

Obesity Among Middle Eastern Women: A Literature Review

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ABSTRACT: *Obesity is growing at an alarming rate around the world with a tremendous increase in the Middle East. The author completes an in-depth review of the available literature, reporting that the prevalence of obesity among women in the Middle East ranges between 13% and 50%. Primary prevention strategies and culturally-appropriate programs are recommended to combat the obesity pandemic among women in the Middle East.*

Keywords : *health education and promotion, Middle Eastern women, obesity, Saudi Arabia.*

Introduction

A tremendous increase in obesity cases in the Middle East over the past twenty years has raised serious health concerns with experts pointing out that if not checked, obesity threatens to become a major health crisis. Research indicates that cases of obesity in the region are nearly twice as high among women as compared to men (al-Mahroos & al-Roomi, 1999). In some countries, such as Kuwait and Saudi Arabia, the number of obese women is nearly half of the total female population (Al Rashdan & Al Nesef, 2010; Alsaif et al., 2002). According to the World Health Organization (WHO), increased cases of obesity in the region are likely to increase the number of non-communicable diseases (Badran & Ismail, 2011). Physical inactivity and poor diet have been recognized as being the main contributors to obesity (Rahaim et al., 2014). In the Middle East, the substitution of the traditional diet with processed and refined foods as well as those rich in salt and fat have led to increased caloric intake (Badran & Ismail, 2011; Abdeen et al., 2012).

The increased prevalence of obesity in the Middle East, most notably among women, have also led to an increase in hypertension and diabetes cases. Studies indicate that women in the Middle East engage in very little physical activity contributing further to the increasing cases of obesity (Al-Eisa & Al-Sobayel, 2012). As much as changes in diet and physical inactivity are major contributors to the increased prevalence of obesity, the causes vary between different countries in the region depending on the cultural, socioeconomic, and geographical differences. Specifically, an increase in obesity cases also comes with an economic burden, specifically in treating the chronic diseases associated with obesity. Apart from increasing the risk of developing non-communicable diseases such as hypertension and diabetes, obesity also may lead to women experiencing difficulties in becoming pregnant and increases the risk of miscarriages among pregnant women. For all of these complex reasons, therefore, it is important for the barriers to physical activity among Middle Eastern women to be identified and addressed in order to reduce this economic burden (Al-Othaimeen, Al-Nozha & Osman, 2007).

The culture of this region may be another contributor to the increasing incidence of obesity. In most of the countries in the region, exercise facilities can only be accessed by men and women are prohibited from exercising in public. Additionally, most societies in the region associate obesity with high social status as well as beauty. In most communities in the Middle East, women who are fat are considered to be beautiful, a fact which has encouraged most women in these communities to add weight (Al-Othaimeen, Al-Nozha & Osman, 2007). As the cases of obesity continue to soar in the Middle East, some governments are developing strategies to minimize the cases.

The purpose of this literature review is to: (1) Identify studies that investigate the cause of increasing cases of obesity among women in the Middle East, (2) Identify studies that discuss the strategies that governments in the Middle East can utilize to minimize the economic costs associated with increased obesity cases.

Materials and Methods

The methodology used for the literature review was a database search for literature published from 1994 to 2014. The database search involved searching articles relevant to obesity among Middle Eastern women. The main method of data collection involved reviewing literature from different online databases. These databases include Academic Search Complete, CINAHL, Food Science Source, *SPORT Discus*, and PsycINFO.

The inclusion process took into consideration a number of factors. For an article to be included in the literature review it had to be written and published in English and classified as empirical research, professional commentaries, or committee papers. The criteria also included research reports from research institutions that are reputable, government agencies, non-profit agencies, as well as educational institutions. Articles published as early as 1994 were utilized in order to gain a historical perspective of the issue, while recent articles were used in order to gain current insights on obesity in the Middle East.

The matrix method was utilized for data abstraction. This approach is easy to follow and coherent, enabling researchers to review the past and present literature systematically. The approach proved effective in identifying, organizing, and critically evaluating the relevant literature. The matrix was used to determine the quality as well as the traits of the studies with regard to obesity among women in the Middle East. A total of twenty-seven articles were reviewed.

Results

Prevalence of Obesity

Numerous studies have been done on the prevalence of obesity and related complications in the Middle East (Table 1). A large portion of research has been conducted in Saudi Arabia, specifically.

Table (1): Prevalence of Obesity in Middle Eastern Countries According to Various Studies

Author and Year Published (See References)	Location/Country	Prevalence Rate of Obesity in Adults
2012 ,etal ,Z ,Abdeen	Palestine	men %17.5 women %31.5
2011 ,etal ,L ,Alhyas	Gulf Countries	men %37-13 women % 49-16
al-Mahroos, F. & al-Roomi, K., 1999	Arabian peninsula	men %25-%16 women %48-%17
2007 ,etal ,I.A ,Othaimen-Al	Saudi Arabia	men %14.2 women %23.6
2010 ,Y ,AlNesef& .I ,AlRashdan	Kuwait	men %39.2 women %53
Alsaif, M.A., et al., 2002	Saudi Arabia	men %29.94 women %49.15
2011 ,L ,Ismail& .M ,Badran	Gulf Countries	men %30-%1 women %55-%2

Elmehdawi, R.R., & Albarsha, A.M., 2012	Libya	men %21.4 women %40.1
Khashoggi, R.H., et al., 1994	Saudi Arabia	women 64% (study did not look at men)
2013 ,etal ,A ,Mirzazadeh	Iran	men %12.9 women %26.2
Sheikh-Ismail, L., et al., 2009	United Arab Emirates	women 16% (study did not look at men)

Prevalence of obesity in Saudi Arabia. Quite a few researchers focused on the overall prevalence of obesity in Saudi Arabia.

For example, al-Mahroos and al-Roomi (1999) conducted a study that investigated the prevalence of obesity in the Arab countries. They discussed the risks associated with obesity, such as coronary artery diseases, diabetes, and hypertension. Their study involved reviewing literature published prior to 1999 and pointed out that the rate of prevalence ranged from 16% to 43% with women being the most affected. Further, they reported that the most common obesity-related diseases in the Arabian Peninsula include diabetes, coronary heart disease, and hypertension.

Al-Othaimeen, Al-Nozha & Osman (2007) also conducted a study to determine the prevalence of obesity in Saudi Arabia. Their study involving 19,598 participants from 2,837 households reported that cases of obesity were present across different age groups. The study showed that the prevalence ranged from one region to another, an indicator that geographical and cultural factors contribute to obesity prevalence. Al-Othaimeen, Al-Nozha & Osman (2007) are of the view that there is need for lifestyle changes among the Saudi population in order to reduce the prevalence of obesity.

Alfarwan (2011) explained that obesity is a life-threatening disease that comes with great cost to the healthcare system of the affected countries and she sought to identify ways through which obese women in Saudi Arabia can overcome the barriers to healthy eating.

Prevalence of obesity and other socio-demographic variables. Khashoggi, Ghaznawy, Ali, and Madani (1994) conducted a study to determine the socioeconomic factors impacting the prevalence of obesity among women in Saudi Arabia. They pointed out that the prevalence of obesity in the sample of 852 Saudi women was high (64.3%) and was significantly associated with age, level of education, marital status, and women's income levels.

Al-Nuaim, Bamgboye, Al-Rubeaan, and Al-Mazrou (1997) are other researchers who sought to analyze obesity cases in the Middle East. Their study focused on the socio-demographic variables and their roles in increasing cases of obesity in Saudi Arabia. The study reported that socio-demographic variables that impacted the prevalence of obesity and overweight cases include residential area, age, gender, income, and education. They pointed out that there is a need for education on better nutrition and an increased focus on physical exercise in order to reduce obesity cases.

Al-Malki, Al-Jaser, and Warsy (2003) also acknowledged the fact that the prevalence of obesity in Saudi Arabia is very high. Their study sought to identify the prevalence of obesity among women who had reached child-bearing age. Their findings indicated that more cases of obesity are found in women who have reached child-bearing age and married women were more likely to be obese as compared to single women.

Prevalence of obesity and risk factors. Like the previously mentioned researchers, Alsaif et al. (2002) studied the prevalence of obesity in Saudi Arabia, however, their focus was on obesity risk factors. Their study utilized national survey data recorded between 1990 and 1993 and included both men and women aged between 30 and 70 years. The findings pointed out that most obesity cases are found in the 40-49 year-old age group and that obese people of this age group are likely to be hypertensive and high-income earners.

Prevalence of Obesity in the Middle East and other Arabic-Speaking Countries

Aside from Saudi Arabia the prevalence of obesity around the globe has increased and other countries in the Middle East are no exception.

Arabic-speaking countries. Sahn (2009) argued that there has been an increase in the number of obese women in the middle-income and developing nations and that this increase is dramatic. The author pointed out that the numbers have especially been high in the Middle Eastern countries. The study utilized more than 70 national surveys and determined that urban areas in the Middle East have more obesity cases than rural areas. Also of note, among the Middle Eastern countries, Egypt's statistics were described as being unique since three in every four women were found to be obese.

In their study, Alhyas, McKay, Balasanthiran, and Majeed (2011) intended to find out the prevalence of obesity cases in the Gulf region as well as the risk factors for obesity. Their analysis of forty-five sources revealed that the prevalence of obesity in the population ranged from 13% to 50% and that the rate of prevalence was higher in females than in males.

Badran & Ismail (2011) discussed factors identified by previously mentioned studies that have contributed to increased obesity cases in the Arabic-speaking countries. These include physical activity, alterations in food consumption as well as demographic and socioeconomic factors. They pointed out that obesity comes with a high economical and personal cost.

Ng et al., (2011) reviewed published literature to determine the prevalence of obesity and overweight complications in Arab countries, including Kuwait, Bahrain, Qatar, Oman, the United Arab Emirates, and Saudi Arabia. The study showed that obesity in the Middle Eastern countries is especially high in women with Kuwait emerging as the leading state in terms of obesity prevalence.

Iran. Mirzazadeh et al., (2013) conducted a meta-analysis of the prevalence of obesity among women in Iran. Their study involved reviewing literature published between 1997 and 2007 and identified that the prevalence of obesity in men and women was 12.9% and 26.2% respectively.

Kuwait. AlRashdan & Al Neseef (2010) studied the prevalence of obesity in Kuwait. They argued that there is inadequate community-based information on obesity in the Arabian countries. Their study pointed out that the prevalence of obesity in Kuwait is alarming with about 53% of Kuwaiti women being obese and 39% of Kuwaiti men.

Libya. Elmehdawi and Albarsha (2012) revealed that obesity has resulted in many cases of premature deaths and morbidity in Libya. Their study identified that more than half of the Libyan adult population is either obese or overweight with the number of women who are obese being twice that of men.

Palestine. Abdeen et al. (2012) pointed out that obesity and the risks associated with it have raised major concerns around the globe, but the increasing obesity prevalence in the Middle East is alarming. Their study

involved a cross-sectional survey in which they found that 31.5% of Palestinian women were obese as compared to 17.5% of Palestinian men.

The United Arab Emirates. Ali, Bernsen & Baynouna (2008) argued that the rate of obesity and related non-communicable diseases such as diabetes and heart disease is higher in the United Arab Emirates (UAE). Findings from the study indicated that barriers to weight management included physical, social, health care-related and personal factors.

Sheikh-Ismail et al. (2009) stated that most women in UAE are obese and that health interventions are necessary to combat obesity in the region. Specifically, they found that 27% of women were overweight and 16% were obese.

In another study, Ali, Baynouna, and Bernsen (2010) also noted that type 2 diabetes is the most prevalent obesity-related disease in the UAE. This study also sought to identify the weight management behaviors as well as perceptions of women in the UAE with regard to increased type 2 diabetes risk.

Other developing countries. Martorell, Khan, Hughes, and Grummer-Strawn (2000) sought to find out the general trends of obesity among women in developing countries. Apart from identifying how it varies with regard to residence and education level, the study also aimed at pointing out how national income impacted the prevalence of obesity. The study found that the prevalence of obesity was highest among women in the Middle East.

In contrast: Israel. Kaluski and Berry (2005) conducted a study to analyze the prevalence of obesity in Israel. Investigation into the prevalence of obesity in Israel found that the trend was different from other countries in the Middle East, with more men being obese compared to women. Additionally, they reported that the Jewish population in Israel was less obese compared to the Arab population in general.

Lifestyle Interventions

The literature discussed so far has sought to analyze the prevalence of obesity and associated risk factors in Arab speaking countries. On the other hand, there are numerous articles that specifically discuss lifestyle interventions for the obese and where future research is headed.

In Saudi Arabia. Alqout and Reynolds (2014) stated that women in Saudi Arabia experience cultural restrictions on social and physical activities that could help manage their weight. Their study aimed to explore the experiences of obese women contemplating alternative ways of overcoming the problem with the main focus being on surgery. Alqout and Reynolds (2014) pointed out that in order to access their normative roles and protect their health, most of the participants chose to go through with bariatric surgery.

In the United Arab Emirates. Ng et al., (2011) investigated how changes in nutrition in the UAE had impacted the levels of obesity. They mentioned that the country has undergone tremendous economic and social changes over the past few years and their findings showed that there has been a significant increase in the caloric intake across different age groups and genders in the UAE. They are of the view that these trends increase the risk of many cardio-metabolic problems in the near future and that the population needs to be educated about healthy diets.

Across the Middle East and in other Arabic-Speaking Countries. Kalter-Leibovici et al. (2010) analyzed the possible lifestyle intervention options available for Arab women who are obese. They indicated that other non-western populations have been reported as having utilized lifestyle intervention trials, but the same has

not been reported in the Arab-speaking population.

According to Sibai et al., (2011) nutritional transition is being experienced in the Middle East, leading to increased obesity cases and the increased obesity cases in the Middle East have come with an increased risk of cardiovascular diseases. The study also reported that there has been a decrease in the intake of carbohydrates, fresh vegetables, and fruits with an increase in the intake of animal protein and fats being recorded.

Popkin and Slining (2013) stated that the levels of obesity in low and middle-income countries are approaching the levels reported in high-income countries. Their study aimed to determine the prevalence of obesity in low and middle-income countries. They report that there has been an annual increase in obesity cases across the different regions and that the Middle East showed the highest rates of obesity prevalence, with more than two-thirds of women being obese.

Rahim et al. (2014) pointed out that recent reports indicate that there has been a significant increase in the burden associated with non-communicable diseases such as heart failure and diabetes in the Arab countries. Additionally, they stated that the burden varies from one country to another, depending on national income levels. Their study reviewed literature published between 2000 and 2013 and indicated that governments in the region have not taken any significant measures in addressing the costs associated with obesity and related diseases.

Kilpi et al. (2014) took a look at what the future holds for obesity and related diseases in the Middle East. They reported that there has been a general increase in obesity cases among women and men in the Middle East and that a slight reduction in obesity incidences would lighten the burden of the associated complications and diseases.

Discussion

The prevalence of obesity among both women and men in the Middle East has been on the rise over the past two decades, and cases of obesity in the region are higher among women than men. The prevalence of obesity in the Middle East stands at 17.4% with prevalence among women ranging from 13% to 50%. In countries such as Kuwait and Saudi Arabia, the number of obese women is nearly half of the total female population.

Physical inactivity and poor diet have been pointed out as being the main contributors to obesity. In the Middle East, the substitution of a traditional diet with processed and refined foods as well as those rich in salt and fat contribute to increased caloric intake. And as much as changes in diet and physical inactivity are major contributors to the increased cases of obesity, the causes vary between different countries in the region depending on the cultural, socioeconomic and geographical differences.

Apart from increasing the risk of developing non-communicable diseases such as diabetes and cardiovascular disease, obesity also may cause difficulties in becoming pregnant and increase the risk of miscarriages among pregnant women. Further, an increase in obesity cases also comes with an enormous economic burden on the patient and on the healthcare system in general. Governments and economists in the Middle East should take note of this socioeconomic impact, specifically in treating the chronic diseases associated with obesity.

It is clear that an insurgence of educational programs aimed at lifestyle interventions is necessary to prevent this pandemic from continuing to worsen.

Implications

This review has important implications for the healthcare community, policy makers, and individuals in

general as it identifies factors contributing to obesity as well as the risks associated with it. Socioeconomic factors such as changes in food consumption behavior, increased availability and access to fast foods, and a change in income levels have contributed to an increase in the obesity prevalence in the Middle East (Badran& Ismail, 2011). Other significant factors include genetic traits as well as environmental conditions (Alhyas et al., 2011).

Lack of physical activity, inadequate motivation, inadequate time as well as poor diet are some of the factors that have contributed to poor weight management among women in the Middle East (Al-Malki, Al-Jaser, and Warsy, 2003). Geographical locations as well as age are also other risk factors associated with obesity (Khashoggi, Ghaznawy, Ali, and Madani, 1994). Better nutritional programs and increased physical activities are necessary in order to bring down the high prevalence rates of obesity among women in the Middle East (Al-Othaimen, Al-Nozha& Osman, 2007). The increased prevalence of obesity in the region has also come with increased burden to the healthcare systems of the affected countries (al-Mahroos& al-Roomi, 1999). This is especially with regard to the risk factors and diseases that obesity comes with non-communicable diseases. The risk factors associated with obesity, such as hypertension, diabetes, and coronary diseases are likely to increase in most Arab countries if the current situation is not controlled (Ali, Bernsen&Baynouna, 2008). These health concerns have contributed to the increased burden on the health care systems and if not checked, the burdens are likely to culminate in an economic crisis in the Middle East region in the near future.

Recommendations

It is important for strategies targeting the young people in the population to be implemented in order to curb future cases of obesity and related diseases. It is recommended that food nutrition programs aimed at educating the public on healthy living and nutrition be implemented.

The governments of countries in the Middle East need to be at the forefront in coming up with such strategies and it is also important for public education about healthy eating habits to be undertaken. It is also recommended that policy makers should come up with policies that encourage lifestyle changes and health awareness. Because of the sheer economic impact of obesity-related diseases in the Middle East, more research needs to be conducted by professionals and scholars to identify the most appropriate approaches to obesity management in Middle Eastern countries.

Most importantly, it is suggested that cultural barriers to weight and obesity management be addressed in order to ensure that future generations don't experience the same barriers. By educating the public, the future occurrence of obesity and related risk factors could be minimized.

Conclusion

The general trend of all of the included studies show that the prevalence of obesity is very high in the entire Middle Eastern region especially among women. Numerous studies have been conducted on the prevalence of obesity among women in the Arabic-speaking world and most of them point out that physical inactivity and lifestyle changes have greatly contributed to the increased cases of obesity in the Middle Eastern population. This high rate of obesity has raised major health concerns among key stakeholders in the region. There is need for intervention strategies to be implemented since obesity also comes with its economic costs.

References

- [1] Abdeen, Z., Jildeh, C., Dkeideek, S., Qasrawi, R., Ghannam, I., & Al Sabbah, H., Overweight and obesity among Palestinian adults: Analyses of the anthropometric data from the first National Health And Nutrition Survey (1999-2000). *Journal of Obesity* 12(20): 16-22, 2012, 16-22.
- [2] Alfarwan, W. M. Perceived personal, social, and environmental barriers to healthy eating among young overweight and obese Saudi women. (10)9. *MiddleEastJournalofFamilyMedicine* 2011, .9-3
- [3] Alhyas, L., McKay, A., Balasanthiran, A., & Majeed, A. Prevalences of overweight, obesity, hyperglycaemia, hypertension and dyslipidaemia in the Gulf: Systematic review. *JRSM Shorts*, 2(7), 2011, 1-16. doi:10.1258/shorts.2011.011019
- [4] Al-Eisa, E. S., & Al-Sobayel, H. I. Physical Activity and Health Beliefs among Saudi Women. *Journal of nutrition and metabolism*, 2012, 642187.
- [5] Ali, H. I., Baynouna, L. M., & Bernsen, R. M.. Barriers and facilitators of weight management: Perspectives of Arab women at risk for type 2 diabetes. *Health & Social Care in the Community*, 18(2), 2010, 219-228. doi:10.1111/j.1365-2524.2009.00896.x
- [6] Ali, H. I., Bernsen, R. M., & Baynouna, L. M. Barriers to weight management among Emirati women: A qualitative investigation of health professionals' perspectives. *International Quarterly of Community Health Education*, 29(2), 2008, 143-159.
- [7] al-Mahroos, F., & al-Roomi, K. Overweight and obesity in the Arabian Peninsula: An overview. *Journal of the Royal Society for the Promotion of Health*, 119(4), 1999, 251-253.
- [8] Al-Malki, J. S., Al-Jaser, M. H., & Warsy, A. S. Overweight and obesity in Saudi females of childbearing age. *International Journal of Obesity*, 27, 2003, 134-139.
- [9] Al-Nuaim, A., Bangboye, E. A., Al-Rubeaan, K., & Al-Mazrou, Y. Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. *Journal of Community Health*, 22, 1997, 211-223. doi:10.1023/A:1025177108996
- [10] Al-Othaimen, A. I., Al-Nozha, M., & Osman, A. K. Obesity: An emerging problem in Saudi Arabia. Analysis of data from the national nutrition survey. *Eastern Mediterranean Health Journal*, 13(2), 2007, 441-448.
- [11] Alqout, O., & Reynolds, F. (2014). Experiences of obesity among Saudi Arabian women contemplating bariatric surgery: An interpretative phenomenological analysis. *Journal of Health Psychology*, 19(5), 2014, 664-677. doi:10.1177/1359105313476977
- [12] Al Rashdan, I., & Al Neseif, Y. Prevalence of overweight, obesity, and metabolic syndrome among adult Kuwaitis: Results from community-based national survey. *Angiology*, 2010, 61(1), 42-48. doi:10.1177/0003319709333226
- [13] Alsaif, M. A., Hakim, I. A., Harris, R. B., Alduwaihy, M., Al-Rubeaan, K., Al-Nuaim, A., & Al-Attas, O. Prevalence and risk factors of obesity and overweight in adult Saudi population. *Nutrition Research*, 22(11), 2002, 1243-1252.
- [14] Badran, M., & Ismail, L. Obesity in Arabic-speaking countries. *Journal Of Obesity*, 2011. doi:10.1155/2011/686430
- [15] Elmehdawi, R. R., & Albarsha, A. M. Obesity in Libya: A review. *Libyan Journal of Medicine*, 7(1), 2012, 1-5. doi:10.3402/ljm.v7i0.19086
- [16] Kalter-Leibovici, O., Younis-Zeidan, N., Atamna, A., Lubin, F., Alpert, G., Chetrit, A., Freedman, L. S. (Lifestyle intervention in obese Arab women: A randomized controlled trial. *Archives of Internal Medicine*, 170(11), 2010, 970-976. doi:10.1001/archinternmed.2010.103
- [17] Kaluski, D. N., & Berry, E. M. (2005). Prevalence of obesity in Israel. *Obesity Reviews*, 6(2), 2005, 115-116. doi:10.1111/j.1467-789X.2005.00168.x
- [18] Khashoggi, R. H., Ghaznawy, H. I., Ali, M. A., & Madani, K. A. Socioeconomic factors affecting the prevalence of obesity among female patients attending primary health centers in Jeddah, Saudi Arabia. *Ecology of Food & Nutrition*, 31(3), 1994, 277.
- [19] Kilpi, F., Webber, L., Musaigner, A., Aitsi-Selmi, A., Marsh, T., Rtveldzde, K., . . . Brown, M. Alarming predictions for obesity and non-communicable diseases in the Middle East. *Public Health Nutrition*, 17(5), 2014, 1078-1086. doi:10.1017/S1368980013000840
- [20] Martorell, R., Khan, L., K., Hughes, M., L., & Grummer-Strawn, L. Obesity in women from developing countries. *European Journal of Clinical Nutrition*, 54(3), 2000, 247-252. doi:10.1038/sj.ejcn.1600931
- [21] Mirzazadeh, A., Salimzadeh, H., Arabi, M., Navadeh, S., Hajarizadeh, B., & Haghdoost, A. A. Trends of obesity in Iranian adults from 1990s to late 2000s; a systematic review and meta-analysis. *Middle East Journal of Digestive Diseases*, 5(3), 2012, 151-157.
- [22] Ng, S. W., Zaghoul, S., Ali, H. I., Harrison, G., & Popkin, B. M. The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf states. *Obesity Reviews*, 12(1), 2011, 1-13. doi:10.1111/j.1467-789X.2010.00750.x
- [23] Ng, S. W., Zaghoul, S., Ali, H., Harrison, G., Yeatts, K., El Sadig, M., & Popkin, B. M. Nutrition transition in the United Arab Emirates. *European Journal of Clinical Nutrition*, 65(12), 2011, 1328-1337. doi:10.1038/ejcn.2011.135
- [24] Popkin, B. M., & Slining, M. M. New dynamics in global obesity facing low- and middle-income countries. *Obesity Reviews*, 14, 2012, 11-20. doi:10.1111/obr.12102
- [25] Rahim, H. F. A., Sibai, A., Khader, Y., Hwalla, N., Fadhil, I., Alsiyabi, H., & Hussein, A. Non-communicable diseases in the Arab world. *Lancet*, 383(9914), 2012, 356-367. doi:10.1016/S0140-6736(13)62383-1
- [26] Sahn, D. E. Weights on the rise: Where and for whom? *Journal of Economic Inequality*, 7(4), 2009, 351-370. doi:10.1007/s10888-008-9085-0
- [27] Sheikh-Ismail, L., Henry, C. J., Lightowler, H. J., Aldhaheri, A. S., Masuadi, E., & Al Hourani, H. M. Prevalence of overweight and obesity among adult females in the United Arab Emirates. *International Journal of Food Sciences & Nutrition*, 60, 2009, 26-33.
- [28] Sibai, A. M., Nasreddine, L., Mokdad, A. H., Adra, N., Tabet, M., & Hwalla, N. Nutrition transition and cardiovascular disease risk factors in Middle East and North Africa countries: Reviewing the evidence. *Annals of Nutrition & Metabolism*, 57(3), 2011, 193-203. doi:10.1159/000321527