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**SURFACE TENSION; A PHYSICAL PROPERTY OF COMMERCIALLY AVAILABLE CONTACT LENS SOLUTIONS IN GHANA**

BY

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INTRODUCTION

Because of the benefits of contact lenses over spectacles, such as, improved optical quality for vision correction and a higher quality of life, the number of people who wear them has steadily increased over time. Contact lenses are primarily used to address refractive problems, as well as for cosmetic and therapeutic reasons. Other reasons to wear contact lenses include the prevention of ocular surface disorders and vocational reasons, such as for athletes. Any of these can be used in combination. The ability of contact lens to perform its functions is dependent on the contact lens solution. Contact lens solution moisturize the lens material giving the contact lens its adherent property. The solutions also help to remove sediments without scratching the surface of the lenses. Again, the use of contact lens care products following the labeling instructions of the manufacturers may provide increased assurance that viable populations of contaminating microorganisms will be reduced. Despite the advantages of contact lenses and their solutions, some individuals experience ocular discomfort. Many contact lens wearers have stopped wearing them temporarily or permanently due to the discomfort they experience while wearing them (Dumbleton K, 2013).

According to a report published by the Tear Film and Ocular Surface Contact Lens Discomfort Workshop, contact lens discomfort is defined as a condition characterized by episodic or persistent adverse ocular sensations related to lens wear, either with or without visual disturbance, resulting from decreased compatibility between the contact lens and the ocular environment, which can lead to decreased wearing time and discontinuation (Nichols, Redfern, & Jacob, 2013). According to the report, contact lens discomfort can be caused by a variety of factors, including the contact lens itself or the surrounding environment (Nichols, Redfern, & Jacob, 2013). This discomfort could be caused by a variety of factors including medications, food, hydration, alcohol consumption, smoking, physiological/fatigue, and the physical qualities of contact lens solution. (Dumbleton K, 2013). Contact lens–related causes include the material, design, and care of the contact lens. Environmental related causes include patient-specific factors, compliance, and ocular surface conditions (Nichols, Redfern, & Jacob, 2013).

Contact lens discomfort has typically been assessed in recent epidemiological studies by self-reported symptoms using a developed and validated questionnaire—the Contact Lens Dry Eye Questionnaire- (Ladage, Yamamoto, & Ren, 2001)—and these studies show that contact lens discomfort can cause temporary dropout in 10 to 50 % of wearers within the first 3 years (Begley, Chalmers, & Mitchell, 2001) and permanent dropout in about 25% of wearers (Begley, Chalmers, & Mitchell, 2001). (Richdale, Sinnott, & Skadahl, 2007). It has been found that 66.7% prevalence rate of contact lens discomfort was observed in an African population as compared with results of the study conducted within an academic population in Malaysia (62.6%) (Reddy, Ying, & Theng, 2016) and in the population-based study in Canada (68%) (Du Toit, Situ, & Simpson, 2001). In general, studies of contact lens discomfort have been remarkably consistent with rates averaging around 50%, except in two other studies conducted in Japan (37%) (Uchino, Dogru, & Uchino, 2008) and China (32.8%) (Zhang, Chen, & Wu, 2012), which reported relatively lower rates, and another study in North America, which reported a slightly higher prevalence of 79% (Chalmers & Begley, 2006).

Dumbleton (2013) stated that contact lens discomfort is a difficult problem that might impair contact lens wearer's short- and long-term success. According to the study, most lens wearers deal with the problem by removing their lenses, which is an inconvenient solution that could indicate that current treatments are unsuccessful. In a previous study within an academic population in Ghana, the proportion of spectacle wearers reporting a history of contact lens wear was 3.3% (Abokyi, Manuh, & Otchere, 2017). In most underdeveloped countries, the scenario is similar. The use of contact lenses as an alternative to spectacles is progressively expanding in Ghana, thanks to increased awareness of their benefits.

Surface tension is defined as the difference in surface energies between solvent molecules and polymer membrane surface (Ginn, Noyees, & Jungermann, 1968). A recent study reported that surface tension (ST) may have the potential to influence patient comfort, either initially upon lens insertion or at the end of the day, through interactions between the solution, the lens, and the patient’s tear film (Pandit, Nagyova, Bron, & Tiffany, 1999). Another study reported that Lens-tear interactions are affected by various aspects of composition and properties of the lens material, such as ionicity, water content, moduli, and surface properties, in addition to the tear film, characteristics of the individual patient (Mann & Tighe, 2013). The ST of human tears falls within the range of 40 to 46 mN/m (Tiffany, 1998)**,** (Pandit, Nagyova, Bron, & Tiffany, 1999)**.**

It has been reported that clean and dry human skin has a surface tension of 27-28 dyne.cm-1 (Ginn, Noyees, & Jungermann, 1968). The surface energy of any substrate must be equal to or less than that of human skin in order for it to stick to the skin's surface. This means that the surface energy of a contact lens solution must be less or identical to the that of the human tears in order for it to stick to the lens' surface. Though contact lens solutions are made up of a variety of different components namely; pH, tonicity, viscosity, surface tension, preservatives, surfactants, and chelating agents. The surface tension as one of the physical properties is involved in aspects such as respreading the film following a blink, determining the thickness of the precorneal film, the curvature and contained volumes of the upper and lower menisci, the interaction of the aqueous layer and the meibomian lipid layers, and the overall stability of the film (Jyotin, Nagyova, Bron, & Tiffany, 1999). The mix of these substances affects the final solution's physical qualities, which could affect a patient's comfort (or discomfort) when utilizing that solution (Dalton, Lakshman, Ronan, & Lyndon, 2008).

Clinicians and researchers in the clinical field should continue to manage contact lens–related discomfort in the short term by carefully selecting lens materials, lens care, and rewetting systems, as well as assessing patient-related risk factors, managing environmental triggers, and other factors that may contribute to dryness symptoms (Dumbleton K, 2013).

In the study, the physical property of contact lens solution; surface tension, will be measured among commercially available contact lens solutions in Ghana. The study aims to determine variability in physical properties of the available contact lens solutions and its possibility that the physical properties of these solutions may influence both patient comfort and patient preference for one care system over the other.

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