Diabesity – a historical perspective: Part I

David Haslam

The expression "diabesity" has recently been coined by former American Diabetes Association president Francine Kaufman amongst others, to describe the co-existence of the twin epidemics of diabetes and obesity in the population and the individual. However, the term is being misused, and has much more profound implications. Ethan Sims originally used the term in the 1970s to describe studies of "experimental human obesity", in which healthy prisoners were deliberately overfed to gain weight to an average BMI of 28 kg/m² – overweight, not obese – and to demonstrate reversible rises in fasting glucose and a deterioration of glucose tolerance – not diabetes (Sims et al, 1973). The purpose was to explore the complex interactions between genes and the environment, proving the limitations of the energy balance equation – why did some prisoners need a tiny number of extra calories to gain the weight, whereas others needed thousands of additional calories to induce the same effect? Rather than simply stating the co-existence of diabetes and obesity, Sims' paper was more subtle, observing the mutual causes of impaired glycaemic control and weight gain and the complex pathophysiology underpinning both. At the time, the paper was a culmination of thousands of years of evolution of the understanding of knowledge about diabetes and obesity, but in the last 40 years our understanding of both conditions (and our management of diabetes) has improved exponentially. Part I of this two-part article documents facts and opinions around what has recently been described as diabesity, tracing its origins back half a million years, and how the way in which diabetes is viewed has changed over time. In the next issue, part II will examine European medical perspectives of diabesity and complete the evolutionary journey to the present day.

Prehistory

Two figurines, the Tan-Tan Venus from Germany, and the Berekhat Ram figurine from the Golan Heights date back up to 500 000 years, and feasibly represent obese individuals. It seems likely that these rocks were discovered by now-extinct *Homo erectus,* thought to vaguely resemble a person, and modified using primitive tools to better represent the shape of obese women. The more modern Venuses, such as Willendorf from 25 000 years ago, and the more recently discovered Hohle Fels Venus from 35 000 years ago are anatomically accurate and without doubt genuine pre-conceived depictions of obesity, proving its existence at that time.

Egyptian medicine

It is difficult to be precise about the history of diabetes, as it depends on the interpretation of writings, without tangible evidence. The earliest medical reference is generally considered to be the Ebers Papyrus from Thebes, across the Nile from Luxor, named after its purchaser George Ebers. It is thought to date back to 1552 BCE. The papyrus is a broad medical text with numerous references to excessive urination and its treatment, but none conclusively describe diabetes; most could equally be urinary tract infections. Treatment was a 4-day course of a decoction of bones, wheat, grain, grit, green lead and earth (MacFarlane, 2007). Also used was a "measuring glass filled with Water from the Bird pond, Elderberry, Fibres of the asit plant, Fresh Milk, Beer-Swill, Flower of the Cucumber, and Green Dates". Urinary troubles in the adult were also corrected with rectal injections of olive oil, honey, sweet beer, sea salt, and seeds of the wonderfruit (Sanders, 2002). Queen Hatshepsut,

Citation: Haslam, D. Diabesity – a historical perspective: Part I. *Diabesity in Practice* **1**: 141–5

Article points

1. The term diabesity has been coined to describe the co-existence of diabetes and obesity.
2. The term was originally used in the 1970s.
3. Part I of this two-part article examines the origins of diabetes and obesity back to prehistoric times.
4. Part II will be published in the next issue and examines European perspectives of diabesity through to the present day.

Key words

- Diabetes
- History
- Obesity

Author

David Haslam is a GP in Hertfordshire and Chair of the National Obesity Forum.

Page points

1. For a long period of history, diabetes was recognised as a disease entity, but not linked to overweight, obesity or lifestyle.
2. In ancient Ayurvedic medicine, Sushruta described diabetes, characterised by passage of large amounts of sweet-tasting urine, primarily affecting obese, sedentary individuals.
3. In traditional Chinese medical texts, diabetes first appears in around 200 BCE.

the female Pharoah, has been shown by recent post-mortem examination to have suffered from obesity and diabetes, although etiquette at the time meant that Egyptians were portrayed as lean in contemporary art.

The lack of ancient historical links between diabetes and obesity is perhaps unsurprising, as many individuals would have been lean, and suffering from what we now know to be type 1 diabetes. Those with type 2 diabetes would have lost considerable weight prior to presentation to their physician; therefore the link would have been obscure.

Ancient Ayurvedic medicine

Thus, for a long period of history, diabetes was recognised as a disease entity, but not apparently linked to overweight, obesity or lifestyle. Possibly the first time excess weight and diabetes were linked medically was in ancient Ayurvedic medicine, around 600 BCE, when Sushruta described diabetes (madhumeha or "honey-like urine"), characterised by passage of large amounts of sweet-tasting urine, primarily affecting obese, sedentary individuals. Sushruta has been described as the father of surgery, pioneering operations such as extracapsular lens extraction in cases of cataracts (Kansupada and Sassani, 1997), but his contribution to medical knowledge was also crucial, notably his descriptions of obesity ("medoroga"; Dwivedi and Dwivedi, 2007), and its link with diabetes and angina ("hritshoola"). A disciple of Dhanwantari, the Lord deity of Ayurveda – the Indian system of medicine – he practised in the city of Benares on the Ganges River. He wrote "*Mellita urina laborantem quem medicus indicat, ille etiam incurabilis dictus est*" [When the doctor states that a man suffers from honey urine, he also declares him incurable], and noted that the urine was sucked up by ants and other insects. He was the first physician recorded to have recommended exercise for diabetes and obesity, described as "moderate in nature or to an intensity that will cause laboured breathing" (Tipton, 2008). This is not far removed from the modern World Health Organization guidelines.

Sushruta's regime "gives the desirable mental qualities of alertness, retentive memory, and keen intelligence", whilst reducing corpulence, increasing digestion, improving resistance against fatigue, elevating temperatures and thirst while improving appearance and complexion. Obesity was blamed on sedentary lifestyle, pampering the belly, sleeping during the day, and avoiding "any sort of physical exercise" (Bhishagratna, 1963). Sushruta identified diabetes as a disease of the urinary tract, a view that was universal until the 18th century.

Charaka, another ancient Hindu physician, described a form of diabetes associated with stout build, gluttony, obesity and sleepiness (Davidson, 2000).

Ancient traditional Chinese medicine

Diabetes first appears in traditional Chinese medical texts around 200 BCE in "Suwen" or "Plain Questions" – the first of two books of the great medical work Nei Jing – Yellow Emperor's Inner Canon. Nei Jing was named after, but not written by, the Yellow Emperor Huang-Ti, who was thought to have reigned between 2697 BCE and 2597 BCE, and is regarded as the initiator of Chinese civilization. According to many scholars, Huang Ti Nei Jing was not compiled by a single author within a limited period of time; rather, it was the efforts of many physicians over the centuries prior to its definitive publication. The major part of the book was completed with various editions in the "Warring States" period of Chinese history (475–221 BCE), with supplements and revisions made in the following Qin Dynasty (221–206 BCE) and Han Dynasty (206 BCE–220 CE). Thus the book is a compendium of medical theories and clinical practices that occurred before the Qin and Han Dynasties. The best-preserved and most authoritative version is one carved and printed in 1339 (see http://bit.ly/TF7HZJ for further information).

There are two words in the Chinese language for diabetes: the original medical name "xiao-ke" meaning "wasting and thirsting", and the modern term "tang-niao-bing" meaning "sugar urine illness". Reference to diabetes by the traditional term appears in Nei Jing. Traditionally, diabetes is divided into three sub-types: upper, middle and lower. Each type reflects the predominance of one of the three main symptoms, thirst, hunger, and excessive urination, and is intimately related to the lung, spleen and kidneys respectively. At some point during the course of their illness, most people with diabetes manifest symptoms of all three types. According to traditional Chinese medicine, Xiao-ke is attributed to three main factors: improper diet – consumption of large

quantities of sweet, fatty or greasy foods, alcohol, and hot drinks such as hot coffee or tea; emotional disturbances – stress, anxiety, depression; and a constitutional Yin deficiency – fatigue, weakness, lethargy and pallor (Choate, 1998). The nature of the pathophysiological defect in diabetes as addressed by traditional Chinese medicine is difficult to assess as the references to lung and spleen are used in a similar way to the Humours described by Hippocrates as conceptual tools rather than precise anatomical references, without a parallel in modern Western medicine. The spleen, for instance, was considered as a cause of diabetes, but more as a concept than a physical organ, "responsible for moving the liquids on behalf of the stomach: When the stomach is out of harmony, then the essence qi is exhausted." Qi, or "life energy", is the central pillar of traditional Chinese medicine and martial arts. Nei Jing makes various references to diet with relation to diabetes, citing both fatty and sugary foods as culprits (Unschuld and Tessenow, 2011):

- "An effusion of fat and delicious food".
- "This person must have frequently consumed sweet and delicious food".
- "His diet was mostly fat".
- "A fat diet lets man experience internal heat".
- "Sweet food lets man have central fullness".
- "Hence, this qi rises and overflows; it turns and causes wasting-and-thirst".

During the Tang dynasty (618–907), Wang Tao, in Wai Tai Mi Yao (Secret Essentials of the External Platform), wrote that, "[If] the kidney qi becomes insufficient, [this may lead to] vacuity detriment wasting and thirsting with polyuria and low back pain." He also wrote that "Every time the disease comes on, the urine must be sweet," and, "those with wasting and thirsting become emaciated." "[Those with] this disease have many welling and flat abscesses," and that their "skin engenders sores." Thus Wang Tao emphasised that the kidneys were considered the root of the pathophysiology of diabetes, with systemic effects.

During the seventh century, the physician Li Xuan concurred with the prevailing view that the urinary tract was the origin of diabetes, writing a monograph on wasting and thirsting and why urine was sweet:

"This disease is due to weakness of the kidneys and bladder. In such cases, the urine is always sweet. … the cereal food of the farmers are the precursors of sweetness… cakes and sweetmeats… mean that they all very soon turn to sweetness… Therefore, the sweetness in the urine comes forth, and the latter does not acquire its normal colour."

Thus, although starchy food was known to be part of the cause of diabetes, the kidneys, rather than the gastrointestinal tract, were still considered to be the culprit. Liu Wan-su, in San Xiao Lun (Treatise on the Three Wastings), hinted at the role of the stomach, writing: "If drinking and eating and taking of cakes and candies are not proper, the intestines and stomach become dry and desiccated and qi and fluids do not obtain normal diffusion."

During the Ming Dynasty (1368–1644), Tai Si-gong, in Mi Chuan Zheng Zhi Yao Lue (Essentials of the Secret Transmission of Proven Treatments), wrote on wasting and thirsting, "[If] the three wastings endure and the urination is not foul-smelling but, contrarily, becomes sweet, the qi is thrown out in the urine bucket and the disease gets worse." (Flaws BF et al, 2002)

In the Qing dynasty (1644–1912), Qin Chang-yu, in Zheng Yin Mai Zhi (The Causes, Pulses and Treatment of Conditions), wrote regarding diabetes: "following drinking, there is thirst; following eating, there is hunger; following urination, there is urination." During this period, the stomach, liver, and spleen became more central to the understanding of the condition. Ye Tian-shi, one of the greatest doctors of the dynasty, recommended the formula Shi Gao E Jiao Tang – gypsum and donkey skin glue decoction (Flaws et al, 2002).

Ancient Greek and Roman medicine

Studies of the writings of Hippocrates have not unearthed any reference to diabetes; it has been surmised that this was because he considered it to be incurable (see http://www.news-medical.net/health/History-of-Diabetes.aspx), although this is unlikely considering his interest in obesity and public health. On obesity, he wrote: "men who are constitutionally very fat are more likely to die quickly than those who are thin" (Mackenzie, 1758). He also described the energy balance equation as a means of maintaining good health and avoiding "distempers", stating "It is very injurious to health to take in more food than the constitution will bear, when, at the same time, one uses no exercise to carry off this excess… For as aliment fills, and exercise empties the body, the result

"During the seventh century, the physician Li Xuan concurred with the prevailing view that the urinary tract was the origin of diabetes, writing a monograph on wasting and thirsting and why urine was sweet."

"Galen gives important insights, saying: 'I am of the opinion that the kidneys too are affected in the rare disease that some call chamber-pot dropsy, diabetes or violent thirst. For my own part I have seen the disease till now only twice when the patients suffered from an inextinguishable thirst which forced them to drink enormous quantities; the fluid was urinated swiftly with a urine resembling the drink'."

of an exact equipoise between them must be, to leave the body in the same state they found it, that is, in perfect health."

Claudius Galenus, CE 129–circa CE 200, more commonly known as Galen, the renowned physician, surgeon, writer and philosopher, is regarded by many as the most important medical man in history (Grant, 2000; Ross, 1964). His huge portfolio of work included clinical practice and case studies on prevention of illness and regaining health, but also surgical dissection and vivisection, studied by medical students for 1500 years. Galen was born in CE 129 in Pergamum, an ancient Greek city in modern-day Turkey. He became doctor to the gladiators, teaching diet and nutrition for optimum health and ultimately becoming personal physician to Emperor Marcus Aurelius. His work centred on the teachings of Hippocrates, and the importance of the humours in disease. The human body contained four basic substances (humours): black bile, yellow bile, phlegm, and blood, which were balanced when a person in good health, and imbalanced in the diseased state. A person's character also depended on the balance of their humours: sanguine, choleric, phlegmatic or melancholic. Disease management centred on purging, bleeding and blistering; methods of rebalancing the humours. Galen followed these principles of Hippocratic tradition, adding a dimension of personal responsibility: the belief that, beyond a reliance on diet, everyone has the power to control their own lifestyle. In *De Temperamentis* he comments on obesity. If a fat person has broad veins he is not naturally fat but has become so by his mode of life. Those with broad veins also have more blood. Women tend to be fatter on the whole than men because they are colder by nature and more sedentary in their way of life. Galen's most important dietary treatise is *On the Power of Foods*, written about CE 180: he thought that a good doctor should also be a good cook.

Galen believed that "fat persons should be made thinner by warm bathing, strong exercise, hard beds, little sleep, proper evacuations, acids, and one meal a day." He described one of the earliest case studies of obesity: "I reduced a huge fat fellow to a moderate size in a short time, by making him run every morning until he fell into a profuse sweat; I then had him rubbed hard, and put into a warm bath; after which I ordered him a small breakfast, and sent him to the warm bath a second time. Some hours after, I permitted him to eat freely of food, which afforded but little nourishment; and lastly, set him to some work which he was accustomed to for the remaining part of the day."

On diabetes, Galen gives important insights, saying: "I am of the opinion that the kidneys too are affected in the rare disease that some call chamber-pot dropsy, diabetes or violent thirst. For my own part I have seen the disease till now only twice when the patients suffered from an inextinguishable thirst which forced them to drink enormous quantities; the fluid was urinated swiftly with a urine resembling the drink." "Diabetes is a genuine kidney disease, analogous to voracious appetite." "One may lay down as the cause, the atony of the kidneys as being no longer able to retain urine" (Henschen, 1969). Alexander Trallion was a Greek writer who followed in Galen's footsteps and practised Galenian methods. He confirmed Galen's view: "There are two circumstances in the condition of the kidneys which give rise to diabetes, namely the weakness of the retentive power, and the strength of their attractive power" – presumably strength in attracting fluid from the blood but weakness in holding it (Black and Black, 1811).

These passages of text demonstrate the rarity of the condition – probably almost universally type 1 diabetes – but also the perception still that the kidney was the diseased organ in diabetes. Henschen, writing in 1969, suggests that Galen was referring to diabetes insipidus because of the rarity of his encounters with it despite his large practice in affluent Rome, and the lack of mention of sweetness of taste of the urine. He hints that maybe obesity-related diabetes mellitus was not so dreadful, because of the possibility of successful management by lifestyle measures. However, against this view is the fact that Galen would have encountered diabetes mellitus in his practice more commonly than diabetes mellitus, and therefore would certainly have described it in his work. The Greek physician Aretaeus the Cappadocian, during approximately the time of the 2nd century, also linked diabetes with weight, or at least bodily habitus, writing: "Diabetes is a wonderful affection… being a melting down of the flesh and limbs into urine. Its cause is of a cold and humid nature as in dropsy. The melting is rapid, the death speedy. Moreover, life is disgusting and painful; thirst unquenchable."

The definition of "a humid nature" is open to interpretation, but is generally thought to mean soft

and cold, probably referring to overweight. Aretaeus coined the expression "diabetes" meaning "siphon". In *Therapeutics of Chronic Diseases* he specifies that "the defluxation is determined to the kidneys and the bladder."

Celsus described diabetes, and promoted physical activity as a cornerstone of treatment: "when the urine exceeds the quantity of the fluid taken, even if it passed without pain it gives rise to wasting and danger of consumption; if it is thin there is need for exercise and rubbing… the food should be astringent the wine dry and undiluted." Rufus of Ephesus, in the 2nd century, described "urinary diarrhoea" and promoted vomiting and blood-letting as treatments. Many writers in the Byzantine era, including Oribasius, Stephanus Alexandrinus, Aetius, Theophilus Protospatharius and Paulus of Aegina, described diabetes in a similar way, blaming the kidneys and bladder (Christopoulou-Aletra and Papavramidou, 2008).

Avicenna, Rhazes and Maimonades: Medieval writings

Ibn Sina, known as Avicenna, was a Muslim physician, philosopher and polymath; he was one of the most important figures in medical history. Born around 981 in Afshana near Bukhara, he studied and modified the works of Galen and Hippocrates to develop a vast knowledge of disease processes, and develop his own complete system of medicine. This is documented in *The Canon of Medicine*, and described as the most important medical book ever written (Nasser M et al, 2009). Remarkably, he had a particular interest in obesity, devoting several chapters to the condition, and accurately describing the associated problems: "Severe obesity restricts the movements and manoeuvres of the body. Breathing passages are obstructed and the flow of air is hindered leading to nasty temperament. The very obese are at risk of a fatal rupture of a blood vessel. They are vulnerable to stroke, hemiplegia, palpitation, diarrhoea, fainting and high fever." It is ironic that Ibn Sina should select obesity as a specialist subject, as now, over 1000 years later, obesity occurs in epidemic proportions, and Muslim populations are amongst the worst affected. Ibn Sina was a major proponent of weight loss as a means to improve health and quality of life, even prescribing weight loss drugs. Even earlier, Muhammad ibn Zakariya Razi, known as Rhazes, gave a description of obesity – "saman-e-mufrat" – and the link with gout, diabetes and high cholesterol, promoting vigorous management.

Maimonides, also known as Rabbi Moses Ben Maimon, or Rambam (born in 1135 Cordoba, Spain and died in 1204 in Fustat, Egypt) escaped Cordoba with his family when Muslim Almohads invaded in 1148, and fled to Morocco with many other Jews eventually settling in Egypt, where he worked as Chief Rabbi in Cairo, and as court physician. His major interest was in public health and the prevention of disease by diet exercise and lifestyle, many of his writings closely echoing Hippocrates and Galen: "One should not eat until one's stomach is full, but one should eat until one's stomach is three-quarters full… In the morning, one should work until one's body gets warm, then one should wait until one's soul has settled, and then one may eat. It is good to wash in hot water after having worked, then wait a while, and then eat."

"If only a person would care himself the way he cares for the animal he rides on, he would be saved from many bad illnesses. You will not find anyone who gives his animal more food than necessary. He measures out the animal's feed according to what the animal can take, but he himself eats to excess without measure and without a thought." In "*Regimen sanitatis*" he emphasised food selection and eating habits, as "fat people generally have shorter lives than thin people" and advising obese individuals to "lose the fat of his flesh through appropriate dieting". Maimonides claimed to have seen 20 cases of diabetes, blaming the sweet waters of the Nile. ■

Part II of this article, to be published in the next issue, will continue the story in 17th century Europe, and bring us through to research in the current day, looking at what we know about the role of gut hormones – why does Roux-en-Y gastric bypass have such a rapid and profound effect on resolving diabetes? What is known about the role of gut microbes and the metagenome in metabolism, insulin resistance, and even food choices? The author will propose that diabesity might one day become an obsolete term, restricting complex physiological and clinical concepts that affect the whole body, to merely a reminder that diabetes and obesity often co-exist.

Bhishagratna KK (1963) *The Sushruta Samhita* [English translation based on the original Sanskrit text]. Chowkhamba Sanskrit Series Office. Varanasi, India

Black A, Black C (1811) *The Edinburgh Medical and Surgical Journal. Volume 7.* Ramsay, Edinburgh

Choate C (1998) *Diabetes Mellitus From Western and TCM Perspectives - Part 2*. Available at: http://www.acupuncture.com/Conditions/diabetes2.htm (accessed 01.11.12)

Christopoulou-Aletra H, Papavramidou N (2008) 'Diabetes' as described by Byzantine writers from the fourth to the ninth century AD: the Graeco-Roman influence. *Diabetologia* **51**: 892–96

Davidson JK (2000) *Clinical Diabetes Mellitus: A Problem-Oriented Approach* (3rd edition). Thieme, New York, NY, USA

Dwivedi G, Dwivedi S (2007) *Indian J Chest Dis Allied Sci* **49**: 2432–44

Flaws BF et al (2002) *The treatment of diabetes mellitus with Chinese medicine*. Blue Poppy Press, Boulder, CO, USA

Grant M (2000) *Galen on Food and Diet*. Routledge, London

Henschen F (1969) On the term diabetes in the works of Aretaeus and Galen. *Med Hist* **13**: 190–192

Kansupada KB, Sassani JW (1997) Sushruta, the father of Indian surgery and ophthalmology. *Doc Ophthalmol* **93**: 159–67

MacFarlane I (2007) *Mathew Dobson (1735-1784) and diabetes*. Available at http://www.lmi.org.uk/Data/10/Docs/07/07MacFarlane.pdf (accessed 1.11.12)

Mackenzie J (1758) *The History of Health and the Art of Preserving It*. William Gordon, Edinburgh

Nasser M et al (2009) Ibn Sina's Canon of Medicine: 11th century rules for assessing the effects of drugs. *J R Soc Med* **102**: 78–80

Ross J A (1964) Galen. *Proc R Soc Med* **57:** 679–81

Sanders LJ (2002) From Thebes to Toronto and the 21st Century: An Incredible Journey. *Diabetes Spectrum* **15:** 56–60

Sims E, Danforth E, Horton ES et al (1973) Endocrine and metabolic effects of experimental obesity in man. *Recent Prog Hormone Res* **29**: 457–96

Tipton, CM (2008) Sushruta of India, an unrecognized contributor to the history of exercise physiology. *J Appl Physiol* **104**: 1553–6

Unschuld PU, Tessenow H (2011) *Huang Di nei jing su wen An Annotated Translation of Huang Di's Inner Classic – Basic Questions*. University of California Press, Los Angeles, CA, USA