Impoverishing Health Expenditure in Iran Before and After the COVID-19 Pandemic: A National Cross-sectional Study

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Abstract

Background: The COVID-19 pandemic has altered healthcare service utilization patterns and, consequently, the financial protection indicators.

Objectives: This study aims to examine the impoverishment caused by health expenditures before and during the COVID-19 pandemic in Iran.

Methods: This retrospective-descriptive study was conducted using six years of national income and expenditure data (2016 - 2021) from 228,910 households. We measured the occurrence and intensity indices of impoverishing health expenditure, such as the poverty headcount (PH), normalized poverty gap (NPG), and normalized mean positive poverty gap (NMPG), at the rural and urban levels separately.

Results: The PH increased from 2016 to 2018, decreased in 2019, and rose again in 2020 and 2021. Moreover, the occurrence of impoverishment health expenditure was at its lowest level in 2016 compared to previous years. PH was consistently higher in rural areas. NPG increased from 2016 to 2018, decreased in 2019, and increased again in 2020 and 2021. The NMPG index ranged from 0.11% to 0.62% in rural areas, and from 0.34% to 1.18% in urban areas.

Conclusion: Impoverishing health expenditure in Iran was significant, especially for rural residents. The COVID-19 pandemic did not change this trend. Reforming economic policies and providing targeted financial support for vulnerable populations are crucial.

Keywords: Out-of-Pocket (OOP) Payments; Impoverishing Health Expenditure; COVID-19; Health Equity; Iran

1. Background

Health is universally acknowledged as a fundamental human right and a vital aspect of overall human well-being. In addition to delivering healthcare services, health systems need to provide equitable financial support for all recipients of these services (1)A. Healthcare financing relies on various sources, such as general taxes, social health insurance, private health insurance, community financing, and out-of-pocket (OOP) payments (2). Some countries also employ health savings accounts and charitable contributions to supplement healthcare funding. Excessive dependence on OOP health payments, which indicates the weakness of prepayment-based financial mechanisms, deprives millions of people of accessing and utilizing essential healthcare services (3).

Facing catastrophic health expenditure (CHE) and impoverishment due to health payments are two major outcomes of high OOP in a health system. These issues have a global impact, with approximately 150 million individuals experiencing CHE each year, and around 100 million people being pushed below the poverty line (PL) due to OOP health payments (4). According to estimates from the World Health Organization (WHO), OOP health spending annually leads to the impoverishment of up to 5% of the global population (5).

The global COVID-19 pandemic has significantly altered the utilization patterns of healthcare services worldwide.

Control measures and lockdown policies implemented during the pandemic, including social distancing, self-isolation, home quarantine, apprehension about visiting healthcare facilities, and the suspension of non-emergency services, have played a crucial role in shaping this shift (6). A systematic review that encompassed studies from 20 different countries revealed a substantial decrease of approximately one-third in healthcare utilization during the pandemic (7). Likewise, in the United States, the implementation of social distancing policies resulted in decreased healthcare utilization, and a significant portion of these reductions would have occurred even in the absence of such policies (8). Similarly, Iran faced adverse effects on healthcare utilization due to the pandemic (9), consequently impacting financial protection indicators.

In Iran's health system, which is categorized as a lower-middle-income country, OOP health payments account for approximately 50% of total health expenditures (10). According to Maher and Fazel's study, 611 and 5,895 households were forced into poverty due to healthcare payments in 2012 and 2015, respectively. Also, impoverishment due to medical expenses significantly increased after the implementation of Iran's health transformation plan (IHTP) (11). A systematic review found that the estimated pooled prevalence of CHE among households was 7% (12). Another study that measured CHE before and after the implementation of the IHTP reported that the total population's exposure to CHE ranged from 1.99% in 2011 to 3.46% in 2017 (13). In a cross-sectional study comparing household financial contributions before and during the COVID-19 pandemic, 1.04% and 0.92% of households were impoverished due to health expenditures in 2019 (before COVID-19) and 2020 (during COVID-19), respectively (14). A scoping review study conducted in 2023 revealed that, on average, 3.19% of households experienced CHE, and 3.21% were pushed into poverty as a result of OOP health payments (15). To address health equity, particularly in healthcare financing, the country has implemented several initiatives, including the fourth, fifth, and sixth programs of economic, social, and cultural development, as well as the IHTP. It appears that these policies have not fully achieved their predetermined goals due to several main root reasons (16, 17).

Iran's economy has been unstable in recent years, severely affected by international sanctions, and inflation rates have sharply increased while healthcare expenditures have also risen (18, 19). The spread of the COVID-19 pandemic should also be added to this situation. These combined factors have resulted in a reduced capacity to pay (CTP) for individuals and households.

2. Objectives

To ensure continuous progress towards universal health coverage (UHC), sustainable development goals, and health for all, the country's policymakers, health managers, and health economists need to have up-to-date information on equitable financial protection indicators. Addressing this need, the present cross-sectional study serves as the first of its kind, aimed at estimating impoverishing health expenditure in Iran before and after the COVID-19 pandemic, utilizing six years of annual national household survey data.

3. Methods

3.1. Study Design and Data Source

The present retrospective-descriptive study was conducted using data for six years (2016 - 2021), which were obtained from the national representative household income and expenditure survey (HIES), undertaken and published annually by the Statistical Center of Iran (SCI) (20). The households were selected using a three-stage stratified random cluster sampling method. The surveys collected information on (1) the social characteristics of household members, (2) housing characteristics, living facilities, and assets, (3) household expenditures on both food and non-food items, and (4) household income. The data from 2016 to 2019 are related to the pre-COVID-19 pandemic period, while data from 2020 and 2021 are related to the post-COVID-19 pandemic period. Expenditure data had monthly or yearly reference periods in the surveys. The preceding year and preceding four weeks were the reference periods for inpatient and outpatient service utilization, respectively. These two variables were converted into yearly measures in the study. The primary sample size in the mentioned national surveys varied from 37,557 to 38,960 households (18,251 to 19,618 in rural areas, and from 18,370 to 20,350 in urban areas) across the study years. Performed analyses were based on the household's food expenditure; therefore, households with missing or zero food expenditure were excluded from the process (additional information was presented in Table 1).

Table 1. Sample Size for the Study Years: 2016 - 2021

Years; Residency	Primary Sample	Excluded Sample a	Final Sample	Sample Size (Rural + Urban)
2016				38,033
Rural	19,337	65	19,272	
Urban	18,809	48	18,761	
2017				37,412
Rural	19,261	54	19,207	

Urban	18,701	496	18,205	
2018				38,863
Rural	18,610	60	18,550	
Urban	20,350	37	20,313	
2019				38,199
Rural	18,399	27	18,372	
Urban	19,898	71	19,827	
2020				37,397
Rural	18,251	87	18,164	
Urban	19,306	73	19,233	
2021				37,830
Rural	19,618	74	19544	
Urban	18,370	84	18286	

[a] Number of households with no food expenditure report.

3.2. Variables Definition and Measurement

We measured the occurrence and intensity indices of impoverishment due to health expenditures in the study years, at the rural and urban levels separately. For this purpose, five indices were estimated before and after healthcare payments to measure the impoverishment due to OOP health payments. Differences between the values of pre-payment and post-payment of these indices were calculated as the poverty impact (PI) of healthcare OOP payments. The definition and measurement of these indices are as follows.

3.2.1. Poverty Headcount

This index refers to the number of poor households (households living below the PL) as a proportion of total households. Poverty headcount (PH) before healthcare payments (PH[pre]) and after healthcare payments (PH[post]) are calculated by Equations 1 and 2:

Equation 1:

$$PH^{pre} = \frac{\sum_{i=1}^{N} P_i^{pre}}{N}$$

Equation 2:

$$PH^{post} = \frac{\sum_{i=1}^{N} P_i^{post}}{N}$$

Where P_i as a dummy variable shows whether the household i is poor or not. It is equal to Equation 1 if $x_i < PL$, and 0 otherwise (where x_i is the consumption of i's household), N is the number of households, and PL is the PL. The PL is the main variable for estimating impoverishing health expenditure and other financial protection measures. The calculation method of this variable is presented in more detail.

3.2.2. Poverty Line

The PL was calculated based on household subsistence expenditure. In this approach, the PL is the weighted mean of households' food expenditure, specifically for households whose share of food expenditure to total expenditure was between the 45th to 55th percentiles (Equation 3).

Equation 3:

$$PL = \frac{\sum w_i \times eqfood_i}{\sum w_i}$$

Where w_i is the weight of household i and $eqfood_i$ denotes the adjusted food expenditure. To calculate subsistence expenditure, household size was adjusted by the Consumption Equivalence Scale as follows (Equations 4 and 5).

Equation 4:

$$eqfood_i = \frac{food_i}{eqsize_i}$$

Equation 5:

$$eqsize = hsize^{\beta}$$

Where food is the food expenditure, eqsize is the consumption equivalents number in the household, hsize is the actual size of the household, and β is the adjustment coefficient, which was selected as 0.56 (21). Based on this method, rural and urban PLs from 2016 to 2021 were calculated.

3.2.3. Poverty Gap

As a measure of poverty depth, this index shows the average shortfall of the whole population from the PL. Poverty gap (PG) calculation before healthcare payments (PG[pre]) and after healthcare payments (PG[post]) are presented in Equations 6 and 7.

Equation 6:

$$PG^{pre} = \frac{\sum_{i=1}^{N} pg_i^{pre}}{N}$$

Equation 7:

$$PG^{post} = \frac{\sum_{i=1}^{N} pg_i^{post}}{N}$$

Where PGi shows the PG for the ith household that equations can calculate as Equations 8 and 9.

Equation 8:

$$PG_i^{post} = P_i^{post}(PL - x_i^{post})$$

Equation 9:

$$PG_i^{pre} = P_i^{pre}(PL - x_i^{pre})$$

3.2.4. Normalized Poverty Gap

The PG divided by PL and used for PG comparisons across countries with different currencies and PLs. Normalized poverty gap (NPG) can also be calculated before healthcare payments (NPG[pre]) and after healthcare payments (NPG[post]) scenarios as follows (Equations 10 and 11).

Equation 10:

$$NPG^{pre} = \frac{PG^{pre}}{PL}$$

Equation 11:

$$NPG^{post} = \frac{PG^{post}}{PL}$$

3.2.5. Mean Positive Poverty Gap

This index shows the intensity of impoverishment and is calculated as the mean shortfall of the poor population from the PL. The mean positive poverty gap (MPG) before (MPG[pre]) and after healthcare payments (MPG[post]) were calculated using Equations 12 and 13.

Equation 12:

$$MPG^{pre} = \frac{PG^{pre}}{PH^{pre}}$$

Equation 13:

$$MPG^{post} = \frac{PG^{post}}{PH^{post}}$$

3.2.6. Normalized Mean Positive Poverty Gap

This index is used for MPG comparisons across countries with different currencies and PLs. Normalized mean positive poverty gap (NMPG) can also be calculated for before (NMPG[pre]) and after healthcare payments (NMPG[post]) scenarios using the following Equations 14 and 15.

Equation 14:

$$NMPG^{pre} = \frac{MPG^{pre}}{PL}$$

Equation 15:

$$NMPG^{post} = \frac{MPG^{post}}{PL}$$

Finally, PI, i.e., the differences between the values of pre-payment and post-payment impoverishment measures, was calculated using the following equations 16 - 20.

Equation 16:

$$PI^{PH} = PH^{post} - PH^{pre}$$

Equation 17:

$$PI^{PG} = PG^{post} - PG^{pre}$$

Equation 18:

$$PI^{PG} = PG^{post} - PG^{pre}$$

Equation 19:

$$PI^{MPG} = MPG^{post} - MPG^{pre}$$

Equation 20:

$$PI^{NMPG} = NMPG^{post} - NMPG^{pre}$$

3.3. Statistical Analysis

The PH, NPG, and NMPG are relative measures expressed as percentages, while PG and MPG are expressed in monetary values per year. All monetary calculations were initially conducted in Iran's official currency, the Rial. To standardize these values, the Rial was converted to PPP $ (Purchasing Power Parity) using PPP conversion factors for the study years obtained from the World Bank (22). The equivalent of PPP $ in Iranian Rial for each year was then estimated by dividing each calculated Rial amount by the respective conversion factor.

The variables required for the analysis were extracted from the original data, and the primary indicators were calculated based on the desired relationships using Excel (version 2016). In this study, the representative weight of each sample household in the SCI data was computed, and it was included in all calculations. Stata (version 14) was employed for all analyses to incorporate the representative weight of each sampled household. Additionally, all figures were generated using Excel (version 2016).

4. Results

The present study's findings showed that the percentage of households exposed to impoverishing health expenditure (PH Index) in rural and urban areas and at the national level — hereafter referred to as "total" in the accompanying tables and figures — increased from 2016 to 2018, decreased in 2019, and rose again in 2020 and 2021. The percentage of occurrence of impoverishing health expenditure over the study years in both mentioned

areas varied between 1.72% and 4.52%. Furthermore, this amount in all years was higher in rural areas than in urban areas and also in 2016 was at its lowest level compared to other years. Regarding NPG, same with the PH Index, the trends related to rural areas, urban areas, and at the national level were ascending in the first three years, then decreased in 2019, and increased again in the two last year. Furthermore, the higher rate of this index was abserved in 2018 in rural areas and in 2021 at the urban and at the national level. Similar to PH Index, in all the study years, the value of this index was also higher in rural areas than in urban areas.

about NMPG, this index varied between 0.11% and 0.62% in rural areas, between 0.34% and 1.18% in urban areas, and between 0.22% and 0.44% at the national level. Also, at the national level, it increased in the two first years, then decreased for the last three years, and rose again in the last year (additional information about PH, NPG, and NMPG is presented in Table 2, and Figures 1 and 2).

Table 2. PH, NPG, and NMPG Before and After the COVID-19 Pandemic: (% of Households) 2016–2021

	Year	2016	2017	2018	2019	2020	2021
	PH (%)						
Rural	PH pre	29.81	29.98	31.93	32.37	33.96	37.30
	PH post	33.70	34.25	36.45	36.64	37.65	41.47
	PI^{PH}	**3.88**	**4.26**	**4.52**	**4.26**	**3.69**	**4.17**
Urban	PH pre	9.59	8.82	11.87	12.47	14.78	15.21
	PH post	11.32	10.56	13.94	14.36	16.74	17.47
	PI^{PH}	**1.72**	**1.74**	**2.07**	**1.89**	**1.96**	**2.26**
Total	PH pre	16.80	16.04	17.34	16.49	21.38	21.71
	PH post	19.17	18.51	20.12	18.99	23.99	24.36
	PI^{PH}	**2.37**	**2.46**	**2.78**	**2.49**	**2.61**	**2.65**
	NPG (%)						
Rural	NPG pre	8.63	8.94	9.50	9.42	10.44	11.96
	NPG post	9.79	10.29	11.07	10.87	11.71	13.46
	PI^{NPG}	**1.16**	**1.35**	**1.57**	**1.44**	**1.27**	**1.51**
Urban	NPG pre	2.20	1.70	2.80	2.92	3.71	3.91
	NPG post	2.64	2.16	3.38	3.47	4.28	4.55
	PI^{NPG}	**0.44**	**0.46**	**0.58**	**0.54**	**0.56**	**0.64**
Total	NPG pre	4.59	4.43	4.85	4.57	6.32	6.49
	NPG post	5.31	5.19	5.71	5.32	7.14	7.39
	PI^{NPG}	**0.72**	**0.76**	**0.86**	**0.75**	**0.82**	**0.89**
	NMPG (%)						
Rural	NMPG pre	28.94	29.81	29.76	29.11	30.75	32.06
	NMPG post	29.06	30.04	30.39	29.67	31.11	32.47
	PI^{NMPG}	**0.11**	**0.22**	**0.62**	**0.56**	**0.35**	**0.41**
Urban	NMPG pre	22.93	19.34	23.63	23.44	25.12	25.71
	NMPG post	23.33	20.52	24.28	24.17	25.55	26.05
	PI^{NMPG}	**0.40**	**1.18**	**0.65**	**0.72**	**0.43**	**0.34**
Total	NMPG pre	27.32	27.61	27.96	27.72	29.54	29.93
	NMPG post	27.70	28.05	28.38	28.03	29.76	30.35
	PI^{NMPG}	**0.38**	**0.44**	**0.42**	**0.30**	**0.22**	**0.41**

• PH: Poverty Headcount; PI: Poverty Impact; NPG: Normalized Poverty Gap; NMPG: Normalized Mean Positive Poverty Gap

• 2016 to 2019: Years Before COVID-19
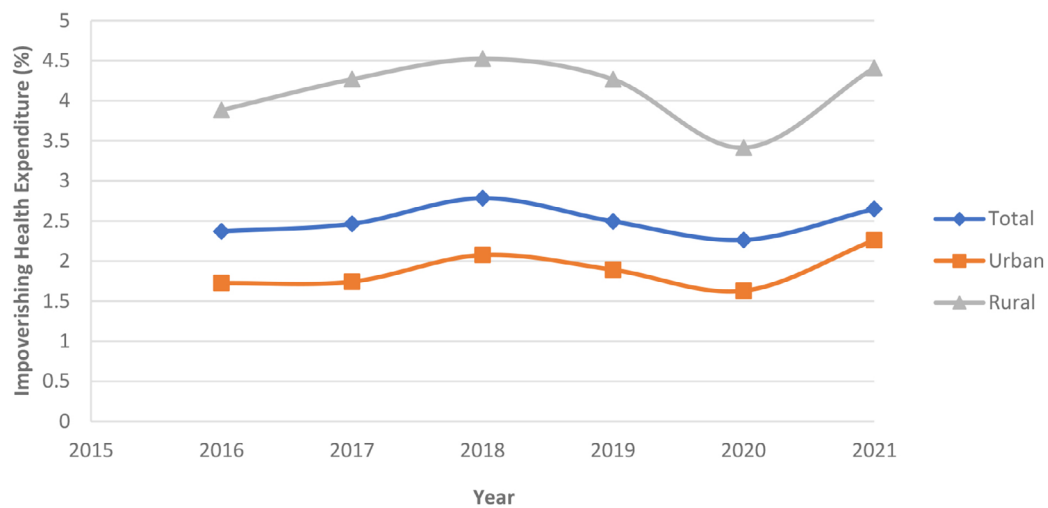
• 2020 and 2021: Years Durring COVID-19

Figure 1. Impoverishing Health Expenditure (%) in Iran by Residence Area: (% of Households) 2016–2021
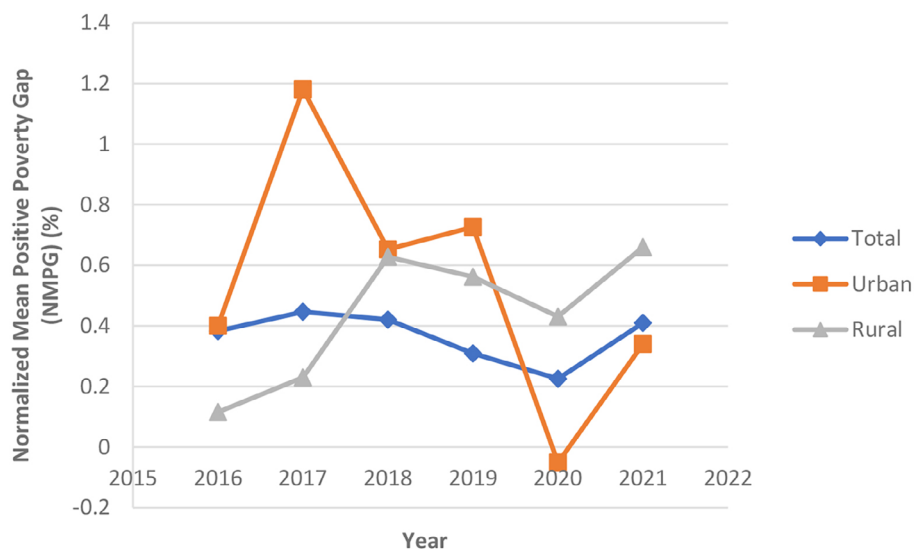

Figure 2. Normalized Mean Positive Poverty Gap (NMPG) (%) in Iran by Residence Area: (% of Households) 2016–2021

Pre-healthcare payments refer to households who were under the PL even before paying for healthcare, and post-healthcare payments illustrate households who are pushed under the PL after OOP payments (For instance, at the national level, the PH Index before OOP payments was 16.80% in 2016, but this index increased to 19.17% after paying for healthcare).

With respect to the PL trend at the national level, the index exhibited a declining trajectory from 2016 to 2020 before increasing 2020 and 2021. Notably, the highest PL value occurred in 2016. This value in rural and urban areas followed a similar pattern.

The PG index varied between 27.22 PPP $ (2020) and 36.58 PPP $ (2018), between 12.05 PPP $ (2016) and 17.56 PPP $ (2021), and between 18.83 PPP $ (2019) and 23.93 PPP $ (2021), in the rural, urban and at the national level, respectively. The lowest value of this index was in 2019 and the highest value was in 2021.

Concerning the MPG, the trend in urban areas had a sinusoidal pattern characterized by a sharp increase in 2017, a significant decline in 2018, a slight uptick in 2019, and another severe decrease in 2020. In contrast, the index did not demonstrate a clear trend in rural areas and at the national level (additional information about PL, PG, and MPG is presented in Table 3 and Figure 3).

Table 3. PL, PG and MPG (PPP $): 2016–2021

Year		2016	2017	2018	2019	2020	2021
PL (PPP $)							
Rural	PL	2397.64	2407.93	2322.64	2259.16	2144.06	2305.34
Urban	PL	2733.87	2781.98	2739.11	2720.84	2658.35	2738.71
Total	PL	2717.28	2714.74	2619.60	2509.94	2602.22	2672.36
PG (PPP $)							
Rural	PG pre	206.95	215.28	220.74	212.91	223.93	275.65
	PG post	234.84	247.82	257.33	245.63	251.15	310.38
	PI^{PG}	**27.89**	**32.53**	**36.58**	**32.71**	**27.22**	**34.73**
Urban	PG pre	60.18	47.47	76.85	94.49	98.66	107.15
	PG post	72.24	60.32	92.78	79.59	113.67	124.72
	PI^{PG}	**12.05**	**12.84**	**15.93**	**14.90**	**15.01**	**17.56**
Total	PG pre	124.74	120.28	127.07	114.81	164.38	173.68
	PG post	144.35	141.00	149.69	133.65	185.78	197.61
	PI^{PG}	**19.60**	**20.72**	**22.61**	**18.83**	**21.39**	**23.93**
MPG (PPP $)							
Rural	MPG pre	694.06	717.90	691.32	657.67	659.39	739.00
	MPG post	696.83	723.44	705.90	670.37	667.00	748.39
	PI^{MPG}	**2.77**	**5.53**	**14.58**	**12.70**	**7.61**	**9.39**
Urban	MPG pre	626.96	538.03	665.19	638.02	667.70	704.25
	MPG post	637.91	570.88	647.30	657.78	679.19	713.61
	PI^{MPG}	**10.94**	**32.85**	**17.88**	**19.76**	**11.49**	**9.35**
Total	MPG pre	742.38	749.59	732.67	695.92	768.69	799.90
	MPG post	752.79	761.72	743.69	703.69	774.39	811.06
	PI^{MPG}	**10.40**	**12.13**	**11.02**	**7.76**	**5.69**	**11.16**

- PL: Poverty Line; PG: Poverty Gap; PI: Poverty Impact; MPG: Mean Positive Poverty Gap; PPP: Purchasing Power Parity
- 2016 to 2019: Years Before COVID-19
- 2020 and 2021: Years After COVID-19
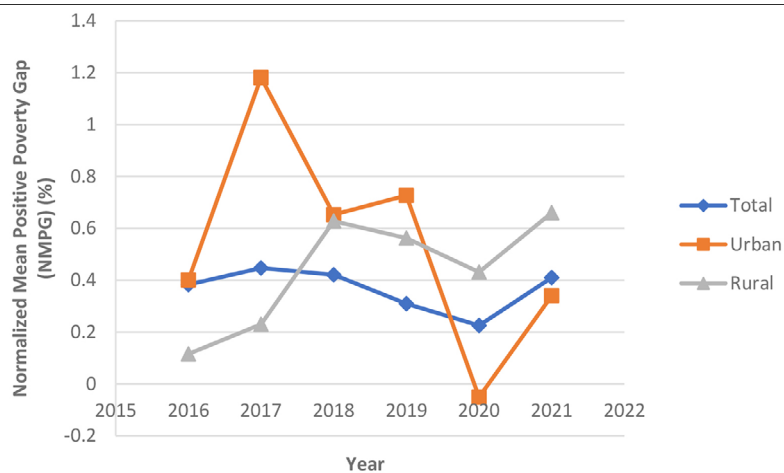
Figure 3. Mean Positive Poverty Gap (MPG) (PPP $) in Iran by Residence Area: 2016–2021

5. Discussion

Ensuring equity in healthcare financing is critical for policymakers, health providers, and patients, particularly concerning OOP payments (23). The present study aimed to measure the proportion of impoverishment due to OOP health payments and its related indices in Iran between 2016 and 2021, before and after the COVID-19 pandemic. The findings will offer insight into the occurrence (PH) and intensity of impoverishment impacts (PG, NPG, MPG, NMPG) at the national level, as well as separately for

rural and urban areas. The PL calculated in this study was based on the method proposed by the WHO. Using other methods to calculate it would lead to altered results.

At the national level, it was found that the occurrence of impoverishing health expenditure varied between 2.37% and 2.78% in Iran and did not exhibit a steady trend over the years. Given that Iran has an estimated 24.196 million households, this suggests that approximately 670,000 households (2021) — or about 2.34 million Iranians (assuming an average household size of 3.5) — are affected by impoverishing health expenditure each year. Also, the average PG has deepened for those below the PL before paying OOP for healthcare services. Studies at the local level of Iran's health system showed a large difference between the provinces in the exposure of their residents to impoverishing health expenditure (24, 25), probably reflecting differences in socioeconomic status and CTP among individuals and households in different regions. At the national level, Abdi et al. indicated that the incidence of impoverishment due to OOP payments increased slightly before and after the implementation of IHTP, from 0.2% to 0.5% (26). Another study found that many households fell below the PL due to OOP payments for purchasing medication (27).

Among studies conducted in other countries, Mulaga et al. in 2021 revealed that 1.6% of Malawians were impoverished due to OOP health expenditures (28). Zhao et al.'s study demonstrated that between 2010 and 2016, the incidence of CHE and impoverishing health expenditure in China decreased from 19.37% to 15.11% and from 7.39% to 5.14%, respectively. Furthermore, the gap between impoverishment rates across the income quartiles grew (29). An international study showed that in 2010, OOP health spending led to the impoverishment of 1.4% of the global population (30). Akazili et al. reported that between 1.6% and 1.8% of the Ghanaian population were impoverished by OOP spending on health in 2005 (31). Despite the wide coverage of social health insurance in China, the financial burden of cancer treatment imposes a significant risk of household impoverishment (32). In Kenya and Uganda, 1.48 million Kenyans (33) and 4% of the Ugandan population are pushed below the PL due to healthcare payments (34). In Turkey, 0.4% of total households were impoverished after OOP health payments (35). The study by Ahmed et al. showed that, following OOP health payments, roughly 4.5% of the Bangladeshi population fell into poverty in 2016 (36). An investigation was conducted in India with the participation of 65,932 households. The findings indicate that the total PH before making OOP payments was 16.44%, which increased to 19.05% after such payments were made. This represents a 2.61% increase in the PH, which corresponds to 6.47 million households (37). One significant contributing factor to these differences may be the variation in healthcare financing mechanisms across countries. Developed countries often rely on general taxation and social health insurance to finance healthcare, while developing countries tend to use OOP payments. These payments may first prevent individuals from accessing standard healthcare services, leading to worsening health problems and unmet health needs. Second, households facing financial toxicity may resort to coping strategies such as selling assets, borrowing, and taking out loans, which can lead to poverty. Additionally, they may reduce the consumption of their necessities to cover health-related expenditures. To address this issue, governments can consider implementing pre-payment mechanisms in their healthcare systems to protect households from high healthcare expenditures and address the root causes of poverty. Regarding the specific conditions in Iran, this country has been facing various heavy sanctions imposed by other countries for years. Iran's economy has become fragile, inflation and poverty rates have increased, the CTP of many population groups has decreased, and household health expenditures have risen (38). The combination of these factors, alongside worsening people's welfare, has exposed them to impoverishing health expenditures. Therefore, in addition to reasons related to the increase in this type of poverty associated with poor governance in the health system, other factors outside the health system should also be considered.

The present study highlights that rural residents of Iran are at a higher risk of impoverishing health expenditure than urban residents. This finding is consistent with surveys conducted in Ethiopia (5), China (29), and Afghanistan (39), which also reported that living in rural areas is a significant variable in facing CHE and impoverishing health expenditure. A study conducted in Bangladesh also revealed that OOP payments for healthcare services push approximately 13% of rural households into poverty annually (40). In Iran, rural households were more exposed to CHE compared to urban households (41), and the number of rural households falling below the PL due to drug costs is greater than that of urban households (27). In this country, for the years 1991 to 2017, the households' expenditure on health out of their monthly budgets increased five times (19). Moreover, in the current study, rural areas had a lower PL compared to urban areas, and if the PL were the same in both areas, rural poverty rates due to OOP payments would be higher. Lower-income groups, which are prevalent in rural areas, are more sensitive to OOP payments and have more health needs than people from higher-income groups. These elements have created difficult conditions for rural and other deprived areas. Based on social equity principles, central governments should focus extensively on economic empowerment and improving the livelihood status of rural residents, invest in their public health infrastructure, and increase both basic and complementary health insurance coverage in rural areas.

Since 2020, the COVID-19 pandemic has brought about significant changes and challenges in various aspects, especially health. The present study found that in 2020, 3.41%, 1.62%, and 2.26% of households in rural areas, urban

areas, and at the national level in Iran fell below the PL due to OOP health payments. In 2021, these rates increased to 4.41%, 2.26%, and 2.65%, respectively. Notably, the occurrence of impoverishing health expenditure was at its lowest rate in 2020 compared to previous years, but it increased again in 2021. To our knowledge, no other study has specifically examined the effects of COVID-19 on impoverishing health expenditure. A systematic review by Moynihan et al. showed that the utilization of healthcare services decreased by about a third during the pandemic, particularly for less severe illnesses (7). Reductions in essential interventions for maternal and child health may also cause over a million additional child deaths (42). Other studies in Germany and the USA have observed reductions in outpatient, emergency department, and inpatient utilization, as well as mental health emergency service utilization rates (43, 44). In Nepal, the COVID-19 pandemic is anticipated to worsen the further availability of healthcare services in rural and urban areas (45). In China, Zhang et al. found a considerable reduction in total utilization and healthcare expenditure when the pandemic reached its peak (46). In addition, telehealth services increased during the COVID-19 pandemic (47). In Iran, patients with COVID-19 and better general conditions were sent to their own homes for self-quarantine, so the utilization rate of homecare services increased (48). Fear of becoming infected by SARS-CoV-2, cancellation of elective services, and lockdowns and stay-at-home policies are possible reasons for the change in healthcare services utilization during the pandemic compared to the pre-pandemic period. Therefore, the decrease in the impoverishing health expenditure burden rural areas in 2020, as found in the present study and supported by national studies conducted by Mirzaei et al. (14) and Sheikhy-Chaman et al. (which focused on CHE) (3), could potentially be attributed to a reduction in healthcare service utilization rather than improvements in financial protection mechanisms for households in Iran. This is further confirmed by the increase in the exposure rate of impoverishing health expenditure in 2021. This year, the global situation regarding the prevalence of the pandemic has returned to a more normal state. Households may also face CHE and impoverishment related to the direct and indirect costs of COVID-19, particularly in rural areas and urban slums. Furthermore, unmet health needs pose serious challenges for health systems in the short, medium, and long term, and policymakers should consider issue.

The present research provides a comprehensive analysis of impoverishing health expenditure using a large dataset and covers a significant period, offering valuable insights into trends over time. The study's national scope ensures that the findings are broadly applicable, and the use of standardized measures enhances the reliability of the results. Despite these strengths, the study has some limitations. The approach used does not consider individuals who did not seek healthcare services due to various obstacles, which may lead to underestimating PH

measures and the severity of impoverishment induced by OOP payments. Additionally, the study design was descriptive. These limitations should be taken into consideration when interpreting and using the results. It is recommended that future research include analytical studies to identify the factors contributing to impoverishing health expenditure in Iran.

5.1. Conclusions

Despite the implementation of various policies aimed at promoting health equity, these measures have not fully achieved their objectives, leading to significant impoverishment due to OOP health payments for many households in Iran, both before and during the COVID-19 pandemic. This issue has persisted and even worsened over the past decade, particularly in rural areas where residents face intensified financial pressures. To address these challenges, comprehensive measures are needed. At the central governance level, policymakers should focus on improving international relations to alleviate sanctions and enhance the country's economic infrastructure, thereby increasing the CTP for individuals and households. Additionally, it is essential to increase funding and budget allocation for the health system. In terms of health system governance, efforts should be directed towards controlling health system costs, reducing reliance on OOP payments, incorporating sustainable funding sources into the healthcare financing cycle, strengthening basic health insurance to cover a larger share of healthcare expenses, expanding the scope of complementary health insurance, and consistently identifying and exempting financially vulnerable groups from healthcare service payments.

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