



REPUBLIC OF MAURITIUS

MINISTRY OF HEALTH & QUALITY OF LIFE

**RODRIGUES
NON-COMMUNICABLE DISEASES
SURVEY 2004**

July 2006

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 - II** – Members of Technical Committee
 - III** – Members of Laboratory subcommittee
 - IV** – Members of Monitoring Committee
 - V** – Daily Sub-Committee
 - VI** – List of names of staff involved in the NCD & Nutrition Survey 2004
(Rodrigues)
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1. EXECUTIVE SUMMARY

The first NCD Survey carried out in Rodrigues in 1992 confirmed that the island had high prevalence of hypertension and that obesity and overweight were very common, particularly among women. The second survey carried out in 1999 showed a 31.0% rise in diabetes and a 5.0% rise in hypertension. A third survey, employing comparable methodologies and criteria as the previous two, was carried out in November 2004 on adults aged 20-74 years.

The main findings of this 2004 NCD Survey and the trends in NCDs and their risk factor prevalence during the period 1992-2004 are:

- The age-standardised prevalence of diabetes in the Rodriguan population aged 20-74 years was 9.4% (7.0% in males, 10.7% in females). The prevalence in 1992 was 8.1% and in 1999 this prevalence had increased to 10.9%.
- The control of diabetes in those who were already diagnosed was poor with 60.4% of them having FPG \geq 8.5 mmol/L and only 16.5% having FPG < 7.0 mmol/L (i.e. being well controlled)
- The ascertainment rate of diabetes (i.e. those in whom the disease had been diagnosed or the known cases) was 40% with a rate of only 22% among males.
- The age-standardised prevalence of Impaired Glucose Tolerance (IGT) was 10.9% (7.6% in males, 12.8% in females). This has been increasing steadily over the years, being 9.5% in 1992 and 10% in 1999.
- The age-standardised prevalence of hypertension in adults aged 20-74 years was 32.8% (34.1% in males, 32.4% in females). In 1992 hypertension prevalence in the same age group was 35.2% and in 1999 it was 36.8%.
- The level of control in those already diagnosed with hypertension was poor with 37% of them having a blood pressure \geq 160/95 mmHg. Good control i.e. blood pressure < 140/90 mmHg was found in 37% of them.
- The ascertainment rate of hypertension (i.e. those in whom the disease had been diagnosed – the known cases) was 61.1%.
- Obesity i.e. (BMI > 30) was found in 23% of the Rodriguan population aged 20-74 years and another 33% were overweight (25 < BMI \leq 30). Prevalence of obesity among females (28.6%) was more than twice that of males (13.5%). Obesity prevalence had remained almost unchanged during the period 1992-1999 at around 19.5%. Overweight prevalence has remained around 32-33% during the period 1992 to 2004.

- **The prevalence of smoking among male adults has shown a steady decrease from 58.4% in 1992 to 43.7% in 1999 and 39.1% in 2004. The prevalence among women has remained below 5% during the same period.**
- **The crude prevalence of abusive alcohol consumption was 40.9% in males and 5.4% in females. Abusive alcohol consumption has increased significantly from 19.1% among males and 0.3% among females in 1992.**
- **The prevalence of hypercholesterolemia (cholesterol \geq 5.2 mmol/L) was 28% in males and 26% in females.**
- **Only 22% of males and 5.3% of females were found to be practising adequate leisure physical activity.**

In summary, diabetes and hypertension prevalence have shown a stabilisation with a probable downward slope. However, a number of risk factors continue to increase, namely Impaired Glucose Tolerance, Obesity, and abusive alcohol intake. The decline in smoking among males is an encouraging sign and so is the gradual uptake of leisure physical activity.

2. INTRODUCTION

2.1 Background of the Survey

Rodrigues is a small island with an area of 108 km² situated some 560 km north east of the main island of the Republic of Mauritius. The island, which became administratively autonomous in 2003, had a population of 36,690 inhabitants in 2004. The population is predominantly Creole with a genetic background similar to Creoles in Mauritius

Because of routine statistics showing high rates of hypertension in Rodrigues in the 1980s and the general lack of information on non-communicable diseases and their lifestyle related risk factors, a population survey of disease and risk factor prevalence in Rodrigues became a priority project of the Ministry of Health in 1990. A first NCD Survey Review was conducted in 1992 to document the prevalence of NCDs and their risk factors. A follow-up survey was subsequently carried out in 1999. During the 7-year period (1992-1999), almost all parameters under study indicated some degree of deterioration.

Following the 1999 NCD Survey, a number of measures for the reinforcement of prevention and control of NCDs and their risk factors were undertaken. These included the setting up of NCD Clinics and the introduction of mass Screening of the population. In November 2004, a new survey to assess the trends in NCDs and their risk factor prevalence and the impact of the intervention measures undertaken was carried out.

2.2 Objectives

2.2.1 General

The 2004 NCD Survey had as participants adults aged 20-74 years and was carried out with the overall goal of documenting the prevalence of NCDs and their risk factors as well as monitoring progress and impact of the intervention programmes.

2.2.2 Specific

The specific objectives of the survey are as follows:

- (a) to determine the prevalence of NCDs (viz.: Type 2 diabetes mellitus hypertension).
- (b) to determine the prevalence of associated risk factors (viz.: obesity, dyslipidaemia, impaired glucose metabolism, smoking, excessive alcohol consumption, inadequate physical activity).
- (c) to study trends in the prevalence of NCDs and their risk factors.
- (d) to study the level of control in diabetic and hypertensive subjects in the trends thereof.

2.3 Methodology

2.3.1 Study Type and Sample Size

This present survey is an island based cross-sectional study involving Rodriguan adults aged 20-74 years. Participants from the clusters of the 1999 Survey were again invited to participate in the survey.

Each cluster was divided into a number of Secondary Enumeration Areas (SEA) and one SEA was selected randomly. From each SEA that was selected around 360-380 individuals enumerated from 175-225 households were invited to participate in the survey and for interviewing and investigation.

The survey site field work was carried out in November 2004. A total of 1,900 adults aged 20-74 years were invited and the response rate was 93%.

2.3.2 Data Collection

A WHO approved protocol similar to those of the 1992 and 1999 surveys was adopted and in many instances the same survey staff were involved.

Each day, approximately 120-125 participants were invited to attend after an overnight fast. Following registration, a fasting blood sample was collected and all participants except diabetics on treatment and newly diagnosed diabetics underwent a glucose tolerance test as per WHO guidelines.

Measurement of the height and weight, waist and hip circumference and blood pressure were then carried out on all participants. They were then interviewed to obtain information on personal and family medical history, lifestyle habits and socio-economic indicators through a questionnaire which was filled in by trained health personnel.

Another questionnaire specifically assessing physical activity levels was filled in for non-diabetic participants aged 35-54 years.

As regards laboratory investigations, fasting and 2-hour blood glucose were measured immediately at the survey site. Other blood samples were sent to the laboratory at Queen Elizabeth Hospital (Rodrigues) and the Central Health Laboratory, Victoria Hospital (Mauritius) for a number of investigations.

2.3.3 Data Capture, Statistical Analysis and Quality Control

A number of steps were taken to ensure the quality of data throughout the whole operational procedure. A Data Officer verified all the forms for completeness before the respondents were allowed to leave the sites. These forms were then sent to the Data Manager in Mauritius.

All the forms were re-edited for consistency. The data entry was done by staff of the Medical Records Office under the close supervision of the Data Manager. The Dbase III plus package was used.

Before analysis, the data was cleared under the close supervision of a Statistician delegated by WHO/AFRO. A number of questionnaires were retrieved for verification and control. The data was checked and amended accordingly.

The data was processed and analysed using EPI-Info statistical package. The findings were assessed for reliability. For the purpose of this preliminary report, simple proportions have been calculated. A few cross-tabulations have also been included. Certain prevalence for the 2004 survey have been standardized using the direct method based on the 2000 census population. However, to ensure comparability across the 3 NCD Surveys, the 1990 census population was used as standard. Crude prevalence have also been given. The interpretation of the different results should therefore be done with caution.

2.3.4 External Quality Assessment (EQA)

External quality assessment of all laboratory investigations were carried out in a UK laboratory (Addenbrooke's Hospital, Cambridge) on one out of every ten blood specimens collected. The external quality control values obtained were not significantly different from the values obtained in Mauritius and Rodrigues. No adjustment of these results was necessary

3. RESULTS OF THE SURVEY

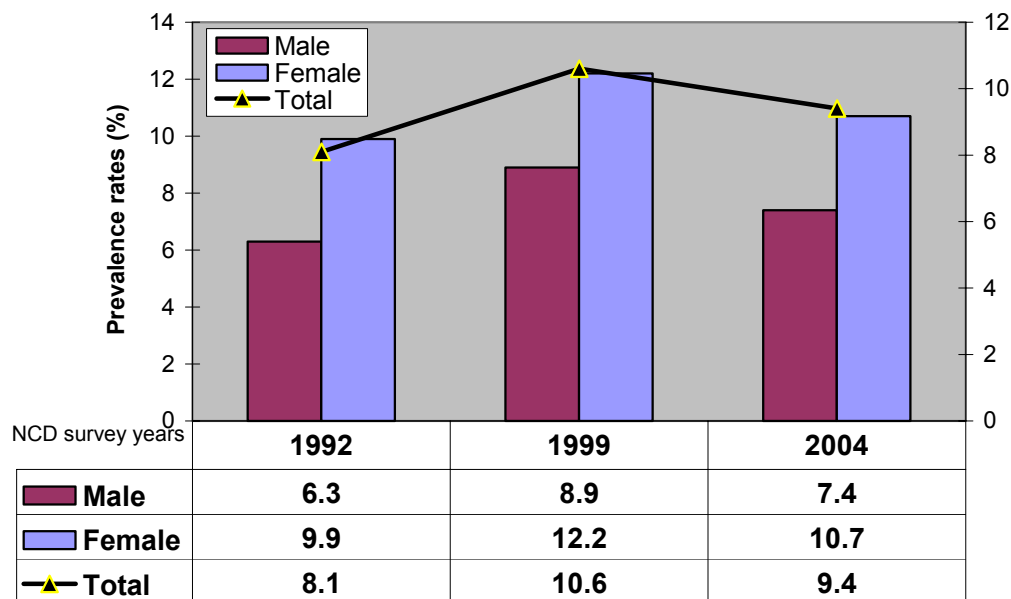
3.1 Diabetes

3.1.1 Prevalence

The preliminary results of the 2004 NCD Survey in the island of Rodrigues indicate that the age-standardised prevalence of diabetes in the population aged 20-74 years was 9.4% (7.0% among male, 10.7% among female).

In order to compare and show the trend in the prevalence of diabetes in the three NCD Surveys, the 2004 NCD Survey results for adults aged 20 years and above have been standardized on the National population as at Census Year 2000. The prevalence of diabetes in that age-group increased from 8.1% in 1992 to 10.6% in 1999 (Table 1). After 1999, a change in the trend has been observed; the prevalence has decreased to 9.4% in 2004.

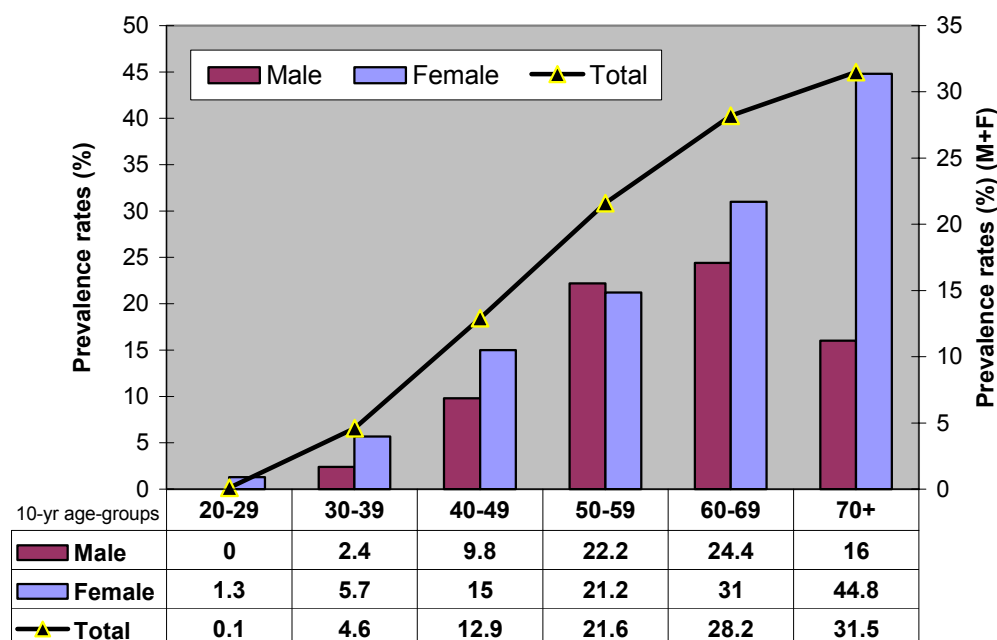
Table 1 - Prevalence of diabetes from 1992 to 2004 in population aged 20 and above



3.1.2 Age-specific Prevalence

The age-specific prevalence rates of diabetes in 2004 (Table 2) show that there is a steady and substantial increase in diabetes prevalence with age especially among women. In men the prevalence increases between 20-60 years and thereafter declines. As expected, the prevalence increases with age; 4.6% among 30-39 years 12.9% among 40-49 years and a peak of over 30% in those aged 70 years and above).

Table 2 - Age-specific prevalence rates of diabetes - 2004



3.1.3 Treatment and Control

In 2004, 84% of known diabetic subjects reported that they were on regular treatment and follow-up. Of all known diabetes subjects, 16.5% had a good control (FPG \leq 7.0 mmol/L), 23.1% a fair control (7.0 mmol/L < FPG < 8.5 mmol/L) and 60.4% a poor control (FPG \geq 8.5 mmol/L).

Table 3 - Effectiveness of control of fasting blood glucose (FBG) in all subjects reporting a diagnosis of diabetes (2004).

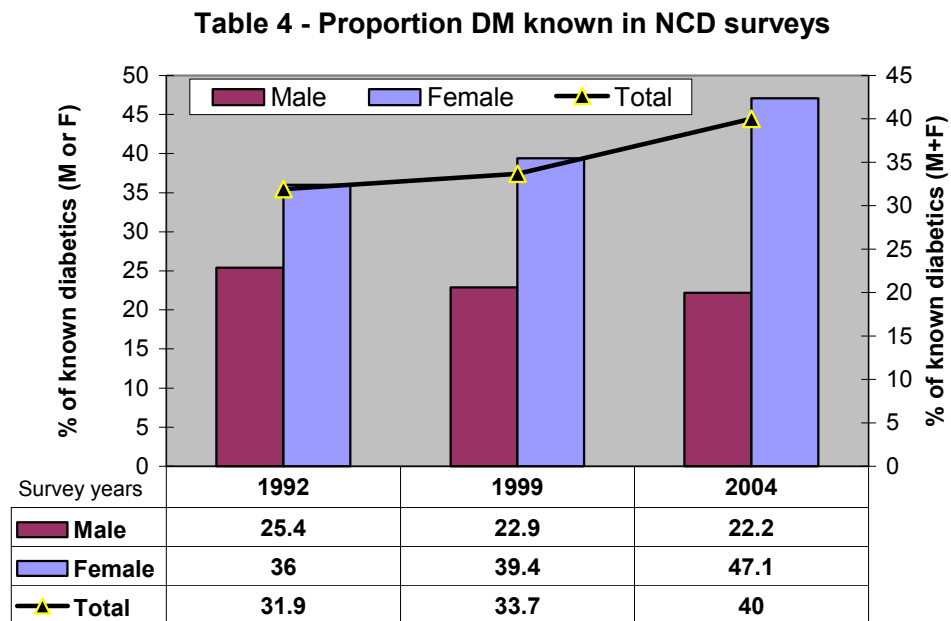
Current treatment for diabetes	%	LEVEL OF CONTROL *		
		FPG < 7.0 Good	7.0 \leq FPG \leq 8.5 Fair	FPG > 8.5 Poor
None	5.5	20.0%	20.0%	60.0%
Diet only	6.6	33.0%	33.3%	33.3%
Herbal	4.4	0	50.0%	50.0%
Oral drug / Insulin	83.5	15.8%	21.1%	63.0%
TOTAL	100.0	16.5%	23.1%	60.4%

* According to new WHO cut-off points

It should be pointed out that the above levels of control are defined according to the new WHO cut-off points. In 1999 poor control was taken as “Fasting Plasma Glucose \geq 11.1 mmol/L” and the percentage of poor control among all known diabetic subjects was 37%. If the same criteria is used for the 2004 survey a prevalence of poor control of 29% is obtained.

3.1.4 Ascertainment of Diabetes

In 2004, the proportion of respondents who already knew that they have diabetes was 40% (22.2% among males, 47.1% among females). These figures are based only on “new” participants. (Table 4)



The ascertainment rates of diabetes by sex during the period 1992 to 2004 show an increase in the 12 year period. However, in 2004, 60.0% of individuals surveyed and found to be diabetics did not know that they had the disease.

3.2 Impaired Glucose Tolerance

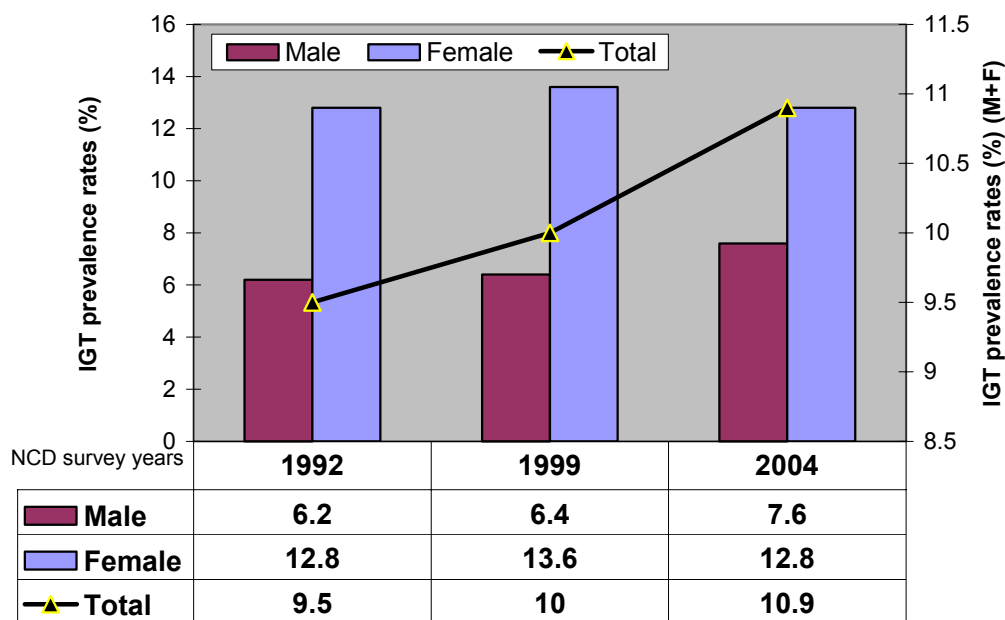
3.2.1 Prevalence

The prevalence of Impaired Glucose Tolerance (IGT), a risk factor for both future Type 2 diabetes and cardiovascular diseases, was determined in all non-diabetic participants aged 20-74 years. The criteria used for classifying individuals as having IGT were based on the WHO criteria modified for epidemiological purposes.

The age-standardised prevalence of IGT in the population aged 20-74 years was found to be 7.6% in males, 12.8% in females and 10.9% for both sexes.

The trend in the prevalence of IGT in the past 12 years is shown in Table 5. IGT continues to be more prevalent among women and a 22.5% increase in IGT prevalence in men between 1992 and 2004 has been documented.

Table 5 - IGT Prevalence (%) among participants aged 20 years and over



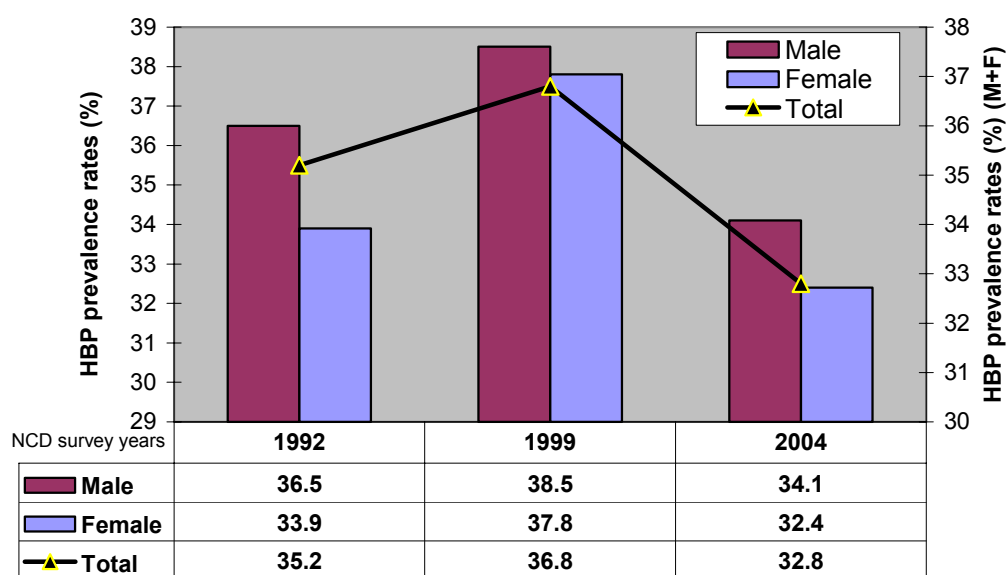
3.3 Hypertension

3.3.1 Prevalence

Blood pressure was measured in all participants and all those not previously diagnosed as having hypertension, were classified as having hypertension when their average blood pressure was > 140/90 mmHg. The prevalence of hypertension in 2004 in participants aged 20-74 years (standardised on the Census Year 2000 population) was 34.1% in males, 32.4% in females and 32.8% in both sexes.

The hypertension prevalence rates in males were slightly higher than those in females during the period 1992 to 2004 (Table 6). When males and females are taken together, a 11% decrease is noted in the prevalence from 1999 to 2004

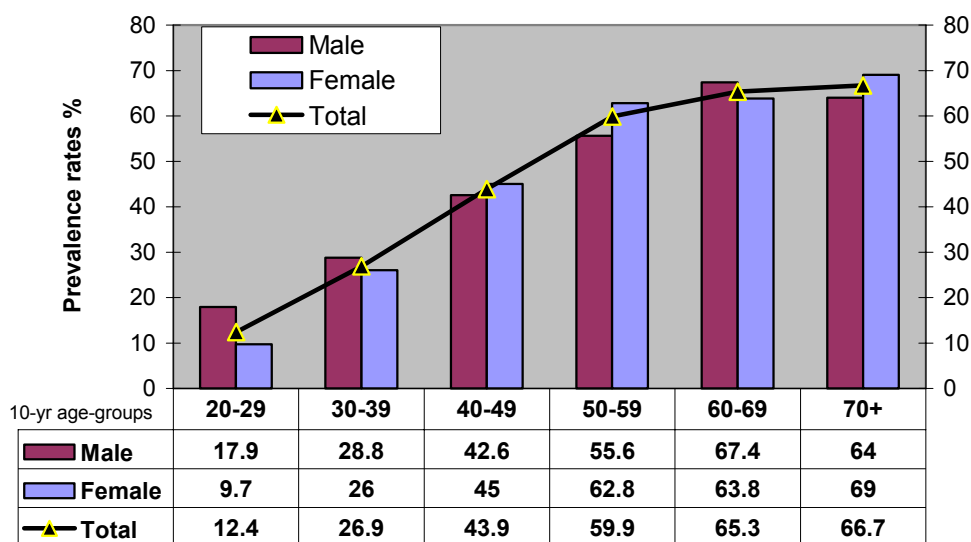
Table 6 - Age standardised prevalence (%) of hypertension in population aged 20 years and over (1992-2004)



3.3.2 Age-specific Prevalence of Hypertension

The age-specific prevalence rates of hypertension in 2004 (Table 7) show that 12.4% of adults aged 20-29 years are hypertensive. The rates among males below the age of 50 years are higher than those among females. After the age of 50 years hypertension becomes more common in females. In the population aged 60 years and over 55-65% are hypertensive.

Table 7 - Age-specific prevalence rates for high blood pressure - 2004



3.3.3 Control of Hypertension

The participants who were known to be hypertensive were assessed for the effectiveness of blood pressure control in them. It is noted that 37% of hypertensive participants were poorly controlled (Table 8) and 37% were well controlled.

Table 8- Effectiveness of control of blood pressure by age group and sex, 2004

Age-group	Good ^a %	Fair ^b %	Poor ^c %
20-39	19.8	54.9	25.3
40-59	27.4	33.2	39.4
60-74	28.1	29.8	42.1
TOTAL	37.0	26.0	37.0

^a Good control = systolic <140 and diastolic <90 mmHg

^b Fair control = values between good and poor

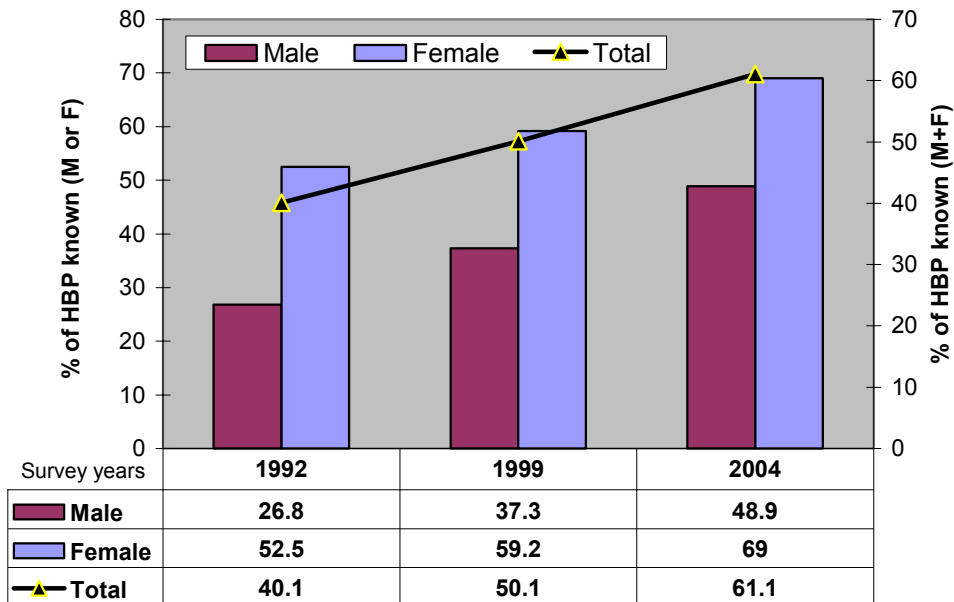
^c Poor control = systolic ≥ 160 or diastolic ≥ 95 mmHg

3.3.4 Ascertainment of Hypertension

Many participants who were found to be hypertensive were not aware that they had hypertension. The rate of detection of hypertension (ascertainment rate) in 2004 was 48.9% in males, 69% in females and 61.1% in both sexes.

Table 9 shows the ascertainment rate of hypertension in men and women during the period 1992-2004. There has been an increase in ascertainment rate over the years but still in 2004 about 39% of individuals found to be hypertensive did not know that they had the disease.

Table 9 - Proportion of HBP known (1992 - 2004) *



* among new “participants” only.

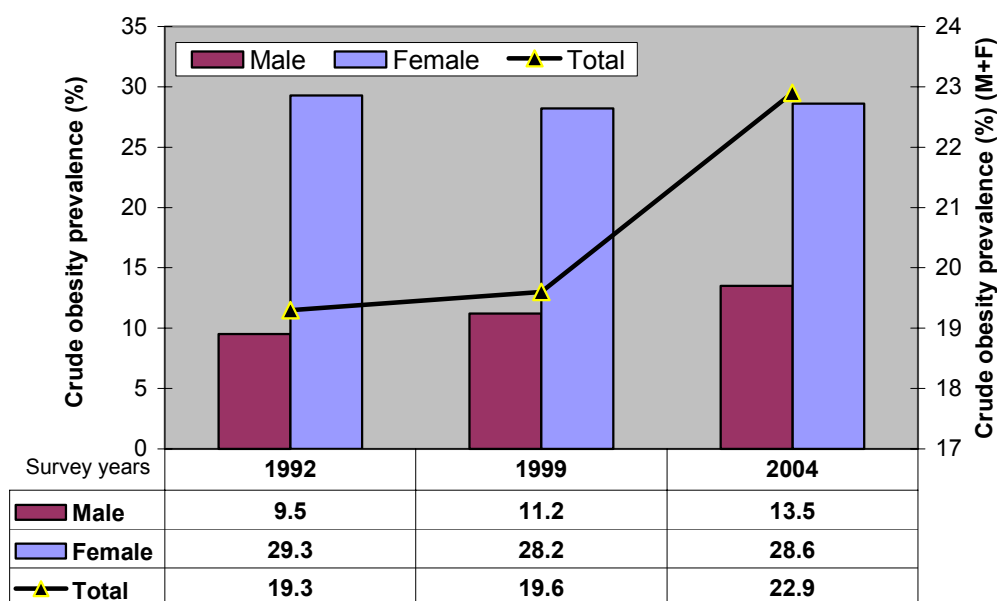
3.4 Obesity and Overweight

3.4.1 Prevalence of Obesity and Overweight from 1992 to 2004

In 2004, the age-standardised prevalence of obesity in adults aged 20-74 years was 13.5% among males and 28.6% among females, giving an overall prevalence of 22.9%. The difference in the prevalence of overweight among males and females was less marked. The prevalence of overweight was 32.5% among males and 32.4% among females giving an overall prevalence of 32.5%. Taken together, 55.4% of the Rodriguan population aged 20-74 years were either obese or overweight; that is more than half of the population in that age-group.

In order to compare the prevalence of obesity and overweight over the period 1992-2004, the Year 2000 Census Population has been used to standardize the rates. The findings are shown in Table 10 and Table 11 respectively.

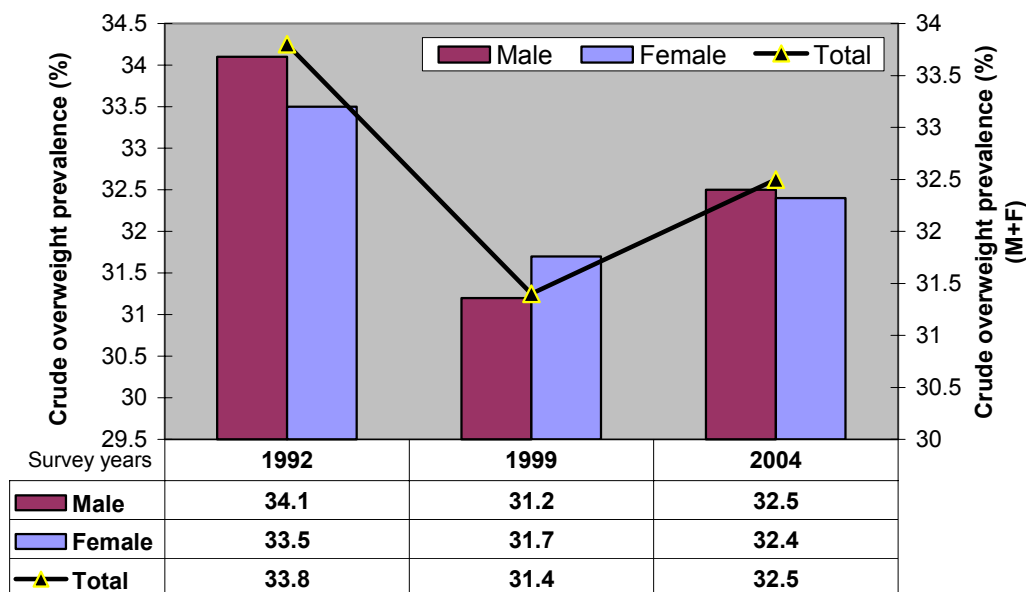
Table 10 - Prevalence of Obesity (1992 - 2004)



“Obesity” being defined as a body mass index greater than 30 kg/m² and “overweight” being a body mass index greater than 25 kg/m² but less than or equal to 30 kg/m²

The trend in the prevalence of obesity over the 12-year period in males and females is different from the trend in the prevalence of overweight. If obesity and overweight are taken together, the age-standardised prevalence were found to be 53.1% in 1992, 51% in 1999 and 55.4% in 2004.

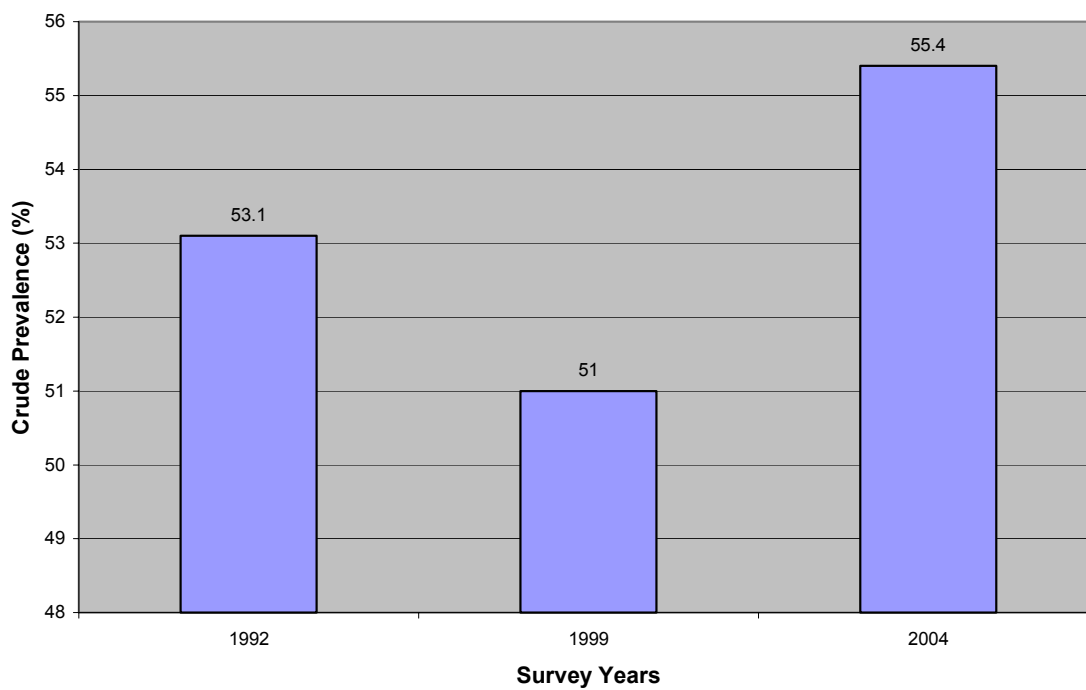
Table 11 - Prevalence of Overweight (1992 - 2004)



3.4.2 Prevalence of Overweight and Obesity combined 1992-2004

The trend in the prevalence of overweight and obesity is shown in Table 12. Obesity and overweight prevalence has remained in the range of 51-55 % over the past 12 years.

Table 12 - Prevalence of Overweight and Obesity (1992 - 2004)



3.4 Tobacco Consumption

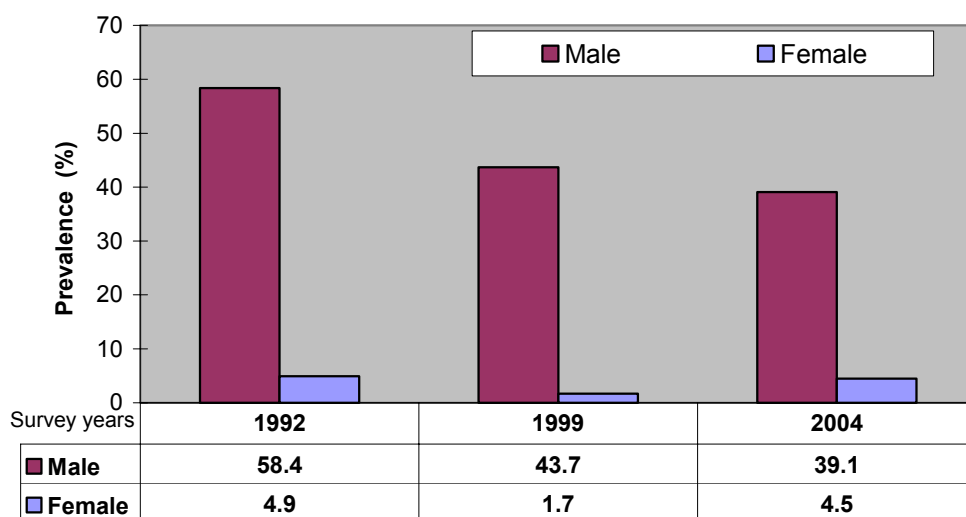
Overall, 39.1% of males and 4.5% of females (aged 20-74 years) were current smokers in 2004 (Table 13). The results also indicate that the percentages of smokers among males are higher in the younger age-groups.

Table 13 - Age-specific smoking rates among males and females (2004)

Age	Current Smokers (%)	
	Male	Female
20-29	44.4	7.0
30-39	48.0	4.1
40-49	35.6	2.9
50-59	28.9	0.7
60-74	35.1	6.2
20-74	39.1	4.5

The prevalence of smokers among males indicates a downward trend across the 12-year period (Table 14). Among females, the decreasing trend noted between 1992 and 1999 has been reversed in 2004.

**Table 14 - Crude prevalence of tobacco consumption
1992 - 2004**



3.6 Alcohol Consumption

The Survey results indicate that 76.2% of males and 26.3% of females consume alcohol.

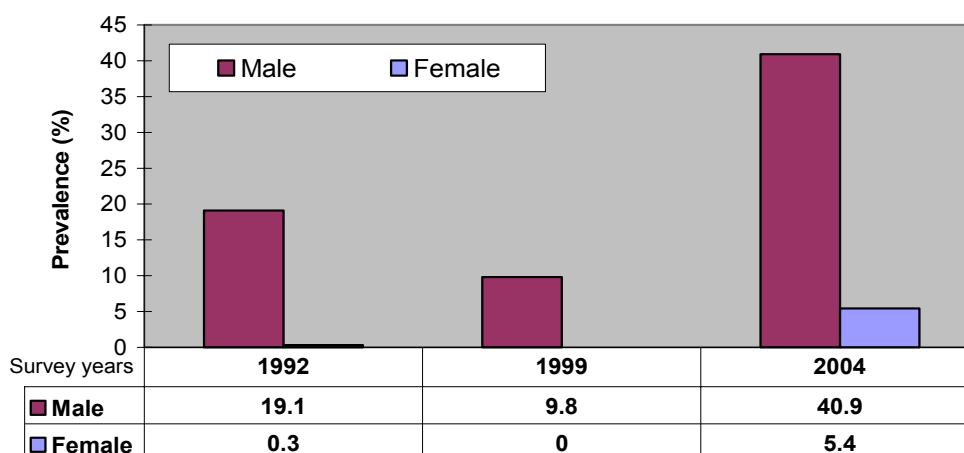
Of those taking alcohol, 5.6% of male drinkers and 5.5% of female drinkers were drinking everyday (Table 15). These data also indicated that 55.4% of males aged 20-74 years were drinking alcohol on a regular basis in 2004. The corresponding figure among females was 14.2%.

Table 15 - Distribution of alcohol consumption by frequency and sex among drinkers.

	Male (%)	Female (%)
Daily	5.6	5.5
4-6 times per week	16.8	1.1
2-3 times per week	3.3	0.7
Once a week or less	29.7	6.9
Occasionally	44.6	85.8
TOTAL	100.0	100.0

Taking into consideration only heavy drinkers, i.e. people with abusive alcohol consumption, the results given in Table 16 indicate that crude prevalence among males had shown a downward trend between 1992 and 1999. However, the prevalence has drastically increased between 1999 and 2004 with 40.9 % of adult males being classified as heavy drinkers in 2004.

Table 16 - Prevalence of abusive alcohol consumption 1992 - 2004



* *Heavy drinkers are those who drink on 2 or more days a week and have at least 3 drinks per day. It also includes those who drink once a week or less but have more than 5 drinks on these days.*

(NB: comparability of 2004 figures with previous surveys may be slightly affected because of definition)

3.7 Serum Lipids

The figures regarding the prevalence of dyslipidaemia, a risk factor for cardio-vascular diseases and diabetes complications, show that the condition is more common among males than among females (Table 17).

Table 17 - Crude prevalence rates of elevated total cholesterol, HDL-cholesterol and fasting triglyceride levels among adults aged 20-74 years in 2004.

	Male (%)	Female (%)
Cholesterol \geq 5.2	27.9	25.8
HDL-Cholesterol $<$ 1.0	26.3	16.8
Triglycerides \geq 2	7.7	2.8

The evolution of dyslipidaemia during the period 1992 to 2004 is shown in Table 18. A marked deterioration was noted between 1992 and 1999. However, during the period 1999 to 2004, there has been some notable improvement in all the above parameters under study.

Table 18 - Crude prevalence (%) of dyslipidaemia from 1992 to 2004.

	1992	1999	2004
Male			
Cholesterol \geq 5.2	16.8	30.6	27.9
HDL-cholesterol $<$ 1.0	4.2	32.8	26.3
Triglycerides \geq 2	10.5	14.0	7.7
Female			
Cholesterol \geq 5.2	21.4	31.1	25.8
HDL-cholesterol $<$ 1.0	2.4	26.3	16.8
Triglycerides \geq 2	4.5	7.2	2.8

3.8 Leisure Physical Activity

In 2004, the prevalence of adequate moderate or heavy leisure physical activity in the age group 35-54 years was 22.0% among males and 5.3% among females.

Table 19 - Prevalence (%) of moderate or heavy leisure physical activity in age group 35 – 54 years.

	1992*	1999*	2004
Male	20.2	19.7	22.0
Female	1.9	2.3	5.3

* adjusted for age

An increase in trend in the prevalence of adequate leisure physical activity during the 12-year period has been noted in both among males and females (Table 19). However, among males, only one in every 5 Rodriguans aged 35-54 years was engaged in such activity, and in females, the ratio is 1 in 20. It is noted that physical activity level continues to remain low, especially among the females.

4. DISCUSSION

The findings of the 2004 Rodrigues NCD Survey suggest that there has been a number of noticeable changes in the evolution of diabetes, hypertension and their risk factors in the population during the past 12 years.

4.1 Diabetes Mellitus

The prevalence rate of Type 2 diabetes in adults aged 20-74 years in 2004 was found to be 9.4%. However, the prevalence is showing a downward trend from the 10.6% documented in 1999. In 1992, the prevalence was at 8.1%.

Case ascertainment of diabetes in the population remains at 40% showing that three in every five persons with diabetes still do not know that they have the disease. This figure has shown a slight increase over the years. It is to be noted that, among males, the case ascertainment rate is still around 22% and has not shown much increase over the years.

The rate of poor control in those with the disease remains high with 60.4% of all diabetics surveyed being poorly controlled (FPG \geq 8.5 mmol/L). (In 1999, the prevalence of poorly controlled diabetes (FPG \geq 11.1 mmol/L) was 37% and this figure has fallen down).

4.2 Impaired Glucose Tolerance (IGT)

The prevalence of Impaired Glucose Tolerance (IGT) has been increasing steadily during the period 1992 to 2004 and it was found to be 10.9% in 2004. Higher levels are found among women. If this trend continues the prevalence of Type 2 diabetes is likely to increase in the future. The continued increase in IGT prevalence may have resulted from a greater prevalence of overweight and obesity, especially among females and the generally low prevalence of adequate leisure physical activity in the population.

4.3 Hypertension

The prevalence of hypertension continues to remain around 32.8%, after having peaked at 36.8% in 1999. Case ascertainment rate continues to increase from 40.1% in 1992 to 50.1% in 1999 and 60.1% in 2004 and the level of poor control of blood pressure (blood pressure \geq 165/95 mmHg) in those with the disease remains at 37%. A number of conditions may have contributed to the fall in prevalence namely greater awareness and improvement in serum lipid profile. However, poor compliance with pharmacological and non-pharmacological treatment and the reluctance of people at risk to get screened and be treated early may still be very common.

4.4 Overweight and Obesity

Obesity has increased during the period 1992 to 2004 with a sharp increase noted during the period 1999 to 2004 from 19.6% to 22.9%. The prevalence of overweight in both males and females has not changed much over the years and stays at around 31-34%. The prevalence of overweight and obesity in 2004 was around 55% with the condition being more prevalent among women than among men.

4.5 Hyperlipidaemia

It is noted that between 1992 and 1999 there has been an overall increase in the prevalence of hypercholesterolaemia (i.e. cholesterol \geq 5.2 mmol/L) in both males and females, and during 1999-2004 there has been a decrease. This may have resulted from greater awareness of the health risks associated with hypercholesterolaemia following the availability of cholesterol lowering drugs. The levels of elevated triglycerides have shown a similar pattern during this period. It should be noted that hypercholesterolaemia level have remained around 26-31% and hyper-triglycerides levels below 15% during the period 1999 – 2004.

4.6 Leisure Physical Activity

The prevalence of adequate moderate or heavy leisure physical activity has increased from 20.2% in 1992 to 22.0% in 2004 in males and from 1.9% in 1992 to 5.3% in 2004 in females. However, adequate Leisure Physical Activity continues to remain at very low levels in females and at low levels in males. These figures are expected to increase as more and more adults adopt a healthier lifestyle where regular physical activity becomes an important component.

4.7 Tobacco Consumption

Tobacco consumption continues to decrease steadily with current smoking among males decreasing from 58.4% in 1992 to 39.1% in 2004. In females there was a decrease from 1992 to 1999 (i.e. from 4.9% to 1.7%) but during the period 1999 to 2004 there is an increase to 4.5%. Smoking remains more common in younger males. This steady fall may have resulted from greater awareness of the ill effects of tobacco on health, anti-smoking measures (fiscal and legislative) taken by the government and anti-tobacco campaigns by non-governmental and other organisations.

4.8 Alcohol Consumption

The prevalence of abusive alcohol intake in males was 19.1% in 1992; this level dropped to 9.8% in 1999 and since then it has shown a dramatic increase to attain 40.9% in 2004. Among women, although the levels are relatively much lower, there has been a significant increase during the period 1999 to 2004 to reach 5% in 2004 from 0% in 1999. Abusive alcohol intake remains a major health problem despite health education and a number of measures (legislative, fiscal and others) taken to discourage people from drinking excessively

