

**Original Article**

**An Epidemiological Study of COVID-19 Pandemic in one Predominantly Rural District of Developing Country: A Cross-Sectional Study**

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**Abstract:**

**Background:** The emerging disease of COVID-19 that started from Wuhan China has now spread to more than 210 countries around the globe including India. Easy way of transmission and absence of immunity makes it highly contagious in nature. As very little data is available on various aspects of the disease, this study was taken up with the objective to generate local epidemiological data in order to provide better insight about the disease scenario prevalent in our region that will help to devise locally relevant strategies to contain the disease. **Study Area:** District Budgam of Kashmir Division. **Materials and Methods:** Cross sectional study done for a period of two month from (16<sup>th</sup> March-to 17<sup>th</sup> May) and all confirmed cases in this time frame were taken up for the study. **Results:** The cumulative number of cases that were reported in two months, till 17<sup>th</sup> May was 57. Out of total 10 medical blocks in the district maximum cases were reported from one block. 59.6% were reported in the age group of 20-39 years and 78.9% were males. In 71.9% cases the source of infection was contact with a positive case and 21% cases gave history of travel. Out of total 57 cases in only 12 cases the contacts turned positive and the percentage of contacts that turned positive ranged from 7% to 12 %. **Conclusion:** In this study estimation of the burden of disease in a district, its time distribution, block wise distribution of cases and major source of infection provide insight about the disease scenario at the local level. This study will be helpful in allocation of the limited resources that are available at the district level by health professionals.

**Keywords:** SARS- CoV2, WHO, COVID-19, District Budgam, Kashmir Division, Coronavirus.

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**Introduction**

The world as on date is facing a huge public health crisis from an agent whose behavior and epidemiology is still evolving and very little data is globally available on various aspects of this pandemic. Coronavirus disease or (COVID-19) the new name given to an Acute Respiratory illness caused by a Novel Coronavirus named as SARS-CoV 2<sup>1</sup>. These viruses are a large family of enveloped, positive-strand RNA viruses ecologically diverse and divided into four genera: Alpha, Beta, Delta and Gamma. Alpha and Beta SARS-CoV2 infect humans<sup>2</sup>. WHO declared this infection as a pandemic on 11 March 2020 that engulfed the whole globe in a very short span of time<sup>2</sup>. This outbreak is the third Coronavirus outbreak in the last 20 years after SARS and MERS-COV<sup>3</sup>. India faced

the jolt of COVID-19 for the first time when the maiden case was reported in Kerala. In the initial stage, the virus was contracted through patients with foreign travel history however as the numbers surged cases of local transmission also came to the fore. With the constraints in resources, tackling the situation not only became difficult in hospital settings in terms of curative care but also in the communities wherein the preventive measures had a significant role to play to reduce the spread. Both preventive and curative health systems had to work in synergy to achieve the best response outcome. This time there was one silver lining in the dark cloud, the administration has been active beforehand and has stepped up preparedness measures to a large extent.<sup>4</sup>

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**Table 1.** Age and gender distribution of COVID-19 cases of district Budgam.

GENDER	Distribution by age				Total
	<20yrs	20-39 yrs	40-59 yrs	=>60 yrs	
Male	4 (8.9%)	30 (66.7%)	10 (22.2%)	1 (2.2%)	45 (78.9%)
Female	3 (25.0%)	4 (33.3%)	4 (33.3%)	1 (8.53%)	12 (21.05%)
Total	7 (12.3%)	34 (59.6%)	14 (24.6%)	2 (3.5%)	57 (100%)

Since there is still dearth of documented information on COVID-19, it is important to generate local epidemiological data through robust studies and surveillance mechanisms and prompt dissemination of findings to the stakeholders for evidence-based decision making that are applicable to the locally prevalent situation. This study was carried out in one of the districts of Kashmir division, with the objective to provide a better insight of the disease scenario in terms of its time sequence, source of infection, age and sex distribution of the cases, contacts tracking within the range of incubation period.

#### Materials and Methods

**Type of the study:** Cross-sectional descriptive study over a period of 2 months from 16 March 2020 to 17 May 2020.

**Study area:** District Budgam of Kashmir Division was selected for the study.

**Study-population:** District Budgam has a population of around 7,35,756 as per census 2011 and a projected population of 7,59,092 (2019-2020). 86% of the district is rural and 14% of the district is within the municipality limits. The whole district is divided into ten medical blocks. As the first confirmed case of COVID-19 in Kashmir division was reported on 16<sup>th</sup> March 2020, all the confirmed cases occurring in different blocks of district Budgam for a period of two month from (16<sup>th</sup> March-to 17<sup>th</sup> May) were taken up for the study. A person with laboratory confirmation of SARS-COV2 by real time PCR irrespective of clinical signs and symptoms was taken as a confirmed case.

**Study variables:** The time of occurrence, age, sex, block wise distribution and source of infection of all the cases was taken into account. Contacts of all

the confirmed cases were line-listed and number of contacts turning positive for disease was noted.

**Study limitations:** As this is an evolving disease, the foundations on which we are laying stress and building our arguments currently are liable to change in due course of time.

**Data management and statistical analysis:** The data was collected, analyzed and interpreted and appropriate statistical test was done using SPSS software.

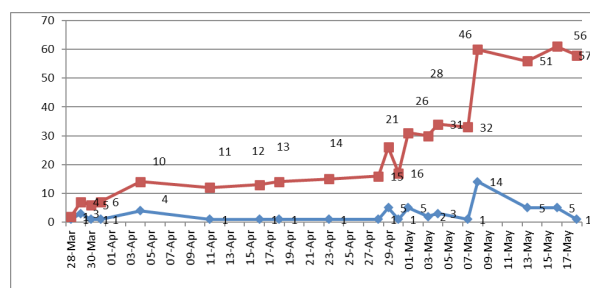
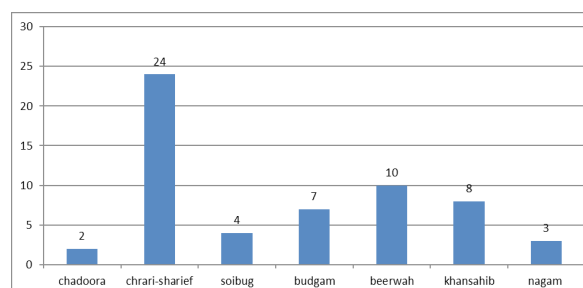
#### Results:

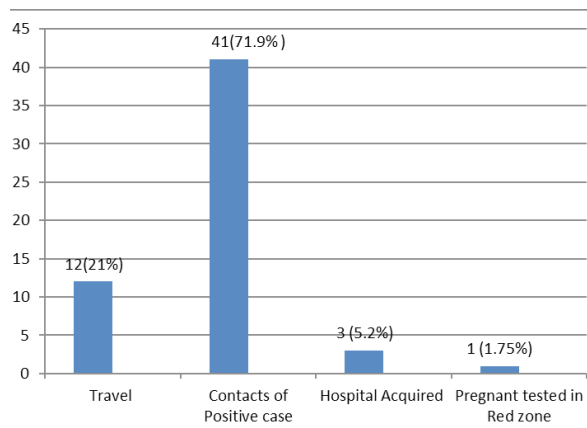
In this study we investigated the time of occurrence, block wise distribution, age and gender distribution, source of infection of the positive the cases. Number of close contacts and number of contacts turning COVID-19 positive were also taken into account and each of these are given respectively.

Time trends in the distribution of cases in district Budgam during two-month post lockdown (from 16 March to 17<sup>th</sup> May) is given in Figure 1. The first confirmed case was on 28 March 2020. Clustering of cases were reported on 8<sup>th</sup> May when 14 cases occurred from the same workplace (cold storage factory). The red line shows the cumulative number of cases reported till 17 May which was 57.

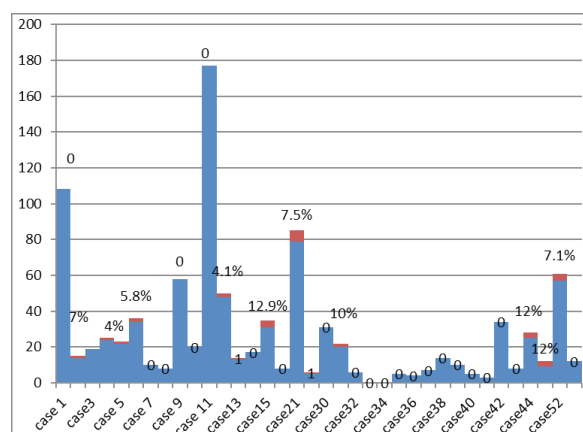
Block wise distribution of cases in district Budgam is given in Figure 2. Out of total 10 medical blocks in the district maximum cases were reported in Chari-Sharief, followed by Beerwah and Khan-sahib. However, any case has not been reported so far from two blocks Magam and Khak.

As for age and gender distribution of COVID-19 cases of district Budgam, 59.6% of COVID-19 positive cases were reported in the age group of 20-39yrs (see Table 1). 66.7% of these positive cases are men. A small percentage of cases

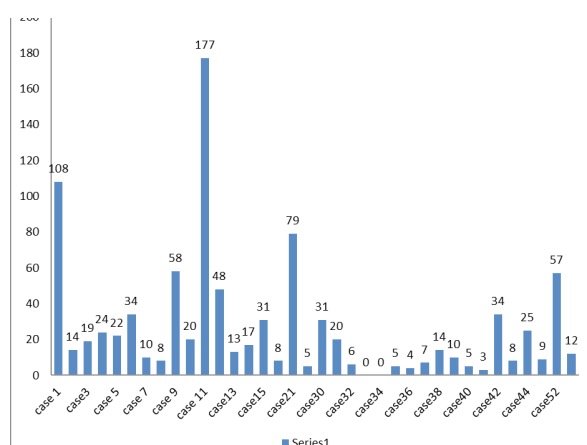
**Figure 1:** Time distribution in the occurrence of cases in district Budgam.**Figure 2:** Block wise distribution of cases of COVID-19 in District Budgam.



**Figure 3:** Possible source of infection among COVID-19 positive cases.



**Figure 4:** Number of close contacts of COVID-19 positive patients that were tracked.



**Figure 5:** Number of contacts who turned out positive from each COVID-19 positive cases.

(3.5%) were reported in the age group of > 60 yrs and among this group 8.5% were females. As far as the gender distribution in the occurrence of cases is concerned, majority of the cases (78.9%) were males and only 21.05% were females.

Figure 3 shows that the infection was acquired from a positive case in majority of the confirmed cases (71.9%). 21% of COVID-19 cases had history of travel. In a small percentage of cases (5.2%) the infection was acquired from the hospital settings. In 1.75% of cases the infection was detected in the process of random sampling of the pregnant ladies in the red zone.

Number of contacts of each tracked case is given in Figure 4. With 177 contacts, Case 11 had the maximum number of contacts and followed by Case 1 with 108 contacts, Case 21 with 79 contacts and Case 52 with 57 contacts.

\*case22, 24,25,26,27 contacts of case21

\*case29 contact of case28

\*case45, 46, 47 contact of case44

\*case49, 50, 51 contact of case48

\*case53, 54, 55, 56 contact of case52

Percentage of contacts that turned positive is given in a bar graph in Figure 5. In Case 2, about 7% contacts were positive, in Case 15 12.9%, and in Case 44 12% contacts turned positive. However, in most of the cases number of the contacts turned to be positive was zero.

#### Discussion:

COVID-19 has impacted the world in a way that could not have been predicted. The recent dramatic increase in the new cases and deaths in China followed by Europe and United-States. This clearly indicates that containment and mitigation measures have to be implemented at the earliest in order to keep the disease under control and let not the disease surge our healthcare system and take its toll. The first confirmed case of COVID-19 in District Budgam was reported on 28 March 2020. As of 17<sup>th</sup> May 2020 a cumulative total of 57 confirmed cases (out of 3679 samples that were tested) till then were reported from district Budgam. This corresponded to around 78 cases per million population and a prevalence of around 7 per lakh Population. Two deaths occurred among COVID positive patient and 28 cases had recovered during this period. In Kashmir division 1035 cases and 18 deaths were reported till 17 May 2020. At the national level cases in India were 90,927 and deaths were 2872. As on 17<sup>th</sup> May 2020, about 1,00,000 tests were performed daily at the national level, which corresponds to around 69 cases per million with around 7692 tests done per million populations<sup>5</sup>. On comparison with developed countries like in United States, 5000 confirmed cases per million with around 40,000 cumulative test per million were reported as on 17<sup>th</sup> May 2020. The figures in our study are desirable when compared nationally and with developed countries like United States and suggesting that decision taken by the state government was timely in enforcing strict containment measures in terms of isolating the confirmed cases in health

facilities, strict administrative quarantine of the close contacts, declaring red zones and restricting inward and outward movement of people in areas from where the cases were coming. Also Implementation of Section 144 by the orders of the District Magistrate and not allowing gathering of more than four people in one place resulted in limiting the spread especially in view of absence of availability of any therapeutic modality or an effective vaccine. In our study maximum cases were reported from Chari-Sharief, followed by Beerwah and Khan-sahib blocks. It is important to strengthen containment strategies in blocks from where the cases are reported, restrict inward and outward movement of people from these blocks and strengthen active as well as passive case finding of individuals with ILI like symptoms, followed by tracking of all the contacts as per the guidelines of Ministry of Health and Family Welfare<sup>6</sup>. Testing of all pregnant women in last trimester and individuals with co-morbidities should be taken up in these blocks on a faster pace. In blocks where no cases are reported focus was given on risk communication and generating awareness about all preventive measures like wearing of masks, hand hygiene and social distancing.

In our study the source investigation of the positive cases showed that 71.9% of cases had contact with a positive case. 21% of the cases had history of travel. In 5.2% cases infection was acquired from the hospital settings. However, in 1.75% cases the source of infection was inconclusive and detected in the process of random sampling of pregnant women in the red zones. *Mukherjee S, Waghmare R, et. al* conducted a study on 192 cases in Maharashtra for whom source investigation was complete. According to their study, 43.8% had travel history and 31.3% had contact history with a confirmed COVID-19 case. However, source of infection was inconclusive in 25% of the cases<sup>7</sup>. When compared with this study, although the source of infection was inconclusive in only 1.75% cases in our study, it is an important indication to strengthen the contact tracking process in the containment zones so as to limit the spread of the disease<sup>8</sup>. In our study the number of contacts

tracked for each case was also noted (e.g. for Case 11, 177 contacts were tracked and for Case 1, 108 contacts were tracked.) Also, the percentage of contacts that turned positive was noted. In Case 2 about 7%, in Case 15 almost 7.5% and in Case 44 almost 12% contacts turned positive. In rest of the cases none of the contacts turned positive. Wei Lie, et. al. performed a cohort study to see characteristics of household transmission of COVID-19. The secondary transmission of SARS-CoV-2 developed in 64 of 392 household contacts (16.3%)<sup>9</sup>. This is slightly higher than the results obtained from our study. The reason of difference may be due to immediate detection and strict isolation of the positive cases and quarantine of all the close contacts for a period of 14 days in our district and implementing strict containment strategy in areas where cases are detected. Since human-to-human transmission is the main mode of spread of the disease, mentioned examples are the best measures currently available for controlling the disease.

#### **Conclusion:**

The response measures put in place for COVID-19 containment at the District level have proved to be successful in limiting its spread. In this study estimation of the burden of disease in a District also provides insight about planning the limited resources of manpower and infrastructure in order to manage the situations at the local level. However, there is still a lot to be known regarding its epidemiological characteristics, pathogenicity and therapeutic modalities. Further research needs to be conducted to know the impact of different interventions on the outcome of the disease, but during this time the government should take strict measures and enforce stringent precautions.

**Conflict of interest:** None declared.

**Ethical approval issue:** Prior to the study permission were sought from the Nodal Officer in charge COVID-19 cell of District Budgam for use of the data for academic research.

**Authors Contribution:** Conceptualizing, data gathering and writing for publication: BM; Analysis and application of statistical software: YJ; Editing final draft: AAB.



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