The persistence of irregular treatment of hypertension in the former Soviet Union

Bayard Roberts,[1] Andrew Stickley,[1,2,3] Dina Balabanova,[1] Christian Haerpfer,[4] Martin McKee[1]

[1]European Centre on Health of Societies in Transition, London School of Hygiene and Tropical Medicine, London, UK
[2]Stockholm Centre on Health of Societies in Transition (SCOHOST), Södertörn University, Huddinge, Sweden
[3]Department of Global Health Policy, Graduate School of Medicine, University of Tokyo, Tokyo, Japan
[4]School of Social Science, University of Aberdeen, Aberdeen, UK

Correspondence to
Bayard Roberts, London School of Hygiene and Tropical Medicine, Faculty of Public Health and Policy, 15-17 Tavistock Place, London WC1H9SH, UK; bayard.roberts@lshtm.ac.uk

Accepted 27 February 2012

ABSTRACT

Background Hypertension is one of the leading causes of avoidable mortality in the former Soviet Union (fSU). In previous work, the authors described patterns of irregular hypertension treatment in eight countries of the fSU in 2001. This paper presents new data on changes in the use of hypertension treatment in the same countries.

Methods Using household survey data from 18 420 (2001) and 17 914 (2010) respondents from Armenia, Azerbaijan (2010 only), Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine, the authors describe changes in rates of irregular treatment use (less than daily) between 2001 and 2010. Multivariate logistic regression was also used to analyse the characteristics associated with irregular treatment.

Results Irregular treatment was extremely high at 74% in 2001 and only fell to 68% in 2010 (all countries combined). Irregular treatment remained particularly high in 2010 in Armenia (79%), Kazakhstan (73%) and Moldova (73%). Recurring characteristics associated with irregular treatment included gender (men), younger age, higher fitness levels, and consuming alcohol and tobacco.

Conclusions Irregular hypertension treatment continues to be a major problem in the countries of the fSU and requires an urgent response.

INTRODUCTION

Hypertension is one of the leading causes of avoidable mortality in the former Soviet Union (fSU), and the declines in hypertension in Western Europe have not been observed in the fSU.[1–4] A number of potential explanations have been advanced to account for the high levels of hypertension in the fSU ranging from changing lifestyles and diet,[2 5] limited diagnosis, inadequate treatment where hypertension is actually diagnosed, and patients' failure to comply with their treatment regimens.[6–8]

In an earlier study using survey data collected in 2001 from eight fSU countries, we assessed the extent to which those who had been diagnosed as having hypertension and had been prescribed treatment were taking it on a daily (ie, regular) basis.[9] The rationale for focusing on the use of daily treatment was the substantial evidence on the importance of treatment for hypertension being taken at least daily (using thiazide diuretics, β blockers and ACE inhibitors).[10–15] Our earlier study revealed high levels of irregular treatment in the eight countries. This paper presents new data from 2010 on changes in the use of hypertension treatment in the fSU compared with 2001 and the factors associated with irregular use.

METHODS

The 2001 data came from LLH study surveys undertaken in 2001 in Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine (http://www.llh.at). In 2010, a new series of surveys were undertaken as part of the follow-up HITT study (http://www.hitt-cis.net) in the same countries, with the addition of Azerbaijan. Both studies sought to compare a wide range of social and economic conditions, lifestyles and health in the adult populations.

The studies used nationally representative cross-sectional designs and multi-stage random sampling. Within each primary sampling unit (based on local administrative boundaries), households were selected by random route procedures. Within each selected household, one person (18+ years) was randomly chosen for the face-to-face interview. Country response rates varied from 71% to 88% in the LLH study, and 47% to 83% in the HITT study. The research conformed to the principles embodied in the Declaration of Helsinki and was approved by the ethics committee of the London School of Hygiene and Tropical Medicine.

The outcome measure was derived from two questions: whether an individual had ever been told by a doctor that their blood pressure was too high (with data age-adjusted based on the European Standard Population), and how frequently they were taking their medication. Frequency of treatment was then dichotomised into a binary outcome of daily or less than daily treatment. Consistent with our previous work, we assumed that all those who had been told that they had hypertension and had been prescribed treatment by a doctor required it and that all those who were taking medication less than daily were receiving irregular, and therefore inadequate, treatment.

In our earlier paper, we examined the influence of country, gender, age, marital status, education level, settlement type, employment status, self-assessed economic status, health-related variables (general health, physical fitness and psychological distress), and alcohol and tobacco consumption on the binary outcome variable of irregular hypertension treatment. In this new paper, we do the same in order to see how their influence may have changed over the preceding decade (with the Azerbaijani data excluded to ensure comparability). The methods for the analysis followed those described in the earlier paper.[9] In summary, the associations of the independent variables with the outcome

Table 1 Proportion of survey respondents diagnosed as having hypertension and the proportion of them taking blood pressure medication less than once a day, by country and study year

	2001 study			2010 study		
	Total sample N*	Hypertension diagnosed %†	% with hypertension not taking daily medication %‡ (95% CI)	Total sample N*	Hypertension diagnosed %†	% with hypertension not taking daily medication %‡ (95% CI)
Armenia	2000	25.1	77.3 (73.7 to 80.8)	1800	24.1	79.0 (75.0 to 83.1)
Azerbaija§				1781	22.7	70.4 (65.4 to 75.3)
Belarus	2000	30.3	72.6 (69.1 to 76.1)	1795	39.4	67.4 (63.8 to 70.9)
Georgia	2020	16.0	58.7 (53.5 to 63.9)	2196	28.2	55.7 (52.0 to 59.5)
Kazakhstan	2000	26.6	80.4 (76.8 to 84.0)	1799	27.7	73.3 (69.1 to 77.4)
Kyrgyzstan	2000	21.5	81.2 (77.2 to 85.2)	1790	27.6	69.3 (64.8 to 73.8)
Moldova	2000	24.3	78.5 (74.9 to 82.1)	1789	32.3	73.1 (69.5 to 76.7)
Russia	4006	33.0	70.9 (68.5 to 73.3)	2972	32.1	64.1 (61.0 to 67.1)
Ukraine	2394	31.3	73.5 (70.4 to 76.5)	1992	33.4	70.2 (66.8 to 73.5)

*Larger sample sizes used in Russia and Ukraine to reflect their larger and more regionally diverse populations, and in Georgia where a booster survey was undertaken to ensure a more representative sample for the 2010 survey.

†% of entire country sample (excluding 'don't knows' or those who refused to answer). Age-adjusted standardised results based on the European Standard Population (and so percentages vary from rates reported in our previous publication,[9] which were not age-adjusted).

‡% of those diagnosed with high blood pressure (excluding 'don't knows' or those who refused to answer).

§Azerbaijan not included in the 2001 study.

variable were initially tested through bivariate logistic regression analysis (using the entire study sample combined to ensure sufficient statistical power). The variables with a significant association ($p<0.05$) were then entered into a multivariate analysis to adjust for the influence of the other independent variables, and a backward stepwise approach was used to select variables that remained significant at $p<0.05$. A logit algorithm in Stata V.12.0 was used to model the outcome variable and the result expressed as ORs.

RESULTS
A total of 18 428 respondents were interviewed in 2001, and 18 000 in 2010. There were a greater proportion of women than men (57% women, 43% men in 2001; and 56% women, 44% men in 2010). The mean age was 45.6 years in 2001 and 43.3 years in 2010. The sociodemographic variables are representative of the study populations, with detailed sample characteristics described elsewhere.[9 16]

In the 2001 study, of a total of 18 420 respondents for whom the relevant data were available, 5253 (27%, age-adjusted) had been told that they had high blood pressure (table 1). Of the 5042 aware of their prescribed medical treatment for their high blood pressure, 3719 (74%) did not take medication at least daily. Rates of this irregular treatment varied from 59% in Georgia to 81% in Kyrgyzstan. In the 2010 study (which includes Azerbaijan), of a total of 17 914 respondents for whom the relevant data were available, 5256 (31%, age-adjusted) had been told they had high blood pressure. Of the 5185 aware of their prescribed medical treatment for high blood pressure, 3525 (68%) did not take medication on a daily basis. The highest rates of irregular treatment were in Armenia (79%), Kazakhstan (73%) and Moldova (73%). We also collected data from Azerbaijan in the 2010 HITT study, finding high rates of irregular treatment there (70%).

The characteristics that showed significant associations with irregular treatment in both studies included gender (men), younger age, high fitness levels, people who currently smoked, and greater frequency of alcohol consumption (table 2). These characteristics were consistent across the two study periods, with the main changes being the insignificant influence of living location in 2010. Respondents in Armenia, Kazakhstan, Moldova and Ukraine were consistently more likely to report irregular treatment than those in Russia, even after adjustment for the influence of other characteristics.

DISCUSSION
This paper shows the persistently high irregular use of hypertension treatment in the fSU. Over two-thirds of respondents who had been diagnosed with, and treated for, hypertension were not taking treatment regularly, with potentially important consequences for their long-term health. Our findings support those of other studies showing high levels of irregular treatment and low awareness levels on the need for regular treatment in the fSU.[5 17 18]

The situation in Armenia may have worsened slightly (although not statistically significantly), and while there were modest declines in irregular treatment between 2001 and 2010 in most of the study countries, only statistically significant declines were observed in Kyrgyzstan and Russia. This may be attributable to their extensive health system reform and modernisation, particularly in Kyrgyzstan which has shown success in improving health for chronic conditions.[19] The increase in levels of reported hypertension in Georgia may reflect improved diagnoses resulting from health system modernisation and the initiation of the 'Medical Insurance Program for the Poor' which includes free services (but not free medication).

The finding that irregular use is more common among men is consistent with research from Russia.[20] The higher probability of irregular use of medication among younger people and those who consume alcohol and tobacco may reflect a generally more fatalistic attitude towards their health. Money spent on alcohol and cigarettes may also be displacing resources for the purchase of drugs. A lack of money may also underpin the high rates of irregular treatment in Kazakhstan, with a study suggesting that not having money to buy drugs is an important reason for non-compliance among hypertensive patients in the country.[8] Low fitness levels also showed a continuing strong positive influence with taking regular treatment, and this accords with research from Russia showing that hypertensive patients who have other serious illnesses are more likely to take their hypertensive medication,[20] perhaps because of a greater awareness, among physicians and patients, of the potential consequences of non-adherence to treatment among those who are already ill. It is also consistent with research in this region suggesting that the

Table 2 Multivariate regression analyses on characteristics associated with not taking medication at least once a day, by study year (all countries combined)

Characteristic	2001 study		2010 study	
	N (%)	OR (95% CI)	N (%)	OR (95% CI)
Country				
Russia	988 (70.9)	Ref	622 (64.1)	Ref
Armenia	411 (77.3)	1.71 (1.24 to 2.36)**	309 (79.0)	1.97 (1.36 to 2.86)**
Belarus	445 (72.6)		458 (67.4)	
Georgia	205 (58.7)		375 (55.7)	
Kazakhstan	381 (80.4)	1.93 (1.38 to 2.70)**	326 (73.3)	1.53 (1.16 to 2.02)**
Kyrgyzstan	298 (81.2)	1.71 (1.11 to 2.63)*	282 (69.3)	
Moldova	398 (78.5)	1.61 (1.16 to 2.24)**	424 (73.1)	1.39 (1.05 to 1.83)*
Ukraine	593 (73.5)	1.63 (1.27 to 2.09)**	496 (70.2)	1.44 (1.13 to 1.85)**
Sex				
Women	2339 (69.7)	Ref	2010 (62.9)	Ref
Men	1380 (81.9)	1.11 (1.01 to 1.21)*	1282 (77.3)	1.31 (1.09 to 1.56)**
Age				
60+ years	1341 (61.5)	Ref	1040 (52.5)	Ref
50—59 years	659 (72.6)		744 (65.0)	1.22 (1.03 to 1.44)*
40—49 years	798 (82.8)	1.85 (1.50 to 2.27)**	673 (82.5)	2.66 (2.11 to 3.34)**
30—39 years	526 (91.2)	3.33 (2.42 to 4.59)**	446 (90.1)	5.05 (3.55 to 7.17)**
18—29 years	395 (95.4)	6.58 (3.75 to 11.53)**	389 (93.5)	7.06 (4.66 to 10.71)**
Type of settlement				
Urban	2303 (71.1)	Ref	1909 (67.6)	Ref
Rural	1389 (79.0)	1.60 (1.35 to 1.91)**	1383 (68.2)	
Fitness levels—walking 1 km				
Very easily	1208 (87.0)	Ref	919 (83.5)	Ref
Fairly easy	1182 (79.2)		1115 (77.4)	
Some difficulty	889 (64.6)	0.50 (0.39 to 0.64)**	799 (61.1)	0.67 (0.53 to 0.85)**
Major difficulty	431 (56.3)	0.41 (0.31 to 0.53)**	440 (45.1)	0.44 (0.34 to 0.56)**
Alcohol use†				
Never	1137 (62.1)	Ref	803 (53.2)	Ref
Once/twice a month or less	1706 (76.9)	1.43 (1.22 to 1.67)**	1782 (71.1)	1.50 (1.29 to 1.75)**
Once a week	455 (87.7)	2.22 (1.63 to 3.03)**	292 (83.4)	2.05 (1.48 to 2.84)**
2 or more times a week	421 (88.8)	2.21 (1.50 to 3.24)**	361 (86.4)	2.70 (1.92 to 3.80)**
Tobacco smoking‡				
Do not currently smoke	2809 (70.0)	Ref	2519 (64.2)	Ref
Currently smoke	909 (88.7)	1.74 (1.33 to 2.27)**	770 (83.3)	1.34 (1.08 to 1.68)**

Results include only variables remaining statistically significant (p<0.05) after backward stepwise regression analysis. 2010 data analysis excludes Azerbaijan to ensure comparability with 2001 data. 2001 data vary from our previous publication[9] because of different categorisation of the independent variable for alcohol.
†Alcohol use is for any amount and type of alcohol (eg, wine, beer, spirits and privately made).
‡Tobacco use is for any amount and type of tobacco (eg, cigarette, papirossi, pipe, cigar).
*p<0.05, **p<0.01.

asymptomatic nature of hypertension may result in non-adherence to medication when symptoms are absent.[8]

Limitations

First, those that have been diagnosed as having hypertension may not be representative of all individuals who actually have it. Also we cannot assume that all those who have been prescribed treatment actually need it. It is also possible that a few individuals have adopted lifestyle changes that have removed the need for treatment. Second, we were unable to measure blood pressure in these surveys and so cannot comment on those who have high blood pressure but are unaware of it, and so our values will underestimate the scale of the problem. Third, we were unable to ascertain whether those drugs prescribed to respondents are actually effective in the treatment of hypertension or are free of significant side effects. Fourth, as respondents were not asked about types and patterns of treatment, we cannot ascertain whether their irregular treatment was a result of inappropriate advice from the health professional, their own decisions or other factors such as drug availability and costs.

What is already known on this subject

Hypertension is a major contributor to the extremely damaging impact of cardiovascular disease in countries of the former Soviet Union. However, there is limited information on treatment behaviour for hypertension across the region.

What this study adds

The study quantifies the scale and pattern of irregular treatment for hypertension in a range of countries in 2001 and in 2010. The findings highlight the scale of irregular hypertension treatment and can help inform activities to address hypertension in the region.

CONCLUSIONS

This study shows that problems persist with regard to hypertension treatment in the fSU. There remains a need for a more detailed understanding of the reasons why individuals do not adhere to treatment for hypertension and the broader health system barriers impeding regular treatment in the region.

REFERENCES

1. **Alwan A,** Armstrong T, Cowan M, et al. *Noncommunicable Diseases: Country Profiles 2011*. Geneva: World Health Organisation, 2011.
2. **World Bank.** *Dying Too Young: Addressing Premature Mortality and Ill Health Due to Non-Communicable Diseases and Injuries in the Russian Federation*. Washington: World Bank, 2005.
3. **Andreev EM,** Nolte E, Shkolnikov VM, et al. The evolving pattern of avoidable mortality in Russia. *Int J Epidemiol* 2003;**32**:437—46.
4. **Danaei G,** Finucane MM, Lin JK, et al; Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group (Blood Pressure). National, regional, and global trends in systolic blood pressure since 1980: systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5.4 million participants. *Lancet* 2011;**377**:568—77.
5. **Young JH,** Parler P, Bristol B, et al. The coming epidemic: hypertension in rural Kyrgyzstan, Central Asia. *J Hum Hypertens* 2005;**19**:145—8.
6. **Bielecka-Dabrowa A,** Aronow WS, Rysz J, et al. The rise and fall of hypertension: lessons learned from Eastern Europe. *Curr Cardiovasc Risk Rep* 2011;**5**:174—9.
7. **Grim C,** Petersen J, Li J, et al. Prevalence of cardiovascular risk factors in the Republic of Georgia. *J Hum Hypertens* 1999;**13**:799.
8. **Nugmanova A,** Pillai G, Nugmanova D, et al. Improving the management of hypertension in Kazakhstan: implications for improving clinical practice, patient behaviours and health outcomes. *Glob Public Health* 2008;**3**:214—31.
9. **Roberts B,** Stickley A, Balabanova D, et al. Irregular treatment of hypertension in the former Soviet Union. *J Epidemiol Community Health*. Published Online First: 6 November 2010. doi:10.1136/jech.2010.111377
10. **Dragomir A,** Cote R, Roy L, et al. Impact of adherence to antihypertensive agents on clinical outcomes and hospitalization costs. *Med Care* 2010;**48**:418—25.
11. **Elliott WJ.** Improving outcomes in hypertensive patients: focus on adherence and persistence with antihypertensive therapy. *J Clin Hypertens (Greenwich)* 2009;**11**:376—82.
12. **Fukuda H,** Kitani M. Differences between treated and untreated hypertensive subjects in the extent of periventricular hyperintensities observed on brain MRI. *Stroke* 1995;**26**:1593—7.
13. **Kostis JB.** Beta-blocker duration of action and implications for therapy. *Am J Cardiol* 1990;**66**:60G—2.
14. **Kubo SH,** Cody RJ. Clinical pharmacokinetics of the angiotensin converting enzyme inhibitors. A review. *Clin Pharmacokinet* 1985;**10**:377—91.
15. **Moser M.** Hypertension treatment—a success study. *J Clin Hypertens (Greenwich)* 2006;**8**:313—14.
16. **Balabanova D,** Roberts B, Richardson E, et al. Health care reform in the former Soviet Union: beyond the transition. *Health Serv Res*. Published Online First: 23 September 2011. doi:10.1111/j.1475-6773.2011.01323.x
17. **Greenberg HM,** Galyavich AS, Ziganshina LE, et al. Identification and management of patients with hypertension in the polyclinic system of the Russian Federation. *Am J Hypertens* 2005;**18**:943—8.
18. **Barbakadze VY,** Koblianidze LG, Kipshidze NN, et al. The Republic of Georgia high blood pressure control program. *Ethn Dis* 2006;**16**(Suppl 2):61—5.
19. **Balabanova D,** McKee M, Mills A, eds. *Good Health at Low Cost 25 Years on. What Makes a Successful Health System?* London: London School of Hygiene & Tropical Medicine, 2011.
20. **Kobalova ZhD,** Starostina EG, Kotovskaia IuV. Antihypertensive treatment compliance and obstacles to its improvement. Results of Russian program ARGUS-2 In Russia. *Ter Arkh* 2008;**80**:76—82.