Original Research

Comparing metabolic control and complications in type 2 diabetes in two Pacific Islands at baseline and following diabetes care intervention

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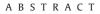[c] Ministry of Health and Medical Services, Solomon Islands
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ABSTRACT

Aim: To compare metabolic control and complications in people with type 2 diabetes in Nauru and the Solomon Islands before and after a project intervention.

Methods: This follow-up study compared metabolic control and complications in a cohort of 216 people with diabetes (81 from Nauru and 135 from the Solomon Islands) at baseline and 15 months following a project intervention (upgrading and equipping the existing diabetes centres, and providing training and clinical support systems) aimed at improving the quality of clinical diabetes care. Subjects were screened using a standardised protocol which gathered information on demographics, treatment, physical and biochemical parameters and their outcomes.

Results: At follow-up, glycaemic control had improved and mean HbA1c had decreased in study participants in both Nauru (mean difference (MD) = –0.9 ± 2.3%) and the Solomon Islands (MD = –0.6 ± 1.4%), $P < 0.001$. Mean blood pressure was reduced in the Solomon Islands (systolic MD = –11.6 ± 19.2 mmHg and diastolic MD = –5.4 ± 10.5 mmHg), $P < 0.001$. There were no significant changes in mean blood lipids or albumin–creatinine ratio. Overall the percentage of subjects achieving recommended clinical targets increased. However these percentages remained low, e.g. 23.5% of participants in Nauru and 20.7% in the Solomon Islands achieved an HbA1c target <7% (53 mmol/mol). A trend towards lower complications rates of foot problems was observed but there were no significant changes in the prevalence of other diabetes complications.

Conclusions: This study indicates improved metabolic control but little change in diabetes complications 15 months after intervention. Efforts to improve and evaluate the ongoing quality and accessibility of diabetes care in Pacific Island settings need to be further strengthened.

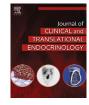© 2016 Published by Elsevier Inc.

Introduction

Diabetes is a major health problem and a global threat to human and economic development, striking hardest at the world's low and middle income countries [1,2]. This is particularly apparent in Pacific Island countries (PICs) which account for seven of the top ten countries with the highest diabetes prevalence worldwide [3,4].

Diabetes complications rates in PICs are high. For example, the prevalence of diabetic retinopathy is reportedly over 50% in Nauru and Fiji [5,6]; microalbuminuria was over 40% in Nauru, Vanuatu and Papua New Guinea [5,7]; and diabetes related amputations were

approximately 11% in the Solomon Islands, Nauru and Vanuatu [5]. The prevalence of risk factors for developing diabetes complications was also substantial. For example, over half of the adult population in most PICs were physically inactive; over 70% were overweight and/or obese in countries such as American Samoa, Samoa, Tokelau and Nauru; and more than 80% consumed too few fruits and vegetables in Cook Islands, Kiribati, Nauru and Tokelau [8]. Studies in the Solomon Islands, Nauru, Vanuatu and Papua New Guinea also reported poor clinical outcomes in people with diabetes with over 60% [5,9] not meeting glycaemic control targets thus exacerbating existing diabetes complications.

Much of the human and social impact caused by diabetes could be averted through cost effective interventions [10,11], and certain clinical processes and practices can delay the onset of diabetes and its complications [12–15]. Despite this, there remain major

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deficiencies in access to essential treatments, technologies, and recommended standards of care for people with diabetes in most if not all PICs [9,16,17]. In addition, there are serious knowledge and evidence gaps which hamper progress. For example, a recent review of the status of the epidemiological, health, social, and economic impact of diabetes in PICs [18] found deficiencies in the quantity, quality and currency of the evidence about diabetes care and outcomes in PICs. Several of the 35 studies reviewed were published 20 or more years ago. In the available studies, sample sizes and characteristics (e.g. age range) varied considerably as did the diagnostic tools and criteria used, thus making comparisons virtually impossible. Only one costing study was available and no pre-post evaluations of interventions were reported.

In order to improve the quality of diabetes care and contribute to the pool of knowledge about the effectiveness, or otherwise, of intervention in PICs, we undertook a diabetes capacity building project in Nauru and the Solomon Islands in partnership with the respective Ministries of Health. The aim of the overarching project was to design and implement a locally relevant and sustainable model to increase the capacity of Nauru and the Solomon Islands to manage, monitor and improve diabetes care and reduce diabetes complications.

The methodology for the overarching project has previously been described for an identical project in Vanuatu [19]. The quality of care component of the project was predicated on:

1. Upgrading diabetes care facilities through the introduction of:
   - DCA analysers to enable measurement of HbA1c and microalbuminuria, LDX analysers to enable measurement of lipids, and basic equipment for assessing blood pressure, capillary blood glucose, peripheral neuropathy, etc
   - Computers and electronic patient records to enable standardised data collection of metabolic control and complications
2. Introducing agreed diagnostic criteria, clinical targets and protocols [19], and referral criteria for assessing and managing metabolic control and complications
3. Upskilling local staff and strengthening interaction between hospital and community health care workers through:
   - in-Australian training for key PICs personnel on all aspects of the project
   - in-country training for local diabetes teams by visiting specialist diabetes teams from Australia
   - a national diabetes care training program for primary health care workers
   - the introduction of staff competencies for diabetes care

This current study was one of a number of evaluations undertaken to assess the impact of the overarching project. It was conducted under a Memorandum of Understanding between the researchers and Ministries of Health and Medical Services in Nauru and the Solomon Islands with the approval of the Human Research Ethics Committee, the University of Sydney and Research Ethics Committees of the Nauru and Solomon Islands.

Aim

The aim of this study was to compare metabolic control and complications in a cohort of people with type 2 diabetes in Nauru and the Solomon Islands at baseline and 15 months following intervention.

Subjects, materials and methods

Metabolic control and diabetes complications were assessed at baseline and 15 months following intervention in a cohort of 216 people with type 2 diabetes (81 from Nauru and 135 from the Solomon Islands).

Subjects

At baseline, a convenience sample of 260 subjects (100 from Nauru and 160 from the Solomon Islands) attending the diabetes clinics in each country during a one week period, which coincided with a visit by an Australian diabetes team, were screened for metabolic control and diabetes complications and the results have been reported elsewhere [5]. At 15 months following intervention, a cohort of 216 subjects (81 from Nauru and 135 from the Solomon Islands) returned for reassessment. Overall follow-up rate was 83% (81% from Nauru and 84% from the Solomon Islands).

The intervention

The key component of the project intervention relevant to this study centred on upgrading and equipping the existing Diabetes Centres in both countries, and providing training and clinical support systems to assist the local diabetes care teams to better assess and manage metabolic control and diabetes complications. At baseline, clinical management guidelines and protocols (including agreed clinical targets) were introduced. These, including education materials, were based on internationally recognised evidence-based guidelines and adapted specifically to each local setting for literacy and cultural appropriateness in collaboration with the local diabetes teams and Ministries of Health. An electronic patient record and information system previously adapted for use in the Pacific, along with appropriate computer hardware and software to support it, was introduced in both countries. The local diabetes staff of doctors and nurses were trained on the above, initially by two of the project leaders and visiting diabetologist according to a pre-developed training package. The package included limited patient education training but a strong focus on foot care and training in the use of new equipment, reagents and supplies for physical and biochemical assessment of metabolic control and complications as described below under *Diagnostic methods, criteria and targets.*

Subjects were screened and assessed at the diabetes centre of the national referral hospitals in each country by an Australian diabetes team assisted by the local diabetes team using a standardised protocol which gathered information on demographics, treatment, physical and biochemical parameters and outcomes.

Diagnostic methods, criteria and targets

The following diagnostic methods and criteria were used.

i) Height and weight were measured and body mass index (BMI) was calculated. Overweight was defined as a BMI ≥25 and obese as a BMI ≥30.
ii) Resting blood pressure was measured three times using the Omron digital automatic blood pressure monitor and mean blood pressure was used in the analysis. Hypertension was defined as a systolic blood pressure of ≥140 mmHg and/or diastolic blood pressure of ≥90 mmHg or taking anti-hypertensive medications.
iii) Visual acuity was checked and fundus examination through dilated pupils was performed by an experienced optometrist.
iv) Foot sensation was assessed by trained nurses using a 10 g monofilament. Neuropathy (abnormal foot sensation) was defined as a loss of the ability to detect this pressure at one or more anatomic sites on the plantar surface of the foot.