ISSN: 2833-4353

Research Article

Archives of Epidemiology & Public Health Research

The Relationship between Covid-19 Fatality and Satisfaction from Quality Health Care in Oecd Countries

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Submitted: 2023 Apr 24; **Accepted**: 2023 May 17; **Published**: 2023 May 30

Citation: Rıdvan, O. T., Akın, D. (2023). The Relationship between Covid-19 Fatality and Satisfaction from Quality Health Care in Oecd Countries. *Arch Epidemiol Pub Health Res, 2*(2), 210-215.

Abstract

Background/aim: *The relationship between COVID-19 fatality and quality health care in OECD countries was aimed to be examined, considering the effectiveness of primary health care, the effectiveness of secondary health care.*

Materials and methods: *Data from OECD countries were collected from open-access websites. Dependent variable is COVID-19 fatality, independent variables are effectiveness of primary health care, the effectiveness of secondary health care, gross domestic product, median age, number of hospital beds, number of intensive care unit beds, number of doctors and nurses, number of computed tomography scanners, educational status and air pollution. Spearman Rho correlation and partial correlation were used in the analysis of the data, and generalized linear regression analysis was performed.*

Results: *A statistically significant relationship was found between case fatality rates and the effectiveness of secondary health care ($p<0,05$). The relationships between case fatality rates and other health, demographic indicators are not statistically significant. In Generalized Linear Model (GLM-Logit Model) analysis results, only the effectiveness of secondary health care ($p< 0,01$) and the number of hospital beds ($p<0,05$) were found to be statistically significant.*

Conclusion: *Satisfaction with quality health care is not associated with COVID-19 fatality. As the effectiveness of secondary health care increases, the fatality of COVID-19 decreases. The effectiveness of primary health care has no effect on COVID-19 fatality.*

Keywords: Health Care Quality, Health Care Delivery, Socioeconomic Factors, SARS- CoV-2, Mortality

1. Introduction

COVID-19, a viral respiratory disease caused by the novel coronavirus, called SARS-CoV-2, started as a pandemic with cases first seen in Wuhan, People's Republic of China. The COVID-19 pandemic has caused many new cases and deaths. Therefore, the importance of quality health care has increased.

Quality of health is the most frequently emphasized health policy principle. In this context, a health system strengthening strategy has been put forward by WHO under the name of the "building blocks" framework. Building blocks; service delivery, health workforce, information, medical products-vaccines-medical technologies, finance, leadership/management. Intermediate strategies have been determined to improve health and achieve the ultimate goals of the health system. Quality, security, accessibility, inclusivity. The ultimate goals of the health system; are health improvement (level and equity), responsiveness, financial protection/financial justice, and increased efficiency [1]. National Institutes of Health (the USA) has defined quality as the satisfaction of individuals and populations with health outcomes and consistency with current medical knowledge [2].

The six dimensions of quality health care are listed as safe, timely, effective, efficient, patient-centered, and fair service. Preventable hospital admissions due to chronic diseases such as asthma and COPD are the determinants of the quality of primary health care, and death due to acute myocardial infarction 30 days after hospital admission can be given as an example of the determinant of the quality of emergency health services [1].

Investigating the satisfaction of patients with health care is an important indicator of health quality [3]. Patient satisfaction studies,

which are used as an indicator of the health services offered, are carried out through satisfaction surveys developed for this purpose. The EUROPEP scale (European Patients Evaluate General/Family Practice), which has international standards, is an example [4].

OECD states that between 2000 and 2010, health expenditures of approximately 34 countries increased by more than 70%. However, high costs are not always associated with high-quality care. In this context, there is the report "Crossing Quality Chasm" published by the National Institutes of Health (the USA) in 2001 [5]. Maternal mortality rates in China fell staggeringly in every region from 2004 to 2016. Adequate investment in health system reform, which includes increasing the number of hospital beds, has been the driving force behind such progress. Increasing hospital bed numbers have contributed to the steady reduction of inequalities in the distribution of hospital bed numbers. At the same time, the increase and equality in the distribution of resources lead to improvements in the health system [6].

The relationship between health workers and COVID-19 fatality was evaluated, it was found that the number of doctors and healthcare professionals per capita decreased, and the COVID-19 mortality increased [7].

2. Materials and methods

The research was designed in a retrospective descriptive type. In the study, total COVID-19 mortality in OECD countries between January 2020 and December 2020, case numbers were obtained. Fatality is calculated with fatality = (total mortality/number of cases) x100 formula. Data were obtained from European Center for Disease Prevention and Control website [8].

2.1. Independent variables

• Population satisfied with the availability of quality health care in the area where they live (2020 or nearest year % of),
• Effectiveness of primary health care (2019 or nearest year, avoidable COPD hospital admissions age-sex standardized per 100 people) Number of avoidable hospital admissions for COPD increases, the effectiveness of primary health care decreases,
• Effectiveness of secondary health care (2019 or nearest year, per 100.000 hospital admission due to acute myocardial infarction, subsequent deaths following acute myocardial infarction within 30 days) As the number of deaths increases, the effectiveness of secondary health care decreases,
• Number of hospital beds (2019 or nearest year, per 1000 population),
• Number of adult intensive care unit beds (2019 or nearest year, per 100,000 population),
• Number of doctors (2019 or nearest year, per 1000 population),
• Number of nurses (2019 or nearest year, per 1000 population),
• Number of computed tomography scanners (2019 or nearest year, per 1.000.000 population),
• Ambient air pollution (2019 or nearest year, deaths per 100.000 population)
was obtained from OECD Health Glance 2021 statistics.
• Educational status (2019 or nearest year, university graduates % of) was obtained from OECD Education at Glance.
• Median age (the year 2020) statistics from the World meter website collected.
• Gross domestic product (income per capita in 2020, dollars) basis) were collected via the World Bank website.
27 of 37 OECD countries, whose data can be obtained on all variables for the specified years, were included in the study.

2.2. Statistical analyses

Mean, standard deviation values and extreme value analyses were performed to define the research data. Since the distribution of the data was below 30 units, nonparametric tests were applied and Spearman's rho correlation and partial correlation were made in the relational screening analysis. There may be deviations from the linear hierarchical regression results, the Generalized Linear Model was used. All analyses were 95% confidence interval and 0,05 significance level, SPSS 25.0 for Windows program.

3. Results

Case fatality rates were reported to be the lowest in New Zealand at 0,003 and the highest in Mexico at 2.27, with a mean value of 0.30±0.43 across all countries. The value of satisfaction with quality health care ranged from 26.38 to 92.54 and had a mean value of 74.35±15.67. Poland was the country where satisfaction with quality health care was reported the lowest with 26.38%, while the highest rate was reported for Norway with 92.54%. Mean values of health indicators for all countries are as shown in Table 1. Mean values of demographic indicators for all countries are as shown in Table 2.

N=27	Mean (SD)
Case fatality rates (%)	0,30±0,43
Satisfaction with quality health care (%)	74,35±15,67
Effectiveness of primary health care (per 100 population)	187,48±82,07
Effectiveness of secondary health care (per 100.000 population)	6,46±4,57
Number of hospital beds (per 1000 population)	3,98±1,74
Number of intensive care unit beds (per 100,000 population)	15,66±11,51
Number of doctors (per 1000 population)	3,65±0,87

Number of nurses (per 1000 population)	9,73±3,94
Number of computed tomography scanners (per 1.000.000 population)	23,83±13,54

Table 1: Distribution of basic research parameters and descriptive values

N=27	Mean (SD)
GDP (per capita, dollar)	45.001,93±24.768,51
Age (year)	40,70±4,50
Educational status (%)	40,19±10,48
Air pollution (per 100.00 population)	24,26±17,04

Table 2: Mean values of demographic indicators for all countries

The results of the Spearman correlation analysis, in which the relationship between variables was evaluated, are as shown in Table 3. There was a statistically significant and positive correlation between case fatality rates and the effectiveness of secondary care ($r=0.438$; $p<0.05$). The relationships between other health and demographic indicators, satisfaction with quality health care and case fatality rates were not statistically significant ($p>0.05$) (Table 3).

According to the results of the GLM analysis, the effects of only effectiveness of secondary care ($B=0.079$; $p<0.01$) and the number of hospital beds ($B=-0.077$; $p<0.05$) on case fatality rates were statistically significant. In the model, linear regression analysis was performed with all research parameters except satisfaction with quality health care and effectiveness of primary health care (Table 4).

Correlation coefficient (R)	Case fatality	Satisfaction with quality health care	Effect. of primary health care	Effect. of second. health care	Numb. of hospital beds	Numb. of intensive care unit beds	Numb. of doctors	Numb. of nurses	Numb. of CT scanners	Gpd	Median Age	Edu. status
Satisfaction with quality health care	-0,165	--	--	--	--	--	--	--	--	--	--	--
Effect. of primary health care	-0,275	0,399*	--	--	--	--	--	--	--	--	--	--
Effect. of secondary health care	0,438*	-0,366	-0,413*	--	--	--	--	--	--	--	--	--
Numb. of hospital beds	-0,131	0,108	-0,105	0,306	--	--	--	--	--	--	--	--
Numb. of intensive care unit beds	0,153	0,010	0,195	0,284	0,527**	--	--	--	--	--	--	--
Numb. of doctors	-0,210	0,285	-0,030	0,009	0,389*	0,003	--	--	--	--	--	--
Numb. of nurses	-0,123	0,720**	0,325	-0,236	0,229	-0,180	0,257	--	--	--	--	--

Numb. of CT scanners	-0,020	0,770**	0,239	-0,247	0,314	0,134	0,530*	0,483*	--	--	--	--
Gpd	-0,180	-0,205	0,387	-0,431*	-0,082	-0,247	0,196	0,818**	0,412*	--	--	--
Median Age	0,089	0,041	-0,341	0,296	0,536*	0,201	0,617*	0,059	0,305	-0,152	--	--
Education status	-0,055	0,361	0,374	-0,252	-0,266	-0,225	-0,166	0,476*	-0,013	0,646*	-0,421*	--
Air pollution	0,192	-0,342	-0,101	0,276	-0,359	0,474*	-0,097	-0,553**	-0,146	-0,601*	0,272	-0,672*

*p<0,05 **p<0,01

Table 3: Spearman correlation analysis results in which the relationship between variables was evaluated.

Parameters	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Minimum	Maximum	Wald X^2	df	P
(Intercept)	-,007	,5500	-1,085	1,071	,000	1	,990
Effect. of second. health care	,079	,0098	,060	,098	65,769	1	,000
Numb. of hospital beds	-,077	,0381	-,151	-,002	4,043	1	,044
Numb. of intensive care unit beds	-,002	,0040	-,010	,006	,218	1	,641
Numb. of doctors	-,051	,0587	-,166	,065	,740	1	,390
Numb. of nurses	,017	,0181	-,019	,052	,866	1	,352
Numb. of CT scanners	,003	,0030	-,003	,009	1,202	1	,273
Gpd	-1,273E-6	2,3435E-6	-5,867E-6	3,320E-6	,295	1	,587
Median Age	,003	,0110	-,018	,025	,088	1	,767
Education status	-,002	,0055	-,013	,009	,161	1	,688
Air pollution	,004	,0040	-,004	,011	,782	1	,376
(Scale)	,031a	,0083	,018	,052			

Table 4: Generalized Linear Model (GLM-Logit Model) analysis results, the effects of research parameters on case fatality rates.

Dependent variable: Case fatality rates (per centum)
Model: (Intercept), Effectiveness of secondary health care (per 100,000 hospital admission due to acute myocardial infarction, subsequent deaths following acute myocardial infarction within 30 days), number of hospital beds (per 1000 population), number of adult intensive care beds (per 100,000 population), number of doctors (per 1000 population), number of nurses (per 1000 population), number of computed tomography scanners (per 1,000,000 population), ambient air pollution (deaths per 100,000 population), educational status (university graduates % of), median age (year 2020), gross domestic product (income per capita in 2020, dollars)
a. Maximum likelihood estimate

4. Discussion

In the study, there was no significant relationship between COVID-19 fatality and satisfaction with quality health care. However, the effectiveness of secondary health care decreases COVID-19 fatality.

4.1. The relationship between quality of health and COVID-19 fatality

In a study by Kontopanthelis et al. in the UK in 2015, it was emphasized that the traditional doctor's payment system did not lead to high quality care and quality improvement. The UK Quality and Outcomes Framework (QOF) which is associated with The National Primary Care Performance-Based System, is a quality indicator and premature death from all or specific causes associated with this framework was examined. No relationship was found between the quality of health care, measured by quality markers in the QOF, and mortality rates. It was emphasized that QOF is not an ideal investment in the use of health system resources, but that mortality rates should be investigated with an advanced method within the primary health care system, considering the quality of local secondary health care services. Quality indicators in the QOF; the structure of the healthcare organization consists of patient experience and more chronic disease management [9]. Like the study conducted in England, we found no relationship between

COVID-19 fatality and satisfaction with quality health care. Investigation of satisfaction with health care is a way to measure quality in health and satisfaction surveys are used for this purpose. Unlike the EUROPEP scale, in the satisfaction survey used in OECD health statistics, a method is used which assumes that each question has the same weight and calculates the satisfaction for each dimension as the average value obtained from the questions forming that dimension. The fact that there was no relationship between satisfaction with quality health care and COVID-19 fatality may have resulted from this difference in the measurement method. In addition, satisfaction with quality health care is negatively related to the effectiveness of primary health care. No statistically significant relationship was found between the effectiveness of secondary health care. It should also be considered that quality health care may be affected by the quality of secondary health services.

4.2. The relationship between socioeconomic factors and COVID-19 fatality

In a study conducted in the USA in 2022 by Backer et al., in which the factors affecting COVID-19 were examined; the relationship between poverty, lack of insurance variables with COVID-19 cases and deaths was evaluated, and mortality rates were found to be higher in poor regions [10]. In a study conducted by Hashim et al. in 93 countries in 2020, COVID-19 mortality in multivariate modelling is associated with high GDP [11]. In our study, the relationship between GDP and COVID-19 fatality was not statistically significant. Findings from our study support the argument of the "Crossing Quality Chasm" report. In rich countries, a larger share of GDP is allocated to health care, but this is not associated with quality health outcomes and reduced fatality. In Hashim's studies, unlike our study, high GDP was found to be associated with high COVID-19 mortality. The main reasons for this situation are widespread testing in countries with high GDP, widespread contagion, strong surveillance and reporting system, air transport and increased travel opportunities to rich countries can be listed as [12]. Although COVID-19 mortality seems to be higher in countries with high GDP, this may be attributed to the difficulty of detecting COVID-19 cases in poor countries due to the insufficient number of tests. In our study, as GDP increases, the effectiveness of secondary health care and the number of computed tomography scanners increase. This can be shown as evidence of the high share of GDP in health expenditures in rich countries with high GDP.

4.3. The relationship between health workforce and COVID-19 fatality

In a study conducted in England by Griffiths et al., the relationship between the number of nurses and mortality was examined by considering the number of doctors and other health professionals, and the excess of inpatients per nurse and doctor was found to be associated with increased mortality [13]. We found the relationship between the number of doctors per capita and the number of nurses per capita with COVID-19 fatality is not statistically significant. As GDP increases, the number of nurses increases. In the study conducted by Griffiths et al., the effect of hospital doctors on inpatient mortality was mentioned and it was seen that the increased number of doctors was associated with decreased mortality. However, in our study, since primary health care services and secondary health care services were evaluated as a whole, it may not have been found to be statistically significant.

4.4. The relationship between hospital bed, intensive care unit bed and COVID-19 fatality

Like the study of Tian et al., in which it was determined that the reform to increase the number of hospital beds, thanks to the strong initiatives of the state in China, decreased maternal mortality, in our study, it is seen that the number of hospital beds had a positive effect on fatality [6]. The relationship between the number of intensive care unit beds and COVID-19 fatality was not statistically significant. In a retrospective cohort study conducted by Abuhasira et al., it was found that increased admissions to the intensive care unit in individuals over the age of 80 did not affect the 2-year mortality after discharge but only increased in-hospital survival [14]. This result is compatible with the findings of our study. The increased number of intensive care unit beds does not reduce the mortality of COVID-19.

5. Conclusion

No relationship was found between satisfaction with quality health care and COVID-19 fatality in our study. Because satisfaction with quality health care was found to be associated with the effectiveness of primary health care, not the effectiveness of secondary health care. As a quality indicator of inpatient treatment, the effectiveness of secondary health care has been found to be effective and have an important role in reducing fatality in pandemics caused by SARS-CoV-2 which places a burden on the health system. The importance of primary health care services in the spread and prevention of pandemics is great, and the fact that its effect on fatality could not be determined in this pandemic suggests the necessity of regulations for primary care. In addition, as stated in the framework of the building blocks put forward by WHO, quality, which is among these interim strategies, is evaluated through satisfaction surveys and it is seen that the effectiveness of primary health care mostly influences satisfaction with quality health care. However, in our study, due to the lack of statistical significance in the relationship between COVID-19 fatality and satisfaction with quality health care, in order to evaluate the effect of satisfaction with quality health care on COVID-19 fatality, considering the local secondary health care systems, the effectiveness of secondary health care are also related to satisfaction with quality health care, a model can be developed in which it plays an effective role in the measurement of satisfaction with quality health care.

When evaluated together with the effectiveness of secondary care, the number of hospital beds has a negative effect on COVID-19 fatality. For the current COVID-19 and possible future COVID-19-like outbreaks, it is necessary to increase the hospital capacity and carry out further studies.

The relationship between GDP and COVID-19 fatality was not statistically significant. An increase in GDP does not cause a de-

crease in COVID-19 fatality, and some studies have found that an increase in GDP increases COVID-19 fatality. However, in our study, GDP was positively related to the effectiveness of secondary health care. This can be important for the correct use of resources, increasing the quality of health, and achieving the ultimate goals of the health system.

Considering that the relationship between the number of doctors and nurses and COVID-19 fatality is not statistically significant, the distribution of healthcare workers rather than the number of doctors and nurses may also be important. The importance of health workers, especially in inpatient treatment services, is also noteworthy in terms of increasing the quality of health. The number of nurses rather than the number of doctors increases satisfaction with quality health care. It would be appropriate to carry out studies in this context. These studies are also important in terms of health workforce planning and the development of cost-effective models.

6. Study Limitations

Ten countries were not included in the study due to the lack of data. Therefore, the results may not reflect all OECD countries. Due to limitations, 2019 or the nearest year data were used for some variables. In addition, COVID-19 cases were detected according to SARS-Cov-2 PCR test positivity. It should be considered that there may be cases and deaths other than those detected.

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