

Effect of Sodium Consumption on Tear Osmolarity Measurements

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Abstract

The purpose of our research was to preliminarily test whether ingesting a meal containing higher than normal dietary salt quantity, than what is recommended by the World Health Organization (WHO), would significantly alter tear osmolarity as measured by the TearLab instrument. TearLab is intended to assist in the diagnosis and management of dry eye. We hypothesize increasing systemic levels of sodium will also increase tear film sodium post-prandial, thus increasing tear osmolarity.

Introduction

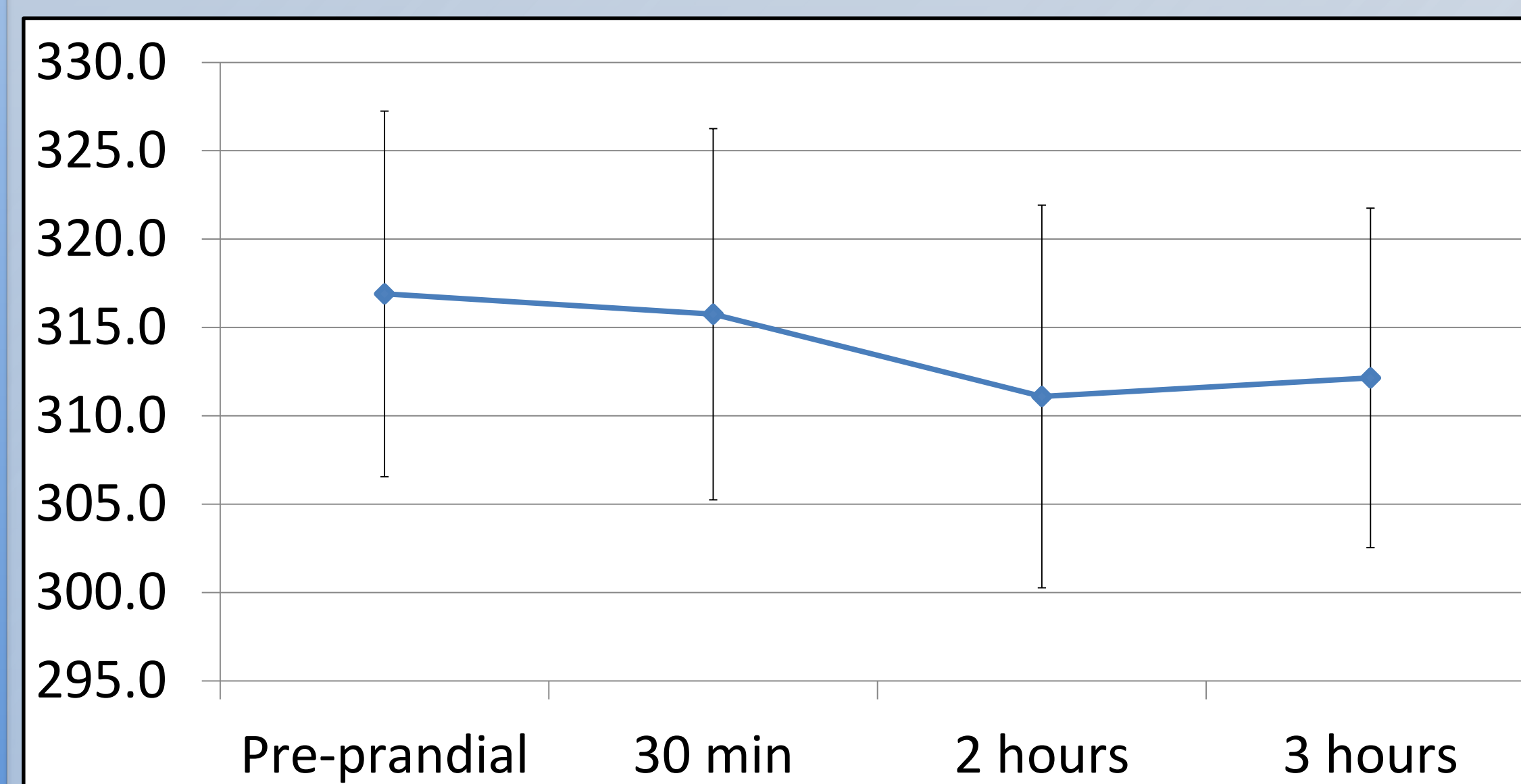
Dry Eye Disease (DED) affects around five to thirty-five percent of persons. Two out of three affected by dry eye disease are women, and the prevalence increases as age increases. Dry eye signs can be assessed many ways. The TearLab Osmolarity System is the first commercial instrumentation to empirically aid in the diagnosis and management of dry eye. Tear osmolarity is measured as the concentration of solution based on the amount of solutes present. TearLab uses electrical impedance to measure tear osmolarity. Very little is known about the effects of sodium (salt) intake on tear composition. The typical American diet is high in sodium due to processed foods. The recommended daily allowance of sodium according to the World Health Organization (WHO) is 2000mg per day for a healthy individual. We hypothesize that a high sodium meal will cause tear osmolarity to increase.

Methods

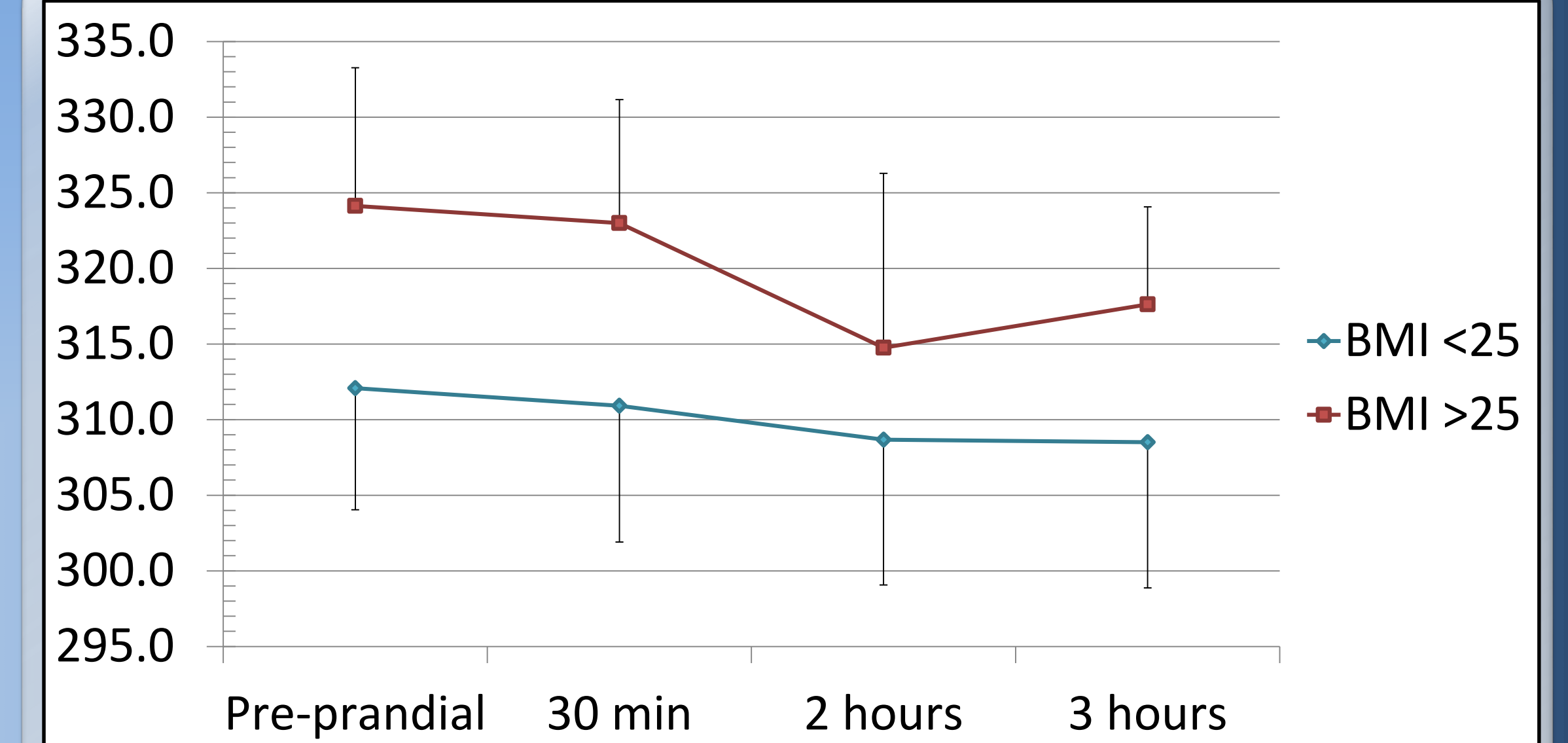
Twenty subjects were recruited which included nine males and eleven females between the ages of 22 and 32 years old. The TearLab Osmolarity System was used to measure the osmolarity of the tear film of each subject. The high salt meal provided was the same for each subject and contained a total of 1175 mg of sodium. Subjects were not allowed to consume any other food or drink not provided by the study. Initial tear osmolarity measurements were taken before the meal, and then measured 30 minutes after beginning the meal, two hours postprandial, and three hours postprandial.

Results

Average tear osmolarity decreased over time and reached minimum value at 2 hour postprandial instead of increasing as expected. Overall, there was no significant difference between preprandial and postprandial measurements. Subjects with higher BMI values (≥ 25) had higher than average tear osmolarities. The high BMI subgroup also had a significant change in tear osmolarity over time.



Highest measurement of the two eyes used in the combined mean value over time.



Highest measurement of the two eyes used in the tear osmolarity versus subgroups low BMI and high BMI.

Discussion

In summary, it is not a valid treatment to treat tear hyperosmolarity and DED with an increase in dietary sodium. The TearLab osmolarity reading does appear to be affected by eating a meal before a measurement is taken. Decreasing an individual's BMI may decrease tear osmolarity which may improve the health of the ocular surface. More investigation is needed before these alternative treatments become standard of care.

References

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