Describing the burden of non-communicable disease risk factors among adults with diabetes in Wallis and Futuna

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Background: The South Pacific Territory of Wallis and Futuna has a high burden of non-communicable diseases (NCD): 18% of adults have diabetes mellitus (DM) and 87% are classified as overweight or obese.

Objective: To characterise the burden of additional World Health Organization (WHO) recognised NCD risk factors, such as smoking, obesity, high blood pressure, eating less than five fruit or vegetable servings per day and a sedentary lifestyle, among adults with DM.

Design: Re-analysis of cross-sectional data from a 2009 national survey. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated.

Results: Of 487 adults sampled, 87 (18%) had DM. Nearly 99% of individuals with DM had at least one additional NCD risk factor, and 62% had three or more concurrent NCD risk factors. Individuals with DM were more likely to be obese (OR 1.66, 95%CI 1.01–2.74) and had a much higher prevalence of high blood pressure (OR 3.02, 95%CI 1.87–4.86).

Conclusion: DM is rarely identified in the absence of other NCD risk factors. We recommend an integrated approach to the management of DM and other NCD risk factors in routine care rather than a disease-specific approach.

World leaders have called non-communicable diseases (NCDs), including diabetes mellitus (DM), 'a challenge of epidemic proportions'.¹ Recognising the overwhelming burden of NCDs in the Pacific Region, several Pacific Islands leaders have declared a national public health emergency to address the serious impact of NCDs in their islands.^{2,3} Of all NCDs, diabetes mellitus (DM) likely has the most extensive impact on the markedly rising health care costs and poor health outcomes in the Pacific Region. A recent World Bank evaluation of NCDs in the Pacific called for 'special attention to diabetes' as the defining NCD that is most responsible for declining health status and unsustainable increases in health care costs.⁴

Like many other Pacific Islands, the Territory of Wallis and Futuna has been significantly affected by NCDs. A national study of risk factors for chronic NCDs in Wallis and Futuna carried out in 2009, the Wallis and Futuna study (WFS), confirmed an increasing prevalence of DM as well as commonly recognised NCD risk factors (Table 1). Nearly 60% of adults are considered 'obese', and 87% of all adults are classified as 'overweight' or 'obese'. DM rates are very high: over 18% of the adult population has DM, and another 67% are at high risk of developing DM.⁵

In the past several years, the Wallis and Futuna Public Health Agency (WF-PHA) has recognised that the population has a very high prevalence of diabetes and other NCDs. The national WFS provided valuable baseline data about the burden of individual NCDs and related health risk factors. This document has become an important tool for public health planning. However, the initial evaluation of NCD prevalence in Wallis and Futuna only addressed the prevalence of individual NCD risk factors, without regard to the significant overlap of multiple NCDs and NCD risk factors among individuals within a population.

NCD prevalence data in several Pacific Island health surveys have been presented for each individual disease or risk factor.⁶ Research is needed to characterise the health of those patients who carry the complex burden of multiple NCDs and other related risk factors. One recent evaluation in the nearby island of Vanuatu showed that 22% of adults had at least three or more NCD risk factors.⁷ Improved data describing the cumulative burden of NCDs will contribute to public health planning, provide guidance for the creation of integrated NCD clinics and increase quality of care for this high-risk group.

The aim of the present study was to characterise NCD risk factors among adults with DM in Wallis and Futuna. For this paper, NCD risk factors included smoking, obesity, high blood pressure, eating fewer than five fruit and vegetable servings per day and inadequate physical activity. Specific objectives were to evaluate the proportion of individual NCD risk factors among adults with DM and to describe the cumulative NCD risk factor burden among adults with DM in Wallis and Futuna.

METHODS

Design

This was a cross-sectional secondary analysis of data from the 2009 WFS.⁵

TABLE 1 Five common risk factors for non-communicable diseases*

- Smoking
- Overweight and obesity
- High blood pressure
- Eating fewer than five fruit and vegetables servings per day
- Physical inactivity

* WHO media centre
WHO = World Health Organization.

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Setting

Located centrally in the South Pacific, the archipelago of Wallis and Futuna consists of three islands, two of which are populated. The 2008 census reported a total population of 13 445 individuals. The majority of the population (68%) lives on the island of Wallis. Most of the islands' inhabitants are of Polynesian descent (97%).

Overwhelmed by high unemployment rates and limited natural resources, the territory of Wallis and Futuna is experiencing difficult economic times and inadequate economic growth.⁸ Wallis has one main hospital with 51 beds and three outlying clinics, while Futuna has a single 21-bed hospital.

In response to the recent awareness of NCDs in the population, the WF-PHA introduced a public health programme to focus on public outreach and prevention of NCDs, as well as promotion of healthy lifestyle practices. Several projects focusing on the prevention of NCDs and promotion of wellness have been initiated at community level, involving various community members and organisations. The burden of DM in the adult population was noted during screening carried out in 2009, in which previously undiagnosed patient with DM were identified by blood glucose testing. Because of the growing health care costs, particularly with extremely expensive off-island medical treatment, special attention has been given to the burden of DM in Wallis and Futuna.

Participant sample

Data for this evaluation are taken from the WFS.⁵ The data represent a sample of 487 adults, selected as a subset of the population that was proportionately sampled over the two inhabited islands of Wallis and Futuna. A standard quota method was used to ensure a representative sample of the adult population. A table for random selection by district, sex and age group was used, making it possible to select one household member randomly to form the final sample. Participation in the study was on a voluntary basis. To compensate for any refusals an additional 10% of households were chosen randomly. Data were collected over a 4-week period in early 2009.

Data variables collected and method of data collection

Data variables included age, sex, fasting blood glucose levels, mean blood pressure, body mass index (BMI), haemoglobin A1c (HgbA1C) (for known diabetics only), daily smoking, physical activity, and daily consumption of fruit and vegetables. DM was defined as fasting blood glucose level >7 mmol or reported treatment for DM. Known diabetics were tested and confirmed, with an HgbA1C defined as $\geq 6.5\%$. Hypertension was defined as systolic ≥ 140 mmHg and/or diastolic ≥ 90 mmHg. Obesity was defined as having a BMI ≥ 30 kg/m². Tobacco use was defined as daily tobacco use. Physical inactivity included those that reported <600 metabolic equivalent of tasks per week. The data were extracted in January 2013 and entered into a structured format.

Analysis and statistics

Data were analysed using EpiData Analysis software (version 2.2.2.178, EpiData Association, Odense, Den-

mark). Odds ratios (ORs) were used as measures of association. Differences at the 5% level ($P < 0.05$) were regarded as significant. A frequency chart was generated to characterise the cumulative burden of NCD risk factors for adults with and those without DM.

Ethics

Ethics approval was obtained from the International Union Against Tuberculosis and Lung Disease Ethics Advisory Group, Paris, France, and the WF-PHA.

RESULTS

Population demographics and a comparison of selected NCD risk factors among the adult population by DM status are shown in Table 2. Of the sample containing 487 Wallis and Futuna adults, 87 had DM according to World Health Organization (WHO) criteria. The sample included 222 men and 265 women, with a mean age of 45 years (standard deviation 15.6). Individuals with DM were more likely to be aged >40 years than those without (OR 5.27, 95%CI 2.78–10.00).

Compared to individuals without DM, a concurrent finding of obesity is significantly more common (OR 1.66, 95%CI 1.01–2.74) among those with DM. Individuals with DM had a significantly higher prevalence of high blood pressure than those without (OR 3.02, 95%CI 1.87–4.86). Individuals with DM were also less likely to smoke on a daily basis than their non-DM counterparts (31% vs. 44%, OR 0.58, 95%CI 0.35–0.95). Analysis of other NCD risk factors, including physical inactivity and reduced consumption of fruit and vegetables, showed no significant differences between the two groups.

The accumulated NCD risk factor burden for individuals already identified as having diabetes in Wallis and Futuna is demonstrated in Figures 1 and 2. The number of WHO-recognised NCD risk factors for individuals with DM is shown in Figure 1. There was a median of three additional risk factors among individuals with DM. Figure 2 depicts the cumulative burden of NCD risk factors among individuals with DM. Notably, nearly 99% of those with DM had at least one additional NCD risk factor in addition to DM, and more than half (58%) had three or more.

DISCUSSION

Surveillance of modifiable NCD risk factors in Wallis and Futuna is essential for policy planning, implementation and evaluation. Many studies have evaluated the prevalence of single NCDs in the Pacific. Most of these are WHO STEPS surveys, which use a common reporting format.^{6,7} Some of the STEPS reports list the percentage of individuals with multiple NCDs or NCD risk factors. However, despite a call for 'special attention' to DM in the Pacific, no previous study has characterised the high rates of corresponding NCD risk factors specifically among individuals with DM. This paper represents the first evaluation of additional NCDs among individuals with DM in the Pacific region, and confirms our belief that individuals with DM most often carry an

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TABLE 2 Magnitude of risk factors for non-communicable diseases among the adult general population by diabetes status, Wallis and Futuna, 2009 ($n = 487$)

Variable	With diabetes <i>n</i> (%)	Without diabetes <i>n</i> (%)	Crude OR (95%CI)
Total ($n = 487$)	87 (18)	400 (82)	
Sex			
Male	35 (40)	187 (47)	0.77 (0.48–1.23)
Female	52 (60)	213 (53)	
Age, years			
≤ 40	12 (14)	183 (46)	5.27 (2.78–10.00)
> 40	75 (86)	217 (54)	
Hypertension			
Yes	49 (57)	122 (31)	3.02 (1.87–4.86)
No	37 (43)	278 (69)	
BMI, kg/m ²			
Obese (BMI > 30 kg/m ²)	61 (70)	234 (59)	1.66 (1.01–2.74)
Non-obese (BMI ≤ 30 kg/m ²)	26 (30)	166 (41)	
Tobacco use			
Yes	27 (31)	174 (44)	0.58 (0.35–0.95)
No	60 (69)	224 (56)	
Physical inactivity			
Yes	30 (34)	154 (39)	0.83 (0.51–1.36)
No	57 (66)	244 (61)	
Low fruit and vegetable consumption			
Yes	73 (84)	339 (85)	0.94 (0.50–1.77)
No	14 (16)	61 (15)	

OR = odds ratio; CI = confidence interval; BMI = body mass index.

additional burden of multiple NCD risk factors that complicates disease management and contributes to poor outcomes.

There are several strengths to this study. The WFS data for this survey are from a representative sample of individuals from both of the inhabited islands of Wallis and Futuna. Furthermore, as the same methodology for selecting and interviewing participants in the study was used throughout, the risk of significant methodological bias was avoided. Importantly, this study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for reporting operational research.⁹

A significant limitation of this study is that the data subset was taken from an existing database, and that only variables that had been collected previously were available for this updated analysis.

FIGURE 1 Diabetes patients with other risk factors for NCDs, Wallis & Futuna, 2009 ($n = 87$). NCDs = non-communicable diseases.

The increased age observed among DM in this study is not surprising, given that the rate of DM increases with age. Among the NCD risk factors that represent 'metabolic syndrome' (DM, high blood pressure and obesity), adults with DM in Wallis and Futuna had a significantly higher prevalence of both high blood pressure and obesity. These three conditions are closely linked to DM in other NCD surveys across the Pacific.⁶ Individuals with DM were considerably older than those without, and both obesity and high blood pressure increase with age. Our purpose, however, was not to evaluate NCD risk factors leading to the high prevalence of DM. Rather, we set out to characterise the additional burden of disease that is typically present among individuals with DM. Rec-

FIGURE 2 Cumulative percentage of diabetes patients with other risk factors for NCDs, Wallis & Futuna, 2009 ($n = 87$). NCDs = non-communicable diseases.

ognition of the strong association between DM, high blood pressure and obesity is essential to address the impact of NCDs in Wallis and Futuna and other Pacific Islands.

We were surprised by the lower likelihood of tobacco use among people with DM. As tobacco use in Wallis and Futuna is higher in males and the prevalence of DM is higher in females, decreased tobacco use among DM could be confounded by sex. Repeat analysis controlling for sex also revealed similar results, however, confirming less tobacco use among people with DM in Wallis and Futuna. Also of interest was the finding that other unhealthy behaviour (physical inactivity and low fruit and vegetable consumption) was not significantly different among people with DM compared to those without. Regardless of the comparative finding, the high rate of physical activity and poor diet must be addressed in Wallis and Futuna and other Pacific Islands. Important new research is emerging that compiles best practices for Pacific Islands to reduce the growing impact of NCDs.¹⁰

Although several Pacific Islands operate specialised DM clinics and manage focused public health-based DM programmes, recent research has called attention to the need for integrated NCD clinics in the Pacific.¹¹ In Wallis and Futuna, almost all individuals with DM have at least one WHO-recognised NCD risk factor, and most have at least three other NCD risk factors in addition to DM. Given the serious additional impact of obesity and high blood pressure on cardiovascular health, management of DM alone is unlikely to result in a significant improvement in health outcomes.

CONCLUSION

In Wallis and Futuna, DM is nearly always identified in the presence of other significant NCD risk factors. To mitigate the growing costs of NCDs in the Pacific, clinical and public health programmes must avoid limiting NCD activities such as outreach, screening, public education and treatment to individual disease categories. Our study adds further momentum to regional efforts to address DM with an integrated approach for multiple NCD risk factors in both clinics and public health programmes. Integrated countrywide NCD plans that address multiple NCD risk factors must replace existing plans addressing individual NCDs.

In addition to expanded and integrated public health approaches, medical clinics in Wallis and Futuna should also increase efforts to address multiple NCDs with each clinic visit. In Wallis and Futuna, as well as in other Pacific Islands, the traditional DM clinic should be integrated into an NCD clinic to expand clinical focus beyond DM control and encourage appropriately integrated care. This is especially important as these results

show that risk factors requiring medical management (i.e., increased blood pressure and obesity) are more strongly associated with DM than those that are considered modifiable, such as smoking, physical activity and dietary habits.

For medical clinics to be able to respond to the need for integrated care addressing all NCD risk factors, training courses for practitioners already in place will need to be offered as well as modifying the current curriculum for physicians, nurses and other medical personal to include prevention of risk factors and an integrated approach to health care.

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Contexte : Le territoire du Pacifique Sud, Wallis et Futuna, qui supporte un lourd fardeau de maladies non-transmissibles (MNT) avec 18% d'adultes diabétiques et 87% considérés comme en surpoids ou obèses.

Objectif : Caractériser le fardeau des autres facteurs de risque de MNT reconnus par l'OMS (tels que le tabac, l'obésité, hypertension artérielle, une consommation de moins de 5 rations de fruits et légumes par jour et une mode de vie sédentaire) chez les adultes diabétiques.

Schema : Nouvelle analyse de données transversales émanant d'une enquête de 2009. Calcul des OR et des intervalles de confiance (IC) à 95%.

Resultats : Sur 487 adultes, 87 (18%) avaient un diabète (DM). Près de 99% des diabétiques ont au moins un facteur de risque de MNT et 62% ont 3 ou 4 facteurs de risque supplémentaires de MNT. Les patients diabétiques étaient plus souvent obèses (OR 1,66 ; IC95% 1,01–2,74) et avaient une prévalence plus élevée d'hypertension artérielle (OR 3,02 ; IC95% 1,87–4,86).

Conclusion : Le DM est rarement identifié en l'absence d'autres facteurs de risque de MNT. Nous recommandons une approche intégrée de la prise en charge des facteurs de risque du DM et des autres MNT dans le cadre des soins de routine plutôt qu'une approche spécifique de chaque maladie.

Marco de referencia: El Territorio de las islas Wallis y Futuna en el Pacífico Sur que presenta una alta carga de morbilidad por enfermedades no transmisibles, donde el 18% de los adultos son diabéticos y el 87% se clasifican con sobrepeso u obesos.

Objetivo: Caracterizar en los adultos con diabetes (DM) la carga de morbilidad por otros factores de riesgo de enfermedades no transmisibles reconocidos por la Organización Mundial de la Salud (como el tabaquismo, la obesidad, la hipertensión arterial, la ingestión de menos de cinco porciones de frutas o verduras diariamente y la vida sedentaria).

Método: Se practicó un nuevo análisis de los datos transversales de una encuesta nacional del 2009. Se calcularon los cocientes de posibilidades (OR) y los intervalos de confianza (IC) del 95%.

Resultados: De los 487 adultos encuestados, 87 presentaban DM (18%). Cerca del 99% de las personas con DM tenían como mínimo otro factor de riesgo de padecer enfermedades no transmisibles y en el 62% se encontraron tres o más factores de riesgo concomitantes. Fue más frecuente la obesidad en las personas con DM (OR 1,66; IC95% de 1,01 a 2,74) y presentaban una prevalencia mucho más alta de hipertensión arterial (OR 3,02; IC95% de 1,87 a 4,86).

Conclusión: Es muy infrecuente establecer el diagnóstico de DM cuando no existen otros factores de riesgo de padecer enfermedades no transmisibles. Se recomienda introducir en la atención de salud corriente un enfoque integrado del manejo de la DM y los demás factores de riesgo, en lugar de aplicar estrategias específicas de la enfermedad.