The Effect of COVID-19 on Referral Time and Cost of Outpatient'S Services Amongst Insured of Iran Health Insurance, Fars, 2020

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Abstract

Background

This study aimed to investigate the effect of COVID-19 epidemic on the rate of referral and costs of outpatient services covered by Iran Health Insurance, Fars, Iran.

Methods

In this cross-sectional study, we used data registry system of Iran health insurance to compare cost of outpatient services and referral time after occurring COVID-19 epidemic with the same time before it. Extracted items included; outpatients' and complementary services. Statistical analyses were performed with Graph Pad Prism software version 8.0, Wilcoxon and Mann-Whitney test.

Results

Costs paid for all outpatient and imaging services significantly decreased in 2020 compared to 2019. Also, the number of prescriptions in all outpatient services has significantly decreased, while the number of imaging diagnostic tests significantly increased.

Conclusion

Further studies are recommended to evaluate whether the reduction in cost of services and referral times are due to underutilization of services or not.

Background

On December 30, 2019, the World Health Organization received a report of an epidemic of pneumonia-like disease in Wuhan, China [1]. The first case of COVID-19 was reported on February 2020 in Iran [2]. The World Health Organization declared a pandemic of the outbreak of Corona virus on March 11, 2020 [3]. The sudden global outbreak of COVID-19 has made people worried and has threatened their lives because of its possible effects [4]. According to a WHO survey, regular healthcare of non-communicable disease has been severely disrupted since the COVID-19 disease began [5], forcing physicians to prioritize their clinical activities [6]. In UK, the COVID-19 epidemic has led to the prioritization of resources of the National Health Service (NHS) to cope with the rising tide of infected patients [7], affects the economy in many aspects, especially the insurance industry. In this regard, the Insurance Information Institute in its report entitled "Global Macro Outlook" that the corona virus affects global growth and this impact is more profound, particularly on the insurance industry, given its role in managing risk and compensating for the damage caused by such crises [8]. Due to the increase in hospitalizations and the lack of services, equipment and medicine, the most direct impact of the corona virus on health insurers will be. Of course,

this effect also depends on each country's health care system and the ratio of private sector insurers to the public sector. In some countries, such as the United States, most health care services are privately provided (except those covered by Medicare and Medicaid), while in other countries, such as Europe and Canada, more public and government services are provided. In Asia, health systems are often immature, and there is more private coverage [9].

COVID-19 pandemic has created an economic crisis for countries. The cost of hospitals has increased significantly since March due to the high number of patients. Prior to the outbreak of the disease, hospital payments for these facilities and services were calculated globally (6% of the cost of hostelling) and paid to patients; But in the case of COVID-19 disease, the cost is much more than 6% of hostelling. According to the estimates made, the average cost per bed per day for COVID-19 patients is about 2-5 million IRR. On the other hand, the cost of beds per day in 2019 for normal beds in a three-bed rooms is 1,826,000 IRR and for intensive care beds is 8,473,000 IRR in a first-class governmental hospital; This means that the minimum estimate for personal protective equipment per bed of the day is more than 100% and about one-twenty of the day's beds, respectively [10, 12].

Due to the prevalence of COVID-19, the costs of providing health care (outpatients and inpatients), have increased significantly. There are two main reasons for the increase in the cost of services: firstly, referrals to providers have decreased, so all the capacity available in hospitals and service centers has not been used, and as a result, the average fixed cost per service has increased. The second reason for the increase in the cost is compliance with the guidelines for providing services in the post-COVID-19 period. Providers need to provide protective equipment and facilities for their staff as well as patients in order to provide services, so their costs increase. Providers may tend to increase the number of services to offset these costs, and create induced demand [10, 13]. Since March, following the COVID-19 outbreak, people's visits to hospitals and health care centers have decreased. A significant part of this decrease in referrals in March and April was due to the quarantine and closure of service provider centers. However, after the reopening the centers, people's demand for non-emergency health services is expected to decrease compared to the previous year for two reasons: the first is people's fear of contracting COVID-19 and the second is the decline in people's financial and purchasing power. Of course, we should also mention that some patients who need regular periodic care (hypertension, diabetes, etc.). In case of lack of timely referral due to fear of developing the disease, they will be referred in the coming months with more unfavorable physical conditions and consequently higher treatment costs [10, 12].

In the case of COVID-19 outbreak, the cost and expenditures of the health insurance organization are affected and, in some cost, groups can see an increase in the amounts and in other cases a decrease in expenditures. Based on the analysis of the organization's statistics, 593 hospitals sent electronic invoices from 617 state university hospitals (statistics sent by the provinces) in February; 577 hospitals have sent their bills in March. In hospitals that have closed their bills, the number of hospitalizations has decreased by 37% and the cost of hospital requests has decreased by 30% [12, 15]. The study of COVID-19 patients' records shows that more than 75% of the insured had a complete and relative recovery after discharge from the hospital and 3382 people (13.8%) of the insured died of the hospital [10, 15]. Considering the

impact that this epidemic can have on health economics, this study was conducted to investigate the effect of COVID-19 epidemic on the rate of referral and the cost of drug and para-clinical of outpatients covered by Iran Health Insurance in Fars province in 2020.

Methods

Study design and population

In this cross-sectional study, we used the census method to compare the cost of outpatient prescriptions and diagnostic test before and after occurring COVID-19 based on registry system (SAPA) of Fars branch of Iran Health Insurance. For this purpose, all registered data since 20th March to 20th December 2020 (the first 9 months of 1399 based on Persian calendar) with critical conditions of corona virus epidemic compared with normal conditions at the same time in 2019 (prior to COVID-19 epidemic condition). According to the statistics from the last census of 2019, the insured population by Iran health insurance organization in Fars province is 2,620,311 people (about 52% of the total population of Fars), which is 63% Rural & Nomads Insurance, 17% Universal Health Insurance, 13% Civil Servant Insurance, 5% The Other Social Strata Insurance and 1% Iranian Medical Insurance [14].

Data collection

Iran health insurance has several funds including; 1) *Civil Servant Insurance*, 2) *Iranian Medical Insurance*, 3) *Universal Health Insurance*, 4) *Rural & Nomads Insurance*, 5) *The Other Social Strata Insurance* such as students, foreign immigrants, Martyrs and Veterans, Judicial trainees, and other social groups based on the referral system. The data of all these funds are registered in SAPA system which is software for medical record for Iran health insurance. Therefore, to compare the cost and referral times of outpatients' services before and after COVID-19 disease, SAPA system of Fars branch of Iran Health Insurance has been used. Items extracted from SAPA system were the cost of outpatients services including; 1) outpatients' visit by general physician or specialist and subspecialists, 2) prescribed medicines, 3) laboratory tests, 4) imaging services (MRI, CT-scan, Sonography, radiotherapy, chest X-ray, nuclear medicine) and 5) other special diagnostic services and complementary services to diagnostic procedures.

Statistical Methods

To describe the number of prescriptions, total number of prescriptions, and to describe the costs paid, the total costs paid in each subgroup (outpatient services and imaging services) were reported. To determine the difference between the numbers of prescriptions as well as costs paid based on outpatient services and imaging services after the COVID-19 epidemic than before it. Given that the data was paired and abnormal, Wilcoxon test has been used. Also, to determine the difference between the number of prescriptions as well as costs paid after COVID-19 than before it based on the type of insurance in outpatient services and imaging services, given that the data was abnormal, Mann-Whitney test was

used. Statistical analyzes were performed with Graph Pad Prism software version 8.0, P-value <0.05 were considered as the level of statistical significance.

Results

According to the available data from this research, the number of prescriptions in all outpatient services in the 9 months after occurring COVID-19 has significantly decreased compared to the same time before this event. Also, the number of prescriptions of MRI imaging services such as, CT-scan, sonography, radiotherapy, chest radiology, non-chest radiology, nuclear medicine, special diagnostic services and complementary services to diagnostic procedures significantly decreased after occurring the pandemic in compare with before it. There has been a significant increase in the number of prescriptions in CT scan and special services, especially MRI, ultrasound, thoracic radiology, non-thoracic radiology, nuclear medicine, and Services complementary to diagnostic measures have reduced the number of prescriptions in 2020 compared to 2019, which was statistically significant (Table 1).

Table 1
comparison of Number of prescriptions) Total services and imaging services(in 2019 and 2020

	Number of perception (2019)	Number of perception (2020)	diff	Growth rate	p- value
Total Outpatient Services					
• Test	686375	449838	-236537	-34%	0.003*
• Drug	3222836	2127255	-1095581	-34%	0.003*
• Imaging services	433086	267701	-165385	-38%	0.003*
• physician Visit	2088638	1123812	-964826	-46%	0.003*
• physician Service	343934	183,415	-160519	-47%	0.003*
Imaging Services					
• MRI	42009	29608	-12401	-30%	0.003*
• CT-scan	38845	47678	8833	23%	0.074
• Sonography	125526	70366	-55160	-44%	0.003*
• Chest X-ray	57883	37871	-20012	-35%	0.003*
• Non- Chest X-ray	243723	125090	-118633	-49%	0.003*
• Radiation therapy	89217	86286	-2931	-3%	0.910
• Nuclear Medicine	22436	12,35	-9828	-44%	0.003*
• Special Diagnostic Services	708	867	159	22%	0.191
• Complementary services on diagnosis	451	228	-223	-49%	0.007*

Costs paid for all outpatient services decreased in 2020 compared to 2019, which included statistically significant costs paid for pharmaceutical services, physician visits and physician services. Also, the costs paid in 2020 compared to 2019 in imaging services except CT scan, radiotherapy and special diagnostic services have decreased in MRI services, sonography, chest radiology, non-chest radiology, nuclear medicine. And services complementary to diagnostic measures the reduction of costs paid in 2020 compared to 2019 has been statistically significant, but in CT scan services and special diagnostic services, a significant increase in costs paid in 2020 compared to 2019 was observed. (Table 2)

Table 2
Comparison of costs paid) Total service and imaging services (in 2019 and 2020

	costs paid (Rial)2019	costs paid (Rial) 2020	Growth rate	p- value
Total Outpatient Services				
• Test	221,361,560,206	217,950,749,516	-2%	0.734
• Drug	1,648,670,371,518	1,545,976,543,325	-6%	0.003*
• Imaging services	237,125,580,702	209,837,612,815	-12%	0.128
• physician Visit	282,777,262,821	179,861,732,310	-36%	0.003*
• physician Service	119,342,893,678	73,574,828,543	-38%	0.003*
Imaging Services				
• MRI	31,563,632,403	26,212,033,248	-17%	0.027*
• CT-scan	22,366,188,410	34,285,550,657	53%	0.011*
• Sonography	45,090,089,540	30,085,940,949	-33%	0.003*
• Chest X-ray	11,970,231,737	7,192,167,282	-40%	0.003*
• Non-Chest X-ray	34,974,302,131	21,073,945,045	-40%	0.003*
• Radiation therapy	62,304,757,158	72,462,546,966	16%	0.250
• Nuclear Medicine	35,292,363,244	20,733,390,885	-41%	0.003*
• Special Diagnostic Services	326,533,844	459,281,752	41%	0.011*
• Complementary services on diagnosis	612,543,008	326,711,980	-47%	0.007*

Figure 1 shows the number of prescriptions prescribed in 9 months of 2019 and 2020 based on outpatient services, and in all graphs a significant difference in the number of prescriptions prescribed in 9 months of 2020 compare with 2019 (from 20 March to 20 December) is estimated. Figure 2 also shows the number of prescriptions prescribed Within the desired period of time based on imaging services. According to the information available in the field of prescriptions in outpatient services based on the type of insurance, in all insurances, a decrease in the number of prescriptions was observed in 2020 compared to 2019, but this difference in none of the insurances are not statistically significant and can be examined (Table 3). Also, prescriptions in imaging services based on the type of insurance have decreased in all insurances in 2020 compared to 2019, but this difference is statistically significant in none of the insurance companies except Rural & Nomads insurance. There has been no attention (Table 3).

Table 3

Number of prescriptions prescribed (total outpatient services and imaging services) in 2019 and 2020 based on insurance type

Type of Insurance	Number of prescriptions 2019	Number of prescriptions 2020	Growth percentage	p-value
Total Outpatient Services				
• Iranian Medical Insurance	254,704	170,349	-33.11	0.062
• Universal Health Insurance	1,581,334	729,661	-53.85	0.062
• Rural & Nomads	1,694,824	996,252	-41.21	0.062
• The Other Social Strata	966,814	749,711	-22.46	0.062
• Civil Servant	2,277,193	1,506,725	-33.83	0.125
Imaging Services				
• Iranian Medical Insurance	28,850	23,244	-19.43	0.425
• Universal Health Insurance	107,945	60,468	-43.98	0.054
• Rural & Nomads	190,545	123,059	-35.41	0.011
• The Other Social Strata	68,568	54,041	-21.19	0.128
• Civil Servant	224,890	150,210	-33.21	0.128

In terms of payments in *outpatient services*, which is determined based on the type of insurance, in all insurances a decrease in costs paid has been observed in 2020 compared to 2019, but there is no statistically significant difference in any of the insurances. Also, in *imaging services* based on the type of insurance, in Universal Health Insurance, Rural & Nomads insurance, The Other Social Strata, and Civil Servant, a decrease in costs paid has been observed and calculated in 2020 compared to 2019, and in Iranian Medical Insurance the increase in costs paid in 2020 compared to 2019 has also been examined. But this difference is not statistically significant in any of the insurances (Table 4).

Table 4

Costs paid (total outpatient services and imaging services) in 2019 and 2020 based on insurance type

Type of Insurance	Costs paid 2019	Costs paid 2020	Growth percentage	p-value
Total Outpatient Services				
• Iranian Medical Insurance	262,727,361,631	258,052,319,658	-1.77	0.312
• Universal Health Insurance	381,692,472,111	279,875,912,753	-26.67	0.062
• Rural & Nomads	750,740,560,859	636,715,737,380	-15.18	0.125
• The Other Social Strata	310,830,514,700	306,098,379,461	-1.55	0.999
• Civil Servant	808,018,894,863	742,003,106,365	-8.17	0.062
Imaging Services				
• Iranian Medical Insurance	14,103,025,007	15,951,499,348	13.11	0.734
• Universal Health Insurance	35,919,195,549	28,059,311,529	-21.88	0.250
• Rural & Nomads	84,114,680,522	69,385,166,380	-17.51	0.743
• The Other Social Strata	24,758,117,775	24,465,384,715	-1.18	0.734
• Civil Servant	85,605,622,622	75,195,018,174	-12.16	0.300

Discussion

In a short period of time, the pandemic COVID-19 has had a significant economic impact on healthcare institutions. Many diagnostic and therapeutic measures were met with a rapid reduction in the volume of cases [16, 17]. Outpatient services are expected to have the largest reduction among a variety of diagnostic and therapeutic procedures [18, 19]. In the present study, the effect of COVID-19 on the rate of referral burden and the cost of drug and paraclinical of outpatients covered by Iranian health insurance in Fars province was investigated. According to the available information, the number of prescriptions prescribed in outpatient services (tests, drugs, imaging, physician visits and physician service) in 9 months of 2020 compare with 2019 (from 20 March to 20 December) in all outpatient services was significantly decreased in the number of prescriptions prescribed in 2020 Compared to 2019. The highest and lowest observed decreases were related to physician visit (49%) and physician Service (47%) and laboratory tests and pharmacy prescriptions (34%). Also, the number of prescriptions prescribed in 2020 compared to 2019 in imaging services showed a significant decrease. However, in order to provide some services such as CT scan (23%) and special diagnostic services (22%), the increase in the number of prescriptions was observed, according to the results, the highest reduction was observed related to complementary services on diagnostic and non-Chest X-ray measures (49%) and the lowest reduction was observed in radiation therapy (3%).

In line with the results of this study, the results of Ramezani et al. showed that in the first six months of 2020 (the period of coronavirus) compared to the same period of the previous year, the number of outpatient visits to physicians decreased by 50%, with the highest reduction in outpatient visits to emergency physicians and clinics (61%) and the lowest reduction was related to private offices (28%). The number of outpatient visits to pharmacies, laboratories and imaging in the first six months of 2020 (coronavirus period) decreased by 31%, 41% and 42%, respectively, compared to the same period of the previous year [20], respectively. Hashemi et al. [21] also showed that during the COVID-19 period, 50% of patients' admission to the hospital decreased. Also, during this period, selective and unnecessary diagnostic methods were significantly reduced. In the outpatient section and based on the information obtained from drug and service verification systems, despite the impact of COVID-19 outbreak on the rate of referrals in physicians' offices, the cost of drug prescriptions has not changed much [12]. In the Hong et al. study conducted in China, visits to health centers and the volume of inpatients decreased by 23.9% and 21.6% from January to June 2020, respectively. The rate of reduction in outpatient visits in Parikh and colleagues' study was 68%, as well as the reduction of mammography and nuclear medicine scan had the greatest effect, respectively, 93% and 61% decrease [23]. A study conducted in New York State showed a 28% overall decrease in imaging [17]. In both Parikh and colleagues [23] and Naidich et al. [18], mammography and nuclear medicine tests showed the highest reduction and simple radiology and CT in hospitalized patients showed the lowest reduction. Recent studies from different regions of the United States have shown a decrease in imaging volume from 30 to 90 percent [16, 24, 25]. Madhuripan et al. [26] showed a relatively small decrease in radiology imaging rates during 9 weeks. The results of some other studies have shown that the pandemic COVID-19 has reduced the use of several clinical interventions in countries [27–29].

The results of a study in England showed that in the first month of closure, a 53% reduction in admissions with chest pain or shortness of breath was achieved in the cardiovascular and coronary care unit (CCU) [7]. Another study in the United States found that in the four weeks since the onset of COVID-19 epidemic, emergency department visits were much lower than in the same four-week period a year ago. In addition to diagnosis associated with lower respiratory disease, pneumonia and difficulty breathing, the number and ratio of visits (initial pandemic period compared to comparison period) for cardiac arrest and ventricular fibrillation increased [5].

This decrease in referrals can also be attributed to various reasons, including: Lack of access to services due to closure and limited admission of centers and service providers, avoid of the referral due to fear and anxiety about the possibility of contracting COVID-19 disease, regardless of unnecessary referrals. Also, in another study in England, the reason of this reduction including: restructuring and prioritization of NHS services, reduced access to primary care, and reduced willingness of patients to seek medical help for fear of exposure to the virus [7]. Another study in Austria at the time of the outbreak showed that low hospitalization rates of patients with acute coronary syndrome (ACS) in hospital could be associated with a significant increase in infarction complications and mortality [30]. Other studies have cited similar reasons [22, 26, 31–39].

According to the data in the present study on the costs paid in outpatient services in 9 months of 2020 compared with 2019 (from 20 March to 20 December), there was a significant decrease costs paid in 2020 compared to 2019, the highest observed reduction was related to physician Visit (36%) and physician's Service (38%) and the lowest decrease related to laboratory tests (2%) and pharmacy (6%). Also, the costs paid in 2020 compared to 2019 in imaging services except CT scan, radiotherapy and special diagnostic services showed a significant decrease. The highest and lowest decreases were respectively observed in nuclear medicine (41%) and MRI (17%). However, in CT scan services (53%) and special diagnostic services (41%), there was a significant increase in costs paid in 2020 compared to 2019. The results showed that among direct medical expenses, drug services (30%), laboratory (16%) and hospitalization (11%) had the highest expenditures in Ilam University of Medical Sciences [40]. In the study of Hashemi et al. [21], the cost of treatment decreased significantly during the prevalence of coronavirus.

In Iran, with the prevalence of Coronavirus, the chief executive officer (CEO) of the Health Insurance Organization announced that the costs of hospitalized Corona's patients will be covered by the Health Insurance Organization. Health insurance with an independent nature provides the necessary financial resources through the public participation of healthy people and provides the need for these people at the time of illness [41]. In the case of COVID-19 prevalence, the cost and expenditures of the Health Insurance Organization are affected and in some cost groups, the amounts increase and in other cases, the reduction of expenditures can be seen. Based on the analysis of the organization's statistics from the data of the inpatient documents processor system and the drug and service verification system, out of 617 university public hospitals (statistics sent by the provinces) in February 593 hospitals sent electronic bills, of which 577 hospitals sent their bills in March. In hospitals that have closed their bills, the burden of hospitalization visits has decreased by 37% and the cost of hospital requests has decreased by 30%. The study of total medical radiation services including MRI, ultrasound, nuclear medicine and other CT scan services in February and March 2019 shows that the referrals and costs of each medical radiation service alone have decreased and overall, the burden of referral and imaging costs has decreased by about 69% [12]. In the Parikh et al. study [23] the volume of system-level imaging decreased by between 55%, which resulted in a loss of 50% net income for the health system in the U.S. country.

As the results of this study showed that the occurrence of a pandemic such as COVID-19 has different effects on the provision of health-related services. In the case of corona disease, due to the nature of the disease, many medical services and referrals decreased during the pandemic period and some medical services had increased. According to the results of this study and similar studies conducted so far [9, 20], It can be said that the occurrence of COVID-19 can have different effects and results on health insurances in the country. One of these results can be a change in the cost of treatment due to the change in the rate of people's use of different medical services, and these changes in the use of medical services were also observed in the results of this study. Other outcomes and effects of COVID-19 include the demand for new medical services (e.g. providing telemedical services due to the nature of the coronavirus). On the other hand, by continuing the trend of this pandemic and not controlling the spread of the disease, it may force insurers to change the rates of health insurance in the coming years. Also, considering that many

health insurances and treatments do not cover epidemics and pandemics, insurers should notice the necessity of certain health insurances such as these [9].

Considering the reduction of medical referrals during the occurrence of COVID-19, The reasons for these reductions are multifactorial and include the restructuring and prioritization of NHS services, reduced access to primary care, and patients' reluctance to seek medical help due to fear of contracting the virus. At the height of the pandemic, it is acceptable to deviate from the standard level of care and agreed guidelines in order to priorities the delivery of essential services [20]. By tariffing the services and care provided at home, we can help to expand the provision of telemedical over and increase the quality of these services [12].

One limitation of the present study is that, even if the usual data were extracted and reported using standard methods, the possibility of data collection errors and delays in reporting cannot be ruled out. Second, we can point out the heterogeneity in the data collected in different centers of the province, which may not have been the same as collecting data from insurance companies and health centers.

Conclusion

Following the COVID-19 pandemic in Iran, the rate of treatment in both clinic and paraclinical wards had decreased significantly. However, some imaging services such as CT scan and special diagnostic services had increased significantly. Further studies are recommended to evaluate whether the reduction in cost of services and referral times are due to underutilization of services or not.

Declarations

Ethics approval and consent to participate

This study has been approved by the Deputy for Research of Shiraz University of Medical Sciences with ethical number: IR.SUMS.REC.1400.296. In this study, all methods were performed in accordance with the Declaration of Helsinki. And because it was based on unnamed data, so there was no need to get informed consent.

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are openly available in the information system website of the Iran Health Insurance Organization available from: <https://www.fr.ihio.gov.ir>

Competing Interests

All authors declare that they have no competing interest.

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Authors' Contribution

MN, HJ and ZF developed the main design of manuscript. All co-authors had contribution and participation in the revision of the manuscript and approved the final manuscript.

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Figures

Figure 1

Comparison of Number of prescriptions) Total services (in 2019 and 2020 A: Tests; B: Drugs; C: Imaging services; D: physician Visit; E: physician Service

Figure 2

comparison of Number of prescriptions) imaging services (in 2019 and 2020