Macroeconomic Factors Affecting Out-of-Pocket Payments for Health: Evidence from Panel Data Analysis of SAARC Countries

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Abstract

The high Out-of-Pocket(OOP) payments for healthcare, and limited health insurance coverage in SAARC countries poses economic hardship to common mass and curtails healthcare access. This paper examines factors affecting OOP payments for healthcare in SAARC countries, focusing on particularly macroeconomic, demographic, and social determinants. The main aim of the paper is to compare healthcare expenditure patterns across these nations and assess the factors influencing OOP payments in the region. The panel data analysis was employed to fulfill the objectives. The fixed effect model reveals that a one percent increase in GDP per capita, consumer price index (CPI), and the population aged 65 years and above leads to changes in OOP payments by 1.08, 0.09 percent, and 1.20 percent, respectively. But the random effect model shows that a 1 percent increase in GDP per capita, remittance inflow, CPI, population aged 65 years and above, mean years of schooling, and domestic government healthcare expenditure changes OOP payments by 1.47 percent, 0.72 percent, 0.06 percent, 0.18 percent, and 0.64 percent, respectively. The fixed effect model explains over 98 percent of the variation in OOP payments, while the random effect model accounts for over 87 percent. The findings reflect that GDP per capita, CPI, domestic government healthcare expenditure, and the population aged 65 years and above significantly influence OOP healthcare payments in SAARC countries. However, the effects of remittance inflows and mean years of schooling remain inconclusive.

Key words: *macroeconomic factors, health expenditure, out-of-pocket payments, panel data analysis, South Asia*

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Introduction

Population health is a crucial factor for economic development, and economic development has an important impact on health outcomes for all societies (Ahangar et al., 2018). The population health outcome improvement has become the significant priority of the governments in contemporary world to enhance ability, efficiency and quality of life of workforce (Wu et al., 2021; WHO, 2016). The analysis of healthcare expenditure is critical for understanding the broader economic impact of healthcare expenditure on economic growth, employment generation, and overall economic stability (Radmehr & Adebayo, 2022), making it an important consideration for policymakers (Yang & Usman 2021; Welfens, 2020). Therefore, the better understanding of complex relationship between healthcare expenditure and its various economic, demographic, and social determinants is essential for resource optimization meant for better health outcome of population (Mbau et al., 2023; White-Williams et al., 2020). Moreover, healthcare financing strategy is a crucial component to determine the accessibility and quality of healthcare services for citizens within a society or a nation (Guida & Carpentieri, 2021; Tzenia, 2019). Essentially, provision of optimal resource allocation to public healthcare sector with its efficient utilization is a sufficient condition for preparing healthy population and getting better health outcome (WHO, 2019). But, out-of-pocket (OOP) payments for health found to be the major healthcare financing source in low-income countries, even the larger than the government expenditure (Asante et al., 2016).

Inadequacy of public healthcare delivery service compels common people to bear overall healthcare cost from their own income and cause serious financial hardship for low-income households (Sirag & Mohamed, 2021; García-Díaz et al., 2018). Many least-developed and developing countries lack resources for equal healthcare access, leading to financial hardship due to OOP payments for healthcare, as a growing portion of the world's population spends significant amounts on medical care which has been regarded as a threat to universal health coverage (Sirag & Mohamed, 2021). Obviously, the increasing trend of OOP payment for healthcare is creating financial hardship by forcing common people to choose between health expenses and other necessities (Rahaman et al., 2022; Sriram & Khan, 2020) and this is a serious cause of welfare loss of common people (O'Donnell, 2019). The OOP payments for health includes all health care expenditure incurred by households or individuals in the form of direct payments to healthcare providers, but these expenditures are not reimbursed by any public or private health insurance scheme (Paris et al., 2010; Mossialos & Thomson, 2002). Hence, the OOP payments for healthcare can create a financial hardship to people to access healthcare services, thereby increasing incidence of poverty (Diaz-Castro et al., 2021). Therefore, OOP payments for healthcare is regarded as an inherently regressive source of financing, meaning that poor households face a higher relative burden of OOP payments as compared to higher income households (Eza et al., 2022; Wang et al., 2020; Thomson et al., 2019; Lorenzoni et al., 2019). Several studies have asserted OOP payment for healthcare as catastrophic when it surpasses a certain threshold of a household's consumption or income (Aregbeshola & Khan, 2021; Imlak & Shabda, 2016; Damme et al., 2004). Eventually, households can be impoverished or further pushed into poverty due to the excessive burden of OOP payments for healthcare (Wagstaff et al., 2018).

The study of Chaudhuri and Roy (2008) indicated that payments increased with increasing ability to pay (ATP), but the consequent financial burden (payment share) decreased with increasing ATP, indicating a regressive system during the study periods. Habib et al. (2016) investigated the relationship between health care expenditure (HCE) and economic growth and to the causality between HCE and economic growth in the selected SAARC countries. They employed the Panel cointegration and panel causality analysis over the period 1995–2012. The study used economic variables like per capita income, and labor force; literacy rate as social variable, and demographic variable such as elderly population. Panel unit root and cointegration tests result reveals that income elasticity of health care expenditure (HCE) is less than unity in both long and short run, with unidirectional causality from per capita GDP to HCE in South Asian countries. Subedi (2016) found the significant contribution of remittance inflow on household healthcare provision and healthcare wellbeing in Nepal. Imlak et al. (2017) examined healthcare expenditures in seven South Asian countries, focusing on OOP payments for health. It identifies the Maldives as having the highest per capita health expenditure, while India has the highest OOP payments for health. The study uses a panel data pooled OLS model to examine factors affecting OOP payments for health, emphasizing final household expenditures as a determinant. This makes valuable contribution to have understanding of healthcare financing in developing economies and informs policy decisions.

Grigorakis et al. (2018) concluded that GDP growth and governmental debt as a share of GDP in OECD and European countries do not have a statistically significant impact on OOP payments for healthcare. Their study found a positive influence of unemployment rate on OOP payments for healthcare. Likewise, government expenditure as a share of GDP presents different influences in static and dynamic models. Governmental and PHI financing indicate a significant negative effect on OOP expenditures.

Sriram (2019) asserted that OOP payment for healthcare account for 62.6 percent of total health expenditure, with 12.4 percent of the population below the poverty line. Berloffa and Giunti (2019) study found the impact of remittances on health capital investments of households left behind, with particular attention to healthcare expenditure. Kanmiki et al. (2019) found the evidence that national health insurance program is significantly contributing to a reduction in OOP payment for primary healthcare in public health facilities of Ghana. Ebaidalla and Ali (2021) investigated factors influencing OOP payments for health in Sub-Saharan Africa (SSA) and found economic factors like per capita income, trade openness, and inflation significantly impact OOP health expenditure.

Health economists are interested to compare health expenditures across different countries to identify best practices and learn from variations in expenditure patterns. This can provide better insights into potential areas for improvement and efficiency gains. In this regard, here have been conducted the studies around the world focusing in this issues. But, the majority of the empirical literatures have investigated the potential drivers of OOP payments for health based in microeconomic approach (Fan and Savedoff, 2012; Meng et al., 2011; Clemente et al., 2004; Musgrove et al., 2002). In other words, there are found two categories of literature relating to factors associated with OOP payments for health. firstly, most of the previous literatures are based on the microeconomic approach of analysis meaning that the studies have focused on the household healthcare expenditure data. Secondly, macroeconomic analysis of the individual country to explore the determinants of OOP payments for health based the time series data. Although, the second types of literature are limited. But, the panel data analysis based on multiple countries are scares and the study of SAARC on the same issue is lacking.

Evidently, the increasing trend of OOP payment for healthcare remains a serious welfare problem worldwide (Al-Manawi, 2021). Obviously, the SAARC region is not free from this serious issue. The specific objectives of the paper are to compare healthcare expenditure patterns amongst the SAARC countries and explore the macroeconomic, demographic and social factors influencing OOP payments for healthcare these countries. This paper employed macroeconomic approach to investigate potential macroeconomic determinants of OOP payment for healthcare in SAARC countries using panel data analysis. Hence, it contributes to existing literature by expanding understanding of macroeconomic parameters and governmental expenditures' impact on OOP spending and filling the gap in responsiveness to PHI funding.

Data and Methodology

Research Design

This paper used panel data analysis technique because of the utilization of time series data combined with the cross-sectional observations of the entities. Panel data analysis is an econometric method analyze the data that involves observations on multiple entities (individuals, firms, countries) over multiple time periods (Hsiao, 2022; Bliese et al., 2020). Since, the panel data regression technique combines time series of cross-section observations and gives more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency (Gujarati, 2021). Therefore, the rationale for using panel data analysis lies in its ability to capture both cross-sectional and temporal variations, providing several advantages over purely cross-sectional or time-series analyses (Epskamp, 2020).

Specification of the Model

Panel data allow for the efficient use of available information by combining cross-sectional and time-series dimensions (Beck, 2001). Likewise, this often leads to a larger sample size, increasing the precision of estimates which is equally important to control for the individual heterogeneity, autocorrelation, heteroscedasticity and addressing endogeneity (Antonakis et al., 2021). The panel data can be micro-panel or macro-panel according to the time they cover. Based on the Baltagi (2013) proposition, this is a micro-panel data analysis as it covers 16 times periods. Since, Beltagio (2013) stated that panels up to 20 periods should be considered micro panel, and panels with more than 20 periods should be macro-panel. Final remark on the choice of the model is that the panel data technique can better detect and measure effects that simply cannot be observed in other techniques such as pure cross-section or pure time series model (Gurarati, 2021). Therefore, the present study adopts the empirical model as follows:

$$y_{it} = \alpha + x_{it}\,\beta + \mu_i + \varepsilon_{it}\,;\; i = 1,2,\ldots\ldots N;\; t = 1,2,\ldots\ldots T$$

In equation (1), y_{it} represents the vector of dependent variable OOP payments for healthcare for country i at time t. The symbol α denotes fixed intercept and X represents the vector of the exogenous variables of the model. The vector of the coefficients of explanatory variables is denoted by β and ε_{it} is the vector of random error. The random effects term is given by u_i (where u_i and ε_{it} are independent). This paper follows a simple model of panel data estimation as suggested by Hsiao (2014) and Elhorst (2003). In the present study, the specific form of the equation derived from the generic form Equation (1) is given in Equation (2) as follows:

$$OOPC_{it} = \alpha + \beta_1\, GDPC_{it} + \beta_2\, RMpc_{it} + \beta_3\, DGHE_{it} + \beta_4\, CPI_{it} + \beta_5\, Pop65_{it} + \beta_6\, MYS_{it} + \mu_i + \varepsilon_{it}$$

In Equation (2), The symbol α denotes fixed intercept, β = 1,2 …6 denotes coefficients for respective explanatory variables and ε_{it} is the vector of random error. The random effects term is given by u_i (where u_i and ε_{it} are independent). In the model, $OOPC_{it}$ denotes out-of-pocket payments for healthcare to the country i at a time t. Similarly, $GDPC_{it}$, $RMpc_{it}$, and $DGHE_{it}$ represents the GDP per capita, remittance inflow per capita, and domestic general government expenditure on health for i th country at a time t respectively which are also variables of interest. Likewise, CPI_{it}, $Pop65_{it}$ and MYS_{it} represents consumer price index, population percentage with age 65 years and above and mean years of schooling for i th country at a time t respectively which are control variables for this study.

The present study is based on the pooled cross-section data and yearly time series data from 2006–2021 for the seven SAARC countries viz; Nepal, Bhutan, Bangladesh, India, Maldives, Sri Lanka and Pakistan. Afghanistan is in the excluded from the analysis because of a lack of data and its continuity. The empirical data was collected from the World Bank statistics on the World Development Indicators. All the variables were converted to natural log to avoid skewness within data (log-log model).

Empirical Results and Discussion

The empirical analysis section is presented starting from the comparative information of various dimensions of healthcare expenditure in SAARC countries and rest of the world followed by Panel unit root test results, descriptive statistics, appropriate model selection test result, estimated result of fixed effect model and random effect model.

Healthcare Expenditure Scenario in SAARC Region

The South Asian Association for Regional Cooperation (SAARC) region has a diverse socio-economic landscape, presenting a complex interplay of factors influencing healthcare financing (Rahman & Tiwari, 2021; Bhattarai & Budd 2019). Nevertheless, the SAARC countries have made significant improvement in healthcare infrastructure and services in recent times (Rahman et al., 2018). Despite this, the issue of OOP expenditure remains a challenge, hindering equitable access to healthcare and exacerbating financial vulnerabilities for individuals and households in SAARC region (Kumar et al., 2011). The mean OOP payments for healthcare for the SAARC countries is estimated to be about 49 percent of the total healthcare expenditure and 0.14 percent of GDP (Mohapatra, 2022). This is a concrete evidence of welfare loss of common people. Table 1 below display comparison of healthcare expenditure between SAARC and rest of the world.

Table 1. Healthcare Expenditure Comparison of SAARC Countries and World

Healthcare Expenditure Indicators	World	SAARC
Current health expenditure(CHE) as percent of GDP	10.89	3.05
Current health expenditure per capita USD	1177	56
OOP payments for health as percent of CHE	16.36	53.37
OOP payments for health per capita USD	193	101
Domestic general government health expenditure as percent of current health expenditure	63.42	34.55
Domestic general government health expenditure per capita in USD	956	66

(Data source: World Health Organization, 2021)

The figures in Table 1 depict valuable insights in terms of comparative healthcare expenditure status of SAARC countries and rest of the world. The data shows that world average for the Current Health Expenditure (CHE) as a percent of GDP is 10.89 percent and the average of SAARC region is meagre 3.05 percent. This clearly indicates that SAARC countries spend a much smaller proportion of their GDP on public healthcare compared to the world average, indicating a potential underinvestment in public healthcare systems. Similarly, in terms of CHE Per Capita (USD), SAARC countries average is meagre USD 56 in comparison to world average USD 1,177 per person. This is also clear indication that per capita health expenditure in SAARC countries is significantly lower than the global average, reflecting lower policy priority for public health services. Likewise, in terms of OOP payments as percent of CHE, SAARC average is 53.37 percent in comparison to world average 16.36. It can be attributed that the reliance on OOP payments in SAARC countries is more than three times higher than the global average, indicating either limited government-funded public healthcare services or insurance coverage.

Moreover, in terms of the Domestic General Government Health Expenditure as percent of CHE, SAARC average is 34.55 percent in comparison to world average is 63.42 percent. This also clearly indicates that governments in SAARC countries contribute significantly less to public health expenditure compared to the global average, shifting the financial burden to common people. Furthermore, in terms of the Domestic General Government Health Expenditure Per Capita (USD), SAARC countries spend only USD 66 per person in comparison to world average USD 956 per person. In summary, it can be stated that SAARC countries allocate a smaller share of their GDP and spend less per capita on healthcare compared to the world average as a result common people in SAARC countries face a higher financial burden and heavily dependence on OOP payments for health due to limited government funding.

Panel Unit Root Test Results

The panel unit root test results at level and first difference are presented in Table 2, Table 3, Table 4 and Table 5. In this study, four panel unit root tests: Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), Augmented Dickey–Fuller (ADF) and PP - Fisher Chi-square are employed on each selected variable without trend and with trend. The empirical test results suggest that few variables are stationary in their level form but many variables are stationary at first difference.

Table 2 shows the result of Levin, Lin, and Chu (2002) unit root test. The result shows that the variables OOPpc, GDPpc, CPI, Pop 65, MYS and D-GGHE are stationary at level and remaining variables such as RMpc and MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 2. Levin, Lin, and Chu Unit Root Test Result

	At Level				At first difference			
Variables	Intercept	p-value	Intercept & Trend	p-value	Intercept	p-value	Intercept & Trend	p-value
OOPpc	-2.42	0.00	-4.58	0.00	-5.53	0.00	-5.76	0.00
GDPpc	-2.83	0.00	-1.96	0.02	-4.45	0.00	-5.24	0.00
RMpc	-3.07	0.00	-0.95	0.16	-3.23	0.00	-2.29	0.01
CPI	-1.52	0.06	-4.08	0.00	-7.39	0.00	-6.28	0.00
Pop65+	-2.44	0.00	-3.56	0.00	-0.82	0.20	-0.34	0.36
MYS	-2.42	0.00	0.69	0.75	-0.24	0.40	-2.13	0.01
D-GGHE	-0.76	0.22	-1.82	0.03	-5.76	0.00	-4.57	0.00

Source: Authors' calculation

Table 3 shows Im, Pesaran and Shin (2003) unit root test result. The result shows that the variables OOPpc, and CPI are stationary at level and remaining variables other than Pop 65 and MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 3. Im, Pesaran and Shin Unit Root Test Result

	At Level				At first difference			
Variables	Intercept	p-value	Intercept & Trend	p-value	Intercept	p-value	Intercept & Trend	p-value
OOPpc	-0.92	0.18	-1.88	0.03	-4.48	0.00	-3.20	0.00
GDPpc	-0.50	0.31	0.81	0.79	-3.36	0.00	-2.87	0.00
RMpc	-0.44	0.33	1.10	0.86	-2.72	0.00	-1.81	0.03
CPI	-0.63	0.26	-2.24	0.01	-6.31	0.00	-4.34	0.00
Pop65+	0.26	0.60	-0.68	0.25	0.15	0.56	1.04	0.85
MYS	1.42	0.92	1.36	0.91	-0.94	0.17	-0.69	0.25
D-GGHE	1.71	0.96	-1.21	0.11	-4.98	0.00	-2.97	0.00

Source: Authors' calculation

Table 4 shows the result of ADF - Fisher Chi-square Unit Root Test Result. The result shows that the variables OOPpc, CPI, and Pop 65 are stationary at level and remaining variables other than MYS are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 4. ADF - Fisher Chi-square Unit Root Test Result

	At Level				At first difference			
Variable	Intercept	p-value	Intercept & Trend	p-value	Intercept	p-value	Intercept & Trend	p-value
OOPpc	23.31	0.06	27.37	0.02	45.93	0.00	35.55	0.00
GDPpc	16.11	0.31	8.69	0.85	36.42	0.00	32.47	0.00
RMpc	14.53	0.41	10.94	0.69	31.45	0.00	-1.81	0.03
CPI	14.65	0.40	28.65	0.01	62.80	0.00	45.85	0.00
Pop65+	19.38	0.15	32.07	0.00	18.62	0.18	13.70	0.47
MYS	10.35	0.74	7.25	0.92	21.35	0.09	20.50	0.12
D-GGHE	4.96	0.99	19.82	0.14	50.57	0.00	33.07	0.00

Source: Authors' calculation

Table 5 shows the Philip-Peron - Fisher Chi-square Unit Root Test Result. The result shows that the variables OOPpc, CPI, and D-GGHE are stationary at level and remaining variables other than Pop 65 are stationary after first difference. Therefore, the null hypothesis of non-stationarity of the series of the included variables can be rejected.

Table 5. Philip-Peron - Fisher Chi-square Unit Root Test Result

	At Level				At first difference			
Variable	Intercept	p-value	Intercept & Trend	p-value	Intercept	p-value	Intercept & Trend	p-value
OOPpc	53.28	0.00	48.18	0.00	60.35	0.00	50.86	0.00
GDPpc	44.74	0.00	19.98	0.13	68.89	0.00	85.79	0.00
RMpc	26.48	0.02	13.61	0.48	80.96	0.00	101.44	0.00
CPI	19.25	0.16	36.94	0.00	115.34	0.00	95.21	0.00
Pop65+	8.95	0.83	4.42	0.99	7.08	0.93	2.29	1.00
MYS	8.28	0.87	9.50	0.80	32.83	0.00	40.96	0.00
D-GGHE	11.27	0.66	29.10	0.01	92.32	0.00	69.40	0.00

Source: Authors' calculation

All four panel unit root tests viz; Levin, Lin, and Chu (2002), Im, Pesaran, and Shin (2003), Augmented Dickey–Fuller (ADF) and PP - Fisher Chi-square are employed on each selected variable without trend and with trend. Based on the empirical test result, it can be concluded that some variables are stationary in their level and others are stationary after first difference. Therefore, they can be included in the panel data analysis model.

Descriptive Statistics

Table 6 depicts the key descriptive statistics of the included variables in the model for the selected SAARC countries covering the study period 2006 to 2021. Table 6 clearly reveals that mean and standard deviation of per capita OOP payments for healthcare of selected SAARC countries, are USD 52.65 and USD 62.81 respectively. Here, mean per capita OOP is less than standard deviation meaning that there is great variation in OOP payments for healthcare amongst the select countries. Similarly, Maldives has highest average OOP USD 196.90 and India has lowest average with USD 15.19. Likewise, mean and standard deviation of per capita GDP are USD 2723.2 and USD 2572.1 respectively. Maldives has highest per capita GDP with USD 8274.4 and Nepal has lowest with USD 783.89. In overall, mean and standard deviation for remittance inflow per capita are USD 496.30 and USD 497.63. Per capita remittance inflow for Maldives is highest and Nepal has lowest with USD 1231.2 and USD 72.91 respectively. In overall, mean and standard deviation of CPI are 6.8 per cent and 3.69 per cent respectively, while Pakistan has highest 9.01 per cent and Maldives has lowest 4.18 percent. In overall, mean and standard deviation of population percentage with age 65 years and above are 5.45 per cent and 1.61 per cent respectively, while Sri Lanka has highest 8.77 per cent and Pakistan has lowest 3.87 percent. Furthermore, in overall, mean and standard deviation of mean years of schooling (MYS)are 5.68 years and 2.3 years respectively, while Sri Lanka has highest 10.42 years and Pakistan has lowest 3.29 years. Finally, in overall per capita domestic general government health expenditure (D-GGHE) for the selected countries are USD 89.07 and USD 171.2 where standard deviation is greater than mean implying that there is great variation. Maldives has highest figure USD 467.11 and Bangladesh has lowest figure USD 5.88 (Table 6).

Table 6. Descriptive Statistics of the variables included in the model

Variables	Overall	Bangladesh	Bhutan	India	Sri Lanka	Maldives	Nepal	Pakistan
	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD	Mean SD
OOPpc (in USD)	52.65	20.92	15.19	30.87	60.73	196.90	21.16	20.07
	62.81	9.53	4.8	5.29	14.89	36.86	8.23	3.17
GDPpc (in USD)	2723.2	1200.5	2588.5	1489.8	3302.5	8274.4	783.89	1269.4
	2572.1	599.67	714.26	390.19	1004	1888.3	280	224
RMpc (in USD)	496.3	275.93	836.71	185.82	723.71	1231.2	72.91	126.77
	497.63	123.86	292.82	59.19	275.23	643.54	25.01	27.78
CPI	6.8	6.98	6.12	7.06	7.3	4.18	7.37	9.01
	3.69	1.74	2.45	2.74	5.25	4.11	2.64	4.42
Pop65+	5.45	4.75	5.49	5.52	8.77	4.38	5.17	3.87

	1.61	0.44	0.44	0.6	1.33	0.19	0.62	0.2
MYS	5.68	5.62	3.29	5.72	10.42	5.68	4.09	4.74
	2.3	0.77	1.17	0.75	0.24	1.48	0.72	0.3
D-GGHE (in USD)	89.07	5.88	64.76	13.87	54.67	467.11	7.67	8.06
	171.2	2.42	21.86	4.69	13.82	185.97	4.14	3.74

Notes: SD, standard deviation; OOPpc, Out-of-pocket percent payments for health; GDPpc, Gross, Domestic Product per capita; RMpc, Remittance inflow per capita; D-GGHE, Domestic General Government Health Expenditure per capita; CPI, Consumer Price Index; Pop65+, Percentage of population with age 65 years and above; MYS denotes, Mean Years of Schooling (Source: World Development Indicators (WDI) (further calculation by authors))

Appropriate Model Section Test

The standard tests for model selection such as Chow test, Hausman test, and Bruesch Pegan Test was done. Chow test is a test of hypothesis to select either Common Effect (CE) or Fixed Effect (FE) model. This test is most appropriately used in estimating panel data. If null hypothesis (H_0) is not rejected, then we select CE ($p > .05$) and if alternative hypothesis (H_1) is selected we select FE ($p < .05$). The Chow test result is given in Table 3 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies fixed effect model is appropriate (Table 7). Similarly, Hausman test is a statistical test to select either Fixed Effect(FE) or Random Effect(RE) model. If null hypothesis (H_0) is not rejected, then we select RE ($p > .05$) and If alternative hypothesis (H_1) is selected we select FE ($p < .05$). The Hausman test result is given in Table 4 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies fixed effect model is appropriate. Essentially, Bruesch Pegan Test or Test Lagrange Multiplier (LM) is a statistical test to select either Common Effect(CE) model or Random Effect(RE) model. If null hypothesis (H_0) is not rejected, then we select CE ($p > .05$) model and if alternative hypothesis (H_1) is selected we select RE ($p < .05$) model. The Bruesch Pegan test result is given in Table 7 that clearly shows the rejection of null hypothesis and selection alternative hypothesis. This implies random effect (RE)model is appropriate (Table 7).

Table 7. Test for selection of appropriate model

Test	Test Statistics	P value	Selected Model/ Conclusion
Model Selection Test			
Chow Test	Cross-section F=63.30		Fixed Effect Model
	Cross-section χ^2=176.53	0.00	Fixed Effect Model
Hausman Test	χ^2= 379.78	0.00	Fixed Effect Model
Bruesch Pegan Tests			
Breusch-Pagan LM	66.468	0.00	Random Effect Model
Pesaran scaled LM	7.016	0.00	
Pesaran CD	2.303	0.02	

Source: Authors' calculation

Estimated Result of Panel Regression Model

The estimated result presented in Table 7 clearly shows the appropriateness of panel data model. It is evident from Table 7 that the appropriate panel model is Fixed effect model based on the Chow test and Hausman test. But, Breusch-pegan test result suggest the random effect model as a robust model. Therefore, estimated result of both model is reported hereunder.

Estimated Result of Fixed Effect Model

The Chow test and Hausman test result presented in Table 7 suggests the Fixed effect model is appropriate. Based on this, estimated result of fixed effect model is presented in Table 8 below. The estimated result shows that coefficients of all the explanatory variables other remittance per capita, mean years of schooling, domestic general government health expenditure are statistically significant. In other words, the explanatory variables GDP per capita(GDPpc), percentage of population with age 65 years and above significant at 1 per cent ($p < .01$) and consumer price index(CPI) are significant at 5 per cent ($p < .05$). But, coefficients for other variables are statistically insignificant. Although the coefficient for remaining all coefficients variables other than remittance per capita bear expected sign consistent with the economic theory. But, unexpectedly the coefficients of the explanatory remittance inflow per capita bears negative sign which is inconsistent with underlying theory. Similarly, the value of coefficient of variation is 0.981 which implies that the explanatory variables included in the model explains more than 98 per cent variation in the dependent variable (Table 8).

Table 8. Fixed Effect Model output in selected SAARC countries in 2006–2021

Dependent variable: Out-of-pocket payments for health per capita USD				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnGDPpc	1.08	0.18	6.14	0.00
lnRMpc	-0.15	0.13	-1.17	0.24
lnCPI	0.09	0.03	2.72	0.01
lnPop65+	1.20	0.41	2.96	0.00
lnMYS	0.00	0.14	0.01	0.99
lnD-GGHE	0.15	0.11	1.34	0.18
Constant	-6.47	0.88	-7.37	0.00
R-squared	0.981			
Adjusted R-squared	0.975			
F-statistic	162.323			
Prob(F-statistic)	0.000			

Source: Authors' calculation

Estimated Result of Random Effect Model

The Breusch-pegan test result suggest the random effect model as a robust model. Based on this, estimated result of random effect model is presented in Table 9 below. Unlike fixed effect model, the estimated result of random effect model shows that coefficients of all the explanatory variables are statistically significant. In other words, the coefficients of the explanatory variables GDP per capita, remittance inflow per capita, mean years of schooling is significant and domestic general government health expenditure are significant at 1 per cent ($p < .01$). Likewise, consumer price index and percentage of population with age 65 years and above, at 5 per cent ($p < .05$). But, unexpectedly the coefficients of the explanatory variables such as remittance per capita and population percentage with age 65 years and above bears negative sign which are inconsistent with underlying theory. But all the remaining coefficients belonging to respective variables bear expected sign consistent with the economic theory. Similarly, the value of coefficient of variation is 0.879 which implies that the explanatory variables included in the model explains more than 87 per cent variation in the dependent variable (Table 9).

Table 9. *Random Effect Model outputs in selected SAARC countries during 2006–2021*

Dependent variable: Out-of-pocket payments for health per capita USD				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnGDPpc	1.47	0.09	17.25	0.00
lnRMpc	-0.72	0.04	-19.78	0.00
lnCPI	0.06	0.02	2.52	0.01
lnPop65+	-0.18	0.08	-2.17	0.03
lnMYS	0.64	0.06	10.64	0.00
lnD-GGHE	0.12	0.04	3.43	0.00
Constant	-4.79	0.44	-10.91	0.00
R-squared	0.879			
Adjusted R-squared	0.872			
F-statistic	127.546			
Prob(F-statistic)	0.000			

Source: Authors' calculation

Conclusion and Recommendations

The study employed panel data analysis to explore the macroeconomic, demographic and social factors influencing OOP payments for healthcare these countries. The model selection tests (Chow, Hausman, and Breusch-Pagan) suggest that the fixed effect model is the most appropriate for the data, though the random effect model also provides valuable insights. The analysis concludes that macroeconomic factors such as GDP per capita, consumer price index (CPI), and the percentage of the population aged 65 and above significantly influence OOP healthcare payments in SAARC countries. The findings indicated the need for comprehensive healthcare reforms in SAARC countries, focusing on macroeconomic factors like income levels and inflation to improve healthcare accessibility and affordability for their populations. However, the impact of remittance inflows and mean years of schooling on OOP payments remains inconclusive and sometimes contradictory to economic theory. These results and conclusion provides valuable insights for policy implication. Firstly, policymakers of the countries of this regions should optimize remittance use, support aging population, and stabilizes prices to alleviate the financial burden of healthcare on individuals. Secondly, governments of SAARC countries need to increase public investment in health systems and reduce reliance on OOP payments for healthcare to improve healthcare access and affordability.

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Conflict of Interest

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References

1. Adams, R. H., Jr (2011). Evaluating the economic impact of international remittances on developing countries using household surveys: A literature review. Journal of Development Studies, 47, 809–828. https://doi.org/10.1080/002 20388.2011.563299.
2. Ahangar, A., Ahmadi, A. M., Mozayani, A. H. M., & Dizaji, S. F. (2018). Why are risk-pooling and risk-sharing arrangements necessary for financing healthcare and improving health outcomes in low and lower middle-income countries. *Health*, *10*(1), 122-131.
3. Antonakis, J., Bastardoz, N., & Rönkkö, M. (2021). On ignoring the random effects assumption in multilevel models: Review, critique, and recommendations. *Organizational Research Methods*, *24*(2), 443-483.
4. Asante, A., Price, J., Hayen, A., Jan, S., & Wiseman, V. (2016). Equity in health care financing in low-and middle-income countries: a systematic review of evidence from studies using benefit and financing incidence analyses. *PloS one*, *11*(4), e0152866.
5. Baltagi, B. H. (2013). Econometrics of Panel Data. Chichester.
    a. Beck, N. (2001). Time-series–cross-section data: What have we learned in the past few years? *Annual review of political science*, *4*(1), 271-293.
6. Berloffa, G., & Giunti, S. (2019). Remittances and healthcare expenditure: Human capital investment or responses to shocks? Evidence from Peru. *Review of Development Economics*, *23*(4), 1540-1561.
7. Bhattarai, K., & Budd, D. (2019). Effects of rapid urbanization on the quality of life. *Multidimensional Approach to Quality of Life Issues: A Spatial Analysis*, 327-341.
8. Bliese, P. D., Schepker, D. J., Essman, S. M., & Ployhart, R. E. (2020). Bridging methodological divides between macro-and microresearch: Endogeneity and methods for panel data. *Journal of Management*, *46*(1), 70-99.
9. Chaudhuri, A., & Roy, K. (2008). Changes in out-of-pocket payments for healthcare in Vietnam and its impact on equity in payments, 1992–2002. *Health Policy*, *88*(1), 38-48.
10. Clemente, J., Marcuello, C., Montañés, A., & Pueyo, F. (2004). On the international stability of health care expenditure functions: are government and private functions similar? *Journal of health economics*, *23*(3), 589-613.
11. Diaz-Castro, L., Cabello-Rangel, H., Pineda-Antúnez, C., & de León, A. P. (2021). Incidence of catastrophic healthcare expenditure and its main determinants in Mexican households caring for a person with a mental disorder. *Global Mental Health*, *8*, e2.
12. Ebaidalla, E. M., & Ali, M. E. M. (2021). Explaining Out-of-Pocket Health care Expenditure in Sub-Saharan Africa: Evidence from Panel Data Analysis. *Journal of Economic Cooperation & Development*, *42*(1), 1-24.
13. Epskamp, S. (2020). Psychometric network models from time-series and panel data. *Psychometrika*, *85*(1), 206-231.
14. Eze, P., Lawani, L. O., Agu, U. J., Amara, L. U., Okorie, C. A., & Acharya, Y. (2022). Factors associated with catastrophic health expenditure in sub-Saharan Africa: A systematic review. *Plos one*, *17*(10), e0276266.
15. Fan, V. Y., & Savedoff, W. D. (2014). The health financing transition: a conceptual framework and empirical evidence. *Social science & medicine*, *105*, 112-121.
16. García-Díaz, R., Sosa-Rubi, S. G., Serván-Mori, E., & Nigenda, G. (2018). Welfare effects of health insurance in Mexico: The case of Seguro Popular de Salud. *PLoS One*, *13*(7), e0199876.
17. Grigorakis, N., Floros, C., Tsangari, H., & Tsoukatos, E. (2018). Macroeconomic and financing determinants of out of pocket payments in health care: Evidence from selected

OECD countries. *Journal of Policy Modeling*, *40*(6), 1290-1312. https://doi.org/10.1016/j.jpolmod.2018.02.006
18. Guida, C., & Carpentieri, G. (2021). Quality of life in the urban environment and primary health services for the elderly during the Covid-19 pandemic: An application to the city of Milan (Italy). *Cities*, *110*, 103038.
19. Gujarati, D. N. (2021). *Essentials of econometrics*. Sage Publications.
20. Habib, Nawaz, Khan., Muhammad, Arshad, Khan., Radzuan, B., Razli., Afz'a, Binti, Sahfie., Gulap, Shehzada., Katrina, Lane, Krebs., Nasrin, Sarvghad. (2016). Health Care Expenditure and Economic Growth in SAARC Countries (1995–2012): A Panel Causality Analysis. Applied Research in Quality of Life, 11(3):639-661. doi: 10.1007/S11482-015-9385-Z
21. Hsiao, C. (2022). *Analysis of panel data* (No. 64). Cambridge university press.
22. Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of econometrics*, *115*(1), 53-74.
23. Kanmiki, E. W., Bawah, A. A., Phillips, J. F., Awoonor-Williams, J. K., Kachur, S. P., Asuming, P. O., ... & Akazili, J. (2019). Out-of-pocket payment for primary healthcare in the era of national health insurance: evidence from northern Ghana. *PloS one*, *14*(8), e0221146.
24. Kumar, A. S., Chen, L. C., Choudhury, M., Ganju, S., Mahajan, V., Sinha, A., & Sen, A. (2011). Financing health care for all: challenges and opportunities. *The Lancet*, *377*(9766), 668-679.
25. Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of econometrics*, *108*(1), 1-24.
26. Lorenzoni, L., Marino, A., Morgan, D., & James, C. (2019). Health Spending Projections to 2030: New results based on a revised OECD methodology.
27. Mbau, R., Musiega, A., Nyawira, L., Tsofa, B., Mulwa, A., Molyneux, S., ... & Barasa, E. (2023). Analysing the efficiency of health systems: a systematic review of the literature. *Applied health economics and health policy*, *21*(2), 205-224.
28. Meng, Q., Xu, L., Zhang, Y., Qian, J., Cai, M., Xin, Y., ... & Barber, S. L. (2012). Trends in access to health services and financial protection in China between 2003 and 2011: a cross-sectional study. *The Lancet*, *379*(9818), 805-814.
29. Mohapatra, S. (2022). Health Expenditures, Health Infrastructure and Health Status in SAARC Countries: A Panel Data Analysis. *Vikalpa*, *47*(3), 205-216.
30. Mossialos, E., Dixon, A., Figueras, J., Kutzin, J., & World Health Organization. (2002). *Funding health care: options for Europe* (No. WHO/EURO: 2002-617-40352-54036). World Health Organization. Regional Office for Europe.
31. Musgrove, P., Zeramdini, R., & Carrin, G. (2002). Basic patterns in national health expenditure. *Bulletin of the World Health Organization*, *80*, 134-146.
32. O'Donnell, O. (2019). Financial protection against medical expense. *Tinbergen Institute Discussion Papers*, *10*.
33. Paris, V., Devaux, M., & Wei, L. (2010). Health systems institutional characteristics: a survey of 29 OECD countries.
34. Radmehr, M., & Adebayo, T. S. (2022). Does health expenditure matter for life expectancy in Mediterranean countries? *Environmental Science and Pollution Research*, *29*(40), 60314-60326.
35. Rahman, A., & Tiwari, N. (2021). *Development, Governance and Gender in South Asia*. Springer Singapore.

36. Rahman, M. M., Khanam, R., & Rahman, M. (2018). Health care expenditure and health outcome nexus: new evidence from the SAARC-ASEAN region. *Globalization and health*, *14*(1), 1-11.
37. Shaikh, I., & Singh, S. (2017). On the examination of out-of-pocket health expenditures in India, Pakistan, Sri Lanka, Maldives, Bhutan, Bangladesh and Nepal. *Business: Theory and Practice*, *18*, 25.
38. Sirag, A., & Mohamed Nor, N. (2021, May). Out-of-pocket health expenditure and poverty: evidence from a dynamic panel threshold analysis. In *Healthcare* (Vol. 9, No. 5, p. 536). MDPI.
39. Sriram, S. (2019). *Health Insurance Program for the Poor, Out-Of-Pocket Costs, and Catastrophic Health Expenditures in India* (Doctoral dissertation, University of South Carolina).
40. Subedi, K.R.(2016). Impact evaluation of remittance in Nepal: A case study of Kailali District. *The Journal of University Grants Commission of Nepal*, 5(4), 17-34. DOI: 10.5281/zenodo.5895270
41. Thomson, S., Cylus, J., & Evetovits, T. (2019). *Can people afford to pay for health care? New evidence on financial protection in Europe*. World Health Organization. Regional Office for Europe.
42. Tzenios, N. (2019). The Determinants of Access to Healthcare: A Review of Individual, Structural, and Systemic Factors. *Journal of Humanities and Applied Science Research*, *2*(1), 1-14.
43. Wagstaff, A., Flores, G., Smitz, M. F., Hsu, J., Chepynoga, K., & Eozenou, P. (2018). Progress on impoverishing health spending in 122 countries: a retrospective observational study. *The Lancet Global Health*, *6*(2), e180-e192.
44. Wang, J., Zhu, H., Liu, H., Wu, K., Zhang, X., Zhao, M., ... & Shan, L. (2020). Can the reform of integrating health insurance reduce inequity in catastrophic health expenditure? Evidence from China. *International Journal for Equity in Health*, *19*, 1-15. 10.1186/s12939-020-1145-5
45. Welfens, P. J. (2020). Macroeconomic and health care aspects of the coronavirus epidemic: EU, US and global perspectives. *International Economics and Economic Policy*, *17*, 295-362.
46. White-Williams, C., Rossi, L. P., Bittner, V. A., Driscoll, A., Durant, R. W., Granger, B. B., ... & American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; and Council on Epidemiology and Prevention. (2020). Addressing social determinants of health in the care of patients with heart failure: a scientific statement from the American Heart Association. *Circulation*, *141*(22), e841-e863.
47. World Health Organization. (2016). Global strategy on human resources for health: workforce 2030.
48. Yang, B., & Usman, M. (2021). Do industrialization, economic growth and globalization processes influence the ecological footprint and healthcare expenditures? Fresh insights based on the STIRPAT model for countries with the highest healthcare expenditures. *Sustainable Production and Consumption*, *28*, 893-910.