Joint Statement on Low Carbohydrate Diets for Health and Weight Loss

by Nutrition Society of South Africa (NSSA) and Association for Dietetics in South Africa (ADSA)

Any diet recommended for the short or long term should be nutritionally sound, not harmful to health or the environment, practical, affordable, and suit the individual's taste preferences and psychosocial environment. The current available evidence does not support an extreme low carbohydrate diet for reducing risk of disease. Low carbohydrate diets may enable some people to lose weight by reducing their energy intake and achieving an energy deficit. However, achieving a nutritionally adequate and healthy dietary pattern becomes problematic with extreme low carbohydrate diets that emphasise high fat intake from predominantly animal foods and restrict and eliminate many nutrient- and fibre-rich foods. The commercialisation of low carbohydrate diets is substantial and consequently many versions of this diet continue to be sold.

In recent years in South Africa, there have been many conflicting public messages provided about healthy eating, and what constitutes an appropriate diet for health and weight loss. This nutrition debate has received a lot of media attention, and while this heightened awareness and focus on the importance of optimal nutrition is positive, many members of the public are confused because the healthy eating and weight loss messages are not always consistent. This Joint Statement therefore aims to present explanations of key concepts and an overview of recent scientific evidence on low carbohydrate diets for health and weight loss. This statement is intended for use by health professionals.

Introduction

Low carbohydrate diets that restrict a variety of foods continue to receive media attention with ensuing intensified public interest and commercial benefits for marketers and retailers. Versions of these diets (e.g. Atkins, South Beach, Banting) make claims about weight loss and prevention and treatment of a range of diseases, such as diabetes, cancer, tuberculosis and Alzheimer's. They are typically promoted via books, magazines, courses, websites and social media, along with food or supplement products, as part of a multibillion dollar industry. This continues despite a considerable body of systematically synthesised scientific evidence showing that current dietary recommendations, which endorse a *range of carbohydrate*, protein and fat intakes and healthy dietary patterns[a], promote adequate nutrition and reduce disease risk.[1] Additionally, this evidence indicates that a number of different diets result in weight loss over the short term if energy intake deficit is achieved, although some dietary patterns may be more beneficial than others for sustaining long term cardio-metabolic health.[2-4]

[a] Dietary patterns can be defined as the quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed.[1]

Carbohydrate restriction

The currently recommended intake of carbohydrates ranges from 45 to 65% of total dietary energy,[5-8] and diets with less than 45% of energy from carbohydrates are regarded as being low in carbohydrates, as they fall below this recommendation. Commercial low carbohydrate diets generally cover a spectrum from extreme restriction, for example 5% of total energy, to more moderate, such as 30%. This restriction may be indicated as a daily quota expressed in grams, for example, 25 grams.

Implications

Carbohydrate restriction can result in an unbalanced and restrictive diet. Our total daily energy intake is derived from macronutrients (carbohydrate, fat and protein) in the diet. For a given level of energy intake (e.g. 8400 kilojoules), increasing the proportion of one macronutrient necessitates decreasing the proportion of one or both of the others. Thus when foods rich in carbohydrates such as grains, cereals and legumes are avoided and other carbohydrate sources such as dairy, fruits and vegetables are restricted, they are replaced with high fat and high protein foods, such as meats, cheese, butter, cream and oils. Diets rich in meat and dairy products pose a significant threat to environmental sustainability.[9,10] Furthermore, as most foods consist of varying combinations of carbohydrates, fats and proteins, compliance with a daily quota of less than 25 grams of carbohydrate, as an example, would permit only one medium-sized apple (about 180 g) with meats, fish and pure fats per day. Any further intake of fruit, vegetables, dairy, nuts, legumes, cereal foods [or grains], would lead to this quota of carbohydrates being exceeded. These foods are not only sources of carbohydrate, but also of other essential nutrients such as vitamins, minerals, water, fibre and phytonutrients. One needs to consider the complete 'nutrient package' of a food before excluding it from one's diet. Extreme carbohydrate restriction therefore makes a varied, nutrient- and fibre-rich diet near impossible to achieve.

Table 1: Recommended ranges of macronutrient goals from selected governmental bodies globally

	Nordic countries[8]	USA, Canada[7]	Australia, New Zealand[5]	Europe[6]
Carbohydrate (% of total energy)	45 – 60	45 – 65	45 – 65	45 - 60
Fat (% of total energy)	25 – 40	20 – 35	20 - 35	20 - 35
Protein (% of total energy)	10 – 20	10 - 35	15 – 25	---

Diet for health vs. Diet for weight loss

Simplistically, diets can be thought of as supporting health or weight loss. A diet for health focusses on preventing nutrient deficiencies and excesses, and reducing non-communicable disease risk. Such diets have a long time horizon with many years of exposure before outcomes, such as disease and death, emerge. By contrast, a diet aimed primarily at managing overweight and obesity has a shorter time horizon as weight change occurs over a relatively short time. Although these two types of diet have different objectives and time-frames, both should be nutritionally sound and avoid doing harm. Thus, diet for weight loss and diet for health are equally important.

Dietary Recommendations for Health

Dietary recommendations developed by governments and associated scientific bodies related to macronutrients, micronutrients, foods and dietary patterns for health aim to: (1) optimise physiological and mental functions and address clinical or subclinical nutrient deficiencies, and (2) reduce the risk of non-communicable diseases. These recommendations are informed by the totality of evidence emerging from various types of research including systematic reviews, randomised controlled trials, large cohort studies, controlled feeding studies and depletion/repletion nutrition studies. In deciding on the strength of specific recommendations careful consideration is given to the potential risk of bias, consistency of effects, generalizability of findings and other elements relating to the available research. While recommendations are usually made for healthy people,[4,5,7,8,11-13] disease-specific dietary guidelines also exist, such as those for people with diabetes or kidney disease.

Comprehensive, systematic and transparent assessments of the evidence, combined with wide consultation of stakeholders, underpin various dietary guidelines produced in Nordic countries,[8] the United States[1,4] and the United Kingdom[14] While the basic foundations of these guidelines have remained relatively stable over time; shifting patterns of disease and new evidence have resulted in some changes in emphasis and application as recommendations have been updated. More recent recommendations incorporate a wider range of macronutrient goals,[5-8] place a greater emphasis on the *quality* of macronutrient food sources; and focus to a greater extent on the *total* diet or *dietary pattern* rather than on isolated nutrients, than has been the case in the past.

Currently recommended macronutrient goals are shown in Table 1. These macronutrient ranges are known to be associated with reduced disease risk and provide adequate intakes of essential nutrients. Within the various ranges there is room for flexibility from lower to higher intakes of carbohydrate, fat and protein. However, extreme restriction or excess can be expected to result in an imbalance of macronutrient intake, suboptimal micronutrient intake and increased disease risk.[7]

Quality of foods and dietary patterns

A healthy diet involves more than ensuring intake of the required amount of nutrients to prevent deficiencies. The quality and variety of foods eaten and dietary patterns over time are equally important.[1,15] Foods provide a complex mixture of nutrients and other compounds that may have a synergistic effect on health.

Carbohydrates, fat and protein are not homogenous entities. Food structure, food source and processing influence their physiologic effects and the amounts that optimise nutrient status and reduce disease risk.[5,7] There is consistent evidence that reducing saturated fats (found predominantly in animal sources, coconut and palm oil) and *trans* fat (processed fats) by partially replacing them with unsaturated fats reduces the risk of cardiovascular events and coronary deaths. For every 1 percent of energy from saturated fats replaced with polyunsaturated fats, the incidence of coronary heart disease is reduced by 2 to 3 percent.[16-19] A recent Cochrane review 20 concluded: "there is a large body of evidence, including almost 60,000 people who have been in studies assessing effects of reducing saturated fat for at least two years each." The authors report that together, these studies show that reducing saturated fat and replacing it with polyunsaturated fats reduces our risk of cardiovascular disease. Analysis of the results suggested that the degree of reduction in cardiovascular events was related to the degree of reduction of serum total cholesterol, and the data suggested greater protection with greater saturated fat reduction or greater increase in polyunsaturated and monounsaturated fats. The evidence quoted refers to clinical disease endpoints (e.g. cardiovascular events, stroke) and is important in terms of effects on burden of disease. Dietary advice that encourages intake of saturated fat therefore may present a real risk for cardiovascular events, especially in at-risk patients. The evidence for replacement of saturated fat by monounsaturated fat or carbohydrate is not as clear, and this likely depends on type and source, but replacing saturated fat with refined carbohydrates may be harmful.[21] Thus, in contrast to the previous focus on absolute amounts, current recommendations now emphasise the *type of fat* (replacement of unhealthy fats with healthy fats), and the *type of carbohydrate* (encouraging consumption of minimally processed or unrefined grains and cereals higher in fibre, as well as beans, lentils, peas, fruit and root vegetables and discouraging highly refined carbohydrates and added sugars).[22,23] Notably, risks from saturated fat or refined carbohydrates are not mutually exclusive, but co-exist in diets, along with other risks related to, for example, sodium intake, fibre intake and total energy intake.

Healthy dietary patterns

Current evidence supports links between certain dietary patterns and risks of obesity and chronic diseases, particularly cardiovascular disease, hypertension, type 2 diabetes and certain cancers.[1,4]

For example, systematic reviews of large long-term studies show that several dietary patterns are equally and consistently associated with a reduced risk of future type 2 diabetes.[24-26] These dietary patterns vary in their actual macronutrient composition but share several common components, including whole grains, fruit, vegetables, nuts, legumes, healthy vegetable oils, proteins such as lean meat and seafood, little or moderate alcohol, and reduced intake of red and processed meats and sugar-sweetened beverages.

Recommendations from different countries based on best evidence have been consistent in what they have identified as healthy dietary patterns (Box 1). The following is an extract from the Nordic report8: "Decrease energy density, increase micronutrient density, and improve carbohydrate quality. Diets dominated by naturally fibre-rich plant foods will generally be lower in energy density compared to diets dominated by animal foods. Energy density is generally high in food products high in fat and added sugar. Whole grains and whole-grain flour are rich in dietary fibre and have lower energy density compared to refined grains and sifted flour".[4]

These guidelines also highlight the importance of achieving and maintaining a healthy weight by maintaining energy balance.

Low carbohydrate dietary pattern

It should be clear from the above, that the dietary pattern associated with carbohydrate restriction (especially the extreme form), is not aligned with healthy variety supported by the evidence. This is especially true for the animal-fat-based versions of low carbohydrate diets. At present, there is a lack of conclusive evidence regarding the health effects of low carbohydrate diets over the long term. However, preliminary data from cohort studies are available which point to an association between low carbohydrate intake and increased risks of heart disease and mortality.[28-31] There is also evidence of adverse effects, such as higher heart disease risk, from diets that emphasise animal fat[16-19] (e.g. butter and lard), and animal-derived foods.[1,11] Furthermore, elimination and restriction of many foods as recommended by low carbohydrate diets reduces dietary variety, which if maintained over time, can result in essential nutrient deficiencies. Promoting such restrictions is particularly concerning in South Africa where poor dietary diversity[32] and low vegetable and fruit intake[33] are prevalent. Various studies confirm that low carbohydrate diets are linked to poor vitamin C, B1, B3, B6, folate, magnesium and dietary fibre intake.[34,35]

In South Africa, low carbohydrate and high fat diets have been promoted by some as being appropriate for infants and young children, without sufficient examination of potential negative consequences of such recommendations. Exclusion of certain foods/food groups from the diet, as is recommended in low-carbohydrate high fat diet regimes, increases the risk for nutrient deficiencies. This is a serious concern in infants and young children as such deficiencies could compromise growth, cognitive development and health in general, during a vulnerable life stage.[36-38] Furthermore, fostering a healthy relationship with food during childhood is important, and balance, variety and moderation are important components that contribute to this relationship. Introducing a culture of 'dieting' or being placed on a diet in childhood is inappropriate and could lead to an unhealthy relationship with food later in life. Restrictive diets for infants should only be followed in specific medical conditions and under strict medical supervision.[39]

Box 1: Healthy dietary patterns as described in dietary guidelines from selected governmental bodies globally

United States of America's 2015 Dietary Guidelines Advisory Committee (DGAC)[4]: "The overall body of evidence examined by the 2015 DGAC identifies that a healthy dietary pattern is higher in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, legumes, and nuts; moderate in alcohol (among adults); lower in red and processed meats; and low in sugar-sweetened foods and drinks and refined grains."

Nordic Nutrition Recommendations 2012[8]**:** "Typical features of a healthy dietary pattern as described in NNR 2012 include plenty of vegetables, fruit and berries, pulses, regular intake of fish, vegetable oils, whole grains, low-fat alternatives of dairy and meat, and limited intake of red and processed meat, sugar, salt and alcohol."

Australian Dietary Guidelines 2013[12]: "A variety of foods should be consumed from each of the five food groups – vegetables and legumes/beans; fruit; grain (cereal) foods mostly wholegrain and/or high cereal fibre varieties; lean meats and poultry, fish, eggs, nuts and seeds, and/or legumes/beans; and milk, yoghurt, cheese and/or alternatives. Mostly reduced fat milk, yoghurt and cheese products are recommended for adults. Limit intake of foods containing saturated fat, added salt, added sugars and alcohol."

Brazilian Dietary Guidelines 2014[13]: "Natural or minimally processed foods, in great variety, mainly of plant origin, are the basis for diets that are nutritious, delicious, appropriate, and supportive of socially and environmentally sustainable food systems."

South African Food-based Dietary Guidelines, 2012[27]**:** "The food-based dietary guideline 'Enjoy a variety of foods' aims to encourage people to consume mixed meals, to increase variety by eating different foods from various food groups, and to alter food preparation methods. A healthy diet contains sufficient water, energy, macronutrients and micronutrient to meet requirements."

Culture, availability of foods and income are factors which should be taken into consideration when formulating public health guidelines intended for a population. Cost of food (affordability/economic accessibility), in particular, is considered a major barrier to following dietary advice, and price is the major factor influencing food purchases. Food insecurity is a public health issue in South Africa, with research showing varying levels of household food insecurity in different population groups. In some informal settlements in SA, household food insecurity is as high as 70%.[40]. Many people consume carbohydrate-based staples because that is all they can afford. For this reason, South Africa implemented the Regulations relating to the fortification of certain foodstuffs in 2003 to ensure that certain commonly consumed staples are fortified with a minimum quantity of specific micronutrients.[41]

Dietary recommendations for weight loss

The aetiology of overweight and obesity is complex. Various biological, psychological, social and economic vulnerabilities appear to be layered on relatively stable genetic and behavioural susceptibilities, all of which are poorly understood at present.[42,43] At the centre of this complexity is the physiologic principle that change in bodyweight results from an imbalance between the energy content of food consumed and the energy used by the body.[44] Sustained energy deficit results in weight loss and sustained energy excess results in weight gain.

Weight loss diets

Strong evidence demonstrates that, as part of a comprehensive lifestyle intervention offered by multidisciplinary teams of professionals, overweight and obese adults can achieve weight loss through a *variety* of dietary patterns if they achieve a sustained energy deficit. Although these dietary patterns will all result in weight loss over a 6-months to 2-year period, long-term effects on cardio-metabolic health may be negative with some dietary patterns.[2-4] Current dietary approaches appear to be insufficient to achieve adequate weight loss in most patients with severe obesity and bariatric surgery provides the only solution for these individuals.[45] Different weight loss approaches work for different people as long as they are able to achieve a reduction in energy intake.

The available evidence strongly suggests that *adherence* to diets is the key to weight loss success, and may explain a large part of whether people are able to achieve energy deficit for weight loss, especially in the long run.[44] Clinical trials have shown greater weight loss in groups that had better adherence to weight loss diets, regardless of whether diets were low carbohydrate or low fat.[3,46,47] Thus, ease of adherence is a critical consideration when recommending weight loss diets.

Dietary patterns that tend to be relatively low in total fat and moderate (not high) in carbohydrate are consistent with reduced risk of excess weight gain.[12] In this regard, evidence from a systematic review (including 33 randomised controlled trials (73 589 participants) and 10 cohort studies) showed that lower total fat intake leads to small but statistically significant and clinically meaningful, sustained reductions in body weight in adults in studies with baseline fat intakes of 28 to 43% of energy intake and durations from six months to over eight years. Evidence supports a similar effect in children and younger people.[48]

Low carbohydrate diets and weight loss

The renewed public interest in low carbohydrate diets has been precipitated in part by selective reporting of publications that suggest beneficial effects, especially on weight loss.[49-51] These studies have mostly been small, short (<2 years) trials comparing the effect of diets differing in macronutrient compositions on changes in weight and surrogate health outcomes of chronic diseases, such as blood lipid levels. Systematic reviews of all relevant trials have demonstrated no differences between the various diets[52,53] or very small differences after 6 months that disappear after 12 months.[49,50] It is, therefore, reasonable to conclude that any diet which supports a sustained dietary energy deficit results in weight loss, regardless of carbohydrate, fat and protein composition.[44,52,54] Low carbohydrate diets likely enable some people to lose weight by reducing their energy intake. Carbohydrate is the largest nutrient class, and greatest source of energy. Therefore, when people reduce carbohydrates, they tend to reduce total energy intake by eating less food.[55,56] Also, the associated higher protein[57] and fat intake[58] is known to decrease hunger leading to less food consumption and reduced energy intake. Finally, dietary free sugars[b] are a type of carbohydrate. Synthesised evidence from randomised trials and cohort studies[54,59] shows that weight change that occurs when intake of free sugars is increased or decreased results from the concomitant changes in energy intake. Reducing free sugar intake, especially from sugar-sweetened beverages, is seen as an important part of a multi-pronged, transversal strategy to reduce risk of overweight, obesity and dental caries.[60]

[b] Free sugars are defined as 'mono- and disaccharides added to foods by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit concentrates'.

Conclusions

Although obesity is acknowledged as a complex issue, many debates about its causes and solutions focus on exceedingly simple dichotomies presenting apparently competing perspectives, such as carbohydrate versus fat as the villain. Other examples of dichotomies include personal versus collective obligations for action, supply versus demand-type justifications for intake of unhealthy food, government regulation versus industry self-regulation.[43] In the recent Lancet series on obesity,[61] an exploration of the dichotomy of individual versus environmental drivers of obesity concludes that "people bear some personal responsibility for their health, but environmental factors can readily support or undermine the ability of people to act in their own self-interest".[43] The authors propose a reframing of obesity that stresses the reciprocal nature of the interaction between the environment and the individual.

Dietary patterns have and are rapidly changing in most countries, particularly in emerging economies, such as South Africa with natural or minimally processed foods of plant origin being displaced with industrialised food products. Aggressively marketed, ultra-processed[c], highly palatable, energy-dense foods now dominate our food systems. These foods contain less protein and fibre, more free sugars, total, saturated and *trans* fats, sodium and, for solid products, more energy per volume, than whole or minimally processed foods.[13,62,63]

[c] Ultra-processed foods are made from processed substances extracted or refined from whole foods e.g. oils, hydrogenated oils and fats, flours and starches, variants of sugar, and cheap parts or remnants of animal foods, with little or no whole foods.

Genuine progress in addressing the global obesity epidemic lies beyond the standoff between entrenched dichotomies, and includes changing our societal approach to food, beverages, and physical activity, as well as better accountability on the part of all actors involved.[43,64] Debates about the 'ideal' macronutrient-focused diet, while shedding little light on workable solutions to ameliorate the persisting problem of obesity; sends out mixed messages and creates public confusion. The opinions that low carbohydrate diets are the best and the solution for obesity (and many other illnesses), arise from good marketing and public relations, rather than good science. While giving attention to the multiple underlying factors involved in obesity, we need to ensure that dietary recommendations for the public are informed by the best, available up-to-date evidence and centred on *healthy foods* and *dietary patterns* rather than *isolated nutrients*, such as carbohydrates.[4,8,12,13]

This manuscript has not been peer reviewed and reflects the collective position of the Nutrition Society of South Africa and The Association of Dietetics in South Africa on the subject matter. The SAJCN will not accept any responsibility of any claims or dispute(s) arising from the contents of the manuscript.

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