

## **Assessment of Risk Factors of Covid-19 in Peshawar Pakistan: A Cross Sectional Study**

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## ABSTRACT

**Background:**The Covid-19 pandemic is spreading like a forest fire among the developed and developing countries. The epidemiology of Covid-19 is still unclear and the public health specialist is adding evidence day by day.

**Objectives:** To identify the risk factors of Covid-19 infection in Peshawar Khyber Pakhtunkhwa, Pakistan.

**Study Design:** A descriptive Cross-Sectional Study

**Place and Duration of Study:**This study was conducted by the Department of Community Medicine North West School of Medicine, Hayatabad, Peshawar, with collaboration of Lady Ready Hospital, and Khyber Medical College, Peshawar, Khyber Pakhtunkhwa Pakistan; during March, April, & May 2020.

**Methodology:**A sample size of 139 was selected based upon 10% prevalence with 95% confidence interval with 5% prevision. A comprehensive structured questionnaire was used to collect information regarding the selected individuals regarding the demographics and risk factors of Covid-19 infection.

**Results:**Of 139 Covid-19 cases; 117(84.27%) were male, 57.55% had age above 40 years, 54% had monthly income of less than 30, 000 PKR, 35.97% were unemployed, and 34.53% were illiterate. Regarding BMI status; 17.27 % were overweight and 32.37% were obese. 41.01% had positive tobacco smoking history and only 16.55% had substance abuse. 81% of Covid-19 cases reported that they got infection from the interaction with close contacts; and 94.24% has received information regarding the benefits of PPEs. Only 32.37% know the routes of transmission of Covid-19; and 12.23% reported that social gatherings are responsible for getting Covid-19. Moreover, 15.83% and 25.90% of Covid-19 are not using face masks before and after Covid-19 infection respectively; whereas the hand hygiene compliance increased from 67.63% to 84.89% respectively for before and after getting Covid-19. The most common symptoms among Covid-19 cases were fever, cough, sore throat, shortness of breath, myalgia, and abnormal smell etc. 75.54% considered quarantine and only 29.50% revealed isolation as protective measures against Covid-19. Furthermore, 82.73% revealed contact with Covid-19 positive case, 42.45% with suspected case, and 30.22% reported contact with recovered Covid-19 case.

**Conclusion:**The Covid-19 infection showed strong relationship with age, gender, socio-economic, important determinants like chronic co-morbidities, obesity, tobacco smoking, PPEs knowledge, health information, and supplements intake, and thus comprehensive preventive and promotive strategies are needed to prioritize the vulnerable communities to reduce the spread and transmission of Covid-19 along with coordination and cooperation from all stakeholders.

**Keywords:**Covid-19, Isolation, Quarantine, Socio-Economic, Obesity, Co-morbidities, Personnel Protective Equipments

## INTRODUCTION

The Covid-19 pandemic has resulted in public health security threat; with millions of cases and related deaths being recorded globally. The First case of Covid-19 was reported in December 2019 from China, and since then covid-19 has spread globally and resulted in pandemic(1, 2, 3). In Pakistan, the first case was reported on February 26, 2020 from Pakistan; and currently according to NCOC Pakistan Covid-19 statistics, total of 692, 231 cases were reported with 14, 821 deaths(4). The Covid-19 has rapidly crossed borders, throughout the whole world and has led to a massive public reaction(5). Since December 2019, this Covid-19 pandemic has triggered a Public Health Emergency of International Concern(6-8).

The Covid-19 pandemic is currently affecting more and more individuals throughout the globe, and everyone is susceptible to the virus. Moreover, the epidemics as well pandemics have impacts on the vulnerable and lower socioeconomic communities(9, 10). Recent researchers revealed that the infectious diseases are more prevalent among adults and common among the overweight, obese and immune-suppressed individuals(11). Moreover, obesity increases risk of Covid-19 infection. The virus shedding is also increased among obese individuals and thus resulting in mutant strain development (12, 13).

The Covid-19 confirmed cases revealed different rates of infection among males and females; and among 10 to 50 years age groups of females showed increased incidence(14). The determinants of Covid-19 include literacy, employment status, financial resources(8), and the social living habitat. The Covid-19 showed strong significant association with more disadvantaged socio-economic position(15), old age, male, with low monthly income, unhygienic outdoor air quality, and other facilities necessary for daily living purposed(8, 11).

Pandemics are more of a social problem than a health care problem, and only poverty resulting in overcrowding and are a major determinant of Covid-19. The different social determinants of health are interrelated and played major role during Covid-19 pandemic i.e. education level, occupation, income level(8).The confirmed cases of Covid-19 showed variations when compared with different strata of age groups among males and females. Moreover, in 10 to 50 years age groups, the female showed increased incidence(14). Male, aged more than sixty years, with

history of tobacco smoking is known as a risk factor to Covid-19(16, 17). It is also believed that the chronic conditions i.e. chronic obstructive pulmonary disease, chronic bronchitis, and asthma increases risk of Covid-19 infection(18, 19). Those with chronic diseases like hypertension(11), diabetes mellitus, cardiovascular disease(20), chronic kidney disease(21), and respiratory diseases greatly affect the risk and prognosis of the Covid-19(22, 23); and hypertension is considered as an important determinant of Covid-19 infection(24).

The Covid-19 pandemic called for more close investigations of the family transmission; and the risk of Covid-19 infection is related to duration of exposure to positive Covid-19 case(25). The familial clusters suggested that person-to-person transmission among casual contacts and social gatherings are important transmission routes. Moreover, the index cases have also been linked to recent Wuhan travel history, or to close contacts(14, 26). Furthermore, the clinical manifestations such as fever, fatigue, shortness of breath, myalgia, etc. were associated with the progression of disease(6).

The Covid-19 infection is highly contagious and infectious and is transmitted through droplet nuclei, aerosol and also having indirect routes(22). Although the droplet nuclei are large but the aerosol particles remain airborne due to their small size. The Covid-19 infectious agent remains in air for short time and when gets entry into the respiratory tract results in Covid-19 infection(22, 27). Thus the Covid-19 can be transmissible through contaminated air, direct contact and also via nonliving fomites(28, 29, 30). In case of Covid-19, there is prolonged shedding of Covid-19 agent and thus requires strict isolation and proper quarantine measures for effective containment, control and management(17). Thus monitoring and surveillance of close contacts are of utmost importance from public health point of view regarding Covid-19 pandemic(31). Moreover, in order to contain, limit and reduce the transmission of Covid-19, all the preventive measures are applied along with basic protocol for prevention of air borne infections(29). Covid-19 risk can be reduced by personal protective equipment(27, 32). The World Health Organization (WHO) has recommended that all the close contacts and health care workers should use face masks and respirators for prevention of air borne infections(29, 33). Moreover, the physical activity reduces the risk of high blood pressure, cardio-vascular events, stroke, diabetes mellitus, depression, and accidents; and thus reduces the risk of obesity, and strengthens the immune system(2).

The WHO acknowledged that the general public must wear face mask during the Covid-19 pandemics, and such interventions had an enormous impact on the transmission of secondary cases(34). The face masks are easily available, simple to use, are cheap, and proved highly effective in homes & outside the home; and helps in breaking the chain of infection of Covid-19 transmission. For example, an ecological study conducted in Hong Kong, revealed that face masks for the general public helped a lot in the prevention of Covid-19(34). In healthy populations, the cost effective benefits of using face masks are more when compared to the negative effects. The Centers for Disease Control and Prevention recommended that individuals must wear a face mask in public; and the masks are specifically designed to prevent the

respiratory routes of transmission during breathing, speaking, or coughing(35).

Proper hand hygiene i.e. hand sanitization and hand washing with soap and water is effective for prevention of covid-19(36). The mandatory compliance of wearing a face mask has started in many communities(29); and the correct use of different personnel protective equipments proved more effective in case of Covid-19 pandemic(37). According to CDC, the disinfection of hands with soap and water, with gel or foams, or any other antiseptic solution comprises proper and effective hand hygiene measures(30). Furthermore, the healthcare workers are at a higher risk Covid-19infection(27, 29). Social distancing is the preventive measure against COVID-19; and proved highly effective in breaking the chain of transmission(13). Public health researchers also revealed that rural individuals are badly affected due to unhygienic socio-economic conditions as compared to urban individuals. Moreover, the current studies revealed that the high infectiousness and contagiousness of Covid-19 is due to transmission through asymptomatic and pre-symptomatic case following the super spreaders phenomenon(23). An international study also revealed that the Covid-19 infected individuals might have insufficient vitamin D(38), and thus in addition to vitamin D; Vitamin B, E& C, along with Omega -3, plays important role and reduces the risk of Covid-19 infection(38-40).

Pakistan is a developing country and has poor social and economic determinants of health. In Pakistan there are limited resources and the health system is weak to control and contain Covid-19 pandemic. The Covid-19 has spread to each and every part of the country; and thus this cross sectional study was carried out to identify the risk factors of Covid-19 and its important socio-economic determinants in Khyber Pakhtunkhwa province of Pakistan; and to suggest measures for the effective prevention and control of Covid-19 infection in order to reduce the further spread, and transmission of Covid-19 infection among the vulnerable communities and also to communicate public health measures and guidelines in the best interest of public.

## METHODOLOGY

This descriptive cross-sectional study was conducted by the Department of Community Medicine North West School of Medicine (NWSM) Hayatabad, Peshawar, Khyber Pakhtunkhwa Pakistan; from March to April, 2020. . Ethical approval was not required as the Covid-19 self-reported positive cases were assessed regarding the demographic and socio-economic characteristics along with significant dependent and independent variables. A sample size of n=139 was selected based on 95% confidence interval and 5% precision with 10% prevalence. All the individuals with Covid-19 positive test were included in the study and those who are not the permanent residents of Khyber Pakhtunkhwa were excluded from the study. The structured questionnaire was developed and consists of information regarding demographics, and a comprehensive assessment of risk factors of Covid-19 along with assessment of knowledge and practices of personnel protective equipment's among the Covid-19 positive cases. There are also questions regarding the behavior, lifestyle factors, pre-existing comorbidities, and symptoms (20). The continuous variables were converted into categories so to make comparisons and the categorical variables were presented in frequency and percentage(2, 24). The obesity was

calculated from measurements of height and weight; and the individual was labeled as obese if the calculated BMI was more than 30 kg/m<sup>2</sup>. Beside the demographics, the socio-economic status was assessed via several questions(24).

## RESULT & DISCUSSION

In our study population of n=139; n=117 (84.17%) were males while the remaining 15.83% were females; whereas in a study conducted internationally showed that 59.6% of females were infected by Covid-19(11). Many international studies also revealed that being male gender is a risk factor of Covid-19(6, 16, 41). According to our study findings, the frequency of Covid-19 was high among the male gender as was supported by a study conducted by Wolff et al., 202; showed higher prevalence among male gender (20). Moreover, in our study, 57.55% of Covid-19 cases had age 40 or above; whereas in many international studies, the 55 years and above age groups showed higher frequency(20, 22). Furthermore, in our study; 15.83% were females, whereas in a study conducted internationally showed that 50.7% of females were infected by Covid-19(26). In an international study, it was found that among Covid-19 cases 75.2% revealed positive marital history; and in our study, 69.78% had positive marital history(42), and thus showed similarity with international findings as was shown with other demographic characteristics in Table No 1.

According to our study results, the source of information regarding PPEs use was through different resources i.e. internet (46.04%), newspaper (26.62%), TV&Radio (46.04%), Friends/ Colleagues (49.64%), family members (74.10%) and health personnel (38.13%), as shown in Table No 2. Moreover, international studies also revealed online internet source, health care workers(42); and TV&Radio(23).

According to our study results, 84.17% used face mask before Covid-19 infection, and only 74.10% were currently using face mask after getting Covid-19 infection. Only 67.63% were properly following hand hygiene practices before covid-19 infection and 84.89% after covid-19 infection. Moreover, majority of the cases, (n=83, 59.71%) had used face mask before Covid-19 infection (Table No. 3). According to our study findings, 79.14% of cases were following protective measures at their homes or offices against Covid-19 infection. Moreover, in our study, 79.86% presented with fever, 46.04% with cough, 27.34% with shortness of breath, and only 19.42% presented with myalgia (Table No 4); whereas in international studies, the same fever was reported as the most common type symptom i.e. 82.3%; followed by cough (66.3%); and shortness of breath (47.5%) (19). The similar type of symptoms were also revealed by international studies of Song et al., 2020; Wolff et al., 2020; &Shen et al., 2020(19, 20, 26).

The presence of pre-existing non-communicable diseases had an increased risk for Covid-19 infection and found that preexisting hypertension, cardiovascular and renal diseases along with diabetes mellitus showed significant relationship with risk of Covid-19(19, 21). According to our study findings, 46.04% of Covid-19 cases reported chronic diseases beside Covid-19 infection, with diabetes mellitus at top followed by hypertension; whereas in an international study, it was

found that 48% of Covid-19 had co-morbidities and hypertension at top followed by diabetes mellitus(20). Those individuals having diabetes mellitus have a significantly higher risk of Covid-19 as compared to non-diabetics(21). Thus our study confirmed and supported the findings of many international studies that co-morbidities are approximately 20-51% among the Covid-19 cases(6, 15, 25, 43). In an international it was found that respiratory diseases were prevalent among 9% and 6.75% of Covid-19 cases respectively(24); as was reported by our study findings by showing 9.35% of respiratory problems among the Covid-19 reported cases (Table No 5). Furthermore, according to China CDC reported 2.4% of Covid-19 had chronic respiratory diseases(24). In our study, 6.48% of Covid-19 cases had cardiovascular problems, whereas in many international studies reported that coronary heart disease had 7 to 15 % prevalence among the Covid-19 cases(9, 22). According to our study findings, n=10 (7.19%) of Covid-19 cases reported major or minor type of mental problems, whereas in a study conducted internationally reported 7% of stress symptoms among the Covid-19 cases(7). Moreover, in another study conducted by Solomou &Constantinidou, 2020; revealed that 41% of Covid-19 cases had anxiety problems(44).

The association between COVID-19 positive cases, and overweight and obesity is plausible. According to our study findings, the obesity was prevalent among 32.37%; and overweight among 17.27% of Covid-19 positive cases; whereas in an international study showed 29.58% (24). Thus our study supported international studies and revealed similar findings (Table No. 1). Moreover, our study also showed strong relationship of Covid-19 with obesity and supported international studies conducted by Rozenfeld et al., 2020, and Caci et al., 2020 (11, 12).

In our study, n=57 (41.01%) of Covid-19 cases had positive history of tobacco current status and only 16.55% had history of substance abuse; as was reported by international studies, the Covid-19 cases showing strong relationship of tobacco smoking, substance abuse and alcoholism(15, 45). Besides public health preventive measures, the social distancing has helped in reduction of Covid-19 transmission (Table No 2). Moreover, there is strong evidence regarding transmission of that Covid-19 in close social and causal contacts with a Covid-19 positive case(8, 26). As we know that socio-economic and demographic features played a key role in the causation and also increase the likelihood of getting Covid-19 infection. Therefore many international studies revealed the importance of avoiding social gatherings and close contacts during the Covid-19 pandemic(11, 31). In a study published by Singu et al., 2020; in Journal of Frontiers in Public Health; revealed that 71% of individuals avoid social gatherings and proved helpful in the Covid-19 pandemic (8). Moreover, reduce social contacts along with face masks compliance reduced the transmission of Covid-19 in communities(35, 46).

The determinants of Covid-19 infection are multidimensional and are strongly related to low house hold income(47). According to our study results, 54.68% of Covid-19 cases had monthly income of less than 30, 000, and similar findings were also reported by an international study showing strong relationship with monthly income and socio-economic status of the family (48). Moreover, in our study; 30.94% had monthly income in between 30, 000 to 70, 000, and only 14.38% had monthly income above 70, 000. In our study, 35.97% of Covid-19 was not employed

as shown in Table No 1, and many international studies revealed strong relationship between Covid-19 and unemployed status(8, 23).

In our study, approximately all types of major important medicines along with supplements were used i.e. anti-malarial (53.24%), antiviral (5.04%), antibiotic (42.45%), multivitamins 67.63%, and mixed types (75.54%)(49)(50). Similarly many international studies also revealed antibiotics, antivirals, therapeutic supplements and micronutrients(51, 52). Moreover, the hand safety and hand hygiene compliance proved one of the most effective and beneficial measure for prevention and spread of Covid-19 infection and kills many types of microorganisms, , as shown in Table No 4 (30). According to our study, 74.82% and 38.13% reported used of gloves and sanitizers whereas in an international study; 72 % reported use of glovesand sanitizers(5).

## CONCLUSIONS

Covid-19 infection showed strong relationship with age, gender, and socio-economic characteristics. Moreover, Covid-19 also showed relationship with important determinants i.e. chronic co-morbidities, obesity, tobacco smoking, personnel protective equipments knowledge, health information, and prophylactic medicines and supplements intake. Thus comprehensive preventive and promotive measures should prioritize vulnerable communities and individuals in order to reduce the spread and transmission of Covid-19. Moreover, policies be implemented focusing on the social and economic characteristics of populations, along with coordination and cooperation from key stakeholders and organizations.

## STUDY LIMITATIONS

This study has some limitations. First, the study was conducted on the already Covid-19 positive casesand thus having chances of systematic error due to the laboratory tests conducted by different institutions. Secondly, although it's a cross sectional study and the issues related to the generalizability cannot be excluded as the sample size was less due to many ethical and social reasons. Thirdly, due to the shortage of time, errors during filling of the questionnaire cannot be ruled out. Fourthly, in this study, only the frequencies and percentages of the respondents were presented and the possibility of the ecological fallacy can be kept in mind. Finally, due to different and specific socio-economic characteristics the results might be impossible to generalize on other communities.

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## Ethical Approval

This study was given approval by the Ethical Review Committee of the NWSM Hayatabad Peshawar. Moreover, the respondents were assured that the confidentiality will be maintained at each step of the research and the main aim of the study was for the benefit of the public.



## Declaration of competing interest

The authors declared that they have no competing interest regarding this research work

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**Table No 1. Frequency & Percentages of Covid-19 Cases (n=139) of Khyber Pakhtunkhwa Pakistan**

Demographics of Covid-19	Variables	f	%
Gender	Male	117	84.17
	Female	22	15.83
Age Groups	< 25 years	18	12.95
	25 - 40 years	41	29.50
	40 - 55 years	49	35.25
	55 & above	31	22.30
Monthly Income	< 30000	76	54.68
	30000 - 700000	43	30.94
	70000 & Above	20	14.39
Occupations	Private Job	51	36.69
	Govt Job	27	19.42
	Housewife	21	15.11
	Students & others	40	28.78
Employment	Yes	89	64.03
	no	50	35.97
Educational Status	Literate	91	65.47
	Illiterate	48	34.53
Social Setup	Rural	38	27.34
	Urban	101	72.66

Marital Status	Married	97	69.78
	Unmarried	37	26.62
	Divorced/ Separated	5	3.60
No of Children	None	51	36.69
	1 or 2	43	30.94
	3 or 4	28	20.14
	> 4	17	12.23
tobacco smoking	yes	57	41.01
	no	82	58.99
Other Substance abuse	yes	23	16.55
	no	116	83.45
family system	Joint	85	61.15
	Nuclear	54	38.85
BMI	< 19	6	4.32
	19-24	64	46.04
	24-29	24	17.27
	30 & above	45	32.37

**Table No 2. Frequency & Percentages of Risk Factors of Covid-19 Cases (n=139) of Khyber Pakhtunkhwa Pakistan**

Risk Factor of Covid-19	Response	Frequency	Percentage
Who was the 1st case affected in your family?	You	27	19.42
	Parents	31	22.30
	Siblings	23	16.55
	Children	8	5.76
	Friends	19	13.67
	Relatives	15	10.79
	Neighbors	16	11.51
Are you having any problem/s after recovering from Covid-19?	Yes	36	25.90
	No	103	74.10
Have you experienced severe complaints during Covid-19 infection?	Yes	43	30.94
	No	96	69.06
Have you received any information regarding PPE use during Covid-19 epidemic?	Yes	131	94.24
	No	8	5.76
Source of information regarding PPE use during Covid-19 epidemic	Internet	64	46.04
	Watsapp	103	74.10
	Newspaper	37	26.62
	TV/ Radio	64	46.04

	Friends/ Colleagues	69	49.64
	Family members	103	74.10
	Health Personnel's	53	38.13
Any idea, how you got this Covid-19 infection?	Yes	45	32.37
	No	94	67.63
Any idea that you got Covid-19 infection from contacts with?	Parents	28	20.14
	Family members	23	16.55
	Friends	15	10.79
	Social Gatherings	17	12.23
	Health Personnel's	11	7.91
	Job Place	32	23.02
	Travel	13	9.35

**Table No 3. Frequency of Risk Factors of Covid-19 Cases (n=139) of Khyber Pakhtunkhwa Pakistan**

Risk Factor of Covid-19	Response	Frequency	Percentage
Have you used face mask before getting Covid-19 infection?	Yes	117	84.17
	No	22	15.83
Are you using face mask after getting Covid-19 infection?	Yes	103	74.10
	No	36	25.90
You followed proper hand hygiene practices before getting Covid-19 infection?	Yes	94	67.63
	No	45	32.37
You are following hand hygiene practices after getting Covid-19 infection?	Yes	118	84.89
	No	21	15.11
You used PPEs before getting Covid-19 infection?	Yes	107	76.98
	No	32	23.02
You are using PPEs after getting Covid-19 infection?	Yes	109	78.42
	No	30	21.58
Which type/s of PPEs you used before getting Covid-19	Face Mask	83	59.71

infection?	N 95 Mask	14	10.07
	Cloth Face Mask	23	16.55
	Google	5	3.60
	Gloves	14	10.07

**Table No 4. Frequency of Risk Factors of Covid-19 Cases (n=139) of Khyber Pakhtunkhwa Pakistan**

Risk Factor of Covid-19	Response	Frequency	Percentage
Are you following protective measures in your homes/ offices/ work place against Covid-19 infection?	Yes	110	79.14
	No	29	20.86
From where did you work during Covid -19 lockdown?	Home	41	29.50
	Office	27	19.42
	Field Work	20	14.39
	None	51	36.69
Common Covid-19 infection symptoms?	Fever	111	79.86
	Cough	64	46.04
	Sore throat	35	25.18
	Shortness of Breath	38	27.34
	Myalgia	27	19.42
	Abnormal Taste	56	40.29
	Abnormal smell	76	54.68
	Heart Problems	12	8.63
What are the protective measures against Covid-19 infection?	Renal Problems	8	5.76
	Face Masks	123	88.49
	Hand Washing	93	66.91
	Hand Sanitizing	104	74.82
	No Hands Shake	112	80.58
	Gloves	53	38.13
	No Social Contacts	76	54.68
	No Social Gatherings	47	33.81
	No Contact with Children	14	10.07
	Proper Quarantine	105	75.54
Used which type of prophylactic medicine against Covid-	Proper Isolation	41	29.50
	Anti-Malarial	74	53.24

19 infection?	Anti-Viral	7	5.04
	Anti-Biotic	59	42.45
	Multivitamins	94	67.63
	Vitamin - C	31	22.30
	Vitamin - D	27	19.42
	Mixed	105	75.54

**Table No 5. Frequency of Risk Factors of Covid-19 cases (n=139) of Khyber Pakhtunkhwa Pakistan**

Risk Factor	Response	Frequency	Percentage
Any close contact with Covid-19 case?	Yes	115	82.73
	No	24	17.27
Visited any confirmed or and suspected Covid-19 case?	Yes	59	42.45
	No	80	57.55
Visited any recovered confirmed Covid-19 patient?	Yes	33	23.74
	No	106	76.26
Visited health facility for other health issue beside Covid-19 infection?	Yes	42	30.22
	No	97	69.78
Are you admitted in hospital for Covid-19 infection?	Yes	35	25.18
	No	104	74.82
Duration of your admission in hospital	< 10 days	17	12.23
	10-20 days	10	7.19
	21 & above	8	5.76
Had any acute disease/s beside Covid-19 infection?	Yes	27	19.42
	No	112	80.58
Had any Chronic disease/s beside Covid-19 infection?	Yes	74	53.24
	No	65	46.76
Name the Chronic disease/s beside Covid-19 infection?	Diabetes Mellitus	12	8.63
	Hypertension	10	7.19
	Stroke	4	2.88
	Myocardial infarction	5	3.60
	HBV/ HCV	15	10.79
	Renal Problem	3	2.16



	Respiratory Problem	13	9.35
	Co-morbidity	2	1.44
	Mental Illnesses	10	7.19