

Skin Friction Coefficient As A Parameter For Temperament Assessment: A Review

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Abstract: The highest level of organization is the organism, the living human being. The organism level represents the sum total of all structural levels working together to promote life. According to Unani system of medicine structural levels composing human body are elements, temperaments, humors, organs, vital forces, faculties and functions. They work cooperatively to promote well being of entire body. Virtually every of seven plays a role to understand human being but temperament provides a concept that helps us to make diagnosis and treatment. It has been explained by all Unani physicians and it is most important fundamental concept of Unani system of medicine. It defines disease as any alteration in normal temperament of the individual while maintenance of equilibrium of temperament is state of health. Thus temperament is very important concept of Unani medicine on which whole medicine relies; maintenance of which is health and deviation from normal is disease. According to this system of medicine humans can be categorized into four groups according to their temperament in their healthy state. These temperament groups are sanguine (hot and moist), choleric (hot and dry), phlegmatic (cold and moist) and melancholic (cold and dry). Almost all renowned Unani physicians have discussed the effective parameters to assess the temperament of individual though the number of these parameters may vary but touch is very important parameter discussed by almost all physicians and taken as first parameter by Ibne Sina. It includes skin roughness and smoothness along with other characteristics, but till now it is only assessed by palpation of skin which is a qualitative method hence depends on skills of investigator. So there is need to develop accurate method to assess the temperament. Now a days friction coefficient of skin is most widely accepted which can assess roughness and smoothness of skin quantitatively. So it can be a good parameter to assess the temperament.

Key words: friction coefficient, human skin, touch, roughness and smoothness, temperament, Unani system of medicine.

1 INTRODUCTION

Unani system of medicine dates back to 500 BC, it was a ferment of continuous change & evolution. Yet the successive epochs of Unani medicine has one thing in common with the medicine of modern era. Disease was no longer regarded as a super natural phenomenon; it was approached from rational naturalistic scientific point of view. But it has quite distinct approach for cure its principles are comprehensive & abreast to the most advanced and up-to-date theories. It considers man as a whole unit with its ultimate goal, survival of itself and its species.

It gives us as a coherent account of physical and intellectual aspects of man as whole to indicate his various relationships both within as well as his environment. It also emphasizes the maintenance of health. It defines disease as any alteration in normal temperament of the individual while maintenance of equilibrium of temperament is state of health. Thus temperament is very important concept of Unani medicine on which whole medicine relies; maintenance of which is health and deviation from normal is disease. So it is very necessary to have very accurate and lucid knowledge of temperament to understand the spirit of Unani medicine and overcome the difficulties of medical jargon^[1]. For the assessment of temperament touch is very important parameter^{[2],[3],[4],[5],[6],[7]}. It ranks first among the signs of temperament assessment discussed by Ibne Sina. It is described in classical Unani literatures that characteristic of human skin depends on their temperament^[8]. Roughness and smoothness of skin is a tool to determine individual's temperament, which is till now the only method to judge the skin surface is by palpation or through human touch which can vary due to different perception of individual investigator as depends solely on skill of oriental doctors. Now a days friction coefficient of skin is most widely accepted. Friction studies are useful in quantitatively investigating the skin surface. So the knowledge of skin friction coefficient can be incorporated in assessment of temperament.

2 BRIEF DESCRIPTION OF TEMPERAMENT AND TOUCH

Unani medicine describes that human body is composed of 7 natural and basic components that are elements, temperament, humors, organs, vital forces, faculties and functions. In the absence of any of these factors existence of human being can't even be imagine. But among these seven working principles mizaj indeed occupies a very important place in Greco-Arab medicine and forms the basis of pathology diagnosis and treatment in this medical system^[9]. The human body, as Greco-Arab system of Medicine quote, comprises four body fluids namely—blood, phlegm, yellow bile and black bile, constituted by initiation of different proportion of all four

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elements^[10]. The temperament of a man is characterized both by the fluid element and its physiological effects, and it is expressed by the preponderance of a particular humor present in his body. Thus a man may be sanguineous phlegmatic, choleric or melancholic in nature according to the preponderance of blood, phlegm, yellow bile and black bile respectively. This concept was originally introduced by Hippocrates (460-370 BC). Almost all renowned Unani physicians have discussed the effective parameters to assess the temperament of individual though the number of these parameter may vary for example Ibn-e- Rushed(1126-1198AD)^[11] has put the criterion of only three parameters while for Arzani (1722 AD) it was four^[12]. Jalinoos(129-200AD)^[13], Zakaria Razi(850-923AD)^[14], Ali Ibne Abbas Majoosi(930-994AD)^[15] and Ismail Jurjani^[16] (12th century AD) were of the opinion that these parameter were five but most vividly acceptable one is given by Ibne Sina which includes ten parameter. Malmas is very important parameter discussed by almost all physicians and taken as first parameter by Ibne Sina^{[17],[18]}. Human could be divided by properties of their skin such as;

- Hotness and coldness
- Dryness and moistness
- Roughness and smoothness
- Hardness and softness,
- Lightness and heaviness^[19]

3 FRICTION COEFFICIENT

The coefficient of friction, often symbolized by the Greek letter μ , is a dimensionless scalar value which describes the ratio of the force of friction between two bodies and the force pressing them together. The coefficient of friction depends on the materials used; for example, ice on steel has a low coefficient of friction, while rubber on pavement has a high coefficient of friction. Coefficients of friction range from near zero to greater than one. The classic rules of sliding friction were discovered by Leonardo Da Vinci, but remained unpublished in his notebooks.^{[20],[21]} Arthur Morin introduced the term and demonstrated the utility of the coefficient of friction^[22]. The coefficient of friction is an empirical measurement. It has to be measured experimentally, and cannot be found through calculations. Rougher surfaces tend to have higher effective values. Both static and kinetic coefficients of friction depend on the pair of surfaces in contact; for a given pair of surfaces, the coefficient of static friction is usually larger than that of kinetic friction; in some sets the two coefficients are equal. The friction coefficient of human skin is a system property determined by surface properties of the skin itself, the contacting material, as well as possible intermediate layers such as temporarily trapped or topically applied substances (e.g. cosmetic products), or sweat and sebum naturally excreted from skin. It is generally acknowledged that skin friction depends on the type and physical properties of contacting materials, as well as on the physiological skin conditions and mechanical contact parameters^[23]. The frictional behavior of skin is usually expressed in the coefficient of friction, which is defined as "the ratio obtained by dividing the tangential force resisting motion between two bodies by the normal force pressing these bodies together". This can be described by the following equation:

$$\mu = F_{\text{friction}} / F_{\text{normal}}$$

In this equation, μ is the dimensionless coefficient of friction; F_{friction} and F_{normal} refer to the friction force and the normal force respectively. In sliding contacts, two coefficients of friction are distinguished: the static coefficient of friction and the dynamic coefficient of friction. In tribology the definitions of these coefficients of friction are based on two values of the friction force referred to as static friction and kinetic friction:

Static friction: the resistance to the force tangential to the interface which is just sufficient to initiate relative motion between two bodies under load. For surfaces at rest relative to each other $\mu = \mu_s$, where μ_s is the coefficient of static friction.

Kinetic friction: the friction between two surfaces in relative motion. For surfaces in relative motion $\mu = \mu_k$, where μ_k is the coefficient of kinetic friction. It is usually less than the coefficient of static friction for the same materials.^{[24],[25]} Skin friction depends on the properties of the skin, the contact material and its properties, the parameters of the contact between the materials and the environment surrounding the materials. Skin friction is believed to vary for various parts of the body^{[26],[27],[28],[29]}.

4 INTERRELATIONS BETWEEN SKIN FRICTION COEFFICIENT AND TEMPERAMENT

The skin is considered as most equable organ of body^[30]. According to temperament, the skin of the body varies from person to person. If the temperament of the body is dry then skin becomes dry and rough. The best quality skin is formed by hot and moist body temperament. The toughest and hardest skin is formed by hot and dry temperament. The cold and moist temperament personality's skin is better than the skin of person of cold and dry temperament but often such type of skin contains less flow of blood.^[31] The soft and smooth skin denotes the moistness of temperament and roughness of skin indicates dry temperament.^[16] Describing signs of normal temperament Avicenna quoted that feel of the body impart sensations mean between hotness, coldness, dryness, moisture, softness, hardness. It means the skin feels moist and warm, and has a beautiful smooth elastic surface.^[32] Friction studies are useful in quantitatively investigating the skin surface as it has big discrimination ability of classification of human temperament. Friction coefficient is known to have great discrimination ability in the classification, which are used in alternative oriental medicines^[33]. Comparative studies are particularly useful as it provides quantitative measurement to assess the skin. Friction studied can be conducted with non invasive method and it gives measure of skin health^[34]. Another category of studies investigated the role of skin friction, especially of the finger pad, in connection with the sense of touch^[25]. Investigation of skin frictional properties is relevant to several research areas, such as skin physiology, skin care products, textile industry, human friction-dependent activities and skin friction-induced injuries. Frictional properties of the skin surface may become an objective assessment of skin pathologies. It has been shown that frictional properties can reflect the chemical and physical properties of the skin surface and thus depend on the physiological variations as well as pathological conditions of skin^[35]. Recently friction has been used as decisive index for progress of bacterial ailment in skin

physiology and importance of skin friction emphasized in the skin care market due to increase awareness of wellbeing issue. In addition friction studies offer insight how skin and skin surface changes across age gender race anatomical site and chemical applications. This can provide better information about expected skin variation in population and why certain topical applications are effective. There have been approaches to investigation, e.g. in relation with the formation of friction blisters^[44], the friction links between fingertip and contacted surfaces^{[36],[37]} and the ageing and wrinkling of human skin^[38]. Due to reduced skin thickness and viscoelastic recovery, aged skin becomes more vulnerable and susceptible to injuries.^[39], for which friction and shear forces are believed to be important risk factors^{[40],[41]}.

5 CONCLUSION

Knowledge of skin friction coefficient can be used to determine the temperament with the help of touch as it is the method to assess the skin roughness and smoothness quantitatively. So there will be chances of less error in temperament assessment. Besides assessing the temperament knowledge of skin friction can be used to manufacture medicine of topical applications, to check prognosis of skin disease. The knowledge of skin friction can also be incorporated in prosthetics, to improve and optimize surface and material which comes in contact with skin to control the undesirable effects of skin friction. However, skin friction raises a lot of questions, is full with uncertainties, and a lot remains to be discovered.

6 REFERENCES

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