

Global epidemic of obesity and present nutrition

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Ekonomia, gizarte eta kultura izaerako aldaketek, beste faktore batzuekin batera, gantza, proteina eta energia gehiago hartzea ekarri zuten herrialde gehienetan, eta hori energiaren gastua gutxitzearekin konbinatu zen, lan eta aisiaren ezaugarriak aldatu zirela eta. Dieta eta bizitza eren aldaketak ez dira era homogeneoan gertatu herrialde garatueta eta garatzeko bidean daudenetan, baizik eta gehiegizko pisuaren eta obesitatearen gehikuntza orokorraren paraleloan.

Giltza-Hitzak: Janaria. Energia. Proteina. Gantza. Laboreak. Kontsumoa. Gehiegizko pisua. Obesitatea.

Los cambios de naturaleza económica, social y cultural, así como otros factores, incrementaron la ingesta de grasas, proteínas y energía en la mayoría de los países, y esto se combinó con una reducción en el gasto de energía debido a cambios en las características del trabajo y del ocio. Los cambios de dietas y de estilo de vida no se han producido homogéneamente en los países desarrollados y en vías de desarrollo, sino de forma paralela al incremento general del sobrepeso y de la obesidad.

Palabras Clave: Comida. Energía. Proteína. Grasa. Cereales. Consumo. Sobrepeso. Obesidad.

Les changements de nature économique, sociale et culturelle, ainsi que d'autres facteurs, augmentèrent l'ingestion de graisse, de protéine et d'énergie dans la majorité des pays, et cela s'est combiné avec une réduction de la dépense d'énergie due aux changements dans les caractéristiques du travail et des loisirs. Les changements de diètes et de style de vie ne se sont pas produits de façon homogène dans les pays développés et en voie de développement, mais de façon parallèle à l'augmentation générale du surpoids et de l'obésité.

Mots-Clés : Nourriture. Énergie. Protéine. Graisse. Céréales. Consommation. Surpoids. Obésité.

Recent changes of economic, social, cultural and further following conditions of the environment resulted, inter alia, in a deteriorated balance between energy input and output. This has been due to the modifications of nutrition, and also to the changes of physical activity and professional work load changes, in both positive and negative way. Social conditions have the most significant effect; this applies especially to under- and malnutrition, and increased professional work load.

1. GLOBAL CHANGES IN NUTRITION

Present diet does not mostly correspond to energy output both during professional and leisure time activities, not only in the industrially developed, and also in higher social strata in the developing countries. As a result, overweight and obesity – still along with malnutrition, have been increasing steadily, and represent a serious health problem which results also in increased economic expenses. Along time, the consumption of energy has been increasing globally, but differently in various regions. On the average, intake of energy between the years 1964-6 up to 1997-9 has increased by cca 40 percent in the world generally, and by cca 30 percent in the developing countries. The industrialized countries increased their energy intake by cca 14 percent. The increase in energy consumption during the same period was relatively highest in East Asia (by cca 49 percent) and in the Near East and North African countries (by cca 31 percent). In South Asia, Latin America and the Caribbean this increase was cca 18-19 percent. The lowest increase in energy intake was found in Sub-Saharan Africa, i.e. by cca 6 percent. The following prospects for the years 2015 up to 2030 is further increase generally, in all mentioned regions of the world.

With regard to the composition of nutrition, the consumption of proteins and fats (especially saturated ones) have been increasing similarly, and to highest levels in the industrially developed countries; Expanding economy e.g. in Japan between 1960 and 1990 increased meat consumption by 360 percent. However, this increase has been relatively most markedly evident in the countries which have changed their economic etc. situation during more recent period. This was reflected especially in the consumption of the meat, which increased relatively most e.g. in Brasil or China. Global consumption of livestock product has more than doubled in the past thirty years, driven mainly by substantial growth in meat and dairy intake. Demand for livestock products in developing countries grew three times faster than in the industrial developed countries. The average resident of a developing country ate 11 kg of meat per year in the mid-1970s, but by the mid-1990s ate 23 kg of meat per year. “Carnivorous cravings” resulting from the shift in global dietary pattern have far-reaching implications for international trade, the rural economy, agricultural land use, and the environment. Increased incomes and standards of living are enabling an expanding global middle class to adopt diets that are higher especially in protein. Between 1995 and 2020, developing countries will account of 85 percent of the growth of the demand for both meat products and livestock feed grains (World Health Organization 1990, 1998, 2004, etc.).

On the other hand, the consumption of cereals in the developing and transition countries has been diminishing. In the industrially developed countries, previous consumption was on the average lower, and during last decades has not been changing. In the USA, the highest consumption of corn, in Europe of wheat, and in India and China of rice has been prevailing traditionally. More detailed information on these changes are available on internet (see References, Who).

Composition and preparation of individual meals has also changed during last decades in a marked way. When we compare various recipes for the energy content, composition and using of various ingredients – especially the basic components as fats, proteins and carbohydrates, then ingredients like salt, simple sugars, spices etc., the differences may be quite significant. With regard to the character of preparation of meals (especially time duration needed, when housewives worked at home, etc.) described in kitchen books from our past, we can find significant differences. Diets were richer in energy and especially fat content, and their preparation were much more time demanding. However, for humans with prevailingly hard intensive work loads and generally higher output of energy (life style, transport, leisure etc.) this was more understandable and – may be acceptable –. At present, e.g. the recommendations and recipes for champion athletes – especially those who had high energy output like e.g. hockey players, long-distance runners, alpinists etc. the amount and composition of meals is surely more generous (but this does not apply e.g. for female gymnasts, dancers etc.; Pařízková, 1977, 1986).

Consumption of energy and of all components of the diet should be considered with regard to the energy output (Pařízková, 1989). The contrast in energy output is mostly marked when comparing the workers in previous centuries, or in the developing countries, with ordinary workers of our time – especially those with sedentary, but also with static work conditions. The last one has become the most usual professional work load in the industrially developed countries. More of the countries which have recently changed their lifestyle including professional activities are at present in a comparable situation. As an exemple can serve e.g. Canadian Inuits and nGanasans from Siberia, who have changed their style of work, leisure time and diet. These population groups have been studied during last decades in greater detail with regard to total adiposity, fat distribution, plasma fatty acid profiles, cardiac risks, and also to their functional capacity and physical fitness. Significant negative changes have been revealed, which were present also in children, i.e. the deterioration of health-related fitness, increased body mass index (BMI), greater accumulation of body fat (Rode; Shephard, 1995a,b.; Rode; et al., 1995a,b, Shephard, 2007).

Present life conditions especially in the industrially developed countries make also difficult to realize a desirable *dietary regime* from the point of view of frequency of meals, regularity and desirable time planning during the day. Professional activities – often stressful, and lack of rest interfere with a reasonable planning of meals. Skipping breakfast, reduced number of meals, which are consumed in larger amount only at the end of the day etc. also

contribute to the development of increased adiposity. These unsuitable food behaviors belong to the characteristics of present lifestyle, also along with fast food which is at present available nearly in the whole world. Its tastiness, attractiveness and low price makes it desirable, in spite that until recently its composition was not favorable from the point of view of health. Unfavourable changes have been revealed especially in children (Bowman; et al., 2004).

In the changes of usual diet consumed by a great proportion of present society an important role plays the commercials and promotion of items which contribute to the enhancement of adiposity. Increased amount of simple sugars in gaseous beverages, saturated fats, meat proteins, too much salt, some spices and compounds enhancing appetite in fast food are the components which accentuate not only energy intake (Bowman; et al., 2004, etc.), but also the consumption of items which can be in greater, inadequate amounts deleterious from the point of view of health. In addition, this sort of diet has been spreading also to the countries where it was not usual not long ago, which applies also to still poor countries which have problems with adequate energy and protein intake. Very often - even when energy intake is insufficient, a diet which has too much of undesirable items is consumed. Then, along with malnutrition and impaired growth, inadequate development of body mass index and of body composition, overweight and obesity can appear simultaneously in certain ratio of the population, often accompanied also by health problems. Up to now, it has been difficult to influence this situation in the market and also in the media, especially TV. Commercials are elaborated on a very high level of psychological effectiveness, and can influence especially growing population, with a undesirable result.

2. CONSEQUENCES IN SOMATIC AND FUNCTIONAL DEVELOPMENT

Mentioned trends in the amount of energy intake and also in the composition of the present diet – amount of proteins and fats, along with reduced energy output have been reflected by the changes of human body composition, especially in the relative and absolute increase of body fatness. Simultaneously, along with technological advancement the output of energy resulting from work load during professional activity, transport, and also during leisure time has been decreasing steadily. As mentioned above, this caused not only increasing adiposity, but also the reduction of body muscularity – total body composition has been in sedentary subjects changing in a negative way. This is reflected also by reduced level of functional capacity – cardiorespiratory fitness, motor development, skill, endurance and muscle strength (Pařízková, 1989).

As followed further, resulting lack of balance between energy intake and output had therefore also a significant impact on the prevalence of overweight and obesity all round the world, and concerned also Spain (Rodríguez-Martín; et al., 2009; Camara; Spijker, 2010, etc.). Along with increasing obesity, also an enhancement of various accompanying diseases has appeared. Such changes are not desirable from the point of view of health, overall health-related fitness, economic productivity, expenses for health care, and life expectancy in a good physical and mental status.

3. OVERWEIGHT AND OBESITY PREVALENCE

The estimation of obesity prevalence is 18 percent of the world population, which is an increase by cca 50 percent during recent decades. Since last years, the prevalence of obesity increased by 10 to 40 percent in the majority of European countries; most marked increase was revealed in Great Britain, where it doubled e.g. between the years 1980 and 1995. In males, the prevalence has been estimated from 6 to 15 percent, and from 8 to 17 percent in females. In China, around 15 percent of the population are overweight, from which 50 percent are 35 to 59 years old. These estimations have very probably doubled since last years. In Brasil or in Columbia, 40 percent of the population is obese. In Sub-Saharan Africa, where the essential proportion of malnourished people live, overweight and obesity concerns cca 30 percent of the population. These estimations surely have been changing – most probably in the majority of cases it has been increasing. According to recent and present lifestyle and nutrition changes, more marked reduction of obesity cannot be expected in the near future. More information is available on internet (see references, Who).

At present, special health problem is childhood obesity (Cole; et al., 2000): in schoolchildren its prevalence has been estimated at 10 percent approximately – not only in the industrially developed countries like the USA or Japan, but also in the developing countries – Algeria, Argentina, Chile, Egypt, Indonesia, Iran, Marocco, Peru, South Africa, Thailand and others (Pařízková, 1985, 2009; Pařízková; Hills, 2005). Detailed statistics are not available, as the assessments in various parts of the world have not been conducted in the comparable and sufficiently exact way. However, different prevalence of overweight and obesity can be found when not using the same criteria, e.g. various cut-off points body mass index (BMI) or the percentage of fat. But all evaluations of available measurements generally agree, and show that the situation concerning overweight and obesity has been getting worse all the time in all age categories including children. Only exceptionally no increase in children was revealed yet (e.g. Japan, Estonia), or levelling off this prevalence (e.g. France). More research in this respect is needed, and the methods for the evaluation of overweight and obesity during growth – when it is more difficult due to the growth changes – should be developed. This concerns especially the assessment of the development of body composition and adiposity (Pařízková, 1977, 1985, 1989, 1991; Pařízková; Hills, 2005).

Overweight and obesity has been increasing in all parts of the world, but still their prevalence has been highest in the industrially developed countries, i.e. in the USA and Western Europe. This prevalence corresponds also in these countries to the increased consumption of protein – mainly meat, and of fats – especially saturated, along with lower intake of cereals, which are the characteristics of an energy rich diet. These are also special characteristics of the above mentioned increasing consumption of fast food, which has been spreading, along with technological development, to nearly all countries of the world. As a consequence, the obesity prevalence has been increasing in all age categories, and this situation is defined as a great threat with regard to morbidity and life expectancy.

The effect of all factors – nutrition and the level of physical activity applies especially when genetic predispositions are present, which are mostly obvious when one, or both parents are obese. Research of genetic factors has developed more recently on a large scale, and revealed many important genes which contribute to an excessive development of adipose tissue. However, these studies have not yet explained in greater detail why in many subjects obesity has developed, e.g. in one family with comparable genetic background and lifestyle, and where only some are obese and others not. Evaluation of genetic predisposition can, however, help to intervene in time, and to promote more efficient obesity prevention and treatment.

Childhood obesity is at present also highest in the industrially developed countries, but the trend of this increase is very similar in many others, also developing countries, but only on different levels. This concerns not only schoolchildren and adolescents, but also young children in preschool age. US children are again on a highest level with regard to overweight and obesity – up to cca 30 percent. On the other hand, e.g. obesity in Chinese children increased from cca 4-5 to 7-8 percent recently (Lobstein; Frelut, 2003; Lobstein; Jackson-Leach, 2006). Obesity in children appeared also in some countries of Africa, e.g. in South African Republic and Cameroun (Cameron, 1998; Pasquet; et al., 1999).

Childhood obesity is a serious health risk also from the point of view of later consequences, as such children mostly become more frequently obese adults, along with all possible comorbidities. From the point of view of history, in the pieces of art – pictures or statues of old masters always an obese child was presented. During previous centuries, larger depots of fat were desirable with regard to reduced morbidity and easier survival when e.g. respiratory and/or gastrointestinal diseases threatened the growing organism. With greater reserves of energy such a child survived more easily, and without negative health and developmental consequences.

Due to present lifestyle, the predispositions for overweight and obesity have developed even more, especially in larger urban agglomerations, where more and more people live at present. There, especially the commercials and availability of fast food, gaseous beverages with too much of simple sugar etc. can influence their consumption. On the other hand, occasions for spontaneous play, exercise and increased physical activity are even more reduced. These aspects are at present more followed up in the industrially developed countries, and show a great importance of these factors. Physical activity and exercise can have even more important role, especially in subjects with rich diet of inadequate composition – with large amount of meat, fats, simple sugars etc. In this respect again a significant role of commercials for mostly unhealthy gaseous beverages, fast food, TV programs and videogames resulting in sedentarism are considered responsible for obesity development.

Some comparisons of e.g. optimally trained adolescent athletes with proper nutrition can demonstrate the effect of life style: optimal body mass index (BMI), body composition and physical fitness was revealed in young athletes

who had both high level of food intake along with high level of exercise. Richer diet is best balanced by more intense physical activity and exercise, and such a situation is recommended especially for young subjects (Pařízková, 1985, 1989). With such a regime, there is a more limited occasion for eventual vitamin and mineral deficiencies, which are more frequent than is usually expected. To define and prepare an adequate diet with all recommended items under the conditions of reduced food intake necessary for hypokinetic subjects is difficult even for nutrition specialists, not speaking about usual members of a family household. More energy dense diet, so frequent at present, is therefore a smaller risk for those who are physically more active, however, in the present society such trends are not parallel and corresponding. Mostly they exist in opposite sense – rich diet and reduced activity. Obesity and accompanying health risks threaten, under such conditions, much more subjects during growth than adults.

Why focus on children? Overweight and obesity reached already the epidemic levels too. World Health Organization (Who, 1981, 1998) evaluated recently 22 millions of e.g. 5-years-old children who suffer of excess body weight. In the USA, the percent of subjects at the age 5 to 14 years who suffer of excess body weight increased during last years from 15 to 32 percent; 11 percent of these children are obese. In Peking, 20 percent of children, and in Saudi Arabia 20 percent of schoolchildren were evaluated as obese. These statistics again have been changing during recent time, and an enhanced prevalence has appeared in most countries.

More recently, overweight and obesity has been increasing also in youngest age categories – preschool children. Many reasons are considered, but again, mainly food intake which does not correspond properly to the needs of the organism – due to inadequately low energy output resulting from hypokinesia – are considered. Such a regime is deleterious especially at the beginning of life – during childhood, when the level of spontaneous physical activity is higher than in other life periods. This is apparent especially before school age; unfortunately, the need for high activity can be met with difficulties, if not at all (Pařízková, 2009).

Research has more recently focused attention on children starting with the earliest period of development: studies concerned already the fetal period and first weeks and months of life. Models using experimental animals focused attention on the effect of various factors during pregnancy and lactation period from the point of view of the delayed effects in the adult offspring, concerning e.g. lipid metabolism, heart microstructure or sensitivity of the heart muscle to noxi (Pařízková, 2009). The results showed a great importance of factors influencing the organism during these life periods, with regard to later development during following periods of life, both from positive and/or negative points of view. Changing nutrition, and also physical activity level can not have therefore during various periods of life the same effect, both at present and/or later in life.

Increased weight increments during initial weeks and months due to rich infant nutrition considered previously as positive, have been shown as a

predisposition for an easier development of obesity during following periods of growth, and also during adulthood. Therefore, recommended dietary and energy recommendations have been diminished as it was shown that children with cca 10 percent lower energy intake grew and developed normally. A very important life period is that of the adiposity rebound (AR – when BMI starts to increase again after a decrease at cca 1 year of age; and which usually occurs between 5-6th year). When AR happens earlier, the development of obesity later on is more probable (Rolland-Cachera 1993, 1995, Rolland-Cachera et al. 1995).

Intake of protein early in life has also a significant impact: when it is increased in early life, the predisposition for later obesity is enhanced (Rolland-Cachera; et al., 1995). Not all studies confirm this finding, also that the design of follow-ups was not identical (Hainer; et al., 1999, 2004). However, all these studies emphasized the importance of all varied factors influencing the growing organism during very early periods, including the predispositions for easier development of obesity in following periods of life. Inadequate nutrition and physical activity level during the beginning of life could have an undesirable consequences for later development and health more often; therefore, it is essential to pay them adequate attention. Such conclusions were presented already in the 17th century when J.A. Comenius, Czech founder of pedagogics, emphasized the importance of early education concerning also dietary intake and physical activity (1650-4; 1984).

4. EVALUATION OF OVERWEIGHT AND OBESITY

The degree of overweight and obesity has been mostly defined by body mass index (BMI) relating height and weight. However, more direct body composition assessment (i.e. absolute and relative lean body mass and fat) is necessary, as often enhanced fat deposition is present even in subjects with BMI which is not markedly increased. This case of “hidden obesity” is the result of not only increased adipose tissue, but also insufficient development of lean body mass – especially of the muscles due to hypokinesia. Body composition is therefore not optimally developed and balanced, in spite that the commonly used characteristic such as BMI is not markedly inadequate. Elevated body fat percentage along with increased cardiovascular risks at low BMI index levels were shown in Asian populations, i.e. Malays, Indians and Singapore Chinese, and the cut-off points for overweight and obesity were also defined at decreased levels as compared to Western populations (Deurenberg; et al., 2002).

Moreover, it is not yet known in detail how vital organs, especially the heart, lungs and others are developed and eventually influenced by unsuitable nutritional and physical activity regimes. Their effect on individual items of body composition influences the overall fitness, especially physical and metabolic one (Pařízková, 1995), and therefore deserves more attention than up to now. Elimination of negative factors would be the best solution of the abovementioned health and life expectancy problems. However, this would

concern not only – and first of all – medical and pedagogic care, but also the economic, social and political situation on a world scale.

Most important reason for coping with obesity are the above mentioned health risks. In the first place, cardiovascular diseases (atherosclerosis, hypertension, infarctus myocardi, dyslipidemia, etc.) are always mentioned, and this concerns especially subjects who have been overweight or obese since childhood. Diabetes type II, which has been recently appearing much more often is another threat, then orthopedic, gall bladder and other gastrointestinal problems, and certain forms of cancer appear more often of subjects with overweight. Sleep apnea, varicous veins, orthopedic problems, etc. are greater risk for those with excess body weight. Reduced life expectancy was also revealed in obese subjects, who often die due to the above mentioned illnesses earlier than subjects with normal body weight. Health problems present then also an ncreasing economic burden, especially with regard to markedly increasing aging population which in the case of obesity needs more health care, and also due to those who die already in productive age.

Psychological problems (depression) accidents, etc., have also accompanied the increasing obesity prevalence, as the ideal of beauty has changed. Obesity has therefore turned in addition to an aesthetic problem, aggravating the situation of an obese subject. What was an ideal of beauty during long periods of our history, has become a serious handicap – both individually and also socially. Reduced possibility to find a partner or to find desirable profession has become a serious, and sometimes the most important problem. Adult subjects with psychiatric problems were often obese during growth and adolescence.

5. TREATMENT OF OBESITY

As follows, it is preferable to use the prevention of the development of overweight and obesity, adopting an adequate dietary and physical activity regimes, in spite of present trends. However, under conditions of present lifestyle it is too difficult – especially in genetically predisposed subjects. Then, an efficient treatment is indispensable (Hainer, 1999). During growth this is more difficult than later on, as the growing organism should increase in all dimension including body weight, and it is necessary to change first of all body composition (Pařízková, 1977, 2009; Pařízková; Hills, 2005).

Many approaches are used, and the natural ones are preferred for obesity treatment especially during growth – monitored diet and increased energy output by exercise. Numerous studies have been conducted starting with the fifties of the last century, with desirable results. Long-term observations revealed positive changes in BMI and body composition – reduction of body fat and increase in lean body mass. This was accompanied also by positive changes of functional capacity – higher level of economy of work, better efficiency characterized e.g. by decreased pulse rate and oxygen consumption during the same work load, increased aerobic power (characterized by increased oxygen uptake during a maximal work load on the treadmill, both

absolutely and relatively (per kg body weight and kg lean body mass), and vital capacity, increased level of motor performance – mostly speed, endurance and skill (Pařízková, 1977, 1993). This was mostly achieved during summer reduction camps, where children also felt psychologically very well, and accepted the regime of monitored diet and physical activity without objections. Main problem remained as the positive results were mostly not permanent; best intervention were regular follow-ups during school year, and repeated stays in summer camps. There was always a disadvantage – arrangement of such camps can be quite costly, however, they are worth of this expenses when considering the health effect, both present and eventually delayed (Pařízková, 1977, 1985, 1993, 2008; Pařízková; et al., 2002; Pařízková; Hills, 2005).

There are also experiences with long-term treatment of adult obese, both under in-patient – clinical, and also under out-patient conditions. Our studies in Obesity Management Centre (Institute of Endocrinology, Prague) have shown significant effect of dietary and life style changes on body composition using anthropometric methods, DEXA, then also assessments of hormonal and biochemical parameters (Hainer, 1999; Hainer; et al., 1992, 1999, etc.). Analyses of the impact of genetic factors were followed up in female monozygotic identical twins (Hainer; et al., 2000, 2001; Kunešová; et al., 2002, etc.). Energy content and composition of the diet of the obese are analyzed, and recommendations on an individual level are given to the patients (Hainer, 1999; Hainer; et al. 1992, 2008; Pařízková; et al., 2003).

In a certain way, the intervention could be easier than in children due to the necessity to reduce simply fat depots, increase lean body mass percentage, and then to improve functional capacity and health status. However, adult patients usually address medical doctors too late, when obesity is advanced and complicated also with further comorbidities. This makes difficult to use more of the natural approaches for reduction of excess adiposity, e.g. of moderately reduced diet and physical exercise (Štich; et al., 1997). Very-low-calorie diet, which could be in more advanced or morbid cases of obesity could be used only under hospitalized conditions (Hainer; et al., 1989, 1992, 2000). Psychological diagnosis and interventions by specialized psychologists are included as indispensable items of such treatment (Hainer; et al., 2008).

Yo-Yo effect during treatment is frequent, and long-term cooperation of subjects is needed. In morbid cases of obesity, also pharmacological and surgical interventions are applied (gastric banding using laparoscopy), showing very positive – but often short-lasting effects again, which are apparent especially when the obese patients with advanced obesity start the treatment too late. Most often, long-term, individualized, regularly supervised and eventually repeated treatment of obese subjects is required.

As follows, it is necessary to advance and develop present methods for timely diagnosis and evaluation of dietary intake, BMI, body composition and health status – especially of the initial stages of overweight and obesity, when they can be more efficiently prevented and treated. Individualized recommendations should be defined and applied; this includes also an

adequately adjusted diet to physical activity and work load level, as essential items of lifestyle. All that is surely the repetition of the old truths, but these must be applied according to new and permanently changing conditions of present life. Nutritional situation resulting from the above mentioned economic, social, cultural etc. changes should be surely modified with regard to health status, its prognosis and life expectancy, and not to export it from the industrially developed countries to further parts of the world where they were absent, or not so developed. Especially the genetically predisposed subjects should first of all to resist the effect of enhanced availability of food, sedentarism, commercials in mass media and general trends of present market. But how to realize all this is surely a very demanding task, which applies not only to the present, but obviously also to the following generations.

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