Reddy, R., Trinidad, R , Seremai, J, & Nasa, J. / Californian Journal of Health Promotion 2009, Volume 7, Special Issue (Obesity Prevention), 125 - 130

Marshallese Diabetic Health Improvement Pilot Project in Ebeye

Ravi Reddy[1], Richard Trinidad[2], Johannes Seremai[2], and Joaquin Nasa[2]

[1]*University of Hawaii, John A. Burns School of Medicine, Department of Family Medicine & Community Health*
[2]*Ebeye Public Health Center*

Abstract

Objectives – Translation and implementation of a diabetes mellitus type 2 educational curriculum in Ebeye, an island within the Republic of Marshall Islands, and a preliminary evaluation of improvements in health outcomes. *Methods* – Ebeye Public Health Clinic Health Educators held a series of hourly diabetes mellitus type 2 educational sessions with 17 Marshallese participants, based on a curriculum previously used with a group of Marshallese diabetics in Hawaii, focusing on diet, exercise, medications, and insulin administration. Baseline and six month data was collected on surrogate markers of health status. *Results* – After 6 months, statistically significant improvements were seen in the percentage of participants with blood pressure < 130/80 mmHg and weight loss of at least 10 pounds since their last visit. Minor trends toward improvement were observed in participation with; statin treatment, self monitoring of blood glucose goals set, and nutritional counseling. *Discussion* – Some markers of diabetic health improvement were observed in this preliminary translational study, and similar studies in other Pacific areas are being planned.

Keywords: Diabetes, Pacific Islander, Marshallese, Ebeye, Health Education, Community-based Health Improvement

Introduction

The current global epidemic of Type 2 Diabetes (DM2) has disproportionately affected non-white populations, particularly members of relatively isolated indigenous groups that have rapidly industrialized. The increased rates of DM2 in such populations has been well documented, and ascribed to the combination of genetics favoring food storage and environmental changes involving increased consumption of fat and total calories (Mau, Grandinetti, Arakaki et al., 1997).

Data from the Republic of Marshall Islands (RMI) Bureau of Health Statistics show that between 1996 and 2000, DM2 was listed as the leading cause of death, accounting for 30% of deaths. The economic and personal costs of this disease have been devastating to Marshallese families who have endured strokes, myocardial infarctions, end-stage renal disease, and extremity amputations due to DM2. Furthermore, a recent epidemiologic study showed that Ebeye, a densely populated island of the Kwajalein atoll, had a 20% prevalence of DM2, more than twice the U. S. prevalence rate (Yamada et al., 2004). The study suggested that 20% is likely an underestimation of the true prevalence.

A previous intervention pilot study of Marshallese with diabetes in Oahu showed that the majority had poor glycemic control with secondary co-morbid conditions (Reddy, et. al. 2005). Although many barriers exist for successful implementation of a diabetes health improvement project in this group, the groundwork for translation of this project to the RMI was put forth, and curriculum translation

and patient recruitment was then started, to move the project to Ebeye, RMI.

Methods

The Principal Investigator (PI) met with Ebeye Public Health Clinic staff, completed and refined translation of the DM2 curriculum previously used in Oahu, to ensure cultural appropriateness for the DM2 population in Ebeye. This curriculum entailed weekly, one hour sessions on diet, exercise, medications, and insulin administration, over a 4 month period. During these sessions, group members shared their experiences with diabetes, its attendant health effects, and successes and failures in their control of this disease. Prior to the educational sessions, a group meeting exploring the content and goals of the educational sessions was held with the participants, health educators, and medical director of the clinic. The PI also met with public health officials and obtained approval from the Ebeye Ministry of Health, as well as the University of Hawaii Institutional Review Board (IRB) prior to initiating the study.

Seventeen (17) Marshallese DM2 patients in the Public Health Clinic in Ebeye were recruited and consented for participation in this study, using a simplified oral consent form, which was felt to be better understood by participants than a detailed written form.

Supplies, including glucometers, test strips, notebooks, pens, and grease boards, were shipped from Oahu to Ebeye. A small sample size was purposefully chosen because it was felt that group educational activities and interaction would be more successful with a smaller group. This recommendation was made by a Project Manager of the Diabetes Prevention Program, which also had group educational sessions as a component of its preventative intervention. If successful, this curriculum could then be offered to other groups of DM2 patients in Ebeye, and later, throughout the Marshall Islands.

Ebeye Public Health Clinic Health Educators led the weekly educational sessions, with contribution and guidance provided by the medical director of the clinic. Also included in these group sessions were cooking classes that demonstrated healthy ways of preparing local meals, and the encouragement of walking groups among participants living in the same village. In particular, emphasis was made to shift away from high caloric imported foods containing large proportions of carbohydrates and fat, such as rice and canned meats, and towards more traditional foods, including fish, breadfruit, and pandanus. Participants were encouraged to avoid deep-frying in saturated oils, and to employ other cooking methods, such as boiling, broiling, and stir-frying. Morning or early evening group walks in the villages were encouraged. Jogging or running was not explored, due to the risk of attack by neighborhood dogs and lack of prior coronary artery disease testing in these participants at high risk for cardiovascular events. Participants were encouraged to share their experiences on dietary change and exercise with each other during the sessions. Additionally, talks on various DM2 topics, including foot care and kidney disease, were given by the medical director of the clinic to the group. Hands-on group activities, besides the cooking demonstrations, included sessions on self monitoring of blood glucose (SMBG) and insulin administration, taught and demonstrated by the health educators.

Baseline and six month data were collected on various surrogate markers of DM health status, including; % of participants at goal blood pressure (BP) for DM2 (<130/80 mmHg) , % of participants on statin therapy, % of participants with SMBG goals set, % of participants with weight reduction of at least ten pounds since their last clinic visit, and % of participants with nutritional evaluation. The study participants continued to be seen and evaluated at their regular clinic visits every 2-3 months, throughout the study duration. Of note, some participants had already lost greater than ten pounds between their last clinic visit and the start of their study. Hence, the change in percentage of participants who lost more than ten pounds from their last clinic visit was assessed over the same duration when measured at baseline, and at six months This data was compiled in a Microsoft Excel Spreadsheet, and sent to the PI using the Patient

Electronic Care System (PECS) system. Patient identifiers were deleted prior to internet data transfer, to maintain confidentiality.

The PI, located in Oahu, met with the health educators and the participants via video teleconference (vtc) during several educational sessions, and communicated frequently with the project team via email.

Study Limitations

An additional study goal was measurement and comparison of HgbA1c levels before and after the group sessions. However, during the study period, the HgbA1c assay machine failed to function properly, and there were insufficient funds to purchase a replacement machine.

Results

Of the 17 Marshallese DM2 participants recruited, 12 were female, with the majority aged 30-64 years with most body mass index (BMI) measurements between 25-35 kg/m^2. At baseline, seven patients had a history of hypertension, four had dyslipidemia, three had retinopathy, three had neuropathy, one had peripheral vascular disease, and one had coronary artery disease. Medication at baseline included; 13 patients on Metformin, eight on an angiotensin converting enzyme (ACE) inhibitor, seven on a sulfonylurea, four on insulin, four on a lipid-lowering agent, four on an anti-platelet agent, one on a beta-blocker, one on an angiotensin receptor blocker (ARB), and one on a diuretic agent. Some of the average baseline lab values were as follows; HgbA1c 10.0%, total cholesterol 178.2 mg/dl, LDL cholesterol 107.3 mg/dl, HDL cholesterol 54.2 mg/dl, triglycerides 151.3 mg/dl.

After six months (two months after the completion of the group educational sessions), the percentage of participants with BP < 130/80 mmHg increased from 35.3% to 68.8%; statin treatment increased from 20.0% to 35.7%; participants with SMBG goals set increased from 58.8% to 81.3%; percentage of participants who lost at least 10 pounds since their last visit increased from 28.6% to 57.1%; and nutritional education increased from 76.5% to 87.5% of participants (See Table 1). During the study period, one of the participants moved off-island, and was unable to complete the intervention.

Table 1. Baseline and 6 months follow up data

PARAMETER goal measured	BASELINE %* of participants at goal	6 MONTHS %* of participants goal (with 95% CI)	p value*
Blood Pressure < 130/80 mm Hg	35.3	68.8 (46.0-91.5)	0.01
On Statin Treatment (HMG CoA Reductase inhibitor)	20.0	35.7 (13.8-61.2)	0.20
SMBG (Self Monitoring of Blood Glucose) goals set	58.8	81.3 (62.1-100.0)	0.14
Weight Loss > 10 pounds	28.6	57.1 (25.5-74.5)	0.02
Nutritional Evaluation done	76.5	87.5 (71.3-100.0)	0.13

* Total number participants = 17 (1 dropped out during study, p value assumes this person did not meet any goals, so that the true p values may be smaller)

Discussion

This project reflected an attempt to take some initial steps at slowing the DM2 epidemic in a Pacific Island Nation, via culturally appropriate group education sessions to the participants, provided by local public health workers.

Baseline data revealed that the mostly female participants had poor glycemic control and were generally overweight or obese. Slightly less than half were hypertensive, and less than a quarter was dyslipidemic. Most of the participants were on Metformin, which is appropriate in this younger, obese DM2 population – subgroup analysis in the United Kingdom Prospective Diabetes Study (UKPDS) revealed maximum benefit, particularly in the prevention of macrovascular disease, in a similar cohort of English patients. Slightly less than half of the participants were on a sulfonylurea, and slightly more than half were on an ACE inhibitor, which is appropriate for DM2 renoprotection. Slightly less than a quarter was on insulin, despite the high average HgbA1c, perhaps suggesting the presence of psychological as well as socioeconomic barriers to the acquisition and use of insulin on Ebeye. Frequent power outages and a paucity of home refrigerators make insulin storage difficult in Ebeye.

Although assessment of changes in glycemic control was precluded by technical barriers, improvements in weight loss, blood pressure, statin use, nutritional education, and SMBG were observed. Control of blood pressure has been previously shown (in the UKPDS) to be more important than tight glycemic control in the prevention of macrovascular complications of DM2. During the Heart Protection Study (HPS), statin use in DM2 patients, regardless of baseline cholesterol and LDL values, was associated with a decrease in macrovascular disease, particularly stroke. Hopefully, the increased number of participants with improved blood pressure control and statin use in the study cohort will eventually translate into fewer cardiovascular and cerebrovascular disease events in this high risk population.

Overall, important markers of health improvement were observed in various parameters, particularly BP reduction and weight loss, but the sample size was very small, so true significance cannot be ascertained from this study. This limitation can be addressed by subsequent studies using either larger groups, or, more likely, pooled data from multiple smaller groups, whose reduced size would allow for more effective group teaching and participation.

This project also revealed many technical and communication barriers inherent in long distance projects undertaken in conjunction with developing nations – communication via email and vtc was severely hampered by limited functionality of the telecommunication satellite used to transmit information, and by frequent power outages in Ebeye. Larger social issues, such as the economics of food in an impoverished population and cultural fatalism, although not studied here, represent another significant challenge to implementation of a successful lifestyle-based DM2 health improvement curriculum. In Ebeye, fresh produce is limited and expensive, due to the lack of arable land on the island. Consequently, high caloric imported foods like rice and canned meats are much more affordable to the islanders, who tend to have low incomes and large families.

In a similar DM2 health improvement project involving Marshallese participants on Oahu, significant cultural fatalism was seen, as many participants ascribed their health condition to "God" or "Atomic Radiation", and had very poor turnout to the educational sessions provided by the study (Reddy et al, 2005). The majority of participants were recent immigrants from the RMI, or traveled frequently between the US and the RMI, whose nations share a Compact of Free Association.

The Marshallese fatalism may have developed from both natural and man-made conditions which imposed an external locus of control on their society. The RMI is relatively isolated in the Pacific Ocean, and is a series of low-lying

atolls. Hence, the Marshallese have historically been subject to natural forces, such as typhoons, causing severe drought and famine (D'Arcy, 2008). Frequent colonization by outside powers, atomic testing, and displacement of islanders has created a dependence on outside support for subsistence.

Another socio-cultural barrier to attempts by non-Marshallese to improve DM2 control among Marshallese may be the historical distrust of "outsiders" by the Marshallese, who suffered from radiation-induced illnesses and social disruption following the Bravo Hydrogen bomb test by the United States Military in 1954 (Simon, S. et. al: 1997). Perhaps more harmful than the radiation exposure, was the mass movement of Marshallese off their home atolls, onto nearby barren islands, to facilitate the atomic testing. This migration away from natural food sources helped to foster a dependence on imported processed foods from the United States, and, combined with genetics favoring food storage in a relatively isolated population, led to the subsequent epidemic of obesity, DM2, and their negative health outcomes in the RMI.

Despite these considerable barriers, implementation of this, or similar DM2 educational projects in more widespread fashion throughout the RMI and other Pacific Island Nations, is planned, in order to improve health of DM2 patients in an area devastated by this disease, which is expected to grow exponentially in the future.

Acknowledgments

The authors would like to thank the Health Educators in the Ebeye Public Health clinic for their considerable work completing translation of English into Marshallese, recruiting participants for the study, and conducting group teaching sessions. Funding for this study was received from the US Department of Health and Human Services funded "Project Export," Dr. Marjorie Mau, MD, Principal Investigator, which had no role in the design, conduct, interpretation, or approval of the study. The authors have no financial interest, arrangement, or affiliation with any organization that could be perceived as a real or apparent conflict of interest in the context of the subject of this study. Additional acknowledgements are Irene Paul, Ebeye Secretary of Health, and Tommy Milne, Administrator Ebeye Public Health Clinic.

References

American Diabetes Association. (2002). Implications of the United Kingdom Prospective Diabetes Study. *Diabetes Care, 25*:S28-32.

Collins, R. et. al; Heart Protection Study Collaborative Group. (2003). MRC/BHF Heart Protection Study of cholesterol-lowering with Simvastatin in 5963 people with diabetes: a randomized placebo-controlled trial. *Lancet, 361,* 2005-2016.

D,Arcy, P. (2008). The People of the Sea. Honolulu:University of Hawaii Press

Office of the National Health Planner. Republic of Marshall Islands. Unpublished Report 2000.

Reddy, R., Shehata, C., Smith, G., and Maskarinec, G. (2005). Characteristics of Marshallese with Type 2 Diabetes on Oahu: A Pilot Study to Implement a Community-Based Diabetic Health Improvement Project. *Californian Journal of Health Promotion, 3*, 36-47

Simon, S. et. al; (1997). Consequences of Nuclear Testing in the Marshall Islands. *Health Physics Journal, 73*, 1-20.

Yamada, S., Dodd, A., Soe, T., Chen, T-H., and Bauman, K. (2004). Diabetes mellitus prevalence in out-patient Marshallese adults on Ebeye Island, Republic of the Marshall Islands. *Hawaii Medical Journal, 63*, 45-51.

Author Information

*Ravi Reddy, M.D.,
Principal Investigator
University of Hawaii,
Department of Family Medicine & Community Health,
John A. Burns School of Medicine
The Physician Center at Mililani
95-390 Kuahelani Avenue
Mililani, HI. 96789
Phone: (808) 627-3200
Fax: (808) 623-7872
Email: ravirmd@pol.net

Richard Trinidad, M.D.
Medical Director
Ebeye Public Health Center

Johannes Seremai, B.S.
Health Education Manager
Ebeye Public Health Center

Joaquin Nasa, M.D.
Staff Physician
Ebeye Public Health Center

* corresponding author