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Commentary

Early screening of the risks of lifestyle related illnesses: needed now more than ever.

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1. INTRODUCTION

The world is changing, illnesses is changing too. Life style related illnesses (Obesity and overweight, DM, BP, Cardiovascular, etc) are number among the main causes of morbidity and mortality world-wide and in UAE [1, 2]. Low Physical activity, Bad Nutritional habits, Environmental Toxins among other problems are the main contributors to the wide spread of these None-communicable Lifestyle related illnesses.

However, nutrition and nutritional habits remain the key player in this area. Bad nutrition or nutritional habits deprive the body from essential elements necessary for healthy body functioning.

2. NUTRITIONAL ELEMENTS ROLES IN PROPER BODY FUNCTIONING,

Minerals and macro- and micronutrients play important roles in proper body functioning, such as carbohydrate and lipid metabolism [3, 4]. Deficiencies or imbalances in these trace elements can cause disorders related to metabolic and physiological imbalances such as impaired insulin release and changes in cholesterol and triglycerides levels [3, 4]. For example, selenium, vanadium, and chromium have been found to play crucial roles in controlling blood glucose concentrations, possibly through their insulin-mimetic effects[5]. A recent study suggested that mechanisms leading to insulin resistance and diabetes and associated complications include high intake of refined and energy-rich food, which is presumed to be accompanied by suboptimal intake of trace elements that are crucial for various biological processes such as zinc, selenium, chromium, and copper [6]. Selenium has been linked to improved insulin metabolism and reduced markers of cardio-metabolic risk [7]. Along with other elements such zinc, chromium, and copper, selenium was also found to be involved in the pathogenesis of diabetes [6, 8]. Another study reported supplementation with vitamin D improved type 2 diabetes by decreasing glycated hemoglobin and increasing sirtuin 1 and irisin [9]. Low serum vitamin D levels have also been associated with insulin resistance in children [10].

It is also known that in the brain, vitamin D activates the gene that codes for TPH2, leading to an increase in serotonin levels, which is expressed by an improvement in behaviours such as mood, memory, well-being, anxiety, impulses. In pregnant women, a deficiency in vitamin D can slow down embryonic brain development (i.e autism) [11].

Another study provides evidence that vitamin D activates the hepatic detoxification system by increasing the presence of CYP3A4, an enzyme of the cytochromic P450 system, which is essential in the degradation of many drugs and toxic products [12] An increased synthesis of vitamin D in summer could therefore accelerate the detoxification of these drugs, whereas in winter when the synthesis of vitamin D under the influence of the sun is low, the degradation of these drugs could be slowed down, thus increasing the risk of undesirable effects, for which supplementation is necessary.

But as vitamin D is a special case among nutrients and drugs, it should attract our attention in particular, because of

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its relationship with pathogens that compete with the vitamin D receptor (VDR) in order to neutralize the immune system and increase their chances of survival (Borrelia (Lyme), Epstein Barr (mononucleosis), Aspergillus (fungus), salmonella, etc. Bacteria thus infiltrate our organism (endotoxemia) and cause a deep chronic low-grade inflammation. This bacterial-induced RVD dysfunction could be the basis for diseases such as in auto-immune disease [13], cardiovascular diseases, diabetes etc.

This is way, vitamin D supplements are not the best choice in ex: the treatment of back pain, except in combination with an anti-pathogen strategy (ex. with a lactoferrin, which is a natural antibiotic [14].

3. CURRENT SCREENING AND DIAGNOSTIC TOOLS

Currently, traditional laboratory blood analysis is the gold standard for measuring minerals and trace elements in the body for diagnostic purposes. Although trusted and widely used, this approach has numerous flaws, including a high cost, which means some at-risk populations may not be able to afford it. These approaches also require the use of chemicals, equipment, and professional experience. Outside of well-established laboratory settings, these resources may not be easily available. These approaches are also time consuming, with some tests needing hours of preparation and testing, which could affect test acceptance and lead to a delay in diagnosis. Finally, because these tests are tertiary diagnostic in nature, they may be considered late markers that confirm illnesses and hence have little preventative value. In addition, blood testing requires invasive, painful withdrawal of blood samples from patients.

Hair analysis is another popular trace element testing method. This approach has been utilized to in the diagnosis of a variety of health conditions [3, 15-18]. Hair analysis, for example, has been used to determine insulin resistance by testing for mineral deficiencies [3]. Essential element content evaluation in hair has also been utilized in children with chronic rhinosinusitis (CRS), with results showing that element concentrations in hair (i.e., calcium, copper, magnesium, and zinc) were considerably lower in a test group compared to control values in that study. Hair mineral content in children with CRS was found to be a negative predictor of the condition in that study [16]. For some disorders, such as inflammatory bowel disease, measuring trace elements in hair has also been regarded a good indication of nutritional status (IBD). Because of long-term inflammation in the gut mucosa and decreased oral intake and absorption, blood levels in patients with IBD are limited in reflecting body nutritional status. As a result, hair mineral and trace element analysis provided a better way to understand micronutrient status in children with IBD [17].

4. EMERGING AI BASED TECHNOLOGY

Recently, a rapid, non-invasive, and non-destructive quantitative analysis of human tissues was performed using an advanced portable contact near-infrared spectroscopy analysis technique based on well-known scientific spectrophotometry principles combined with artificial intelligence (AI) technology [19, 20]. A reflectance spectra in visible short-wave infrared regions can be acquired and evaluated with this device from the body part exposed to infrared light. The collected lightsignals are composed as a spectral signature (i.e., “fingerprint”). These spectrum fingerprints represent precise, repeatable measurements of the tissue’s overall biological and chemical characteristics [19, 20].

Spectral signatures can be further processed using an AI system that has a massive collection of spectral signatures for healthy and unhealthy. This can estimate tissue concentrations of trace elements, vitamins, and heavy metals in the human body with a reasonable accuracy accepted for screening purposes [19, 20].

The fact that it is simple, quick, and non-invasive is a big advantage of this technique. It can also be employed in large-scale screening efforts to discover changes in chemical compositions of body tissues and their possible effects on bodily function early on before diseases actually happen. This technology has only had a limited clinical use and has shown a promising results in the early screening of the risk to serious illnesses such osteoporosis, insulin resistance, diabetes, and thyroid dysfunction [21-23].

This paper argues for the need to conduct further clinical and validation studies for this technology to assess its effectiveness in the early detection of risk for insulin resistance, diabetes, and lipid metabolism problems in a sample of healthy and non-healthy individuals.

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