The Ketogenic Diet: A Solution to Ireland's Obesity Epidemic?

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Ireland is facing an obesity epidemic. To combat this, the Irish HSE advocates a multifaceted approach to weight loss: emphasizing increased exercise; decreased fat intake; increased carbohydrate, vegetable, and fruit consumption; and, if necessary, pharmaceutical intervention with Orlistat. Despite the Irish government's best intentions, new research is coming to light that implicates a low fat, high carbohydrate diet coupled with exercise and Orlistat is not the best way to obtain sustained weight loss. Rather, a low carbohydrate, high fat ketogenic diet yields much more promising, sustained results.

According to the World Health Organization, 25.2% of the adult Irish population currently qualifies as obese. By 2030, this number is expected to nearly double to a projected 47%, poising Ireland to become the fattest country in Europe[1]. In response to this estimation, the Irish Health Service Executive (HSE) has implemented "A Healthy Weight for Ireland" program, with a goal of promoting a sustained 0.5% weight loss per overweight and obese individual each year until that individual realizes a healthful weight. To accomplish this, the HSE promotes a multifaceted approach: emphasizing increased exercise; decreased fat intake; increased carbohydrate, vegetable, and fruit consumption; and, if necessary, pharmaceutical intervention with Orlistat[2]. Despite the Irish government's best intentions, new research is emerging that implicates a low fat, high carbohydrate diet (LFHCD) coupled with exercise and Orlistat is not the most efficacious method to obtain sustained weight loss among overweight and obese individuals. Rather, a low carbohydrate, high fat ketogenic diet (KD) yields more promising and sustained results.

Obesity has been rare throughout most of human history. Even in the United States of America, obesity is a relatively new phenomenon. Between 1960 and1962, 13.4% of the USA population qualified as obese compared to the 34.3% of the American population between 2007 and 20083. This increase in obesity was not gradual, but rather a sharp ascension. Between 1960 and 1980, obesity only increased 1.6%, but between 1980 and 2000, obesity in the United States increased 15.9%[3]. The USA led the charge in the obesity epidemic and the rest of the world followed, leaving many to ponder, what is the cause for this relatively new obesity phenomenon and why has its ascension been so drastic?

The answer lies partly in the 1977 governmental decree titled "Dietary Goals for the United States". This directive stated that excessive dietary fat leads to increased incidence in obesity, heart disease, and stroke[4]. The decree went a step further and declared that carbohydrates should constitute 55-60%

of daily calories and fat consumption should be limited to 30% of calories[4]. These dietary recommendations were reaffirmed numerous times by the American government after 1977, including in 1995 with the official introduction to the Food Guide Pyramid with 6-11 servings of grains daily recommended at its base. These dietary recommendations soon spread to the rest of the world, but what no one stopped to ask was, “where’s the evidence?”

An Alternative Diet

Holes began to emerge in the LFHCD in 2006 when the Women’s Health Initiative Dietary Modification Trial was published. This trial was conducted on 48,835 postmenopausal women in the USA from a diverse ethnic background. The trial examined two cohorts: a control group, instructed to eat as they normally would, and an intervention group, instructed to increase exercise, limit fat intake to 20% of their daily calories, increase their grain consumption to six servings per day, and increase their fruit and vegetable intake to five servings per day. What the study found was that the intervention group showed no statistically significant increase in weight loss across any pre-study BMI group over a 9-year period relative to the control group[5].

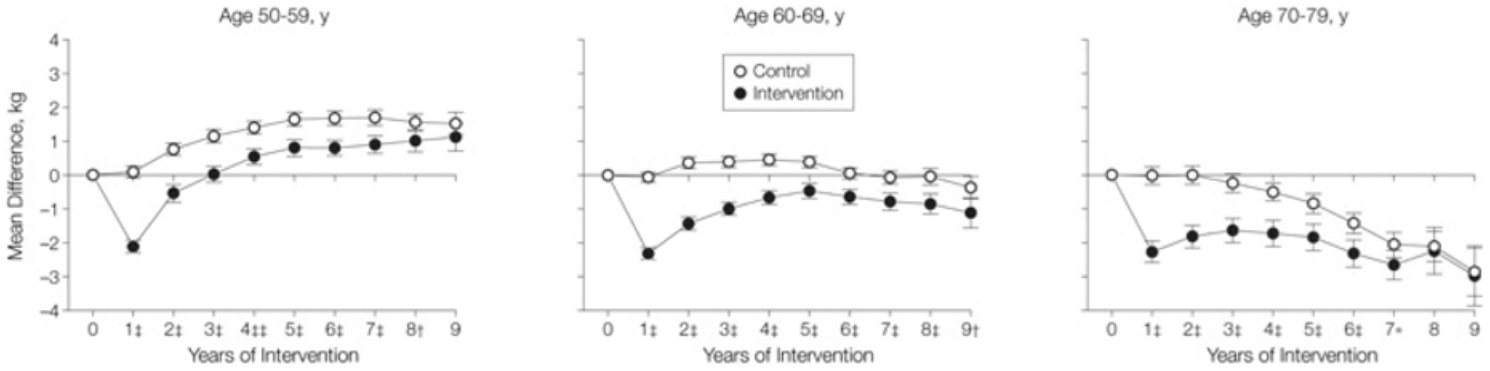

Figure 1: Stratification by baseline BMI showed that the differences in weight change between the intervention and control groups were similar across BMI groups[5]

Contrary to the modern LFHCD, the KD is a viable, natural option for long-term weight loss. A study conducted over 24 weeks on 83 obese patients who complied with a strict KD saw average weight reduction of 14.36 kilograms6. In a separate study, weight loss among 64 obese individuals on the KD was monitored over a 56-week period. Thirty-one of these subjects were suffering from Type II Diabetes prior to the study while 33 subjects displayed normal blood glucose levels. After 56 weeks the Type II Diabetes cohort lost an average of 24.55 kilograms while the normal blood glucose cohort lost an average of 30.35 kilograms[7]. The Type II Diabetes cohort also saw their blood glucose levels decrease from an average of 10.48 mmol/l to an average of 4.87 mmol/l, within the healthy range. In both studies (24 and 56 weeks), compliance with the ketogenic diet was accompanied by sustained weight loss, and no instances of regaining the lost weight. Further, a study comparing the HSE recommendation for weight loss (LFHCD combined with Orlistat), to the KD found the KD to be just as effective as promoting weight loss, serum lipid control, and healthy glycemic parameters as the HSE recommended diet, and was found to be more effective at lowering blood pressure[8]. In this sense, a simple dietary intervention

leads to greater health outcomes relative to an expensive pharmaceutical intervention with potential side effects.

Hormonal Regulation of Weight

A major reason why LFHCDs do not lead to significant long-term weight loss is because they ignore a major piece of the puzzle, which the KD addresses head-on: the hormonal regulation of weight. Ghrelin is an orexigenic hormone that is released by the stomach and acts on the hypothalamus to increase one's appetite, while peptide YY and cholecystokinin are released in response to food intake and act as appetite suppressants. A recent study found that when subjects were given a daily diet of 500 kcal they produced weight loss in the short-term of 13.5 kg[9]. Once the weight was lost, the subjects were prescribed a low-fat diet for weight maintenance and encouraged to exercise. The study found that all subjects regained almost half of the weight shortly after. More interestingly, ghrelin concentrations were found to have increased above their pre-study baseline one year after the initial weight loss, indicating that the individual's body was promoting further weight gain back to pre-study levels[9]. On the other hand, peptide YY and cholecystokinin had been significantly reduced in these subjects, indicating that these individuals required larger meals to feel satiated[9].

Two other hormones that play a role in controlling appetite are insulin and leptin. Insulin is released from pancreatic beta cells in response to food intake, especially carbohydrates, while leptin is secreted from adipose tissue in response to elevated plasma insulin levels. Together, these two hormones work, along with cholecystokinin and peptide YY, on the hypothalamus's arcuate nucleus to oppose ghrelin and promote satiety. In obese individuals, it has been found that both insulin and leptin levels are elevated proportionally relative to an individual's weight[10]. Constant elevation overtime leads to resistance and thus the chronically obese can partially lose the satiety signal in their brain. The KD, unlike the LFHCD, has been shown to robustly combat this metabolic resistance by decreasing serum leptin and insulin levels and increase other pro-health metabolic markers such as AMP-kinase and acetyl CoA carboxylase[11]. The KD has also been shown to suppress ghrelin levels and promote cholecystokinin release in the long-term, further adding to its' anti-orexigenic effects[12].

Safety Concerns

Despite emerging evidence indicating the effectiveness of prescribing the KD for long-term, sustained weight-loss, many remain skeptical as to whether it is a safe diet to prescribe to the obese. Main concerns remain regarding the diet's effect on the blood lipid profile and kidney function. Despite its paradoxical nature, decreasing carbohydrate while increasing fat and protein consumption has been found to lead to total cholesterol reduction, increased HDL, decreased blood triglyceride levels, decreased blood glucose levels, and lowered size and volume of LDL-C particles[13]. Further, over a two year period the low carbohydrate diet was not found to have any adverse effect on kidney function, with glomerular filtration rate, albuminuria, and fluid or electrolyte balance not being significantly

different compared to individuals on a low fat diet[14].

Because obesity is one of the key risk factors cardiovascular disease and metabolic syndrome, the HSE has outlined a number of strategies to combat the growing epidemic, including dieting, prescribing Orlistat, increasing energy output, and bariatric surgery. While general consensus about the fundamental basis of weight loss exists – change energy expenditure through decreased consumption and increased activity levels – how to achieve these goals is less clear. This is largely because in the past dietary obesity interventions were numerous, with little scientific evidence to recommend one over the other. This was the case until the scientific community began to understand the KD as a tool for weight loss. Because of this diet's success, coupled with increased physical activity levels and decreased energy consumption, further investigation into the KDs potential for long-term, sustained weight loss is advocated.

Conflict of interest

The authors declare no conflict of interest.

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