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Obesity and Economic Growth: An Analysis for Organisation of Islamic Cooperation Members: A Comparison between Africa and Eastern Mediterranean Regions*

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Abstract

The increasing global trend in obesity rates is mainly linked to various social, economic, and medical determinants. Besides economic growth being named in the literature as one of the main motivations that trigger people to gain weight, culture-based motivations might also impact obesity. Although Islam suggests a healthy lifestyle and disciplined eating behaviour, many Islamic countries face high obesity rates. Using the fixed effects model, we examined the relationship between obesity rates and economic growth in the context of the Obesity Kuznets Curve Model by comparing the Organisation of Islamic Cooperation member countries in Africa and Eastern Mediterranean regions for the years between 1975 and 2016. We also estimated a second model for Africa by comparing the Organisation of Islamic Cooperation members and other countries outside the organisation. The results show that Obesity Kuznets Curve Model is valid for both Organisation of Islamic Cooperation members in Africa and the Eastern Mediterranean. On the other hand, the impact of economic growth is insignificant for the countries outside of the organisation in Africa if the economy continues to grow.

Keywords: *Obesity rates, economic growth, Organisation of Islamic Cooperation, Obesity Kuznets Curve model*

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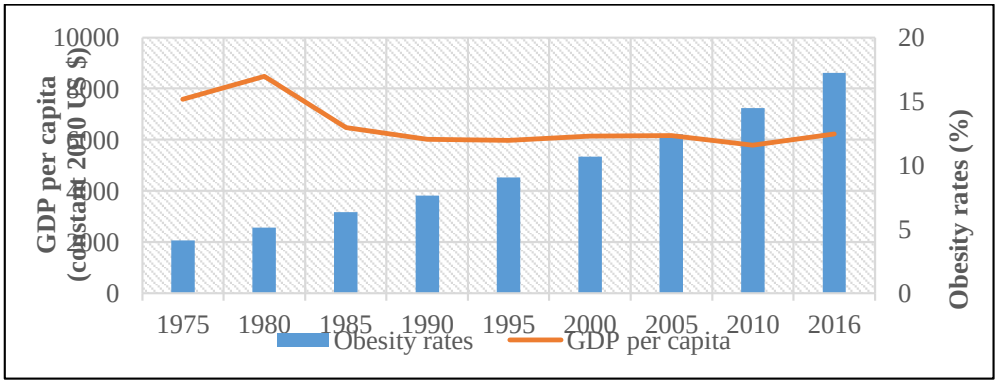
1. Introduction

Obesity is a state of having a body mass index (BMI) over 30, which is calculated by dividing a person's weight into the square of height in meters (World Health Organisation, 2022). Even though there are many medical reasons to explain the existence of obesity, social and economic motivations that cause people to eat more or have a sedentary lifestyle are likely to be linked to being obese in the social sciences literature. Owing to its social and economic factors and increasing rates over the years, obesity worldwide has been an intriguing topic amongst health economists.

Cultural, regional, and even religious differences between countries may significantly impact human health regarding its roles in daily life and eating habits. For instance, the religion of Islam suggests a balanced eating behaviour, a healthy lifestyle, and physically active daily routines (Iftikhar et al., 2016). From the Islamic perspective, Muslim people ought to be having an ideal body weight since they are advised to be so. On the contrary, alongside the global upward trend in obesity, the prevalence of obesity is also notably increasing in Islamic regions. Plus, with the changing traditional eating habits to the western diet, Arab and Gulf nations are becoming more overweight and obese over the years (Musaiger, 1994). An inactive lifestyle is also considered in health economics as one of the main factors that might have considerable impacts on population health, particularly weight. In addition to changing eating habits, the upward trend in economic growth, namely wealth in Gulf Arab economies, created a sedentary lifestyle for people (Iftikhar et al., 2016). Shortly, changing dietary habits and diminishing daily activities in Islamic regions are essential factors shaping people's health status. Therefore, obesity rates in the Islamic areas may be affected by a lack of physical exercise and an unhealthy diet. Figure 1 shows the obesity rates and gross domestic product (GDP) per capita in the Organisation of Islamic Cooperation (OIC) from 1975 to 2016. As obesity rates were consistently increasing for the given period, GDP per capita had fluctuations in OIC.

Figure 1. Obesity rates and GDP per capita in OIC (1975-2016)



Source: World Health Organisation, 2022; World Bank, 2022

The relationship between economic growth and obesity is linear or non-linear across the economies, depending on various factors. Grecu and Rothoff (2015) hypothesised a non-linear relationship between obesity and economic growth, suggesting people eat as income rises but exchange eating with a healthy lifestyle as income continues to rise (Grecu and Rothoff, 2015). This non-linear relationship is called as Obesity Kuznets Curve (OKC) model in the literature.

This paper investigates the relationship between economic growth and obesity from 1975 to 2016 by firstly comparing OIC member countries in Africa and the Eastern Mediterranean regions. Since OIC members in Africa and Eastern Mediterranean regions have different economic outlooks, we purposely categorise the members into two regions to clearly picture the impacts of economic growth on obesity rates in OIC members from two different regions. We, therefore, aim to distinguish the difference in results depending on the possible impacts of economic growth on obesity for OIC members from different regions. We later estimate a second model for OIC and non-OIC countries in Africa. The reason to compare OIC and non-OIC countries in the same regions is to show if religious diversification would be a key determinant for the relationship between obesity and economic growth while the economic outlook across the countries in the same region is almost the same. In other words, we aim to contribute to the literature by obtaining comparable results for Islamic countries from different regions and the different groups of countries in the same area using the OKC model to analyse the relationship between economic growth and obesity.

The study is organised as follows: The next section is literature review followed by a general overview of OIC and OPEC. Then, we shortly picture an overview of obesity and economic growth for OIC members in Africa and Eastern Mediterranean regions, and later for OIC and non-OIC countries in Africa. Next, we describe the data, model and methodology. Lastly, the empirical results and conclusion with some recommendations are placed respectively in the paper.

2. Literature

There are notable studies in the literature using different data and applying various methodologies in order to analyse the relationship between obesity and economic growth. When we examine the studies on this subject, it could be stated that the analyses vary with gender, income level of economies, and regions.

The sample range of some studies is up to a group of 190 countries, such as Asal et al. (2019), while some papers investigated only one country, such as Grecu and Rothoff (2015) and Pisa and Pisa (2016). While most studies obtained data for a time range from 10-year to 40-year, some papers also analyse a specific year such as Egger et al. (2012) and Murphy et al. (2016).

Spline regression analysis, ordered multinomial model, differences in differences, and logistics regression analysis are some of the methodologies used by researchers. However, OLS and fixed effects are the two most commonly used methodologies in the analyses. Considering all the variables used in the studies, we could state that obesity rates, overweight rates, and (BMI) were used as the dependent variable. On the other hand, household income, GDP, and GDP per capita were used as explanatory variables to estimate the models. According to findings, despite the relationship between obesity and economic growth being generally found out positive, there are several results differ depending on the income levels (Ameye and Swinnen, 2019), regions (Gortmaker et al., 2014), and gender (Murphy et al., 2016). Below, we have summarised the related literature trying to point out key elements of the studies conducted from 2012 to 2020.

Table 1. Overview of the reviewed studies

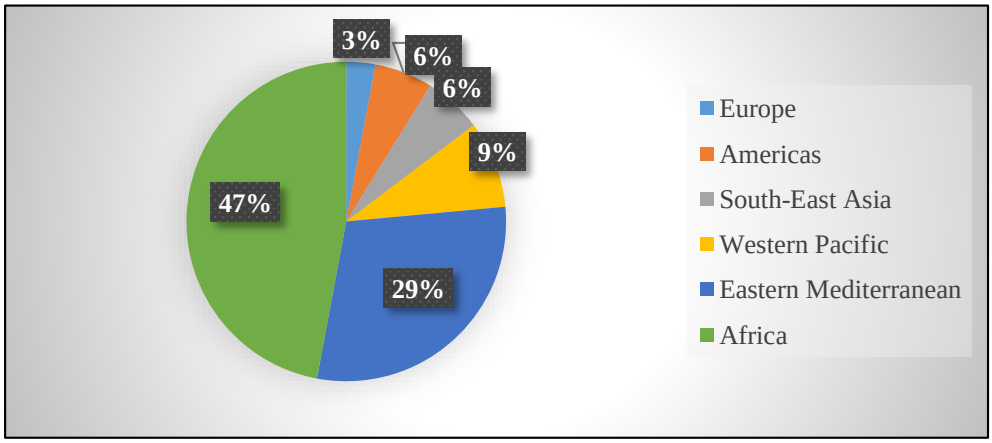
Author&Year	Period	Sample	Methodology	Findings
Egger, Islam & Swinburn,2012	2007	175 countries	Spline regression analyses	GDP positively affects BMI up to $3000. Above $3000, the relationship is insignificant.
Goryakin & Suhrcke, 2014	1991- 2009	56 countries	OLS & fixed effects	Negative relationship between overweight and GDP per capita in low income countries.
Gortmaker, Kawachi, Neuman & Subramanian, 2014	1991- 2010	38 countries	Ordered multinomial model	Insignificant relationship between GDP per capita and BMI in poor regions.
Grecu & Rotthoff, 2015	1991- 2010	USA	Differences-in-differences	The relationship between obesity and household income is non-linear.
Murphy, Lawson & Williamson, 2016	1995 and 2000-2009	135 countries	Pooled OLS & fixed effects	The relationship between BMI and income among men is positive while it is negative among women in developed countries.
Pisa & Pisa, 2016	1998- 2012	South Africa	Unadjusted time trend plot	The relationship is between GDP per capita and obesity.
Ameye & Swinnen, 2019	1976- 2016	Low, middle and upper income countries	Literature review	Obesity rises with increasing income in low-income countries; no relationship for middle-income countries; obesity falls with increasing income in upper-income countries.
Asal, Fox & Wengel, 2019	1980- 2008	190 countries	Two-way-fixed-effects & OLS	The relationship is positive between obesity and GDP per capita in low-income countries but negative for upper-income countries.

Aydın, 2019	1991- 2016	20 countries	Bounds test-ARDL	Non-linear relationship between economic growth and obesity in the long-run. Obesity increases with growing economy but falls if economy continues to rise.
Bendavid, Dieleman, Hashiguchi, Templin & Thomson, 2019	1995- 2016	103 countries	Logistics regression & fixed-effects	Obesity decreases as GDP per capita rises in wealthy group but increases in less wealthy group.
Hlaing, Kakinaka & Windarti, 2019	1975- 2010	130 countries	OLS-Dynamic panel regression analysis	The relationship is positive between obesity rises and income in low-income countries but obesity falls as income rises in upper-income countries.
Talukdar, Seenivasan, Cameron and Sacks, 2020	2019-2024	147 countries	Bayesian hierarchical model	The relationship is positive between obesity prevalence and national income but there is no evidence for Obesity Kuznets Curve, non-linearity.

3. A General View of Organisation of Islamic Cooperation

The Organisation of Islamic Cooperation is an intergovernmental organisation founded in 1969 and currently consists of 57 countries from different regions and income levels (OIC, 2022). Due to the lack of obesity and GDP per capita data of 23 countries in the organisation for the given period, 34 out of 57 countries were used in this study. 47 % of 34 countries are located in Africa, and 29 % are in Eastern Mediterranean. Figure 2 shows the percentage share of the 34 OIC member countries in the six world regions. Eastern Mediterranean and Africa are two leading regions where OIC members outnumber.

Figure 2. OIC members by region



Source: OIC, 2022; World Bank, 2022

3.1. Organisation of the Petroleum Exporting Countries and OIC Members in the Organisation

Organisation of the Petroleum Exporting Countries (OPEC) is an intergovernmental organisation founded in 1960, firstly with five countries which are currently 14 (OPEC, 2022). Seven countries are in the Eastern Mediterranean, five are in Africa, and two are in South America.

7 OIC members are also part of OPEC. Some of the remarkable facts about OIC and OPEC are as follows:

- It was estimated that OPEC member countries possessed 79.4 % of the world's proven oil reserves at the end of 2018 (OPEC Annual Statistical Bulletin, 2019).
- East Mediterranean and Africa, respectively, are the two leading OPEC regions with the highest crude oil reserves share.
- Seven members of 14 OPEC countries are also members of OIC.
- 18.8 % of the OIC members in Africa and 40 % of the OIC members in the Eastern Mediterranean are members of OPEC.
- OIC members possess crude oil reserves predominantly located in the Eastern Mediterranean region.

The facts above may help picture a general economic view of OIC members. According to current estimates of OPEC Annual Statistical Bulletin 2021, the share of the oil and gas sector of gross domestic product in Saudi Arabia is 50 percent. Around 30 percent of the United Arab Emirates' gross domestic product is directly based on oil and gas output. (OPEC Annual Statistical Bulletin, 2021). As the share of oil is apparently significant in GDP, the impacts of GDP on obesity rates might vary across the countries and regions.

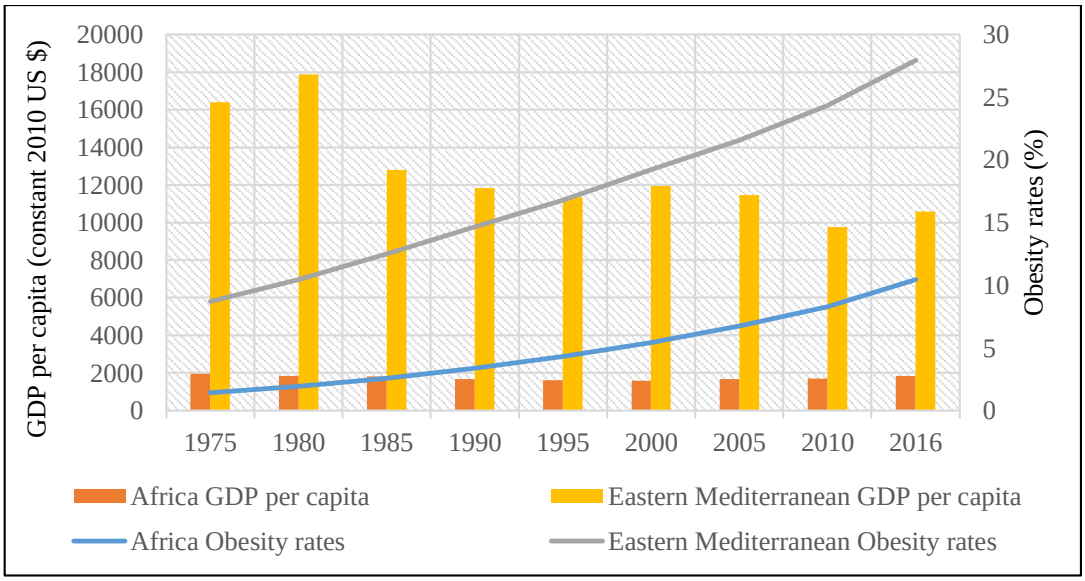
4. Obesity and Economic Growth in OIC members in Africa and Eastern Mediterranean Regions

The OIC members in the Eastern Mediterranean and Africa had a remarkable difference in the economic outlook and obesity rates. Figure 3 shows GDP per capita and obesity rates for OIC members in Africa and Eastern Mediterranean between 1975 and 2016. While GDP per capita had relatively slight changes from 1975 to 2016 in Africa, Eastern Mediterranean had relatively high and fluctuant GDP per capita in the given period. These ups and downs in economic growth in Eastern Mediterranean might be the outcome of its high share of the oil sector in GDP, which might lead to considerable changes in the economy.

Figure 3 shows that there was a widening gap in obesity rates between the two regions from 1975 to 2016. Although the obesity rates were comparatively high in

the Eastern Mediterranean region, Africa also experienced a gradual increase in obesity rates.

Figure 3. Obesity rates and GDP per capita in OIC members in Africa and Eastern Mediterranean regions



Source: World Health Organisation, 2022; World Bank, 2022

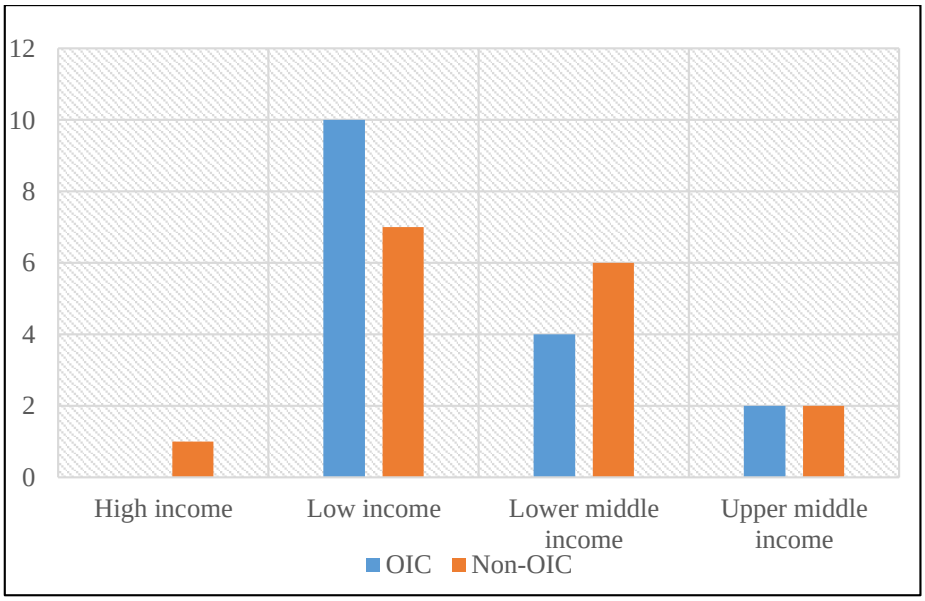
It is commonly stated in the literature that economic factors are one of the significant determinants of high levels of obesity rates. Therefore, the high GDP per capita in the Eastern Mediterranean might have triggered people to eat more and gain weight. However, economic growth was unstable due to fluctuations during the given period. Nonetheless, obesity rates did not seem to be negatively affected by decreasing GDP per capita. This outlook might be due to other economic or social factors that might affect obesity rates to rise in OIC members in the Eastern Mediterranean. Obesity rates were also steadily rising in Africa despite almost stagnant GDP per capita between 1975 and 2016.

4.1. The Relationship Between Obesity and Economic Growth in Africa: A Comparison between OIC and non-OIC countries

This section provides an overview of the economic growth and obesity rates of 32 countries in Africa which are divided into two groups, OIC members and non-OIC countries. Due to a lack of data, we used only 16 OIC members and 16 non-OIC countries in this section. We categorised the countries regarding their income levels to visualise the difference between them. Figure 4 shows the number of OIC members and non-OIC countries in Africa with different income levels. As can be seen in the figure below, the income levels of OIC members and non-OIC countries

are different. While 14 OIC members are low and lower-middle-income economies, 2 are upper-middle-income economies. On the other hand, 13 non-OIC countries are at low and lower-middle-income levels, and two are in the upper middle. Only one country, Seychelles, is a high-income economy among the non-OIC countries in Africa.

Figure 4. Income levels of OIC and non-OIC countries in Africa

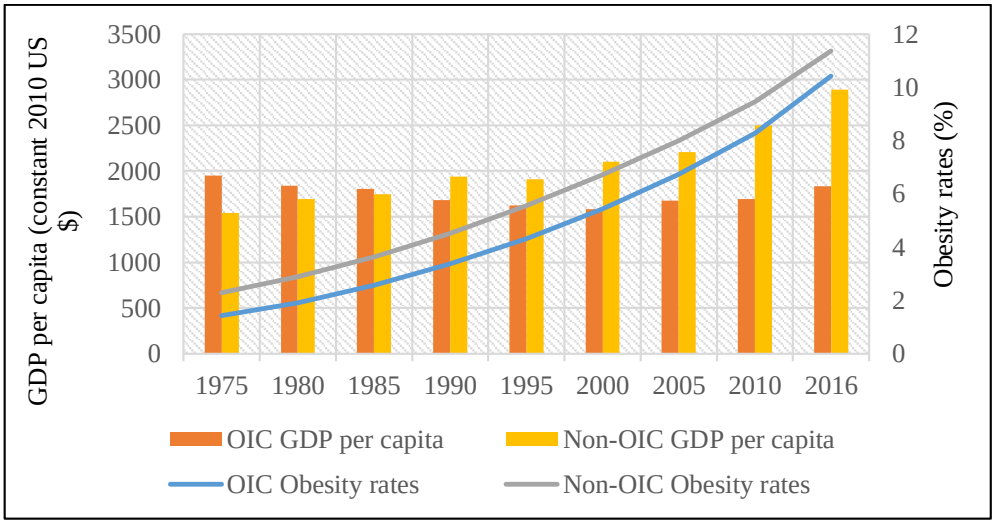


Source: World Bank, 2022

Figure 5 shows the obesity rates and GDP per capita from 1975 to 2016 for both OIC and non-OIC countries in Africa. There was an upward trend in obesity rates in both OIC and non-OIC countries in Africa between 1975 and 2016. Additionally, the gap between the obesity rates of the two groups was almost stable during the period. On the other hand, non-OIC countries experienced a gradual increase in GDP per capita for the given period, except for a fall in 1995, while GDP per capita in OIC countries had a remarkable fall from 1975 to 2000. However, GDP per capita gradually increased from 2000 to 2016 in OIC members in Africa. There was no salient difference in GDP per capita between the two groups for the given period, but the gap had started to grow from 1995, reaching its peak in 2016.

Firstly, this study will focus on analysing the relationship between obesity rates and GDP per capita between 1975 and 2016 for OIC members in the context of the OKC Model by comparing the Africa and Eastern Mediterranean regions. Therefore, we aim to determine if the relationship between obesity and economic growth is non-linear for these two regions. We will later estimate a second model to compare OIC members and non-OIC countries in Africa to examine if OKC Model is valid for these two groups.

Figure 5. Obesity rates and GDP per capita in OIC and non-OIC countries in Africa



Source: World Bank, 2022; World Health Organisation, 2022

5. Data, Model and Methodology

This study examines the relationship between obesity rates and economic growth using GDP per capita as an independent variable. Obesity (OB) data is obtained from the World Health Organization Global Health Observatory database, and GDP per capita data (2010 constant US dollars) is obtained from the World Bank database. We used the prevalence of obesity among adults with BMI equal to and higher than 30, the age-standardized estimate. Because obesity data is only available between 1975 and 2016, we used the data from 1975 to 2016. The relationship between GDP per capita and obesity rates is analysed using the OKC Model. The function of the model is defined as follows:

$$OB = f(GDP, GDP^{2}) \quad (1)$$

The models to be estimated are as follows:

$$LogOb_t^{Africa} = \beta_0^{Africa} + \beta_1^{Africa} LogGDP_t^{Africa} + \beta_2^{Africa} LogGDP_t^{Africa^2} + \varepsilon_t \quad (2)$$

$$LogOb_t^{Eastern\ M} = \beta_0^{Eastern\ M} + \beta_1^{Eastern\ M} LogGDP_t^{Eastern\ M} + \beta_2^{Eastern\ M} LogGDP_t^{Eastern\ M^2} + \varepsilon_t \quad (3)$$

$$LogOb_t^{Non\ OIC\ Africa} = \beta_0^{Non\ OIC\ Africa} + \beta_1^{Non\ OIC\ Africa} LogGDP_t^{Non\ OIC\ Africa} + \beta_2^{Non\ OIC\ Africa} LogGDP_t^{Non\ OIC\ Africa^2} + \varepsilon_t \quad (4)$$

Model (2) and Model (3) are to be estimated for OIC members in Africa and Eastern Mediterranean, respectively. Model (4) is to be estimated for non-OIC countries in Africa in order to compare with the results obtained from Model (2).

6.Empirical Results

First, we tested the dependency between the cross-sections for all models and found that cross-sections are dependent. Secondly, stationary levels of the variables are tested using second-generation unit root tests to detect if the variables are unit root. We obtained the results that all the variables are stationary except log GDP per capita in the model (4), and this variable is stationary at first-difference. We used the fixed effects model to estimate the regression models.

Table 2. Regression Results for OIC members in Africa and Eastern Mediterranean

Variable	Result	
	OIC members in Africa (2)	OIC members in Eastern Mediterranean (3)
Log GDP in millions ($)	7.8850* (0.9926)	5.5062* (0.2813)
Log GDP in millions ($) square	-0.5320* (0.0703)	-0.2827* (0.0163)
Constant term (c)	-27.4279* (3.5304)	-23.2019* (1.2410)
Sample	672	420
R square	0.4191	0.8474

Statistical significance * p value < 0.01

Table 2 shows the results of the model (2) and model (3) that compare the relationship between obesity and economic growth in OIC members in both Africa and the Eastern Mediterranean. The results show that OIC members in Africa and Eastern Mediterranean would first experience a rise in obesity rates with increasing GDP per capita. However, obesity rates would fall as the economy continues to grow in the coming years. Moreover, obesity rates in OIC members in Africa would decrease two times more than the obesity rates in OIC members in Eastern Mediterranean. Shortly, the OKC model is valid for both two groups. However, according to R square results, explanatory variables explain 85 % of the change in obesity rates in OIC members in the Eastern Mediterranean region, while it is 42 % in OIC members in Africa.

Table 3. Regression Results for OIC members and non-OIC countries in Africa

Variable	Results			
	OIC members in Africa (2)		non- OIC countries in Africa (4)	
Log GDP pc in millions ($)	7.8850*	(0.9926)	0.9182**	(0.4520)
Log GDP pc in millions ($) square	-0.5320*	(0.0703)	0.7415	(1.1763)
Constant term (c)	-27.4279*	(3.5304)	1.4528*	(0.0218)
Sample	672		656	
Adjusted R square	0.4191		0.6223	

Statistical significance * p value < 0.01 ** p value < 0.05

Table 3 shows the results of the model (2) and model (4) that compare the relationship between obesity and economic growth in Africa for both OIC members and non-OIC countries. The results show that obesity rates would increase in both two groups of countries in Africa as the economy grows, but the rise would be more in OIC countries in Africa. Plus, obesity rates would fall in OIC members in Africa if GDP per capita continues to increase. However, since GDP square is insignificant due to its unacceptable p-value, we cannot state that obesity will start to decrease as the economy continues to grow in non-OIC countries in Africa. Thus, the OKC model is not valid for non-OIC countries in Africa, while it is valid for OIC countries in Africa.

We also tested an alternative model excluding one high-income country amongst the non-OIC countries Africa region, Seychelles, to detect if there would be any difference in the results of non-OIC countries' model estimation. The results show that excluding Seychelles would not make any difference. According to the results, obesity rates would rise with a growing economy, but GDP square is still insignificant.

7. Conclusion

The relationship between obesity rates and economic growth was examined in this study using the OKC model estimating the fixed effects model firstly for OIC members in Africa and Eastern Mediterranean. We discovered that OKC is valid for OIC members in both Africa and Eastern Mediterranean. Even though Islam shapes the eating behaviours and daily lives of Muslim people, body weight might be affected by economic factors in OIC members in Africa and Eastern Mediterranean regions. We obtained a result showing that obesity rates in OIC members in Africa and Eastern Mediterranean would first rise as GDP per capita increases. However, obesity rates would fall if GDP per capita continues to go up. Additionally, OIC members in Africa would experience two times more fall in obesity rates with

continually rising economic growth than OIC members in Eastern Mediterranean. However, this result contradicts the literature analysing high- and upper-middle-income countries. Multiple studies suggest that obesity rates would experience a fall more in high and upper-middle-income economies than in low-income economies due to changing eating habits and choosing healthy lifestyles. OIC members in Africa are low- and lower-middle-income economies. Thus, the results can be interpreted that African countries might have different cultures, eating habits, daily routines, and more, which might negatively affect body weights with increasing economic growth. Plus, since they are low- and lower-middle-income countries, a growing economy might not be sufficient to compensate for malnutrition in those areas. Further studies should examine why obesity rates would decrease more in Africa with a continually growing economy.

We also estimated the OKC model for OIC and non-OIC countries in Africa as the second part of this study to examine if the relationship between economic growth and obesity differs between the two groups. The results provided us with comparable outcomes. As we know from the previous result, the OKC model is valid for OIC members in Africa, showing that obesity rates are likely to first rise with an increase in GDP per capita but may start to fall as GDP continues to rise in OIC members in Africa. On the other hand, in non-OIC countries in Africa, obesity rates are also likely to rise as GDP per capita rises. However, GDP per capita square is insignificant for non-OIC countries in Africa, unlike OIC countries in Africa. We, therefore, cannot state that the OKC model is valid for non-OIC countries in Africa.

We can summarise that GDP per capita positively affects the obesity rates in OIC members in Africa and the Eastern Mediterranean and non-OIC countries in Africa. Plus, the OKC model is valid for OIC members in both Africa and Eastern Mediterranean but not for non-OIC countries in Africa. Economic growth, at first, may have positive impacts on all three groups of countries but would start to negatively affect obesity rates in OIC members in both Africa and Eastern Mediterranean. OIC members in Africa are the countries where the positive effects of GDP per capita on obesity rates and the impacts of economic growth on reducing obesity in the future are likely to be the strongest among all groups.

We have tried to contribute to the literature with this study by offering that the OKC model is valid for OIC members in Africa and Eastern Mediterranean but not valid for non-OIC countries in Africa. The results might be attributed to some possible reasons, such as social and economic motivations. Future studies should examine any presumptive motives that might impact weight gain in OIC, such as social, religious, and economic factors. Additionally, further analyses should investigate the non- OIC economies in Africa to find out the importance of economic growth in changing obesity rates.

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