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Some Aspects of Women's Health in Republic of Macedonia

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Abstract

INTRODUCTION: Sex and gender "matters" in terms of the health status as well as a result of both biological and gender-related differences. Thus, sex must be considered in all aspects and all levels of biomedical research.

AIM: This study aims to analyze sex- and gender-based differences in Republic of Macedonia through analysis of some aspects of mortality, the knowledge, and attitudes related to women's health.

METHODS: Analysis of the general and age-standardized mortality patterns and computer-assisted personal interview composed on different topics including women's health for the period of 2017–2020 were used.

RESULTS: Age-standardized mortality rates (all-causes of death, circulatory and respiratory diseases, and neoplasms) are prevalent and higher in the male population in Republic of Macedonia. A significantly higher all-cause mortality trend for both sexes was found in 2020 making this year hardly comparable with the previous years. A decreasing trend of malignant neoplasms rate of female genital organs and an increasing trend of breast cancer mortality is observed. The majority of the respondents (50.6%) rated their current health status as excellent with a statistically significant difference between the age and ethnical groups. One-third of the respondents reported regular physical activity, mostly on a daily basis. The majority (39.3%) are overweight and 27.5% belongs to the obesity Class I without a significant difference in terms of ethnicity. Respondents (27%) reported that have high blood pressure, 20.2% vaginal infections, 19.9% allergies, heart issues 15.1%, anemia 11.7%, while diabetes and cancer 8.5% and 2.5%, respectively. The youngest and oldest age groups of Albanian women are the least informed about the early detection procedures of malignant compared to Macedonian women and other ethnic groups.

CONCLUSIONS: Analyzing some aspects of women's health in Republic of Macedonia through the mortality and knowledge and attitudes of Macedonian women, we provide some further evidence for the development and implementation of targeted interventions and policies aimed to reduce the sex- and gender-based health inequalities in the country.

Introduction

The common idea that "women get sicker but men die quicker" dates back to the 1960s to the 1980s but has never been properly explained. Genetic factors can explain the so-called gender and health paradox no more than 25–30%. Still, the association between genetics and longevity is strongly influenced by other non-genetic factors such as environmental, cultural, and economic conditions, and stochastics [1]. Sociocultural factors might prevent women and girls to access and benefit from quality health services and attaining the best possible level of health or education. Many societies taught appropriate norms and behaviors in terms of social interactions with the opposite sex within the community and when disobeyed, individuals face stigma and even social exclusion [2].

The key differences in the terminology in terms of sex and gender are summarized by the World Health Organization in the following: Sex refers to "the different biological and physiological characteristics of males and females, such as reproductive organs, chromosomes, and hormones." Gender refers to "the socially constructed characteristics of women and men – such as norms, roles, and relationships of and between groups of women and men. It varies from society to society and can be changed. The concept of gender includes five important elements: Relational, hierarchical, historical, contextual, and institutional" [2].

Gender issues profoundly influence not only the shape of an infant's future but as well the employment status of women, their working life is often interrupted during pregnancy or caring (focus on women's reproductive role), likely working less-paid jobs and less occupy top position in society. Women's economic dependence on men and dramatic change in their lives after divorce or separation altogether with lower self-esteem is some of the facts that represent different aspects of inequality. Older women, women in a low-paid job, and lone parents have been identified as the most vulnerable groups, while all women are often

at risk of violence (emotional, sexual, and physical), particularly by their male partners [3]. Macedonian women work in the informal sector after having children, and the gap in labor force participation between women and men is about 27% point. The lack of economic/financial independence makes them vulnerable, dependent on their partners or prone to gender-based violence. As an addition to the situation, the gender norms and often limitations on women's freedom and movement outside their homes limit them to learn some new skills and resulting with lower self-confidence [4].

Sex and gender "matters" in terms of the health status as well as a result of both biological and gender-related differences. Thus, sex must be considered in all aspects and all levels of biomedical research. The health of women and girls is of particular concern because they have some unique health issues (pregnancy, breastfeeding, and menopause) but also some health conditions can affect women differently than men. According to the National Institute of Child Health and Human Development, they are more likely to die from heart attack compared to men, they suffer more of depression, anxiety, and osteoarthritis than men and sexually transmitted diseases can be more serious in women [5]. Poverty strongly affects and influences both men and women, still the effects are often higher in women or girls (for example, household air pollution due to cooking fuels).

There is a huge body of evidence and research on sex and gender differences aiming to understand those health differences at all levels, from studies on cells to large, clinical trials involving thousands of patients. The differences have been reported in terms of mortality as well. Analyzing leading causes of death for all races in the USA in women, heart disease and cancer (21.8% and 20.7% of total mortality) followed by chronic lower respiratory diseases, stroke, and Alzheimer's disease (6.2%, 6.2%, and 6.1%) are among top five causes of death. In the male population, heart disease and cancer are as well leading causes of death (24.2% and 21.9%), but on third place are unintentional injuries (7.6%) followed by chronic lower respiratory diseases and stroke with 5.2% and 4.3% of total mortality [6].

The situation in Republic of Macedonia

Bearing in mind one of the main recommendations of the US Institute of Medicine, Committee on Women's Health Research that says "Being male or female is an important basic human variable and should be considered in designing and analyzing studies in all areas and at all levels of biomedical and health-related research" [7], our aim was to analyze those sex-based and gender-based differences in Republic of Macedonia through analysis of some aspects of mortality and the knowledge and attitudes related to their (women) health.

Mortality and life expectancy are commonly used indicators of population health. According to the latest census (2021), women are representing 50.4% of the total population in the Republic of Macedonia (1 836 713). In Republic of Macedonia, men have a life expectancy at birth of 72.3 years in 2009 and 74.7 years 10 years later; female life expectancy at birth rose from 76.7 to 78.6 years. Although increasing, life expectancy in Republic of Macedonia is lower than EU member states (78.5 for males and 81 for female) [8]. The difference between LE at birth in men and women in EU declined from 6.6 years in 2002–5.5 years in 2019 (in favor of women). The increasing trend of life expectancy reported during the last century is explained by improved life standards and lifestyles, better education and advances in health care and medicine, and reductions in infant mortality as well.

There is a difference as well in terms of *healthy life expectancy* in Republic of Macedonia which is estimated on 67.3 years for females and 65.1 in men [9]. This is one of the gender-sensitive indicators of women health important for a better understanding of the differences.

Materials and Methods

Two main approaches were used for the analysis: General mortality patterns, data obtained from the state statistical office (SSO) of Republic of Macedonia, and age-standardized mortality rates (standardized to the 2013 European standard population (ESP) for the observed period (2017–2020), described and presented by major causes of death and sex; and CAPI (computer-assisted personal interview) survey questionnaire composed on different topics including women's health [10].

The survey has been done within the Women's Study in the Republic of Macedonia 2020 asking questions about different topics (values and trust, education and employment, politics and participation, and safety and security) including women's health. In this paper, we highlight some main points and results of the survey in terms of the Macedonian women's knowledge and attitudes related to their health only, aiming to link those findings with the observed mortality rate analysis previously presented. The CAPI survey used a stratified-quota sample based on population estimation for 2019 done by SSO. The target population is women aged 18–67 years, who live in Republic of Macedonia, stratified by subgroups (strata) according to the statistical regions (eight in total), municipality, and age groups. The sample population is stratified by a specific ratio of quotas according to ethnicity and place of residence.

The sample size was calculated resulting in a marginal error of 3% and a confidence level of

95% (710,287 target population), and the size of the projected research sample is N = 1 066. The CAPI field research survey was administered in two languages (Macedonian and Albanian) from October 19, 2020, to November 10, 2020. Quantitative data were analyzed at univariate, bivariate, and multivariate levels using appropriate statistical procedures in SPSS.

Results

Mortality patterns and age-standardized mortality rates in Republic of Macedonia

Mortality is strongly influenced not only by biological (hormonal) factors but environmental, sociocultural, economic, and psychological factors and health-related behaviors also play a role in the risk of mortality [11], [12]. In 2017, 9764 women died in Republic of Macedonia presents 48.1% of total (all-cause) mortality, and 11,840 in 2020 (46.0% of the total (all-cause) mortality). Circulatory diseases (stroke especially), neoplasms, and respiratory diseases are leading causes of death representing 61.8–80% of reported deaths in the female population in the observed period. The age-specific rates are slowly starting to increase in the age group 55 and over, but the higher rates are observed in the age group 75 and over in terms of all analyzed causes of death, including all-cause mortality.

To analyze these sex and gender differences, mortality patterns in the Macedonian population are presented in Table A1 and age-standardized mortality rates (according to ESP 2013) were calculated. The focus is on all-cause mortality patterns and sex/biologically based causes of deaths (such as neoplasms of female and male reproductive organs, breast cancer) that are highly preventable and some behavioral-related risk factor such as lung cancer.

Even expected to find some higher mortality rates in women, age standardization of mortality shows that in terms of all-causes of death, circulatory diseases (including ischemic heart disease (IHD) and stroke), respiratory diseases mortality, and neoplasms, the rates are prevalent and higher in the male population in Republic of Macedonia (Table A1). The all-cause mortality rate for the observed period (2017–2020) had an insignificant decreasing trend (from 1810/100,000 population in males and 1395/100,000 in females in 2017–1 747 and 1352/100,000 respectively in 2019), a trend that had been interrupted by COVID-19 in 2020. A significantly higher all-cause mortality trend for both sexes was found in 2020 (2237/100,000 in male and 1574/100,000 in female population) making this year hardly to be comparable with the previous years. The higher increment of mortality in 2020 has been reported in terms of respiratory mortality (and 148/100,000 in males and 74/100,000 in females, compared to 93/100,000 in males and 42/100,000 in females in 2017, respectively).

Age-standardized mortality rates due to circulatory diseases are higher in male population compared to female (1016/100,000 in male and 891/1000 in female in 2017–957/100,000 in male and 779/100,000 in females in 2020), and the trend is decreasing slowly during the observed period both, in male and female population (Table A3).

Still, worth mentioning is a slightly decreasing trend in the rate of malignant neoplasms of female genital organs (ICD10-code C51-C58) from 26.2/100,000 in 2017 to 21.5/100,000 in 2020. The trend of malignant neoplasms of male genital organs (ICD10-code C60-C63) is increasing (26.2/100,000 in 2017–42.4/100,000 in 2020). Unfortunately, the trend of breast cancer (ICD10-code C50) in females rose in the observed period as well (from 31.7/100,000 in 2017 to 36.5/100,000 population in 2020).

Lung cancer mortality is traditionally prevalent in the male population in Republic of Macedonia (86/100,000 in 2017–90.4/100,000 in 2020 in the male population versus 21.4 and 21.2/100,000 in the female population, respectively).

Survey on knowledge and attitudes of female population in Republic of Macedonia related to their (women) health

General characteristic of the sample

Majority of the female respondents in the survey was from the Skopje Region (30.3%) followed by Polog Region (16.6%) and Southwest Region (11.8%). The distribution of the respondents by age groups is in the range of 16.1% (age group 60 and over) and 23.0% in the youngest age group (18–29). Since Republic of Macedonia is a multiethnic and multireligious country, the majority (64.2%) are Macedonians, 26.9% declared themselves as Albanian, 2.9% Roma, and other ethnical groups (6.0%). About 61% declared themselves as Orthodox and 33% as Muslims. In terms of their employment status, 47.7% of the respondents are employed, 13.2% are housewife (unemployed and not job searching women) while 10.7 are unemployed but actively are searching for a job. The relationship status of the respondents shows that 63% are married, 16% are single, and 8% are in a relationship. The majority declared that have children (68%), 53% of them have two children, and 22% only one.

Body mass index (BMI) was calculated based on the question of the respondent's weight and height and the results are presented in Table 1. The question was optional.

Asked to rate their health, 50.6% of the respondents rated their current health status as excellent, while only 9.4% and 2.9% rated it as acceptable and

not good. As expected, there is a statistically significant difference (χ^2 = 171.13, p < 0.001) in terms of the age groups, meaning that younger are more satisfied with their health status (38%) of the age group 18–29 compared to 7.6% in the age group 60–65. As well, there is a statistically significant difference (χ^2 = 20.06, p = 0.01) between ethnic groups in behalf of the Albanian women who declared that their health status is excellent and very good (25.2% and 32.2%) compared to the Macedonian women (19.2% and 28.7%).

Table 1: Distribution of the respondents in terms of the BMI, by ethnic groups

Classification	Macedonian		Albanian		Other ethnicity		Total	
	#	% within the ethnic group	#	% within the ethnic group	#	% within the ethnic group	#	%
Normal weight	133	19.7	48	17.2	13	13.8	194	18.5
Overweight	251	37.2	125	44.8	35	37.2	411	39.3
Obesity Class I	195	28.9	62	22.2	31	33.0	288	27.5
Obesity Class II	63	9.3	28	10.0	11	11.7	102	9.7
Obesity Class III	32	4.7	16	5.7	4	4.3	52	5.0

Respondents, when asked do they have some of the *chronic diseases* present, 27% reported that have high blood pressure, 20.2% vaginal infections, 19.9% allergies, heart issues 15.1%, anemia 11.7%, while diabetes and cancer 8.5% and 2.5%, respectively (Table 2).

Table 2: Distribution of the respondents answers on the question "Do you have or have you had any of the following chronic diseases?" by the ethnicity

Health problem	Macedonian	Albanian	Other ethnicity	Total
	(% within the ethnic group)			
High blood pressure	25.7	31.8	22.1	27.0
Diabetes	8.1	9.1	9.5	8.5
Heart problems	16.4	11.9	14.7	15.1
Vaginal infections	21.7	16.4	21.1	20.2
Anemia	11.6	11.2	13.7	11.7
Cancer	3.1	1.7	1.1	2.5
*Allergies	23.6	10.5	22.1	19.9
*Cramps	19.9	10.8	16.8	17.2

*Statistically significant difference (p < 0.05).

High blood pressure is prevalent in the Albanian group of women (31.8%) and in Macedonian, 25.7% but the difference is not statistically significant (χ^2 = 5.14, p = 0.076). The distribution of the burden is highest and most significant (χ^2 = 261.66, p < 0.001) in the age group of 60–65 (65.5%) while lowest in the age group of 30–39 (11.0%) and 18–29 (2.4%). Although the difference was found in terms of the reported *heart problems* between the different ethnic groups (16.4% of Macedonian women reported some heart issues and 11.9% of Albanian ones), the difference is not significant (χ^2 = 3.25, p = 0.197) as it is in terms of the age groups (χ^2 = 107.61, p < 0.001). Namely, health problems occur and begin to grow from the age of 40 and over (15.9% in the age group 40–49, 21.2 in the group 50–59 and 36.3% in the age group 60–65). The same implies in terms of diabetes, the difference is statistically significant (χ^2 = 77.90, p < 0.001) and is more common in the oldest group of respondents (24.0% of women over the age of 60).

Vaginal infections are prevalent in younger age groups (18–49 almost equally, about 24%) and the difference is significant (χ^2 = 15.29, p = 0.004) without any ethnical differences. There is not statistically significant difference in terms of the occurrence of *anemia* both, by ethnicity and age distribution (χ^2 = 1.82, p = 0.769).

Allergies present a high fraction of the reported health issues in this survey with statistically significant differences (χ^2 = 22.02, p < 0.001) between ethnic groups (23.6% of Macedonian women reported and only 10.5% of Albanian), almost evenly distributed in all observed age groups. Although only 8.5% of respondents reported *cancer* as a health problem, there is a significant difference between different age groups (χ^2 = 10.40, p = 0.034) with the highest distribution in the age group 60–65 (4.1%), 50–59 (3.9%), and 3.4% in the age group 40–49. No reported cases of malignant in the age group of 18–29.

We were interested to learn about the lifestyle of the respondents, especially about their daily/weekly physical activity routine and the most preferred type of activity. We found that only 38.1% of the respondents confirmed who are practicing regularly some physical activity, out of which, a high percent (60%) on a daily basis and 19% twice or 3 times a week. The majority of respondents (61.9%) answered negatively. We also found a significant difference in terms of ethnicity and age groups (χ^2 = 57.59, p < 0.001 and χ^2 = 40.06, p < 0.001). About 76.5% of Macedonian women confirmed, and only 13.8% of Albanian and 9.6% of other ethnicities are practicing regular physical activity. Expectedly, the most active are the younger age groups, 18–29 (30.1%) and 30–39 years (25.7%). In the older age group (60–65 years), only 10.1% are practicing some physical activity regularly. As the most preferable activity, they listed walking, cycling, and jogging.

In our research, we asked questions about how much Macedonian women are informed about the procedures for early detection of malignant diseases in women? The majority (69.8%) are well informed about the procedures, with significant differences (χ^2 = 110.18, p < 0.001) between Macedonian women (80.1%), and other ethnicities (67.4%) and less informed Albanian women (46.2%). Among them, the youngest age group (18–29) and 60–65 have the lowest knowledge (62.9% and 63.7%) regarding the question, while the highest is reported in the age group 40–49 (78.4%). This difference is statistically significant (χ^2 = 18.56–31.01, p < 0.001). Furthermore, we analyze the problem within the different ethnic groups and distribution by age groups. The results show that 69.1% of the youngest age group (18–29) and 61.8% of the age group 60–65 of Albanian women are the least informed about the procedures for early detection compared to Macedonian women (27.8%) and other ethnic groups (28.1%).

Discussion

The underlying mechanisms of sex differences in terms of longevity are examined and explained largely in wild animals. However, the cumulated body of evidence is clear that female survival advantage in humans is "ubiquitous and persists throughout life." The other characteristic of humans is that women live longer but they face and suffer more physical limitations in their later life compared to men. Possible explanations are based on studies that analyze hormones, sex chromosomes, as well the differences in the vulnerability to different environmental stressors. Although the evidence is weak, the studies are focused on the role of the hormones in the inflammatory and immunological responses, greater resistance to oxidative stress, and damage in women [13]. That advantage begins several weeks prior to birth even other studies showed that it began at conception and is robust *in utero* as well [13], [14], [15].

The evidence for a better understanding of so-called mortality-morbidity paradox is often contradictory but is clear that women are more willing to seek medical attention, take more medications, have a higher absenteeism rate, and spend more days in hospitals than men. It was reported not only in the Western countries but as well in other countries (Bangladesh, China, Egypt, the Philippines, Thailand, etc.). The chronic pain conditions due to women's greater susceptibility to connective tissue diseases (tissue that is highly responsive to female hormones) and secondary effects of chronic sleep deprivation and stress are the main reasons for such higher doctor visits rate in women [13], [16].

Mortality is not only a health indicator but it is considered as an indicator of economic success and/or failure, an indicator of the nature of social inequalities including gender and racial disparities [17]. Many countries report a decrease in the female advantage in life expectancy at birth (a difference of 7.4 years in 1980 to 4.7 in 2013). The sex difference in Republic of Macedonia declined from 4.4 years in 2009 to 3.9 10 years later. According to some studies, the shift in health behaviors (smoking behavior among women for example) is one of the contributing factors to the current situation when epidemiological circumstances (infectious diseases) are not present. Of course, public health infrastructure and health-care resources are highly influencing the difference between male and female mortality rates [18].

Analyzing the age- and sex-specific mortality rates and sex differentials in Republic of Macedonia for the entire observed 4-year period (Table A2), is evident that all-cause, age-adjusted mortality rate (in all age groups) is higher in male, 1880/100,000 (1845–1914, 95% CI) compared to female population 1409/100,000 (1382–1437, 95% CI), meaning that male mortality is 33% higher compared to female. Getting in depth, when mortality is disaggregated by age groups, sex ratio (M/F ratio) is changing and gets higher in the female population starting from the age group of 75 and over. The sex difference in this age group ranges from 59 to 618 deaths more in the female population.

The same situation is observed regarding circulatory diseases mortality (I00–I99). Although the average crude mortality rate due to circulatory diseases is higher in females (534.2/100,000 vs. 505.0/100,000 in males), when standardized, the rates are higher in males (964.6/100,000 compared to 817.9/100,000 in female population). Again, opposite and higher sex ratios and sex differences are reported in women in the age group of 75–84, 85–94, and 95 and over (Table A3).

Heart attack and stroke are main causes of death that affect both women and man. According to National Institutes of Health, women often have different symptoms prior the heart event compared to men – unusual fatigue, sleep disturbance, and during the attack – shortness of breath, weakness, and fatigue or atypical chest pain, back pain, or jaw pain, not always chest pain, discomfort, or tightness [19], [20]. Moreover, two-third of them who died had no any previous symptoms which are specific as well. The chances of getting a misdiagnosis after a heart attack are 50% higher in women [21] and some studies show that doctors are less attentive to women's concerns regarding the CVD risk factors and are not aware of the extent of the problem for women [22], [23]. Thus, females, especially the age group of 75 and over, supposed to be the main focus of the targeted health preventive and health-care policies and actions to reduce the burden of coronary diseases. Increment of women's knowledge of warning signs of heart attack is one of the positive examples of such a measure [24]. The age-standardized mortality rate due to IHD in Republic of Macedonia is higher in males (102.1/100,000 compared to females, 64.6/100,000) and the sex difference is smaller in terms of stroke, but still prevalent in males (241.0 vs. 210.4/100,000) for the 4-year period. Annually, in Republic of Macedonia, about 1500 women are dying due to stroke and about 480 from IHD. Many studies reported that cause-specific (circulatory disease) death rates are higher in people with a lower level of education and less income [25], [26], [27], [28]. The lack of detailed mortality data regarding the ethnicity, socioeconomic, or educational status of the deceased people prevents us to analyze the contribution of those factors to mortality.

The association between obesity and cardiovascular risk factors, hypertension, diabetes type 2, and sleep disorders is well established. According to the American Heart Association, cardiovascular disease and cardiovascular disease mortality are associated with obesity independently of other cardiovascular risk factors, also, abdominal obesity, as risk marker of CVD independent of BMI.

The analysis and calculation of the BMI based on the self-reported respondent's data on their weight and height in our survey (Table 1) showed that majority (39.3%) are overweight and 27.5% belongs to the obesity Class I

without significant difference in terms of the ethnicity. The prevalence of overweight in Republic of Macedonia is higher among men (60.5%) than women (47.8%), while 22% of men were obese and 20.0% of women, respectively. Between 1997 and 2016, the female obesity prevalence of Republic of Macedonia grew substantially from 17.8 to 22.1%. The adulthood obesity prevalence forecasts model for the R. Macedonia predicts that 25% of men and 7% of women will be obese [29], [30]. In the United States, more than 2 in three women older than 20 are overweight and obese. Extra weight can lead to many diseases both in male and female populations such as circulatory diseases, many cancers, and diabetes. The problem is more prevalent in African-American and Hispanic women. Interestingly, lesbians and bisexual women are more likely to have overweight or obesity compared to heterosexual women [31], [32], [33].

The complexity of obesity where family background and other factors play a significant role is influenced largely by other external factors such as the place where we live. Lack of safe parks and sidewalks, easy access to fast food restaurants, or inability to have healthy food option in the neighborhood, and more important, air pollution in the place where you live, is highly linked to obesity [34], [35], [36], [37]. A recent study conducted in Republic of Macedonia on the role of the place on human health and well-being highlighted the issue that “people feel powerless, unsafe, and cars take precedence over peoples’ needs for more greenery, cleaner air, and peaceful neighborhoods” [38]. Based on the findings in the survey, the high BMI of the respondents is understandable but also expected having in mind that only 38% confirmed that are practicing regular physical activity, while the rest 62% do not have such a healthy practice and routine.

In the regions with the highest HDI (human development index), lung cancer, female breast, prostate, and colorectal cancers accounted for over half of the overall cancer burden. All of them are not associated with some infectious causes [39]. Screening, early detection, and treatment are critical for reducing mortality rates and increasing the survival of cancer patients. It takes increased knowledge and awareness of the first signs of cancers among the general public as well as among the health-care providers, accompanied by improved accessibility and affordability of the diagnostic and treatment services. That is very relevant in terms of breast cancer, cervix, colon, rectum, and skin cancer.

In our study, although the majority of the respondents were familiar with procedures for early detection of malignant diseases in women, still, there is a gap among different ethnicities. Namely, majority of the youngest Albanian respondents (age group 18–29) as well as the oldest (60–65) have the lowest knowledge. Analysis of the mortality patterns in Republic of Macedonia shows that public focus should be on the screening and preventive measures and policies in terms of malignant neoplasms of male genital organs and breast cancer in females due to the increasing trend reported by the SSO, while the trend of malignant neoplasms of female genital organs is decreasing. The highest mortality rates observed in 2020 might be explained by the COVID-19 pandemic and the adaptation of the health-care facilities to combat the virus. Many studies reported interruption of all aspects of cancer screening, control and therapeutic regiments during pandemics [40], [41], [42], [43], [44].

In terms of the rates, observed increasing cause-specific mortality rate of *breast cancer* in Republic of Macedonia (ranging from 30.0 to 36.5/100,000 in the observed period) is in line with the increased mortality rate for the Central Europe reported by the Institute of Health Metrics and Evaluation (ranging from 14.8 to 32.5/100,000 for the period 1990–2015) [45]. Studies’ results indicate that a higher level of awareness of breast cancer is reported in women with higher educational and economic status and women with a family history of breast cancer. It is higher as well in unmarried women and women with high annual family income [44], [46]. Physical examination of the breasts in a culturally appropriate manner (self-examination or clinical breast exams performed by a trained health-care provider) is cost-effective and resource-sustainable preventable measures compared to mammographic screening.

Although traditionally *lung cancer* is prevalent in the male population in Republic of Macedonia (4 times higher rates are observed in men), beside the current activities and programs to reduce the rate of smokers, still, 31.6% of boys and 19.7% of the girls aged 14–29 are active smokers and about 18–19% are practicing occasionally smoking [47]. Adding the ambient air pollution as the most serious and pressing public health issue in the country [48], [49], the near-stagnant rate of lung cancer should come as no surprise. The study that analyzes worldwide mortality patterns in terms of lung cancer found a positive correlation between mortality rates and GDP per capita and HDI for both sexes. All countries in West Europe, South Europe, and East Europe were found to have increased mortality due to lung cancer in women. The increasing trend in mortality has been explained also by the “so-called “westernization“ effect where tobacco use and air pollution associated with industrialization play the crucial role. In the case of R. Macedonia, we see a stagnant rate of lung cancer both, among male and female populations (20.0–21.4/100,000). On a global scale, mortality rates of lung cancer have decreasing trends in men and opposite, an increasing one in women [39].

Conclusions

Analyzing some aspects of women’s health in Republic of Macedonia through the mortality and knowledge and attitudes of Macedonian women, we

provide some further evidence for development and implementation of more targeted interventions and tailored policies aimed to reduce the sex- and gender-based health inequalities in the country.

In conclusion, although lower than male mortality rates, female mortality rates in terms of all-cause and cause-specific mortality (due to circulatory diseases) could be lessened with improved control and management of the risk and more important, changes in individual behavior and lifestyle. Female, especially age group of 75 and over, supposed to be in the main focus of the targeted health preventive and health-care policies and actions to reduce the burden of coronary diseases. Increment of the women's knowledge of warning signs of heart attack is one of the priorities. Those actions need to be supported by appropriate infrastructure and better spatial planning that will provide more green spaces, healthier mobility options, cleaner air, and quiet places for the residents to cope with increasing trend of obesity and accordingly reduce the morbidity and mortality rates.

The public focus should be as well on the screening and preventive measures and policies in terms of malignant neoplasms of male genital organs and breast cancer in female due to increasing trends, beside the decreasing trend of malignant neoplasms of female genital organs. High self-reported level of vaginal infections and identified gap in the knowledge among ethnicities on procedures for early detection of female cancer in the study imposes the need for improved educational programs on sexually transmitted diseases and cancer prevention in both, younger and elderly female populations.

Considering the increasing trend of lung cancer with the further and higher socioeconomic development worldwide, almost steady (stagnant) rates of lung cancer in male and female in the country require development and stricter implementation of preventive strategies and measures through the taxation policy, smoke-free areas and strict inspection and monitoring, and better education on harmful effects of tobacco or bans of tobacco advertisement. The entire set of actions aimed to reduce the cancer morbidity and mortality rate need to be supported by more health-care facilities and human resources for treatment, consultation, and support of patients with cancer.

Aiming to improve the findings of such further research studies on women's health, enhancing the availability and access to more detailed morbidity and mortality data in terms of the ethnicity, socioeconomic or educational status of the deceased people is an important recommendation of the study.

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APPENDIX

Table A1: The age-standardized mortality rate per 100,00 population in North Macedonia

Causes of death	Sex	2017		2018		2019		2020	
		Rate	95% CI	Rate	95% CI	Rate	95% CI	Rate	95% CI
All-cause Mt	Female	1395.8	1368.1–1423.5	1314.7	1288.1–1341.3	1352.4	1325.6–1379.1	1573.7	1545.3–1602.0
	Male	1810.2	1775.7–1844.7	1724.4	1691.1–1757.6	1747.8	1714.6–1781.1	2237.0	2199.8–2274.1
Circulatory diseases (I00–I99)	Female	890.5	867.6–913.4	813.7	792.1–835.2	788.4	767.4–809.4	779.2	758.5–799.9
	Male	1015.6	988.4–1042.8	951.4	925.5–977.3	934.7	909.2–960.2	956.6	930.8–982.4
IHD (I20–I25)	Female	81.9	75.3–88.6	63.0	57.3–68.7	51.9	46.9–57.0	61.5	55.9–67.0
	Male	122.4	114.1–130.7	106.6	98.5–114.6	79.3	72.6–85.9	100	92.4–107.7
Stroke (I60–I63, I64, I65–I67, I69.0–I69.3)	Female	221.5	210.4–232.6	209.8	199.0–220.6	204.6	194.2–215.1	205.6	195.1–216.0
	Male	246.4	233.3–259.6	221.7	209.4–233.9	238.3	225.7–250.9	257.4	244.3–270.6
Respiratory diseases (J00–J99)	Female	42.1	37.5–46.8	43.3	38.5–48.1	49.0	44.0–53.9	73.5	67.5–79.5
	Male	92.8	84.9–100.7	81.3	74.0–88.5	86.7	79.3–94.2	148.2	138.6–157.8
Lung cancer (C32–D34)	Female	21.4	18.5–24.4	21.4	18.5–24.4	20.0	17.2–22.9	21.2	18.2–24.1
	Male	85.6	79.1–92.0	96.3	89.4–103.2	92.5	85.9–99.2	90.4	84.0–96.9
Neoplasms (C00–D49)	Female	174.6	165.8–183.4	166.7	158.2–175.1	173.1	164.5–181.7	161.9	153.6–170.1
	Male	303.3	290.6–316.0	306.1	293.5–318.8	301.3	288.9–313.8	317.1	304.4–329.8
Malignant neoplasms of female genital organs (C51–C58)	Female	26.2	22.9–29.6	23.9	20.7–27.1	22.7	19.6–25.7	21.5	18.5–24.2
Malignant neoplasms of male genital organs (C60–C63)	Male	35.6	30.8–40.5	34.7	30.0–39.5	36.0	31.1–40.8	42.4	37.1–47.6
Malignant neoplasms of breast (C50)	Female	31.7	28.0–35.4	30.0	26.4–33.5	34.5	30.7–38.3	36.5	32.6–40.4
	Male	0.6	–0.1–1.3	1.3	0.3–2.3	1.4	0.5–2.3	0.9	0.2–1.5

IHD: Ischemic heart disease

Table A2: The age- and sex-specific all-cause mortality rates and age and sex differentials in North Macedonia for the period 2017–2020

Age group	Mortality rate per 100,000		Sex ratio (M/F)	Sex difference (M-F)
	Male	Female		
<1	72	64	1.11	7.3
1–4	13	8	1.65	5.0
5–14	20	14	1.41	5.8
15–24	58	24	2.40	33.5
25–34	101	52	1.93	48.5
35–44	245	132	1.87	113.8
45–54	700	372	1.88	327.5
55–64	1913	1054	1.82	859.3
65–74	2978	2181	1.37	796.8
75–84	3582	3953	0.91	−371.0
85–94	1599	2217	0.72	−617.5
95+	77	136	0.57	−58.5
Adjusted (ESP 2013)	1879.8	1409.1	1.33	470.7
Crude mortality rate	1093.6	985.4	1.11	108.2

Table A3: The age- and sex-specific mortality rates (circulatory diseases) and age and sex differentials in North Macedonia for the period of 2017–2020

Age group	Mortality rate per 100,000		Sex ratio (M/F)	Sex difference (M–F)
	Male	Female		
<1	0	1	0.00	−0.8
1–4	3	3	1.00	0.0
5–14	3	3	1.20	0.5
15–24	11	7	1.56	3.8
25–34	27	13	2.10	14.3
35–44	77	34	2.29	43.3
45–54	256	110	2.34	146.8
55–64	704	363	1.94	341.0
65–74	1203	981	1.23	221.5
75–84	1902	2383	0.80	−480.3
85–94	1008	1535	0.66	−527.8
95+	52	103	0.51	−50.5
Adjusted (ESP 2013)	964.6	817.9	1.18	146.7
Crude mortality rate	505.0	534.2	0.9	−29.2