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Dietary interventions for weight loss and cardiovascular risk reduction in people of African ancestry (blacks): a systematic review

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Abstract

Objective: To systematically review weight and cardiovascular risk reduction in blacks by diet and lifestyle changes.

Design: Randomised and non-randomised controlled trials of diet with/without lifestyle changes with duration of intervention ≥3 months, and published between January 1990 and December 2009, were searched in electronic databases including MEDLINE, EMBASE, CINAHL and CCTR (Cochrane Controlled Trials Register). Studies were included if they reported weight/BMI changes with changes in at least one of the following: systolic and diastolic blood pressure, fasting plasma lipids and glucose, and glycated haemoglobin.

Setting: Clinical, community and church-based interventions.

Subjects: Study participants were of African ancestry (blacks).

Results: Eighteen studies met the inclusion criteria. Average mean difference in weight loss was −2·66 kg, with improvements in all outcomes except total cholesterol. No significant difference was observed in outcome measures between all studies and studies that recruited only healthy participants or patients with type 2 diabetes.

Conclusions: Diet and lifestyle changes result in weight loss with improvements in cardiovascular risk factors in blacks. However, more culturally tailored programmes have been suggested to motivate and encourage blacks to participate in intervention trials.

Keywords
Weight loss
Cardiovascular risk reduction
Blacks

Obesity poses a major public health problem worldwide, driving an epidemic of associated complications such as type 2 diabetes mellitus and CVD[1]. People of sub-Saharan African ancestry (blacks) in Western countries exhibit higher prevalences of obesity and obesity-related cardiovascular disease risk factors than people of European ancestry (whites).

Surveys in the USA have indicated that the prevalence of obesity is 32·2% in the general population, 30·6% in whites and 45·0% in blacks. Among men, the prevalence is similar in whites (31·1%) and blacks (34·0%). However, black women are more likely to be obese (53·9%) than white women (30·2%)[2]. In addition to higher obesity rates, blacks have higher prevalences of CVD risk factors, including higher prevalences of diabetes, hypertension and stroke[3–6], and higher mortality rates from CVD[7] compared with whites.

The higher prevalence of obesity and CVD risk factors in blacks can be ameliorated by effective weight management. However, this is both a clinical and a public health challenge, as evidence from trials indicates that blacks underachieve in weight management programmes compared with whites[8–13]. Various reasons have been proposed for this including social and cultural barriers such as differential body-image ideals, cultural food attitudes, fewer models for physical activity, and normative views of overweight and obesity[14,15].

No review has been identified focusing on the effect of weight change by dietary and other lifestyle changes on risk factors in blacks. The present review is therefore opportune, given the higher cardiovascular risk in blacks, exacerbated by limited access to the knowledge or resources required to incorporate dietary and lifestyle changes[16].

Methods

Data sources and study selection

The following sources were searched: MEDLINE, EMBASE, CINAHL and CCTR (Cochrane Controlled Trials Register). Reference lists of original studies and other systematic reviews were also examined. Keywords used included 'blacks' or 'black Africans' or 'African Americans' or 'Afro-Caribbeans' or 'black British' or 'black Americans' and 'obesity' or 'overweight' or 'diabetes' or 'heart disease' or 'cardiovascular disease' or 'hypertension' in combination

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with 'intervention' or 'trial' using various suffixes. Electronic searches and reviewing of results were performed by one reviewer (G.O.A.).

Another reviewer (C.B.) assessed the relevance of identified studies for inclusion, and disagreements were resolved by consensus. Studies were included on the basis of: (i) dietary intervention with/without lifestyle change (behaviour change and physical activity) *v.* control; (ii) randomised or non-randomised controlled trials; (iii) black participants (for studies made up of mixed ethnicity, authors were contacted for subgroup results on blacks); (iv) duration of intervention ≥3 months; (v) studies published between January 1990 and December 2009; and (vi) reported weight/BMI change and change in at least one of the following: waist circumference, systolic and diastolic blood pressures, fasting plasma lipids and glucose, and glycated haemoglobin (HbA1c).

Data synthesis

A QUOROM (quality of reporting of meta-analysis) statement was used to describe how studies identified through the searches were processed[17]. Each study was summarized with regard to characteristics of participants and interventions, duration and dropout rate. Because of the various dietary interventions employed, results of included studies were not pooled but rather expressed as the average mean difference between intervention and control using StatsDirect Statistical Software version 2·7·7 (StatsDirect Ltd, Altrincham, UK).

Results

Findings and description of studies

Search results are summarized in the QUOROM flow diagram (Fig. 1). Eighteen studies met the inclusion criteria out of thirty-five potential studies[18–35]. Seven of the studies recruited healthy obese participants, ten enrolled only participants with diabetes[18,19,21,23,26,30,31,33–35] and one study recruited participants with hypertension[32]. Intervention duration ranged from 3·5 to 12 months (median of 6 months).

All studies took place in the USA, and about 50 % of the included trials recruited less than 100 participants in the either intervention or control arm. Furthermore all studies

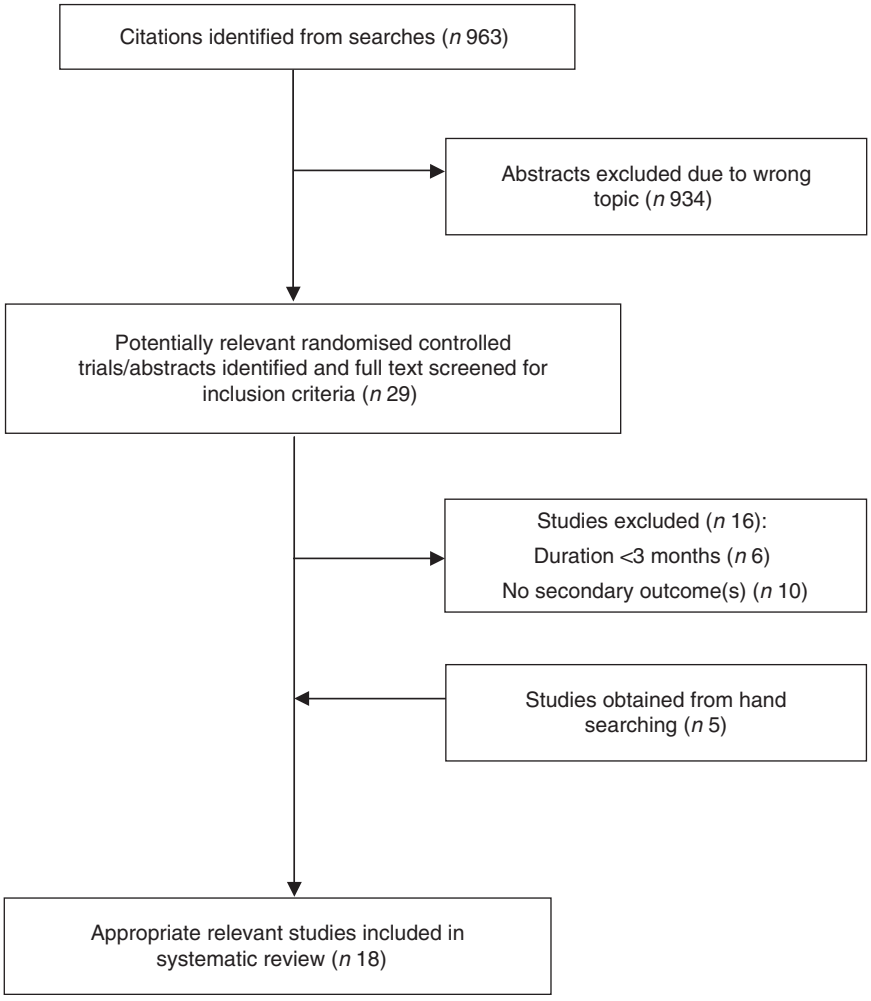

Fig. 1 QUOROM (quality of reporting of meta-analysis) flowchart

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employed dietary interventions/advice with lifestyle modifications (behaviour change and physical activity).

The majority (fifteen of eighteen) of the trials that were described as randomised specified eligibility criteria, but none explicitly stated the method of randomisation and details of allocation concealment in the trials. Incomplete outcome data were addressed in ten of eighteen trials. Six studies recruited only women participants[22,24,26–29] and the rest were of mixed gender. Most of the studies were clinic- or community-based, and only three were church-based[22–24]. Attrition rate ranged from 6% to 32%. Table 1 summarises the characteristics of the participants and interventions.

Outcomes

All studies showed a positive treatment effect on weight change between intervention and control except two studies[20,23]. Net average weight loss ranged from 5·40 kg in 3·5 months[35] to 2·49 kg in 6 months[18,19,22,26–29,31–33] and 2·91 kg in 12 months[20,21,23–25,30,34]. Average mean difference in weight loss was −2·66 kg for all studies, −2·63 kg for studies that recruited healthy participants and −2·76 kg for studies that enrolled only patients with type 2 diabetes. Even though weight loss in type 2 diabetes patients was higher, it was not significantly different from weight loss in all studies or in healthy participants (Table 2).

Weight loss was associated with net improvements in waist circumference (−2·95 cm), fasting blood glucose (−0·82 mmol/l), HbA1c (−0·51 %), systolic (−1·4 mmHg) and diastolic blood pressures (−0·6 mmHg), LDL cholesterol (−0·06 mmol/l), HDL cholesterol (+0·31 mmol/l) and TAG (−0·29 mmol/l), but not in total cholesterol. No significant difference was detected between all studies and the studies of healthy participants or type 2 diabetes patients for any outcome (Table 2).

Discussion

The higher prevalence of cardiovascular risk factors in blacks has been attributed to multiple influences of genetics, socio-economic factors and lifestyle that promote obesity and make weight loss difficult[36–40]. Reducing CVD risk factors in blacks by weight control has therefore not been effective, probably due to a lack of cultural competency in weight management programmes coupled with a failure to address issues of relevance to the population[41,42]. Additionally there is paucity of high-quality data on diet and lifestyle interventions for weight and cardiovascular risk reduction in people of African ancestry, and this gap presents a major hurdle in developing effective policies and programmes[43].

Reviews on weight management interventions in minorities have been published recently[44,45], but the magnitude of the average net treatment effect on cardiovascular risk reduction has not been studied in people of African ancestry. Eighteen out of thirty-five potential studies fulfilled the inclusion criteria of the present review. Most of the potential studies that were excluded targeted weight management without assessment of its impact on cardiovascular risk reduction.

The net average weight loss of 2·7 kg found in the present review is lower than that reported previously in mostly white Caucasian populations (−5·0 kg, range −0·40 to −7·80 kg) using standard 2510 kJ/d (600 kcal/d) deficit and low-fat diets for ≥12 months[46]. However, the results are comparable to analyses which showed, for each kilogram of weight loss, that systolic and diastolic blood pressures fall by 1·0 mmHg each[47] and blood parameters improve: total cholesterol by −0·13 mmol/l, TAG by −0·09 mmol/l, LDL cholesterol by −0·05 mmol/l, HDL cholesterol by +0·004 mmol/l[48] and fasting plasma glucose by −0·2 mmol/l[49].

Although the clinical significance of the results of the present review cannot be fully determined, one cannot dismiss its public health relevance in blacks. This is because studies have intimated that reductions in the incidence of type 2 diabetes and CVD can be achieved by sustained lifestyle changes[18,50–52].

Results of the Diabetes Prevention Programme (DPP) in which 19·9 % of participants were blacks[50,51] and the Look AHEAD study[34] in which 15·5 % of participants were blacks all provide a standard for weight management for the control of risk factors in blacks. Findings of the DPP and Look AHEAD should therefore be of interest to clinicians and public health researchers who are interested in implementing interventions in people of African ancestry. It must however be recognised that participants in the DPP were rigorously selected to be highly motivated and the intervention was resource-intensive to deliver[28,51].

Some of the studies included in the present review suffered from limitations, including small number of participants, lack of power to detect significant changes and high attrition rates. Some of the studies attempted to address the higher attrition rates by using the last observation carried forward (LOCF). However, such analysis underestimates or overestimates the results, depending on different dropout rates in treatment and control groups[53].

The present review has highlighted a serious deficiency of published research in an increasingly important area in people of African ancestry. Although interesting, the studies that have been published have used various approaches which have suggested improvement in weight and cardiovascular risk factor reduction in the medium term (6 months). However, changing attitudes may not by themselves lead to sustained behaviour change if the environment is not supportive of these changes[54]. More studies are therefore needed: first to examine the 'obesogenic' environment, health beliefs and the social context within which blacks live and work, and second to examine the motivators for behaviour change within this population.

Table 1 Key characteristics of studies included in the present review on dietary interventions for weight loss and cardiovascular risk reduction in blacks

Study	Mean age (years)	Mean BMI (kg/m^2)	Intervention *v.* control	Length of intervention (months)	Dropout rate (%)
Agurs-Collins *et al.* (1997)[18]	61·8	33·9	Weekly sessions on dietary advice and exercise (*n* 30) *v.* class session and informational mailings (*n* 25)	6	14
Anderson-Loftin *et al.* (2005)[19]	57.3	33.1	Low-fat diet advice plus peer group discussions (*n* 38) *v.* usual diabetes care class (*n* 27)	6	23
Becker *et al.* (2005)[20]	47.8	31.5	Lifestyle advice to reduce heart disease (*n* 196) *v.* enhanced primary care to reduce heart disease (*n* 168)	12	27
Racette *et al.* (2001)[21]	47.5	40.0	Diet and activity advice sessions (*n* 19) *v.* one diet and activity session (*n* 17)	12	24
Resnicow *et al.* (2005)[22]	13.8	32.7	High-intensity behavioural group intervention (*n* 53) *v.* moderate-intensity behavioural group intervention (*n* 70)	6	21
Samuel-Hodge *et al.* (2009)[23]	59·0	35·0	Individual counselling plus group sessions (*n* 96) *v.* standard educational pamphlets by mail (*n* 72)	12	16
Yanek *et al.* (2001)[24]	53·1	32·2	Healthy lifestyle sessions plus spiritual components (*n* 455) *v.* self-help information (*n* 74)	12	25
Zemel *et al.* (2005)[25]	41·9	34·5	High dairy/calcium plus energy restriction (*n* 17) *v.* low dairy/calcium plus energy restriction (*n* 12)	12	19
West *et al.* (2007)[26]	53	36·5	Individual motivational interviewing (*n* 42) *v.* attention as adjunct to behavioural weight-control programme (*n* 41)	6	16
Hall *et al.* (2003)[27]	59·9	28·9	Reduction in total fat intake to ≤20 % of energy (*n* 335) *v.* pamphlet on general dietary guidelines (*n* 203)	6	15
Samaha *et al.* (2003)[28]	53·5	42·9	Low-carbohydrate diet (≤30 g/d; *n* 43) *v.* low-fat diet (≤30 % of total energy derived from fat; *n* 36)	6	25
Kennedy *et al.* (2009)[29]	45·9	33·7	Classroom peer nutrition and physical activity lessons (*n* 18) *v.* monthly take home lessons (*n* 19)	6	0
Mayer-Davis *et al.* (2004)[30]	61·1	36·4	Intensive diabetes prevention programme (*n* 49) *v.* usual care (one individual session; *n* 56)	12	21
Ziemer *et al.* (2003)[31]	52·0	33·5	Healthy food meal plan (*n* 289) *v.* exchange-based meal plan (*n* 359)	6	32
Elmer *et al.* (2006)[32]	49·9	33·1	Comprehensive lifestyle modification (*n* 79) *v.* advice only (*n* 100)	6	12
Barnard *et al.* (2006)[33]	55·6	34·9	Low-fat vegan diet (*n* 22) *v.* American Diabetes Association guideline (*n* 22)	5·5	8
Look AHEAD Research Group[34]	58·7	36·4	Lifestyle intervention of group and individual meetings (*n* 399) *v.* diabetes support and education (*n* 404)	12	15
McNabb *et al.* (1997)[35]	56·6	33·5	PATHWAYS weight-loss programme (*n* 15) *v.* wait list control group (*n* 18)	3·5	6

Table 2 Outcome measures (expressed as average mean difference between intervention and control) of dietary interventions for weight loss and cardiovascular risk reduction in blacks[18–35]

Outcome	All studies	Healthy participants	Patients with type 2 diabetes
Weight (kg)	−2·66	−2·63	−2·76
Waist circumference (cm)	−2·95	−2·26	−3·63
Systolic blood pressure (mmHg)	−1·39	−1·54	−0·70
Diastolic blood pressure (mmHg)	−0·61	−0·77	−0·69
Fasting blood glucose (mmol/l)	−0·82	−0·2	−1·73
Glycated haemoglobin, HbA1c (%)	−0·51	–	−0·57
HDL cholesterol (mmol/l)	0·31	0·19	0·38
LDL cholesterol (mmol/l)	−0·06	−0·11	−0·04
Total cholesterol (mmol/l)	0·87	0·27	1·10
TAG (mmol/l)	−0·29	−0·86	−0·04

Cultural adaptations in interventions involving blacks have also been suggested, such as involving black providers, using a community setting, using the group's preferred language, and incorporating cultural food and activity preferences, traditions and concepts into programme content.

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