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Araştırma / Research Article

Orta gelirli ülkelerin sağlık harcamalarını etkileyen değişkenler bakımından gruplandırılması

Grouping of middle income countries in terms of variables affecting their health expenditures

Pınar Yalçın Balçık, Songül Çınaroğlu, Gülnur İlgün

ÖZET

Gelişmiş ülkeler ile karşılaştırıldığında orta gelirli ülkelerin sağlığa sınırlı kaynak ayırdıkları bilinmektedir. Buna rağmen bu ülkelerin sağlık harcamaları bakımından genellikle OECD ülkeleri ile karşılaştırıldıkları görülmektedir. Literatürde orta gelirli ülkeler için sağlık harcamaları esas alınarak yapılacak karşılaştırmalarda OECD ülkeleri gibi gelişmiş ülkeleri esas almaktan ziyade bu ülkeler içerisinde benzer özelliklere sahip olanların karşılaştırılması gerektiğinden bahsedilmektedir. Bu gereklilikten dolayı bu çalışmada Dünya Bankası tarafından yapılan gelir sınıflamasına göre orta gelir grubunda bulunan ülkeleri WHO ve WB verilerini kullanarak sağlık harcamalarını etkilediği düşünülen değişkenler bakımından gruplandırmak amaçlanmıştır. Yapılan hiyerarşik kümeleme analizi sonucunda toplam 95 ülkeyi temsil eden iki kümenin oluştuğu görülmüştür. Analiz sonuçları orta gelirli ülkeler içerisinde daha yüksek gelir grubunda bulunan, Doğu ve Batı Asya'da yer alan ülkelerin birinci kümede yer aldıkları, düşük gelir grubunda yer alan Güney Afrika ve Güney Asya ülkelerinin ise ikinci kümede bulunduklarını göstermektedir. Buna göre oluşan kümelerin Dünya Bankası tarafından ülkelerin gelir düzeyine göre yapılan sınıflama ile benzerlikler taşıdığı söylenebilmektedir. Çalışma sonuçlarının sağlık harcamalarını etkileyen değişkenler bakımından heterojen bir özellik gösteren orta gelirli ülkelerin karşılaştırılması konusunda yararlı bilgiler sağlayacağı düşünülmektedir.

ABSTRACT

It is known that health care resources and expenditures are limited in middle income countries compared to those with developed countries. However these countries usually compared in terms of health care expenditures with OECD countries. It is mentioned in the literature that, in comparisons to be made based on health expenditures for middle income countries, these countries should be compared within groups to be formed according to similar properties within themselves rather than being compared based on developed countries such as OECD countries. Due to this requirement, in this study it was aimed at making groups in terms of variables considered to be affecting health expenditures using WHO and WB data for middle income countries. As a result of hierarchical cluster analysis, it was seen that two groups representing a total of 95 countries were formed. Analysis results indicated that within middle income countries, countries located in Eastern and Western Asia which were in a higher income group were included in the first cluster and countries in Southern Africa and Southern Asia which were in a lower income group were included in the second cluster. According to study results, it could be said that the formed country clusters were similar to the classification made by World Bank according to the income levels of the countries. Study results provided beneficial information about the comparison of middle income countries indicating heterogeneous characteristics in terms of variables affecting health expenditures.

Hacettepe Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Sağlık İdaresi Bölümü, Ankara, Türkiye.

Yazışma Adresi/Address for correspondence:
Pınar Yalçın Balçık, Hacettepe Üniversitesi, İktisadi ve İdari Bilimler Fakültesi, Sağlık İdaresi Bölümü, Ankara, Türkiye.
pyalcin@hacettepe.edu.tr

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INTRODUCTION

The level of health expenditure is recognized as the main indicator of a country's welfare and development (1). The rise in total health expenditures will lead to a rise in its contribution to global development and it will speed up the rise in global welfare (2). For this reason, in many countries policies are trying to be determined which aim at increasing health expenditure and thereby improving social health. As a result of these policies it becomes possible to deal with the burden of disease. On the other hand in undeveloped countries the problem of increasing lack of resources emerges (3).

It is seen that increase in health expenditure has a positive contribution to the betterment of healthcare services in areas such as improvement of medical treatment practices and processes, patient follow-ups and increasing patient satisfaction (4). In addition, it can be said that increase in health expenditure improves the most basic health outcomes such as, mortality and morbidity rates (5).

There are many variables affecting health expenditure. Within this scope, the number of studies focusing on health expenditure and aiming to find out its key determinants is quite high. In some studies, the

relationships between health expenditure and its increase examined and variables such as Gross Domestic Product, income per capita and percentage of elderly population have been investigated. Meanwhile, in other studies the question whether health expenditures are made for a luxurious need or a normal need purposes has been addressed (6).

The literature review on the studies on health expenditure show that the determinants affecting health expenditure are GNIPC, GDP per capita, the age composition of population, demographic characteristics of population, technological improvements in medical practices, the form of service delivery, characteristics of healthcare system, OOP health expenditures, mortality and morbidity rates, total expenditure on health as a percentage of GDP, number of population per doctor, percentage of hospitals, number of hospital beds per person and expenditures of insurance agencies (7, 8, 9, 10, 11, 12).

In addition to the fact that there are high numbers of variables affecting health expenditure, the developing mid-income countries also do not have the high health expenditure levels of developed European countries (13). Because of the international development and health improvement plans and policies undertaken by many international organizations like the World Health Organization (WHO) and the World Bank (WB), improvements in health levels and decreases in disease burdens are observed in many societies. The differences among mid-income countries in development levels, health levels and use of healthcare services make it difficult to compare these countries according to indicators related to health, especially health expenditures (14). When comparisons are made according to indicators related to health expenditures in mid-income countries, developed countries such as the OECD members are generally taken as reference points. These comparisons which are made without taking into consideration the local dynamics of mid-income countries lead to wrong decisions in global resource use and distribution. When it is considered that health expenditure is a fundamental variable directing healthcare services (15) a classification of mid-income countries according to their health expenditures is necessary in order to ensure efficiency in resource distribution (16). For this reason, this study aims to classify mid-income countries according to their health expenditures.

METHOD

Data Source

As a result of literature search, variables considered to be affecting health expenditures were selected. In this study selected variables which are affecting health expenditures are; life expectancy, Gross National Income per capita (GNIPC), total expenditure on health as a percentage of GDP, social security expenditure on health as a percentage of general government expenditure on health, out of pocket expenditure as a percentage of total expenditure on health, number of hospitals (total density per 100.000 population), health expenditure per capita (PPP, $). A total of 95 countries, which were determined to be in the middle income group by WB were included in the data set.

Data set was obtained from World Health Organization (WHO) and World Bank (WB). Variables affecting the health expenditures were selected from WHO and WB web site. As there are no data regarding the research variables regarding the countries of American Samoa, Bangladesh, Kenya, Kosovo, Kyrgyz Republic, Mauritania, Myanmar, Tajikistan and West Bank and Gaza, these were excluded from the research. Variables considered to be affecting health expenditures were determined as; life expectancy at birth, Gross National Income per capita (GNIPC), total expenditure on health as a percentage of GDP, social security expenditure on health as a percentage of general government expenditure on health, out-of-pocket expenditure as a percentage of total expenditure on health, total density of hospitals per 100.000 population and health expenditure per capita (PPP, $). All research variables were taken from WHO (17) web site; only Gross National Income per capita and Health Expenditure per capita (PPP, $) taken from WB (18) web site. Descriptions and sources of variables can be seen in Table 1.

The values related to the health expenditure per capita PPP (Purchasing Power Parity) ($) variable of the 95 countries included in the study are provided in Table 2. This variable is defined as; the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. According to Table 2, while Cuba is the highest with a value of 1828.43 (PPP, $) Lao PDR is the lowest with a value of 95.20 (PPP, $).

Table 1. Descriptions and Sources of Variables Included in the Analysis

Variable	Variable Description	Variable Source
Life Expectancy	The average number of years that a newborn could expect to live, if he or she were to pass through life exposed to the sex- and age-specific death rates prevailing at the time of his or her birth, for a specific year, in a given country, territory, or geographic area.	WHO,2013
GNIPC	Gross National Income per capita (GNIPC) is the dollar value of a country's final income in a year divided by its population using Atlas methodology.	WB, 2013
Total expenditure on health as a percentage of GDP	Level of total expenditure on health (THE) expressed as a percentage of gross domestic product (GDP).	WHO,2013
Social security expenditure on health as a percentage of general government expenditure on health	Level of social security funds expressed as a percentage of general government expenditure on health.	WHO,2013
OOP expenditure as a percentage of total expenditure on health	Level of out-of-pocket (OOP) expenditure expressed as a percentage of total expenditure on health	WHO,2013
Number of hospitals (Total density per 100.000 population)	Number of hospitals, including the following hospital categories: rural and district, provincial (second level referral), regional/specialized/teaching and research hospitals (tertiary care), from the public and private sectors, per 100,000 population.	WHO,2013
Health expenditure per capita, PPP (Purchasing Power Parity) ($)	Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation.	WB, 2013

Data Analysis

In this study, cluster analysis was used for grouping the countries indicating similarities in terms of seven variables considered to be affecting health expenditures. Agglomerative hierarchical clustering method was used for the determination of the number of country clusters. Hierarchical cluster analysis is a method used for constituting similar groups hidden in the data set and visual presentation of the groups formed by this method can be indicated in the dendrogram graphic drawn (19). In the literature it is recommended that prior to the hierarchic cluster analysis, Z standardization be applied to all variables in order to remove the effect of differences in measuring units (20). In this study, Z standardization was applied to all variables before the hierarchic cluster analysis and measurement unit differences were removed. After the effects of differences in measuring units are eliminated, Pearson correlation coefficient is used in the determination of the existence of a multicollinearity problem among variables (21). In this study multicollinearity problem examined by using Pearson correlation coefficients. This situation has shown that the variables which have been selected to be included in the research can be used in the cluster analysis of variables. After the relation among the variables was examined in terms of multicollinearity, agglomerative hierarchic cluster analysis was implemented. When the number of clusters was not limited using Euclid range measurement unit and Wards method, it was seen that two clusters were formed. Analyses were made in SPSS 20.0 program.

FINDINGS

Descriptive Statistics

Descriptive statistics for all countries included in the research (n=95) can be seen in Table 3. Mean value of life expectancy is 70.17 years (±6.51), GNIPC is 5.028 US$ (±2.898), total expenditure on health as a percentage of GDP is 6.47% (±2.84), Social security expenditure on health as a percentage of general government expenditure on health is 24.47% (±28.24), OOP expenditure as a percentage of total expenditure on health is 33.81% (±18.23), total density of hospitals per 100.000 population is 2.06 (±1.69), health expenditure per capita (PPP, $) is 595.81 (±368.81).

Table 2. Health Expenditure per capita (PPP) ($) for Study Countries

Country Name	Health expenditure per capita, PPP ($) WB 2013	Country Name	Health expenditure per capita, PPP ($) WB 2013	Country Name	Health expenditure per capita, PPP ($) WB 2013
Albania	539.28	Guatemala	466.59	Papua New Guinea	114.06
Algeria	778.08	Guyana	425.81	Paraguay	724.33
Angola	355.43	Honduras	400.36	Peru	626.20
Armenia	351.38	India	214.68	Philippines	287.33
Azerbaijan	956.65	Indonesia	293.30	Romania	988.16
Belarus	1081.39	Iran	1414.50	Saint Lucia	897.64
Belize	458.24	Iraq	695.35	Samoa	379.39
Bhutan	275.50	Jamaica	511.92	Sao Tome and Principe	202.92
Bolivia	371.76	Jordan	760.63	Senegal	96.40
Bosnia and Herzegovina	928.45	Kazakhstan	1023.48	Serbia	986.94
Botswana	851.08	Kiribati	186.95	Solomon Islands	106.17
Brazil	1453.90	Lao PDR	95.20	South Africa	1121.25
Bulgaria	1212.52	Lebanon	1092.08	Sri Lanka	304.14
Cabo Verde	279.14	Lesotho	296.76	St. Vincent and the Grenadines	554.51
Cameroon	138.43	Libya	764.45	Sudan	221.45
China	645.63	Macedonia	758.68	Suriname	743.92
Colombia	842.70	Malaysia	938.29	Swaziland	563.86
Congo	241.76	Maldives	1259.60	Syrian Arab Republic	168.95
Costa Rica	1369.03	Marshall Islands	703.13	Thailand	658.24
Côte d'Ivoire	171.77	Mauritius	863.89	Timor-Leste	96.32
Cuba	1828.43	Mexico	1061.13	Tonga	249.84
Djibouti	246.84	Micronesia	448.10	Tunisia	790.59
Dominica	596.85	Moldova	553.35	Turkey	1053.48
Dominican Republic	631.39	Mongolia	566.83	Turkmenistan	276.17
Ecuador	788.92	Montenegro	926.37	Tuvalu	663.22
Egypt	539.13	Morocco	438.24	Ukraine	686.70
El Salvador	539.19	Namibia	749.37	Uzbekistan	330.24
Fiji	328.38	Nicaragua	381.76	Vanuatu	115.22
Gabon	734.68	Nigeria	217.10	Viet Nam	308.30
Georgia	696.99	Pakistan	126.33	Yemen	200.11
Ghana	214.25	Palau	1287.55	Zambia	191.73
Grenada	728,80	Panama	796,08		

Table 3. Descriptive Statistics

	Short Name	All Countries (n=95)			
		Min.	Max.	Mean	Sd.
Life Expectancy	Life_Exp	50	80	70.17	6.51
GNIPC	GNIPC	460	12550	5028	2898
Total expenditure on health as a percentage of GDP	Tot_HE_GDP	1.30	19.70	6.47	2.84
Social security expenditure on health as a percentage of general government expenditure on health	Soc_Sec_Exp	0.00	97.50	24.47	28.24
OOP expenditure as a percentage of total expenditure on health	OOP	0.10	75.80	33.81	18.23
Number of hospitals (Total density per 100.000 population)	Num_Hosp	0.00	10.13	2.06	1.69
Health expenditure per capita, PPP ($)	HE_Per_Cap	95.20	1828.43	595.81	368.81

It was observed in Table 4 that all correlations were <0.65 and this result indicate that there is no multicollinearity problem. As this study aims to classify countries which are in mid-income level group according to their health expenditures, it is expected that the health expenditure per capita (PPP, $) variable will have a higher correlation with other variables. When the correlation matrix in Table 4 is examined it can be seen that there are generally significant and high correlations between the relevant variable and other variables.

Cluster Analysis Results

In Table 5, two clusters obtained as a result of cluster analyses can be seen. According to this, there are 41 countries in the first cluster and 54 countries in the second cluster.

In Table 6, descriptive statistics for clusters can be seen. Within all research variables, it is seen that the average values belonging to the variables in the 1st cluster are higher than the values belonging to the variables in the 2nd cluster. It is seen that the findings of the research are consistent with the classification made by WB based on the income level of the countries. According to this, as a result of cluster analysis, countries in a higher income group compared to the other countries are in the first cluster. The countries in the 2nd cluster represents the countries in a lower income group compared to the others.

In Figure 1, the dendrogram graphic obtained using hierarchical cluster analysis can be seen. In Figure 2, clusters formed by the countries are demonstrated in different colors and on world map. Countries in the 1st cluster are demonstrated in dendrogram graphic and on world map in blue color. These countries are Southern America, Eastern Asia and Western Asia countries such as Brazil, China, Palau and Turkey. Countries in the 2nd cluster are demonstrated in dendrogram graphic and on world map in red colour. These countries are Sub-Saharan Africa and Southeastern Asia countries such as Sudan, India, Angola and Sri Lanka.

Table 4. Correlations Between Variables

	Life_Exp	GNIPC	Tot_HE GDP	Sos_Sec Exp	OOP	Num_Hosp	HE_Per_Cap
Life_Exp	1						
GNIPC	0.45**	1					
Tot_HE GDP	0.10	0.07	1				
Sos_Sec Exp	0.51	0.29**	0.23*	1			
OOP	-0.02	-0.21*	-0.24*	0.08	1		
Num_Hosp	0.06	0.14	0.35	-0.08	-0.03	1	
HE_Per_Cap	0.52**	0.62**	0.37**	0.45**	-0.14	0.19	1

*p<0.05, **p<0.01

Table 5. Country Clusters According to Selected Variables that Influences Health Expenditures

Cluster	Country Names
1 (n=41)	Albania, Azerbaijan, Belarus, Bosnia and Herzegovina, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Gabon, Georgia, Grenada, Iran, Iraq, Kazakhstan, Lebanon, Libya, Macedonia, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Micronesia, Moldova, Montenegro, Palau, Panama, Paraguay, Peru, Romania, Saint Lucia, Serbia, Suriname, Tunisia, Turkey, Tuvalu
2 (n=54)	Algeria, Angola, Armenia, Belize, Bhutan, Bolivia, Botswana, Cabo Verde, Cameroon, Congo Côte d'Ivoire, Djibouti, Egypt, El Salvador, Fiji, Ghana, Guatemala, Guyana, Honduras, India Indonesia, Jamaica, Jordan, Kiribati, Lao PDR, Lesotho, Mongolia, Morocco, Namibia, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Samoa, Sao Tome and Principe Senegal, Solomon Islands, South Africa, Sri Lanka, St. Vincent and the Grenadines, Sudan, Swaziland, Syrian Arab Republic, Thailand, Timor-Leste, Tonga, Turkmenistan, Ukraine Uzbekistan, Vanuatu, Viet Nam, Yemen, Zambia

Table 6. Descriptive Statistics for Clusters

	Cluster 1 (n=41)		Cluster 2 (n=54)	
	Mean	Sd.	Mean	Sd.
Life Expectancy	74,17	3,28	67,13	6,74
GNIPC	7321,22	2497,82	3288,52	1744,60
Total expenditure on health as a percentage of GDP	7,67	3,27	5,56	2,06
Social security expenditure on health as a percentage of general government expenditure on health	42,15	32,47	11,05	13,92
OOP expenditure as a percentage of total expenditure on health	33,87	15,53	33,76	20,19
Number of hospitals (Total density per 100.000 population)	2,69	2,16	1,59	1,00
Health expenditure per capita, PPP ($)	904,78	287,74	361,21	220,97

DISCUSSION

Today it can be observed that the health expenditures in developed and developing countries are increasing and the share allocated to health among total expenditures is steadily rising. For this reason, policy-makers and health insurance agencies are trying to take under control the increase in health expenditures and determine the factors causing this increase (11, 22, 23).

The health expenditure as a share of GDP is varies depending on the economic development level of the countries. While some countries allocate 12% of their GDP, for poor countries this percentage drops to 3%. Concordantly, it can be seen that per capita health expenditure also varies according to country. While in low-income countries per capita health expenditure is 30$, it can be as high as 3000$ in high-income countries. This heterogeneous pattern observed in health expenditures in especially mid-income countries have created the need for a classification of these countries among themselves in order to make better comparisons (11). Although there are different variables affecting health expenditure, in this study variables such as life expectancy, GNIPC, total expenditure on health as a percentage of GDP, social security expenditure on health as a percentage of general government expenditure on health, OOP expenditure as a percentage of total expenditure on health, number of hospitals (total density per 100,000 population) and health expenditure per capita (PPP, $) have been included in the research.

In this study, mid-income members of the WB have been classified according to the variables affecting their health expenditures. As a result of the cluster analysis 41 and 54 countries have been distributed to the first and second clusters, respectively. Accordingly, while those in the first group consist of countries which have higher income levels among mid-income countries relative to those in the second group, those in the second group consist of countries with lower income levels. While in the first group are countries from Europe, Central Asia and Latin America such as China, Turkey, Belarus, Romania, Bulgaria, Azerbaijan and Serbia, in the second group are East Asian and sub-Saharan African countries such as Armenia, Egypt, India, Indonesia, Pakistan and Ghana. Correspondingly, most of the countries in the first group represent developed countries classified as high-income according to the income classification made by the World Bank while the countries in the second group represent less developed countries located in the low-income group. This outcome shows that the clusters obtained in the study show similarities with the classification made by the World Bank according to country income levels.

When the clusters obtained as a result of the analysis are examined with respect to the seven variables included in the research it is seen that the countries in the first group have higher averages in regard to the relevant variables than those in the second group. For example, while the average life expectancy of the first cluster is 74.14 (± 3.28) the second cluster has an average of 67.13 (± 6.74). While the first group has an average ratio of total expenditure on health as a percentage of GDP of 7.67 (± 3.24), the second group has a ratio of 5.56 (± 2.06). It has been determined that the health expenditure per capita (PPP, $) of the countries in the first group is 904.78 (± 287.74) and that of the countries in the second is 361. 21 (± 220.87). According to these findings, the variation of the countries, which are located in the mid-income group based upon the classification of the World Bank, among themselves in terms of their levels of income also expresses a difference in their health expenditures.

As a result of the cluster analysis conducted within the scope of the research, it has been seen that Turkey is in the first cluster. Accordingly, after Turkey's values in relation to the seven variables were compared with the averages of the first cluster it has been seen that with respect to the life expectancy (75), GNIPC (10,980), social security expenditure on health as a percentage of general government expenditure on health (64.1) and health expenditure per capita (PPP, $) (1053.48) variables Turkey is above the averages of the countries in the first group and that with respect to the other three variables of total expenditure on health as a percentage of GDP (5.6),

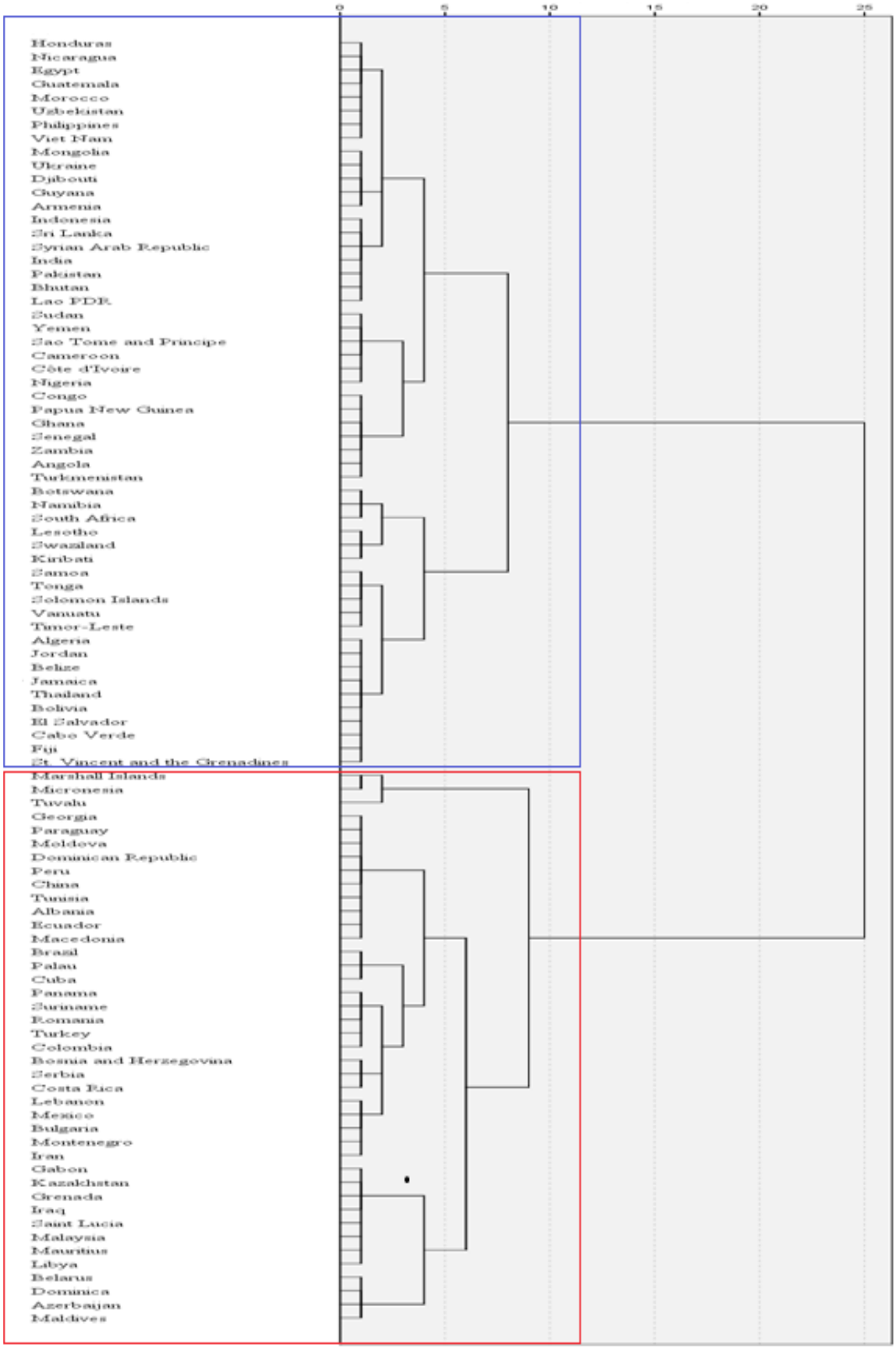

Fig. 1. Dendrogram of Agglomerative Clustering of Countries According to Variables Influence Health Expenditures

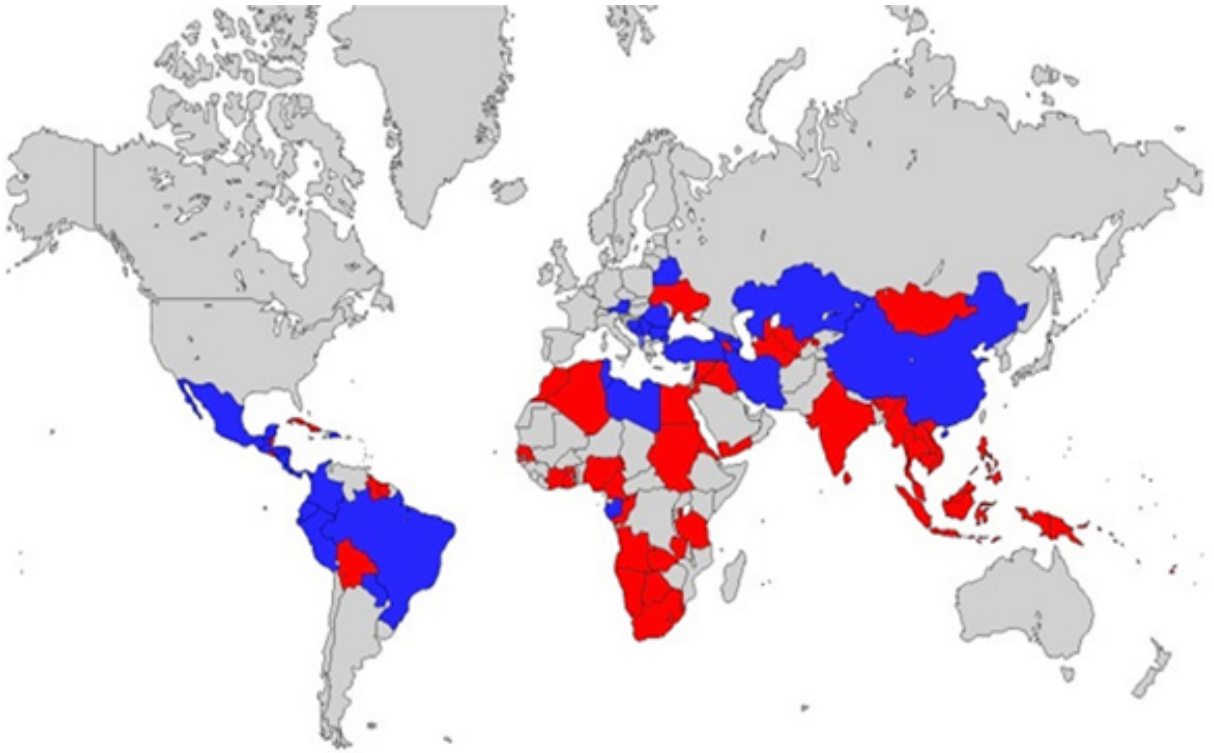

Fig. 2. Geographic Distribution of Countries According to Variables Influence Health Expenditures

OOP expenditure as a percentage of total expenditure on health (15) and number of hospitals (total density per 100,000 population) (1.55) Turkey is below the average.

Ecological study is useful for comparing not individuals but groups, societies or countries (24, 25, 26). Because ecological studies are based upon data obtained for different purposes a cautious approach is required for the interpretation of results. As this is also an ecological study, it needs to be remembered that the variables which affect health expenditure but were not included in this research will have effects on health expenditure.

It is believed that this study, which classified the countries, that according to the World Bank are in the mid-income level group, with respect to the variables considered to have an effect on health expenditure by using a hierarchic cluster analysis will guide policy-makers in determining the countries which have similar characteristics in relation to the variables affecting health expenditure and taking separate decisions for the two groups. Moreover, when the fact that health expenditure is a fundamental variable guiding healthcare services is taken into account it is considered that in order for resource distribution to be carried out efficiently, effectively and justly it is very important for mid-income countries to be classified among themselves. It is believed that the study, which was also conducted with this point in mind, will provide important clues for decision-makers in healthcare services.

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