CHAPTER 17

Common nutrition and health issues of food in the Balkans

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17.1 Introduction

The Balkans are the only region in Europe where the intersection between the influences of the Eastern and Western culture can be found, the same applies nowadays to nutrition and health. Being a historical point of division (e.g., the Roman, Byzantine, and Ottoman Empires, the Habsburg Monarchy, the First and Second World war, and the Yugoslav wars), the Balkan region was not always easy for people to live in. The frequent wars often caused food deprivation for many despite the region's fecund soil. Due to the late industrialization of the Balkans, food production has traditionally been difficult and laborious. It relied solely on the physical strength of the population and their food needs. Working in the fields was hard, involving mostly manual work and all family members, sometimes assisted by oxen, donkeys, and horses. The main production included cereals, fruits, vegetables, dairy products (e.g., cheese, milk), and limited meat and meat products. This had remained for generations, forming the various cuisines of the Balkan countries that share many commonalities and yet are different due to the influences of the surrounding cultures.

17.2 Health characteristics of Balkan cuisines

Balkan food is hearty and filling, full of fresh salads made with seasonal produce, delicious dips, and grilled meat. Some foods in the Balkans can be found throughout the region (e.g., "mekitsi," "musaka") even if under a different name (e.g., "banitsa" in Bulgaria is called "gibanica" in Serbia)—virtually every Balkan country has a variation of the same meal. For example, borek/burek can be found in Turkey, Macedonia, and Serbia and in Greece where it is known as pita. Grilled meat dishes (e.g., "kebab") can be found anywhere, whereas some other Balkan foods are hard to find outside their country of origin. Given the similarities of the cuisines of the Balkan countries, it is expected that health issues will not vary too much.

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17.3 Health issues

17.3.1 Water, sanitation, and hygiene

Water reserves in the Balkans are extremely large. Often this region is affected by frequent floods and earthquakes. According to the study of Nichols, Lake, and Heaviside (2018), these disasters facilitate water and soil pollution and, consequently, the spread of many infectious diseases. Sanitation facilities must be able to separate human excreta from human contact. Emphasizing on the data from the WHO (2018a), one of the most critical aspects of people's lives is living in adequate, sanitary housing conditions. Improved sanitation facilities include flush toilets (alternatively pour flush to piped sewer system, septic tank, or pit latrine), improved ventilated pit latrines, pit latrines with slab, and composting toilets (WHO, 2018a). In 2015, 97.9% of the population in the WHO European Region, which includes all countries from the Balkans, had access to piped drinking water (96.3% of the population in rural areas, 99.3% of the population in urban areas) and 92.9% of them had access to improved sanitation systems (89.2% of the population in rural areas, 94.6% of the population in urban areas) (WHO, 2018a).

17.3.1.1 Water

On average, the human body is made up of 60% water, which is why drinking water is essential for life and health (Benelam & Wyness, 2010). According to latest statistics, most of the Balkan region has excellent access to safe drinking water, except for Moldova with only 88.4% of the population having access to clean water, respectively (see Table 17.1).

17.3.1.2 Hygiene

Hygiene is an important part of health. The countries with the best access to sanitation are Macedonia and Slovenia with 99.1% and the worst is Moldova with only 76.3% of the population having access to sanitation.

17.3.1.3 Medical doctors

Medical doctors play an important role in supporting a healthy lifestyle. Latest statistics highlight Greece as the country with the most doctors, while the worst are Albania and Turkey. These numbers are constantly changing due to the migration of doctors to the EU countries, especially from Romania and Bulgaria, and in the last years from Macedonia, Serbia, and Bosnia and Herzegovina.

17.3.1.4 Life expectancy

According to the World Bank, Greeks and Slovenians have the longest life expectancy of 81.0 and 81.4 years, respectively. The lowest life expectancy in the region is of 71.8 years in Moldova and 72.2 in Kosovo.

Table 17.1 Water access (average values from 2013 to 2017) and sanitation access (2017), physicians per 1000 population (years between 2015 and 2017), and life expectancy (2018) in Balkan countries.

Country	Safe drinking water access[1] (%)	Sanitation access[2] (%)	Doctors[3] (per 1000 population)	Life expectancy[4] (years)
Albania	95.1	97.7	1.2 (2016)	78.5
Bosnia & Herzegovina	99.9	95.4	2.2 (2015)	77.3
Bulgaria	99.4	86.0	4.0 (2015)	75.0
Croatia	99.6	96.5	3.0 (2016)	78.1
Greece	100	99.0	5.5 (2017)	81.0
Kosovo	–	–	–	72.2
Macedonia	99.4	99.1	2.9 (2015)	75.7
Moldova	88.4	76.3	3.2 (2017)	71.8
Montenegro	99.7	97.8	2.4 (2015)	76.8
Romania	100	84.3	3.0 (2017)	75.4
Serbia	99.2	97.6	3.1 (2016)	75.9
Slovenia	99.5	99.1	3.1 (2017)	81.4
Turkey	100	97.3	1.8 (2017)	77.4

[1]FAO. (2016). *AQUASTAT*. Data from<http://www.fao.org/nr/water/aquastat/data/query/index.html?lang = en>; [2]World Bank. (2020a). *People using at least basic sanitation services (% of population) - Europe & Central Asia*. Data from <https://data.worldbank.org/indicator/SH.STA.BASS.ZS?locations = Z7>; [3]World Bank. (2020b). *Physicians (per 1,000 people) - Europe & Central Asia*. Data from <https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?locations = Z7>; [4]World Bank. (2020c). *Life expectancy at birth, total (years) - Europe & Central Asia*. Data from <https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations = Z7>.

17.3.2 Food consumption

17.3.2.1 Calories

According to WHO and FAO, the global population-weighted average dietary energy requirement for the global average caloric intake required for a healthy life is 2353 kcal/person/day (Berners-Lee, Kennelly, Watson, & Hewitt, 2018). Within the Balkan region, Greece is the country with the highest intake of calories of 3710 per person per day, while Serbia and Montenegro have the least intake of 2700 calories (see Table 17.2).

17.3.2.2 Body mass index

Body mass index (BMI) is the most practical and most commonly used method for measuring fat accumulation in the body. It is an indicator of the health status of an individual and it is defined as the ratio between a person's weight and the square of the person's height (kg/m^2). A BMI value of 18.5–24.9 is considered normal for adults over 20 years of age, while values below 18.5 are representative for an

Table 17.2 Daily calories consumption (2006–08), average body mass index (BMI) (2014), overweight (2014), and obesity (2014) in Balkan countries.

Country	Calories[1]	Average BMI[2]	Overweight[2] (%) (BMI ≥ 25)	Obesity[2] (%) (BMI ≥ 30)
Albania	2890	26.1	52.7	17.6
Bosnia & Herzegovina	3080	26.1	51.8	17.9
Bulgaria	2760	26.0	59.1	23.2
Croatia	2990	25.5	58.8	23.3
Greece	3710	27.3	60.5	22.9
Kosovo	–	–	–	–
Macedonia	3060	26.0	55.2	19.6
Moldova	2850	26.7	46.6	14.9
Montenegro	2700	26.0	55.8	20.0
Romania	3490	25.3	57.6	21.7
Serbia	2700	25.8	54.5	19.5
Slovenia	3220	26.9	60.6	25.1
Turkey	3500	27.8	66.3	29.5

[1]FAO. (n.d.). *Food consumption. Dietary energy consumption.* Data from <https://web.archive.org/web/20200629205957/http://www.fao.org/fileadmin/templates/ess/documents/food_security_statistics/FoodConsumptionNutrients_en.xls>; [2]WHO. (2014). *Global status. Report on noncommunicable diseases 2014.* Data from <https://apps.who.int/iris/bitstream/handle/10665/148114/9789241564854_eng.pdf?sequence = 1>.

underweight status and over 24.9 for obesity (WHO, 2020a). All Balkan countries fall above a healthy weight range with BMI values ranging from 25.3 (Romania) to 27.8 (Turkey) (see Table 17.2).

17.3.2.3 Overweight and obesity

Obesity is a disorder of energy balance. It is defined as increased body weight caused by adipose tissue accumulation. Obesity and excess body weight are associated with many human disorders. Obesity is associated with insulin resistance and hyperinsulinemia, important features of type 2 diabetes (IDF, 2019). Obese people tend to have hypertriglyceridemia and low cholesterol levels of high density lipoproteins, factors which increase the risk of coronary artery disease. Obesity and type 2 diabetes are commonly associated with nonalcoholic fatty liver disease, which can advance to fibrosis and cirrhosis. Cholelithiasis (gallstones) is six times more common in obese subjects compared with lean ones. Hypoventilation syndrome is a cluster of anomalies in the respiratory system in very obese people. This was coined Pickwickian syndrome, after the fat lad in Charles Dickens's *The Pickwick Papers* who was always falling asleep. Hyper somnolence during both day and night is typical and linked to apneic pauses during sleep (sleep apnea), polycythemia, and eventual right-sided heart failure. Marked adiposity is a causative factor for degenerative joint disease (osteoarthritis) to develop. This form of arthritis, usually seen in

elderly people, is primarily due to the accumulated effects of wear and tear on joints (Kumar, Abbas, & Aster, 2018). There is an increased incidence of certain cancers in the overweight, including cancers of the esophagus, thyroid, colon, and kidney in men and cancers of the esophagus, endometrium, gallbladder, and kidney in women (Roberts, Dive, & Renehan, 2010). Probable pathways of carcinogenesis, especially in gastrointestinal cancers, are due to the change of human microbiota (Graham, Mullen, & Whelan, 2016). Globally, obesity is associated with approximately 20% of cancer deaths in women and 14% of deaths in men (Wolin, Carson, & Colditz, 2010).

Worldwide obesity has nearly tripled since 1975 and doubled between 1980 and 2008. According to estimates for 2008, over 50% of both men and women in Europe were overweight, and approximately 23% women and 20% men were obese (WHO, n.d.a). According to WHO (2014), data show that Turkey and Slovenia came in as the fattest countries in the Balkan region with 66.3% and 60.6%, respectively, of its population either overweight, or obese (i.e., 29.5% and 25.1%, respectively). The slimmest countries in the region are Moldova with 46.6% and Bosnia and Herzegovina with 51.8% of the population overweight. Moldova and Albania are with the lowest rate of obese population with 14.9% and 17.6%, respectively (see Table 17.2).

According to the study of Roberts et al. (2010), the development of obesity in a 5-year period in women is significantly positively associated with frequent consumption of "hidden" fats of animal origin and is significantly negative with each higher education level. In all Balkan countries the percentage of obese females is higher than the percentage of obese males (Roberts et al., 2010). The causes of this epidemic are tightly related to social changes in diet and levels of physical activity as it was reported by Sekulic, Vasiljevic, Radevic, and Djonovic (2018). The study of Jarani et al. (2016) emphasized that there are differences between the prevalence of overweight and obesity among Albanian children living in the Balkans and that these depend on the country, gender, and geographic location. Obesity and overweight remain a serious health problem for the Balkan population; the alarming rates of excess body weight continue to increase and therefore preventive measures must urgently be taken (Graham et al., 2016).

17.3.3 Alcohol consumption

There is a high variation in levels of alcohol consumption between the Balkan countries. The data from European Health Report show that the total consumption of pure alcohol is the amount of alcohol consumed per adult within a calendar year expressed in liters of pure alcohol. In Europe, the average per capita alcohol consumption in 2014 was 8.6 L of pure alcohol (WHO, 2018a). In Balkans, the highest alcohol consumption per capita in 2016 was 11.5 L in Bulgaria, while the lowest was in Turkey (1.3 L) (see Table 17.3).

Table 17.3 Total alcohol consumption in liters per capita (years between 2015 and 2016), age-standardized mortality rate from liver cirrhosis (years between 2013 and 2014), and liver cancer (2018) for both sexes and all ages in Balkans.

Country	Alcohol consumption[1] (L/capita/year)	Chronic liver disease and cirrhosis, per 100,000 (age-standardized death rate)[2]	Age-standardized mortality rate from liver cancer[3]
Albania	5.1 (2016)	–	7.6
Bosnia & Herzegovina	4.4 (2016)	7.72 (2014)	6.4
Bulgaria	11.5 (2016)	16.9 (2014)	3.6
Croatia	10.3 (2016)	17.8 (2014)	5.2
Greece	6.5 (2016)	4.7 (2014)	4.5
Kosovo	–	–	–
Macedonia	4.8 (2016)	8.27 (2013)	5.0
Moldova	9.3 (2016)	77.3 (2014)	11.2
Montenegro	6.4 (2015)	–	3.9
Romania	10.4 (2015)	35.8 (2014)	7.5
Serbia	9.2 (2016)	7.3 (2014)	4.7
Slovenia	10.5 (2016)	17.4 (2014)	5.0
Turkey	1.3 (2016)	3.8 (2014)	4.4

[1]WHO. (n.d.b). *Pure alcohol consumption, litres per capita, age 15+*. Data from <https://gateway.euro.who.int/en/indicators/hfa_426-3050-pure-alcohol-consumption-litres-per-capita-age-15plus/>; [2]WHO. (n.d.c). *SDR, chronic liver disease and cirrhosis, all ages, per 100 000*. Data from <https://gateway.euro.who.int/en/indicators/hfa_236-1860-sdr-chronic-liver-disease-and-cirrhosis-all-ages-per-100-000/>; [3]International Agency of Research on Cancer (IARC). (2018). *Cancer today*. Data from <https://gco.iarc.fr/today/online-analysis-table>.

Alcohol consumption is responsible for more deaths arising from accidents than from any other causes. It is also well known that the end stage of chronic alcoholism is liver cirrhosis (Louvet & Mathurin, 2015), which is a good background for developing hepatocellular cancer (Forner, Llovet, & Bruix, 2012; Kocabayoglu & Friedman, 2013; Seitz & Stickel, 2007). The highest age-standardized mortality rate from liver cirrhosis was recorded in Moldova (77.3), while the lowest was in Turkey with 3.8 per 100,000 people. There was no high variety in estimated age-standardized mortality rate in the Balkans from liver cancer with exception of Moldova (11.2). From the other countries, the highest rates were recorded in Albania and Romania (7.6 and 7.5, respectively), and the lowest in Bulgaria (3.6) and Montenegro (3.9) (see Table 17.3).

17.3.4 Diabetes

Diabetes mellitus is a group of metabolic disorders characterized by hyperglycemia. Hyperglycemia in diabetes results from defects in insulin secretion, insulin action, or most commonly both (DeFronzo, Ferrannini, & Groop, 2015). Chronic hyperglycemia and associated diabetes metabolic abnormalities often are followed by secondary damages in several organs, particularly in the kidneys, but also in eyes, nerves, and

Table 17.4 Estimated age-adjusted prevalence of diabetes (type 1 or type 2) (2019) in the Balkan countries.

Country	Diabetes age-adjusted prevalence (%) in adults of population ages 20–79
Albania	9.0
Bosnia & Herzegovina	9.0
Bulgaria	6.0
Croatia	5.4
Greece	4.7
Kosovo	–
Macedonia	9.3
Moldova	5.7
Montenegro	9.0
Romania	6.8
Serbia	9.0
Slovenia	5.8
Turkey	11.1

International Diabetes Federation (IDF). (2019). *IDF diabetes atlas* (9th ed.). Data from <https://www.diabetesatlas.org/upload/resources/2019/IDF_Atlas_9th_Edition_2019.pdf>.

blood vessels (Kumar et al., 2018). As in other countries, diabetes in the Balkans is the leading cause of end-stage renal disease, adult-onset blindness, and no traumatic lower-extremity amputations resulting from atherosclerosis of arteries (Kumar et al., 2018). There are two types of diabetes. Type 1 diabetes is defined as an autoimmune disease in which islet destruction is caused primarily by immune effector cells that react against endogenous beta cell antigens, leading to the destruction of insulin producing cells in the pancreas. Type 2 diabetes is characterized by two defects: (1) a decreased ability of peripheral tissues to respond to insulin (insulin resistance), and (2) beta cell dysfunction that is manifested as inadequate insulin secretion in the face of insulin resistance and hyperglycemia (Andersen, Andren-Sandberg, & Duell, 2013).

According to 2019 data of the International Diabetes Federation (IDF, 2019), the highest incidence of diabetes was recorded in Turkey (11.1%) and the lowest in Greece (4.7%) (see Table 17.4).

17.3.5 Cardiovascular diseases

Cardiovascular diseases (CVD) are disorders of the heart and blood vessels, which include atherosclerosis, ischemic heart disease (IHD) (coronary artery disease), hypertension, cerebrovascular diseases, and many other conditions. Four out of five CVD deaths are due to heart attacks and strokes. Individuals at risk of CVD may present raised blood pressure, glucose, and lipids, as well as overweight and obesity. About 31% of all deaths worldwide are due to CVD, more than 75% occur in low and

middle developed countries, and 85% are due to heart attacks and strokes (WHO, 2020b). In Europe, CVD account for 45% of all deaths (Wilkins et al., 2017).

17.3.5.1 Hypertension

Similar to height and weight, blood pressure is a continuous variable; moreover, detrimental consequences increase continuously as the pressure rises, with no rigidly defined threshold dependably predicting total safety. Sustained diastolic pressures above 90 mm Hg or sustained systolic pressures above 140 mm Hg are consistently correlated with an increased risk of atherosclerosis and are thus used as cutoffs in the clinical setting for diagnosing hypertension (Kumar et al., 2018). According to latest available data (WHO, 2018b), Montenegro has the lowest mortality rate due to hypertension (0.1), while Romania has the highest (62.1) (see Table 17.5).

17.3.5.2 Atherosclerosis

Atherosclerosis is identified by atheroma (or atheromatous or atherosclerotic plaques) intimal lesions that impinge on the vascular lumen and can burst to cause sudden occlusion. This underlies coronary, cerebral, and peripheral vascular disease pathogenesis and induces more morbidity and mortality (approx. half of all deaths) than any other condition (Kumar et al., 2018). Atheromatous plaques are raised lesions composed of fibrous caps that have a soft friable (grumous) lipid core (mainly cholesterol

Table 17.5 Estimated age-standardized mortality rate per 100,000 people, both sexes and all ages, for hypertension, ischemic heart disease, and cerebrovascular diseases in the Balkan countries (latest available year).

Country	Hypertensive diseases	Ischemic heart disease	Cerebrovascular diseases
Albania	2.3 (2010)	60 (2010)	65.4 (2010)
Bosnia & Herzegovina	20.2 (2014)	61.4 (2014)	61.6 (2014)
Bulgaria	40.3 (2014)	77.1 (2014)	127.4 (2014)
Croatia	13.2 (2016)	97.4 (2016)	59.8 (2016)
Greece	10.5 (2015)	45.2 (2015)	39.5 (2015)
Kosovo	-	-	-
Macedonia	34.7 (2013)	54.5 (2013)	122.4 (2013)
Moldova	42.5 (2016)	264.7 (2016)	114.7 (2016)
Montenegro	0.1 (2009)	45.1 (2009)	54.5 (2009)
Romania	62.1 (2016)	112.9 (2016)	94 (2016)
Serbia	35.9 (2015)	60.9 (2015)	75.3 (2015)
Slovenia	11.7 (2015)	42.7 (2015)	35.5 (2015)
Turkey	19.3 (2015)	81.2 (2015)	48.4 (2015)

WHO. (2018b). *WHO mortality database*. Data from <https://apps.who.int/healthinfo/statistics/mortality/whodpms/tables/tablea.php>.

and cholesterol esters, with necrotic debris). Atherosclerotic plaques can mechanically block vascular lumina as they expand, leading to stenosis. Far more worryingly, atherosclerotic plaques are also susceptible to rupture, an occurrence that may lead to thrombosis and sudden occlusion of the vessel. Hyperlipidemia—and, more precisely, hypercholesterolemia—is a significant risk factor for the development of atherosclerosis and suffices to cause lesions in the absence of other risk factors (Kumar et al., 2018). Conditions leading to atherosclerosis are high dietary intake of cholesterols, cigarette smoking, type 2 diabetes, hypertension, low physical activity, as well as age and gender (Fishbein & Fishbein, 2015).

17.3.5.3 Ischemic heart disease

IHD is a broad term that includes several intimately related syndromes triggered by myocardial ischemia—an imbalance between cardiac blood supply (perfusion) and myocardial oxygen and nutritional requirements (Kumar et al., 2018). In more than 90% of cases, IHD is a consequence of reduced coronary blood flow, secondary to obstructive atherosclerotic vascular disease, and it is a major cause of morbidity and mortality in many countries worldwide (Finegold, Asaria, & Francis, 2013). Myocardial infarction (MI), also commonly referred to as "heart attack," is necrosis of the heart muscle resulting from ischemia. The vast majority of MIs are caused by acute thrombosis within coronary arteries (Hausenloy & Yellon, 2013).

Chronic IHD, also called ischemic cardiomyopathy, is a progressive heart failure, secondary to ischemic myocardial damage. In most instances, there is a known clinical history of previous MI (Heusch, Libby, & Gersh, 2014). In the Balkans, the highest mortality rate arising from coronary heart disease was recorded for Moldova (264.7) and Romania (112.9), and the lowest in Slovenia (42.7), Greece (45.2), and Montenegro (45.1) (see Table 17.5).

17.3.5.4 Stroke

Cerebrovascular diseases are disorders of the brain caused by pathologic processes involving blood vessels. Within the developed world, they are a major cause of death and are the most prevalent cause of neurologic morbidity. The three principal pathogenic mechanisms are (1) thrombotic occlusion, (2) embolic occlusion, and (3) vascular rupture. Stroke is the clinical name applied to all these conditions when acute symptoms begin. Thrombosis and embolism have similar consequences for the brain: loss of oxygen and metabolic substrates, causing infarction or ischemic injury of the regions supplied by the affected vessel (Kumar et al., 2018). Among the Balkan countries, the lowest mortality rate from cerebrovascular diseases was noted in Slovenia (35.5) and Greece (39.5), while Macedonia (122.4) and Bulgaria (127.4) have the highest rate (see Table 17.5).

17.3.6 Gastric and colorectal cancer

Gastric adenocarcinoma (GAC) is the most common stomach malignancy with over 90% of all gastric cancers (Kumar et al., 2018). Rates of this disease vary markedly with geography. The data from the European National Cancer Register (ENCR, 2017) emphasize that Japan, Chile, and Eastern Europe, including part of the Balkans, have 20 times higher incidence than Northern Europe, Africa, and South East Asia. It is more common in lower socioeconomic groups. By the biological nature, GAC is a genetically heterogeneous disease, but the bases of it are molecular alterations, very possibly triggered by *Helicobacter pylori* induced chronic gastritis (Wroblewski & Peek, 2013).

Adenocarcinoma of the large bowel (colorectal cancer—CRC) is the most common malignancy and a major contributor to morbidity and mortality worldwide. CRC is most prevalent in the Western world or so-called developed countries with high income (Brenner, Kloor, & Pox, 2014). All these countries share same lifestyle and diet of the "West." Dietary factors most closely associated with CRC are high intake of refined carbohydrates and fat, and low intake of dietary fibers (Corley, Levin, & Doubeni, 2014).

There is variability in the incidence and mortality rate of gastric cancer across the Balkan countries. According to the International Agency of Research on Cancer (International Agency of Research on Cancer IARC, 2018), the lowest incidence and mortality rate for GAC are recorded in Montenegro (5.0 and 4.3, respectively). The highest estimated values of incidence rate are in Moldova (13.0) and Albania (12.7) followed by Turkey (12.5) and Macedonia (10.5). Similar distribution is seen for GAC mortality rate: Turkey (10.3) and Moldova (10) have the highest rates, followed again by Albania (9.6) and Macedonia (8.1). These data strongly suggest that social and economic factors in these countries and dietary lifestyle are of great importance in developing this deleterious disease. Regarding CRC, the highest incidence rates are found in Slovenia (41.1), Serbia (36.7), Moldova (34.2), and Croatia (34.1), which have also the highest mortality rate (i.e., Croatia 18.9, Moldova 18.7, and Serbia 16.8) (see Table 17.6).

17.4 Our food and the accompanying person(s)

When we talk about human body and health, we tend to be limited by an anthropocentric viewpoint, so we only see an average human body in its lonely existence in its average lifetime. We assume that the living conditions are an outcome coming only from the human genes that are set in our human cells. Out of that limit, we witness an explosion of spectacular researches in the field of microbiota over the past decades (Curcic-Trajkovska & Jashar, 2016).

17.4.1 Healthy microbiota development

One of the most important factors that define the baby's normal flora is human milk feeding. Human microbiota is shaped by mother's breast milk (Hinde & German, 2012; Hinde &

Table 17.6 Estimated age-standardized incidence and mortality rates for both sexes and all ages, for gastric adenocarcinoma (GAC) and colorectal adenocarcinoma (CRC) per 100,000 population.

Country	GAC incidence	GAC mortality	CRC incidence	CRC mortality
Albania	12.7	9.6	8.4	3.7
Bosnia & Herzegovina	10.1	7.4	26.1	13.3
Bulgaria	8.0	6.2	28.5	14.9
Croatia	8.4	6.9	34.1	18.9
Greece	6.5	4.4	26.2	9.7
Kosovo	-	-	-	-
Macedonia	10.5	8.1	28.4	12.5
Moldova	13.0	10.0	34.2	18.7
Montenegro	5.0	4.3	18.6	9.2
Romania	8.3	6.8	26.7	13.7
Serbia	7.1	5.5	36.7	16.8
Slovenia	8.9	5.5	41.1	12.5
Turkey	12.5	10.3	21.0	10.2

International Agency of Research on Cancer (IARC). (2018). *Cancer today*. Data from <https://gco.iarc.fr/today/online-analysis-table>.

Lewis, 2015). The dominant microorganisms that are present in the mother's milk are main contributors of microbiota composition in early baby's life (Murphy, Curley, & Callaghan, 2017). WHO highly recommends breastfeeding and encourages all mothers to breastfeed when they are provided with accurate information, and support from their families, the health care system and the society (WHO, 2020c). According to the latest available data, breastfeeding community programs are available only in Croatia, Serbia, and Albania. Early initiation of breastfeeding rates are 50%–70% for Albania and Serbia, 30%–50% for Bosnia and Herzegovina, and below 30% for Montenegro. Exclusive breastfeeding rates (0–5 months) are 20%–40% for Albania and below 20% for Serbia, Bosnia & Herzegovina, Croatia, and Montenegro. Continued breastfeeding rates for the first year are 40%–60% for Albania and below 40% for Serbia, Bosnia & Herzegovina, and Montenegro. Continued breastfeeding rates within 2 years are 20%–40% for Albania and below 20% for Serbia, Bosnia and Herzegovina, and Montenegro (UNICEF, n.d.).

Until the age of two, the process of microbiota maturation and stabilization is complete and it is defined for a lifetime, except in an extreme host changes and conditions (Sekirov, Russell, Antunes, & Finlay, 2010). In childhood, diet preference is the main tool that shapes the healthy microbiome with proper dynamics and this remains unchanged in adulthood (Dethlefsen, Eckburg, Bik, & Relman, 2006; Ehrlich, 2010; Lozupone, Stombaugh, Gordon, Jansson, & Knight, 2012).

17.4.2 Microbiota and diet—the Balkan traditional diet

Diets and direct dietary modulation are the most important factors that influence gut microbiome diversity and stability (Kashtanova et al., 2016; Sánchez et al., 2017;

Singh et al., 2017). One of the most recommended diets, which is considered as a standard for healthy lifestyle, is the Mediterranean diet, because it is based on a balanced intake of fruits, grains, monounsaturated fat, vegetables, and polyunsaturated fats (Vasilopoulou, Dilis, & Trichopoulou, 2013). Fermented foods and beverages are also highly recommended for consumption for wellbeing of microbiota in a human host (Bell, Ferrão, & Fernandes, 2017; Gille, Schmid, Walther, & Vergères, 2018; Marco et al., 2017). The traditional food pattern in the Balkan countries is very similar to the Mediterranean diet and is rich in antioxidants that are found in basic food products that are regularly consumed: traditional fermented milk products, bee products, multigrain products, cereals, typical seasonal fruits, nuts and vegetables, fish or seafood, white and red meat, eggs, and poultry (Estruch & Salas-Salvado, 2013; Handjiev, 2017).

17.4.3 Consumer attitudes and habits regarding traditional Balkan food

According to the research done in the frame of the FOCUS-BALKANS (2011) project, the majority of Balkan consumers eat at home and like cooking. Only a few people eat at restaurant, generally due to lack of money and, for some of them, due to lack of habits. Consumers living in rural areas never or hardly ever eat at restaurant. In all countries, most participants are involved in the preparation of the meal and like eating. In Bosnia & Herzegovina and Serbia, the "health" dimension appears at the beginning of the discussion. Bosnian consumers want to cook themselves in order to check the quality of their food. In Serbia, consumers practice or try to practice a healthy diet. This perception of healthy food seems to be mainly related to homemade food rather than fast-food, processed food, or cold meals like sandwiches, as well as eating meals at particular times of the day, together with other members of the family. Some participants of focus groups have their own garden, so they grow fruits and vegetables. A few of them breed also animals for milk or meat. Shopping places for food are supermarkets, minimarkets, green markets, and less often specialized shops, such as butchers, or directly from farmers (Barjolle, Brečić, Cerjak, & Giraud, 2015).

17.4.3.1 Balkan traditional fermented milk products

In the Balkans, the most consumed traditional milk fermented product is commonly known as yogurt, also called by many names in different countries of the region. There are biologically active compounds (e.g., lactic acid bacteria) in milk that produce metabolites in fermented milk products with many beneficial effects (Ignatov & Pesheva, 2018; Teneva-Angelova, 2018), such as: immunomodulatory activity (Shao, Wu, Zhang, & Chen, 2014; Surayot, Wang, Seesuriyachan, & Kuntiya, 2014; Tellez, Corredig, Turner, & Morales, 2011); antihypertensive (Chang, Wang, Chiu, & Chen, 2015; Jauhiainen, Ronnback, Vapaatalo, & Wuolle, 2010; Nejati, Rizzello, Di Cagno, & Sheikh-Zeinoddin, 2013; Solieri, Rutella, & Tagliazucchi, 2015; Wakai & Yamamoto, 2012); antitumor or anticancer activity (Dilna, Surya, Aswathy, & Varsha,

2015; Li & Gu, 2016; Li, Luo, Kong, & Liu, 2016; Wang, Li, Rui, & Chen, 2014; Wang, Zhao, Yang, & Zhao, 2015); and antioxidant activity (Aleksandrova, Chikov, Velikova, & Dimitrov, 2013; Ramesh, Kumar, Singh, & Kaushik, 2012).

17.4.3.2 Bee products

Propolis, royal jelly, bee powder, and honey are the milestones for the healthy Balkan nutrition. Honey contains prebiotics and antibacterial components that can synergistically enhance the probiotic efficacy against pathogens. In addition to increasing the viable cell count of the probiotics, other reported benefits include enhanced probiotic persistence in the gut, elevated levels of short-chain fatty acids, and increased resistance to pathogens (Asahara, Nomoto, Shimizu, Watanuki, & Tanaka, 2001; Gmeiner et al., 2000; Rastall & Maitin, 2002). The described almost magical holistic physiological benefits, however, are not the same for the different types of honey. Further in vivo trials should be established to claim all health benefits of honey.

17.4.3.3 Multigrain products

Bread and bread products that are rich in fibers are quality compounds of the Balkan diet. Bread is constantly present at the traditional Balkan lunch and dinner table. Everyday bread consumption has a high influence on increasing the *Bacteroides*, *Prevotella*, and *Bifidobacteria*—representatives of gut microbiota (Senghor, 2018).

17.4.3.4 Fruits, grains, nuts, and vegetables

Balanced and regular intake of seasonal and local fruits, grains, nuts, and vegetables have antiinflammatory capabilities and can be even used to reduce inflammation in diseases (De Filippis et al., 2016; Marlow et al., 2013).

17.4.3.5 Meat, poultry, fish, cheese, milk, nuts, and legumes proteins

These proteins are main components of the Balkan diet and, due to their consumption, the numbers of *Lactobacilli* and *Bifidobacteria* in gut microbiota are significantly increased (McAllan et al., 2014; Sprong, Schonewille, & van der Meer, 2010).

17.4.3.6 Dysbiosis

Many factors can harm the microscopic members of the super organ. Dietary changes, among other factors, are important reasons for dysbiosis (Hawrelak & Myers, 2004). Dysbiosis refers to an unbalanced microbiota, and this condition most of the time is believed to be harmful. In the new century there is a trend to switch from healthy traditional Balkan diet to a fast-food Western diet that reduces *Bacteroidetes* and increases *Firmicutes*, and is inducing obesity (Ley et al., 2005; Turnbaugh, Bäckhed, Fulton, & Gordon, 2008). The fast-food generation is taking less or not at all vegetables, fish, and fruits that is reducing gut microbiome in general and is enhancing inflammation,

increasing triglyceride level, insulin resistance, and low density lipoproteins cholesterol (Matijasi et al., 2014).

It has been found that dysbiosis is a major ethiopathogenesis of various immune, infectious, metabolic, and cancerous disorders, as well as it possibly determines many physiological states, such as: cardiac size, hepatic gene expression, central nervous system function, and behavioral patterns. Many papers describe loss of diversity in digestive diseases like Crohn's disease (Matsuoka & Kanai, 2015; Sha et al., 2013), irritable bowel syndrome (Carroll, Ringel-Kulka, Siddle, & Ringel, 2012; Durbán et al., 2012), and colorectal cancer (Ahn et al., 2013), as a risk factor for *Clostridium diffcile* colitis relapse (Chang et al., 2008), and even in obesity (Cotillard et al., 2013; Tagliabue & Elli, 2013; Turnbaugh et al., 2009).

The traditional food promotion and popularization could help in improving quality of the lifestyle and in suppressing the modern Western diet of the "fast-food generation," which includes less or no fibers and vegetables (Cummings & Englyst, 1991; De Filippo et al., 2010; Giraud et al., 2013).

17.5 Conclusion

Everything considered, we really are what we eat. Current research highlights that we can cultivate a new microbiota from the first 24 h just by changing what we eat and, over time, microbiota grows to combat many conditions connected with dysbiosis. Diet certainly modulates the composition of the microbiota universe and the microbiota certainly affects the development of the human immune system. However, the mechanisms of the diet—microbiota modulation and the impact of the microbiota—immune system are still not well understood. In modern science, research is not only to be focused on specific dietary habits, but also on the association between dietary patterns and microbiome diversity. There is an urgent necessity of a multidisciplinary approach using new tools, applying new ways of understanding, and near-future further investigations of the mechanisms of the host—microbiome interactions. Microbiota is definitely a high promising "friend" in the process of prevention, management, and treatment of some old and of various new and modern human diseases and conditions. Thus, the Balkan diet is already scientifically proven to have a plausible effect on gut microbiome diversity. With a wide variety of nutritional and health benefits, traditional Balkan food products can play a significant role in future modern healthy way of eating.

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