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Alcohol Consumption and Gender Gap in Hypertension Mortality in Russia

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Abstract

Aims: To estimate the population-level link between alcohol consumption and the gender gap in mortality from hypertension in Russia.

Methods: In a comparative perspective, the trends in alcohol consumption per capita and the gender gap in the death rates from hypertension between 1980 and 2015 using the autoregressive-integrated moving average (ARIMA) method were analyzed.

Results: The level of alcohol consumption is positively correlated with the gender gap in hypertension death rate: an increase in alcohol drinking by 1 liter leads to an increase in the gender gap by 15.9%. Evaluation of the alcohol-attributable fraction indicated that alcohol is responsible for 88.5% of the difference in mortality from hypertension among men and women.

Conclusion: These results suggest that alcohol is an important factor in the gender gap in the mortality from hypertension in Russia.

Keyword: *Alcohol; Mortality; Hypertension; Gender Gap; Russia*

Introduction

Essential hypertension is considered the leading risk factor for the global burden of disease, since it is the main cause of cardiovascular disease, which is the leading cause of death in the population [7]. Despite the achieved success in the treatment of hypertension, this pathology continues to be a serious public health problem due to the progressive aging of the population and the increasing prevalence of modifiable risk factors: sedentary lifestyle, obesity, stress, alcohol consumption, tobacco smoking [19].

The available data indicate that alcohol consumption is a major risk factor for the development of hypertension [2,3,8,11-18]. A number of studies conducted at the population level have shown a positive linear relationship between alcohol consumption and the incidence of hypertension [11-13]. In one of the screening studies, which involved 80 thousand people aged 15 to 75 years, it was found that drinking one standard dose of alcohol per day increases systolic blood pressure by 1 millimeter of mercury [12]. A meta-analysis of prospective studies has shown that consumption of more than 25 grams of alcohol per day increases the risk of hypertension by 40%, and consumption of 100 grams of alcohol per day increases the risk fourfold [6]. The prevalence of hypertension in Russia is high [11]. According to epidemiological studies, this indicator among men and women is 57% and 55%, respectively [12].

The results of studies carried out in different countries indicate that the prevalence of hypertension is significantly higher among men than among women [4-6,16]. It should be noted that the gender gradient in the prevalence of hypertension is age specific. Analysis of

screening studies carried out in the United States in the period from 1999 to 2004 showed that the prevalence of hypertension among men is higher in the age group of 18 - 69 years [15]. At the age of over 70, the opposite is true, i.e. the prevalence of hypertension among women is higher than among men. The reasons for the gender gap in the prevalence of hypertension are not fully understood. Age features of the gender gradient in the prevalence of hypertension indicate an important role in the etiology of this phenomenon of female sex hormones, which improve the lipidemic profile, cause vasodilatation, and prevent vascular remodeling [16]. Gender differences in exposure to psychosocial and behavioral risk factors, including alcohol consumption and tobacco smoking, also contribute to the gender gradient in the prevalence of hypertension [6].

Alcohol contributes significantly to the burden of hypertension in Russia. One study showed that Russian men who drink more than 1 liter of alcohol per year have a 2.35 times higher risk of developing hypertension than men who do not drink alcohol [12]. Given the dose-dependent nature of the relationship between alcohol consumption and the risk of developing hypertension [8], as well as the significantly higher prevalence of alcohol consumption among men [9], it can be assumed that alcohol is an important factor in the gender gradient in the mortality rate from hypertension in Russia.

Aim of the Study

The aim of this study was to assess the contribution of alcohol to the difference in mortality from hypertension among men and women in Russia using population data.

Materials and Methods

In a comparative perspective, the trends in alcohol consumption per capita and the gender gap in the death rates from hypertension between 1980 and 2015 were analyzed. The standardized sex mortality rates from hypertension for the period obtained from Rosstat reports were used (rosstat.gov.ru). The overall level of alcohol consumption was estimated using an indirect method [10]. The association between the trends in alcohol consumption and the gender gap in the death rates from hypertension was evaluated using the ARIMA analytical technique. It is well known, that bivariate correlations between the raw data from two time-series can be spurious due to common trends and autocorrelation [1]. In order to reduce the risk of obtaining a spurious correlation between two time series, a differentiation procedure was used. This approach is the most widely used in time series analysis [1]. A time-series analysis was performed using the statistical package "Statistica 12. StatSoft".

Results

Analysis of graphical data shows similar trends in the alcohol consumption and gender-specific death rates from hypertension (Figure 1). The trends of these variables were subjected to significant fluctuations. The level of alcohol consumption, as well as the mortality rate from hypertension, significantly decreased in the early 1980s; dreamed sharply in the mid-1980s; grew substantially in the first half of the 1990s; then it declined until 1998; increased between 1998 and 2003, and then it began to decrease again. The graphical evidence suggests that the trends in alcohol consumption and the gender gap in the mortality from hypertension was quite similar (Figure 2).

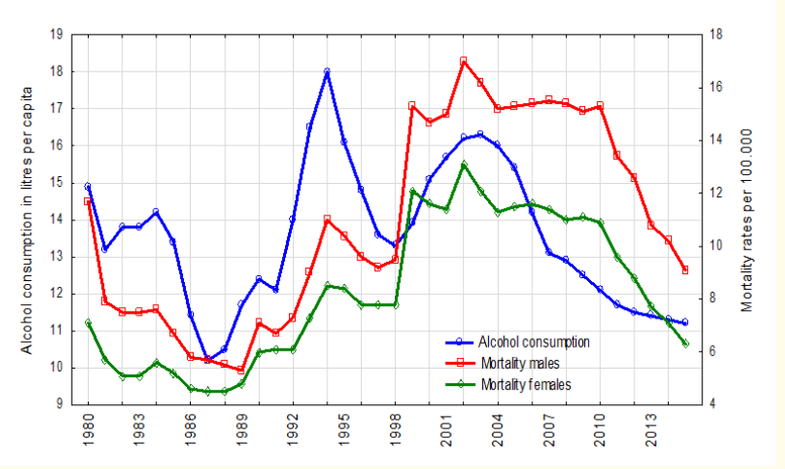

Figure 1: *Alcohol consumption and gender-specific trends in hypertension mortality in Russia between 1980 and 2015.*

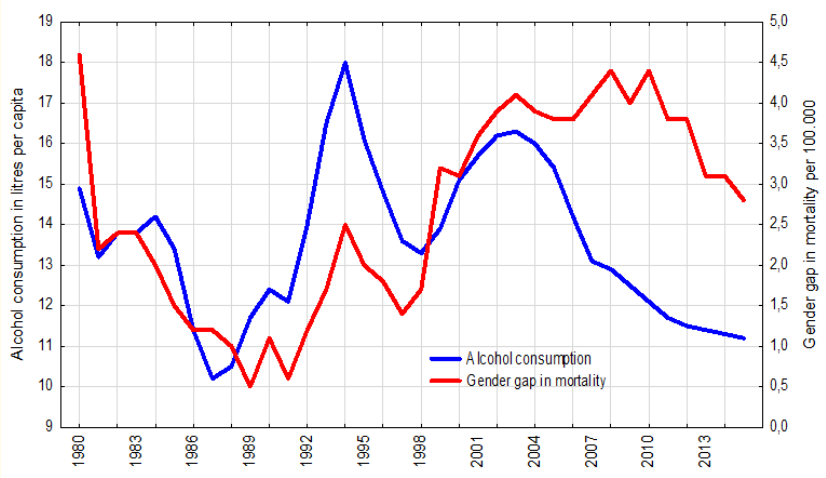

Figure 2: *Trends in alcohol consumption and gender gap in hypertension mortality in Russia between 1980 and 2015.*

Spearman's correlation analysis suggest a positive relationship between the alcohol consumption and the gender gap in the death rate from hypertension ($r = 0.52$; $p < 0.000$). The graphical evidence suggests that the time series have a significant trend. In relation to this, the next step was to eliminate this trend using the differentiation procedure. Cross-correlation analysis revealed a close relationship between the trends in alcohol consumption and the gender gap in the death rate from hypertension ($r = 0.57$: $SE = 0.143$). According to the estimates using the ARIMA method, the level of alcohol consumption is positively correlated with the gender gap in hypertension death rate: an increase in alcohol drinking by 1 liter leads to an increase in the gender gap by 15.9%. An estimation of the alcohol-attributable fraction indicated that alcohol is responsible for 88.5% of the difference in mortality from hypertension among men and women.

Discussion

An official statistic indicated that in Russia the death rate from hypertension among men is substantially higher than among women. Over the past decades, the gender gap in the death rate from hypertension fluctuated significantly. It is obvious that these fluctuations were associated with the influence of behavioral risk factors. The candidate for the role of such a factor is binge drinking, the prevalence of which in Russia is significantly higher among men than among women [12].

An important role of alcohol in the gender gap in mortality from hypertension is evidenced by the fact that fluctuations in this parameter associated well with changes in the availability of alcohol. In particular, the decrease in the physical availability of alcohol during the Gorbatchev's anti-alcohol campaign in the mid-1980s was associated with a decrease in the gender gap in the death rate from hypertension, while an increase in the availability in the first half of the 1990s associated with a dramatic increase in the gender gap [9]. In addition, the decline in the gender gap in the death rate from hypertension in the last years is consistent with the adoption of a number of anti-alcohol measures that reduced the availability of alcohol [10].

Conclusion

In conclusion, the outcomes of this study suggest a close relationship between alcohol consumption and the gender gap in mortality from hypertension in Russia at the population level. This research evidence indirectly supports the hypothesis that alcohol is one of the main factors in the gender gap in the death rate from hypertension in this country.

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