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Frequency of COVID-19 IgG Antibodies among Special Police Squad Lahore, Pakistan

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ABSTRACT

Objective: To find out the sero-prevalence of COVID-19 IgG antibodies among policemen performing duties at high risk areas of Lahore, Pakistan.

Study Design: Cross-sectional, observational study.

Place and Duration of Study: Chughtai Lab Lahore from 20th to 30th May 2020.

Methodology: One hundred and fifty-four young policemen (mean age 27.1 ± 3.8 years) were included in the study after written consent. Squad officers who had any sign of acute respiratory infection were excluded from the study. The participants were asked to fill a questionnaire regarding nature of exposure with the infected cases, kind of personal protective equipment they are provided with and living arrangements. Three ml of blood samples were collected from the participants and immediately sent to the lab for analysis. COVID-19 IgG antibodies were analysed using chemiluminescence immunoassay method on Architect Ci8200 (Abbott). SPSS 23.0 was used for data analysis.

Results: All participants were males and mean age was 27.1 ± 3.8 years. Out of 154 squad members, 24 were reactive for COVID-19 IgG antibodies and performing duties at the areas of high virus exposure. None of COVID-19 IgG reactive cases exhibited symptoms and most of them performed duties at high risk areas with only masks provided as personal protective equipment. Only 10% of the participants who were exposed to confirmed cases of COVID-19 were found to have anti-COVID IgG.

Conclusion: COVID-19 IgG antibody reactive cases may not show any symptoms. Police force is at high risk of exposure. Serosurveys can help to find the spread of infection in the community and aid in planning healthcare strategies.

Key Words: COVID-19, SARS CoV-2, Seroprevalence, Pandemic, Asymptomatic cases.

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INTRODUCTION

The extent of spread of COVID-19 (Coronavirus Disease 2019) epidemic is still rampant in Pakistan, posing a huge health challenge to the government officials and healthcare authorities. The confirmed cases in the country are reported on the base of polymerase chain reaction only, and this leads to inaccurate estimate of the affected number of individuals in the country. The recovered cases, individuals with mild or no symptoms, and cases residing in the areas of limited supply of resources can easily be missed with this approach. The situation report of OCHA (United Nations Office for the Coordination of Humanitarian Affairs) revealed that confirmed cases of COVID-19 in Pakistan had risen to 19,103 as of May 03, 2020.¹ Punjab being the most affected province is followed by Sindh, Khyber Pakhtunkhwa and Balochistan, respectively.

As of July 15, 2020, the confirmed cases of COVID-19 in Pakistan was 255,769 with 2,078 critical cases and 172,810 recoveries. The maximum number of tests had been conducted in Punjab followed by Sindh.²

COVID-19 seems to have different epidemiological features as compared to other viruses of the same family. Most of the infected population can be asymptomatic, carrying on usual daily activities and can be a major source of spread of the infection.³ Timely detection of SARS CoV-2 infection is of vital importance to control virus transmission. The most sensitive and specific method to detect COVID-19 is reverse transcriptase polymerase chain reaction (RT-PCR); but in majority of the cases, viral RNA becomes undetectable by day-14 post symptom onset.⁴ Sampling procedure and timing of sample collection during the disease course are the major determinants of PCR test results. Moreover, RT-PCR is time consuming, costly, and mostly used by the healthcare agencies to confirm symptomatic cases, leaving behind asymptomatic cases undiagnosed.⁵ With the reported limitations of PCR, immunological assays can be of a great help to reduce the percentage of undiagnosed cases and estimate the prevalence of disease in the community.

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Table I: Serological status of squad members according to level of exposure to confirmed or suspected cases of COVID-19.

Nature of exposure	Total number of squad members falling in the category	Number of participants reactive for COVID-19 IgG antibody	Number of participants non-reactive for COVID-19 IgG antibody
Posted for duty at quarantine centres, exposure to confirmed cases of COVID-19 including family members positive for the infection.	27	0 (Nil)	27
Exposed to confirmed cases of COVID-19 including family members positive for the infection (No duty performed at quarantine centres).	21	7	17
Exposed to confirmed cases of COVID-19 (No family member positive for the infection, no duty performed at quarantine centres).	24	0 (Nil)	24
Exposed to suspected cases of COVID-19 only (No exposure to confirmed cases).	82	17	65

Table II: Serological status of squad members according to PPE provided.

PPE provided	Total number of squad members falling in the category	Number of participants reactive for COVID 19 IgG antibody falling in the category	Number of participants non-reactive for COVID 19 IgG antibody falling in the category
Gloves only	1	0 (Nil)	1
Protective masks only	102	21	81
Gloves along with protective masks	40	3	37
Gloves along with protective masks and face shields	11	0 (Nil)	11

Table III: Serological status of squad members, according to living arrangement.

Living arrangement	Total number of squad members falling in the category	Number of participants reactive for COVID 19 IgG antibody falling in the category	Number of participants non-reactive for COVID 19 IgG antibody falling in the category
Joint family	93	14	79
Single accommodation	61	10	51

Serological testing is a major diagnostic approach providing information regarding active COVID-19 infection and past exposure to the virus. Many healthcare authorities around the world have developed serological assays to detect antibodies against SARS CoV-2 from patient's blood.⁶ The sensitivity and specificity of point of care devices is highly questionable. On the other hand, laboratory-based tests on fully automated analysers using chemiluminescence as assay principle have high sensitivity and specificity.⁷

Dolphin Force is a specialised unit of Punjab Police, Pakistan to deal with street crimes and security situation in Lahore, performing duties at high risk areas and comes in contact with COVID-19 patients quite often, making them more vulnerable to the disease. IgG denotes past exposure to the virus.

The objective of this study was to determine the frequency of anti-SARS CoV-2 antibodies (IgG) among the *Dolphin Force* in Lahore, Pakistan through serological testing to find out the percentage of police workers exposed to the virus.

METHODOLOGY

It was a cross-sectional study approved by Institutional

Review Board of Chughtai Lab, Lahore. A total of 154 policemen of Elite Security Unit of Punjab Police, *Dolphin Force*, were selected to participate in the study after their written consent. The objective of the study was explained to the participants. Squad members willing to participate in the study were enrolled; and those not willing to give the blood samples for research purpose, were excluded from the study. Squad officers who had any sign of acute respiratory infection were excluded from the study as they might be a risk to the team members of the laboratory taking samples. The participants were asked to fill a questionnaire mentioning their identification, age, place of duty, nature of exposure with the infected cases, kind of personal protective equipment (PPE) they are provided with, presence or absence of sign and symptoms of the infection, availability of PCR testing, and living arrangements of the squad officers.

Three ml of blood samples were collected from the participants and immediately were sent to the Lab for analysis. COVID-19 IgG antibodies were analysed using chemiluminescence immunoassay on Architect Ci8200 (Abbott). It is a qualitative assay with a specificity of 99% and positive percent agreement with RT-PCR at ≥ 14 days post-symptom onset of 96.77% (95% CI). A cutoff of 1.4

Index was used to declare the results as reactive or nonreactive for COVID-19 IgG antibodies. Results greater than or equal to the cutoff value were declared as reactive for COVID 19 IgG antibodies; and results less than the cutoff were taken as nonreactive for COVID 19 IgG antibodies.

SPSS version 23.0 was used for data analysis. Data was checked for normality using Kolmogorov-Smirnov test and Shapiro-Wilk test. Quantitative variables were expressed as mean and SD; whereas, qualitative data were expressed as frequencies and percentages. Mann-Whitney U-Test was used for comparison. A p-value of <0.05 was considered as significant.

RESULTS

The mean age of the participants was 27.1 ± 3.8 years and all participants were males. The blood sample analysis for COVID-19 IgG antibody showed that 24 participants (15.6%) were reactive for COVID-19 IgG antibody, showing past exposure to the virus; while, 130 participants (84.42%) were non-reactive for COVID-19 IgG antibody. None of the participants had been tested via RT-PCR or point of care devices to rule out infection. Of all the squad members participating in the survey, 150 (97.4%) did not show any signs and symptoms, while only four members (2.6%) gave history of symptoms of the disease (cough, fever, headache, shortness of breath). The symptoms in these participants appeared a month before the time of blood collection, resolving spontaneously (within a week) and none of them were admitted in the hospital. All the participants who were reactive for COVID-19 IgG antibodies were asymptomatic. The seropositivity of the policemen for COVID-19 IgG antibodies according to level of exposure with the diseased individuals, is given in Table I. Around 20% of the participants, who were not exposed to confirmed cases of COVID-19, were found to have anti-COVID IgG; whereas, only 10% of the participants who were exposed to confirmed cases had these antibodies.

The seropositivity for COVID-19 IgG antibodies among the policemen, according to the personal protective equipment (PPE) provided, is given in Table II.

The seropositivity for COVID-19 IgG antibodies among the squad members, according to the living arrangement, is given in Table III.

Majority of the squad members performed duty at busy public areas like Cantonment (n=39), Model Town (n=32); while only 36 members performed duty at Walton Dolphin Police Headquarters. Other duty areas were Shadman, Raiwind, and Iqbal Town. All these areas have busy public movement throughout the day and there is a high chance of exposure with COVID-19 suspected cases. The squad members, who were reactive for COVID-19 IgG antibodies

(n=24), performed duty at four areas of Lahore; 11 of the reactive cases for COVID-19 IgG antibodies performed duty at Headquarters and Civil Lines, six at Lahore Cantonment, and three each at Model Town and Iqbal Town. All the squad members, whose duty was only confined to quarantine centres, were non-reactive for COVID-19 IgG antibodies.

DISCUSSION

Serological data can be used by the healthcare professionals to formulate policies. Measuring COVID-19 IgG antibodies in the population can assess the number of individuals who have developed an immune response and depict subclinical infection or past exposure to the virus and may suggest recovery. Some of the recent studies have shown that these antibodies remain positive for at least four weeks.⁸ Research has shown that seroconversion is usually attained after a median of 10 days for IgM and 14 days for IgG after symptom onset. The maximum level of seroconversion can be seen at 2 weeks for IgM and 3 to 6 weeks for IgG.⁹ Around 7 weeks IgG shows maximum seropositivity; whereas, IgM seems to disappear.¹⁰ In this study, IgG antibodies were measured in participants' serum and the presence of antibodies in 15.6% of the policemen who did not show any symptoms indicate that they have been exposed to the virus and have recovered.

Recently, a seroepidemiological study was carried out in Spain to find out the percentage of population who have developed antibodies against coronavirus; and to evaluate the spread of pandemic across the country. More than 35,000 households were selected through two-stage random sampling. Seroprevalence was found to be 5.0%; and one-third of the seropositive patients were asymptomatic.¹¹ Young *et al.* used serological testing in Singapore to trace PCR negative COVID-19 cases and helped the health authorities to limit the spread of infection by giving an estimate of the spread of infection in the community.¹²

Many studies have revealed that SARS CoV-2 IgG antibodies were positive in more than 90% of confirmed COVID-19 patients two weeks after the onset of symptoms. It is unknown that the remaining percentage of the cases not developing antibodies are likely to be re infected or not.¹³ Serological screenings are also being used by the healthcare professionals to screen blood for therapeutic application.¹⁴ Plasma rich in antibodies against SARS CoV-2 obtained from recovered patients of COVID-19 are transfused to critically ill patients in intensive care units. An experimental study conducted in China showed promising results of this treatment.¹⁵ Plasma transfused in this study was done as per previous studies, which reported favourable results.¹⁶ Plasma was collected and transfused on the same day to preserve the natural activity of the antibodies.

Accurate estimate of infected individuals is necessary for Government healthcare agencies to understand the spread of infection, trace contacts and plan strategies. In the past, serosurveys have been used to evaluate immune status of the population against infections like Ebola. These surveys estimate the size of the recovered population to calculate the peak of infection outbreak using specialised research models.¹⁷ On the other hand, studies also reveal that serological tests do not aid in the diagnosis of current infection.¹⁸

A population-based study is recently conducted in Geneva for five weeks between April and May 2020. This week-wise study revealed that seroprevalence increased from first to fifth week of the survey; and individuals between 20 to 49 years had a higher risk of being seropositive. The authors suggested that findings of the study can be helpful for countries to make strategies regarding easing of restrictions.¹⁹ A recent study conducted in the city of Wuhan, China estimated IgG and IgM levels in more than 17,000 individuals and found a seropositivity of 3.8% in different cohorts. The researchers found that patients regularly visiting the hospitals and healthcare workers had higher seroprevalence as compared to the general population.²⁰ Sood *et al.* conducted a serological survey in a community in California to estimate the incidence of SARS-CoV-2 infection; and found a seroprevalence of 4.6%.²¹ Bendavid *et al.* found COVID-19 IgG seroprevalence of 2.8% among their study population in Santa Clara County; and stated that infection may be more widespread than indicated by the number of PCR confirmed cases.²²

Number of confirmed cases and deaths due to COVID 19 may monitor disease progression and outcome, but do not estimate the actual proportion of the affected population. Asymptomatic and mildly infected individuals are not generally screened and number of confirmed cases remain underestimated. World Health Organisation is providing technical support and study protocol to the countries for epidemiological surveys regarding antibodies against COVID-19 and is also establishing design for a multinational antibody testing study called "Solidarity 2".²³ Similar studies in Pakistan can be helpful for the healthcare agencies and the government.

The seroprevalence surveys can be helpful for estimation of epidemiological variables, disease burden, and rate of transmission. These surveys can help healthcare workers and security or law enforcing agencies to develop strategies; with the help of which, they can be protected against the virus transmission. The identification of individuals who have developed an immune response can be used to label potential plasma donors for the treatment of COVID-19 patients.

CONCLUSION

A high number of young police squad officers were found reactive for IgG antibodies against SARS CoV-2 and none of

them have experienced any symptoms. Serological surveys can be of a great help to identify undiagnosed cases in the community.

FUNDING SOURCE:

Chughtai Lab, Lahore, Pakistan.

ETHICAL APPROVAL:

Ethical approval was obtained by Institutional Review Board of Chughtai Institute of Pathology, Lahore, prior to initiation of the research work.

PATIENTS' CONSENT:

Informed consent was obtained from all patients to publish the data concerning this study.

CONFLICT OF INTEREST:

Authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

OC: Original concept, study design, supervision.

HB: Paper writeup, data collection and analysis, literature review.

MDK: Proofreading, approval, discussion.

ASC: Literature review, final approval

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