

Alcohol Consumption and Gender Gap in Cardiovascular Disease Mortality in Russia

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Abstract

Background: A great deal of evidence indicates that higher level of alcohol consumption has been implicated both in the high cardiovascular disease (CVD) mortality and its dramatic fluctuations during the recent decades in Russia. This evidence suggests that alcohol may play an important role in explaining the pronounced gender gap in CVD mortality in Russia.

Objective: This study aims to test the hypothesis of the close aggregate level link between alcohol consumption and gender difference in CVD mortality rates in Russia using data on sex-specific CVD mortality rates and alcohol consumption per capita between 1956 and 2010.

Method: Time-series analytical modeling techniques were used to examine the relation between the gender difference in CVD mortality and trends in alcohol consumption per capita.

Results: The results of the analysis suggest that 55.3 % of the difference in CVD mortality rates between males and females in Russia could be attributed to alcohol.

Conclusion: The outcomes of this study provide indirect support for the hypothesis that alcohol is a major contributor to the high gender gap in CVD mortality and its dramatic fluctuations in Russia during the last few decades.

Keywords: Alcohol consumption, gender difference, CVD mortality, Russia, 1956-2010.

1. INTRODUCTION

Cardiovascular disease (CVD) is the largest contributor to the morbidity and mortality in all developed countries [1]. Mortality from CVD remains substantially higher among men than women across a range of countries that have very different economic, social and cultural background [2, 6]. The reasons underpinning sex differences in CVD mortality rates are not fully understood. A protective effect of estrogens on CVD risk in women has often been suggested [5]. In particular, the reduced risk of CVD in women who take hormone replacement therapy points to the hormone-mediated sex differences in the relative risk of CVD mortality [7]. It was suggested, however, that differences in unhealthy behavior, including cigarette smoking and binge drinking, were more important determinants of the excess male mortality than sex differences in physiology [8, 16, 23].

Russia has one of the highest CVD mortality rate when compared to European Union countries [11]. It is important to point out that, while the gender difference in CVD mortality rates in Western Europe remains relatively

stable across time, Russia show huge fluctuations in the gender gap [1]. This suggests that although biological risk factors may account for some of the gender difference in CVD mortality rates in Russia; it is likely that other factors also contribute to the CVD mortality-gender paradox in this country. A great deal of evidence indicates that higher level of alcohol consumption has been implicated both in the high CVD mortality and its dramatic fluctuations during the recent decades in Russia [9-12, 17, 18, 20-22]. It has also been reported that Russian men have considerably higher levels of alcohol consumption than women [13]. This evidence suggests that alcohol may play an important role in explaining the pronounced gender gap in CVD mortality in Russia.

This study aims to test the hypothesis of the close aggregate level link between alcohol consumption and gender difference in CVD mortality rates in Russia using data on sex-specific CVD mortality rates and alcohol consumption per capita between 1956 and 2005.

2. MATERIAL AND METHODS

Data: The data on sex-specific CVD mortality rates (per 1000.000 of the population) between

1956 and 2005 are taken from the Rosstat (Russian State Statistical Committee). The total level of alcohol consumption (in litres of pure alcohol) in Russia has been estimated using the indirect method based on alcohol poisonings mortality rate [13, 14, 19].

Statistical Analysis: To estimate the relation between changes in population drinking and gender difference in CVD mortality rates across the study period a time series analysis was performed using the statistical package “Statistica.” The dependent variable was the gender difference in CVD mortality and the independent variable was aggregate alcohol consumption. The correlations between the raw data from two time series can often be spurious due to common sources in the trends and due to autocorrelation [3]. In order to reduce the risk of obtaining spurious correlation between variables that have common trends we removed these trends by means of a “differencing” procedure. The procedure which eliminates the systematic variation within a time series is referred to as “prewhitening.” We used ARIMA (autoregressive integrated moving average) modeling to estimate the relationship between the time series gender difference in CVD mortality and population drinking in this paper. In addition, the effect of population drinking on gender difference in CVD mortality rates will be presented in terms of alcohol-attributable fraction [15].

3. RESULTS

The trend of gender gap in CVD mortality fluctuated dramatically over time: it increased from 1964 to 1980, decreased markedly between 1984 and 1988, then jumped dramatically between 1992 and 1994. From 1994-1998 there was a fall in rates of before they again rose between 1998 and 2004, and then finally started to decrease (Figures 1). The graphical evidence also suggests that the temporal pattern of gender difference in CVD mortality fits closely with changes in alcohol consumption per capita.

A Spearman’s correlation analysis suggests a strong association between the gender gap in CVD mortality and alcohol consumption per capita ($r=0.82$; $p<0.000$). There were sharp trends in the time series data across the entire study period. These systematic variations were well accounted for by the application of first-order differencing and the specification of a first order moving average parameter. After prewhitening the cross-correlations between

alcohol consumption and gender difference in CVD mortality rates, time series were inspected. The outcome indicated statistically significant cross-correlation between the two variables at lag zero ($r=0.71$; $SE=0.143$). According to the results of ARIMA analysis, alcohol consumption is a statistically significant factor associated with gender difference in CVD mortality rates in Russia, implying that a 1-litre increase in consumption per capita is associated with an increase in the difference between male and female CVD mortality rates by 6.1%. The results of the analysis also suggest that 55.3 % of the difference in CVD mortality rates between males and females in Russia could be attributed to alcohol.

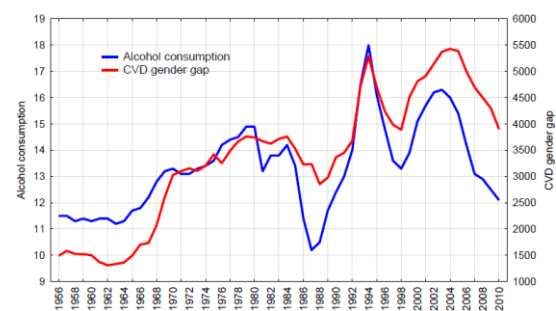


Figure 1. Trends in the gender gap in CVD mortality and alcohol consumption per capita in Russia between 1956 and 2010.

4. DISCUSSION

The dramatic fluctuations in the gender gap of CVD mortality rates in Russia suggest that the determinants cannot be purely biological, but might also reflect changes in sex-specific, modifiable lifestyle risk factors. It is well established in Russia that behavioral risk factors alone, primarily binge drinking and smoking, account for extremely higher rates in male CVD mortality [1, 4]. Therefore, the alcohol-related hypothesis may help in explaining the high gender gap in CVD mortality and its dramatic variations in Russia during the last few decades. The results of the time series analysis, which suggest positive and statistically significant effects of alcohol consumption per capita on gender difference in CVD mortality rate in Russia between 1956 and 2010 indirectly supports this alcohol-related hypothesis.

Before concluding, some potential limitations of this study must be mentioned. It should be recognized that ignoring the confounding variables may imply that the effect of population drinking on sex differences in CVD mortality is overestimated. It can be assumed that the alcohol consumption effect on gender gap in

CVD mortality is a spurious indicator of the impact of other powerful risk factors such as smoking. There is general agreement that cigarette smoking is a major contributor to the sex difference in CVD mortality in developed countries [5]. The high prevalence of smoking among Russian men (about 60%) probably explains a fact of the high male CVD mortality rate compared with the female mortality rate [4]. However, taking into account the fact that smoking has a long term effect on CHD mortality, this factor alone cannot explain the trajectories in the gender difference in Russian mortality rates during the last decades.

In conclusion, the outcomes of this study provide indirect support for the hypothesis that alcohol is a major contributor to the high gender difference in CVD mortality and its dramatic fluctuations in Russia during the last few decades. Further efforts in the understanding of the underlying mechanisms of sex differences in CVD mortality are needed for the development of strategies to prevent and treat CVD more efficiently.

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