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Original article

The Main Risk Factors and Special Aspects of Metabolic Syndrome in Civil Servants

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Abstract

Purpose of the study: To study the development characteristics of metabolic syndrome and risk factors in civil servants of Astana city.

Methods. The study was conducted in Astana with two groups of study, main group and control group. These groups were consist of 475 people working in civil service and people working in other fields of service aged 18 to 63.

Results. To conduct the study we selected people with metabolic syndrome in accordance with the criteria of the International Diabetes Federation (IDF 2009), we also reviewed the case with prevalence of metabolic syndrome in people of studied groups. In the main group, the incidence of metabolic syndrome was 10.6% lower than in the control group and it was found that the majority of them were 53.5% men. The differences between metabolic syndrome components compared to the control group, in men: triglycerides, blood glucose level, high arterial blood pressure ($p<0.05$), and in women: triglycerides, high-density lipoproteins, high arterial blood pressure ($p<0.05$). It was noticed, that the combination of the metabolic syndrome components in both groups occurs mainly in the form of waist + glucose + triglyceride circumference. In addition, high arterial blood pressure, triglyceride and smoking were identified as the leading risk factors of this pathological condition among the respondents.

Conclusions. There is a characteristic tendency of spreading the metabolic syndrome, the course of components and the accompanying situation among civil servants. It is based on risk factors that influenced. In this way, the given study results can be used as a basis for the formation of preventive measures of metabolic syndrome among civil servants.

Keywords: metabolic syndrome, civil servants, prevalence characteristics, risk factors.

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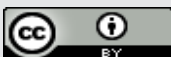
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Introduction

Metabolic syndrome (MetS) is one of the most common pathological conditions today. Currently, more than a billion people in the world suffer from MetS. In developed countries, the prevalence of MetS among young people, according to scientific sources, among this group in the USA among people aged 20 to 39, increased to 48.6% [1], in European countries to 24.3% [2], in the Russian Federation to 26.7% [3] and in the Republic of Kazakhstan was 17.9% for women and 15.3% for men [4].

The reasons for the development of metabolic syndrome are excessive consumption of saturated fats, reduced physical activity, uncontrolled frequent use of drugs, increasing stress situations and so on [5]. These factors are common among civil servants, so they are classified as high risk groups due to MetS [6].

According to the Bureau of National Statistics of the Republic of Kazakhstan, in three years, starting in 2016, the number of civil servants in the country increased from 472.8 thousand to 500.5 thousand [7]. According to research conducted in Kazakhstan, the incidence of MetS among people in the category of public servants is very high, for example, in the age group 35-70 it was on average 40.3% [8].

Materials and methods

The research work was carried out in Medical Center Hospital of President's Affairs Administration of the Republic of Kazakhstan in Astana as a part of the project «National Program for the Implementation of Personalized and Preventive Medicine in the Republic of Kazakhstan for 2021-2023».

People aged 18 to 63 working in Astana took part in the study. All respondents were divided into 2 groups depending on the specifics of their activities. There were 475 people in each group. The main group included civil servants, and the control group included people working in other fields. The metabolic syndrome symptoms were determined by the following indicators: height, weight, body mass index (BMI), waist circumference (WC), triglycerides (TG) in the blood, high-density lipoproteins (HDL), arterial blood pressure (ABP), blood glucose level (BGL).

According to the purpose of the research, people who met five criteria of International Diabetes Federation (2009) suffer from metabolic syndrome. According to the IDF 2009 criteria, the metabolic syndrome is diagnosed, when two of the four factors listed below go together with abdominal obesity (WC >94 cm in men and WC >80 cm in women) [10]:

1. Triglycerides level 150 mg/dL (1.7 mmol/L) or specific treatment for this disorder;

The risk of metabolic syndrome is very high, for example, compared to people without MetS, the risk of developing coronary heart disease in people with MetS increases 2-3 times, the risk of developing diabetes increases 3.5-5 times and the cause of death increases 1,2-1,6 times [9].

According to 2019, 98 726 civil servants were registered in Kazakhstan and Astana held the leading position in the Republic with 14,441 people [7].

One of the most important issues today is to study the characters of the clinical aspects of metabolic syndrome, pathogenesis and complex developing diseases and the identification of risk factors that affect them. Therefore, the topic of this paper is relevant scientific direction.

In this regard, **the purpose of our research** is to study the characteristics and risk factors of metabolic syndrome development in civil servants working in Astana.

2. Low HDL: <40 mg/dL (1.03 mmol/L) in men and <39 mg/dL (1.29 mmol/L) in women;

3. Systolic arterial pressure \geq 130 mm Hg and diastolic pressure \geq 85 mm Hg or special treatment for hypertension;

4. Plasma glucose levels >101 mg/dL (5.6 mmol/L).

The criteria proposed by IDF 2009 were used to assess the results. All indicators were statistically processed using IBM SPSS Statistics 20 and Excel 2019. The numerical values were compared using parametric and non-parametric methods. Parametric methods included Student's T-test. The Mann-Whitney U-test was used in comparative groups using nonparametric methods. The force between the risk factor and the result was determined using the ϕ -criterion. To reject the null hypothesis, the boundary level of statistical significance was $p < 0.05$.

At the early stages of the study, we identified patients with metabolic syndrome among the respondents of both groups. The metabolic syndrome prevalence among study group is presented in Table 1.

Table 1 - Prevalence of metabolic syndrome among study groups

Research groups	Total number	Metabolic syndrome		Men		Women		Middle age
		Number	Percentage	Number	Percentage	Number	Percentage	
Main	475	226	47.5%	121	53.5%	105	46.5%	47±1.09
Control	475	276	58.1%	158	57.2%	118	42.8%	51.6±0.79

Results

According to the prevalence of metabolic syndrome among the study groups, we found that the number of MetS patients among civil servants was 10,6% lower than in the control group and in both groups, the majority was found in men.

Components for abdominal obesity, high levels of triglycerides, high arterial blood pressure, high blood glucose level and low levels of high-density lipoproteins were taken into account in determining the frequency of component prevalence among people with MetS. During

the analysis of the components indicators of civil servants, there was a significant differences in \uparrow triglycerides, \downarrow HDL, \uparrow arterial blood pressure for men ($p < 0.05$) compared to the control group and \uparrow triglycerides, \downarrow HDL, \uparrow arterial blood pressure for women ($p < 0.05$) were confirmed (Table 2).

Table 2 - Indicators of the components of metabolic syndrome among the government employees

Indicators of MetS	Total n=226	Abs. number	Men n=121	p	Abs. number	Women n=105	p
MetS	226	121			105		
Abdominal obesity	226	121	103.9±1.34	0.273	105	100.3±2.29	0.931
↑Triglyceride	170	101	2.64±0.32	0.019*	69	2.17±0.34	0.005*
↓High-density lipoproteins	149	65	1.05±0.05	1	84	1.17±0.04	0.0005*
↑Glucose	178	100	7.07±0.49	0.011*	78	7.5±0.65	0.121
↑Arterial blood pressure	100	54	131.49±3.26 86.12±2.43	0.043*	46	128.3±3.43 84.9±2.56	0.018*

*p<0.05 statistical differences between the main and control groups

Identification of metabolic syndrome components in the main group showed interest in further study of the combination characteristics. Combined metabolic syndrome groups were more common among men in both groups as WC+BGL+TG was 66.1% (in the main group), 62.6%

(in the control group). According to the main group, the combination of WC+HDL+BGL was 10.74%, the lowest value of WC+BGL+ABP was 5.78%. It was vice versa in the control group, the combination of WC+BGL+ABP was 17%, and the minimum value of WC+HDL+BGL was 3.16% (Figure 1).

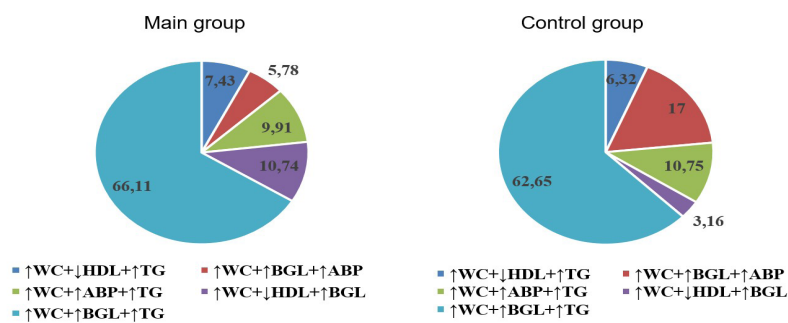


Figure 1 - Features of the combination of components of metabolic syndrome among men

Among women, the combination of MetS in both groups showed 46.66%, the combination of the components of ↑WC+↓HDL+↑ABP was 49.15%. In the main group, the combination of the components of ↑WC+↓HDL+↑TG was distinguished by the control group, which was 13.33%, the

minimum of ↑WC+↓HDL+↑ABP and ↑WC+↑ABP+↑TG was 5.71%. Among women in the control group, on the contrary, the combination of ↑WC+↓HDL+↑ABP was 18.64%, the minimum ↑WC+↑ABP+↑TG was 2.5% and ↑WC+↑BGL+↑ABP components were 1.69% (Figure 2).

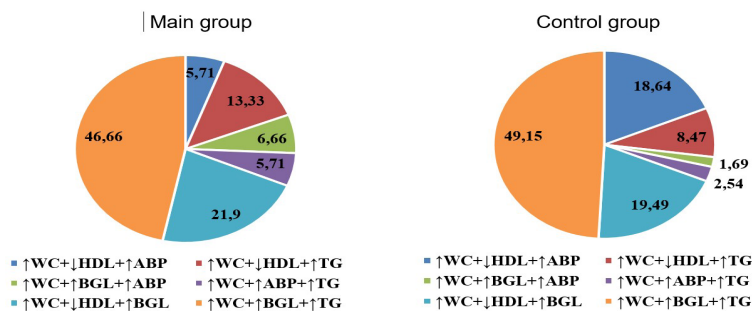


Figure 2 - Features of the combination of components of metabolic syndrome among women

Detecting the metabolic syndrome characteristics in civil servants has greatly stimulated interest to examine this pathology prevention. Therefore, we conducted the analysis work on factors affecting the components of MetS. Using the relativity table, the connectivity χ^2 were calculated and according to the ϕ -criterion of 10 main factors influencing the four components of metabolic syndrome (Table 3).According to the ϕ -criterion, among the factors influencing MetS components, there is a high correlation: BPL, TG, and smoking; BGL and stress ($\chi^2=76240$; $p<0.001$), seeking medical care for chronic diseases ($\chi^2=17.718$; $p<0.001$); TG and salt levels were specified ($\chi^2=12.099$; $p<0.001$).

Among the MetS components, moderate contact was detected for the following components: arterial blood pressure and alcohol consumption ($\chi^2=8.239$; $p<0.001$); HDL level and smoking; TG level and nutritional status, seeking medical care for chronic disease.

Table 3 - The ratio of factors influencing the MS components according to ϕ -criterion

No	Factors	Triglycerides	Arterial blood pressure	High-density lipoproteins	Blood glucose
1	Alcohol consumption	0.138 weak	0.270 moderate	Men: 0.038 no connection	0.054 no connection
				Women: 0.035 no connection	
2	Smoking	0.463 relatively strong	0.700 strong	Men: 0.288 moderate	0.041 no connection
				Women: 0.262 moderate	
3	Stress	0.092 no connection	0.067 no connection	Men: 0.017 no connection	0.47 relatively strong
				Women: 0.500 relatively strong	
4	Physical activity	0.093 no connection	0.100 weak	Men: 0.145 weak	0.036 no connection
				Women: no connection 0.116 weak	
5	Nutritional status	0.274 moderate	0.126 weak	Men: 0.025 no connection	0.073 no connection
				Women: 0.030 no connection	
6	Amount of salt	0.438 relatively strong	0.085 weak	Men: 0.116 weak	0.211 moderate
				Women: 0.116 weak	
7	Seeking the help of a doctor for a chronic disease	0.362 moderate	0.134 weak	Men: 0.016 weak	0.404 relatively strong
				Women: 0.186 no connection	
8	Working conditions	0.003 no connection	0.025 weak	Men: 0.064 no connection	0.058 no connection
				Women: 0.032 no connection	
9	Work experience	0.224 moderate	0.182 weak	Men: 0.054 no connection	0.009 no connection
				Women: 0.020 no connection	
10	Housing conditions	0.134 weak	0.048 no connection	Men: 0.083 no connection	0.066 no connection
				Women: 0.029 no connection	

Discussion

During the study, the purpose of which was to identify the development characteristics of metabolic syndrome and risk factors among people working in civil service in Astana, we chose the prevalence of MS between the two groups in accordance with the IDF criterion 2009. As a result, the prevalence of metabolic syndrome among civil servants was low in comparison to the control group and the majority in the main group were men. While the levels of triglycerides, glucose and high blood pressure were the same in men of the main group, they differed in the other groups. The taken results of the study can be due to the quality of work of civil servants, high educational level, and quality of medical care, socio-economic status and healthy lifestyle etc. We know that people with higher educational level take care of their health better than those whose level of education is lower. According to the study that had been conducted in USA from 1995 and 2015, people with higher educational level are healthier and live the life longer for 3.5%, than people who are the same aged but with lower level of education [11]. As a consequence people with lower level of education are more susceptible to prevalence of metabolic syndrome as well as coronary vascular diseases [12] and cerebrovascular accident [13]. Among highly educated people, the attitude to their health is characterized by their lifestyle. The study showed that life expectancy without diabetes, cardiovascular disease and cancer among healthy women aged 50 was 34.4 years, while for women who did not live healthy life was only 23.7 years [14]. In our research group, 100% of civil servants have higher education and those who have received additional education.

People's life expectancy also depends on their access to health care. A study conducted in China showed that the life expectancy of the population in urban areas is different compared to rural areas [15]. It was found that the frequency of seeking appropriate medical care among civil servants is higher. Respondents from this group are under regular medical check-up in leading hospitals with high-quality medical care in Astana, and all medical care (including sanatorium-and-health-resort) is provided in a timely manner and free of charge. The persons who are classified as civil servants in Astana, which we reviewed, are at the highest level of social status, as the majority of this population are in administrative and managerial positions.

In this regard, it was shown that combination of MS components in civil servants is often characterized by the increasing blood sugar level, triglycerides and waist circumference. According to studies conducted in the United States among patients with chronic kidney disease, among the possible combinations of the three components of metabolic syndrome, the most common combination is in the form of abdominal obesity, elevated triglycerides and glucose in the fasted state [16] and this coincided with previous studies.

The differences specified in this research group are that this group has a high incidence of cardiovascular diseases, including diabetes, and the results from other countries are the same. For example, a study conducted in the USA from 1983 to 2016 showed that people aged 25 to 80 with low professional status had a higher risk of cardiovascular diseases [17].

In addition, in our study, smoking, stress, excessive salt intake were identified as the leading risk factors for metabolic syndrome among civil servants who are more educated and have leading positions, while those who are

lower rank owners, alcohol consumption, nutritional status are identified and serve as the basis for implementation of preventive measures.

Conclusion

There is a characteristic tendency of spreading the metabolic syndrome, the course of components and the accompanying situation among civil servants. It is based on risk factors that influenced. In this way, the given study results can be used as a basis for the formation of preventive measures of metabolic syndrome among civil servants.

Conflict of interest. The authors declare the absence of obvious and potential conflicts of interest related to the content of this article.

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Contribution of the authors. All authors

contributed to the study conception and design. Material preparation, data collection and analysis were performed by Ulpan Kuandyk, Saule Tardzhibayeva. The first draft of the manuscript was written by Ulpan Kuandyk and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript. Conceptualization: Yerkezhan Tolegenova, Dastan Shakanov; Methodology: Saule Tardzhibayeva; Writing - original draft preparation: Ulpan Kuandyk, Saule Tardzhibayeva; Writing - review and editing: Yerkezhan Tolegenova, Dastan Shakanov.

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Мемлекеттік қызметкерлердегі метаболизм синдромының негізгі қауіп-қатер факторлары мен ерекшеліктері

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Түйіндеме

Зерттеу мақсаты: Астана қаласындағы мемлекеттік қызметкерлердегі метаболизм синдромының даму ерекшеліктері мен қауіп-қатер факторларын зерттеу.

Әдістері. Зерттеу Астана қаласында екі зерттеу тобының қатысуымен жүргізілді: негізгі және бақылау. Бұл топтар мемлекеттік қызметте және өзге салаларда жұмыс істейтін 18 бен 63 жас аралығындағы 475 адамнан құралған адамдардан тұрды.

Нәтижелер. Нәтижесінде, метаболизм синдромының халықаралық қант диабеті Федерациясы (IDF 2009) критерийлеріне сәйкес науқастар іріктеліп, негізгі және бақылау топтарында метаболизм синдромының таралу жағдайы қарастырылды. Негізгі топта метаболизм синдромының таралуы бақылау тобымен салыстырғанда 10,6% төмен болды және оның басым бөлігі 53,5% ерлер болатыны анықталды. Қызметкерлер арасында метаболизм синдромы компоненттері бақылау тобымен салыстырғанда ерлерде үшглицерид, қандағы глюкоза деңгейі, артериялық қысымның жоғарылауы ($p < 0,05$) болса, әйелдерде триглицерид, тығыздығы жоғары липопротеидтер, артериялық қысымның жоғарылауы бойынша шынайы айырмашылықтар бойынша расталды ($p < 0,05$). Метаболизм синдромы компоненттерінің ұштасуы екі топта да басым бөлігі бел шеңбері + глюкоза + триглицерид түрінде кездесетіні байқалды. Сонымен қатар, жоғары қан қысымы, триглицерид деңгейі және темекі шегу респонденттер арасында осы патологиялық жағдайдың дамуының жетекші қауіп-қатер факторлары ретінде анықталды.

Қорытынды. Қызметкерлер арасында метаболизм синдромының ағымында өзіне тән таралу үрдісімен, компоненттер ағымымен және ұштасу жағдаймен ерекшеленеді. Оның негізінде қауіп-қатер факторлардың әсері жатыр. Осылайша, анықталған нәтижелер мемлекеттік қызметкерлер арасындағы метаболизм синдромының алдын алу шараларды қалыптастыруға негіз ретінде пайдалануға мүмкіншілік береді.

Түйін сөздер: метаболизм синдромы, мемлекеттік қызметкерлер, таралу ерекшеліктері, қауіп-қатер факторлар.

Основные факторы риска и особенности метаболического синдрома у государственных служащих

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Резюме

Цель исследования: Изучение особенностей развития метаболического синдрома и факторов риска у государственных служащих города Астаны.

Методы. Исследование проводилось в Астане с участием двух исследуемых групп: основной и контрольной. Эти группы состояли из 475 человек, работающих на государственной службе, и людей, работающих в других сферах службы, в возрасте от 18 до 63 лет.

Результаты. В результате были отобраны пациенты с метаболическим синдромом в соответствии с критериями Международной диабетической Федерации (IDF 2009) и рассмотрен случай распространения метаболического синдрома в основной и контрольной группах. В основной группе распространенность метаболического синдрома была на 10,6% ниже, чем в контрольной группе, и было обнаружено, что большинство из них составляли 53,5% мужчин. Среди сотрудников были подтверждены истинные различия между компонентами метаболического синдрома по сравнению с контрольной группой, у мужчин: триглицериды, уровень глюкозы в крови, высокое кровяное давление ($p < 0,05$), а у женщин: триглицериды, липопротеины высокой плотности, высокое кровяное давление ($p < 0,05$). Было замечено, что сочетание компонентов метаболического синдрома в обеих группах встречается преимущественно в виде окружности талии + глюкозы + триглицерида. Кроме того, высокое артериальное давление, уровень триглицеридов и курение были определены среди респондентов в качестве ведущих факторов риска развития этого патологического состояния.

Выводы. В течении метаболического синдрома среди сотрудников различают характерную тенденцию к распространению, течение компонентов и сопутствующую ситуацию. В его основе лежит влияние факторов риска. Таким образом, выявленные результаты позволяют использовать в качестве основы для формирования профилактических мер метаболического синдрома среди государственных служащих.

Ключевые слова: метаболический синдром, государственные служащие, особенности распределения, факторы риска.