

A History of Obesity, or How What Was Good Became Ugly and Then Bad

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Chronic food shortage and malnutrition have been the scourge of humankind from the dawn of history. The current worldwide epidemic of obesity, now recognized as a public health crisis, is barely a few decades old. Only after the technological advances of the eighteenth century did a gradual increase in food supply become available. The initial effect of these advances in improved public health and amount, quality, and variety of food was increased longevity and body size. These early favorable outcomes of technological advances notwithstanding, their incremental effect since the Second World War has been an overabundance of easily accessible food, coupled with reduced physical activity, that accounts for the recent increased prevalence of obesity. Obesity as a chronic disease with well-defined pathologic consequences is less than a century old. The scarcity of food throughout most of history had led to connotations that being fat was good, and that corpulence and increased "flesh" were desirable as reflected in the arts, literature, and medical opinion of the times. Only in the latter half of the nineteenth century did being fat begin to be stigmatized for aesthetic reasons, and in the twentieth century, its association with increased mortality was recognized. Whereas early reports listed obesity as a risk factor for mortality from "chronic nephritis," the subsequent recognition of the more common association of obesity with diabetes, hypertension, and heart disease altered the listings and questioned its being a risk factor for kidney disease. An enlarging body of evidence, accrued over the past decade, now indicates a direct association of obesity with chronic kidney disease and its outcomes.

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Obesity is a worldwide public-health problem, with increasing incidence and prevalence, high costs, and poor outcomes. As a disease, with defined pathologic and pathophysiological complications, it is just about a century old.¹⁻³ In fact, the term "obesity" does not appear in the English language until the seventeenth century, and then only as a descriptive literary term for excessive fatness or corpulence.⁴ The impact of obesity on quality of life began to be appreciated and recorded in the eighteenth century, but only in the middle of the nineteenth century it was recognized as a cause of ill health, and then only in the first decades of the twentieth century were its morbid complications and increased mortality documented.^{1-3,5} What has made this gradual medicalization of obesity alarming is the exponential increase in its incidence over the past 60 years, which led the World Health Organization to declare it a global epidemic and worldwide public-health crisis.^{6,7}

Much like other killer diseases (cardiac, vascular, and respiratory) that have emerged as the scourge of humankind over the same period of time, obesity is a chronic disease. As a chronic disease, the indolent onset of its complications (diabetes, hypertension, and atherosclerosis) account for its morbidity and mortality.⁵ Unlike

the other chronic diseases, however, it is not a silent killer, but one whose external manifestations are evident to afflicted individuals from its outset as weight gain and increased girth. As a public-health problem, therefore, this externally manifest disease is one that is easy to detect, which allows for potentially considerable time to prevent its complications. Prevention is not an easy task at best, and complications remain "a bomb awaiting to be defused."⁸

Historical Roots

The accrued evidence for a multifactorial etiology of obesity notwithstanding, the available information from thermodynamics of food metabolism has clearly established what had long been intuitively assumed—that in the final analysis, the cause of excess subcutaneous and visceral fat deposition in an individual is the cumulative effect of an imbalance between the

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energy of ingested food and that expanded in the course of daily activities.¹⁻³ Essentially, the deposition of fat is an adaptive physiologic process of energy storage that became maladaptive when technological advances altered the balance between the availability of food and the body's expenditure of energy, especially that expended on obtaining food.^{1-3,9} As such, the story of obesity is indelibly related to that of the history of food. It is a classic example of the diseases that have been argued to be side effects of the evolutionary process.¹⁰

In the evolutionary history of humankind, bodily fat seems to have served nature's purpose by outfitting the species with a built-in mechanism for storing its own food reserves. During prehistoric times, when the burden of disease was that of pestilence and famine, natural selection rewarded the "thrifty" genotypes of those who could store the greatest amount of fat from the least amount of the then erratically available foods and to release it as frugally as possible over the long run. This ability to store surplus fat from the least possible amount of food intake may have made the difference between life and death, not only for the individual but also—more importantly—for the species. Those who could store fat easily had an evolutionary advantage in the harsh environment of early hunters and gatherers.^{1-3,9} The esthetic value and cultural significance attached to obesity is reflected in the mysterious nude female figurines of Stone Age Europe, dating back to more than 20,000 years ago, considered to be matriarchal icons of fertility or the mother goddess. The best known of these earliest representations of the human form is the one discovered in Willendorf, Austria in 1908 (Fig 1). Commonly known as the Venus of Willendorf, its squat body, bulbous contours, pendulous breasts, and prominent belly are as esthetically a factual rendering of gross obesity as can be.^{4,11}

The discovery of agriculture and domestication of animals some 10,000 years ago gradually reduced the precarious food supply imposed theretofore by hunting and gathering. From its humbler beginnings as a species struggling to survive in an environment that offered few options between feast and famine, humankind could now grow its food. How-



Figure 1. The Venus of Willendorf. Limestone figure from the Late Paleolithic Period, c. 25,000 BC (Naturhistorisches Museum, Vienna, Austria. Reproduced with permission.) Photo credit: Erich Lessing, Art Resource, NY.

ever, whereas the new society of farmers and herders improved control over food production, eventually paving the way to city-states and empires, food supply remained scarce, erratic, and subject to the vagaries of nature.⁹ Perhaps the best record of those times, the Bible, is filled with food imagery because it was written for an audience that was hungry most of the time, and for whom the abundance of food in the Garden of Eden, the idea of Heaven as a place where food was plentiful, and the promise of a land of milk and honey had a lurid potency, as did those of the vividly described periods of food shortages and famine.¹² This hypothesis also explains why every biblical event of any importance was an excuse for eating and why food was a sacrificial offering to God and the deities of Egypt and Mesopotamia.

Whereas famine, being more spectacular, has received the greater attention, in the long term, chronic food shortage has been more deadly to humankind. As documented and eloquently exposed by the 1993 Nobel laureate in economics, Robert William Fogel,

throughout most of human history, chronic malnutrition has been the norm.⁹ Only after the technological advances of the eighteenth century, which led to what Fogel calls the second agricultural revolution, did a gradual increase in food supply become available. That malnutrition persisted well into the first decades of the twentieth century is perhaps best exemplified in Herbert Hoover's 1928 campaign slogan of "a chicken in every pot." In any case, the gradual increase in the available amount, quality, and variety of food, just about the time that public health measures were being adopted, enabled humans to increase their average longevity and body size. Larger and healthier humans then accelerated economic growth, which resulted in reduced workload and increased leisure time. Hence, the proposition of Fogel that the consequent reduced physical activity coupled with an abundance of easily accessible food accounts for the increased number of overweight and obese people since the Second World War.⁹ Once dependent on plants and game that crossed the path of hunters and gatherers at random, hungry humans today have easy access to an endless choice of foods and delicacies from all over the world—with minimal energy expended to obtain them—by merely walking to a refrigerator or driving to a supermarket.

This thumbnail sketch of what took humankind 7,000 generations to attain is encapsulated and scientifically documented in that of the last 3 generations of Pima Indians.¹³ From the athletic fighters of past generations who scrambled for food in the arid desert of Arizona, they now have access to a surfeit of junk food, while exerting a minimum of physical activity in the sedentary life of their Gila River reservation. Their thrifty genes, once an advantage, have become a liability that accounts for the greatest incidence of obesity and diabetes of any ethnic group.⁴

Obviously, the pathogenesis of obesity is more complex than a simple paradigm of available food and the effort spent to obtain it. Factors beyond diet and exercise influence obesity and make the consequences of bad diet and limited exercise much worse than they would be otherwise. Whatever these confounding genetic or pathophysiologic factors may be, in the

final analysis, the imbalance between energy intake and output, otherwise stated as the easy availability of high-caloric foods and reduced physical activity, apparently accounts for the current epidemic of obesity.

Cultural Connotations

The scarcity of food throughout most of human history and consequent connotations that being fat was good and that corpulence and increased "flesh" were desirable are reflected in the arts, literature, and politics of the times. The gross obesity of the mother goddess of the Ice Age (Fig 1) did not last beyond the Pleistocene Age, as is evident from the Hippocratic Corpus, which attributes fatigability to excess weight, the record of the Spartans who ostracized fat men, and stories that Socrates danced every morning to keep his figure in reasonable bounds. Nevertheless, the ideal of female fleshiness and chubbiness persisted well into the first decades of the twentieth century. Any inspection of the religious paintings that dominate the arts of the Middle Ages reveals a sharp contrast between the fleshy, well-curved feminine figures and that of the long legged, slender, and gracile image of Jesus. The latter may be a reflection on the emergence of medieval mystics who established a close relation between eating (ie, fasting) and spirituality as exemplified in the stories of the early Desert Fathers of the Church.¹⁴ The corpulent feminine features are all the more evident in Renaissance art, especially in the statuesque women of Michelangelo (1475-1564), so evident in his frescoes of the Sistine Chapel and the contrast between his rendering of the bodies of Mary and Jesus of the Pieta in the Vatican. The full and rounded women of Rubens (1577-1643), which gave rise to the adjective Rubenesque for plumpness, stand in sharp contrast to the changes in artistic imagery that were to come in the latter part of the nineteenth century, as illustrated in the slim cupids of Bougerau (1825-1905). Still, corpulence continued to be favored and associated with affluence, power, and influence as reflected in the portly figures of the industrial barons and the feminine figures of Auguste Renoir (1841-1919) from the early decades of the past century.

A similar attitude is reflected in the literature of the period, where the personality of

the corpulent is depicted as jolly, lovable, and good natured, such as Cervantes' Sancho Panza and Shakespeare's Falstaff, who stand in sharp contrast to the introvert, miserly, and agonizing personality of such slim characters as Cervantes' Don Quixote and Shakespeare's Hamlet. Attitudes towards obesity started to be altered in the eighteenth century and really began to change in the nineteenth century, principally for esthetic reasons. However, only in the latter part of the twentieth century did being fat become stigmatized. As a result, the literary and folkloric stereotypes changed from that of an amiable chubby individual, as reflected in the characterization of Joe by Charles Dickens (1812-1870) as "a wonderfully fat boy," to that of Marty, the hero of the 1953 play by the same name by Paddy Chayefsky (1923-1981), who attributes his rejection by girls to being "an ugly fat man." Thus, before becoming bad, fat became ugly. The consequent passion for slimming continued to mount steadily and reached a frenzy by the middle of the twentieth century, when the supermodel Twiggy, with her sticklike figure, burst into the fashion scene and became a teenage icon. Still, at the end of every calendar year, we are reminded of the old notion of the jolly fat figure in the person of Santa Claus, in contrast to that of the miserly slim one of Scrooge.

The favorable cultural connotations of fatness are reflected also in the figures of past American presidents, at a time when being fat was considered a symbol of health, prosperity, and strength. The stout, corpulent figures of past presidents (Hoover, Taylor, Grant, Taft, and Cleveland) stand in sharp contrast to those of the second half of the twentieth century (Kennedy, Nixon, Reagan, and Bush). In fact, whether any of those past presidents would be able to win an election in today's environment of image makers and television publicity is doubtful. The changes in public taste in weight and the medical consequences of its excess are perhaps illustrated best in Bill Clinton, whose image went from that of chubby doughnut-eating candidate to that of a courtly president, but not until he suffered the medical consequences of past dietary indulgences did he really slimmed

down and become an evangelist for the dietary control of obesity.

Medical Consequences

The health consequences of obesity began to be noted in the medical literature of the eighteenth century.¹⁵ William Cullen (1710-1790) lists those of fatigue, gout, and breathing difficulties. Actually, the respiratory difficulties of obesity were not fully documented until 1956 and dubbed the Pickwickian syndrome, after the description of Fat Boy in *The Posthumous Papers of the Pickwick Club*, published between 1837 and 1839 by Charles Dickens.¹⁶ A medical problem that haunted William H. Taft (1857-1930), one of the stoutest of U.S. presidents of the twentieth century. At 5' 11.5" in height, Taft weighed 243 pounds when he graduated from college, 320 pounds when he became secretary of war, and up to 340 pounds when he was in the White House. With a body mass index of more than 45, Taft had severe sleep apnea, was chronically fatigued throughout his presidency, and was known for his drowsiness and somnolence during public functions. He was also hypertensive and developed all the manifestations of cerebral and cardiac vascular disease.¹⁷

Whereas the medical consequences of obesity were noted and recorded in the medical literature in the nineteenth century, being grossly fat was considered to be morally reprehensible and medically undesirable.¹⁵ In his 1905 textbook, *The Principles and Practice of Medicine*, William Osler (1849-1929) attributes obesity to "overeating, a vice which is more prevalent than and only a little behind overdrinking in its disastrous effects," but mentions none of the alluded to "disastrous effects" in the one and a half pages devoted to the subject.¹⁸ Indeed, throughout most of the nineteenth century and well into the early twentieth century, medical opinion held that carrying an extra 20 to 50 pounds of excess "flesh" was healthy. A decent amount of "flesh" was considered prudent. It provided a reserve of "vitality" that would keep a person from being run down through an extended illness. Being thin was not healthy and attributed to neurasthenia. Instead of advice on

reducing caloric intake, the emphasis was on how to gain weight.

The first alarm against excess weight was sounded by the insurance industry. Actuarial studies that linked excess weight to increased mortality began to appear in the early years of the twentieth century. By the 1920s, studies on the experience of industrial policyholders of the Metropolitan Life Insurance Company were analyzed for differential mortality by weight and associated with specific diseases by Louis I. Dublin (1882-1969), a statistician and vice-president of the company.¹⁹ By the 1930s, the medical profession made a total about face on the desirability of excess "flesh" and accepted excess fat as a health problem. The first physicians to capitalize on this development were the psychiatrists, who, during the heydays of Freudian psychology in the 1940s, identified and described bulimia and anorexia nervosa. As a result, the literary and folkloric stereotype of the jolly, easygoing image of fat individuals changed into that of an affective, intensely reactive, and emotionally grown-up child of Freudian psychology. This change reflected mostly the use of new terminology and not a new invention. Overeating had been attributed to depression, hypochondria, and melancholy since the seventeenth century.¹⁵ Nevertheless, the subsequent decades saw the blame for fatness evolve from being a consequence of undisciplined behavior to subconscious conflicts to a physiological disorder. By the 1960s, the study of obesity began in earnest, and soon body fat was defined as an organ, with its own hormones, receptors, genetics, and cellular biology rather than the passive store of energy it had been considered theretofore.²⁰ As the study of fat became an acceptable scientific pursuit, it began to unlock obesity's secrets, each of which, in turn, became the impetus for the growing 30 to 50 billion dollar slimming industry that exists today.

Nutrition Becomes a Science

Three principal advances refined the understanding and management of obesity: thermodynamics of food utilization by the body, nutritional components and their metabolism, and the refined definition of obesity.

Only at the end of the eighteenth century, after the introduction of chemical methods of analysis, did the story of body thermodynamics begin to unfold.²¹ The beginnings of nutritional thermodynamics are based on the pioneering studies of Lavoisier (1743-1794) and his wife on respiration, of Francois Magendie (1783-1855) on the source of nitrogen necessary for tissue synthesis, and of James Joule (1818-1889), after whom the SI unit of work is named, on the relation of muscular mechanical work to heat generation. On the basis of these initial discoveries, subsequent nutritional balance studies of increasing sophistication with respirometers were undertaken by Carl Voit (1831-1908) and Max von Pettenkofer (1818-1901) in Germany and William Atwater (1844-1907) in the United States. As the connection between body-heat generation and muscular work and the conversion of food into energy began to be revealed, nutrition evolved into a quantifiable science that expressed food values in calories, and caloric control, rather than spoons and cups as measures of food, became the basis of weight control.

Parallel milestones in the physiology of digestion and hunger, beginning with the studies of William Beaumont (1785-1853) on gastric physiology and of Walter Cannon (1871-1945) on the sensation of hunger, paved the way to studies of gastrointestinal absorption, feeling of satiety, and nutritional-deficiency disorders such as scurvy, goiter, beriberi, rickets, and pellagra and of the effects of vitamin and trace-mineral deficiencies. Subsequent identification of the relative deficiencies of nutrients provided a basis for the medical therapy of obesity with drugs. The changes in treatment of obesity that followed are perhaps best reflected in the changing name of the society that devotes itself to the management of obesity. Established in 1950 as the National Obesity Society, it was renamed the National Glandular Society, later the American College of Endocrinology and Nutrition, and then, in 1961, the American Society of Bariatrics. Bariatrics is a new word, still not in the Oxford English Dictionary, marking the shift in treatment of obesity toward appetite control, caloric restriction, and exercise. The society has now split again into the American As-

sociation of Bariatrics Surgery, which reflects the entry of surgery into the treatment of obesity, and the American Society of Bariatrics Physicians, which became a member of the House of Delegates of the American Medical Association in 2000.²²

Once platform scales became accessible in the second half of the nineteenth century, accrued information on body weight became gradually available for analysis. On the basis of the data presented by Dublin on the differential effect of weight on mortality, insurance companies, which initially expressed weights as averages gradually, started reporting ideal weights for age and height. With recognition that weight varied by height, investigators turned to the Quetelet index. The Quetelet index, better known as body mass index (BMI), is now used for the classification of overweight status ($BMI > 25$) and obesity ($BMI > 30$) and in programs of weight control. It is named after Alphonse Quetelet (1795-1844), a Belgian astronomer turned statistician (Fig 2), who, in his attempts to define the average man (*l'homme moyen*), used data from the heights and weights of the French and Scottish armies to show that most cases fell within the range defined as a person's weight in kilograms divided by the square of the person's height in meters.

Independent of these refinements, the story of weight control is intimately linked to that of one of the complications of obesity—diabetes.^{23,24} Historically, diabetes had been associated with excess food, a high-carbohydrate diet, and corpulence. Once the cause of diabetes was recognized as the presence of saccharine matter, first in the urine and then in the blood, the quest for the source of saccharine matter soon led to gastrointestinal absorption. Beginning with the work of John Rollo (d. 1809), dietary management and weight loss became the mainstay of treating diabetic patients until the discovery and availability of insulin in 1922.²² Indeed, so closely tied were obesity, diet, and diabetes that when F. Banting (1891-1941) and C. Best (1892-1978) isolated insulin, they prescribed it with a low-carbohydrate, low-fat diet that required the careful weighing of food. During the decade that followed, insulin syringes and food scales were the inseparable ware of people with diabetes.



Figure 2. Stamp issued by Belgium to honor the many contributions of Adolphe Quetelet (1796-1874), astronomer and mathematician, who in his studies of probability statistics developed the “Quetelet Index,” also known as the body mass index (BMI).

Obesity and Chronic Kidney Disease

An association between obesity and kidney disease was noted in the earliest reports that analyzed the medical consequences of obesity. “Chronic nephritis” is listed as the fourth or fifth leading cause of the obese in the all-cause mortality (ACM) tables generated by the Metropolitan Life Insurance Company and published in the medical literature of the 1920s.^{19,25} Over time, as the number of listed diseases increased and disease classification became more detailed, diabetes and hypertension appeared on the lists of ACM and replaced “chronic nephritis,” which gradually moved down and disappeared when obesity as a risk factor for kidney disease was questioned. The Web page of the NIDDK Weight-Control Information Network (WIN) does not list the kidney on its table of diseases for which obesity and overweight are known as a risk factor or are associated with.²⁶

Whereas the cautiousness of the NIDDK likely reflects the fact that kidney disease of the overweight and obese may be secondary to its more common association with diabetes, hypertension, and heart disease, increasing evidence accrued over the past decade show an association of nondiabetic consequences of obesity on the kidney, including outcomes of end-stage renal disease, kidney transplantation, and other diseases of the kidney.²⁷⁻²⁹ A specific obesity-related glomerulopathy described in 1975 is now being detected with increasing frequency.^{30,31} Additionally, experimental studies have identified functional effects of obesity on the kidney that may account for the clinical consequences of obesity on the kidney.^{32,33} This enlarging body of evidence on the association between obesity and CKD is summarized in the state-of-the-art reviews of the present issue of *Advances in Chronic Kidney Disease*.

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