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Review Article

A systematic review and meta-analysis of primary prevention programmes to improve cardio-metabolic risk in non-urban communities

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ABSTRACT

Introduction. Although cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM) prevention programmes have been effective in urban residents, their effectiveness in non-urban settings, where cardio-metabolic risk is typically elevated, is unknown. We systematically reviewed the effectiveness of primary prevention programmes aimed at reducing risk factors for CVD/T2DM, including blood pressure, body mass index (BMI), blood lipid and glucose, diet, lifestyle, and knowledge in adults residing in non-urban areas.

Methods. Twenty-five manuscripts, globally, from 1990 were selected for review (seven included in the meta-analyses) and classified according to: 1) study design (randomised controlled trial [RCT] or pre-/post-intervention); 2) intervention duration (short [<12 months] or long term [≥12 months]), and; 3) programme type (community-based programmes or non-community-based programmes).

Results. Multiple strategies within interventions focusing on health behaviour change effectively reduced cardio-metabolic risk in non-urban individuals. Pre-/post-test design studies showed more favourable improvements generally, while RCTs showed greater improvements in physical activity and disease and risk knowledge. Short-term programmes were more effective than long-term programmes and in pre-/post-test designs reduced systolic blood pressure by 4.02 mm Hg (95% CI −6.25 to −1.79) versus 3.63 mm Hg (95% CI −7.34 to 0.08) in long-term programmes. Community-based programmes achieved good results for most risk factors except BMI and (glycated haemoglobin) HbA1c.

Conclusion. The setting for applying cardio-metabolic prevention programmes is important given its likelihood to influence programme efficacy. Further investigation is needed to elucidate the individual determinants of cardio-metabolic risk in non-urban populations and in contrast to urban populations.

Contents

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1. Introduction

The burden of cardiovascular disease (CVD), and its common precursor type 2 diabetes mellitus (T2DM), extends globally but differentially according to location and population profile (Mendis et al., 2011).

Globally, CVD accounts for over 30% of deaths per year (Mendis et al., 2011) and a significant proportion of the population have risk factors that contribute to the development of CVD (ABS, 2011). While CVD can be attributed to risk factors that cannot be modified, many cases are caused by risk factors that can be detected and treated; including but not limited to, elevated blood cholesterol and sugar, overweight/obesity, hypertension, smoking and physical inactivity (Mendis et al., 2011). Individuals with multiple risk factors, as in the case of metabolic syndrome (MetS) and type 2 diabetes mellitus (T2DM) are at increased risk of CVD (Mendis et al., 2011). Many risk factors are shared between diabetes and CVD such that diabetes risk reduction programmes are associated with a reduced incidence of CVD- and all-cause-mortality, as well as diabetes after 23-years follow-up (Li et al., 2014). Hence, application of public health and clinical interventions to reduce the major risk factors for these diseases, while differing in their focus (e.g. dietary intervention to reduce saturated fats for CVD versus carbohydrates for diabetes), could substantially reduce the disease burden.

People living in rural, regional and remote (non-urban) locations have worse health compared to their metropolitan counterparts (Department of Health, Victoria, 2008) with mortality rates rising with greater remoteness (ABS, 2011). Non-urban residing individuals are renowned for having higher levels of antecedent risk for CVD and this observation is paralleled around the globe from Africa (Strasser, 2003) and Europe (World Health Assembly, 2009), to USA (Singh and Siahpush, 2014) and Australia (Trickett et al., 1998). In particular in Australia, a higher proportion of non-urban individuals had high blood pressure (BP, 40%) (Carrington et al., 2010) and were overweight or obese (70%) (Carrington et al., 2010) compared to urban residents, where 32% had high blood pressure (Carrington et al., 2010) and 64% are overweight or obese (Carrington et al., 2010). Non-urban populations are geographically more distant from specialist health care (Carrington et al., 2012) and locally, have limited availability to primary care services per capita (Clark et al., 2007), few or no walking paths or bike tracks and may pay more for fresh produce and meat (Burns et al., 2004). Non-urban dwelling residents tend to be from lower socio-economic backgrounds (reflected by occupational and educational status) (Trickett et al., 1998), engage in sub-optimal dietary and lifestyle behaviours (ABS, 2011), and have poorer attitudes toward health (Elliot-Schmidt, 1997) which may contribute to regional disparities in cardio-metabolic health outcomes. The interpretation of these findings are strongest when representative national comparisons are made yet may be diluted when extrapolated to more local areas where CVD risk and outcomes have been shown to be no worse between urban and non-urban residents (Tideman et al., 2013). These key differentials suggest that a one-size-fits-all approach to preventive health may not always suffice. While lifestyle modifications to improve cardio-metabolic risk in an urban setting have been widely reviewed and deemed efficacious (Gillies et al., 2007), few studies have investigated their effectiveness in non-urban populations. The aim of this systematic review therefore was to assess the effectiveness of primary prevention programmes targeting cardiovascular disease and/or diabetes risk in non-urban adults.

2. Methods

In 2015, relevant publications and research reports on primary prevention programmes relating to cardio-metabolic health were identified utilising specific search terms with Boolean operators (rural/regional/remote AND prevention/intervention/programme AND cardiovascular disease/CVD/diabetes/T2DM/metabolic syndrome) via Ovid Medline, PubMed, PsychINFO, EMBASE, Cochrane Database of Systematic Reviews and CINAHL plus. Reference lists of included publications were also examined for additional relevant inclusions.

3. Inclusion and exclusion criteria

The abstracts of potentially relevant manuscripts were reviewed by two independent reviewers for eligibility with a third reviewer's opinion where there was no consensus. Publications were included if they: were published between the years inclusive of 1990 and 2015, were defined as rural, regional or remote studies; were primary prevention in nature; and were focused on CVD or diabetes risk factors. Studies were excluded from review if; the publication pre-dated 1990, sample size was less than 30, the programme duration was less than 6 months; or if analyses included individuals aged under 18 years of age. Observational studies and studies targeting secondary prevention were excluded in addition to literature reviews, single-participant case-studies, opinion pieces, animal studies and non-peer reviewed publications such as editorials and letters.

As shown in Fig. 1, a total of 8671 records were identified. After removal of duplicates, 6215 titles were identified for review. Of these, 6154 abstracts were excluded, predominantly because their focus was incongruent with the aims of this review. Upon reading the articles (61 in total), an additional 36 manuscripts were excluded, again mainly due to incongruence. Ultimately, 25 eligible study publications were included in this systematic review.

4. Definitions

4.1. Non-urban

There is no universal definition for “non-urban”. For the purpose of this review, the term non-urban will be used as a collective for rural, regional and remote communities, indicating distance from a