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DYNAMICS OF MORTALITY FROM HYPOTHERMIA IN SAKHA (YAKUTIA) REPUBLIC FOR PERIOD OF 2006-2015

ABSTRACT

The article presents an analysis of mortality from total body hypothermia in the Sakha (Yakutia) Republic for the period from 2006 to 2015. Dynamics shows persistent trends of reducing deaths from the defined causes, the frequency of which depends on the place of residence (territorial zone), the season of the year, the age and length of stay.

Keywords: mortality, general hypothermia, cold trauma, Yakutia.

The Republic of Sakha (Yakutia), due to its geographical location, is the coldest region in the world. More than 40% of the territory of the Republic is located to the north of the Arctic Circle. That is, half of Yakutia has the same weather properties as the Subarctic. It has extreme climatic and geographic conditions, where cold is one of the main environmental factors adversely affecting the human body [1]. It is here that the pole of the cold of the Northern Hemisphere – Oymyakon is situated. The study of the effect of low temperatures on the human body represents both theoretical and practical relevance in fundamental and medical science. In the Far North, more than 11,000 cases of medical care to victims of acute cold trauma, general body hypothermia or frostbite are recorded annually. The most frequently effects of low temperatures with adverse effects on the human body among the population of Yakutia are recorded [4].

We analyzed the data from all deaths (2009) from total body hypothermia in the Sakha (Yakutia) Republic for 2006-2015 of the Yakut Republican Medical Information and Analytical Center database. It should be noted that the term «mortality from general hypothermia» is a collective term in which we included the following disease codes for ICD-10: the effects of excessively low natural temperature (X31), frostbite (T33-T35), hypothermia (T68) and other effects of low temperature (T69).

In the structure of all causes of death from injuries, poisonings (class XIX) and external causes (class XX), the proportion of deaths from fatal hypothermia is, on average, 10%, i.e. 200 of the Republic's people die from hypothermia every year (Table 1).

In the dynamics of observation in the period of 2006 to 2015, there is a persistent tendency to reduce deaths from total hypothermia in a group of men. The analysis of the comparison of groups by sex showed gender differences in the frequency of detection of death from fatal hypothermia. Men in comparison with women are much more often exposed to low temperatures with fatal outcome. In women, there is no decrease in deaths from total hypothermia. In the structure of all causes of death from trauma, poisoning and external causes among the deceased from general hypothermia, women account for the largest share. In 2009, in comparison with other years, we recorded the greatest number of deaths from fatal hypothermia with an increase in the group of men and women (Fig. 1).

Mortality from general hypothermia in the uluses (territories), depending on the socio-territorial zones, proposed by M.A. Tyrylgin [3] showed that the Arctic zone is the first place in terms of death rate, followed by rural and mixed ones. The lowest mortality rate is observed in the industrial zone and in Yakutsk. The peak of mortality from hypothermia in the Arctic zone falls at 2009-2010, with a decrease by 2011 with a subsequent rise to 2013, followed by a decline in mortality from this pathology until 2015. In general, for the period from 2009 to 2010 is characterized by an increased mortality from total hypothermia in three main areas of residence: Arctic, rural, and mixed (Table 2, Fig. 2). There are speculations that the risk of pathological hypothermia is higher in places of residence with extreme climatic conditions and not densely populated areas [8, 9].

Analysis of mortality from low temperatures on the human body by age group indicates a high mortality rate in the group of people of working age, from 40 years and above. For the period from 2006-2015, a consistently high

Table 1

Proportion of deaths from total hypothermia in the structure of all causes of death from injuries, poisoning and external causes in the Sakha (Yakutia) Republic 2006 - 2015

Year	All deaths from injuries, poisoning and external causes			Cases of death from hypothermia					
				abs.			Proportion in %		
	total	male	female	total	male	female	total	male	female
2006	2061	1654	407	204	162	42	9	9	10
2007	2010	1648	362	184	140	44	9	8	12
2008	2036	1668	368	211	171	40	10	10	11
2009	2364	1877	487	306	226	80	13	12	16
2010	2009	1604	405	246	186	60	12	12	15
2011	1863	1506	357	200	156	44	11	10	12
2012	1683	1365	318	181	144	37	11	11	12
2013	1540	1237	303	170	113	57	11	9	19
2014	1484	1212	272	162	123	39	11	10	14
2015	1407	1147	260	145	104	41	10	9	16

death rate is observed in the age group of 45-49, 50-54. The highest mortality rate was registered in 2009 for almost all age groups, beginning under 20 and up to 55-59 years (Table 3). Only in 2011 the highest indicator was found in the group of persons from 40 to 44 years. The lowest mortality rate for each year of observation falls on the age of up to 20 years. In 25-29 yrs group we also trace decreasing trend of people dying from general hypothermia. It should be noted that in only one age group – over 60, in dynamics the mortality rate decreases every year. The older a person, the more quickly the body loses heat. In comparison with the young, they are more prone to hypothermia in view of the accumulation of chronic diseases with age and the intake of medications [5, 7].

The greatest frequency of occurrence of cases from total hypothermia is in the winter months of the year (Table 4). As of March, the most frequent cases of mortality were in 2009 and 2012. In these years, the highest percentage of deaths from hypothermia was observed in December, January and March. Frequency of deaths was almost identical in January and March, 2009 and slightly higher in March, than in January, 2012. However, 2015 is different from all previous years, the fact that exactly then the high frequency of cases of exposure to cold was recorded not only in December and January, but also in April and May. In that year's spring months there were more cases of hypothermia than in January. Thus, based on statistics, the most frequent seasonal causes of mortality from total hypothermia are the winter and spring periods of the year, as shown more clearly in Fig. 3. According to other studies, The authors argue that death from general hypothermia is seasonal. From their sources it follows that about 16% of death from hypothermia occurs in the autumn-winter months, and more than 19% in spring [2, 6].

The analysis of the investigated deaths from total hypothermia by nationality revealed that the highest mortality rate is observed in people of ethnic groups that do not belong either to the indigenous (Yakuts, small indigenous peoples of the North), nor to non-indigenous people (Russians). The second place in the group of frequent deaths from cold is given to the small peoples of the North. From 2008 - 2010 there is a positive trend in a significant decrease in mortality in the group of the small people of the North

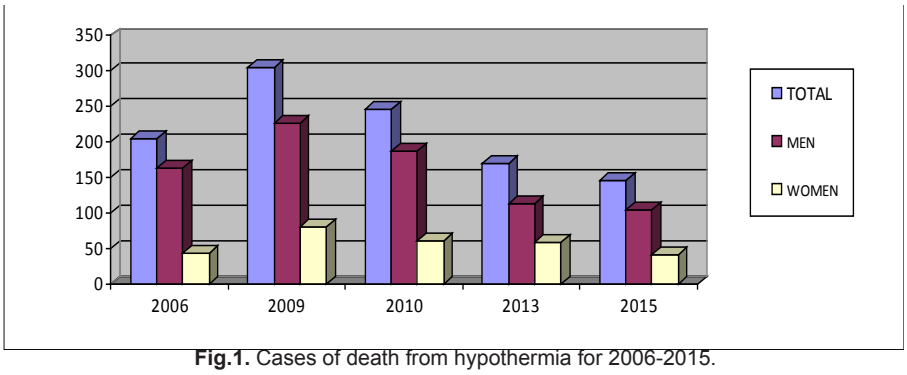

Fig.1. Cases of death from hypothermia for 2006-2015.

Table 2

Mortality Rate from Hypothermia by Socio-territorial Zones from 2006 - 2015 per 1000 People

area	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Yakutsk	0,20	0,10	0,15	0,23	0,19	0,15	0,16	0,18	0,11	0,09
Arctic	0,31	0,45	0,49	0,59	0,59	0,39	0,29	0,49	0,26	0,23
Industrial	0,20	0,11	0,17	0,19	0,16	0,12	0,08	0,08	0,09	0,11
Rural	0,18	0,29	0,27	0,52	0,28	0,30	0,28	0,23	0,26	0,23
Mixed	0,31	0,29	0,29	0,32	0,43	0,30	0,27	0,16	0,28	0,21
Sakha Republic	0,21	0,193	0,222	0,32	0,26	0,209	0,189	0,177	0,169	0,151

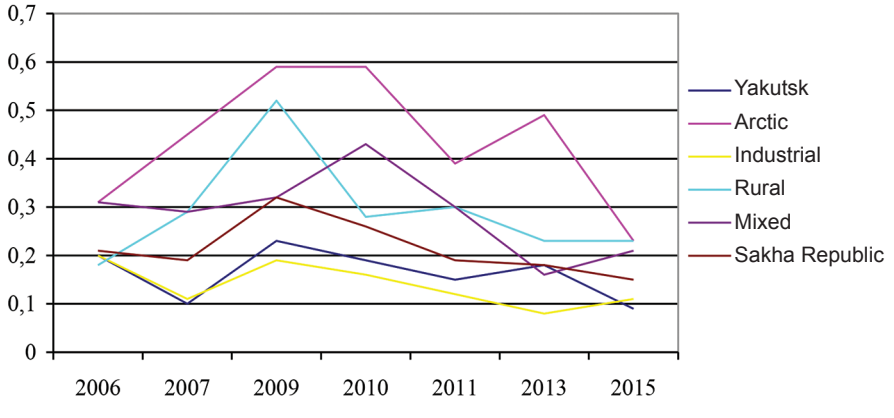

Fig.2. Death Rate from Hypothermia by Socio-territorial Zones from 2006 - 2015 per 1000 People.

Table 3

Death Rate from Hypothermia by Age Groups for 2006-2015 (per 1000 Persons of Corresponding Age Groups)

Age group	year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
<20	0,019	0,010	0,020	0,031	0,025	0,021	0,014	0,011	0,011	0,007
20-24	0,128	0,157	0,109	0,109	0,077	0,088	0,115	0,122	0,053	0,056
25-29	0,106	0,209	0,165	0,198	0,165	0,165	0,161	0,045	0,090	0,068
30-34	0,182	0,111	0,209	0,556	0,289	0,261	0,150	0,159	0,272	0,126
35-39	0,182	0,319	0,346	0,404	0,281	0,177	0,250	0,281	0,177	0,190
40-44	0,235	0,374	0,423	0,546	0,443	0,413	0,304	0,238	0,222	0,298
45-49	0,431	0,378	0,344	0,579	0,315	0,388	0,353	0,449	0,385	0,381
50-54	0,503	0,361	0,524	0,726	0,584	0,337	0,454	0,377	0,385	0,355
55-59	0,423	0,373	0,273	0,646	0,574	0,312	0,305	0,298	0,227	0,254
>60	0,464	0,271	0,336	0,351	0,477	0,307	0,273	0,241	0,239	0,218
total	0,214	0,193	0,222	0,322	0,257	0,209	0,189	0,177	0,169	0,151

Table 4

Seasonal frequency of mortality from fatal hypothermia in Sakha (Yakutia) Republic for 2006-2015

month	year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
January	14,71	14,13	16,11	18,30	15,04	14,21	16,57	12,35	16,67	12,41
February	10,78	10,33	8,06	11,76	14,23	10,53	9,94	15,88	10,49	10,34
March	9,80	9,24	9,48	17,97	10,16	10,53	17,13	17,06	10,49	11,03
April	9,80	10,87	7,58	11,11	7,72	7,37	7,18	8,24	10,49	13,10
May	6,37	6,52	9,48	7,19	6,10	6,32	8,29	7,65	8,02	14,48
June	0,49	1,09	2,37	1,31	0,41	0,53	4,42	0,59	2,47	6,21
July	0,49	1,63	0,47	1,63	0,41	1,05	1,10	1,18	0,62	0,69
August	1,96	0,00	1,42	0,33	0,81	0,00	1,10	1,18	0,00	0,00
September	6,37	4,35	6,16	3,92	8,54	10,53	2,76	4,71	2,47	2,76
OCTOBER	13,73	11,41	9,48	6,54	7,72	9,47	7,18	6,47	9,88	2,76
NOVEMBER	8,82	13,59	15,64	7,19	8,54	12,63	9,94	6,47	10,49	6,90
DECEMBER	16,67	16,85	13,74	12,75	20,33	16,84	14,36	18,24	17,90	19,31
TOTAL	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

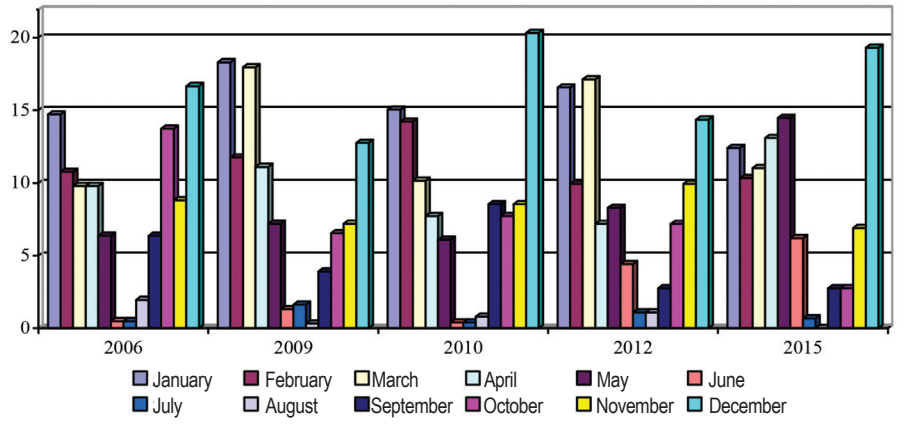

Fig.3. seasonal frequency of hypothermia in sakha republic for 2006-2015.

Table 5

Structure of Mortality from Hypothermia by Ethnic Groups for 2006-2015 (per 1000 Persons of Corresponding Ethnic Groups)

Ethnic group	year									
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Yakuts	0,199	0,250	0,229	0,368	0,103	0,066	0,064	0,028	0,051	0,047
SIPN	0,434	0,403	0,713	0,651	0,351	0,376	0,200	0,376	0,175	0,125
Russians	0,205	0,102	0,131	0,146	0,136	0,088	0,085	0,037	0,068	0,062
Others	0,280	0,268	0,443	0,804	0,939	0,885	0,737	0,845	0,617	0,684
total	0,214	0,193	0,222	0,322	0,257	0,209	0,189	0,177	0,169	0,151

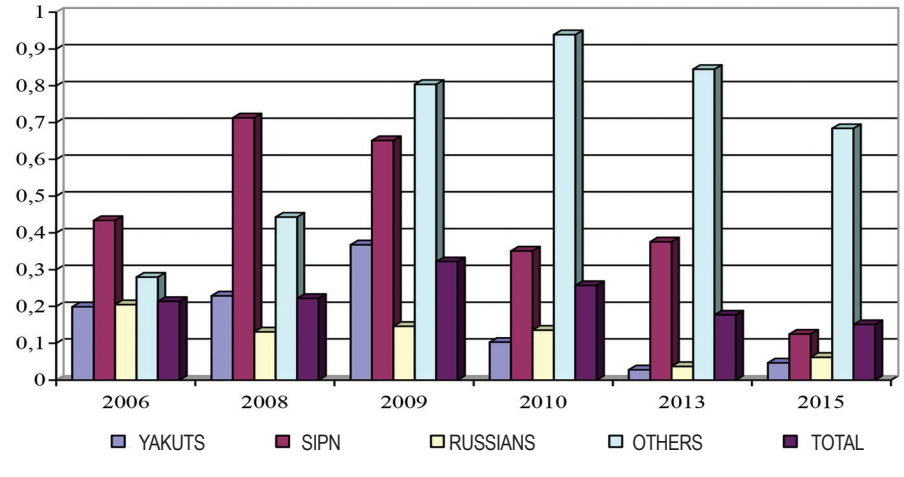

Fig.4. structure of mortality from hypothermia by ethnic groups for 2006-2015 (per 1000 persons of corresponding ethnic groups).

- the tendency to reduce the susceptibility to hypothermia of people of other ethnic groups. The death rate of Yakuts and Russians in the structure of mortality from hypothermia is the smallest in comparison with other ethnic groups and has not increased since 2009 (Table 5, Fig. 4).

People, who have been born or lived for a long time in a warm climate and adapted to it, are exposed to cooling more often than the native population in view of the increased sensitivity to it [2].

In a study done in Sweden from 1992 to 2008, the northern regions of Sweden were analyzed for fatal causes of hypothermia, the following **Conclusion**s were drawn:

- causes for fatalities were heart disease, strokes, dementia, mental illness, alcoholism, as well as recent trauma;
- 72% of deaths occurred in rural areas and 93% in out-of-the-premises areas;
- more than 75% of deaths occur in the cold season of the year from October to March months [6].

Synthesis of the results of the analysis of hypothermia mortality in Sakha (Yakutia) Republic for 2006-2015 suggests that the frequency of deaths from hypothermia depends on the place of residence (territorial zone), the season of the year, the age and the length of stay. Considering these risk factors, it is necessary to develop a set of measures aimed at developing preventive, socio-economic, production and technical directions to increase the effectiveness of measures to reduce the risk of death from general hypothermia.

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CLINICAL MANIFESTATIONS OF ATHEROSCLEROSIS AMONG THE GROUP OF PATIENTS OVER 60 YEARS OF AGE WITH CHD LIVING IN CONDITIONS OF THE FAR NORTH

ABSTRACT

The clinical manifestations of atherosclerosis in the indigenous and non-indigenous population in a group of patients with CHD older than 60 years, living in the Far North, were studied. The highest frequency of myocardial infarction has been identified (at the time of the survey) among the group of patients of senile age (75 years). The frequency of myocardial infarction and angina pectoris decreases as the age increases. The gender disparities have been observed on clinical manifestations of angina pectoris that can be clearly monitored in the indigenous group. The analysis of five-year survival observation revealed the senile age, myocardial infarction and higher class of angina pectoris to be the most relevant factors of mortality in the group of people over 60 years of age.

Keywords: coronary heart disease, myocardial infarction, non-indigenous, indigenous (Yakut) population, elderly, senile age, long-livers.

Introduction. The death from the diseases of the circulatory system has been rated the major cause in Russia and mostly due to CHD [8]. In Russia more than 50% of mortality accounts for cardiovascular diseases compared toin West countries.Furthermore, more than 80 per cent of fatal cases are related to the CHD and cerebral stroke [5,7,10]. From the studies it can be seen that CHD is still one of the major health-related issues and more common among the older and senior aged population rather than young [6,12]. Myocardial infarction (MI) is one of the serious forms of CHD for people aged over 60.According to studies, the compared analysis of the mortality rate due to MI taken from 2006 to 2015 years revealed the significant increase of the death rate in the group of long-livers and its stability in the group of patients aged 80 years and older [3].Most patients with cardiovascular diseases living in the Far North have demonstrated the significant change in the threshold of the physiological reaction to the climatic factors that in turn lead to the decrease of body adaptation to the external environment. Severe climatic factors of Sakha Republic are proved to play the negative role in the formation and prognosis of the different diseases, particularly the atherosclerosis and myocardial infarction [11, 13].

Purpose. To study the clinical manifestations of atherosclerosis in the group of patients with CHD aged over 60 years living in the Far North.

Materials and methods. We analyzed 354 patients aged 60 years and older with a verified diagnosis of CHD who had passed the examination and treatment at Cardiologic department of Geriatric Center, Yakutsk city.The studied population were divided into two groups as following: native – Yakut people (100%) (n=205, average age 77,6±0,6) and non-native – Russians (91,3%),Ukrainians, Tatars and Germans (8,7%) (n=149, average age 75,5±0,7). We divided all the surveyed patients based on gender – men (n=187)and women(n=167), on age – elderly (from 60 to 74 years, n=154), senile (from 75 to 89 years, n=149)and long-livers (aged 90 years and over, n=51) (WHO, 1963). By the time of the study, the period of residence of non-native patients in Yakutia was more than 30 years.

The diagnosis of CHD was verified based on complaints, medical history, laboratory research, data taken with instrumental methods – electrocardiographs (ECG with the use of Minnesota code) for the estimation of ECG [Rose G.A. et al.,1982]), echocardiography, Holter monitoring of ECG and careful study of patients' medical records taken from repository of medical authority.

The local committee on biomedical ethics at Science Centre of Complex Medical Problems approved the study.

Parametric and non-parametric statistical methods were used to conduct the statistical processing of the received results. Student's T-test was applied to estimate the cross-group differences in evidence having continuous distribution, while Pearson Chi-square testand Fisher's method were usedfor comparison of frequency values. Other used methods were Kruskal-Wallis H test, one-, two- and three-factor analysis