Outpatient Screening Project for Suspected Covid-19 Patients in Zanjan Province, Iran

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ABSTRACT

Background & Objective: Screening and timely diagnosis of positive individuals is one of the important issues in controlling pandemic of Covid-19. Early and timely diagnosis of asymptomatic individuals, contact tracking, disconnection of Covid-19 transmission chain through early detection of patients and decreasing R0 were the main objectives of the current study.

Materials & Methods: The Covid-19 outpatient sampling detection project started in Zanjan province on March 26, 2020 and samples were taken from people suspected of having Corona Virus and people in contact with these patients.

Results: All 31,937 cases (48% male, 52% female) who had referred to Comprehensive Health Care Centers until May 16, 2020, were selected. A considerable percentage of incidences were observed in Zanjan and Khodabandeh cities. 20% of the examined samples had positive results. A substantial incidence was found in the age group of over 70 -year- old. Following implementation of the outpatient screening project, R0 fell below 1 in the province.

Conclusion: Prior to the implementation of Covid-19 laboratorial outpatient screening project, the value of R0 was 1.4 in Zanjan province. However, this value fell below 1, after implementation of the laboratorial outpatient screening indicating that the principal way to effectively control Covid -19 is to detect positive cases and manage them.

Keywords: : Mass screening, Outpatients, Covid-19

Introduction

Coronaviruses are major viruses that cause a variety of diseases in many animals and humans, and have long been known to cause colds in humans. With the start of Covid-19 in China and its dissemination to the continents of the world, the World Health Organization declared Covid-19 a pandemic **(1)**. The incidence of this disease in Iran has similarly affected people and has vastly increased the number of referrals to the hospitals, with subsequent increase in the number of hospitalizations in the provinces involved. Considering the occurrence of the disease in China in late December 2019, thoughtful and detailed planning was taken in advance at Zanjan University of Medical Sciences and the Deputy of Health, to get fully prepared for the management of the outbreak in the province. Among the measures taken at the level of health care, was thoughtful and meticulous planning to get prepared for the control of the outbreak including preparation of training packages for diverse groups of people such as the requires trainings for the control and prevention of Corona Virus, preparing training and disease prevention platforms, as well as monitoring and screening foreign workers in the province, introduction of selected centers for timely referral of patients, closure of all universities and schools, and continuous disinfecting of public transport vehicles and disinfecting 52 areas of the province, determination of quarantine stations for suspects and patients, provincial ban on all gatherings, hookah houses, restaurants, halls, ceremonies, continuous monitoring of all business activities and bakeries, etc.

With the pandemic of Covid-19 and its country-wide dissemination, given that about 85% of cases of Covid-19 indicate mild or asymptomatic symptoms; identifying and isolating Covid-19 patients sound incredibly efficient in reducing R0 rate and consequently preventing and controlling the incidence. To this end, an innovative planning was implemented in Zanjan province since March 26, 2020 to screen the cases of Covid-19 in outpatients referred to 16-hour centers.

Materials and Methods

Covid-19 Outpatient Sampling Project started on March 26, 2020 in Zanjan Province, in 10 comprehensive 16-hour health centers and two selected round-the-clock health centers. The criteria for selecting patients for laboratory tests were:

• Suspected people with Covid-19

• Three people in close contact with a patient of positive laboratory test results

•Three people in close contact with a dead patient with negative Coronavirus test but positive CT scan of the chest.

• Three people in close contact with a dead patient with positive laboratory test results for Covid-19.

The exclusion criterion included all those who were unwilling for sampling.

At present, molecular diagnostic test is the gold standard for Covid-19 disease. The definite confirmation of Covid-19 disease is subject to the discovery of a specific sequence of nucleic acid virus by RT-PCR method and, if necessary, its confirmation by sequencing. Specific regions in genes RdRp, S, N, E are used as targets. A sample of the upper respiratory tract (nasopharyngeal swab and oropharyngeal swab, or both) taken by a thin Dacron sterile swab with a plastic or aluminum handle is the main sample needed for the test. The sample was taken by a trained laboratory expert and health care professional. After sampling, the nasopharyngeal swab and the oropharyngeal swab were both placed in a durable, leak-proof tube that comprises the virus transmission environment and its lid was closed completely. Each tube belonged to a patient and the required IDs, location and date of sampling were legibly written on the label. On the same day, the sample was transported to the laboratory in cool temperature conditions (2-8 Degrees of Centigrade) in accordance with the standard packaging conditions and safe and secure transfer of the sample, and subsequently the results were checked. Positive cases were followed by contact tracing and all their contacts were tracked and samples were taken from the people who have been contacted. In this way, all the contacts of the people were identified and the disease screening was done very accurately. Positive cases that had outpatient treatment indications received outpatient care according to the protocol of the Ministry of Health.

Results

Zanjan province has 8 cities, the demographic characteristics of which are as follows:(Table 1). f General information on the status of care and treatment of suspected cases of Covid-19 in the 16-hour outpatient centers of the province.

Table 1. Demographic characteristics of Zanjan province

Rural Population			Urban Population			Population			City
Male	Female	total	Male	Female	total	Male	Female	total	
52668	50799	103467	225526	21811	445347	278213	270616	548829	**Zanjan**
53836	50894	104730	34595	33628	68223	88431	84522	172953	**Khodabandeh**
6657	6372	13029	27879	27327	55206	34538	33701	68239	**Khorramdareh**
13805	13229	27034	63465	69566	133031	77269	75795	153064	**Abhar**
20025	18621	38646	5516	5468	10984	25541	24089	49630	**Tarom**
14754	13984	28738	5431	5290	10721	20184	19274	39458	**Mahneshan**
16561	15821	32382	1689	1646	3335	18250	17467	35717	**Ijruod**
11470	10910	22380	4058	3918	7976	15528	14828	30356	**Soltanieh**
189776	180630	370406	368169	366654	734823	557954	540292	1098246	**Total**

As the table 2 shows the frequency of females and males who referred to outpatient centers was 16255 and 15682, respectively.

Table2. The total number of clients who referred to the selected comprehensive health service centers by May 16, 2020

Male	Female	City
6132	7287	**Zanjan**
1491	2054	**Khodabandeh**
1519	1673	**Khorramdareh**
2164	2142	**Abhar**
657	659	**Tarom**
634	854	**Mahneshan**
642	982	**Ijroud**
454	602	**Soltanieh**
15682	16255	**Whole Number**

The number of positive cases with suspected Covid-19 and people in contact with these patients, in the 16-hour centers of the province is 10056. The total number of tested samples is 9760 (Table 3). The total number of detected positive cases was 1917 (19.6%).

The percentage of positive samples to the total number of tested samples obtained from outpatient centers by cities is as follows: Abhar 19%, Ijroud 12%, Khodabandeh 23%, Khorramdareh 18%, Zanjan 22%, Soltanieh 21%, Tarom 14%, Mahneshan is 19%, and ultimately across the whole province, this value is 20% (Table 3).

Table3. The status of Covid-19 incidence in the cities of Zanjan province

Percentage of positive samples to total tested samples Hospitalization	Percentage of positive samples to total tested samples Outpatient	The number of identified positive cases	Number of tested samples	The total number of prepared samples	City
33	19	269	1424	1456	**Abhar**
28	12	64	561	582	**Ijroud**
29	23	206	934	993	**Khodabandeh**
35	18	154	877	872	**Khorramdareh**
35	22	973	4502	4602	**Zanjan**
23	21	73	368	384	**Soltanieh**
28	14	96	683	721	**Tarom**
23	19	62	338	369	**Mahneshan**
21	32	18	73	73	**Out of Province**
33	20	1917	9760	10056	**Whole Number**

It seems that the samples correspond to the population of each city, i.e., by comparing the population of Abhar and Mahneshan, in proportion to the population of Abhar which is 4 times more than Mahneshan, the size of samples correspondingly increases. The city of Zanjan has a population of 3 times more than Abhar and the size of sample is subsequently larger. Therefore, comparing the size of samples with the population of cities, the obtained sample sizes are reasonably reliable.

The Covid-19 age specificity in our 16-hour outpatient centers (per 100,000 population) had the following distributions: age range under 10 years old: 47 cases; 10 - 19 years old : 111 cases; 20 - 29 years old: 169 cases; 30 - 39 years old:227 cases; 40 - 49 years old: 229 cases; 50 -59 years old: 247 cases; 60 - 69 years old: 270 cases; 70 - 79 years old : 336 cases; and finally over 80 years old had 237 cases.

As the table 4 shows, outpatient total cases exceeded hospitalized patients. In Abhar, for example, there were

177 outpatient cases and 83 hospitalizations, i.e., significantly double in value. In Ijroud and Soltanieh, the number of hospitalizations is noticeably lower indicating that the disease detection is more accurate and therefore the hospitalization figure in these two cities tends to be lower.

Outpatient case detection brought about a marked effect on reducing hospitalized cases; otherwise, we would have faced a significant peak in hospitalization and subsequent increase in mortality rates.

Table 4. **The incidence of Covid-19 disease in 16-hour outpatient centers of the province by May 16, 2020 in terms of cities**

Number of hospitalizations on April 9, 2020 (based on hospitalization date excluding cases outside the province)	Number of hospitalization cases on May 26, 2020 (based on hospitalization date excluding cases outside the province)	Incident Frequency (Per one thousand population) Hospitalization	Incident Frequency (Per one thousand population) Outpatients	Number of Positive Cases	Total Populaton of city	City
4	6	83	177	269	153064	**Abhar**
1	0	53	179	64	35717	**Ijroud**
6	3	49	120	206	172953	**Khodabandeh**
0	3	135	229	154	68239	**Khorramdareh**
10	27	123	181	973	548829	**Zanjan**
0	0	53	248	75	30356	**Soltanieh**
1	2	70	196	96	49630	**Tarom**
1	0	59	159	62	39458	**Mahneshan**
-	-	-	-	18	-	**Out of Province**
23	41	96	177	1917	1098246	**Province**

B- Follow-up monitoring of the identified cases in 16-hour outpatient centers:

Positive Covid-19 disease detection based on clinical signs was as follows: 46% of the diagnosed cases had clinical symptoms and the rest did not exhibit any symptoms.

Out of 1833 identified and followed up cases, 775 received home-based treatment, 65 were treated in hospitals and 993 were closely monitored at home. A total of 235 positive patients referred to the hospital, of whom 65 were hospitalized. 1624 cases improved and the recovery rate in the detected patients was 88%.

Out of 1833 positive cases examined, 840 were eligible for medication; therefore, all of these cases received medication. Of positively identified patients, 1605 were isolated at homes and 343 were transferred to the recovery centers. The percentage of patients isolated was 100%. 1833 followed–up-patients were detected through outpatient laboratory screening, 3936 patients who had been in close contact with these patients were tracked. The mean contact in the tracked

cases was 1.2. From 3,936 people in close contact, 643 had symptoms and 570 received medical treatment. 2547 of these cases were tested, of whom 39.5% were in the process of contact traced compared to those who were, until the date of compilation of this paper.

Due to the fact that over 50% of the population of Zanjan province are urban residences and considering that the main focus of the city population is in Zanjan city, the distribution map of Covid-19 disease in Zanjan city was extracted based on the incidence of 100,000 populations and hot zones of the city was marked on the map. The distribution map of outpatient and inpatient cases in Zanjan city was also studied and compared (figure1,2). In the inpatient distribution map, the important point is that the high incidence of Covid-19 is seen in the areas with higher social and economic status. This is probably due to the reluctance of people in these areas to refer to 16-hour centers. In affluent districts, due to the unwillingness of people to refer to public or state centers and instead their tendency to refer to private clinics, the number of hospitalizations are markedly increased.

Figure1. Distribution map of inpatient cases of Covid-19 in city of Zanjan (incidence per 100000 people).

Figure2. Distribution map of outpatient cases of Covid-19 in city of Zanjan (incidence per 100000 people).

Discussion

The Covid-19 pandemic is currently the world's most important health challenge. The rapid and dramatic dissemination of Covid-19 has given rise serious social, economic, cultural, psychological and even political issues in the countries. Although, this virus seems to have a lower death risk in comparison with other emerging viruses in the Corona Group, such as Sars and Mers, the rate of incidence and pathogenic behavior of this virus make it extremely difficult to control [2].

The pandemic caused by the spread of the virus, has led countries to adopt policies that are tailored to their

circumstances. Due to the lack of treatment methods, vaccines, and the rate of contagiousness and pathogenicity, sufficient efforts must be taken to slow down the progression of this disease and assure safety in the community, to alleviate intense pressure on the health system, and to provide sufficient opportunities for the development of effective treatment and prevention methods [3]. To achieve this goal and delay the onset of the disease, the most effective tool available at the moment is to isolate patients, so that suspicious and infected people have the least contact

with healthy people and thus break the transmission chain (1, 3).

Accordingly, it seems that this epidemic is very serious and requires long-term measures. To control the first wave of the outbreak, the policy of isolating suspicious patients and reducing close contact with infected people is the most important factor for controlling the disease. The first step in achieving this, is to perform timely and rapid screening of suspected individuals in laboratory (4-9). Therefore, an innovative screening plan was proposed to fight against Covid-19 and cut its chain and reduce R0 and generational renewal (10-12). Ultimately, the practical purpose of this project implementation was to reduce disease transmission and cut off transmission chain. Screening based on salamat.gov.ir system is continuously carried out successfully in the province and due to the one-on-one screening of patients, we have been able to diagnose and screen about 80% of patients within three days of the onset of symptoms, and another 20% within 6 days.

In health science and epidemiology of infectious diseases, one of the most important indicators that can help health policymakers' prediction of the future epidemics is R0 index. The R0 index reached 1.4 in the province following the implementation of the Covid-19 Outpatient Laboratory Screening Project. This value fell below 1, indicating that the best way to control the disease is to find positive cases and have control over them.

Considering that covid-19 disease is an easy-to-transmit respiratory disease, and given that in the normal course of transmission of this disease, up to 85% of cases may be asymptomatic or mild; merely following-up, monitoring and care of hospitalized cases (15%) seem like the tip of the iceberg and inadequate; which may greatly surprise the health system admitting that a vast majority of asymptomatic patients (85%) act as carriers of the disease and infect people who are more susceptible to the disease, and disseminate the infection and transmission chain all over the society (1,2, 13-15). Therefore, in order to screen, detect, care and examine people in contact with Covid-19 patients with the goal of their isolation and implementation of environmental measures on one hand and relying upon the research proposal of Zanjan University of Medical Sciences and subsequent approval of the Ministry of Health and Medical Education, the laboratory outpatient screening project was implemented in patients referred to 16-hour and 24-hour outpatient centers. The analysis of the results of this study project in Zanjan province is as follows:

The total number of clients and those referred to the comprehensive selected health care centers by May 16, 2020, was 31,937, of whom 48% were men and 52% were women. The highest percentage of patients identified in the tested cases prior to the date of writing this article incorporates to Zanjan and Khodabandeh cities. However, 20% of the tested samples comprised

positive cases of Covid-19 in the province. Based on the results of our study, the incidence is seen in all age groups. Due to the population of different age groups and the process of adaptation with specific population, the highest specific age incidence of covid-19 in outpatient centers of the province related to the age group over 70 years. A significant point in the specific incidence of age-related outpatient cases compared to hospitalized cases is the substantial distribution of all age groups, so that in a comparison of inpatient with outpatient cases, the proportion of age groups under 60 years old was considerably low.

On the other hand, we came to the conclusion that isolation at home alone does not provide favorable conditions and is not considered fairly valuable. According to our investigation, 36.8% of those with positive Covid-19 test who were in a home-based quarantine, indicated that they did not receive effective isolation care at home.

The Covid-19 detection process is increasing in outpatient cases since the implementation of screening project was implemented. This increase is interesting compared to the decrease in hospitalized cases. The reason for this proportion may lie in the fact that before the implementation of the Covid-19 Screening Project, a large number of cases of Covid-19 (85%) lacked clinical signs or had mild clinical symptoms and easily disseminated the disease in the community. i.e., they were not tested and no identification or isolation was carried out. Therefore, following the implementation of the screening project and the referral of suspicious outpatient cases and those around them to 16-hour centers and their identification, treatment, care, isolation and control, the number of visits to the province's hospitals decreased. In other words, of 1,833 positive cases identified so far, merely 65 have been hospitalized.

The incidence of covid-19 among outpatient cases in Khorramdareh and Soltanieh cities was higher than other cities of the province. Interestingly, the disease is less common in some cities, where positive cases of covid-19 have been identified which may be due to the lack of proper facilities in the mentioned cities, which has led to more severe cases being referred to more specialized hospitals. This notion means that throughout screening and detecting the outpatient cases, extreme care is required in detecting more patients. This issue includes a significant number of patients and has played an effective role in the rotation of the virus in the mentioned cities. However, by treating outpatients, we reduced hospitalizations. The number of people who discharged from outpatient hospitals also decreased, and we did not have even a single case of death. It is hoped that in the future the disease will be controlled in these cities, with timely identification and home isolation or referral to a recovery center. The distribution map of outpatient and inpatient cases in Zanjan city has also been examined. The noteworthy point is the high incidence of Covid-19 in areas with

higher social and economic status, which is probably due to the unwillingness of people to refer to such public centers. The higher the income level, the more hospitalized cases, which displays that the private sector is not able to take optimal measures to prevent and diagnose the disease on its own. In areas with lower incomes, the rate of outpatient disease is vast, while the rate of hospitalization is less, indicating the ability of comprehensive health care centers to diagnose and take health measurements.

Outpatient laboratory screening measures have significantly reduced the number of hospitalizations in the province. In a way that, for example, in Abhar, Khodabandeh, and Zanjan cities out of 269, 206 and 973 positive cases, 83,49 and 123 cases were hospitalized, respectively. 46% of patients diagnosed in outpatient centers had clinical symptoms and 54% had no clinical symptoms.

87.5% of the cases identified in the outpatient centers of the province were isolated at home and 12.4% of the patients were monitored in the recovery centers of the province. Considering that it is difficult to monitor patients isolated in homes due to the lack of legal procedures, setting up recovery centers and consequently isolation of patients in these centers can be an effective way to cut the Covid-19 transmission chain.

Out of the followed-up and contact tracing patients, 3936 cases with close contact were identified during this time span with an average of 2.1 contacts per person. Subsequent to contact tracing, 2,547 cases took laboratory tests, of whom 2,398 have received laboratory results so far and 149 are waiting to be reported. Taking into account the lab reports, 39.5% of the contact tracing samples have been identified positive.

Conclusion

The level of R0 in the province had reached to 1.4, which significantly dropped below 1 after the implementation of the covid-19 Outpatient Laboratory Screening Project. This result suggests that the best way to control the disease is to find and control the positive cases. 90.8% of the identified patients have been well isolated so far. On the one hand, the best way to control the disease is to find positive cases and control them. On the other hand, home-based isolation did not prove to be effective. This finding recommends that patients ought to be isolated and closely monitored in recovery homes and outdoor centers.

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Conflict of Interest

None.

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None.

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