According to a murine model, when the SARS-CoV spike protein binds to ACE2, alter its regulation and result to increase the secretion of angiotensin II which eventually increase vascular permeability of lungs inducing pulmonary edema and abridged lung function [35].

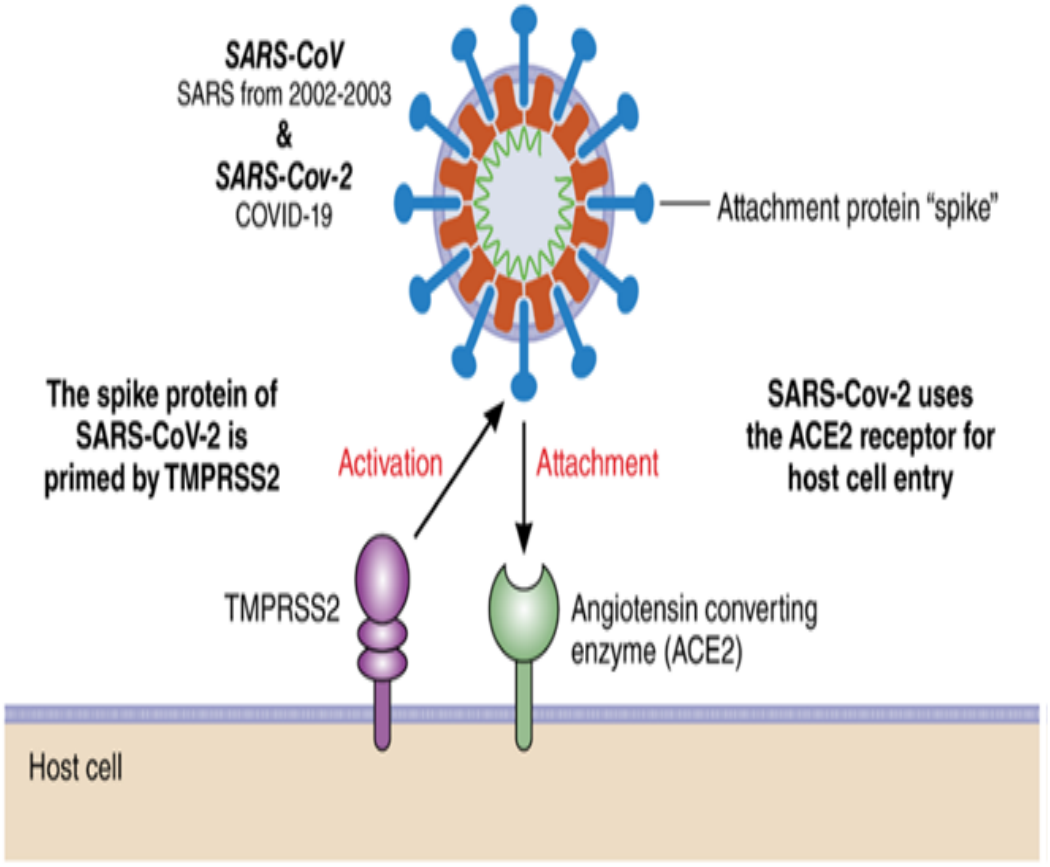

FIGURE 2.4: Acute Respiratory syndrome binds to coronavirus 2 (SARS cov-2) angiotensin-converting enzyme 2 (ACE2) receptors after activation of spike proteins through trans membrane protease serine 2 (TMPRS2) [34].

2.6 Comparative Study of Beginning and Spreading of Coronaviruses

The Chinese population in 2003 Guangdong Province became infected with a sever acute respiratory syndrome (SARS) virus, As a member of the Subgroup on Beta Coronavirus the virus has confirmed and called SARS-CoV [36]. Affected patients showed signs of pneumonia with scattered ovular injury that escalated to acute respiratory distress syndrome (ARDS). In Guangdong, China, SARS first rose and then spread exponentially across the world with more than 8,000 infected individuals, 776 expiring. In 2012, after 10 years, a few Saudi Arabian nationals were hospitalized with another COVID infection .The World Health, Organization described in detail that MERS-COVID affected more than 2428 people and 8 38 passers-by [37]. The Chinese government recently told WHO of multiple cases of pneumonia with new etiology before the end of 2019. The disease began at the Hunan seafood market in the city of Wuhan, China, where more than 50 people were seriously affected [39]. On the basis of sequences analysis, the virus is considered as a novel coronavirus. Similarly other evidence such as genetic sequence also proved it is the viral infection. In the beginning it was considered this infection is due to the use of stuff available in seafood market in Wuhan city of china, but later other cases has reported, the investigation showed that there were no history of contact to the seafood market from this observation it is concluded, there is great chances of human to human transmission, as it mentioned in more than 100 countries in the world.

2.7 Types of Coronavirus

1. Alphacoronavirus 229E.
2. Alphacoronavirus NL63.
3. Betacoronavirus HKU.
4. Betacoronavirus OC43.

5. Severe Acute Respiratory syndrome coronaviruses (SARS-CoV.)
6. Severe Acute Respiratory syndrome coronaviruses (SARS-CoV-2).
7. Middle East Respiratory Syndrome coonavirus (MERS-CoV) [41].

2.8 Etiology of COVID-19

COVID-19 is a member of the family of Beta coronavirus. The results of the phylogenetic study revealed that this infection entered a subgenus similar to that of COVID that triggered the 2002-2004 episode of Severe Acute Respiratory syndrome (SARS), namely Sarbecovirus [42]. On this basis, the name SARS-CoV-2 was suggested by the International Committee on the Taxonomy of Viruses [43].

2.9 Coronavirus Main Reservoirs and Hosts

It is necessary to decide the cause of initiation and transmission in order to establish prevention systems to control the disease. Scientists have previously concentrated on raccoon canines and palm. Civets were the primary source of infection in SARS-CoV reservoirs, but only the sample taken from civets Positive findings have been seen on the food market for The role of viral RNA, suggesting that civet palms might well be secondary hosts [44]. In 2001, the sample was taken for antibodies test from healthy people from Hong Kong, so the result revealed that antibodies formed against SARS-COVID were 2.5 percent frequency levels. These indicators indicated that SARS-COVID might be running in people before triggering the epidemic in 2003 [45]. Rhinolophus bats have also been later found to have antibodies to SARS-CoV, revealing bats as a viral replication vector [46]. COVID'S Middle East Respiratory syndrome (MERS) first rose in Saudi Arabia in 2012 [47]. MERS-COVID also links to beta-COVID and camel as a zoonotic. or primary host origin [48]. MERS-COVID has also been recognized in Pipistrellus and Perimyotis bats [49]. Indicating that bats are the main host and interacting

mode for infection. In the ongoing study that bats are the primary host and mode of communication for infection [50]. At first, A group of researchers said that snakes were imaginary hosts, but after discovering the genomic similarities of the current coyote with bat-like infections such as storks, it was claimed that bats could be important water reservoirs, not snakes [51].

2.10 Transmission

The SARS-CoV-2 sequence is alike to a bat-isolated coronavirus, so the postulate is that SARS-CoV-2 comes from bats that then mutate and infect humans. [52]. As an intermediary reservoir, mammals and birds are considered [53]. As an intermediate reservoir, pangolins were suspected in the case of COVID-19. In the genome, coronavirus strains in pangolins are similar to coronavirus bats (90.5%) and SARS-CoV-2 (91%) [54, 55]. At present, the primary source of transmission is the spread of SA.RS-CoV-2 from humans to humans, so the spread is more powerful. Transmission of SA.RS-CoV-2 from symptomatic patients occurs by droplets that emerge when coughing or sneezing [56].

Moreover, it has investigated that SARS-CoV-2 can be aerosol viable (made with a nebulizer) for at least 3 hours [57]. Some case reports indicate suspected asymptomatic career transmissions, but the exact mechanism is unknown. Asymptomatic career transmitting cases usually have a history of direct contact with COVID-19 patients [58]. A study reported contamination with SARS-CoV-2 in neonates. However, there has not been proven vertical transmission from pregnant women to the foetus. The evidence indicates that the chances of vertical transmission are limited if that will happen [59]. Virological investigation of amniotic fluid, umbilical cord blood, and breast milk is found to be negative in mothers who were COVID-19-positive [60]. Another research found air contamination in the rooms and toilets of CO VID-19 patients with minor symptoms in Singapore. In door knobs, bathrooms, light switches, windows, cabinets and ventilation fans, viruses can be detected, but not in air samples [61].

2.11 Diagnosis of COVID-19

As the corona virus infection spread worldwide, and adopted a pandemic situation, diagnosing COVID-19 in suspected cases carry importance in order that the patient undergo preventative measures such as isolating himself to prevent further spread of infection. Also he or she may seek early medical care to prevent complications in the form of multiple organ failure [62].

2.11.1 Serology Test

The patient blood sample is screened for the presence of antibodies against corona virus.The drawback of serological test is that it may be false negative in the initial days of infection when antibodies have not formed yet. Also it could be false negative in some immunocompromised patient e.g. HIV [63].

2.11.2 Detection of Viral Genome

Viral RNA is detected in swab sample taken from nasopharynx, oropharynx or sputum. Using polymerase chain reaction (PCR). This technique is quiet useful in detecting acute corona infection, it is a bit time consuming and the result is declared in several hours [64].

2.12 Clinical Presentation of COVID-19

Patients with COVID-19 with pyrexia are 85 percent after their disease, but only 45 percent fibrils were originally [65]. However, 67.7% having cough while 33.4% having sputum. Other Respiratory symptoms such as congestion 4.8%, dyspnea 18.6% and sore throat 13.6% [66]. Headache is noticed about 13.6, chills are 11.4% and bone or muscles aches observed about 14.8% [67]. In case of GIT such as diarrhea is found in 3.7% while vomiting is about 5%.

Acute respiratory distress syndrome (ARDS) and patients older than 60 years are the major contributors to HDU and mortality from COVID-19.

2.13 Major Outbreak of Virus from 2000 to 2020

Table 2.1: Cases, Basic Reproductive Rate and Mortality Rate [42].

Virus-(Disease)	**Cases**	**Mortality Rate**	**Ro**
SARS-CoV-2 (COVID-19)	304,900*	3.4% estimated from WHO-on March 3, 2020	2-2.5
SARS-CoV-1 (SARS 2003)	8,098	9.6%	2-5
MERS-CoV (MERS 2012)	2,494	34%	0.3-0.8
H1N1 Influenza A (Swine flu 2009)	60.8 million	0.02%	1.4-1.6

2.14 Children with COVID-19

It has reported only 1-2% of children and young people affected by COVID-19 [69]. Children of all ages were affected by COVID-19, although there was no significant difference in sex. Though the clinical presentation of childhood cases of COVID-19 was usually less serious than that of adult patients, young children, particularly babies, remained vulnerable to infection.

2.15 Possibility of COVID-19 for Patients with Cancer

About 15,590 cases of confirmed corona virus disease (COVID-19) were reported in 2019 in 18 patients with a history of cancer. It is stated that COVID-19 cancer patients are much more likely than people with no cancer history [71]. Regular analysis of different cancer patients with COVID-19 is necessary, provided that cancer patients have a higher risk of infection. A large prospective study involving 105 cancer patients and 536 age appropriate cancer patients were confirmed with COVID-19. Our studies concluded that cancer patients were at a higher risk of getting COVID-19 in all respects. In patients with haematological, liver or metastatic (stage IV) cancer, the severity is the same. Patients of non-metastatic cancer have the same frequency as non-cancer patients [72].

Immune system failure fails to differentiate between self and non-self the outcome of cancer pathogenesis and viral infections. Both viruses and cancer produce proteins that are detected by host T cells, and both are immediately mediated by T cells to mediate inflammation, It is supposed to cause and remove different types of cancer, respectively It is understood that coronaviruses attack the human respiratory system mainly. COVID-19 is the 6th member of the coronavirus family to be infected by humans. COVID-19 seems biologically new on its own, but little is understood about the role of the new SARS-CoV-2 coronavirus in cancer In addition to other severe acute respiratory outbreaks (SARS-CoV, MERS-CoV).

Complications such as asthma and malignancy predispose COVID-19 positive patients to unfavorable health outcomes. A new study involving 1,590 COVID-19 positive patients in China indicates that cancer is one of the most significant comorbidities that raises the risk of COVID-19. According to World Health, It is also known that cancer is likely to trigger pathogenesis to COVID-19 [73].

2.16 Risk of COVID-19 by Blood Group

Several risk factors, including age , sex, and multiple chronic and complex diseases and laboratory results, are reported for COVID-19 inflammation, ill health, and death 2. They found a link between the form of ABO blood group and infection in a study performed on COVID-19 patients in Wuhan and Shenzhen.7, 770 COVID-19 patients examined at the New York Presbyterian (NYP) hospital, we concluded that blood B group is more susceptible, and O blood group is less susceptible [74]. It has reported there is a relation between blood group and COVID 19. Blood O group is considered is a protective against the SARS-Cov-1 [75, 76]. Other report mentioned that blood group O have no such link with COVID-19 while blood group A was more prone to COVID-19 [77, 78]. Another investigation has been done on the ABO blood group system; they found different association of blood group with COVID-19. Blood group A more prone to COVID-19 than blood group O. It is concluded that ABO system is a somewhat associated with COVID-19 and it can be used as biomarker for COVID 19.In the past, the infection of coronavirus with association with ABO system were similar risk pattern to COVID-19. The susceptibility of COVID-19 to blood group system were studied in Hong Kong [79]. A study has conducted on blood group system, they compare non O blood group to O blood group system they found that having blood O group is less chances of getting infection than others blood group types. (Patrice et al found that anti-A antibodies specifically repressed the linkage of SARS-CoV S protein-expressing cells to ACE2-expressing cell lines7. The less prone of blood group O to COVID -19 and the high prone of blood group A to COVID-19 is due to the presence of

natural anti blood group antibodies. But it need further studies to find the very basic cause of ABO system and COVID association [80].

2.17 COVID-19 Association with Diabetes

Diabetes is also one of the major causes of mortality and morbidity worldwide. The disease is due to a few macro vascular and micro vascular complications, which ultimately impair the stamina of the general patient [81]. A association has been scientifically observed between diabetes and infection for some time [82]. Infections, especially flu and pneumonia, in older individuals with type 2 diabetes mellitus (T2DM) are also common and more genuine [83].

However, the data reported does not actually support that diabetes itself increases infection. The consideration involved is other conditions such as coronary and renal comorbidities related to diabetes [84]. In patients afflicted with multiple illnesses, including the 2009 pandemic flu A (H1N1) pandemic, diabetes and untreated glycaemia is accounted for as important markers of intensity and transmission [85]. SARS-CoV [86, 53] and MERS-CoV [87]. A few studies have not found a fair correlation between diabetes and serious illness in the most recent SARS-CoV-2 pandemic [88]. However, different reports from China [89] and Italy [90].

It has been found that older patients with chronic conditions, including diabetes, are at greater risk of extreme COVID-19 and mortality. Diabetes and different comorbidities are important measures of morbidity and mortality in COVID-19 patients.. Glycaemic regulation at the hospital During treatment at the hospital, sudden hyperglycemia has been reported, leading to a poor diagnosis in COVID-19 patients in Wuhan. They had a fourfold higher mortality rate during hospital stays with diabetes or hyperglycaemia. (288) in 1122 patients with COVID-19 admitted to hospital in the USA,84 compared to those with norm glycaemia (6-2 %). In comparison, patients with hyperglycemia and those without undiagnosed diabetes had a higher mortality rate. Another study revealed that 77 patients with

severe COVID-19 are at risk of death during care at a hyperglycemia hospital. In a propensity-matched score analysis, matching diabetes-related comorbidities, these results were confirmed in [91].

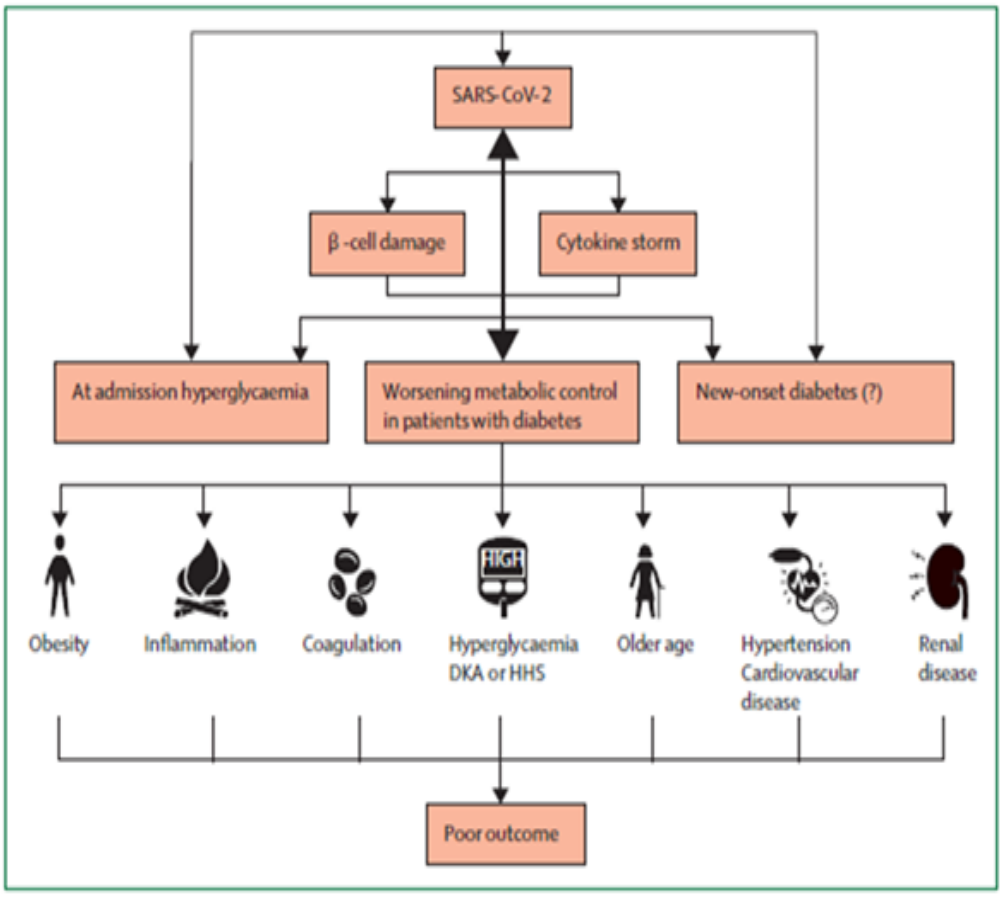

FIGURE 2.5: Interactions Between Diabetes and COVID-19 [81].

There is a mutual alliance between COVID-19 and diabetes. Because of several related factors that raise the risk, people with diabetes experience poorer effects. Due to its β-cell tropism, SARS-CoV-2 can induce new onset diabetes or maintain hyperglycemia upon hospital entry. More severe metabolic disorders (DKA or HHS) interfere with inflammatory cytokine surges and anti-regulatory hormonal responses, as well as disruption of β-cell cell activity. In contrast, new start diabetes, hyperglycemia and severe metabolic decline will further exacerbate the effects of COVID-19. DKA = ketoacidosis diabetes. HHS = hypermolar hyperglycemic syndrome.

2.18 COVID-19 and Hypertension

Hypertension is one of the most widely recognized risk related comorbidities, however this association is helped to establish by age. It isn't clear if hypertension is an age free risk factor of COVID-19-related results. As a precaution, it is basic that hypertension stays very much controlled [92]. It is not known whether hypertension is a risk factor for SARSCoV-2 infection accessible evidence suggests a prevalence rate of 15–40 %, to a large degree in line with the rate of hypertension in the general population (30 %) [93]. There was a greater contrast between hypertension (18.9 %) and those without hypertension Patients screened positive for COVID-19 & hypertension has been profoundly related to extreme COVID-19 [94].

2.19 Confirmed Cases of COVID-19 as Globally

Globally, as of 7:49pm CET, 26 January 2021, there have been 99,363,697 confirmed cases of COVID-19, including 2,135,959 deaths, reported to WHO.

2.20 Numbers of COVID-19 in Pakistan

The summarized data are taken from the site of world health organization.

Table 2.2: Pakistan Statistics by WHO (31 January 2021)

S.No	**Cases**	**Numbers**
1	Confirmed-cases	544,813
2	Deaths	11,657
3	Recovered	499,974

Table 2.3: Province & Cities Wise Cases by WHO (31 January 2021)

S.No	**Province & Cities**	**Numbers**
1	SINDH	246437
2	KPK	11,657
3	PUNJUB	499,974
4	ISLAMABAD	41359
5	BALOCHISTAN	18815
6	AJK	8988
7	GILGIT BALTISTAN	4908

The above table shows that, Sindh province is more affected as compare to other provinces.

Chapter 3

Methodology

3.1 Data Collection Method

A data acquisition form was developed to find out prevalence of COVID-19 in the north of Khyber Pakhtoonkhwa, district Swat city Mingora for a period of 6 months between August, 2020 to January, 2021. The geographical map of Mingora Swat is given below.

FIGURE 3.1: Map of Mingora City.

A data acquisition form was designed to find out the prevalence of COVID -19 in Corona ward, different question were asked such as the age, gender, and health condition of the patient. Furthermore, patients were asked blood group and ill health condition such as hypertension, diabetes, asthma etc. A acquisition form contained the following questions;

- Name of a patients.
- Age.
- Occupation.
- Gender.
- Blood group.
- Do you have any history of hypertension ?
- Any history of Lungs diseases ?
- Any history of Diabetes ?
- Symptoms.
- Have you travelled abroad recently ?
- Have you recently been in contact with anyone who has tested positive for COVID-19.
- Any history of smoking ?

3.2 Protocol for Self Protection

For self-protection I followed the standard protocol such as;

1. Use of mask.
2. Use of gloves.
3. Use of sanitizer.

3.3 Procedure

Data were collected from hospitals, specifically from corona ward, I visited the hospitals (Saudi medical hospitals) thrice a week.

3.4 Data Interpretation

All data were collected and interpret with Excel 2010, SPSS (16.0) and mini tab software.

Chapter 4

Results and Discussions

4.1 Prevelance Among the Gender

To find out the prevalence of COVID-19 and its relationship with blood group, age and diabetes. We collected data from 500 hospitalized patients including, 300 male and 200 females.

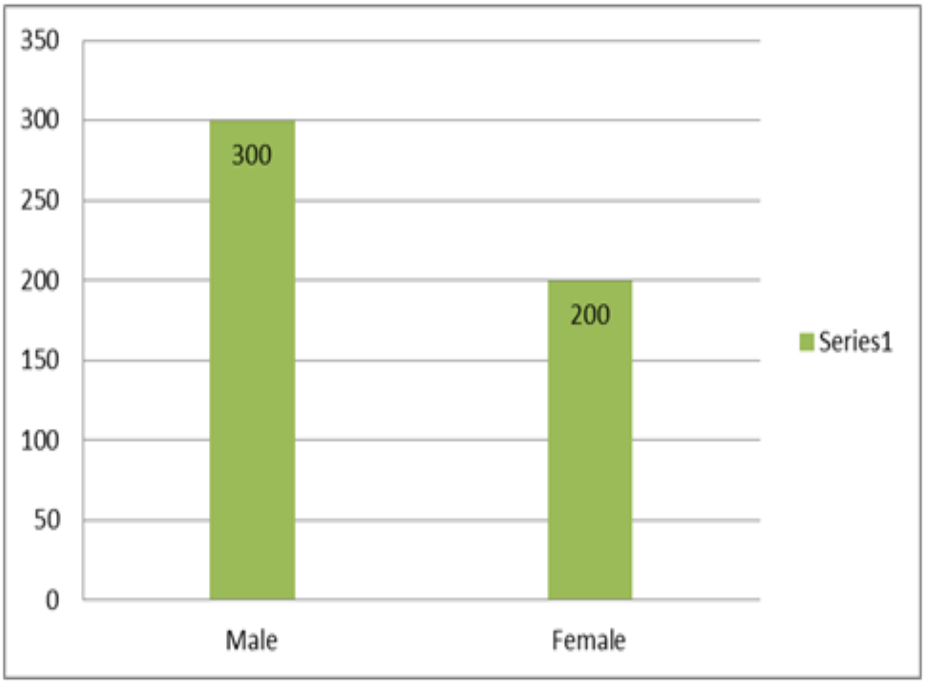

FIGURE 4.1: Total Number of Samples.

4.1.1 Number of Male and Female Infected with COVID-19

We found that Infected male were 94 out of 300 and infected female were 103 out of 200. Results are summarized in the given table 4.1 and figure 4.2. A Study were conducted in china, showed that the number of male is more than female. Infected male were 72 while female were 42 [95].

TABLE 4.1: Gender Wise Prevalence of COVID-19.

	Male	**Female**	**Total**
Confirmed Cases	94(31%)	103(51%)	197(82%)

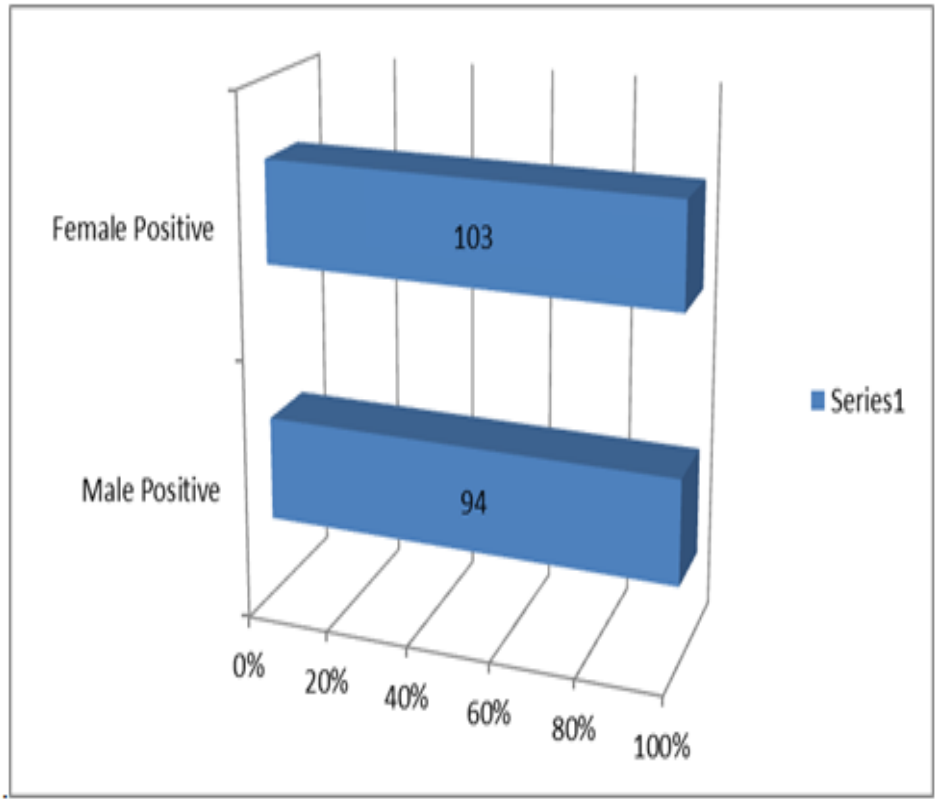

FIGURE 4.2: Gender Wise Prevalence of COVID-19.

4.1.2 Number of Male and Female Expired with COVID-19

Gander were also selected as a variable for the prevalence of COVID-19. Comparison was done between the gender and COVID-19. The total respondents were 500, the numbers of male were (300) and the numbers of female were 200. Out of 300 male, 79 expired while out of 200 female, 69 were expired.

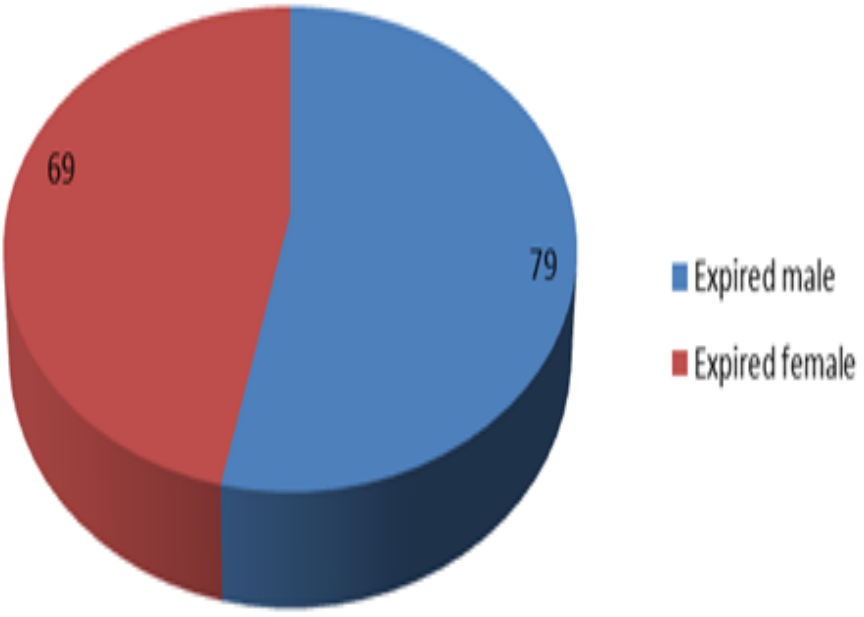

FIGURE 4.3: Gender Wise Prevalance of Expired Pateints.

TABLE 4.2: Gender Wise Prevalence of Expired patients.

	Male	**Female**	**Total**
Expired cases	79(26%)	69(34%)	148(60%)

4.2 Diabetes and COVID-19

According to our finding Prevalence of COVID-19 with diabetes were 147 individuals and 50 were non diabetics. Data are summarized in figure 4.4. A study conducted in china 39 Covid patients had no history of diabetes but after hospitalization 20 out of 39 developed diabetes, so it might be possible that COVID -19 destroy the islets of pancreas [96]. Another finding of diabetes with COVID-19 was 10% to 11.9% which is a high figure [97, 98]. It has been observed during this COVID-19 that patients having comorbidities like diabetes were more at risk than normal person. Still the mechanism of pathophysiology is unknown [99, 102]. Diabetes is the inflammatory condition, which causes vascular and metabolic abnormalities in the body as a result the body does not show any response to any foreign particles [103]. Diabetes may itself increase the entry of coronavirus into body due to the increased expression of ACE2 [104, 105]. It is unknown, how the diabetic patients are worse to Coronavirus, but there are some postulate about the poor effect of Coronavirus on diabetic patients; The immune system of diabetics patients are in a weak condition so therefore diabetic patients are more prone to Coronavirus [106].

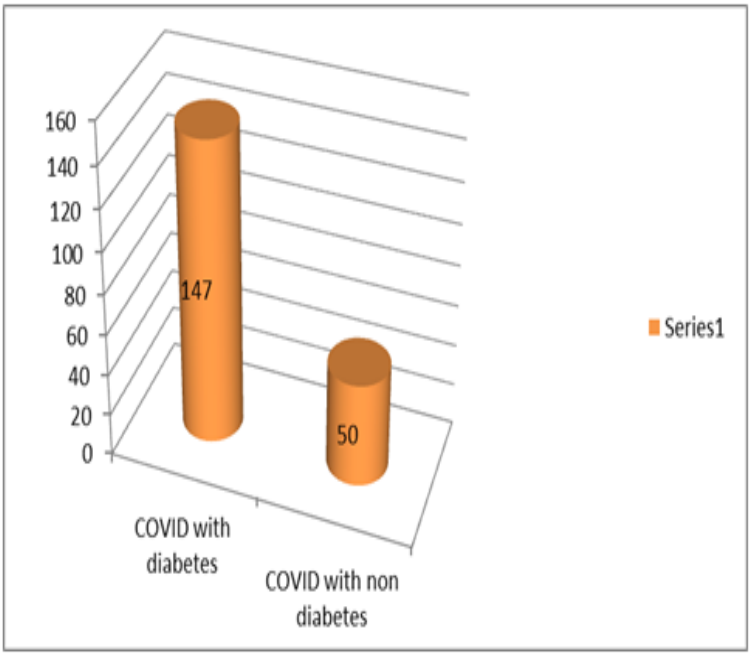

FIGURE 4.4: COVID with Diabetes.

Comparison has been done among the diabetic patients with COVID-19 and also checked the death ratio of diabetic patients with COVID-19. 113 patients out of 147 COVID with diabetes were expired and 34 patients were lived so it is concluded that patients having comorbidities like diabetes were more prone than normal people.

Table 4.3: Diabetes COVID * Death Cases.

			Death Expired	**Alive**	**Total**
COVID	Diabetic	Count	113	34	147
		Expected Count	110.4	36.6	147.0
		% within Diabetes	76.9%	23.1%	100.0%
	Non Diabetic	Count	35	15	50
		Expected Count	37.6	12.4	50.0
		% within Diabetes	70.0%	30.0%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within Diabetes	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 0.943$ P value = 0.03					

We then applied chi-square test on this data to find the if the data was significant or not.The results is significant because “P” was less than the standard value which is 0.05 (Table 4.3)

4.3 ABO System and COVID-19

It has been investigated 84 people were A positive, 160 were B positive, 40 were O positive, 20 were AB positive and 50 were don't know their blood group. The data are summarized in the given(figure 4.5).Many infectious diseases like hepatitis B, dengue hemorrhagic fever were associated with ABO system of human being. Presently the new pandemic COVID-19 occur, it should neccerrey to find the relationship of ABO system and coronavirus infectious diseases. It is reported , blood group O is less prone to infectious diseses [106].

Another study found that malaria patients having A blood group has high level of anemia than those who have blood group O [107]. A Study has conducted, their result was about the ABO blood group system is; O Blood group was less prone and A Blood group was more prone. But they added that there should be further work on the ABO Blood group and its relationship with Coronavirus. In case of dengue, it has reported patients having AB have 2.5 more chances of getting infection than those whose blood group is other than AB [108].

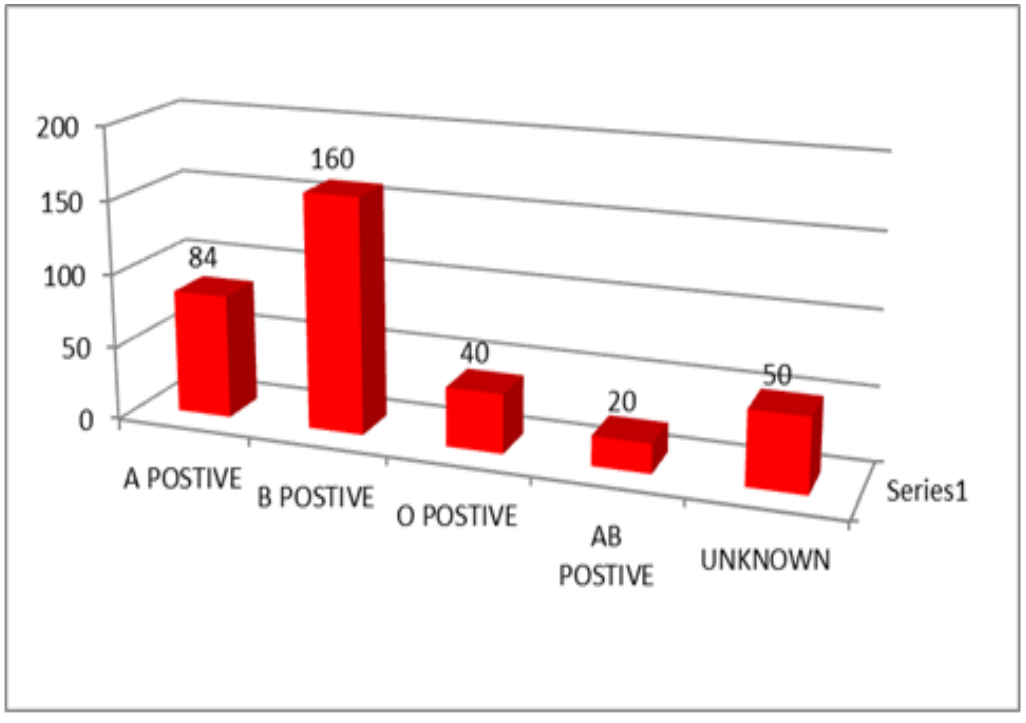

FIGURE 4.5: ABO Blood System (Positive) Among Population.

Similarly the ABO system (negative) of a population were found in different ratio such as 56 people were B negative, 50 were A negative, 30 were AB negative and 10 were O positive.The distribution are vary in different population.

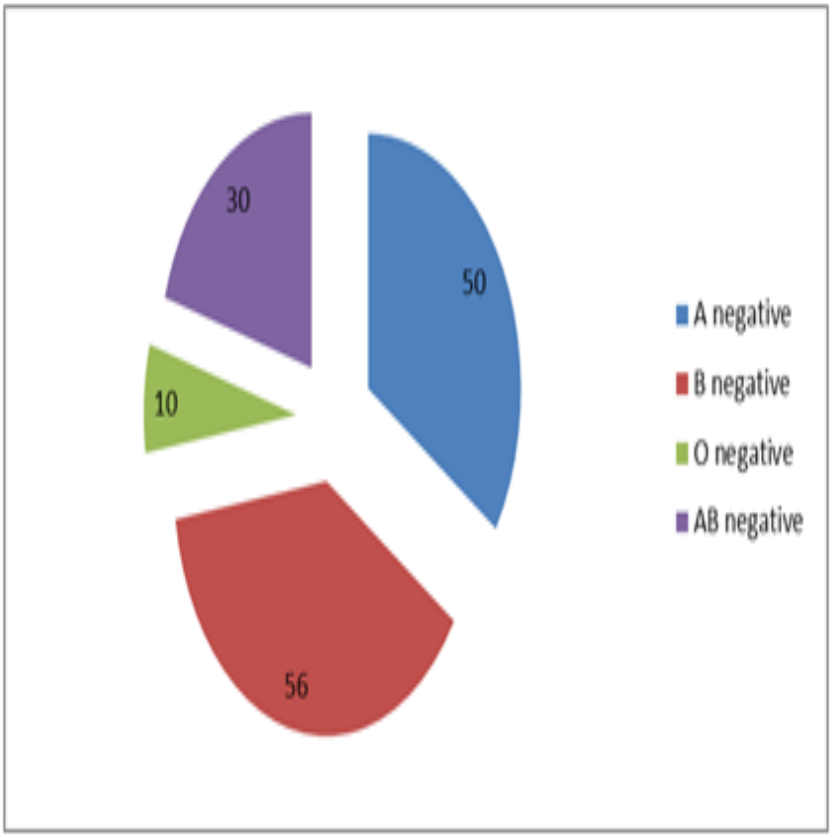

FIGURE 4.6: ABO Blood System (Ngative) Among Population.

4.3.1 Death Number of COVID-19 with ABO System

After general prevalence of ABO system among the various group, of blood, then compared this data with the death ratio of various blood group. In our study we found different result as given in the table 4.4. Infectious diseases were previously linked with ABO blood system. In some infectious diseases some type of blood were more prone than other type of blood. Coronavirus is a infectious diseases it might be possible to have link with ABO system [109].

Table 4.4: Distribution of Blood Type, Number of Positive Cases, Number of Blood Type and Number of Death Cases

Blood type	**No of samples**	**No of positive cases**	**No of death cases**
A positive	84	34	26
A negative	50	14	9
B positive	160	63	52
B negative	56	23	16
AB positive	40	20	17
AB negative	30	10	8
O positive	20	15	7
O negative	10	6	5
Unknown	50	12	8

In the above table (4.4) the highest number of positive cases having blood group B with death 52 while the lowest number of positive cases having blood group O with death 7. The chi-square was applied through SPSS on the different group of blood given below (Table: 4.5, 4.6, 4.7, 4.8).

Table 4.5: Relation of COVID-19 with Blood Group A.

		Death Expired/Alive		**Total**
Blood Group	A POSITVE	Count	26	58	84
		Expected Count	21.9	62.1	84.0
		% within Blood Group	31.0%	69.0%	100.0%
	A NEGATIVE	Count	9	41	50
		Expected Count	13.1	36.9	50.0
		% within Blood Group	18.0%	82.0%	100.0%
Total		Count	35	99	134
		Expected Count	35.0	99.0	134.0
		% within Blood Group	26.1%	73.9%	100.0%
Test statistics Chi square Test $x^2 = 2.725$ P value = 0.09					

We applied chi-square test on this data. The results are not significant because "P" value was 0.09 which was more than the standard value which is 0.05.

Table 4.6: Relation of COVID-19 with Blood Group B.

		Death Expired/Alive		**Total**
Blood Group	B POSITVE	Count	52	108	160
		Expected Count	50.4	109.6	160.0
		% within Blood Group	32.5%	67.5%	100.0%
	B NEGATIVE	Count	16	40	56
		Expected Count	17.6	38.4	56.0
		% within Blood Group	28.6%	71.4%	100.0%
Total		Count	68	148	216
		Expected Count	68.0	148.0	216.0
		% within Blood Group	31.5%	68.5%	100.0%
Test statistics Chi square Test $x^2 = 150.01$ P value = 0.000					

We applied chi-square test on this data. We found the value of "P" equal to 0.000 which was less than the standard value so the results is significant

Table 4.7: Relation of COVID-19 with Blood Group AB.

		Death Expired/Alive		**Total**
Blood Group	AB POSITVE	Count	17	23	40
		Expected Count	14.3	25.7	40.0
		% within Blood Group	42.5%	57.5%	100.0%
	AB NEGATIVE	Count	8	22	30
		Expected Count	10.7	19.3	30.0
		% within Blood Group	26.7%	73.3%	100.0%
Total		Count	25	45	70
		Expected Count	25.0	45.0	70.0
		% within Blood Group	35.7%	64.3%	100.0%
Test statistics Chi square Test $x^2 = 1.872$ P value = 0.171					

We applied chi-square Test on this data. we found out "P" was equal to 0.171 leaving the result non significant.

Table 4.8: Relation of COVID-19 with Blood Group O.

		Death Expired/Alive		**Total**
Blood Group	O POSITVE	Count	7	13	20
		Expected Count	8.0	12.0	20.0
		% within Blood Group	35.0%	65.0%	100.0%
	O NEGATIVE	Count	5	5	10
		Expected Count	4.0	6.0	10.0
		% within Blood Group	50.0%	50.0%	100.0%
Total		Count	12	18	30
		Expected Count	12.0	18.0	30.0
		% within Blood Group	40.0%	60.0%	100.0%
Test statistics Chi square Test $x^2 = 0.625$ P value = 0.425					

We applied chi-square Test on this data. We found out "P" was equal to 0.425 which is not significant

4.4 COVID-19 VS Age Wise

Age is another variable, in most of the previous pandemic aged people were more vulnerable than young people. For this purpose we categorized the age in four groups such as;

1. Teen age 10 year to 20 year considered.
2. Young age 20 year to 35 year considered.
3. Middle age 35 year to 50 year considered.
4. Old age 50 to onward considered.

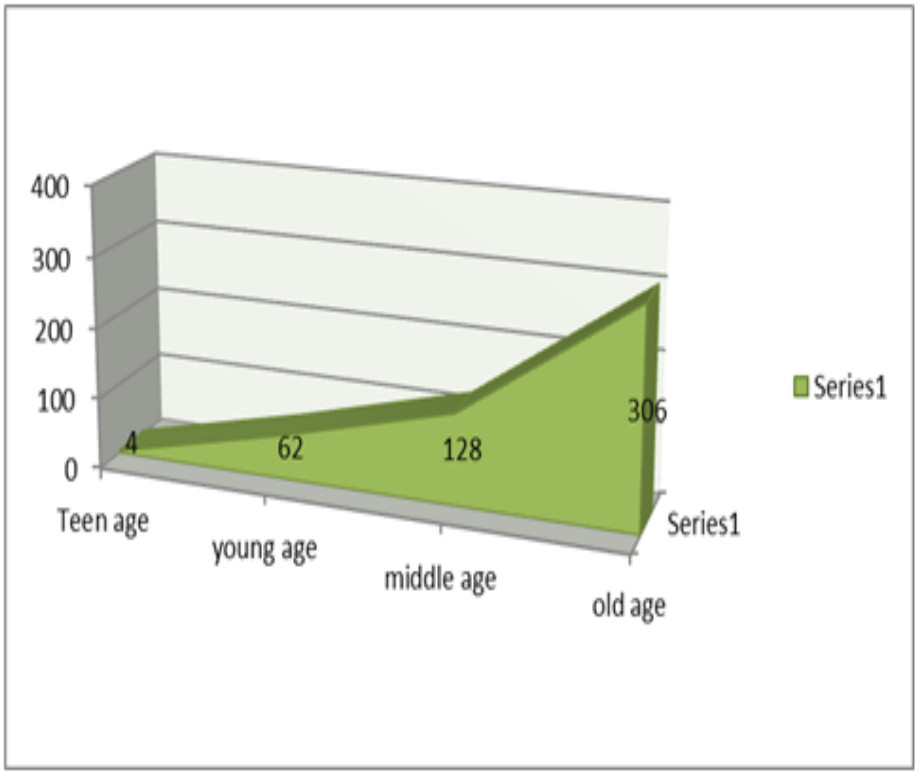

FIGURE 4.7: Age Wise Distribution.

4.4.1 Teen Age & COVID-19

Patients were divided into four groups according to age. One is teen group it contain age of 10 to 20 year. we found 1 positive and 3 were negative.

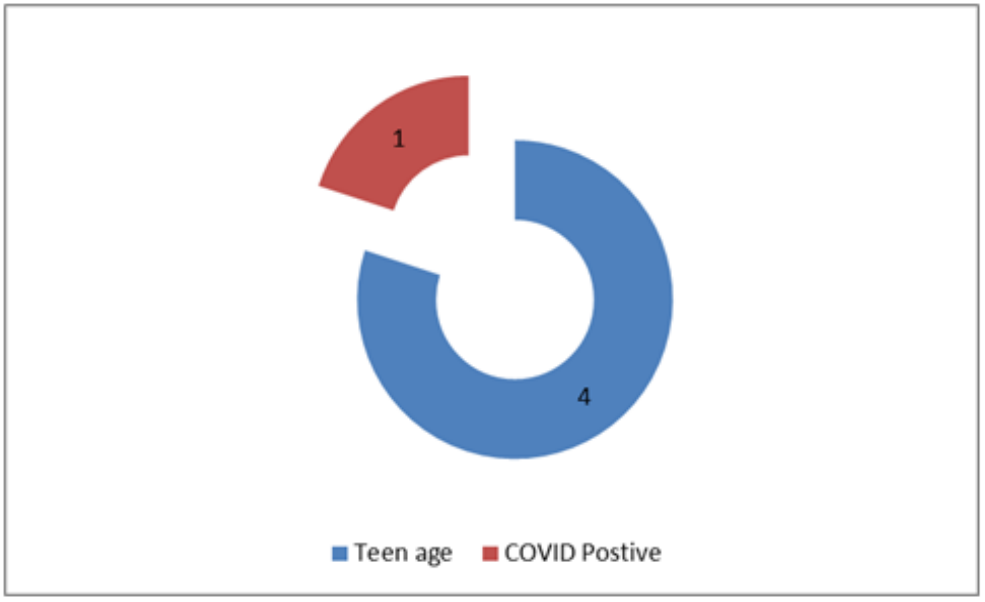

FIGURE 4.8: Teen Age and COVID.

4.4.2 Young Age & COVID-19

In this group we add the age of 20 to 35 year old population. Total respondent of young age were 62 respondent out of it 33 were diagnosed positive.

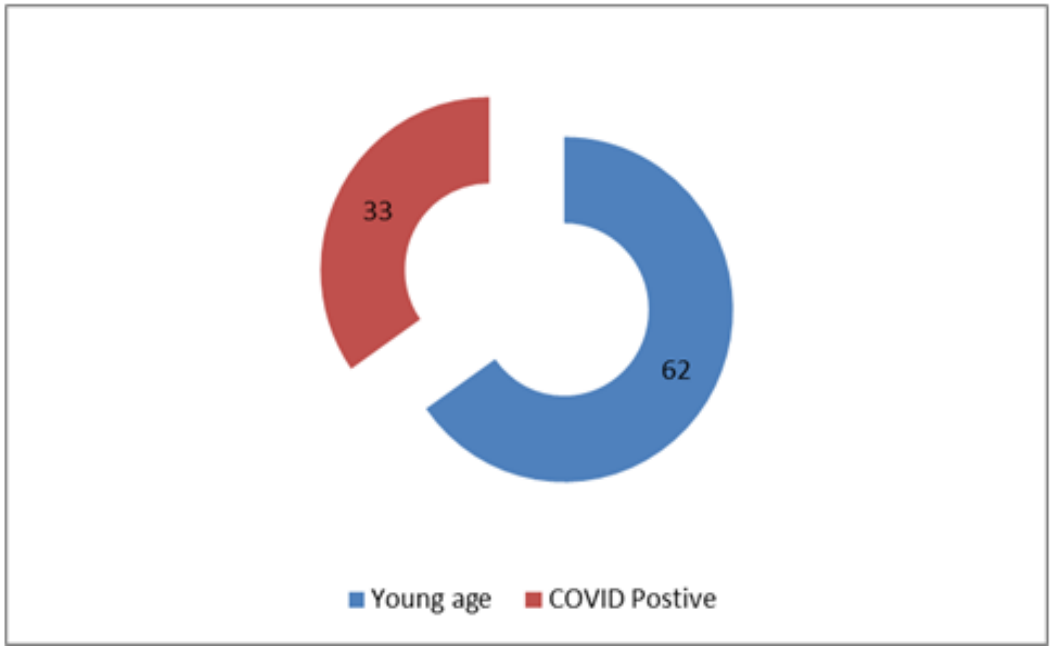

FIGURE 4.9: Young Age and COVID.

4.4.3 Middle Age & COVID-19

Middle age group is from 35 to 50 year old. The age of these group were more infected then young age group. Total number of middle group were 128 and 69 were diagnosed with COVID-19.

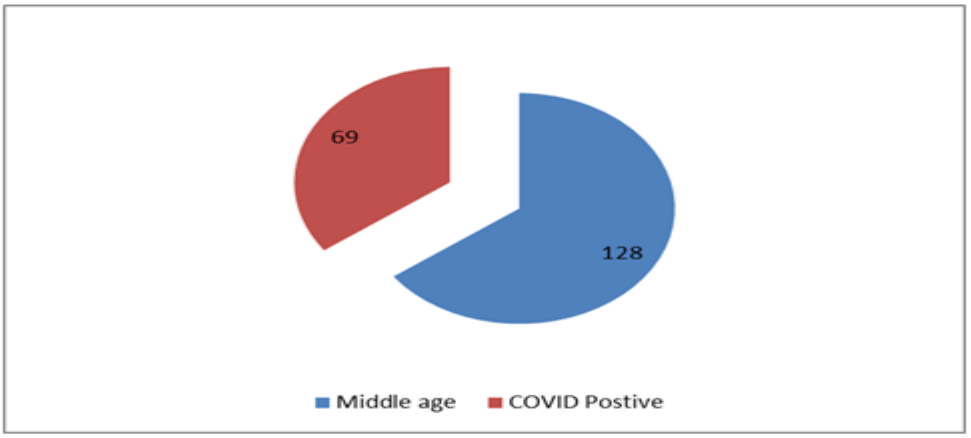

FIGURE 4.10: Middle Age and COVID.

4.4.4 Old Age & COVID-19

Old age group included patients of 50 years and above. The age of this group were more infected then the other group. It was observed that total number of diagnosed cases were 234 out of 306 respondents.

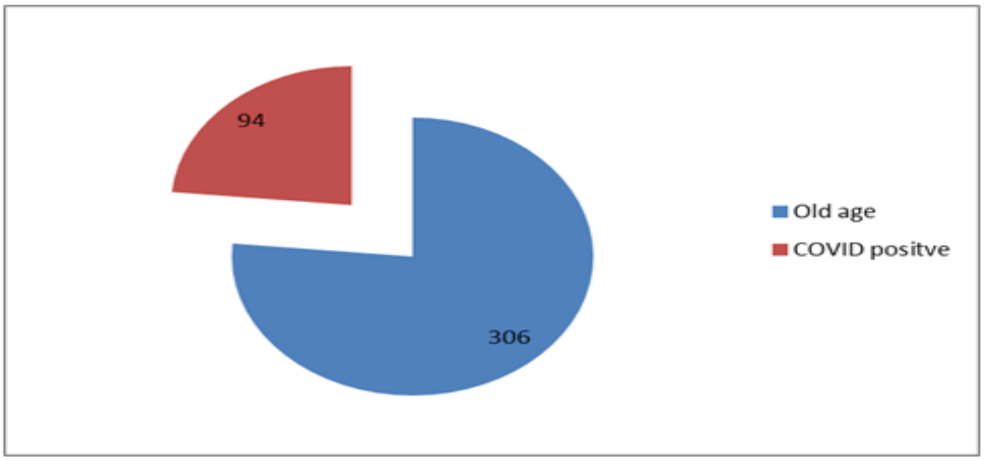

FIGURE 4.11: Old Age and COVID

Table 4.9: Age Group * Infection Cases.

			Infection Positive	Infection Negative	Total
Age Group	Teen	Count	1	3	4
		Expected Count	2.0	3.0	5.0
		% within Blood Group	20.0%	80.0%	100.0%
	Young	Count	33	29	62
		Expected Count	38.2	56.8	95.0
		% within Age Group	34.7%	65.3%	100.0%
	Middle	Count	69	59	128
		Expected Count	79.3	177.7	197.0
		% within Age Group	35.0%	65.0%	100.0%
	Old	Count	94	212	306
		Expected Count	94	306	400.0
		% within Age Group	43.3%	56.7%	100.0%
Total		Count	197	303	500
		Expected Count	213.0	500.0	837.0
		% within Age Group	40.3%	59.7%	100.0%
Test statistics Chi square Test $x^2 = 6.423$ P value = 0.04					

We applied Chi-square Test on this data. The "P" value was equal to 0.04 which is significant.

4.4.5 Effect of COVID-19 on Teen, Young, Middle & Old Age People

It is concluded old age were more at risk than other groups. Teen age and young age were more safe than middle age.

TABLE 4.10: Age Wise Distribution and their Death Numbers.

S.No	Age	Death
1	Teen age	0
2	Young age	17
3	Middle age	49
4	Old age	82

4.5 Pneumonia & COVID-19

In our study some people had pneumonia before the C0VID-19 they were more prone because their lungs were already infected. We found 36 people who had pneumonia before COVID-19 and 80 patients got pneumonia when the patients were tested COVID positive. The data is given in the figure 4.12 and table 4.11. Inflammation of lungs can increase the mortality rate of patients [110].

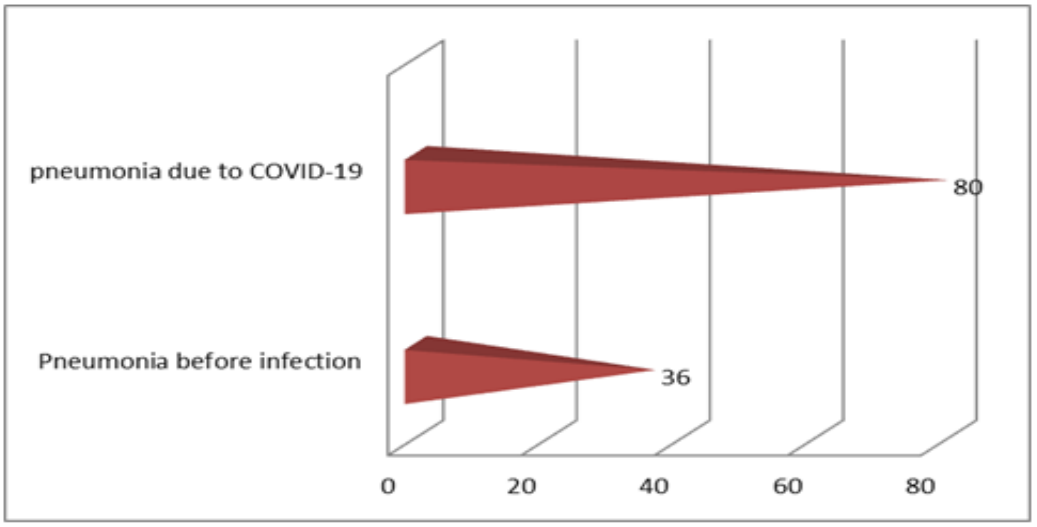

FIGURE 4.12: Number of Pneumonia Patients Before and Due to COVID.

Table 4.11: Table Pneumonia * Death Cases.

			Death Expired/Alive		**Total**
Pneumonia	Yes	Count	67	49	116
		Expected Count	87.1	28.9	116.0
		% within Pneumonia	57.8%	42.2%	100.0%
	No	Count	81	0	81
		Expected Count	60.9	20.1	81.0
		% within Pneumonia	100.0%	0.0%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within Pneumonia	26.1%	73.9%	100.0%
Test statistics Chi square Test $x^2 = 45.544$ P value = 0.000					

We applied chi-square test on this data. We found "P" value was equal to 0.000 which is significant.

4.6 Health Problem Before COVID-19

During our study we found different poor ill condition. 90 people had Cardiac diseases, 84 were Diabetes, 20 had liver diseases, 92 had chronic lung diseases, 9 had cancer and 34 had renal diseases. Data are in the Figure 4.13. Comorbidity factors elevated the chances of infection, a study was done on the comparison of COVID-19 patients with their ill-health factors; Hypertension was 15.18%, Diabetes was 9.4%, HIV was 1.50%, Malignancy 1.50%, Renal disorders was 0.80% and Immunodeficiency state was 0.019 [111].

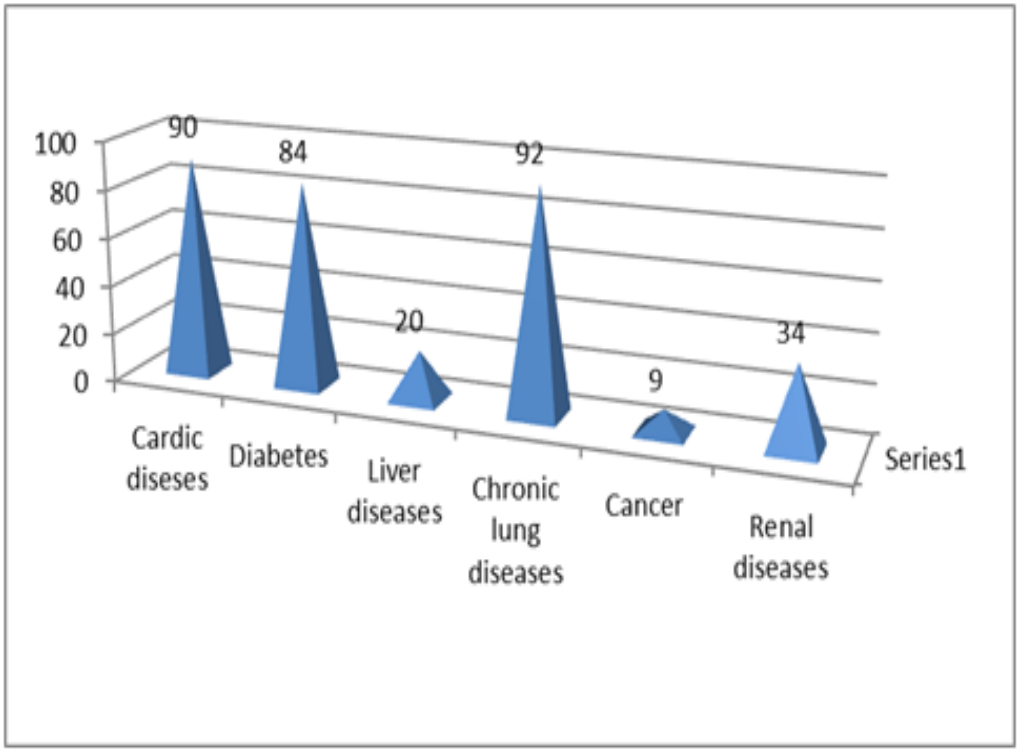

FIGURE 4.13: Different Numbers of Poor Illness Condition.

4.6.1 Cardiac Diseases & COVID-19

In our study the cardiac patients were 90 people. COVID patients were 63 and 60 patients has expired. The data is summarized in the Table 4.12. A study was conducted in china, they compared different variables with COVID-19 one of the morbidities was Cardiac disease it were 15 to 40 % [112].

Table 4.12: Relation of Cardiac with COVID-19.

			Death Expired/Alive		**Total**
COVID	Cardiac Problem	Count	60	3	63
		Expected Count	47.3	15.7	63.0
		% within COVID	95.2%	4.8%	100.0%
	No Cardiac Problem	Count	88	46	134
		Expected Count	100.7	33.3	134.0
		% within COVID	65.7%	34.3%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 20.047$ P value = 0.000008					

We applied chi square test on this data. The "P" was equal to 0.000008 which is less than from the standard value so our result is significant.

4.6.2 Liver Disease & COVID-19

It was found that 20 people who had liver diseases. 7 patients expired out of 20 patients due to Coronavirus. The data are summarized in Figure 4.14 and Table 4.13. There is no strong evidence that liver patients were more prone [113, 115]. A study conducted on 1099 patients of COVID-19 showed that only 21 people had hepatitis B [116].

Every type of virus can affect human body enzymes at a specific angle. Similarly, Coronavirus affects liver enzymes, disturbs the normal body level of homeostasis. One of the most important enzymes is transaminases which are elevated due to the COVID infection, a high level of transaminases is the indicator for the chances of liver damage. The exact mechanism of, how the SARS-Cov-2 affect the liver enzymes are unknown, but it may be due to the immune response to infection [117, 118]. A study was done 6,913 patients were screened for COVID-19, 3,381 were associated with liver infection it was due to COVID-19 implication [119].

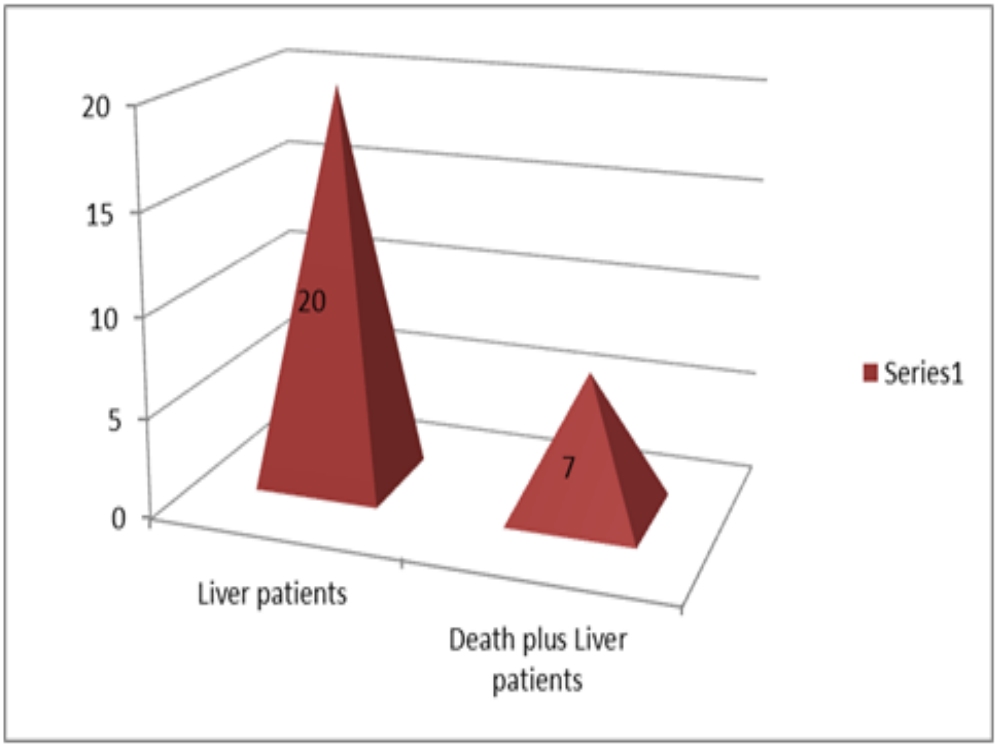

FIGURE 4.14: It Show Number of Death Plus Liver Patients.

Table 4.13: Relation of Liver Problem with COVID-19.

			Death Expired	**Alive**	**Total**
COVID	Liver Problem	Count	7	13	20
		Expected Count	15.0	5.0	20.0
		% within COVID	35.0%	65.0%	100.0%
	No Liver Problem	Count	141	36	177
		Expected Count	133.0	44.0	177.0
		% within COVID	79.7%	20.3%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 19.181$ P value = 0.000012					

We applied chi- square Test on this data. The "P" was equal to 0.00012 which is significant.

4.6.3 Lungs Disease & COVID-19

It was found that 92 COVID patients had lung diseases. 57 expired out of 92 patients. The data are summarized in Figure 4.15 and Table 4.14. A study carried in spinach 48 patients were admitted to hospitals out of it 38 patients had lungs diseases COVID [120].

COVID patients have a severe chances of infection [121]. Lungs are the most important organ for oxidation and reduction but the lungs have been the target for Coronavirus, which can affect other parts of the body such as the gastrointestinal tract, brain, etc. Lungs have a Receptor which is called Angiotensin-converting enzymes (ACE2). The Severe acute respiratory syndrome-Coronavirus-2(SARS-Cov-2) can bind with this ACE2 and ultimately cause severe infection in the lungs [122].

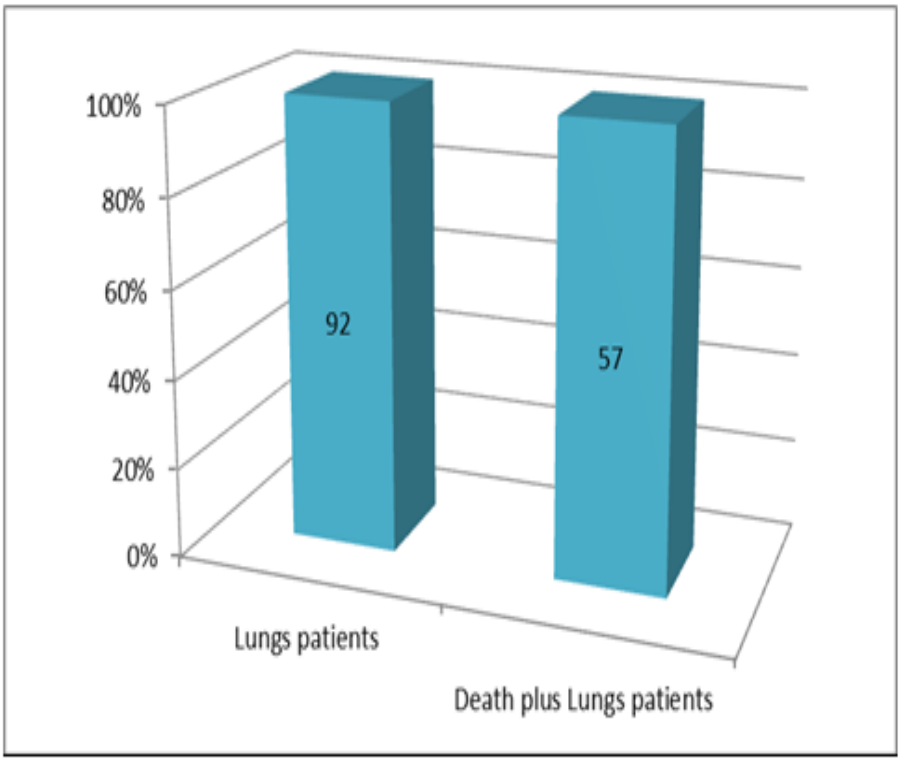

FIGURE 4.15: It Show Number of Death Plus Lungs Diseases.

Table 4.14: Relation of Lung Diseases with COVID-19.

			Death Expired	**Alive**	**Total**
COVID	Lung diseases	Count	57	35	92
		Expected Count	69.1	22.9	92.0
		% within COVID	62.0%	38.0%	100.0%
	No Lung disease	Count	91	14	105
		Expected Count	78.9	26.1	105.0
		% within COVID	86.7%	13.3%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 16.023$ P value = 0.000063					

We applied chi-square Test on this data.The "P" was equal to 0.000063 which is significant.

4.6.4 Cancer & COVID-19

It has identified of 9 patients of cancer who were tested positive and 3 patients of cancer were expired during my investigation. The data are summarized in Figure 4.16 and Table 4.15. The Prevalence of COVID-19 with cancer was reported in US, 1794 out of 22914 patients so the prevalence of COVID-19 with cancer were 7.8% [123].

Cancer patients are more at risk of Coronavirus because cancerous cells continuously increase in number and the immune system of our body becomes weak, so therefore cancer patients are unable to fight these infectious diseases. Patients who are lung cancer, who are on treatment of chemotherapy or radiation are more prone to COVID-19 [124]. So from the above discussion, it is concluded that cancer patients are more vulnerable to Coronavirus.

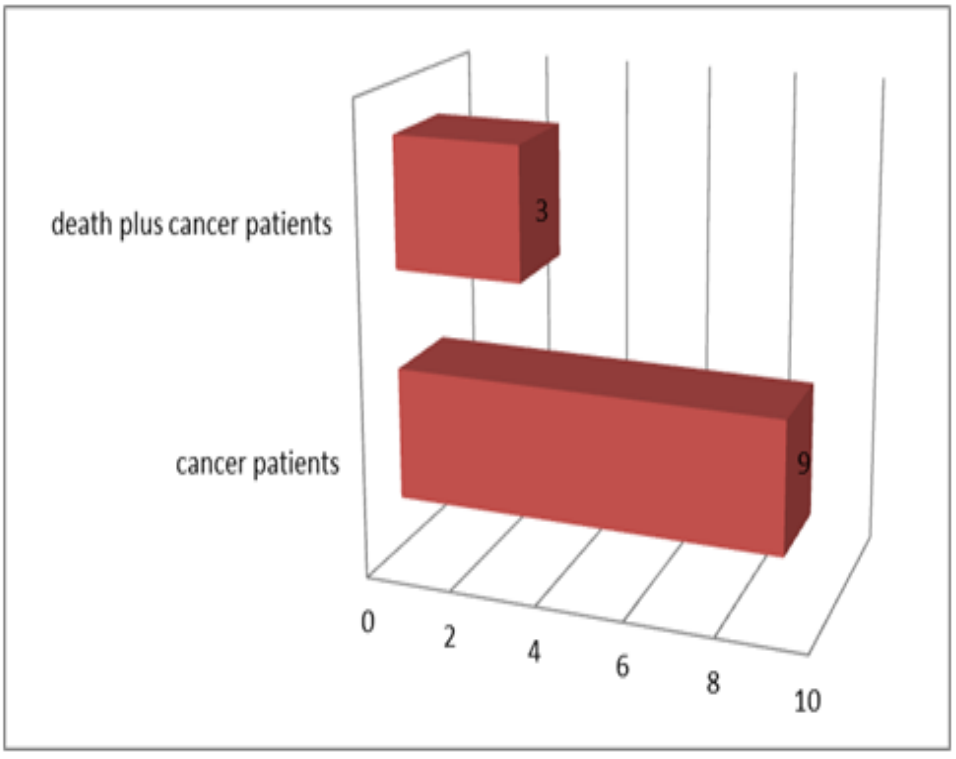

FIGURE 4.16: It Show Number of Cancer and Death Plus Cancer Patients.

Table 4.15: Relation of Cancer with COVID-19.

			Death Expired/Alive		**Total**
COVID	Cancer	Count	3	6	9
		Expected Count	6.8	2.2	9.0
		% within COVID	33.3%	66.7%	100.0%
	No Cancer	Count	145	44	188
		Expected Count	141.2	46.8	188.0
		% within COVID	77.1%	22.9%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 8.815$ P value = 0.003					

We applied chi- square test on this data. The “P” was significant which is 0,003.

4.6.5 Renal Disease & COVID-19

In our investigation we found 34 patients of renal diseases and 13 were expired out of 34 patients. The data are summarized in Figure 4.17 and Table 4.16. A study conducted in china from 14 January 2020 to 17 February 2020, during this study 37 patients out of 270 were hemodialysis [125]. Virus cannot enter only through lungs; it can enter through other organs such as mucosa cells, bladder cells and kidney cells etc [126, 127].

When SARS-2 bind with kidney receptor it causes disturbance in the homeostasis of the body [128]. Those patients which have kidney disease are more at risk of other illnesses. Similarly, patients on dialysis are a weaker immune response to a virus. During this pandemic, those patients who have some sort of kidney disease were more prone [129]. So it is concluded that Renal disease have coronavirus have a significant relationship.

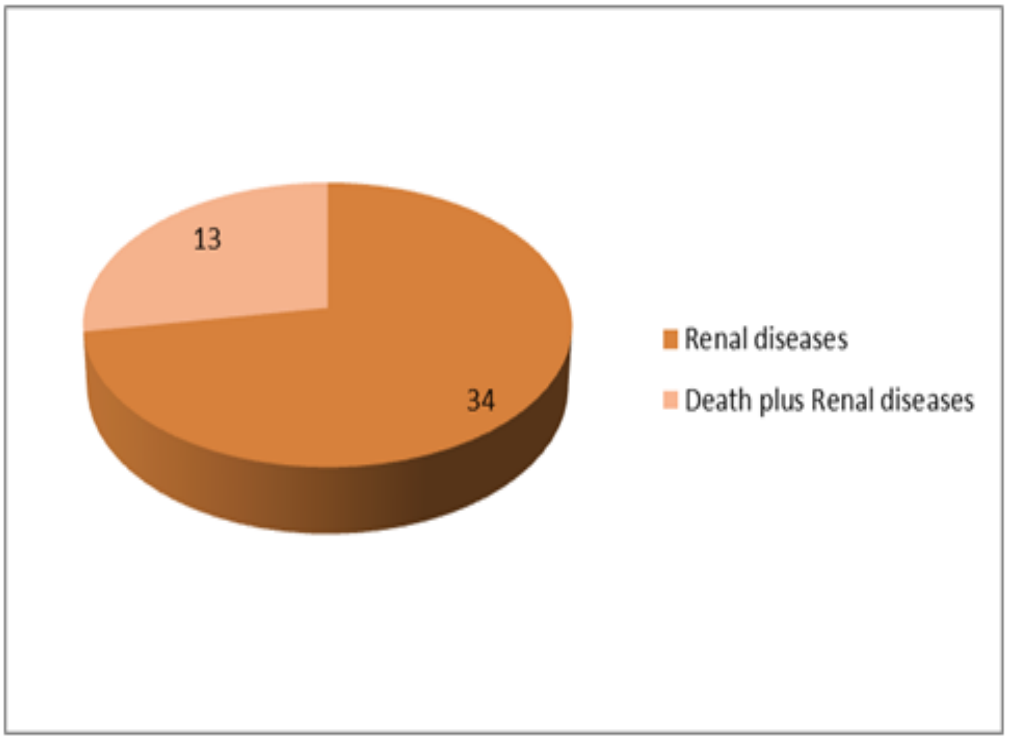

FIGURE 4.17: It Show Number of Renal Diseases plus death.

Table 4.16: Relation of Renal Diseases with COVID-19.

			Death Expired/Alive		**Total**
COVID	Renal Diseases	Count	13	21	34
		Expected Count	25.5	8.5	34.0
		% within COVID	38.2%	61.8%	100.0%
	No Renal Diseases	Count	135	28	163
		Expected Count	122.5	40.5	163.0
		% within COVID	82.8%	17.2%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 29.929$ P value = 0.000					

We applied chi-square Test on the data. Which is significant because "P" was equal to 0.000.

4.7 Symptoms & COVID-19

During my investigation I found different prevalence of symptoms as given below in the Figure 4.18. COVID-19 is a life threatening entity whose most frequent signs include cough, insomnia headache, dyspnea, musculoskeletal symptoms (fatigue, joint pain and myalgia), dysgeusia, and gastrointestinal symptoms [130, 131]. A study has been reported at COVID-19 patients 72.7% of participants had evidence of interstitial pneumonia. Some showed fatigue (53.1%), dyspnea (43.4%), joint pain, (27.3%) and chest pain (21.7%) [132].

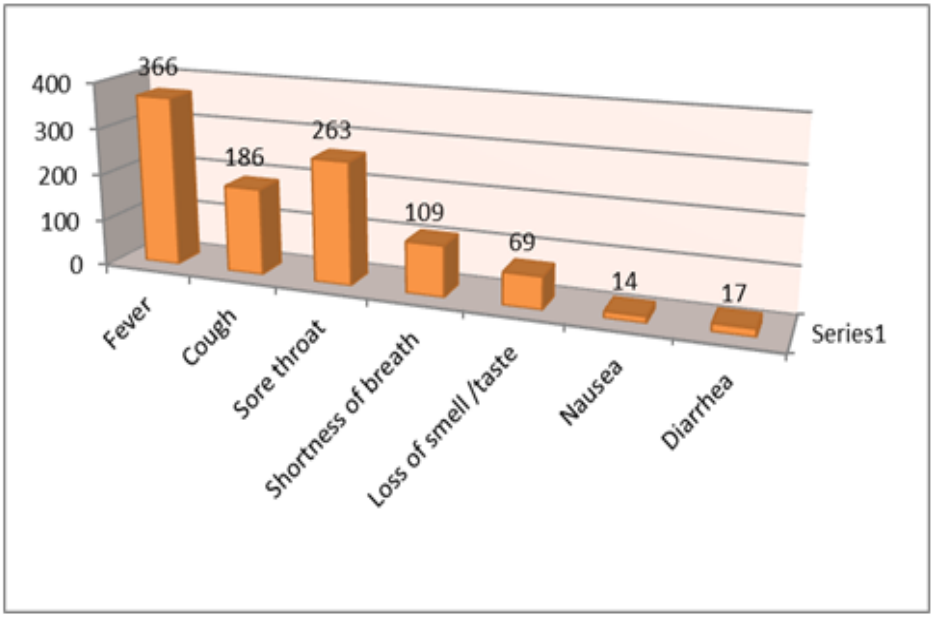

FIGURE 4.18: Different Symptoms of COVID-19.

4.8 COVID-19 & Asymptomatic Cases

We found 67 patients of COVID-19 having no symptoms. A summarized Figure 4.19 is given below. During our study we asked if you have asymptomatic then why you did COVID-19 Test we got two type of answer. (1) One of my family members was infected that's why we screened our whole family. (2) We were in contact in COVID positive patients. Many study reported that in some cases of

coronavirus infection does not develop any symptoms. A study conducted in china they found 133 cases without a symptom out of 166 patients [133].

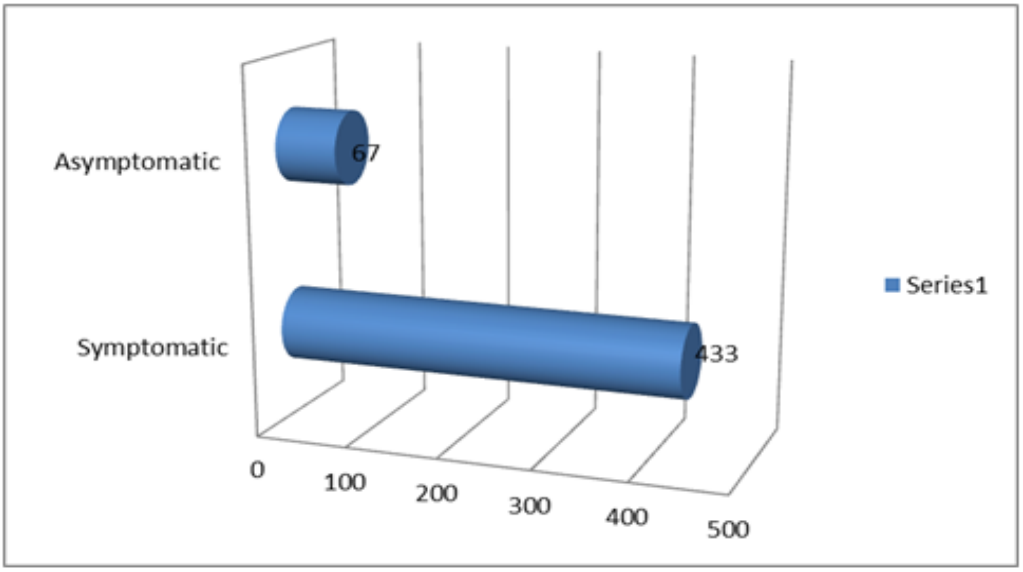

FIGURE 4.19: Number of Symptomatic and Asymptomatic.

4.9 COVID-19 PCR

During our study some patients were detected with COVID-19, some were suspected and some were not detected their number is given below in Figure 4.20.

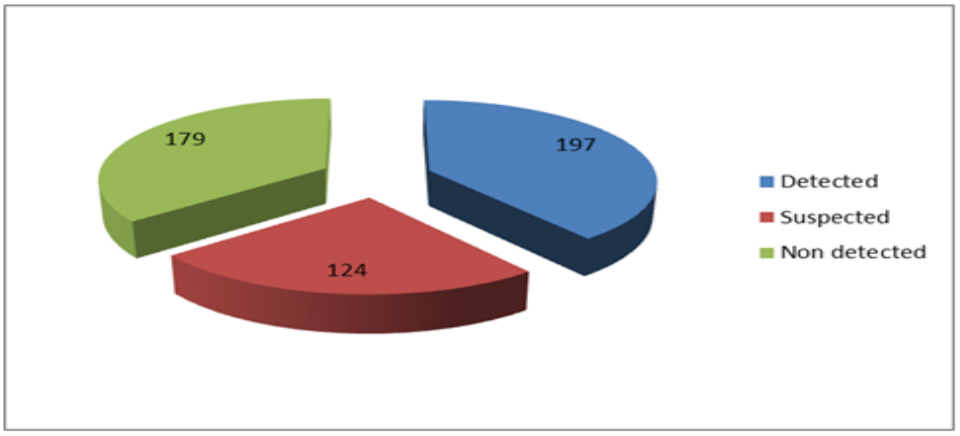

FIGURE 4.20: Numbers of Detected, Suspected and Non Detected.

4.10 Smoking & COVID-19

In our study we found 54 patients of COVID-19 have habit of smoking. Only 12 patients of COVID-19 were expired out of 54.The effect of smoking on COVID-19 is extremely controversial considering the lack of accurate records. COVID-19 is a new, different disease. Hospital presentations and results for people with a wide variety of the number of symptoms; our understanding of them is still inadequate.

Such research reports, not financed by the Committee Tobacco industry or electronic cigarette firms, might lead to a clearer understanding of how to smoke make a significant contribution to COVID-19 [134].

Smoking can increase the chances of transmission of Coronavirus, it may be possible Coronavirus particles present on the fingertips or the surface of the cigarette, and most people share their cigarette with other people, so smoking can indirectly affect the normal person [135].

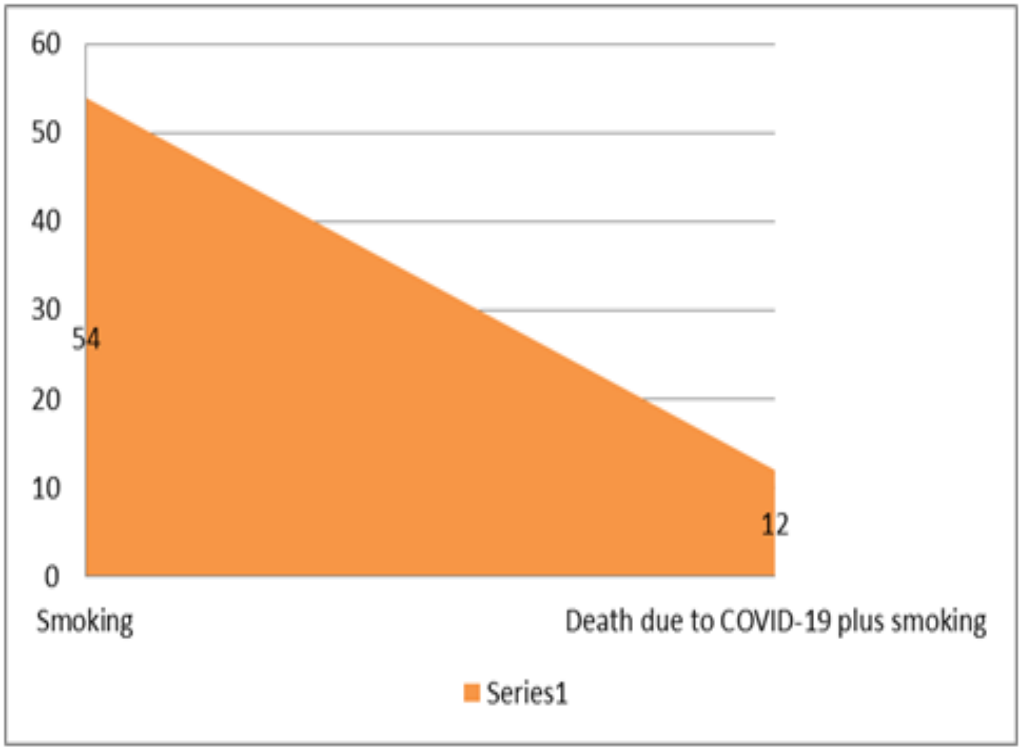

FIGURE 4.21: Number of Death Due to COVID-19 Plus Smoking.

Table 4.17: Relation of Smoker and Non Smoker with COVID-19.

			Death Expired	**Total Alive**	
COVID	Smokers	Count	12	42	54
		Expected Count	40.6	13.4	54.0
		% within COVID	22.2%	77.8%	100.0%
	Non Smokers	Count	136	7	143
		Expected Count	107.4	35.6	143.0
		% within COVID	95.1%	4.9%	100.0%
Total		Count	148	49	197
		Expected Count	148.0	49.0	197.0
		% within COVID	75.1%	24.9%	100.0%
Test statistics Chi square Test $x^2 = 111.426$ P value = 0.0000					

We applied chi-square Test on this data. The result is significant because “p” was equal to0.000.

Chapter 5

Conclusions and Recommendations

We collected data of 500 samples regarding COVID-19 from a corona ward in Swat.300 was an apex for male and the remaining 200 were female. Our aim was to find the number of known cases in Swat and finding its variable factor i.e. blood group, age difference and diabetes. To achieve this aims we designed an acquisition form to know more about the victims. Some of the information needed was about blood group, gender, age, ill-health condition, diabetes etc. According to our investigation 197 were tested positive, 94 out of 300 males were tested positive and 103 out of 200 females. A total of 148 patients died out the 500 we investigated. 79 were male and 69 were females out of the dead. More females were affected as compared to the male but then the death ratio of man was greater than woman. Male ratio for being tested positive was mere but the death was more in ratio. As we know 197 were tested positive. Then, we compared these cases to a variable factor i-e Diabetes. A total of 147 were also diabetes patients and the remaining 50 were safe from diabetes.113 died in these 147 while 34 recovered. We then applied chi-square test on this data to find if the data was significant or not significant. The results were not apprehension because "P" was less than the standard value which is 0.05. After diabetes, we compared the cases to ABO system. 34 out of 197 had a blood group of A Positive with 26 deaths and 30 had

a blood group of A negative and 9 died later on. We then applied chi-square test through spss.The result was not significant because "P" value was 0.09 which was more than the standard value.63 had a blood group of B positive with a total of 52 deaths. While patients with the blood group B negative were 23 and 16 deaths. After applying chi-square test we found the value of "P" equal to 0.00 which was significant. 20 patients had a blood group of AB positive leading to a death of 17 while 10 had a blood group of AB negative and deaths of 8. After applying chi-square test, we found out "P" was equal to 0.171 leaving the result non-significant. 15 had the blood group of O positive with deaths of 7 and O negative were 6 leaving a single person alive with 5 dead. Applying chi-square test we found out "P" was equal to 0.425 which was not significant. Then, we compare the COVID cases to another variables factor i.e; age difference. We categorized this "age" difference into 4 groups. (1) Teenage (10-20 year) the number of teenage tested were 4 with only one positive and zero rates of death.(2) Young age(20-35 year) the number of people tested were 62 with 33 positive and 10 dead. (3) Middle age (35-50year) the number of people tested were 128 and 69 were tested positive with 32 deaths.(4) Old age (50 onward) The number of patients with age more than 50 were 306 and 94 were tested positive with 82 deaths.

5.1 Recommendations

This conclusion was based on the first wave of COVID-19, because of the research we did, we know that diabetic and old aged people are more sensitive to the coronavirus as compared to others. Similarly, people with blood group B positive are more prone to the coronavirus. We can suggest that further research should take place on "WHY" diabetic and people with blood group B positive are more prone to the coronavirus as compared to people with other blood group.

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Appendix A

DATA ACQUISITION FORM FOR RESEARCH PROJECT

Project Title: Relationship of ABO Blood Group, Diabetes and Age with Severity of COVID-19 among Swat, KPK Population

BIODATA: (This information provided by patient will be confidential)

Patient Name: ———————— Age: ———— Gender: ————————

Contact no: ———— City/Village: ———————— Province: ————

1. Case type COVID-19 PCR

Detected —— Yes —— No —— Unknown

Non Detected —— Yes —— No —— Unknown

Suspected —— Yes —— No —— Unknown

2. Symptoms.

Fever —— Yes —— No —— Unknown

Cough —— Yes —— No —— Unknown

Sore Throat —— Yes —— No —— Unknown

Shortness of breath —— Yes —— No —— Unknown

Loss of smell & taste —— Yes —— No —— Unknown

Nausea —— Yes —— No —— Unknown

Diarrhoea —— Yes —— No —— Unknown

3. Any history pneuomonia ? Yes —— N0—— Unknown———

4. Did you have any health problem before your COVID-19 illness ?

Yes——- No—— Unknown

Cardiac Disease —— Yes —— No —— Unknown

Diabetes —— Yes —— No —— Unknown

Liver Disease—— Yes —— No —— Unknown

Chronic lung disease —— Yes —— No —— Unknown

Cancer —— Yes —— No —— Unknown

Renal disorder —— Yes —— No —— Unknown

Any other disease ————————-

5. Blood Group ? ————

6. Any history of smoking ? —— Yes —— No —— Unknown

7. For Asymptomatic cases only, Specify the reasons for COVID-19 test ?

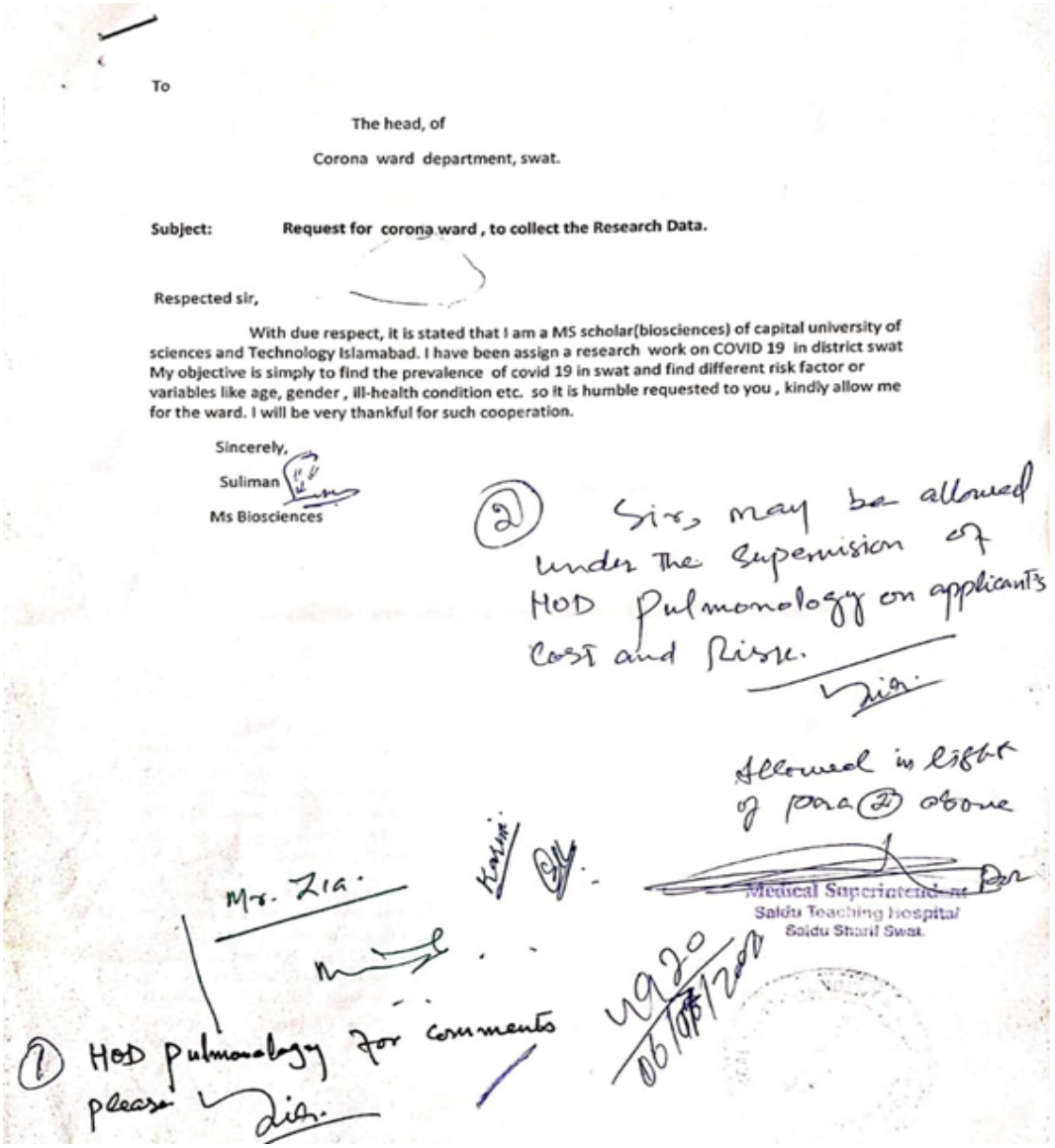
8. Does the patient have traveling history to abroad ? —— Yes —— No —— Unknown

9. Do you have any contact in last 14 days with COVID-19 patient ? —— Yes —— No —— Unknown

10. Status of the patient ?

Has this person died—— Yes —— No —— Unknown

Appendix B



To

The head, of

Corona ward department, swat.

Subject: **Request for corona ward , to collect the Research Data.**

Respected sir,

With due respect, it is stated that I am a MS scholar(biosciences) of capital university of sciences and Technology Islamabad. I have been assign a research work on COVID 19 in district swat My objective is simply to find the prevalence of covid 19 in swat and find different risk factor or variables like age, gender , ill-health condition etc. so it is humble requested to you , kindly allow me for the ward. I will be very thankful for such cooperation.

Sincerely,

Suliman

Ms Biosciences

(2) Sir, may be allowed under the supervision of HOD Pulmonology on applicants cost and Risk.

Zia.

Allowed in light of para (2) above

Medical Superintendent
Saidu Teaching Hospital
Saidu Sharif Swat.

Ms. Zia.

(1) HOD pulmonology for comments please

Zia.