Anthrop. Közl. *45:* 19–25. (2004)

HEALTH AS AN EXPRESSION OF HUMAN MORPHOLOGY AND LIVING CONDITIONS

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Abstract: *This article reviews current knowledge of the possible effects of human morphology on morbidity and mortality from cardiovascular and metabolic diseases. It highlights the well-established increased risk associated with obesity and, more specifically, with abdominal obesity, related to hyperinsulinemia and insulin resistance, which raises cholesterol levels. The value of the anthropometric indices for the detection of abnormal conditions is supported by examination of the results of extensive prospective studies. Special emphasis will be placed on environmental effects that could modify morphology and shape as well, and so impair the health of individuals and populations. The concept of sedentary lifestyle is presented as linked to the clinical manifestation of coronary heart disease. The chosen topics will highlight the interrelations among different areas such as auxology, nutrition, endocrinology and genetics.*

Keywords: *Epidemiology; Physical activity; Risk profiles.*

Introduction

Human morphology, quality of life, and health constitute a subject that requires a multidisciplinary approach that brings out the relationship of body physique to auxology, endocrinology, nutrition and genetics. Of no less importance is the consideration of environmental aspects, such as quality of life and physical activity, which affect the health of individuals and populations.

Human beings have been interested in their own shape and bodily conformation dates since the remote past, and in antiquity philosophers, artists, theoreticians and architects chandelled this interest in the design of the human body through the governing concept of aesthetics. Already in the first century A.D. the notion emerged of proportion and its metrological implications, that is, those relating to absolute measurement and function (Panero and Martín 1987).

The discoveries of the Renaissance modified the theories of antiquity, and anatomists advanced a little beyond the classical theory of the four humorous with their discovery of the complexities of the respiratory and excretory systems. The well-known Vitruvian man and Michelangelo's David, for example, combine the concepts of anatomy with bodily proportions.

A more recent development was the emergence of the biotypological schools, whose authors began to relate the bodily shape or conformation to the psyche and the physiological functions. One of them, the German school of Kretschmer, rests on empirical observation, from which it establishes by induction the different somatic and psychic types and their association with the prevalence of specific diseases. The picnic type was associated with a higher frequency of manic-depressive psychosis, diabetes, diseases of the gall bladder, arterial hypertension, and arteriosclerosis. The athletic type,

with his muscular physique, was, according to the scientists of the time, more susceptible to epilepsy, and the leptosome to tuberculosis, gastric ulcers and schizophrenia (Comas 1966).

These observations laid the foundations for the subsequent understanding of the relationship between, on the one hand, structure and function, i.e., the correspondence between the biotype and physical aptitude and, on the other hand, between the physique and health. These concepts, which we work with today, are the product of the integration of research in different areas of knowledge.

Anthropometric Indicators

Today we human biologists have at our disposal readily accessible tools for the evaluation of morphological characteristics. The values they yield are interpreted as indicators of risk profiles, which are used in systems for surveillance of the health-disease process. These are the anthropometric indicators, which are used in the diagnosis of body shape and conformation and in epidemiological research.

The index most frequently used in current epidemiological research is the body mass index (BMI), to evaluate overweight and obesity, and which became more popular following publication of the reference percentiles by Must et al. (1991). Other highly useful indicators, such as measures of the different components of the physique and body fat topography, to mention but a few, supply data that are interpreted as risk factors, and so are of interest in diagnosis of the state of health. It is useful to mention here that the evaluation of obesity in the child and the adolescent is hampered by the growth process itself, which brings about changes in, among other factors, body fat distribution and weight/height ratios (McArdle et al. 1999).

When working with specific populations, however, as with athletes engaging in different sports, we must use great caution in interpreting the BMI because, as we all know, one of the variables in the equation is weight, which may reflect different types of tissues, for the body mass index does not distinguish among components of the body. Others apart from adipose tissue – bone structure, muscle mass, and even the increase in the plasmatic volume generated by training – affect the numerator in the equation. We kinanthropometrists have highlighted this point on different occasions.

The connection between human morphology and health is shown particularly by a consideration of the risks of overweight and obesity, which today have become an emerging public health problem. This risk factor is associated with the non-communicable chronic and degenerative diseases, and is magnified when combined with sedentary habits and changes in food patterns.

We must not forget, however, that obesity is associated with certain genes, though, on the other hand, we must also note that some disorders of endocrine origin, such as the Prader-Willi syndrome, account for but a very small proportion of infant obesity. (Morenos 2003).

In one of the many models and hypotheses that seek a genetic explanation for obesity, the OB gene, usually active in adipose tissue, promotes the production of the satiety hormone leptin, which hormone then enters the bloodstream in amounts proportional to the quantity of adipose tissue on the body. Afterwards it travels to the hypothalamic nucleus, the part of the brain that controls appetite. This appetite-suppressing hormone normally checks the desire to eat and adjusts energy expenditure when the calorie intake

maintains ideal fat reserves. Dysfunction of the so-called satiation gene can strongly affect leptin production. (McArdle et al. 1999)

It is worth noting that events that are almost exclusively biological in nature, such as maturation, point to an association between obesity and early sexual maturity in adolescents (Kaplowitz et al. 2001). Noted researchers point out that in their adolescence and young adulthood, late-maturing children present a distribution of subcutaneous adiposity that is associated with low risks from degenerative diseases in adulthood (Beunen et al. 1994). Conversely, the values found in a recent study by the Human Nutrition Department and the Epidemiology and Statistics Division of the University of Chicago (Wang 2002) point to a tendency to obesity and overweight in girls of average and early maturation between the ages of 8 and 14 years.

Obesity is a problem in itself for all segments of the population – children and adults, men and women. It is quite common in the aggregate process of demographic and epidemiological transition, in which obesity and undernutrition coexist, as is currently the case in many countries, especially those in Latin America (Monteiro et al. 1995). Venezuela is no exception, as the data of the Food and Nutrition Surveillance System show: this situation is more or less prevalent in all the federal subdivisions except the states of Barinas and Portuguesa, and the percentage of this prevalence is particularly high in the Capital/Federal District (National Institute of Nutrition 2002).

The effects of obesity on health are manifested in psychosocial, endocrine and motor disorders, to mention just a few. Among children in some societies, overweight and obesity have taken the place of undernutrition and infections as the leading causes of the degradation of health and the quality of life. (Tojo Sierra and Leis Trabazo 2002). Early detection of this disorder is so important because of its consequences later on, for it becomes a risk factor in adulthood, as became clear in the last two decades of the 20th century. The risks are manifested in rising indexes of morbidity from hypertension, coronary disease, apoplexy, gall bladder diseases, apnoeas, orthopaedic problems, and mammary, ovarian, prostate and colon cancer (Rodríguez et al. 2002).

In other age groups the incidence of oesophageal and gastric adenocarcinomas has also risen in the last two decades. Several published papers have examined these diseases in relation to increased frequency of obesity, and have found a strong association between them. The researchers concluded that lifetime obesity is strongly associated with adenocarcinoma of the upper gastrointestinal tract, and also with increased risk of colon cancer (Nutrition Reviews 2001).

Body Fat Distribution

The two most common patterns of body fat distribution – android (truncal-abdominal obesity) and gynoid (gluteofemoral obesity) – differ in the risks they pose for the emergence of non-communicable chronic diseases. Thus, the literature reports substantial differences among the lipoprotein profiles of subjects with pronounced abdominal adiposity. Clearly, the risk of cardiovascular disease is greatest for individuals with high levels of both subcutaneous adiposity and visceral fat, that is, fat deposited along the intestinal tract in the abdominal cavity (Després et al. 1990)

A recent study by Cuban scientists on obese patients found insulin resistance to be predominant in android obesity. Moreover, it found that the correlation between hyperinsulinism and insulin resistance was independent of the degree of the obesity;

instead, the distribution of the fat, measured in this case by the waist-thigh ratio, was found to be more important (Barceló-Acosta et al. 2002).

In Japan, for example, It has been shown that the association of excess visceral adiposity with health risk factors is greater than the gross Body Mass Index values may suggest. The researchers showed the importance of anthropometric measurements in noting that obtaining the circumference of the waist, is a step toward the identification of visceral adiposity that in their view, must be included in clinical and epidemiological studies of obesity (Japan Society for the Study of Obesity 2002).

At the same time, however, moderate uniform body overweight has been cited as a factor for protection against osteoporosis, as bone mineral density increases with weight. This disease, fairly common today among women in particular, cannot be viewed in a solely biological context: the causes may be laid to a complex variety of factors. This is shown by a study done at the National University of Colombia, in which the patients underwent changes in bone density in keeping with the reported BMI values; meanwhile, it was interesting that significant differences were found in the BMIs for women in different economic strata (Sánchez et al. 1997).

Shifting from overweight and obesity to underweight, we find at this other extreme anorexia nervosa, a not infrequent phenomenon in the young, including the athletic population. This disorder is not just a problem, but also an attempt to solve a problem, with effects that not only are visible in the physique but also affect different systems and tissues.

Influence of the Environment

Another aspect that merits consideration in the present article is the effect of socioeconomic and environmental factors on the epidemiology of the chronic diseases, which as a general rule, trace their aetiology to a multitude of factors.

The advantages of an urban environment have been seen in many populations, and have generally been manifested in greater height and weight. However, these differences, for the variables taken as examples, are not seen in children reared in urban areas that are depressed. This suggests the presence of a factor that can only operate in favourable surroundings. Many examples could be cited because, moreover, in the great urban conglomerates and poor communities in different parts of the world, we find a tainted environment whose contaminants, even when ingested in only small proportions, affect different physiological systems such as the nervous, the immune, the endocrine, and even the reproductive system (WHO 2002b).

In some countries obesity has been found to be closely tied to socioeconomic level, and the disorder has been most frequently seen in the most depressed groups. In Venezuela, for example, several studies, as in the study of Living Conditions in the State of Vargas have found greater weight and generalizad adiposity in women of the lower strata (FUNDACREDESA 2002). This situation is repeated in other Latin American countries such as Brazil and Chile, and in the United States, to cite only some, where the largest proportion of obese people is found in the strata at the lowest socioeconomic levels (Albala and Vio 2000).

Thus all these studies point to the existence of highly complex and diverse socioanthropological determinants of physical condition, whose triggering factors include access to food of acceptable quality and quantity, physical activity, perception of one's

own body, the adoption of cultural patterns of the industrializad countries and, in some cases, even self-deprivation of a certain food for the benefit of other members of the family (Aguirre 2000).

In Mexico the Yucatan region had been geographically isolated until a railroad was built between 1950 and 1970, an event that promoted a shift from the traditional diet of the population to an urban one. The result was an increased frequency of overweight and obesity and the adoption of a more sedentary life style. Before rail service began the rural economy was based on exports of hemp, the price for which dropped suddenly with the introduction of synthetic fibers. Today a high percentage of the men in that community work in industry, trade and services, a change that may have contributed to a shift in the causes of their mortality from infectious and parasitic diseases and those deriving from undernutrition, to heart and cerebrovascular diseases and diabetes (Arroyo 1999) .

Physical activity, morbidity and mortality

Today it is fully accepted in public health that human behaviour, in the present case the degree of physical activity, influences health and the risk of premature death. This fact is highlighted in a host of scientific papers, meetings of world organizations, and projects of long duration, in all of which physical exertion is seen as a protective factor.

The latest data point to the sedentary habit, associated with cardiovascular problems, as very serious in most countries, where it also leads to numerous diseases – hypertension, hyperlipidemias, type 2 diabetes, and colon cancer, among others – in which obesity is also present, and accounts for about 200,000 deaths per year in the United States alone (Haskell 1995).

The epidemiology of physical activity has emerged as a new field of study and intervention only in the last twenty years. There is nothing new about its ideas, however, its origins may trace back to 2500 B.C., when exercise was practiced for preventive purposes.

To make clear the part played by physical activity in health all the factors involved must be considered in a context of models devised by epidemiologists; only then can we understand the interactive and/or dependent causes of disease, lesions and death. Genetic makeup accounts at least in part for the fact that one individual exhibits a stronger predisposition than another to hypertension, atherosclerosis, diabetes, osteoporosis, cancer, or heart attacks. These factors can also play an important part in determining the individual's level of activity and physical capacity (muscular strength and aerobic capacity, among others). In a way they account for individual differences in physiological response: body fat, cholesterol, blood pressure, and aerobic capacity. In general, however, all environmental factors – climate, population density, natural resources, economics, educational level and cultural values – can affect, either jointly or separately, the predisposition to risk factors (Dishman et al. 2004).

The accelerated, unplanned urbanization in progress has been accompanied by an increase in the so-called life-style diseases that derive from the sedentary habit. A characteristic feature of urban life is a reduction of physical activity, in which excessive dedication to electronic games and long sittings in front of the TV set contribute significantly to reduced energy expenditure. World Health Organization is of the view that physical activity may be regarded as a factor for the prevention of non-communicable diseases (WHO 2002a).

A study of 8,973 men between the ages of 45 and 65 in Puerto Rico, who were monitored for almost nine years for risk of cardiovascular disease relative to the index of physical activity, found an inverse relationship between the incidence of coronary events and the practice of exercise (García-Palmieri et al. 1982).

Similarly, a longitudinal study done in Dallas brought out the benefits of physical fitness or training. The association of training with lower risk of coronary disease and other causes of death was found to be independent of overweight defined as BMI>27. The relative risk of cardiovascular disease and death in overweight men and women did not differ from that of persons of normal weight after adjustment for other risk factors (age, smoking, family history, cholesterol). This relative risk was the same for women with a BMI above 25 kg m^2 as for those with a BMI ranging between 22 and 25 but – and this is most important – the former were physically very fit (Dishman et al. 2004).

Human populations adapt to changes in the environment. It must be noted, however, that "adaptation" is a term with different implications that are all equally applied as synonyms for homeostasis or accommodation. For Waterlow (1990) the term "adapted" includes the sense of continued life, but a marasmic child, for example, may not be described as "adapted". Waterlow also maintains that each adaptation involves a cost and a choice, but for such a child staying small to survive is not a successful adaptation. Also, in some groups there is an imbalance between energy consumption and the requirements for a given life style. If this balance is negative, the level of physical activity is lowered to attain a better biological adaptation, which entrains adverse social and economic consequences because inactivity is chosen in order to survive.

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