The 4BE quinqunx: A model for obesity pathogenesis

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Abstract

For obesity management to be effective, one must appreciate its causes and consequences. To do so, the seemingly complex science of obesity must be made simpler. A model which helps us explain its causes, contributory factors, as well as potential corrective measures, is needed. We share the 4BE winged quincunx model of obesity etiopathogenesis. Four central players - the Brain, Bowel, Beta/alpha cell and Bulk (adipose tissue)- form a causative quadruple, with four wings- Environmental determinants, Endocrine factors, Enteric microbiome and Extraneous limitations. The centre of the quincunx is occupied, in a stylish manner, by the ABC of weight management: Attitude, Behaviour and Choices. The 4BE concept makes it easy for health care professionals to understand, and explain, obesity.

KEYWORDS: Biochemistry, endocrinology, obesity, overweight, pathogenesis, person centred care, therapeutic patient education

DOI: https://doi.org/10.47391/JPMA.25-46

Introduction

Obesity is a complex syndrome, characterized by multifaceted abnormalities. Multiple mechanisms have been proposed to explain the etiopathogenesis of obesity. These include rubrics such as the "octopus in the room", ominous octet and octagon of opportunities. These models have supplemented, and supplanted, the earlier uni-focussed concept of imbalance between energy intake and energy expenditure.[1-3]

As obesity has increased in incidence and prevalence, so has interest in its prevention and management. There is a need for a simple model of obesity, based on biochemical and physiological evidence. This construct should allow easy understanding of the syndrome, as well as its treatment. We propose the 4BE winged quincunx (Figure 1) to explain obesity in a person-friendly manner. This concept, along with the use of the words 'houseful' and hungry' hormones, suffices for most cases of obesity.

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The Quadruple

The 4 Bs, the brain, bowel, beta/alpha cell, and bulk (adipose tissue) are interconnected with each other, in a multidirectional manner.[4] All these organs produce both 'houseful' (satiety) (anorexigenic) and 'hungry' (hunger) (orexigenic) hormones and hormonoids (neurotransmitters, chemicals).

In health, the 4Bs live in harmony with each other, secreting houseful hormones when 'smiling' (satiated), and hungry hormones when 'starving'. The balance of these hormones ensures homeostasis and maintenance of weight.

Due to alterations in any of the four Bs, this process may get disturbed. Apart from the homeostatic eating meant to ensure optimal nutrition and weight, hedonistic eating (for pleasure) may become predominant. This leads to overconsumption of nutrients, and inability of the bowel and beta cell to metabolize these nutrients (incretin resistance, insulin resistance). Leptin resistance plays out at the level of 'bulk' (adipose tissue), which finds itself producing excess leptin, while being unable to respond to its signals. Once a vicious cycle sets in, the 'bulk' and bowel begin secreting hungry hormones in a dystonic manner.

This enhances the load on the beta cell (hyperinsulinaemia) and its adjacent alpha cell (hyperglucagonaemia), thus creating a state of islet cell fatigue. The bowel and liver are grouped together in the 4BE model, as the entero-hepatic circulation allows it to be considered as one contiguous anatomico-physiological organ. The bidirectional arrows in Figure 1 reinforce the multiplicity of mechanisms that operate to ensure cross-talk between the four Bs.

The Wings

While the 4B quadruple captures the essence of weight regulation, it does not address many important contributors to obesity. These are included in the wings of the 4BE rubric. This mentions external influences (social, psychological, economic determinants of obesity), the

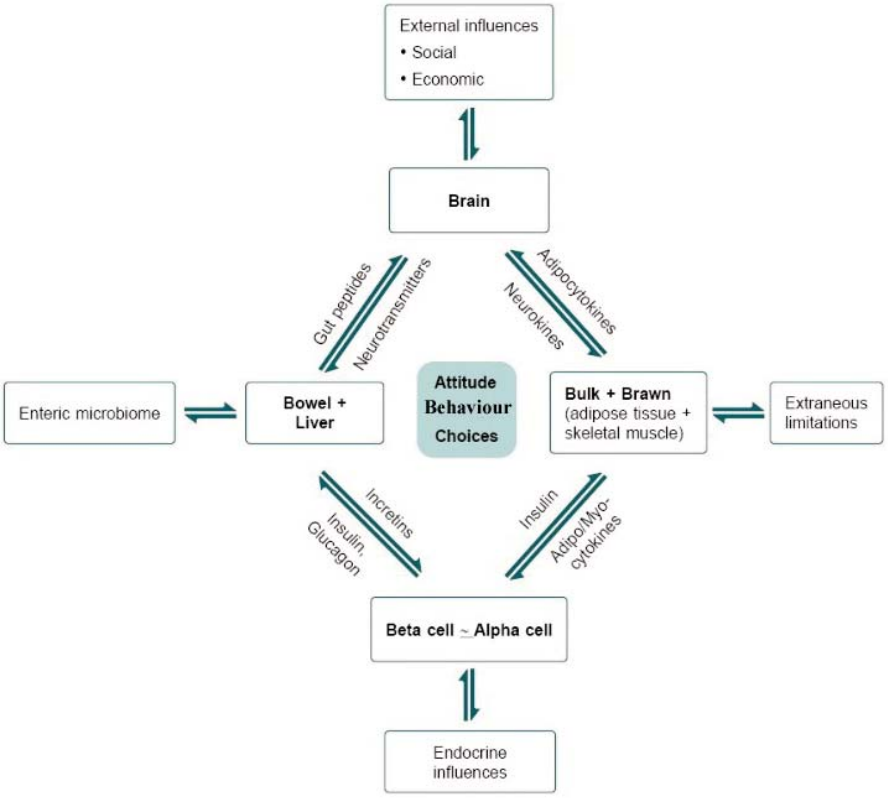

Figure: The 4be Quinqunx.

enteric microbiome, endocrine influencers (the hypothalamus, pituitary, thyroid, adrenals, gonads) and extraneous limitations (e.g. concomitant orthopaedic, surgical or medical disease which limit ability to exercise). Together, these cover almost all the pathophysiologic factors of obesity.

The Quinqunx

While the 4 BE model, as discussed so far, is a useful one, it does not mention two important determinants of weight: dietary intake and exercise. This is handled by converting the winged quadruple into a quincunx, with an ABC, attitude, behaviour and choices, at the centre of the diagram. The use of these terms, in alphabetical order, reinforces the importance of self-care and self-management (healthy daily routine, exercise, diet and stress handling), in a non-judgmental and non-stigmatizing manner.

Use And Utility

This quincunx lends itself to easy, step wise explanation of the causative factors and contributors of obesity. It encourages persons living with obesity, their care givers, and health care professionals, to think of obesity as a complex, but potentially conquerable,disease. While it underscores the need for comprehensive interventions, it also fosters the need for self-care. The model allows one to view obesity as a biomedical disease, negating feelings such as self-guilt and stigma.

The 4BE quincunx can be used to advocate for comprehensive obesity prevention and care services. Ideally, such endocrinology-led services, should be based on teamwork from nutritional, medical, mental, physiotherapeutic and surgical experts. We hope that this model will create a sense of appreciation of the challenges involved in weight management, foster such teamwork, and ultimately lead to better outcomes.

Acknowledgement: We thank Arnav Kalra for his insightful comments and critical analysis, and Tanuja Bisht for help in preparing the figure.

Disclaimer: None.

Conflict of Interest: None.

Source of Funding: None.

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