

Water consumption for the general population

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PICO Statement:

In the general population, what is the effect of drinking enough or over hydrating on the cardiovascular and renal system compared with staying in a dehydrated state. The general population has been commonly known to be dehydrated. Americans especially drink soda, caffeine and consume high sodium diets. The American diet has led to many becoming chronically dehydrated leading to many health problems down the road. Would it be counterproductive to consume more water for hypertensive patients? Could water be potentially dangerous for those who are hypertensive? In some cases, it most definitely could! Does diluting the blood play a factor in the vessels throughout the body? How did being dehydrated become congruent with kidney damage. I will be going over a few studies that indicate the differences in blood pressure in hydrated volunteers. Sequentially, there will be a review of blood viscosity and how the thickened blood affects the vessels through the body. Lastly, there will be a review on the dynamics that water plays on the kidneys and how it affects the different systems in the kidneys.

Identify and discuss your 3 main points:

Water affects the blood pressure in an interesting way. In a study by Endo Yutaka, researchers evaluated patients' blood pressure of overnight dehydrated patients while drinking a liter of water for two minutes. When your drinking initiates reflex adjustments to restore homeostasis. The early phases of drinking increased the mean blood pressure by over 20 mmHg within 30 seconds and peaked at 4 minutes by increasing mean BP by 30. The blood pressure gradually decreased after 10 minutes back to the control after 35 minutes. (Yutaka E., Riko T., Fumio Y., Seuko S., Katsuya Y., Yuka T., Toshihito M., Keizo S., 2001). The statements help understand the effects on blood pressure immediately after drinking water. It illustrates that there

could be a potential danger for a short period in time. The effects of blood pressure are not long lasting in healthy individuals. However, the contraindications may be if the patient already has hypertension then it has a potential of reaching a hypertensive crisis state, in turn, increasing chances of kidney damage, stroke, and cardiovascular issues. The study does indicate good potential for patients with orthostatic hypotension as the rise in blood pressure may prevent injury if hydrated. Unfortunately, there is insufficient research on the effects on blood pressure with a gradual long term increase in water intake.

Blood viscosity is the thickening of blood and resistance to the flow. If the blood viscosity becomes too thick it can be detrimental to blood vessels and cardiac output. A study on firefighters concluded that as the firefighters participated in a simulation they became dehydrated resulting in higher levels of whole blood viscosity (WBV), hematocrit (HCT) and hemoglobin (HB). The levels of HB and HCT returned to baseline soon after but WBV only improved slightly. The firefighters then received half their kg weight in fluid ounces (Ralph E. Holsworth Jr, Young I. Cho, Joseph Weidman). The result of the study signified blood viscosity levels were increased likely from dehydration. The abrupt change from administering fluids to the firefighters was critical to elevate the blood levels. After hydration the study showed, “WBV changes were significantly larger than HCT and Hb changes, suggesting the profound influence of hydration states on WBV” (Ralph E. Holsworth Jr, Young I Cho, Joseph Weidman, 2013). A 15% reduction in plasma volume was observed after three bouts of firefighting activity, which had a significant physiologic impact, such as decreased stroke volume. This reduction of plasma volume was caused by heat stress and dehydration resulting in hemoconcentration (Ralph E. Holsworth Jr, Young I Cho, Joseph Weidman, 2013). The 15% reduction in plasma volume signifies the effect of dehydration and loss of fluids that can occur very rapidly. As the study

indicated, the loss of water decreased stroke volume as the blood thickened. Any prolonged effect of dehydration may lower blood pressure, cause weakness, altered mental status, increased body temperature and many other symptoms (Betty J. Ackley, Gail B. Ladwig, Mary Beth Flynn Makic, Marina Martinez-Kratz, Melody Zanotti, pg. 407).

Acute renal dysfunction is commonly associated with hypertension and/or dehydration. I will be discussing a study's findings that indicate three pathways in which dehydration causes renal injury. According to the study, dehydration stimulates vasopressin release, however, with sufficient hydration vasopressin levels are suppressed in turn slowing the progression of renal damage. The second pathway indicated by dehydrated lab rats show that hyperosmolarity can activate aldose reductase-fructokinase pathway leading to intracellular phosphate depletion. This leads to generation of uric acid, oxidative stress, production of chemokines resulting in tubular injury and fibrosis. Lastly, the heat associated dehydration results in hyperuricemia by increasing production of urate and reducing excretion due to renal vasoconstriction. It is recognized as a risk for acute or chronic kidney injury. The study suggests that these three pathways play a critical part in kidney health and that the functions must be regulated by sufficient water consumption (C. Roncal-Jimenez, M.A. Lanaspa, T. Jensen, L.G. Sanchez- Lozada, R.J. Johnson, 2015). Many of these pathways show that dehydration releases many kidney damaging effects that could otherwise be avoided by sufficient water.

Relevance to Career:

This review is important because it is commonly taught that higher liquids and sodium will increase blood pressure. This, in turn, may have nurses attempt to withhold or educate on limiting water intake for hypertensive patients. It is important to understand the mechanisms of which having a patient be dehydrated for long periods of time may cause serious damage. "The

nurse promotes, advocates for, and protects the rights, health, and safety of the patient”

(American Nurses Association, 2015). It is vital to be informed on the best practices for the best outcomes for the patient. It is also important to understand as a healthcare provider to hydrate as you are on the move constantly and must take care of oneself in order to provide care to others properly. There must always be a general promotion of health and in the health care setting it is vital to maintain good working conditions. “The nurse owes the same duties to self as to others, including the responsibility to promote health and safety, preserve wholeness of character and integrity, maintain competence, and continue personal and professional growth.” (American Nurses Association, 2015). There may be cases where it is important to withhold water but you must outweigh the benefits and costs on a case-by-case basis.

Conclusion:

In the general population, what is the effect of drinking enough or over hydrating on the cardiovascular and renal system compared with staying in a dehydrated state. Drinking sufficient water is crucial for the cardiovascular and renal system. There are many crucial systems through the renal system and vessels that must be maintained to provide adequate output of nutrients throughout the body. For the renal system, insufficient water leads to kidney damage in three possible pathways. Water affects the blood by diluting the blood making lowering the blood viscosity in turn reducing stress on the blood vessels and heart. There is a potential for harm in blood pressure as those with hypertension come at a risk of rising blood pressure leading to stroke, heart attack or kidney damage. However, those with hypotension may provide amazing therapeutic benefits. To the general population drinking water is crucial to avoid renal failure, decreasing the workload of heart and blood vessels, but may be harmful to those with

comorbidities.

Works Cited

Vázquez B. Y. (2012). Blood pressure and blood viscosity are not correlated in normal healthy subjects. *Vascular health and risk management*, 8, 1–6.

<https://doi.org/10.2147/VHRM.S27415>

Endo, Y., Torii, R., Yamazaki, F., Sagawa, S., Yamauchi, K., Tsutsui, Y., Morikawa, T., & Shiraki, K. (2014). Water drinking causes a biphasic change in blood composition in humans. *Pflügers Archiv European Journal of Physiology*, 442(3), 362-368.

Yildirim Çınar, A. Mete Şenyol, Kamber Duman, Blood viscosity and blood pressure: role of temperature and hyperglycemia, *American Journal of Hypertension*, Volume 14, Issue 5, May 2001, Pages 433–438, [https://doi.org/10.1016/S0895-7061\(00\)01260-7](https://doi.org/10.1016/S0895-7061(00)01260-7)

Roncal-Jimenez C, Lanaspá M, A, Jensen T, Sanchez-Lozada L, G, Johnson R, J: Mechanisms by Which Dehydration May Lead to Chronic Kidney Disease. *Ann Nutr Metab* 2015;66(suppl 3):10-13. doi: 10.1159/000381239

Ladwig, G. B., Ackley, B. J., Flynn, M. M. B., Martinez-Kratz, M. R., & Zanotti, M. (2022).

Mosby's Guide to Nursing Diagnosis: Revised reprint with 2021-2023 Nanda-I® updates.

Elsevier.

Holsworth RE Jr, Cho YI, Weidman J. Effect of hydration on whole blood viscosity in

firefighters. *Altern Ther Health Med*. 2013 Jul-Aug;19(4):44-9. PMID: 23981371.

American Nurses Association. (2015). Code of ethics with interpretive statements. Silver

Spring, MD: Author. Retrieved from

<http://www.nursingworld.org/MainMenuCategories/EthicsStandards/CodeofEthicsforNurses/Code-ofEthics-For-Nurses.html>