

**DESIGNING AN IMPROVED PREVENTIVE ALGORITHM FOR
ARTERIAL HYPERTENSION IN WOMEN OF CHILDBEARING AGE**

Dilbar Bakhriddinovna Rakhmatova - Associate Professor, Department of Internal Diseases in Family Medicine, Bukhara State Medical Institute named after Abu Ali ibn Sina, PhD
orcid.org/0000-0002-7321-3248

ABSTRACT. Arterial hypertension remains one of the most widespread and socially significant chronic non-communicable conditions, contributing to the development of cardiovascular complications and reduced functional capacity in the population. In recent years, rising hypertension rates among women of reproductive age have garnered particular attention. This trend is closely linked to hormonal fluctuations, metabolic disturbances, and psycho-emotional influences. Effective prevention of arterial hypertension in this population requires a comprehensive and individualized strategy that accounts for reproductive health, lifestyle patterns, and accompanying risk factors. The purpose of this study is to design an improved algorithm aimed at strengthening preventive measures for the early identification and prevention of arterial hypertension in women of fertile age. The research includes an analysis of the pathogenetic mechanisms of hypertension, evaluation of hormonal status and metabolic abnormalities, as well as social and behavioral determinants that influence blood pressure. The proposed algorithm is intended to optimize the preventive care system and enhance the efficiency of medical surveillance among women in this demographic group.

Keywords: arterial hypertension, women of reproductive age, prevention, risk factors, metabolic syndrome, hormonal status, algorithm.

**РАЗРАБОТКА УСОВЕРШЕНСТВОВАННОГО
ПРОФИЛАКТИЧЕСКОГО АЛГОРИТМА АРТЕРИАЛЬНОЙ
ГИПЕРТЕНЗИИ У ЖЕНЩИН ДЕТОРОДНОГО ВОЗРАСТА**

Рахматова Дилбар Бахриддиновна - доцент кафедры "Внутренние болезни по семейной медицине" Бухарского государственного медицинского института им. Абу Али ибн Сины, PhD
orcid.org/0000-0002-7321-3248

АННОТАЦИЯ. Артериальная гипертензия остается одним из наиболее распространенных и социально значимых хронических неинфекционных заболеваний, способствующих развитию сердечно-сосудистых осложнений и снижению функциональных возможностей населения. В последние годы особое внимание привлекает рост частоты гипертонии среди женщин репродуктивного возраста. Эта тенденция тесно связана с гормональными колебаниями, метаболическими нарушениями и психоэмоциональными факторами. Эффективная профилактика артериальной гипертензии в данной группе населения требует комплексной и индивидуализированной стратегии, учитывающей репродуктивное здоровье, образ жизни и сопутствующие факторы риска. Целью данного исследования является разработка усовершенствованного алгоритма, направленного на усиление

профилактических мер по раннему выявлению и предупреждению артериальной гипертензии у женщин фертильного возраста. Исследование включает анализ патогенетических механизмов гипертонии, оценку гормонального статуса и метаболических нарушений, а также социальных и поведенческих детерминант, влияющих на артериальное давление. Предложенный алгоритм призван оптимизировать систему профилактической помощи и повысить эффективность медицинского наблюдения за женщинами данной демографической группы.

Ключевые слова: артериальная гипертензия, женщины репродуктивного возраста, профилактика, факторы риска, метаболический синдром, гормональный статус, алгоритм.

Introduction. Arterial hypertension (AH) is one of the most widespread chronic non-communicable diseases of modern times and remains a leading cause of morbidity, disability, and mortality worldwide [1,2]. According to the World Health Organization (WHO), more than 1.2 billion people suffer from hypertension, and a significant proportion of them do not receive timely diagnosis or adequate treatment [3].

Particular concern is associated with the increasing prevalence of arterial hypertension among women of fertile (reproductive) age [4]. In this population, the disease often presents covertly, masking itself as physiological or hormonal fluctuations related to the menstrual cycle, pregnancy, or the postpartum period. The presence of hypertension during reproductive years increases the risk of preeclampsia, cardiovascular complications, metabolic syndrome, and adversely affects a woman's reproductive health [5].

Despite the availability of modern diagnostic and therapeutic methods, the effectiveness of preventive measures among women of reproductive age remains insufficient [6]. This is largely due to the absence of a comprehensive and individualized approach that considers hormonal status, metabolic characteristics, and socio-behavioral risk factors.

In this context, the development of a scientifically grounded algorithm to improve the prevention of arterial hypertension in women of fertile age is highly relevant. Such an algorithm should aim at the early detection of blood pressure regulation disorders, correction of risk factors, and enhancement of the quality of clinical follow-up [7].

Aim of the study. To develop a scientifically substantiated algorithm for improving the prevention of arterial hypertension in women of reproductive age, aimed at the early identification of risk factors, pathogenetic disturbances, and increasing the overall effectiveness of preventive interventions.

Results and analysis of the study. Arterial hypertension (AH) remains one of the most common chronic non-communicable diseases that substantially affects public health [1]. In recent years, there has been a steady increase in the prevalence of hypertension among women of reproductive age, which is associated with lifestyle changes, stress-related influences, and disturbances in hormonal and metabolic balance [2,3].

The issue of preventing arterial hypertension in women of childbearing age is particularly relevant, as elevated blood pressure during this stage of life increases the risk of pregnancy complications, preterm birth, and the development of cardiovascular diseases later in life.

Modern medical practice necessitates the creation of scientifically grounded algorithms aimed at the early identification of risk factors, assessment of hormonal status, metabolic abnormalities, and lifestyle modification. The development of an improved prevention algorithm for AH in women of reproductive age will enhance the effectiveness of clinical follow-up and improve reproductive and cardiovascular health outcomes.

To further advance the research and improve preventive strategies for arterial hypertension among women of fertile age, the correlation between obesity and blood levels of endothelin-1 (ET-1), as previously identified, and their relationship with 24-hour systolic (SBP) and diastolic blood pressure (DBP) was examined (Table 1).

Table 1. Correlation of Obesity and Blood ET-1 Levels with 24-hour SBP and DBP in Women of Reproductive Age

Criteria	Mean 24-hour SBP	Mean 24-hour DBP
Obesity	0,6	0,54
Endothelin-1	0,85	0,72

According to Table 1, a moderate positive correlation was observed between obesity and mean 24-hour systolic blood pressure (SBP) ($r = 0.6$), as well as between obesity and mean 24-hour diastolic blood pressure (DBP) ($r = 0.54$). A strong direct correlation was found between ET-1 levels and mean 24-hour SBP ($r = 0.85$), as well as between ET-1 and mean 24-hour DBP ($r = 0.72$).

This finding represents a key component of our study, confirming that in women, an increase in BMI and obesity is accompanied by a pathogenetically determined rise in blood ET-1 levels and an organic elevation of both systolic and diastolic blood pressure as a response to endothelial dysfunction.

To further verify this association, we examined the correlation between mean 24-hour SBP and DBP with mean daytime and mean nighttime SBP (Table 2).

Table 2. Correlation Between Mean 24-hour SBP/DBP and Mean Daytime and Mean Nighttime SBP

Criteria	Mean Daytime SBP	Mean Nighttime SBP
Mean 24-hour SBP	0,98	0,70
Mean 24-hour DBP	0,98	0,67

According to the data presented in Table 2, a strong positive correlation was observed between mean 24-hour systolic blood pressure (SBP) and mean daytime SBP ($r = 0.98$), as well as between mean 24-hour SBP and mean nighttime SBP ($r = 0.70$). A strong direct correlation was also identified between mean 24-hour diastolic blood pressure (DBP) and mean daytime SBP ($r = 0.98$), while a moderate positive correlation was noted between mean 24-hour DBP and mean

nighttime SBP ($r = 0.67$). These findings indicate that the increase in mean 24-hour SBP and DBP is primarily associated with changes in mean daytime SBP, highlighting the significant contribution of daytime hemodynamic load to overall blood pressure levels.

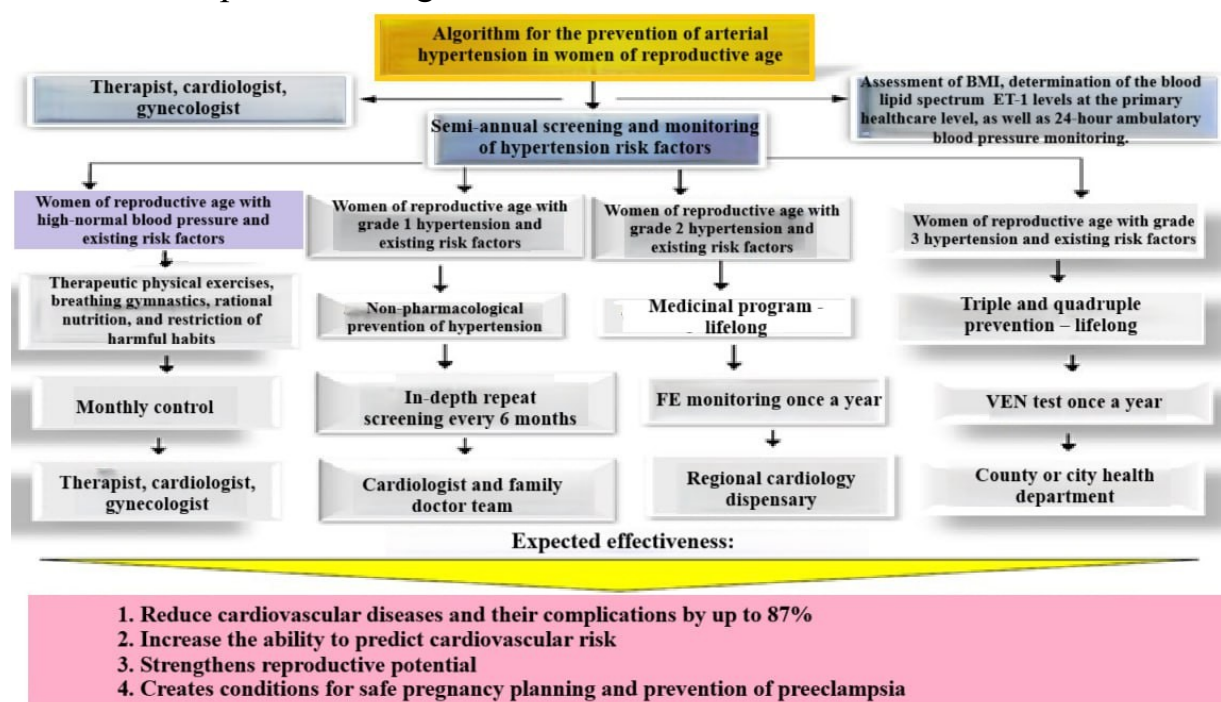
Based on the primary objective of our study, it is important to highlight the following findings: among the 172 women examined, 65 (37.7%) had high-normal blood pressure, 90 (52.3%) were diagnosed with stage 1 arterial hypertension, and 17 (10%) had stage 2 arterial hypertension. It was noted that blood ET-1 levels corresponded to a low-risk range even in individuals with high-normal blood pressure, to a moderate-risk range in those with stage 1 hypertension, and to a high-risk range in women with stage 2 hypertension.

Specifically, although 9 out of 14 women in Group 1 demonstrated high-normal blood pressure, 2 women in Group 2 and 4 women in Group 3 had stage 1 hypertension, while 1 woman in Group 3 had stage 2 hypertension. Nevertheless, the mean ET-1 concentration in these 16 women (9.3%) remained within the optimal threshold.

Thus, among the 172 women, only 16 had ET-1 levels within the optimal range, while 56 were within the low-risk range. This indicates that persistent arterial hypertension is likely to develop in 100 women (58%) of reproductive age.

At the same time, coordinated and improved preventive interventions could help prevent the development of arterial hypertension in only 72 (42%) women. Therefore, at the final stage of our research, the following algorithm was developed (Fig. 1).

Fig. 1. Algorithm for Optimizing the Prevention of Arterial Hypertension in Women of Reproductive Age



Expected effects:

1. Allows reducing the development of cardiovascular diseases and their complications by up to 87%
2. Increases the ability to predict cardiovascular risk
3. Strengthens reproductive potential
4. Creates conditions for safe pregnancy planning and prevention of preeclampsia

This algorithm enables the prevention of early complications of arterial hypertension in women of childbearing age by reducing morbidity, disability, and mortality, while ensuring high treatment effectiveness through the improvement of women's quality of life. Strengthening reproductive potential — meaning the normalization of blood pressure and the correction of endothelial dysfunction in women over 35 years of age — creates favorable conditions for safe pregnancy planning and the prevention of preeclampsia. Integrating this program into the outpatient care system will enhance the efficiency of inpatient services, reduce overall healthcare costs, and improve cardiovascular risk prediction through the use of endothelin-1 as a biomarker and 24-hour ambulatory blood pressure monitoring (ABPM).

According to publicly available data, the population of the city of Bukhara is approximately 280,000 people. Applying the general proportion of women of reproductive age to the female population of Bukhara, it can be assumed that their number is around 100,000–140,000. The precise number of women of childbearing age in Bukhara requires official statistical sources; however, based on national demographic data for Uzbekistan, this estimate is reasonable.

Arterial hypertension in women of reproductive age occurs in approximately 5–10% of cases, according to various sources, and represents a significant risk factor for cardiovascular complications.

If an average family polyclinic supervises around 6,500 women of reproductive age, and 10% of them—approximately 650 women—may develop arterial hypertension, then the use of the preventive algorithm may help protect about 272 women (42%) from hypertension-related complications. Likewise, if the total number of reproductive-age women in the region is around 140,000, and 14,000 of them (10%) may develop arterial hypertension, the implementation of the preventive algorithm could reduce cardiovascular complications in approximately 5,860 women (42%).

If preventive examinations conducted every six months help prevent hypertension-related complications in 42% of the population at risk, then within one year, this cumulative effect may reach as high as 84%.

Conclusion. Arterial hypertension in women of reproductive age represents a significant medical and social challenge in modern healthcare. Hormonal, metabolic, and psycho-emotional factors have a substantial impact on the development of the disease, often contributing to its latent course and delayed diagnosis. The analysis conducted in this study demonstrated that hypertension during reproductive years frequently develops against the background of metabolic

syndrome, insulin resistance, and hormonal imbalance, which increases the risk of cardiovascular complications and impairs reproductive health.

The developed algorithm for optimizing the prevention of arterial hypertension is aimed at the early identification of predisposing factors, assessment of hormonal and metabolic status, and determination of psychosocial influences affecting blood pressure levels. The algorithm incorporates a comprehensive set of measures for creating individualized recommendations, including lifestyle modification, dietary correction, increased physical activity, and regular medical follow-up.

Implementation of this algorithm in clinical practice will enhance the effectiveness of preventive programs, reduce the prevalence of arterial hypertension among women of reproductive age, improve their quality of life, and contribute to the preservation of reproductive and cardiovascular health in this population group.

REFERENCES

1. World Health Organization (WHO). (2021). Hypertension: Key facts and global statistics. Geneva: WHO Press.
2. Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews Nephrology*, 16(4), 223–237. <https://doi.org/10.1038/s41581-019-0244-2>
3. Forouzanfar, M. H., Liu, P., Roth, G. A., et al. (2017). Global burden of hypertension and its complications, 1990–2015: A systematic analysis for the Global Burden of Disease Study. *The Lancet*, 389(10064), 37–55.
4. Pimenta, E., & Oparil, S. (2018). Management of hypertension in women: Current perspectives. *Current Hypertension Reports*, 20(11), 89–97. <https://doi.org/10.1007/s11906-018-0897-4>
5. Whelton, P. K., Carey, R. M., Aronow, W. S., et al. (2018). 2017 ACC/AHA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults. *Journal of the American College of Cardiology*, 71(19), e127–e248. <https://doi.org/10.1016/j.jacc.2017.11.006>
6. Shlyakhto, E. V., & Konradi, A. O. (2020). Gender-specific aspects of arterial hypertension: Pathogenesis, diagnosis, and prevention. *Russian Journal of Cardiology*, 25(5), 134–142.

ИСПОЛЬЗОВАННАЯ ЛИТЕРАТУРА:

1. Всемирная организация здравоохранения (ВОЗ). (2021). Гипертония: ключевые факты и мировая статистика. Женева: Издательство ВОЗ.
2. Миллс, К. Т., Стефанеску, А., и Хе, Дж. (2020). Мировая эпидемиология гипертонии. *Nature Reviews Nephrology*, 16 (4), 223-237. <https://doi.org/10.1038/s41581-019-0244-2>
3. Forouzanfar, M. H., Liu, P., Roth, G. A. и др. (2017). Глобальная нагрузка на гипертонию и ее осложнения, 1990-2015 гг.: Системный анализ глобальной нагрузки на заболевания. *Ланцет*, 389 (10064), 37-55.

4. Пимента, Э., и Опарил, С. (2018). Лечение гипертензии у женщин: современные взгляды. *Current Hypertension Reports*, 20 (11), 89-97. <https://doi.org/10.1007/s11906-018-0897-4>
5. Уэлтон, П. К., Кэри, Р. М., Аронов, У. С. и др. (2018). Руководство АСС/АНА 2017 года по профилактике, выявлению, оценке и лечению повышенного артериального давления у взрослых. *Журнал Американского колледжа кардиологии*, 71 (19), e127-e248. <https://doi.org/10.1016/j.jacc.2017.11.006>
6. Шляхто, Е. В., и Конради, А. О. (2020). Гендерные аспекты артериальной гипертензии: патогенез, диагностика и профилактика. *Русский журнал кардиологии*, 25 (5), 134-142.