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A NON-LINEAR ANALYSIS OF ENERGY POVERTY, BIOMASS ENERGY CONSUMPTION AND HEALTH OUTCOMES IN DEVELOPING COUNTRIES: PANEL DATA ANALYSIS

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ABSTRACT

Energy poverty is a very main or genuine problem in developing countries. In this modern world, energy poverty is a very big issue because the majority of people live in those areas where the availability of electricity is not good. It becomes very difficult for those people who live in rural areas. The main objective of this research is to analyze the different impacts of energy access on the determinants of the health sector based on energy poverty. The role of carbon dioxide emissions on the health sector and investigate the effect of combustible renewable energy on the health sector in 82 developing countries. For analysis purpose the study use panel data for the period 1990-to 2021. Health index is used as a dependent variable while independent variables are energy poverty of the total population, energy poverty in rural population, energy poverty in urban population, carbon dioxide emission, combustible renewable and waste, industry including construction (value added), primary school enrollment, exports of goods and services and population. This study uses Panel

Quantile Regression (PQR) econometric technique for estimation purpose. The results show that the health index is positively affected by energy poverty, biomass energy consumption and carbon dioxide emission. The findings tell the link between health outcomes with energy poverty, biomass energy consumption, and carbon dioxide emission. This study suggests that government should take to provide electricity in developing countries. The availability of electricity improves health outcomes.

INTRODUCTION

No one ignores the importance of energy in this modern world. Economic activities depend on energy. Energy is the most important sector in the developing or developed world. Energy is to be considered oxygen in the economy. Without the help of Energy country fails to run factories houses and all the kind of transportation in both developing and developed countries. All the economic activities are helpful for the production of goods and services which helps to improve the living standard of human life. Energy is the most important indicator of the economy. Energy is so important in our daily lives because it is a human basic need. We use energy not only for heat and also used our human made structures but we use it to cool them as well energy is necessary for getting to the street or even lifting your finger.

Energy poverty is the lack of access to the current services. Energy does not provide in the modern stage. These services describe the access to electricity in household and cooking facilities such as the fuels or stoves doesn't cause the pollution in the houses. Energy is a need for human development. Energy is also needed for well-being and survival. It is most important for the provision of some social services such as health and education and some critical input into all economic sectors from the household farming, production, or the industry. The status of the hidden wealth and development and its objectives are closely linked and extent to the access to energy. The most efficient energy technologies are available. The better conditions for the development of households, the community of the society and the economy. So thus, improving energy access is a great goal for development and the government.

Energy poverty is the main problem affecting public health. Energy poverty affects health. The period 2000-to 2015 countries included the 125 countries which affect energy poverty and health. Energy poverty had a very bad effect on public health. Energy poverty also impacts the living standard. So, the policies' implications in public health transition to renewable (Panet. al. 2021). Energy poverty badly affects the health of people. In developing countries, energy poverty and health is the main problem. Because in these countries electricity was not provided and access to electricity is the main problem. Due to the access if electricity people use renewable energy sources for cooking. They live in the houses cooking food in the houses that's why energy poverty affects their health. If the health of people is not good then children do not go to the school. Energy poverty also affects education. Energy poverty also affects the exports of goods and services because of health. Industry products also affect the health of people. So, if the access to electricity is low then the health outcomes are good.

Biomass Consumption is an important part of energy consumption and is as old as humanity. However, traditional biomass energy consumption is not to be commonly used around the world because it has not met the energy needs of the economy in recent years. Biomass consumption is used in the open fire cook stove which produces smoke and affects the health of humans. It also generates other chemical gasses such as CO_2 hydrocarbon and also affects the environment and causes many health problems such as cancer, pneumonia, lung disease, etc. These diseases usually affect the women's health, because when they cook food usually infants are accompanied by their mothers. In many developing countries indoor pollution is very dangerous. In many developing countries Biomass collation is the duty of women and children and they spend most of their time collecting the biomass. Forgiving the access to electricity in the household women feel free the collection of biomass. They spend more time on the children's health. Biomass consumption is done by women usually the countries have drinking and sanitation water, and energy poverty is bought by the remote areas. They carry a picture on their head and travel long. These difficult tasks are also done. Providing the access to an electricity provide a hand pump for water, a washing machine to wash the clothes electric water system provides for drinking clean water. Energy plays an important role and use central to humans and provides many benefits such as the health. But energy also creates some health issues. This paper examines the impacts of health on energy and pointing the different issues for the problems of diseases every place. The largest health issues such as coal, biomass and the burning of fuels and main in the terms of occupational health risk and air pollution. Providing electricity; providing better sanitary conditions, and clean health reduce the negative impacts on health or energy. We have not discussed the impacts on health as well as the energy re renewables. We both discussed the health review of the environment or climate changes, which were the most climate warning for the energy process but did not discuss the health co benefits of decreasing the certain climate related carbon dioxide emission (Smith et.al. 2013).

Significance Of the Study

In this study, we will discuss the Non-Linear Analysis of energy poverty, and biomass energy Consumption on health outcomes. Because in the previous studies no study tells us the non-linear analysis of energy poverty and biomass energy consumption on health outcomes. The previous study tells us the linear relationship among these. So we want to study the nonlinear relationship that is new in our research. So that’s why this study is very significant and the relationship is not yet explored. This study is significant because it identifies the connection between energy poverty, biomass energy consumption and health outcomes in developing countries. This study uses the non-linear analysis of energy poverty, biomass energy consumption and health outcomes. This study uses an appropriate estimation methodology for estimating the relationship between explained and explanatory variables. Furthermore, the following study determines the effect of energy poverty on health, the effect of energy poverty on rural or urban populations in health, the effect of carbon dioxide emission on health and the effect of combustible renewable and waste on health in developing countries with the help of some control variables. In

addition, this study adds some information to existing literature. With the help of findings, the problem can be controlled to attain the energy poverty in developing countries.

Objective Of the Study

This study explores to meet the following objectives.

I. To access the determinants of the health sector based on energy poverty.
II. To examine the role of CO2 emission in the health sector.
III. To investigate the effect of combustible renewable energy on the health sector.

LITERATURE REVIEW

Savcol (2012) highlighted the political economy to the Energy Poverty. This review especially investigates the energy poverty and the causes the effect on infant mortality rate and the most current data was available on energy poverty, electrification and dependency on biomass fuels for cooking. It explains the relationships between Development Goals energy access and especially the connection between the natural environment degradation and different modern energy services. It tells us about the very serious problem of energy poverty and concerns the public health growth which relates to the indoor air pollution, access to electricity and medical services not provided lack of refrigeration, physical injury during the collection of biomass energy consumption [fuel wood]. It declares that Energy Poverty affects the educational system in children or adults and also affects the gender role in society. It also tells us that the environmental impact on greenhouse gases and well as the change in the land and deforestation [poverty encompass] and in the final system tells the global energy system that settles and encourages the Energy system.

Smith et.al. (2013) discussed energy and human health. Energy plays an important role and use central to humans and provides many benefits such as the health. But energy also creates some health issues. This paper examines the impacts of health on energy and pointing the different issues for the problems of diseases every place. The largest health issues such as coal, biomass and the burning of fuels and main in the terms of occupational health risk and air pollution. Providing electricity; providing better sanitary conditions, and clean health reduce the negative impacts on health or energy. We have not discussed the impacts on health as well as the energy renewable. We both discussed the health review of environment or climate changes, which were the most climate warning for the energy process but did not discuss the health co benefits of decreasing the certain climate related CO_2 emissions.

Day, Walker, and Simcock (2016) discussed the uses of energy and energy uses. In this study, different authors such as Sen and Nassbaum informed about this work. Firstly, understand the definition of energy and also understood the capabilities. Such arguments defined the theoretical work and relationship between health and energy and also discussed the energy deprivation and the setting across the North and South. Same time, it was to be deployed in a way that is to be very serious context. Also understood the

energy and energy uses and some capabilities were also provided the identified the different sites of intervention. These areas included that were included overlooked. Energy poverty was the address of climate change and also unbiased for the impurity of combined energy consumption.Olmo et.al. (2017) highlighted the health inequalities and housing policies. Many studies show the relationship between mental health, physical conditions and housing conditions. The basic aim of this was to elaborate on the summarized impacts of local policies on health. Also focused on the different issues of fuel poverty and housing in the project Sophie. The case study of Spain discussed the insecurity of houses and also tell the intense level of mental distress. We observed that the safe and secure housing adequate improves the housing instability and public policies. In Europe, housing conditions linked with fuel poverty are correlated with poor health and distribution. Housing energy efficiency can be reduced the wellbeing and health of fuel poverty. The most unsafe groups were also targeted that can adaptable to their needs.

Kose (2019) discussed energy poverty and health. This study discussed energy poverty and health in the case of Turkish. Energy poverty is linked with health. This study guided the relationship between energy poverty and health in turkey. An empirical health index was to be provided for the link between health and energy poverty. Some multi level models tell that energy was negatively linked to health. Different house situations such as physical and some insulation problems are negatively linked with the health index So, in the last, some empirical results tell that healthy individuals were linked with the demographic and housed hold factors linked with the regional level variables.

Enyew and Hailu (2021) highlighted the uses of Biomass fuel and respiratory infection in Ethiopia. Use a systematic review and meta-analysis. This study tells the respiratory infection (AIR) in children under five years. Also, discuss the association of biomass fuel that is used for domestic purposes. Also, discuss the some other behavioral and housing system in Ethiopia. The main purpose of this study is how biomass fuel affects the child's health 5 years younger (under five years). Ouedraogo (2021) guided in their study in (1980 to 2018) 24, Sub-Saharan Countries tells the Energy Poverty, Biomass Energy Consumption [access to electricity] on health. It tells us t improve the Energy Poverty [access to electricity] in the Sub-Saharan Countries. Mortality Rate was measured by the health capital under the four to five year children and frequently [percentage] of Malaria and natural death rates. This study is to help access electricity and improve health in the different Sub-Saharan Countries.

Yousafet. al. (2021) discussed the household sectors of non-renewable, biomass energy consumption and CO2 in Pakistan. The main challenge of climate change, Carbon dioxide emissions faced by human beings. In Pakistan how carbon dioxide emissions were released through nonrenewable and biomass energy. By using the data for 2018-2019. In the addition using the STIRPAT model. This study investigates the energy, biomass energy and nonrenewable in the household sector. The magnitude of firewood was the largest at 142.06kg in one month kerosene at 4.08kg in one month among the

CO_2 and nonrenewable. The largest magnitude was dang cake and coal which was 0.87 tons and coal at 0.76 tons. So, the findings tell that coal was a very minor commodity. The main finding was that small houses use LPG and large houses use dang cake. By increasing the clean energy households reduce the biomass and nonrenewable this study investigates clean the energy.

Zahid et.al. (2021) discussed the role of energy consumption on human development. Energy demand was high in the South Asian region. Many previous studies discussed the role of energy growth and clean input. This study highlighted the renewable or nonrenewable combination of energy mixes and its different components on sustainable development while controlling industrialization or trade. The feasible generalized least square method was used for the estimation of different quadratic functions for SAARC countries (five SAARC countries 1990-2017). This study showed the renewable or nonrenewable energy mixes by using the U shaped inverted. In the promotion of development, renewable was better than nonrenewable in the order of energy. Pan et.al. (2021) discussed energy poverty and public health. Energy poverty affects health. In the period 2000 to 2018 and including the 125 countries, this paper highlighted the energy poverty and health. By using the GMM method or Oster's method to analyze the causal effect, our findings highlighted that energy poverty had a very bad effect on public health. Energy poverty also impacts the living standard. So, in the last, our findings have the policy implication for the public health transition to renewable energy.

DATA AND METHODOLOGY

The main purpose of this research is to appraise the energy poverty, biomass energy consumption and health index in 82 developing countries. The main purpose is to examine how energy poverty and biomass energy consumption affect the health of the people in developing countries. In this methodology, the research investigates energy poverty, biomass energy consumption and health in 82 developing countries. Using the panel data and the time period 1990-2020 is selected for the analysis. The health index is a dependent variable. Energy Poverty, Energy poverty for the rural population, energy poverty for the urban population, Combustible renewable and waste, and Carbon Dioxide emissions use as the independent variables in this analysis. Primary school enrollment, Industry value added, population, and exports of goods and services use as control variables in this analysis. The given data of independent variables are taken from the official website of WDI (World Development Indicators) 2021. The data of the health index is taken from the University of Norte Dame Global Adaption Index. The researcher use the ND-GAIN health index in the research, the data is original and authentic for the study.

To estimate the energy poverty, biomass energy consumption and health researcher developed the following econometric models and models explained below.

$$HLIND_{ti} = \beta_0 - \beta_1 HLIND_{ti} + \beta_2 EPU_{ti} +, \beta 3 PRI_{ti} + \beta_4 INDU_{ti} + \beta_5 EXPO_{ti} + \beta_6 POPti + \varepsilon_{ti} \ldots\ldots\ldots \textbf{(1)}$$

The health index is a dependent variable. Energy Poverty of urban population, primary school enrollment, industry included construction (value added), exports of goods and services and population were used as independent variables.

$HLIND_{ti}= \beta_0 -\beta_1 HLIND_{ti}+\beta_2 EPR_{ti} +, \beta 3PRI_{ti} +\beta_4 INDU_{ti} + \beta_5 EXPO_{ti}+ \beta_6 POPti+ \varepsilon_{ti}$…… **(2)**

The health index is a dependent variable. Energy Poverty of rural population, primary school enrollment, industry included construction (value added), exports of goods and services and population were used as independent variables.

$HLIND_{ti}= \beta_0-\beta_1 HLIND_{ti}+\beta_2 EP_{ti}+\beta_3 PRI_{ti}+\beta_4 INDU_{ti}+\beta_5 EXPO_{ti}+ \beta_6 POP_{ti} + \varepsilon_{ti}$ …… **(3)**

The health index is a dependent variable. Energy Poverty of total population, primary school enrollment, industry included construction (value added), exports of goods and services and population used as independent variables.

$HLIND_{ti} = \beta_0 -\beta_1 HLIND_{ti}+\beta_2 CBREW_{ti} +\beta_3 PRI_{ti} +\beta_4 INDU_{ti} + \beta_5 EXPO_{ti}+\beta_6 POP_{ti} + \varepsilon_{ti}$…… **(4)**

The health index is a dependent variable. Combustible renewable and waste, primary school enrollment, industry included construction (value added), exports of goods and services and population used as an independent variable.

$HLIND_{ti} = \beta_0 - \beta_1 HLIND_{ti}+\beta_2 CO2_{ti}+\beta_3 PRI_{ti}+\beta_4 INDU_{ti} + \beta_5 EXPO_{ti}+\beta_6 POP_{ti} + \varepsilon_{ti}$…… **(5)**

The health index is a dependent variable. Carbon dioxide emission, primary school enrollment, industry included construction (value added), exports of goods and services, and population used as an independent.

Panel Quantile Regression Technique

Panel quantile data are used that allow the effects of estimation that are heterogeneous throughout the contribution of the response variables and control the time specific confounder and the individuals. To check the robustness of the empirical outcomes panel quantile regression is used (Lamarche 2010). The main function of Panel Quantile Regression is it lies in minimizing the biases raised by outliers. When the error terms are not normally distributed then POR is more effective than the OLS. Critically, the effect of economic development on the environment is different for each economy at a different level of productivity. The use of shrinkage methods is to estimate the fixed effect vectorKoenker (2004) and (Caney 2011) use the two steps Panel Quantile Regression model with the fixed effect. The benefit of panel quantile regression is, it is the relationship among the mentioned variables. The potential likelihood of fixed effect is linearly incorporated but restricted quantiles are almost free from this anticipation.

Statistical Results and Discussion

This section mainly deals with the interpretation and conclusion of the estimation. The estimation procedure is divided into five parts. 1st step is to examine the summary of the model statistics. Table 1 summarizes the variables, including the mean value, the value standard deviation, the minimum value and the maximum value. The mean is a good representative of the variable and the standard deviation shows the model is distributed. 2nd shows panel unit root by LLC (Levin Len and Chu) and panel unit root test is testified. While in the 3rd and 4th parts correlation matrix and Koe Residual CointegrationTest are discussed. In the 5th and last part panel, quantile regression results are discussed.

Table 1: Summary of the variables and Descriptive statistics

Variable	Observations	Mean	Std.Deviation	Minimum	Maximum
HLIND	2356	0.59	0.16	0.16	0.90
LNEP	2511	3.35	1.57	-5.15	4.60
LNEPR	2511	3.64	1.50	-5.15	4.61
LNEPU	2511	3.35	1.94	-11.11	4.61
LNCBREW	1358	2.71	2.28	-5.08	4.54
LNCO2	2442	-0.84	1.27	-4.12	2.59
LNPRI	2471	4.55	0.31	-1.29	5.30
LNINDU	2395	3.09	0.51	-1.80	4.29
LNEXPO	2362	3.22	0.71	-3.34	5.45
LNPOP	1466	2.94	0.94	-1.34	4.98

Note: Authors calculation by using Stata

The mean value of the health index is 0.59, energy poverty of the total population has a 3.35 mean, energy poverty of the rural population has 3.64 mean, energy poverty of the urban population has a mean3.35, combustible renewables and waste have a 2.71mean, carbon dioxide emission has -0.84 mean, primary school enrollment has mean4.55, industry included construction value added have mean 3.09, exports of goods and services 3.22 and population have 2.94 mean. The standard deviation of the health index is 0.16, energy poverty has 1.57, energy poverty of rural population has 1.50, energy poverty of urban population has 1.94, combustible renewable and waste have 2.28, carbon dioxide emission has 1.27, primary school enrollment has 0.31, industry included value added have 0.51, exports of goods and services have 0.71 and population have 0.94. The standard deviation shows how much data is spread out the mean value. A standard deviation represents the high spread of the data minimum value and the maximum of the observation is 0.16 and 5.45.

Table 2: Correlation Matrix

	HLIND	LNEP	LNEPU	LNEPR	LNCREW	LNCO2	LNPRI	LNINDU	LNEXPO	LNPOP
HLIND	1									
LNEP	0.31	1								
LNEPU	0.33	0.73	1							
LNEPR	0.34	0.85	0.73	1						
LNCREW	0.01	0.38	0.30	0.38	1					
LNCO2	-0.61	-0.57	-0.66	-0.62	-0.01	1				
LNPRI	-0.35	-0.07	-0.38	-0.25	0.05	0.49	1			
LNINDU	0.04	-0.08	-0.19	-0.02	-0.27	-0.15	0.01	1		
LNEXPO	-0.20	0.18	0.03	-0.04	0.04	0.33	0.36	-0.18	1	
LNPOP	0.36	-0.07	0.06	-0.05	0.30	-0.15	-0.09	-0.32	-0.32	1

Note: Authors calculation by Stata

In the table, the diagonal is 1 which shows the relationship among the variables with themselves like 1. The correlation between the energy poverty is 1. Primary school enrollment, industry included construction value added and exports of goods and services are weekly correlated with the energy poverty, energy poverty of the rural population, energy poverty of urban population and combustible renewable and waste. If the value is less than 0.8 then there is no issue of multicollinearity and if the value is greater than one then there is an issue of multicollinearity. Primary school enrollment strongly correlates with carbon dioxide. Industry included construction value added strongly correlates with carbon dioxide emission and primary school enrollment. Exports of goods and services also positively correlate with the carbon dioxide emission, primary school enrollment, and industry including construction value added. Correlation between the population and carbon dioxide emission, primary school enrollment and industry including construction value added is positively correlated.

Table 3: Panel Unit Root Test

Panel unit root by LLC				
	Level I (0)		**1st difference I(1)**	
Variable	**Statistic**	**Prob.****	**Statistic**	**Prob.****
HLIND	1.47	0.93	-42.08	0.00
LNEP	9.82	1.00	-29.59	0.00
LNEPR	9.67	1.00	-25.52	0.00
LNEPU	10.17	1.00	-37.37	0.00
LNCBREW	7.48	1.00	-18.54	0.00
LNCO2	-0.75	0.23	-38.42	0.00
LNPRI	105.62	1.00	87.99	0.00
LNINDU	-11.68	0.00	--	--
LNEXPO	-5.24	0.00	--	--
LNPOP	1.35	0.91	-27.00	0.00

Note: Authors calculation by using Stata

The results show that LNCO2, LNINDU and LNEXPO are stationary at level. The remaining variables HLIND, LNEP, LNEPR, LNEPU, LNCBREW, LNPRI and, LNPOP are stationary at first difference. Both tests of the unit root show the conflicting results at a 5 percent level of significance. The results of panel data show that all variables of selected developing countries under the study are a mixture of integrated (0) and integrated (1). In the cointegration, if the P value is 0.00 then it means, in the long run, dependent variables exist with the independent variables which means the dependent variable is correlated with the independent variable. We apply the KOE test

Table 4: Results of Panel Cointegration test Kao Residual Test

	Model - 1	**Model – 2**	**Model - 3**	**Model – 4**	**Model – 5**
ADF	4.04*	3.65*	4.07	5.21*	4.06

Note: *shows 1% level of significance **note**: Authors calculation by using Stata
There is no Cointegration between the variables according to the results. There is no null hypothesis and accept the alternative hypothesis that there exists cointegration between the variables.

Table 5: Panel Quantile Regression Results

Dependent Variable: HLIND															
Variables	**Model 1**			**Model 2**			**Model 3**			**Model 4**			**Model 5**		
	25	**50**	**75**	**25**	**50**	**75**	**25**	**50**	**75**	**25**	**50**	**75**	**25**	**50**	**75**
LNEP							0.06* (0.00)	0.04* (0.00)	0.02* (0.00)						
LNEPU	0.04* (0.00)	0.02* (0.00)	0.01* (0.00)												
LNEPR				0.05* (0.00)	0.04* (0.00)	0.02* (0.00)									
LNCBREW										0.03* (0.00)	0.00* (0.11)	-0.01* (0.00)			
LNCO2													0.01* (0.25)	-0.01* (0.52)	-0.03* (0.02)
LNPRI	0.11* (0.00)	0.12* (0.00)	0.01* (0.02)	0.09* (0.00)	0.08* (0.00)	0.01* (0.74)	0.10* (0.00)	0.10* (0.00)	0.01* (0.60)	0.04* (0.00)	0.11* (0.00)	0.09* (0.00)	0.04* (0.04)	0.10* (0.00)	0.02* (0.37)
LNINDU	-0.01* (0.02)	-0.01* (0.00)	0.02** (0.02)	0.01* (0.63)	0.00* (0.89)	0.02* (0.46)	0.02* (0.10)	-0.01** (0.67)	0.01** (0.53)	0.01** (0.77)	-0.02** (0.13)	-0.02** (0.09)	-0.02* (0.34)	-0.01** (0.37)	0.02** (0.42)
LNEXPO	-0.02* (0.01)	-0.01* (0.00)	0.02* (0.02)	-0.02*	-0.02* (0.01)	0.00* (0.61)	-0.03* (0.00)	-0.01* (0.05)	0.00* (0.96)	-0.03* (0.00)	-0.01* (0.07)	0.01* (0.07	0.01* (0.07	-0.02* (0.03)	0.00* (0.74)

				(0.00)											
LNPOP	-0.02* (0.03)	-0.04* (0.00)	-0.04* (0.00)	-0.01* (0.01)	-0.05* (0.00)	-0.04* (0.00)	0.00* (0.60)	-0.03* (0.00)	-0.03* (0.01)	-0.02* (0.00)	-0.08* (0.00)	-0.08* (0.00)	-0.08* (0.00)	-0.08* (0.00)	-0.02* (0.12)
CONS	0.09 (0.36)	0.19 (0.06)	0.70 (0.00)	0.02* (0.73)	0.29 (0.00)	0.67 (0.00)	-0.12** (0.08)	0.17 (0.09)	0.61 (0.00)	0.23 (0.02)	0.44** (0.00)	0.63 (0.00)	0.64 (0.00)	0.47 (0.00)	0.60 (0.00)
PSEUDO R2	0.11	0.12	0.08	0.19	0.14	0.09	0.19	0.14	0.09	0.12	0.12	0.12	0.09	0.10	0.08

Note. *, ** shows levels of significance of 1% and 5% In this given table researcher examines the results of five models with the help of the Panel Quantile Regression technique. Here, there are five models in which health index is used as a dependent variable and independent variables are energy poverty, energy poverty of the rural population, energy poverty of the urban population, combustible renewable and waste, carbon dioxide emission, industry included construction value added, exports of goods and services, primary school enrollment and population.
Results of panel quantile regression in Table 6 shows why the health index is detoriate. The reason is that energy poverty is the main reason for the health sector. Energy poverty affects the health sector because of access to electricity, and lack of energy. Because due to the access to electricity and lack of energy health sector is badly effect. The empirical results explain that there is a link between energy poverty, biomass energy consumption and health outcomes. The findings of some previous literature are Kose (2019) and Brazilian et.al. (2021). Energy poverty is seriously linked with the many health measures. Kose (2019) finds that there is a strong or positive relationship between energy poverty and health through the multi-dimensional model. Oliveraset. al. (2021) finds the impacts of energy poverty on health. This finding shows our results at the 25^{th} quantile, 50^{th} quantile and 75^{th} quantile. The first model explains that energy poverty affects the health sector due to the access to electricity and lack of energy. 1^{st} model finds shows the positive link between energy poverty and health. At the 25^{th} quantile, the coefficient value is 0.06, at the 50^{th} quantile the value of the coefficient is 0.06 and 75^{Th}0.06 quantile the coefficient value is 0.02. The value of the standard error of heath index and energy poverty is 0.00 at the 25^{th} quantile, 50^{th} quantile and 75^{th}. The probability value is 0.00 at the 25^{th} quantile, 50^{th} quantile and 75^{th} quantile. P value is 0.00 which means in the long run dependent variable exists with the independent variable. It correlates with each other

Energy poverty in the urban population also affects the health of the urban population. In the urban population, there is a big problem with the access to electricity that affects health. Nathan and Hari (2021) measure that energy poverty is dictated by the deprivation of cooking in the larger states. Nammaet. al. (2020) observes that the energy poverty mix results in the energy sources and domestic need. Namma finds the energy poverty in the urban peripheries. The findings of the second model explain that the health index effect urban energy poverty. Energy poverty increases health outcomes significantly. At the 25th quantile, the coefficient value is 0.04, at the 50th quantile the value of the coefficient is 0.02 and 75th the quantile the coefficient value is 0.01. The value of the standard error of heath index and energy poverty is 0.00 at 25thquantile, 50th quantile and 75th. The probability value is 0.00 at the 25th quantile, 50th quantile and 75th quantile. P value is 0.00 which means in the long run dependent variable exists with the independent variable. These findings observe that rural electrification improves due to the cookstove. Tang and Liao (2014) observe the rural energy poverty and fuels in China's rural population. The findings of 3rd model explain the link between the energy poverty of rural populations and health. At the 25th quantile, the coefficient value is 0.05, at the 50th quantile the value coefficient is 0.04 and 75th the quantile the coefficient value is 0.02. The value of the standard error of heath index and energy poverty is 0.00 at the 25th quantile, 50th quantile and 75th. The probability value is 0.00 at the 25th quantile, 50th quantile and in quantile.

Combustible renewable and waste are linked with health. The burning of fossil fuels and industrial waste cause health issues. Jebli (2016) uses the ARDL approach and observes that combustible renewable and waste positively and significantly impact the health sector. Nicholas et.al. (2018) use the panel methodologies and explore the link between renewable energy consumption and health. Khalid et.al. (2016) observe the negative link between combustible renewable and waste and health. In some research, there is a negative relationship between combustible renewable and waste and health. Our finding in the fourth model explains the link between combustible renewable and waste. In the fourth model, the coefficient value at the 25th quantile is 0.03 which shows a positive link with health. At the 50th quantile, the value of the coefficient is 0.00 and at the 75th quantile there is a negative link between combustible renewable and waste and health that's coefficient value is -0.01.Chaabouni (2010) that the unidirectional causality between the carbon dioxide emission and health. The fifth model explains the negative or positive link between carbon dioxide emission and health. The value of the coefficient at the 25th quantile is 0.01 and at the 50th quantile, the value of the coefficient is negatively linked with the health is -0.01. At the 75th quantile, CO2 emission is negatively linked with health which is -0.02. The value of standard error is 0.01 at the 25th quantile, 50th quantile and 75th quantile. The value of probability is 0.25 at the 25th quantile, 0.52 at the 50th quantile and 75th quantile the value is 0.02.

Here, there are some findings of control variables that are positively or negatively linked with the health index. The researcher uses the five control variables in the models 1,2,3,4 and 5. The first control variable is primary

school enrollment. Primary school enrollment is also linked with the health index. Education also affects energy poverty. Energy poverty affects health that's why the ratio of primary school enrollment is high. I. Our findings there is a positive link between health outcomes and primary school enrollment. In the rural areas, there is a big issue if education. The availability of electricity is not good that is why children don't go to school. Yazeedet. al. (2018) observes that primary school enrollment is associated with health. Ghumanet. al. (2006) observes primary school enrollment and health. In the first model, the coefficient value of primary school enrollment is positively linked with health. In the second and third models, there is a positive link between health and primary school enrollment. The coefficient value at the 25th quantile is 0.11, at the 50th quantile the value of the coefficient is 0.12 and at the 75th quantile, the value is 0.01. The value of standard error is 0.02, 0.02 and 0.03 at the 25th, 50th and 75th quantile. The probability value is 0.00 at the 25th quantile 0.00 at the 50th quantile and 0.02 at the 75th quantile. In the 3rd, 4rth and fifth models there is a positive relationship between health and primary school enrollment.

The other control variable is industry included construction value added that is positively or negatively associated with the health McCabe (2008) explores the link between the industry included construction value added and health index. This investigates the link between the constitution industry and health. In each model, industry included construction value added linked negatively or positively associated with the health. Exports of goods and services also affect health. The health system is better or good that the ratio of exports of goods and services is high. Ozdemir (2018) and Narayan (2010) analyzed population is also another control variable in our models that is also affected by health. In some models, the population positively affects health and in some models, it is negative effects. The values of CONS are also found below in the table. The last table and column show the value of Pesudo R2 of the five models at the 25th quantile, 50th quantile and 75th quantile.

CONCLUSION

To investigate the non-linear analysis of energy poverty, biomass energy consumption and health outcomes of developing countries by using the eighty two developing countries including the lower-income countries and higher middle-income countries, the categorization of nations stand on the World Bank classification, the list of the table is given in the appendix. This study used the panel quantile regression model for estimation. The econometric technique is based on the nature of variables. Levin Len and Chu tests are used to checking the stationery of variables. The outcomes of the penal unit root test shoes all factors are integrated into order one and the level. The findings of the regression include that energy poverty affects the health outcomes of developing countries. But if the access if electricity is low then it gives good health outcomes and if low then gives bad health outcomes. Energy poverty of rural population and energy poverty of urban population affect health. If the electricity system is good in rural and urban populations then good and better health outcomes occur. Carbon dioxide emission also affects health outcomes. Because woods, dumb cakes and animal materials are used for cooking purposes. But if the electricity is provided then carbon dioxide emission is decreased and better health outcomes are increased. Combustion of renewable

and waste also affects the health of people. People use waste materials for different purposes that cause different health diseases and affect primary school, affect the education system. Exports of goods and services also affect energy poverty. Population and industry included construction value-added also effects because is the energy poverty is high then industry products cause the reason of bad health. So that's the exports of goods and services, population and industry included construction also affects health. Results indicated that how populated the population saves the facility of energy. If the system of energy poverty is good then health outcomes are good and carbon dioxide emission, combustible renewable, and waste increase.

POLICY IMPLICATIONS

Providing recommendations in the conclusion of the study is included in the objective of the study. These recommendations provide will guide the policymakers to make such policies that will heighten the economic performance of underdeveloped countries. Some recommendations are given below.

- Measure the energy poverty is not possible in the real case. It affects health. So, it should necessary to improve energy poverty by using new technologies.
- In Developing countries, people face the problem of electricity. It should be very important to provide electricity in rural areas than better health outcomes.
- In Developing countries, people face the problem of electricity. It should be very compulsory that energy poverty in the urban population should be decreased and then better health outcomes.
- The burning of fossil fuels also affects health. It should be important to avoid the burning of fossil fuels.
- Combustible renewable and waste is the main problem for health. It should be very necessary to improve the technology and provide the electricity.
- In the economy education system and knowledge improves economic development.
- Some industrial things also affect the health of people. So, it is necessary to improve the production of industrial things.
- Exports of goods and services also affect health. The government must provide better technology and better health facilities.
- In these countries, the government should play its role by providing different and better health facilities that help to improve the health issues in developing countries. All these policies improve the ratio of energy poverty and help to improve the health outcome.

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