



Role of Stress in the Pathophysiology of Hypertension

Yes, stress plays a **significant role** in the development and progression of **hypertension**. While acute stress causes a **temporary spike** in blood pressure, **chronic stress** can lead to **long-term hypertension** through multiple physiological mechanisms.

1. How Stress Affects Blood Pressure

✓ Activation of the Sympathetic Nervous System (SNS)

- Stress triggers the "fight-or-flight" response, causing the **release of adrenaline & noradrenaline**.
- This leads to **increased heart rate, vasoconstriction, and elevated blood pressure**.

✓ Overactivation of the Hypothalamic-Pituitary-Adrenal (HPA) Axis

- Chronic stress leads to **excess cortisol production**, which:
 - Increases **sodium retention** (raising BP).
 - Promotes **insulin resistance & obesity** (risk factors for hypertension).
 - Enhances **inflammation & endothelial dysfunction**, reducing nitric oxide (NO) availability and impairing vasodilation.

✓ Oxidative Stress & Inflammation

- Chronic stress leads to **increased free radicals & inflammatory markers (CRP, IL-6, TNF- α)**, damaging blood vessels.
- This contributes to **arterial stiffness & atherosclerosis**, worsening BP control.

✓ Alteration of the Renin-Angiotensin-Aldosterone System (RAAS)

- Stress stimulates **renin release**, leading to increased **angiotensin II & aldosterone levels**, which cause **vasoconstriction & fluid retention**, raising BP.

✓ Impact on Lifestyle Factors

- Chronic stress increases **unhealthy behaviors** like:
 - **Poor diet** (high salt, high sugar intake).
 - **Emotional eating & weight gain**.
 - **Smoking & alcohol consumption** (which elevate BP).
 - **Sleep disturbances** (leading to nighttime BP elevation).

2. Psychological Stress & Hypertension Risk

✓ **Work Stress** – Long working hours, job strain, and poor work-life balance increase hypertension risk.

✓ **Social Stress** – Family conflicts, financial problems, and loneliness contribute to BP elevation.

✓ **Anxiety & Depression** – These conditions **increase SNS activity**, leading to chronic hypertension.



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3. Stress Management for Hypertension Control

- ✓ **Mindfulness & Meditation** – Lowers cortisol & SNS activity.
- ✓ **Yoga & Deep Breathing Exercises (Pranayama)** – Proven to reduce BP.
- ✓ **Regular Physical Activity** – Reduces stress hormone levels & improves vascular health.
- ✓ **Good Sleep Hygiene** – Reduces nighttime BP surges.
- ✓ **Healthy Diet (DASH Diet)** – Lowers stress-induced inflammation.
- ✓ **Social Support & Therapy** – Reduces emotional stress impact.

Conclusion

- ✓ **Chronic stress is a major contributor to hypertension via SNS activation, hormonal changes, and lifestyle factors.**
- ✓ **Stress reduction techniques** are essential for BP control, along with medications and lifestyle modifications.
- ✓ **Addressing stress through meditation, yoga, sleep improvement, and counseling** can significantly improve hypertension outcomes.