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Original article

Dietary analysis and nutritional behaviour in people with and without age-related macular disease

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SUMMARY

Background and aims: Consumption of antioxidant nutrients can reduce the risk of progression of age-related macular degeneration (AMD) - the leading cause of visual impairment in adults over the age of 50 years in the UK. Lutein and zeaxanthin (L&Z) are of particular interest because they are selectively absorbed by the central retina. The objectives of this study were to analyse the dietary intake of a group of AMD patients, assess their ability to prepare and cook healthy food, and to make comparisons with people not affected by AMD.

Methods: 158 participants with AMD were recruited via the UK charity The Macular Society, and fifty participants without AMD were recruited from optometric practice. A telephone interview was conducted by trained workers where participants completed a 24 h food diary, and answered questions about cooking and shopping capabilities.

Results: In the AMD group, the average L&Z intake was low in for both males and females. Those able to cook a hot meal consumed significantly more L&Z than those who were not able. Most participants were not consuming the recommended dietary allowance of fibre, calcium, vitamin D and E, and calorific intake was also lower than recommendations for their age-group. The non-AMD group consumed more kilocalories and more nutrients than the AMD group, but the L&Z intake was similar to those with AMD. The main factor that influenced participant's food choices was personal preference.

Conclusion: For an 'informed' population, many AMD participants were under-consuming nutrients considered to be useful for their condition. Participants without AMD were more likely to reach recommended daily allowance values for energy and a range of nutrients. It is therefore essential to design more effective dietary education and dissemination methods for people with, and at risk of, AMD.

1. Introduction

Age-related macular degeneration (AMD) can result in loss of central vision, and is the leading cause of visual impairment in adults (>50 years) in the UK [1]. In 2012, the prevalence of AMD was predicted to increase significantly by 2020 due to aging of the population [2,3].

The Age-Related Eye Disease Study (AREDS) [4] reported that taking a supplement containing vitamins E and C, beta-carotene and zinc reduced risk of progression of the disease by 25%. Since then, the carotenoids lutein (L), zeaxanthin (Z) have been identified as nutrients that can provide a protective role in the progression of AMD due to their antioxidant and photo protective properties [5]. Collectively, L and Z form the macular pigment which interacts with free radicals and reactive oxygen species, prevent lipid peroxidation and filter out high energy blue light [6]. Carotenoids are not produced by the body and must be obtained via the diet. Recently, the AREDS II [7] found that people who took a supplement containing L and Z instead of beta-carotene had their risk of progression reduced by a further 18% compared with the original AREDS formulation [7].

Despite results from AREDS studies, there remains confusion among patients and practitioners in what supplements to take, and what foods should be consumed in order to maximise absorption of useful nutrients [8]. Many patients turn to other organisations for

Abbreviations: AMD, age-related macular degeneration; RDA, recommended daily allowance.

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clarity of information such as the Macular Society – the UK charity that is devoted to helping those with diseases of the macula. Following the results of AREDS II, the Macular Society have advocated the use of the AREDS II formulation, where appropriate, and eating vegetables that are L&Z rich. The highest mole percentage of L&Z has been found to be in egg yolk, maize (corn), spinach, collard greens and kale [9].

Patients who have sought the help of the Macular Society could be considered an 'informed' population as they have information available to them in the form of monthly magazines, written material, a helpline and the Society's website. However, in a recent study, not all were not taking a nutritional supplement and many of those that did take a supplement were not taking a clinically proven formulation or dosage [10]. We therefore sought to investigate this population's dietary intake of L and Z, and compare it to a cohort of age matched patients without the condition. As dietary patterns are multi-factorial, any other contributing factors will be investigated.

The objectives of this study were to analyse the nutrient intake of a group of AMD patients and a group of non-AMD patients, and to determine their ability to prepare and cook healthy food.

2. Materials and methods

Using data from a previous study from Bartlett et al., it was calculated that for an average effect size (Cohen's d) of 0.4, a minimum sample size of between 15 and 94 would be appropriate for each cohort [11].

2.1. AMD participants

A total of 158 participants with AMD were recruited between January 2012 and March 2012. Recruitment was via the Macular Society helpline. Individuals who contacted the Macular Society helpline between January 2012 and March 2012 were asked if they would like to take part in a telephone survey. Inclusion criteria for potential participants were that they should be aged over 55 years and have been diagnosed with any form of AMD.

2.2. Non-AMD participants

A group of 50 participants without AMD were recruited between August 2013 and December 2013. Recruitment was via seven optometric practices around the UK and Aston University patient clinics. The study was advertised on posters, and individuals who took part volunteered of their own accord and provided contact details and a convenient time to be telephoned. The only inclusion criterion was that they should be aged over 55 years – individuals with co-morbidities and other visual problems were not excluded.

2.3. Survey design

A 36 question cross-sectional survey was designed to explore nutritional habits, supplement usage, physical abilities in food preparation and cooking, and sources of knowledge in order to ascertain the beliefs participants have, and compare their beliefs with their behaviours. The initial questions covered demographic topics, occupations and participants' perceptions of the link between nutrition and AMD. The terms 'wet' and 'dry were employed to coincide with many patient's understanding of AMD classifications. After a section on nutritional supplement use, the questions subsequently focused on perceived state of vision and health, and ability to perform preparation and cooking of food. Participants also provided a 24 h food recall. This was done as part of the telephone survey so the patient had little time to prepare and would be more likely to report honestly. Participants were asked to quantify the amounts of food eaten by using the Zimbabwe Hand method [12] – participants used their palms or fingers to estimate the portion size of various foods. The survey was then piloted, refined and administered to the cohort. Full details of the piloting process and survey design and are reported elsewhere [10]. The focus of this report is on the dietary aspects of this survey and cooking abilities, hence, not all the results of the 36 questions are covered here [10]. The participants' occupations were divided into 10 major groups using the International Standard Classification of Occupations (ISCO) version 08.

The 24 h food diary data was analysed using nutritional software A La Calc (Red Hot Rails LLP, Doncaster, UK.), where each participant's daily food was analysed for numerous nutrients, calorie values and other constituents using the USDA (United States Department of Agriculture) SR25 food database (http://ndb.nal.usda.gov/).

2.4. Procedure

If an AMD patient decided to participate, oral informed consent was obtained over the telephone and they were advised that they could withdraw at any time. An appointment was scheduled for a future telephone interview or the interview began immediately if the AMD patient agreed. Non-AMD patients who provided their contact details were telephoned at a time that they specified was convenient, and the interview usually began immediately. The survey typically lasted 25 min and was administered either by RS or by one of four Macular Society employees who were trained by RS. All responses were recorded using Bristol Online Survey software (University of Bristol, Bristol, UK) [10].

2.5. Data and statistical analysis

Descriptive analyses were performed using the software Microsoft Excel. Data was then analysed in statistical software IBM SPSS version 20 (IBM UK Ltd, Portsmouth, Hampshire) to draw comparisons between results using parametric and non-parametric tests as not all the data was normally distributed.

2.6. Ethics

This study was conducted according to the guidelines laid in the Declaration of Helsinki and all procedures involving human subjects were approved by the Aston University Ethics Committee. Verbal informed consent was obtained from all subjects and formally recorded.

3. Results

3.1. Sample characteristics: AMD participants

Table 1 shows some of the demographic characteristics of the sample; AMD participants were aged 56–95 (mean 79 ± sd 7.8 years). Of the AMD cohort, 61% were female, with both sexes showing similar age distributions. The prevalence of 'wet' and 'dry' types of AMD was almost equal. The mean duration of the disease was 6.08 ± 4.7 years (median 5 years, range 1–25 years). The majority of AMD participants (63%) were not registered sight impaired (partially sighted) or severely sight impaired (blind). There was a trend for participants who were on a visual impairment register to have had AMD for a longer time period (Mann–Whitney $U = 977.5$, $p = 0.07$). No AMD participant felt that their vision was "*extremely good*" on the day of the interview - 57% of participants felt their vision was "*poor*" or "*extremely poor*" and only 7% felt their vision was "*good*". These results contrast with perceptions of general