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INFLATION AND MORTALITY NEXUS: EMPIRICAL EVIDENCE FROM SOUTH ASIAN COUNTRIES

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ABSTRACT

Higher inflation decreases the purchasing power, food and non-food expenditures, insufficient health care expenditure, increases poverty rate, and decline the expenditures on other basic necessities. Lower expenditures on basic necessities causes the poor nutritious/healthy diet leading to early deaths and increases chances of mortality. This research aims to analyze the effect of inflation rate on mortality in South Asian countries (like Bangladesh, Bhutan, India, Nepal, Pakistan and Sri Lanka). Further, to identify the effectiveness of macroeconomic determinants of mortality rate in selected countries. For empirical analysis, the data from 1972 to 2018 were collected from world development indicators (WDI), Penn world table, and UN comtrade for the selected countries. The dynamic panel model using the Generalized Method of Moments (GMM) developed by Arellano & Bond (1991) is estimated. The empirical results showed that the rate of inflation, CO_2 emissions, population growth, and life expectancy rates have positive and significant impact on mortality rate. Also, higher inflation causes reduction in the overall consumption of necessities expenditures on health thus further exacerbating the mortality rate. Moreover, GDP per capita, employment, human capital, and government health expenditure significantly negatively impact the mortality rate. It is suggested that institutions are required to maintain price stability through effective monetary and fiscal policies to safeguard household consumption of essential goods and health services, thereby reducing inflation-induced mortality. The government is required to enhance the public sector expenditures in the health sector for equitable access to quality healthcare. Further, the government in selected countries should promote such programs to reduce CO_2 emission and population growth.

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INTRODUCTION

Higher inflation rate reduces the real value of money, which lowers personal disposable income and purchasing power, decreases the value of pensions, savings and treasury notes. Reduction in purchasing power creates difficulty in obtaining food and non-food items, lowering the health expenditures. The lower expenditures on food items is a foundation of poor intake of nutritious diet, poor living standard and health expenditures, which creates the problem of malnutrition, unhealthy and poor quality of life leading to high mortality (Summers et al., 2016; Stefler et al., 2021; Jayanama et al., 2021; Baltas et al., 2022). The existing studies channelized poor nutrition into four subcategories such as underweight, stunting, wasting, and deficiencies in vitamins and minerals **(**Abbuy 2018; Ensor et al., 2010). Researchers concluded that poor diet has great impact on health and individuals can get chronic diseases like cancer, cardiovascular conditions (heart disease and stroke), diabetes, osteoporosis, dental issues and obesity (Ali & Audi 2016; Nasreen et al., 2012; Preston 2017; Sharma 2018; Szwarcwald et al., 2016).

Increasing prices on one hand encourage producers to reap higher profit but on the other hand it could dishearten the consumers not only to reduce spending on luxury goods but also on necessities. Reducing the expenditures on necessary consumable items creates the problem of malnutrition, unhealthy and poor quality of life leading to high mortality (Summers et al., 2016; Bourne et al., 2014). In developing countries, mortality is high because of low access to necessities, increase in prices, high rate of absolute poverty, income inequality, increased environmental degradation, poorer health infrastructure, and deficiency of per-person food consumption. The common problems of developing countries are instability, low per capita income, high unemployment, underutilization of resources, high population growth, high inflation rate, poorer life expectancy rate with a high mortality rate (Abbuy, 2018; Bourne, 2012). The major share of the population in developing countries is engaged in the agriculture sector. Having fewer income resources, destitute access to necessities and poor health facilities creates economic and social difficulties. In most developing countries, food prices grow more than the other baskets of goods. High food poverty caused by general inflation disproportionately affects the poor's health (Ozgur et al., 2012; Haberman & Russolillo, 2005).

As per the Millennium Development Goals (MDGs) report in 2015, every year two-thirds of deaths comprise of those who age below five years. In South Asia, over 1.8 million kids die every year, around 6 million children die globally which means almost 30 percent belong to South Asia (Lee et al., 2016; Ozgur et al., 2012). The major cause of mortality in South Asia could be less equitable resource allocation.

When consumer goods' prices increase it also implies that more funds are required to stay alive and enjoy the same level of stand of living. Further, Lee et al., (2016) and Bourne et al. (2014) emphasized that well skilled and trained human capital, healthy lifestyles, and stable rate of inflation could help in reducing the mortality rates.

The mortality rate has been declining for almost all ages groups, and life expectancy improving in both male and female. It has been found that there is a negative correlation between economic growth infant mortality and vice versa (Bourne, 2012). Health concerns vary during the recessions and expansions of economic activities, as the economy grows there are more income generations and employment opportunities, people have extra income available to spend on health and food items (Ecevit, 2013). In South Asia (particularly India, Pakistan, Bangladesh, Sri Lanka, Nepal and Maldives) exposure to inflation in various types of baskets of goods due to imbalance in the demand and supply factors could have consequences for the malnutrition and crude death rate (Kidane, & Woldemichael, 2020).

Historically, the mortality rates can be high where the population growth is fast leading to resource deficiency and availability of livelihoods. Imbalance in resources allocations and income distribution in developing countries are the leading causes of mortality. Some of the existing studies found that inflation raises income inequality not only in developing countries but also in developed countries (Nasreen et al., 2012; Ali & Audi, 2016; Szwarcwald et al., 2016). In developing countries, food inflation is higher than general inflation and rapidly grows at a higher rate compared to real economic growth. Additionally, consumer's welfare is better off having access to various types of commodities at reasonable prices. In contrast, producers grow a commodity bundle that fetches them better prices to attain maximum profit. However, a higher inflation rate reduces the real income thus sometimes even the necessities become unaffordable. In this context, stability in monetary policy becomes very important to control the money supply for controlling the inflation rate (Kidane & Woldemichael, 2020, Brown et al., 2000, Nasreen et al., 2012). The improvements in the life expectancy and mortality have been investigated in developed countries by Lee & Carter (1992); Tuljapurkar, (2000) and Haberman & Russolillo (2005) and concluded that such phenomena have been attributed to better lifestyles, better provisions of healthcare facilities (Shaw et al., 2005), social improvements and financial development (Chen & Ching, 2000).

There is rich literature available on lower level of life expectancy, high mortality rate such as Ali & Audi (2016); Nasreen et al. (2012), Preston (2017), Sharma (2018), Kim & Garcia (2010), Szwarcwald et al. (2016), and Ensor et al. (2010). Inflations may lead to unaffordability of the basic necessities of life resulting in endemic poverty and mortality. Mortality rates in the selected South Asian economies have been alarming and one major reason for such high rates could be inflation. The existing studies

mainly focused on factors affecting the life expectancy and mortality rate (Darby et al., 2007; Blinova et al., 2020; Singh et al., 2022). The research is missing on inflation impact on mortality rate in South Asian countries. In sufficient, literature is available on macroeconomic determinants of mortality rate in South Asian countries. However, this research focuses on studying the nexus between the inflation rate and mortality rate in South Asian countries while controlling for the other macroeconomic determinants. There seems that fresh evidence is needed to look at this nexus as the COVID-19 has further made the imbalance between demand and supply and many countries are witnessing the high inflation rates especially in countries like Pakistan.

LITERATURE REVIEW

The obtained research has different views on the effectiveness of macroeconomic determinants of life expectancy and mortality rate both in developed and developing countries. As Bourne et al. (2014) and Salatin & Jaragdashti (2016) in two different studies found that inflation and life expectancy have a negative association while inflation has a positive association with the mortality rate in middle-income countries. Hyperinflation positively affects the mortality rate, which raises mortality in developing countries (Paxson & Schady, 2005). In addition, unemployment has a very strong effect on inflation and mortality rate. Further, inflation rate has a negative impact on life expectancy. Further, Ensor et al., (2010) revealed a strong negative correlation between mortality rate and GDP per capita. Increase in GDP per capita reduced the level of mortality in developing countries. The economic instability creates the problem of a higher mortality rate. Bourne (2012) concludes that higher inflation leads to a decline in real wages and amplifying the mortality rate. Unequal income distributed countries are at high risk of mortality, and the mortality rate is risen due to asymmetric resource allocation (Croix & Sommacal, 2009). Granados (2005) argued that mortality rate is elevated because of high population and unemployment rate. Population pressure and high unemployment rate directly affect the necessities and health expenditure, leading to a rise in mortality. The poverty rate has a significantly negative correlation with life expectancy in developing countries; as the poverty rate increases, life expectancy reduces.

Similarly, Sharma (2018) highlights that healthy work force encourages economic growth, and vice versa as rising in real income promotes the health standards and reduces mortality. Croix and Sommacal (2009) argued that in England's budget the allocation for health played a vistal role in promoting a healthy life and life expectancy, through which mortality rate reduced. Abbuy (2018) concluded that public health expenditure plays a positive role in reducing infant mortality rate while increase in GDP per capita was vital in infant mortality reduction. Somayeh et al. (2014) argued that economic growth is a deterministic factor for improving health

status. In developing countries, economic growth can play a huge role to sustain healthy life. Baird et al. (2011) found that GDP per capita has a significant impact on mortality reduction and improves the living standard in developing countries. Adjuik et al. (2006) found out the mortality rate is affected by income inequality and health expenditures. Furthermore, income inequality is negatively associated with life expectancy and a better living standard.

Study suggested that food insecurity, environmental deprivation, and inflation rate negatively impact health outcomes in the region, while institutional quality provide the moderate effects (Azimi & Rahman, 2024). Further, studies have confirmed a significant connection between inflation, food insecurity and increased mortality risk. A study found that severely food insecure adults had 95.3 percent higher mortality rates compared to food secure individuals (Gundersen et al., 2016). Additionally, severely food insecure adults had 2.60 times higher chances of death than food secure individuals (Gundersen et al., 2018). In the United States, food insecure individuals showed 49 percent higher odds of mortality after adjusting for demographics, though this relationship lost significance when accounting for lifestyle factors (Walker et al., 2019). The study reported that food insecure individuals had 1.46 times higher risk of mortality, and 1.75 times higher risk of cardiovascular mortality compared to food secure individuals, even after adjusting for multiple demographic and health risk factors (Banerjee et al., 2020).

Income inequality and environmental degradation have a negative impact on life expectancy and mortality rate. However, globalization has a significantly positive impact on life expectancy (Owen & Wu, 2007). Surprisingly, Bussmann (2009) argued that female life expectancy is not affected because of globalization. Brainerd (2001) and Jaba et al. (2014) argued that employment level and economic stability play a positive role in improving the living standard. Furthermore, population growth positively impacts the mortality rate as the population grows; the mortality rate will also increase. Ecevit (2013) found that life expectancy is the fundamental determinant of economic growth in OECD countries. Nutrition and food availability and health expenditures are the main factors for improving longevity, whereas smoking seems to be causing high mortality (Halicioglu, 2011). In addition, Coelho et al. (2010) concluded that population growth creates imbalance in resource allocation and thus enhances mortality rate.

RESEARCH METHODS

Theoretical Framework

The correlation between inflation and mortality is complex, as rising prices directly affect consumer's affordability for basic necessities. Specifically, inflation reduces the purchasing power of households, making it difficult for lower income and middle-income families to attain adequate nutrition, clean water, and healthcare

services. Those are essential for survival. In the long run, this corrosion in affordability can lead to malnutrition in the human body, increased vulnerability to diseases which higher the mortality rate. Consequently, controlling inflation is not only an economic imperative but also critical for public health. So, inflation is a macroeconomic factor that affects mortality through several interrelated channels, predominantly in the distinctive socioeconomic context of South Asian countries.

Theory of Purchasing Power and Household Consumption: Purchasing power and household theory are directly linked with each other; inflation erodes the purchasing power of money (Terborgh, 1926). In South Asian countries, a significant portion of the population is low-income, and their consumption basket is heavily weighted towards essential goods like food and basic utilities. When the prices of these necessities rise rapidly due to inflation, these households must either reduce their consumption or divert funds from other critical areas (Nelson & Consoli, 2010). Additionally, the Malthusian Trap shown that higher food inflation can push food consumption below a minimum required caloric intake, leading to malnutrition (Malthus, & Robert, 1807). While the malnutrition is a primary cause of mortality in South Asian Countries.

Income Redistribution Theory: Inflation does not affect all segments of the population equally. The individuals on fixed wages, pensions, or government support are the most severely affected. Due to inflation the real income declines with every percentage point, making households progressively poorer. This can force them into a vicious cycle of poverty and poor health outcomes (Cooper, 1998). Similarly, healthcare cost theory shows that higher rate of inflation in the healthcare sector leads to reduce the household health expenditure. The input cost of medical supplies, medical equipment, imported pharmaceuticals, and healthcare wages all rise. This increases the cost of providing healthcare services which raises the cost push inflation. Furthermore, the Stress and Mental Health theory indicated that economic hardship and uncertainty are fundamental sources of chronic stress, which creates anxiety and depression. Continuing worry about rising prices, food security and the ability to afford healthcare can lead to an increase in depression, anxiety and other mental health issues (Moore & Cooper, 1996).

The *vicious cycle of poverty* integrated the above theories that develop the narrative of this research about the role of inflation in mortality rate. The higher inflation will reduce the purchasing power that reduces food security and healthcare access (Sarmah, 2022). Increasing prices leads to a reduction in the health budget and deterioration of public health services. Such factors collectively lead to a decline in public health status and an increase in mortality rates.

Data and Data Sources

This research used data (1972 - 2018) for the sample of the South Asian countries namely Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka to estimate the nexus between inflation and mortality. The data were collected from the World

Development Indicator (WDI) of the World Bank, Pane World Table, Un-Comtrade and Barro and Lee data table.

Empirical Framework

Mortality rates in the selected Asian economies have been alarming and one major reason for such high rates could be inflation. Inflation causes real income of people to fall and thus a major portion of the population struggle to meet the nutritional needs met. Further, if a certain health calamity befalls a family, it is harder to meet any health-related expenditures and thus higher mortalities. Salatin and Noorpoor (2016) and Abbuy (2018) worked on the role of government health expenditure and urbanization on life expectancy and mortality rate by utilizing dynamic estimation techniques. These studies argued that government health consumption and urbanization have a significant positive impact on the life expectancy rate with a negative impact on the mortality rate in selected countries. Inflation rate has a positive effect on the mortality rate and especially middle- and low-income groups are affected proportionally more (Ali & Audi 2016; Nasreen et al., 2012; Preston 2017; Sharma 2018; Kim & Garcia 2010; Szwarcwald et al., 2016; Abbuy 2018; Ensor et al., 2010).

To capture the effect of inflation rate on mortality, this study used the dynamic panel model based on studies of Granados (2005); Croix & Sommacal (2009); Bourne (2012); Sharma (2018); and Abbuy (2018) which is given as follows:

$$\mathrm{Mor_{it}} = \mathrm{B_0} + +\mathrm{B_1INF_{it}} + \mathrm{B_2GHE_{it}} + \beta_3 HHC_{\mathrm{it}} + \mathrm{B_4}LE_{\mathrm{it}} + \mathrm{B_5X_{it}} + \varepsilon_{\mathrm{it}} + \mu_{\mathrm{t}} + \tau_{\mathrm{i}}$$

To examine the empirical relationship, this research employs a dynamic panel model drawing on methodologies from Granados (2005), Croix and Sommacal (2009), Bourne (2012), Sharma (2018), and Abbuy (2018). The dependent variable is the mortality rate (MOR_{it}), operationalized as the number of deaths per 1,000 individuals in a specified country. The fundamental explanatory variable is inflation rate (INF_{it}) is measured as the annual percentage change in the food prices through Consumer Price Index (CPI). Government Health Expenditures (GHE_{it}) represent the total government spending on the health sector as a percentage of GDP. Household Consumption (HHC_{it}) is captured through household final household expenditure percentage of GDP, reflecting the economic capacity of households to meet essential needs. Life Expectancy (LE_{it}) is measured in years and serves as an indicator of population health and longevity. This research also adopted vector of control variables including GDP per capita ($GDPP_{it}$) which is measured as a constant US dollars, Population Growth (POP_{it}) is measured as an annual percentage increase in total population, Employment Rate (EMP_{it}) demonstrated as a percentage of the working age population that is employed and Net Carbon Emissions (CO_2E_{it}) that is measured in metric tons per capita, serving as a proxy for environmental quality and its potential health implications.

Estimation Techniques

Due to the nature of the data, this research uses panel data estimation techniques. However, the Pool OLS estimates are not efficient because the results of diagnostic tests (Breusch-Pagan test for heteroscedasticity and serial correlation) cannot be accepted for all specifications which indicate that intercept values do not remain the same across cross-sections (the results of Pool OLS and Breusch Pagan (1979) test are presented Appendix A). The results of Pool OLS and Breusch Pagan test directed us for fixed effect and random effect test. The fixed effect and random effect are used to make an alternative decision among cross-section and time series. For heteroskedasticity and serial correlation, we used robust error coefficients. The Housman test is used to choose between fixed effect and random effect. The null hypothesis of the Housman test is "*Random effect model is appropriate/sufficient estimate*". The robust method takes care of serial correlation. Further, we implemented the Housman (1978) test for comparing Random and Fixed effects (As the results of fixed effect, random effect and Hausman test are given in Appendix B & C). The Housman test resulted in the rejection of the null hypothesis of "*Random effect model is appropriate/sufficient estimate*" and thus we use the fixed effect model.
We use the Generalized Method of Moments (GMM) method developed by Arellano & Bond (1991) for the estimation. The dynamic panel models offer advantages over static models as GMM estimates the dynamic model with restrictions that are consistent with theory. There is no need for any additional assumptions to reflect the basis of the model. Secondly, serial correlation in panel data, which is quite common, is resolved too as GMM is efficient despite supplementary moment's condition. Finally, analysis through GMM resolves the unobserved estimates through differencing of the regression as well as through instruments.

RESULTS AND DISCUSSION

Descriptive Analysis

The main objective of this research is to investigate the impact of the prices of necessary goods on mortality rate in developing countries. For empirical analysis, the Consumer Price Index (CPI_{it}) is taken as a proxy for inflation (INF_{it}). Table 1 shows the result of the summary statistic of the variables used for analysis, expressed variables are in logarithmic forms to normalize and reduction of heteroscedasticity. The observation column shows that sufficient numbers of observation are available against all respected variables for final analysis. The maximum level of logarithmic MOR_{it} in the selected sample is 5.13, and the minimum is 2.01, where the mean value of 4.11 and standard deviation of 0.74 which indicates the moderate variation in mortality rate. Similarly, the maximum level of logarithmic of the CPI_{it} is 4.38 and minimum is -1.86 with mean value is 3.52. POP_{it} values range from -7.20 to 1.27, indicating significant differences in population dynamics. The mean value of GHE_{it} is 2.30, with values between 0.29 and 4.21.

Furthermore, the value of LE_{it} demonstrates relatively low dispersion, with values ranging from 3.71 to 4.32.

Table 1 Summary Statistics Source: Author's calculation

Variable	Obs.	Mean	SD	Min	Max
Log MOR_{it}	276	4.1149	.7400	2.0149	5.1322
Log POP_{it}	272	.5739	0.6364	-7.2028	1.2687
Log $GDPP_{it}$	268	6.1460	0.8533	4.3327	8.3123
Log EMP_{it}	242	2.6684	2.1806	-1.8439	6.2349
Log $CO2E_{it}$	258	9.1625	2.9680	1.2993	14.621
Log CPI_{it}	254	3.5184	1.0831	0.7734	5.1463
Log HHC_{it}	154	1.0676	1.3164	-6.1062	4.1670
Log GHE_{it}	102	2.2987	1.1038	0.2910	4.2143
Log LE_{it}	270	4.0978	0.1446	3.7070	4.3212

Results of GMM Models

The results of various specifications of the Generalized Method of Moments (GMM) models are given in table 2 with mortality rate (MOR_{it}) as dependent variable while keeping CPI_{it} which is proxy of inflation (INF_{it}), household consumption (HHC_{it}), government health expenditure (GHE_{it}), life expectancy rate (LE_{it}), population growth (POP_{it}), gross domestic product per capita ($GDPP_{it}$), the employment rate (EMP_{it}), and net carbon emission ($CO2E_{it}$) as control variables as well as other independent variables. For robustness, we estimated various specifications and explained below.

The model is estimated using the Generalized Method of Moments (GMM) technique, which is appropriate for addressing concerns of heteroskedasticity, endogeneity, and autocorrelation in dynamic panel data models. A series of preliminary diagnostic tests were conducted, including Pooled Ordinary Least Squares (Pooled OLS), Fixed Effects (FE), and Random Effects (RE) models. Additionally, the Hausman test was applied to determine the most appropriate estimator among the Fixed and Random Effects models. The results of these preliminary estimations are provided in the Appendix for reference. The GMM framework effectively accounts for unobserved heterogeneity, endogeneity of

explanatory variables, and dynamic feedback mechanisms, which the conventional models (Pooled OLS, FE, and RE) fail to address adequately.

In the first specification, the variable of interest is CPI_{it}, a proxy of the Inflation rate. The estimated results show that the coefficient value of CPIit has a positive and significant impact on the mortality rate. This shows that the increase in consumer prices positively affects the mortality rate in the selected sample countries. The coefficient value of CPI_{it} is 0.075, which is significant at one percent level that shows one percent increase in CPI_{it} leads to enhance the mortality rate by seven percent. This may be due to the reason that an increase in CPI_{it} influences the consumer basket making it less affordable and reduces the health spending. Further, as the prices go up, it also results in poor nutritional diet, poor living standards which reduce the life expectancy and become the causes of early deaths (Bergh & Nilsson 2010; Bourne et al., 2014). The estimated results are consistent with the findings of Bergh and Nilsson (2010) Baird et al., (2011) Kidane & Woldemichael (2020) Lee et al., (2016) Usman et al. (2023) and Summers et al., (2016). The value of adj-R^2 is 0.93, which shows 93 percent variation in mortality rate is due to CPI_{it}, EMP_{it}, POP_{it}, $GDPP_{it}$, $CO2E_{it}$, HHC_{it} and GHE_{it}. F-stat's estimated value is high and significant, which indicates the validation of the overall model is significant.

The estimated value of the slope coefficient of population growth (POPit) is positive and statistically significant which indicates that as the POPit increases, the intensity of mortality increases too. The population growth is increasing over time due to which the problem of food insecurities is increasing too. Overpopulation creates problems such as not meeting the necessities of life, less household consumption, less health facilities, poorer living standards, and other social and economic problems. The estimates are consistent with Haberman & Russolillo (2005) who found that population growth has effect on infant mortality rates and argued that incremental change in POP_{it} is the fundamental cause of infant mortality rate in developing countries. The South Asian governments and institutions are failing to control the population growth rate, which causes high mortality rate (Brown et al., 2000, Nasreen et al., 2012, and Peterson 2017). In addition, the estimated coefficient of $GDPP_{it}$ is negative and significant, which indicates that an increase in $GDPP_{it}$ results in a reduction in mortality rate. The $GDPP_{it}$ coefficient value is -0.43, which shows a 1 percent increase in per capita GDP leads to a reduction in the mortality rate by 43 percent in selected South Asian countries. An increase in per capita GDP affects an overall rise in income level, better living standard, better availably of necessity goods, access to good healthcare facilities, and better spending on healthcare and livelihoods. So, increase in $GDPP_{it}$ of South Asian countries has a significant impact on mortality reduction. The outcomes of this research are in line

with the findings of Tuljapurkar et al., (2000) Abbuy (2018); Baird et al., (2011); Brown et al., (2000).

The coefficient value of employment (EMP_{it}) is negative and significant; it indicates that the increase in employment level reduces mortality in selected South Asian countries with a coefficient value of -3.11. If the employment level is increased, the individuals earn more and focus on their health care. The South Asian region's problem is a higher unemployment rate, which creates poverty and income inequality. Policies directed towards reducing unemployment may have significant effect on mortality reduction (Bussmann 2009; Abbuy 2018; Ensor et al., 2010; and Granados 2005). The value of the slope coefficient of $CO2E_{it}$ emission is 0.35, which has a positive and significant effect on the mortality rate. If the net carbon emission is increasing in an atmosphere, the mortality rate also increases correspondingly. The increase in $CO2E_{it}$ emission directly impacts the natural environment, global warming, harmful radiation, stress on water facilities, and climate change worldwide. Increase in carbon emission leads to an increase in the mortality rate by 35 percent in selected sample countries. The higher amount of carbon emission in the air causes different diseases in human beings (Ali & Audi 2016; and Kindane & Worldemichael 2020).

In the second estimated model, consumer price index (CPI_{it}) is replaced with $HHC_{it,}$ while the other control variables are the same as in model first. The value of F-stat and Adj-R^2 shows the estimated model is good fitted and statistically significant. In this model, the results of our estimated policy variable HHC_{it} significantly negatively impact the mortality rate in selected sample countries. The slope coefficient value of HHC_{it} is -0.0071, which shows that a one percent increase in household consumption reduces the mortality rate by 0.71 percent. This illustrats that any increase in household consumption leads to a lower mortality. The findings are consistent with the analysis results of Jaba et al., (2014), and Szwarcwald et al., (2016).

In model three, the fundamental variable CPI_{it} is replaced with government health expenditure (GHE_{it}). The behaviour of all estimated control variables follows the same pattern as in model 1 and 2. The estimated coefficient of GHE_{it} has a significant negative impact on the mortality rate. If governments of sample countries increase the health expenditure by one percent, it reduces the mortality rate with a coefficient value of -0.77. The results are consistent with Ali & Audi (2016); and Szwarcwald et al., (2016) which also indicated that any increase in health expenditure results in reduction in mortality. An expenditure on healthcare by the government can improve access to affordable healthcare facilities and thus lowers the mortality rate (Jaba et al., 2014; and Nasreen et al., 2012).

In model four, the CPI_{it} is replaced with life expectancy (LE_{it}) as a policy variable. The estimated coefficient of LE_{it} has a significantly negative impact on mortality rate in selected countries. As the LE_{it} rate increases, the level of mortality rate decreases by 3.2 percent. In developed countries, the LE_{it} level is increasing from the past century, but in developing countries, LE_{it} falls because of inadequate health facilities and high poverty rate (Shaw 2005). Further, the studies of Chen & Ching (2000); and Halicioglu (2011) also argued that LE_{it} is very important in bringing down the mortality rate.

Table 2. Estimated Results of GMM (Independent Variable is Mortality Rate)

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Variable	Model 1	Model 2	Model 3	Model 4
Log POP_{it}	0.4341	2.333	-0.3294	0.4447
	(0.000)***	(0.000)***	(0.252)	(0.001)***
Log $GDPP_{it}$	-0.4370	-0.0605	-0.1515	-1.267
	(0.000)***	(0.303)	(0.001)***	(0.019)**
Log EMP_{it}	-3.113	-0.9363	-1.396	0.5173
	(0.000)***	(0.210)	(0.001)***	(0.316)
Log $CO2E_{it}$	0.3524	0.723	0.8244	1.032
	(0.069)*	(0.001)***	(0.000)***	(0.176)
Log CPI_{it}	0 .075			
	(0.000)***			
Log HHC_{it}		-0.0071		
		(0.097)*		
Log GHE_{it}			-0.778	
			(0.000)***	
Log LE_{it}				-0.321
				(0.734)
Obs.	210	138	89	237
Wald chi^2 (p-values)	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Serial correlation test (p-values)	(0.08)*	(0.057)*	(0.130)*	(0.065)*
Sargan test	4.84	5.99	17.51	23.19
	(0.184)	(0.307)	(0.328)	(0.109)

Source: Author's analysis

In the above table *, **, *** shows the significance level at 10, 5 and 1 percent level respectively. The values probability values are in parenthesis. The dependent variable in the model (1), (2), (3), and (4) is mortality rate which measured through two-step system GMM through utilizing the data selected South Asian countries. Values presented for Walid chi-square, Serial Correlation tests and Sargan test values, respectively.

CONCLUSION

In the wake of COVID-19 pandemics and supply chain disruptions common people are faced with high mortality, loss of jobs and less productivity. There has been a huge gap created between the demand and supply resulting in high inflation. The high inflation could severely affect the purchasing power of especially the low- and middle-income groups to make them more vulnerable. The empirical findings of this research provide robust evidence that inflation, household consumption, government health expenditure, and life expectancy, play a significant role in determining the mortality rate in developing South Asian economies. The dynamic panel estimations using the GMM confirm that higher inflation significantly increases the mortality rate by reducing households' real income, lowering access to nutrition diet, and limiting healthcare affordability. Furthermore, higher GDP per capita, greater employment, increased household consumption, and more substantial government health expenditure are associated with remarkable reductions in mortality rates in selected countries, reflecting their positive contributions to economic well-being and access to essential services. The population growth and rising CO_2 emissions were found to heighten the mortality rate, highlighting the health challenges associated with overpopulation and environmental degradation. Based on results, this research recommended following policies to reduce the mortality rate in selected countries.

Monetary institutions are required to implement inflation-targeting monetary policies to maintain price stability, with a focus on minimizing the adverse effects on lower- and middle-income households. There should be coordination between fiscal and monetary policies to simultaneously stabilize prices, reduce unemployment, and promote inclusive economic growth, thereby increasing per capita GDP and improving population health outcomes. The government of selected countries needs to increase the health expenditure by allocating a larger share of the national budget to healthcare, with a focus on improving the accessibility and affordability of essential health services. The government should focus on long term investment strategies to improve life expectancy, such as preventive healthcare, public sanitation, and health education, recognizing their role in sustaining lower mortality rates.

Limitations and Future Research

This study is limited by the availability of data for certain important variables and countries to incorporate all South Asian countries, particularly household consumption and government health expenditure, across all years and countries. Future research studies should explore the inflation rates effect and mortality relationship using more disaggregated data such as country specific or gender specific. Likewise, post-COVID-19 datasets may be taken into consideration to capture recent structural changes in health and economic systems.

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Appendix A

Table: Pool OLS Regression Result

Variable	Model 1	Model 2	Model 3	Model 4
Log POP_{it}	1.2072 (0.000)***	0.3710 (0.000)***	0.4064 (0.000)***	0.4118 (0.000)***
Log $GDPP_{it}$	-0.2619 (0.000)***	-0.2185 (0.000)***	-0.1699 (0.000)***	-0.0382 (0.069)***

Log EMP_{it}	0.1505 (0.001)***	-0.2624 (0.000)***	-0.3320 (0.000)***	-0.1536 (0.000)***
Log $CO2E_{it}$	-0.0375 (0.228)***	0.2575 (0.000)***	0.3025 (0.000)***	0.1477 (0.000)***
Log CPI_{it}	0.0768 (0.009)***			
Log HHC_{it}		-0.0051 (0.015)***		
Log GHE_{it}			-0.0082 (0.000)***	
Log LE_{it}				-0.0319 (0.000)***
Obs.	190	169	75	206
F-Stat	360.65 (0.000)***	873.64 (0.000)***	962.31 (0.000)***	1481.32 (0.000)***
Hetero test (BP)	23.27(0.000)***	10.25 (0.0014)***	1.67 (0.1967)	41.57 (0.0000)***
Adj R-squared	0.9302	0.9732	0.9891	0.9806

In the above table *, **, *** shows the level of significance at 10, 5 and 1 percent level respectively.

Source: Author's calculations

Appendix B

Table: Fixed Effect Results

Variable	Model 1	Model 2	Model 3	Model 4
Log POP_{it}	0.4708 (0.000)***	0.2616 (0.000)***	0.2961 (0.000)***	0.2903 (0.000)***
Log $GDPP_{it}$	-0.0850 (0.046)**	-0.1635 (0.000)***	-0.0023 (0.965)	-0.1537 (0.000)***
Log EMP_{it}	0.0645 (0.546)	-0.2089 (0.050)**	-0.1634 (0.122)	0.4789 (0.000)***
Log $CO2E_{it}$	-0.1108 (0.013)**	-0.0388 (0.455)	-0.17847 (0.002)***	0.1338 (0.001)***
Log CPI_{it}	-0.1642 (0.000)***			
Log HHC_{it}		-0.00003 (0.984)		
Log GHE_{it}			-0.0105 (0.000)***	
Log LE_{it}				-0.0533 (0.000)***
Obs.	190	169	75	206
F-Stat	328.27 (0.000)***	405.44 (0.0000)***	192.47 (0.0000)***	760.77 (0.000)***
Hetero test (BP)	83.99 (0.0000)***	19.89 (0.0000)***	33. 03 (0.0000)***	24.53 (0.000)***
Hausman Test	683.05	83.83	141. 98	103.43

	(0.0000)***	(0.000)***	(0.0000)***	(0.0000)***

In the above table *, **, *** shows the level of significance at 10, 5 and 1 percent level respectively.

Source: Author's Calculation

Appendix C

Table: Random Effect Results

Variable	Model 1	Model 2	Model 3	Model 4
Log POP_{it}	1.2072	0.3710	0.4064	0.4118
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Log $GDPP_{it}$	(-.2619)	-0.2185	-0.1699	-0.0382
	(0.000)***	(0.000)***	(0.000)***	(0.067)***
Log EMP_{it}	0.1505	-0.2624	-0.3320	-0.1536
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Log $CO2E_{it}$	-0.0375	0.2575	0.3025	0.1477
	(0.226)***	(0.000)***	(0.000)***	(0.000)***
Log CPI_{it}	0.0767			
	(0.008)***			
Log HHC_{it}		-0.0050		
		(0.014)***		
Log GHE_{it}			-0.0082	
			(0.000)***	
Log LE_{it}				-0.0319
				(0.000)***
Obs.	190	169	75	206
F-Stat	2524.53	6115.45	6736.17	10369.26
	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Hetero test	83.99	19.89	33. 03	24.53
(BP)	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Hausman	683.05	83.83	141. 98	103.43
Test	(0.0000)***	(0.000)***	(0.0000)***	(0.0000)***

In the above table *, **, *** shows the level of significance at 10, 5 and 1 percent level respectively.

Source: Author's calculation.