



MAURITIUS RESEARCH COUNCIL

BIOMEDICAL RESEARCH

(September 2001)

TABLE OF CONTENTS

Page

PREFACE	
ACKNOWLEDGEMENT	
LIST OF ABBREVIATIONS	
EXECUTIVE SUMMARY	1
1. INTRODUCTION	2
2. OBJECTIVES AND SCOPE	2
3. IMPORTANCE OF BIOMEDICAL RESEARCH IN MAURITIUS	2
4. CURRENT STATUS OF BIOMEDICAL RESEARCH	5
5. CONSTRAINTS AND CHALLENGES	5
6. PROPOSED MEASURES TO DEVELOP BIOMEDICAL RESEARCH IN MAURITIUS	6
7. LIST OF RESEARCH PROPOSALS	6
8. ANNEX	42
ANNEX 1: COMPOSITION OF WORKING GROUP	42
ANNEX 2: REFERENCES	43
ANNEX 3: STUDIES AND SURVEYS CARRIED OUT IN BIOMEDICAL RESEARCH	45
ANNEX 4: SUGGESTED THEMES	48

LIST OF ABBREVIATIONS

ABO	<i>Refers to ABO Blood Group</i>
ApoA	<i>Apolipoprotein A</i>
ApoB	<i>Apolipoprotein B</i>
BARI	<i>Bypass Angioplasty Revascularisation Investigation</i>
PCD	<i>Prevalence Clinically Detectable</i>
CHD	<i>Coronary Heart Disease</i>
CRP	<i>C-Reactive Protein</i>
CVD	<i>Cardiovascular Diseases</i>
EPI INPO	<i>Epidemiology information</i>
FEV1	<i>Forced Expiratory Volume (first minutes)</i>
FVL	<i>Factor V (five) Leiden</i>
GHbA1c	<i>Glycated Haemoglobin</i>
HBP	<i>High Blood Pressure</i>
HCA	<i>Health Care Assistants</i>
HDL	<i>High Density Hypoprotein</i>
IGT	<i>Impaired Glucose Tolerance</i>
IHD	<i>Ischaemic Heart Disease</i>
IPR	<i>Intellectual Property Rights</i>
IPSC	<i>International Prostate Symptom Score</i>
KABP	<i>Knowledge, Attitude, Behaviour, Practice</i>
Lp(a)	<i>Lipoprotein</i>
MRC	<i>Mauritius Research Council</i>
MFPA	<i>Mauritius Family Planning Association</i>
MOH	<i>Ministry of Health</i>
NCD	<i>Non Communicable Diseases</i>
OPD	<i>Outpatient Department</i>
PAP	<i>Prostatic Acid Phosphatase</i>
PCR	<i>Polymerase Chain Reaction</i>
PSA	<i>Prostate Specific Antigen</i>
SNPS	<i>Single Nucloetide Polymorphisms</i>
T2D	<i>Type 2 Diabetes</i>
TAGVHD	<i>Transfusion Associated Graft Versus Host Disease</i>
WHO	<i>World Health Organisation</i>

EXECUTIVE SUMMARY

Biomedical Research is an important component of a health care system of country. The overall aim is to elucidate problems associated with health service and with delivery of health care and to help understand the aetiology, pathogenesis, and causes and mechanisms of various types of diseases. It also entails the definition, diagnosis and management of treatment of those diseases. Research requires indices of burden on the health system and they include mortality , morbidity, hospital admissions and attendance at health points. Thus in Mauritius, infant mortality rate is 19.9/1000 while deaths due to heart diseases account for 30 percent of total. Prevalence of diabetes in the adult Mauritian population has increased by 36 percent since 1987 with the prevalence rate being nearly 20percent in 1998, and of whom about 37 percent are poorly controlled. Similarly, diagnosed cases of hypertension has risen by 20percent and dyslipidemia, an important risk factor of heart disease, has reached the 50percent since 1992. During the five-year period from 1994, hospital admissions increased by 25.2 percent and the number of operations performed increased too by 50.5 percent. The disease responsible for greatest number of first attendance at the health points was influenza, representing 20.9 percent of the total number of first attendance. Nearly one every five cases treated at general hospitals was a person aged 60 or over.

The three main causes of mortality in Mauritians are heart disease (29.6percent) , cerebrovascular diseases, (14.4percent and diabetes (4.7percent).Diseases due to circulatory system account for 10.4 percent of all cases compared to 9.8 percent in 1994. Mortality due to the same represents 39.9 percent of all deaths. During an eight-year period (1989-1996) 1085 cases of female breast cancer and 855 cases of cancer of the cervix were registered. About 200 cases of cancer of the prostate and 177 cases of colon cancer were noted during the same period.

The main areas for research will thus include infant and child health, adolescent health and health of the elderly; non- communicable diseases and associated risk factors; communicable diseases, maternal, perinatal and nutritional considerations. Other important components in the health service for requiring systems research will include quality assurance, communication and aspects of ethics.

The present Thematic Task Group had as specific objectives to (a) assess the relative importance of biomedical science in the country; (b) discuss the constraints and challenges facing the sector;(c) identify areas of research;(d) list the support required for the proposed research; (e) have an estimate of the costs and time required for each project.

The main recommendations of the Working Group were:

- To set up a national coordinating body to identify and set up priorities for biomedical research;
- To increase capacity building for research through appropriate and systematic training programmes;
- To protect the works of the researcher through the Intellectual Property rights; and
- To make Mauritius and Rodrigues a reference centre for Biomedical Research in the Africa Region.

1. Introduction

Biomedical science including biomedical research is known to bring significant benefits to any national health service programme. Human health-related research, be it epidemiological, applied, fundamental such as molecular, or genetic encompasses health services research as well as population based research. When it involves solving practical and relevant problems in health care delivery, one refers to health systems research to improve the health status of the individual as well as that of the population. Biomedical research can therefore, be categorised into clinical research, operational research, research in health economics as well as population studies. In the latter type, there is often the component of social, psychological and educational research.

2. Objectives and Scope

The overall objective of biomedical research is to elucidate problems associated with health service and with delivery of health care and to help understand the aetiology, pathogenesis, and epidemiology of various types of diseases. It also entails the definition, diagnosis and management of diseases, their prevention and health promotion.

3. Importance of Biomedical Research in Mauritius

It has long been recognised that biomedical research is vital, more so, when we consider the present health status of the African region. Recent world health reports show that the disability-adjusted life expectancy from birth in Africa is between 44- 47 years as compared to 68-73 in Europe or in America.

Deaths caused by communicable diseases including maternal and perinatal deaths account for 67-73 percent in Africa, which represent 17 percent of the worldwide total for communicable diseases mortality. Deaths due to non-communicable diseases (NCDs) are 20-25 percent in Africa, equivalent to 3.2 percent of worldwide total for non-communicable diseases. About 20 percent of the NCD mortality is due to cancer and over 40percent to cardiovascular diseases.

There is a rising incidence of cancer, cardiovascular diseases, diabetes, hypertension and other chronic diseases as well as of the infectious diseases in particular HIV. In many developing countries of Africa Region, biomedical research has been conducted by overseas agencies and experience there has shown that research findings are not appropriately used for local needs.

In Mauritius, up to the late eighties most studies carried out were for implementation of health programmes. A health systems research was set up in the Ministry of Health in 1988. In the following year, the Mauritius Institute of Health was created with one of its functions was to carry out health systems research, particularly in aspect of operation and utilisation of health services, provision of quality of care and output of health programmes, and identification of determinants and risk factors in occurrence of major health problems. The SSR Medical Research Centre was also created to look into causes of specific diseases such as asthma and cardio vascular diseases.

The prevalence of diabetes in the adult Mauritian population was, in 1998, nearly 20percent and has increased by 36 percent since 1987, of whom about 37 percent are poorly controlled. Diagnosed cases of hypertension which was in the same year about 14percent has risen by 20percent and dyslipidemia,

an important risk factor of heart disease, has reached the 50percent since 1992. Deaths due to heart diseases accounted for 30 percent of total deaths and 14.4 percent were due to cerebrovascular diseases.

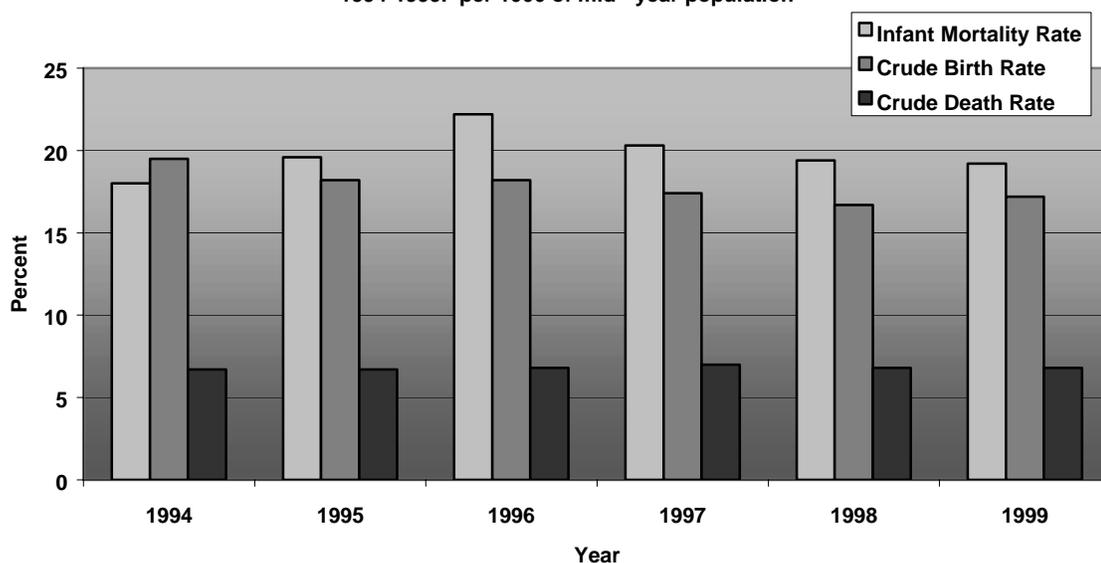
The health situation in the island of Rodrigues appears worse. In a seven-year period from 1992, there has been a notable rise in diabetes (31percent), with one in every sixth person having Type 2 diabetes. Obesity is high in the Rodriguans. The rate of hypertension was 48percent, probably the highest reported anywhere in the world.

All this warrants important and immediate research into the causes and management of diseases. In particular, research should be oriented towards prevention strategies for these conditions, whether primordial, primary, secondary or tertiary prevention to reduce the incidence and prevalence and complication of those diseases.

Priorities for research are dictated by indices of burden on the health service of the country and also by decision on the importance of the fields of research, the extent to which effort is already being deployed and the scientific feasibility and interest of what is proposed.

The main indices of burden include mortality, morbidity, hospital admissions and attendance at health points. While the crude birth rate in Mauritius in 1999 was 17.2 per thousand, the crude death rate was 6.8 per thousand of mid year resident population. The infant mortality rate was 19.9 per thousand in the same year. Figure 1 depicts the trend in the crude birth, and death rate, and infant mortality rate measured by 1000 of population.

Figure 1: POPULATION VITAL STATISTICS FOR MAURITIUS, 1994-1999. per 1000 of mid - year population



Source: Ministry of Health and Quality of Life.

During the five-year period from 1994, hospital admissions increased by 25.2 percent and the number of surgical operations performed increased too by 50.5 percent. The disease responsible for greatest number of first attendance at the health points was influenza-like, representing 20.9 percent of the total number of first attendance. Nearly one in every five cases treated at general hospitals was a person aged 60 or over.

The three main causes of mortality in Mauritians are heart disease (29.6percent), cerebrovascular diseases, (14.4percent) and diabetes (4.7percent). Considering the international classification of causes of death (ICD 1975 Revision), mortality due to diseases due to circulatory system, account for about 40percent and that due to neoplasm 9.7percent. In Seychelles, infant morality rate was estimate at 12 per 1000 of population while the death rate was 7.8 per 1000 of population in 1997.

**TABLE 1: INTERNATIONAL CLASSIFICATION OF DEATHS (ALL AGES)
IN MAURITIUS BY SEX, 1996 – 1999**

	1997		1998		1999	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
Infectious and parasitic diseases	86	65	50	47	64	40
Neoplasms	366	275	379	346	383	348
Endocrine, nutritional and metabolic diseases, and immunity disorders	143	160	167	191	187	218
Diseases of the blood and blood-forming organs	12	10	12	15	12	12
Mental disorders	66	5	41	4	43	6
Diseases of the nervous system and sense organs	31	24	45	28	47	38
Diseases of the circulatory system	2006	1660	2034	1711	1998	1714
Diseases of the respiratory system	393	234	435	276	456	289
Diseases of the digestive system	319	73	306	83	324	79
Diseases of the genitourinary system	211	168	154	106	166	125
Complications of pregnancy, childbirth, and the puerperium	0	10	0	4	0	7
Diseases of the skin and subcutaneous tissue	0	0	3	0	3	1
Diseases of the musculoskeletal system and connective tissue	3	3	1	4	3	8
Congenital anomalies	22	14	36	28	38	36
Certain conditions originating in the perinatal period	176	117	140	118	131	99
Symptoms, signs and ill-defined conditions	337	340	199	196	162	204
Injury and poisoning	368	101	382	110	399	151
TOTAL	4539	3259	4384	3267	4416	3375

Source Ministry of Health and Quality of Life.

During an eight-year period (1989-1996), the total number of cases of cancer that were registered was 3000. 1085 cases of female breast cancer and 855 cases of cancer of the cervix were also registered. About 200 cases of cancer of the prostate and 177 cases of colon cancer were noted during the same period.

The main areas for research will thus include infant and child reproductive health, adolescent health and health of the elderly; non- communicable diseases and associated risk factors; communicable diseases, maternal, and nutritional considerations. Other important components in the health service requiring system research will include quality assurance, communication and ethical aspect.

4. Current Status of Biomedical Research

At present only a few institutions are actively engaged in biomedical research. The Mauritius Institute of Health besides its activities in health systems research contributes to the capacity development through training courses in public health and applied epidemiology, among others. The SSR Centre of the University of Mauritius has carried out genetic studies related to cardiovascular diseases, genetics of insulin resistance, premature coronary heart disease, and haemoglobinopathies. The Central Health Laboratory of the Ministry of Health and Quality of Life has been active in research on clinical aspects of diabetes, hypertension, and tumour markers and in the field of sexually transmitted diseases and HIV. The Department of Health and Medical Sciences of the University of Mauritius, whilst engaged in teaching of health sciences has carried out studies related to hepatitis B, pharmacology and anticancer therapy and diagnosis and on the impact of environmental pollution on health. Research in the field of sexual and reproductive health has been done at the Mauritius Family Planning Association as well as at other Institutions.

The Nutrition Unit, the Medical Statistics Unit and the Non Communicable Diseases Unit of the Ministry of Health and Quality of Life have contributed significantly to surveys and studies in important health issues.

In some of the above-mentioned cases, research grants were obtained from overseas institutions. In other cases, the sponsorship has been from the Mauritius Research Council, the apex body whose principal aim is to promote, coordinate and fund research in all spheres.

However, there is at present no definite mechanism of collaboration or of coordination among these institutions. Not all research activities appear to be in accordance with the requirement of a national policy. There is as well an absence of a coordinating body at the national level to identify and set up priorities of biomedical research. There is in fact a need for capacity building for research, which should include training of researchers and setting up of a database and reference library. Albeit, some capacity building is offered by the Mauritius Institute of Health. Allocation of funds for research is another important consideration.

5. Constraints and Challenges

Therefore, despite research being timidly carried out by above institutions, there are important constraints to the development of biomedical research in the country. Inadequate funds, inappropriate research capacity and inconsistent official commitment are important impediments. Coordination at national level is lacking. The scanty research funding is probably not being utilised properly and optimally.

The main challenge is thus to find ways and means to increase awareness of the importance of biomedical research and to define priorities at national level, which should also include the situation in Rodrigues. Resources should be clearly and adequately allocated to health research. Appropriate coordination must be set up for Mauritius and Rodrigues to ensure optimal utilisation of funds.

6. Proposed Measures to Develop Biomedical Research in Mauritius

Biomedical research must be directed and coordinated by an apex body. Important considerations for viable biomedical research will also include training of researchers and supporting staff; availability of data bank of vital information including statistics; means of motivating personnel in the medical field to indulge in active research and a proper mechanism and dissemination of research. The latter can be in form of assisting the researcher in preparing publications as well as providing financial incentives for particular research. There is need for collaboration for cost effective research: an inventory of available equipment and personnel resources in the different research institutions can be an initial step. Collaboration must also be sought from international agencies, which include research centres and universities. A memorandum of understanding with selected centres will enable exchange of knowledge and transfer of technologies, mainly in form of training, expert missions, equipment donation, and scientific visits and seminars. Ethics will be an important aspect and research proposals and works of the researcher must be protected by the Intellectual Property Rights.

Once biomedical research gets well anchored in the country, Mauritius will eventually stand as a potential reference centre for biomedical research in the Region.

7. LIST OF RESEARCH PROPOSALS

7.1 Assessment of a Preventive Strategy for Specific Non-Communicable Diseases - (NCDs) in the Mauritian Population.

(Dr F Hemraj)

Objectives

The main objectives of the study will be:

- To develop a practical cost effective programme for prevention and control of specific NCDs, including is haemic heart disease, stroke, hypertension and diabetes mellitus and where appropriate asthma.
- To train staff appropriately and to build the programmes in respective health structures.

Background and Justification

Non -communicable diseases, particularly cardiovascular diseases (CVD), cancer, diabetes and respiratory disease are the major causes of morbidity and mortality in the developed world. Thus in 1990 WHO reported that CVD accounted for 44.5 percent of deaths and 25 percent were due to malignant neoplasms with external causes, chronic obstructive lung disease, diabetes and cirrhosis contributing a further 14percent. As developing countries go through the transition to developed status NCDs are emerging as a massive problem and reaching epidemic proportions. Thus the heart disease is now the main cause of deaths in rapidly industrialised countries such as Mauritius and Singapore [1], whilst type 2 diabetes affects a quarter of adults in Nauru [2] and approximately a fifth of the Mauritian adult population [3].

Type 2 diabetes is associated with increased risk of CVD and increased incidence of hypertension and almost universally those populations showing a rapid increase in diabetes have similar rapid rise in CVD and vice versa.

In Mauritius, whilst total mortality is falling, deaths from diseases of the circulatory system rose from 114 to 297 per thousand between 1942 and 1986- 45 percent of total deaths compared with 4percent. Mauritius is a multiracial island, the main groups being Asian Indian Hindus, Asian Indian Muslims, Creoles and a small number of Chinese. The first study for prevalence of NCDs carried in 1987 showed an overall crude prevalence of diabetes of 12.8percent with 17.9percent showing impaired glucose tolerance, which is a risk category for both Type 2 diabetes and ischaemic heart disease (IHD) [3]. Major risk could be attributed to overweight, central adiposity and physical inactivity [4,5]. The crude prevalence of hypertension was 16.1percent in males and 13.8 percent in females [6] with Asian Indian Muslims lowest and Creoles highest. About 60percent of Type 2 and 40percent of hypertensives were previously unknown, indicating a large pool of unknown morbidity in the community. IHD was also common, the age group of 35-74 showing a probable or possible ischaemia in 19 percent of males and 35percent of women. Hypertension, glucose intolerance, uric acid and raised cholesterol were the main determinants. Other CVD risk factors were also evident. Thus 26percent of males and 38 percent of females were overweight .of males 58percent were current smokers but only 6.9percent of women. Physical inactivity was found in 46percent of men at work and 84 percent for leisure with figures of 81percent and 99percent respectively for women [7].

A follow-up survey was carried in 1992 [8]. The prevalence of Type 2 diabetes and of IGT was not changed significantly, but there was more awareness in the community and the proportion of unknown cases had fallen. On the other hand the incidence of new diabetes cases in the five years was high and proportion of poorly controlled diabetic patients had increased to 42percent. The proportion of obese or overweight individuals had increased also: from 26 percent to 36 percent in males and from 38percent to a massive 48 percent in females.

By contrast hypertension had improved: down from 15 percent to 12 percent in males and 12.4percent to 10.9 percent in females and the proportion of known cases had increased. The number with poorly controlled blood pressure had also decreased from one half to one third. Leisure time physical activity had increased, alcohol consumption had gone down and smoking had fallen markedly from 58percent to 47percent in males and to 4percent in females. Cholesterol had fallen by about 1 mmol/L, attributable mainly to a change in subsidy from palm oil to soybean based cooking oil.

A survey carried in the following year in the neighbouring island of Rodrigues, part of the Republic of Mauritius, showed similar prevalence for Type 2 diabetes and IGT. The population there is predominantly Creole. Hypertension rates were alarming- occurring in 22percent males and females, with borderline levels in a further 14 percent. Only 7 percent of all those had found well-controlled blood pressure, despite treatment in many. Overweight was also commoner than in the main island [9]

The last survey carried in Mauritius was in 1998 [10]. Results are alarming. The prevalence of diabetes in the adult Mauritian population increased by 36 percent since 1987, with about 37percent poorly controlled. Diagnosed cases of hypertension has risen by 20percent and dyslipidemia, an important risk factor of heart disease, has reached the 50percent since 1992.

In the island of Rodrigues from 1992 to 1999, there has been notable rise in diabetes (31percent), with one in every sixth person having Type 2 diabetes. Obesity is high and rate of hypertension is 48percent, which may be one of the highest reported anywhere in the world [11].

Mauritius has therefore major problems with IHD, CVD risk factors and diabetes. These NCDs are taking and may have taken epidemic proportions now. Much needs to be done for prevention and intervention. A new approach to decrease NCDs and their risk factors, and better control programmes for those with established diseases are necessary. Both prevention and control actions are required.

Methodology

- Primary prevention involving the community, with emphasis laid on diet, exercise, and smoking.
- Programme will be implemented initially in pilot areas (five) and evaluated and monitored on a regular basis.
- Programme will then be extended to other Centres as well as to selected work institutions.
- Detection activities will be carried out to screen for diabetes, dyslipidemia and hypertension, on adults aged 40 and above and on high risk individuals, initially at selected centres.
- For control programmes, cost effective drug intervention will be used; training programmes will be held for both community based primary health care staff and physicians
- Monitoring of compliance, change in life-style, and effect of risk factors will be carried out.

Resource requirements

- Supplies for detection, control, and education programmes

- Transport facilities
- Health Centres

Financial

The estimated cost is 1.2 million rupees per year

Time frame

Five years.

Manpower

Lecturers, Medical officers, Health education officers, Nutritionists, Nurses

Institution Support

- The Ministry of Health and Quality of Life and other Ministries;
- The Mauritius Institute of Health
- Overseas specialist centres

Expected Results

- Availability of effective health education programmes;
- Diminished population prevalence of obesity;
- Evidence of change in lifestyle;
- Evidence of a continued screening programme in place nation wide;
- Appropriate treatment delivered to detected cases;
- Availability of validated interventions and protocols;
- Lower prevalence of dyslipidemia; and
- Long term decrease in myocardial infarction, stroke, and diabetic complications.

Beneficiaries

- Patients
- Health care providers
- The population at large

7.2 Treatment of Obesity in Childhood Leads to A Decreased Prevalence of Adult Obesity.

(Dr F Hemraj)

Objectives

To assess the health benefits achieved through implementation of a behavioural treatment involving improvement of eating habits and of levels of physical activity in children at high risk for significant adult obesity.

Background

Obesity can be defined as the disease in which excess fat has accumulated to such an extent that health may be impaired [12]. The prevalence of overweight and obesity is increasing worldwide at an alarming rate, both developed and developing countries being significantly affected [13]. The problem is increasing rapidly in both children and adults. From limited prevalence data available in Africa Region, obesity is a definite problem, particularly among women.

Obesity may result in an increased risk of premature death as well as to non-fatal conditions which can adversely affect the quality of life of the individual. Obesity is a known major risk factor of Type 2 diabetes, cerebrovascular diseases and cancer. Abdominal obesity is of particular concern as it is associated with greater risk to health than is a more peripheral fat distribution.

In Mauritius and in Rodrigues, obesity is of similar trend as in industrialised regions such as Europe and America. In fact, a dramatic increase in obesity prevalence over a five-year period was noted in men and women aged 25 to 74 years. The proportion of obese men increased from 3.4 percent in 1987 to 5.3 percent in 1992, while the proportion of obese women increased from 10.4 percent to 15.2 percent in the same period [14,15]. This increase was seen in all age groups and ethnic groups [16]. Obesity is thus a major health problem in the country, a result of the adverse effect of life style change which accompanied the rapid modernising population.

Methodology

- Selection of families with children at high risk for significant adult obesity;
- Data collection and baseline biochemical investigations of children and parents at initial treatment;
- Devise different treatment , involving diet and physical exercise;
- Apply the group behaviour modification treatment over a period of 8-12 week, followed by monthly maintenance sessions for 6-12 months; and
- Measure obesity indicators including body weight at end of 5 years and 10 years.

Resource Requirements:

- Supply of materials for questionnaires, biochemical investigations, and education materials;
- Transport facilities; and
- Centres for counselling and treatment.

Financial

Estimated cost is Rs. 500,000 per year.

Manpower: Nurses, Doctors, Scientists, Nutritionists, Sociologists.

Institution Support

- The Ministry of Health and Quality of Life and other Ministries
- University of Mauritius.
- Overseas institutions.

Time Frame

5-10 years.

Expected results

- Availability of tested treatment for obesity in form of a behavioural change;
- Evidence of reversal of obesity in the treated subjects;
- Evidence of favourable biochemical indicators; and
- Evidence of family support in treatment regime.

Beneficiaries

Children and adults; population in general.

7.3 Salt Excretion and Diet in Rodrigues: a Follow up Study.

(Dr F Hemraj)

Objectives

To determine whether high salt intake through consumption of certain diets and /or consumption of drinking water is responsible for the very high prevalence of hypertension in Rodrigues.

Background

Epidemiological evidence suggests that blood pressure of a population and therefore the prevalence of hypertension is related to interplay of genetic and environmental factors [17]. High salt intake, high alcohol consumption and obesity all have important influences on blood pressure [18]. In 1992, the first NCD survey carried out in the Island of Rodrigues already showed an extraordinary prevalence of hypertension with marked regional variation [9]. After a seven year period there was a rise in the prevalence of hypertension reaching the 48 percent: one in every two adults in Rodrigues is hypertensive. In population terms, the rate of obesity has remained high as well (19.6percent). However, the rate of alcohol consumption has significantly declined by 51percent during that period. There have been anecdotal impressions that there is high intake of salt, mainly through consumption of salted fish. A study on the mineral content of drinking water in Rodrigues has shown pockets of high sodium chloride concentration in at least three regions.

Methodology

- A study of 24-hr urinary salt excretion be performed on a sub-sample of adults from the previous NCD survey;
- A study of nutrition be performed on same subjects through 24-hr recall, food frequency and health knowledge/attitudes/practice questionnaire;
- A questionnaire to assess intake of specific foods high in salt;
- Collection of 24 hour urine sample for biochemical analysis; and
- Collection of drinking water from various selected sources, for analysis of mineral content.

Resource Requirements

Laboratory equipment and consumables, stationary, statistical requirements, transport

Financial

Total estimated cost: Rs. 500,000.

Manpower

Coordinators, Field Workers, Laboratory Personnel, Nurses, Doctors, Motivators, Nutritionists, Interviewers.

Institution Support

- Ministry of Health and Quality of Life
- University of Mauritius
- Overseas institutions.

Time Frame

Six months

Expected results

- Evidence of wrong type of diet, conducive to hypertension
- Evidence of drinking water, inappropriate to health
- Database on the nutritional status of Rodriguans

Beneficiaries

- Policy makers in Mauritius and Rodrigues
- Inhabitants of Rodrigues.

7.4 Use of Computer Science to Transform Biomedical Data in a Form Suitable for Study and Use.

(Dr F Hemraj)

Objectives

To establish through computer science a programme for practice of information storage, curation, analysis, and retrieval with subsequent consolidation of biomedical research. To render in a form suitable for use and study, all biomedical data obtained from routine medical practice and from research works and surveys.

Background

There is a huge amount of biomedical data which is being generated daily in all activities of medicine. The enormous repository of information which results from for example clinical trials, medical routine statistics, surveys and studies (including genetics or the Human Genome Project), is such that its storage and retrieval will necessitate phenomenal space and resources. Information technology now provide advanced database and database technologies which include methods to store, retrieve and analyse biomedical data. Bioinformation can help researchers to gather and standardize data from basic research and computer modelling. The knowledge contained therein can be extracted. With increased availability of information there is need for standardization and interoperability of databases.

Methodology

- To identify areas in biomedicine which require biomedical computing;
- To develop expertise among biomedical researchers in using computational tools;
- To create appropriate software;
- To prepare suitable algorithms as mathematical expression of information in a specialized environment; and
- To create database with its subsequent curation and access.

Time Frame

1-2 years

7.5 Type 2 Diabetes: Assessment of Incipient Nephropathy in Mauritian Adults.

(Dr F Hemraj)

Objective

To initiate a prevention programme for Type 2 diabetes with the specific aim to detect subclinical proteinuria in Mauritian diabetic patients.

Background

Type 2 diabetes has been recognized as a major health problem in Mauritius: prevalence of the disease was 13.8 percent in 1992 and has now increased to about 20percent. Around 40 percent of the diagnosed cases of diabetes are poorly controlled [1]

Although relatively new phenomenon, Type 2 diabetes is major concern for the health authorities. Prevention programmes had been introduced but the annual average rate of deaths per 100,000 mid year population was 10.6 (ischaemic heart disease), 3.3 (diabetes) and 2.5 (renal failure) [16]. Studies have shown that diabetic patients are 17 times as prone as non-diabetic subjects to develop kidney disease; diabetes is in fact a leading cause of deaths due to end-stage renal disease in the United States [34]. Type 2 diabetes is an important risk factor for cardiovascular disease. Several studies have shown that presence of albumin undetected by conventional dipsticks, and termed as microalbumin in urine of patients, is not only a predictor for proteinuria and progressive diabetic nephropathy but also a prognostic indicator of early mortality[35]. Microalbuminuria defines the first stage of diabetic nephropathy, incipient or subclinical nephropathy, where there is a persistent increase in albumin excretion rate without frank proteinuria[36]

Surveys in Mauritius have shown signs of early diabetic renal complications [8] coupled to the fact that glycemic control has not improved. There is thus a need to initiate a programme to reduce mortality and morbidity that can arise from diabetic nephropathy.

Methodology

- Selection of patients attending diabetic clinics;
- Baseline study including measurement of height,weight, blood pressure, collection of data through questionnaire on family history, nutritional habits ,medial history and of other associated risk factors;
- Collection of blood and urine specimen under standardized conditions; and
- analyses of biochemical parameters including microalbumin.

Time frame

1-2 years.

7.6 Micronutrient Deficiencies in Elderly.

(Mr Doreemeeah)

Objectives

The overall objectives is to assess level micronutrients such as iron, vitamin A, zinc and magnesium in a sample of 1000 subjects with a view to determining the magnitude of the problem.

Background

With an ageing population and a shift from extended family to nuclear family, the elderly are left on their own. Consequently, they have developed poor eating habits because of certain disabilities and less enthusiasm to prepare and consume a Balanced Diet.

Although life expectancy has increased, but the emerging Non-Communicable Disease related with faulty eating habits will no doubt increase the burden of diseases.

Methodology

- Survey through questionnaire.
- Laboratory blood analysis.

Resource Requirements

Financial

Rs. 700,000

Manpower

Doctors, Nurses, Nutritionists, Lab Technicians and Interviewers.

Equipment

Laboratory and reagents.

Institutional Support

Ministry and Residential Homes.

Time Frame

18 Months

Expected Results

Provide baseline information for proper intervention programme with a view to improving the quality of life of elderly.

Beneficiaries

Policy makers, institutions responsible for the management of elderly.

7.7 Prevalence of Zinc Deficiency in Children Under 5 Years.

(Mr Doreemeeah)

Objectives

To determine the causal effects of zinc deficiency in stunting and under nutrition among 1000 children below the age of 5.

Background

- During the past few years more attention has been given to the possibly high prevalence of zinc deficiency among children from developing countries and its consequences. Zinc seems to stimulate growth especially in growth retarded and underweight children.
- The First Nutrition Surveys carried out in 1985 indicated that 21.5percent of children were stunted (Height for age) but the figure for 1995 show some improvement yet it is a still on the high side i.e. 14percent.

Methodology

- Design a questionnaire – 24 hour Dietary call.
- Level of zinc in blood.

Resource Requirements

Financial

Rs. 500,000

Manpower

Paediatrician, nurses, nutritionist, Lab technician and interviewers.

Equipment

Laboratory for zinc analysis.

Time Frame

Expected Results

Provide accurate and scientific information for proper intervention programmes.

Expected Results

Provide baseline information for proper intervention programme with a view to improving the quality of life of elderly

Beneficiaries

Government Institution, Policy makers, parents and finally children.

7.8 Search for Genetic Factors Underlying Susceptibility to Premature Coronary Heart Disease in Mauritius

(Dr Mrs Manraj)

Objectives

To identify the genetic factors contributing to coronary atherosclerosis in our population. Finding the genes conferring susceptibility to this complex disease can potentially help to unveil pathways involved in its pathophysiology. A better understanding of the disease process is crucial in order to propose adapted modes of prevention and cure for a disease which is affecting the active workforce in our country.

Brief Background

Coronary Heart Disease (CHD) is a complex disease, caused by both lifestyle (smoking or sedentary lifestyle) and genetic risk factors. Coronary atherosclerosis is caused by plaque formation in coronary arteries and is complex in origin. Its pathogenesis involves inflammatory, hemodynamic, thrombotic and carbohydrate-lipid metabolic variables, along with intrinsic characteristics of the vessel wall.

CHD mortality in Mauritius is amongst the highest in the world (Vos et al, 1998)[19] and is not declining unlike what has been witnessed in most epidemiological studies elsewhere in the last decade (Tunstall-Pedoe et al, 1999)[20]. The pattern of CHD mortality decline is expected to be quite different in a few years in countries experiencing an increase in the prevalence of type 2 diabetes (T2D) as prevalence of both cardiovascular diseases and cardiovascular mortality is increased among diabetic patients. In the Global Burden of Disease Study (Lopez & Murray, 1998)[21], CHD is expected to rank first in 2020 in the baseline scenario worldwide and not only in developed countries, as is the case presently.

High rates of CHD mortality in migrant populations from the Indian subcontinent have been documented previously (McKeigue et al, 1989)[22]. In populations with a high prevalence of T2D, CHD carries a poor prognosis as the atherosclerotic process tends to be diffuse, with less successful outcomes after angioplasty or surgery (The BARI Investigators, 1996)[23].

In atherosclerotic diseases, genetic factors have a substantial influence over age of onset and the frequency and severity of symptoms, as well as response to therapy. In a twin study, the risk of death from CHD, after controlling for risk factors, was increased 8-15 times in monozygotic twins when their co-twin died prematurely from this disease (Marenberg et al, 1994)[24]. In this study, age at which one twin died of CHD was the primary independent variable to predict risk of death from the same disease in the other twin. It also showed that in myocardial infarction occurring at a young age, genetics may be the leading causative factor, it also suggested that some genetic mechanisms for susceptibility are yet to be identified.

We carried out case-control studies of position-independent candidate genes for premature CHD (age of onset before the age of 60) in 3 different ethnic groups in Mauritius: North-Indians (NI: ancestors came from the port of Calcutta), South-Indians (SI: ancestors came from Madras) and Creole subgroup (PG). The odds ratio for having a sibling affected by CHD was 7.42 (95percent CI: 3.34-17.13) in NI CHD patients compared to controls matched for ethnicity, the family clustering was quite similar in other ethnic groups. Abnormal glucose metabolism, high blood pressure (HBP) or the metabolic syndrome as defined by WHO were prevalent mostly in female patients and in the male PG group. 50percent of male NI and SI CHD patients did not present these qualitative risk factors but had higher

BMI, higher fasting insulin, higher fasting glycemia, higher plasma lipid values than controls matched for gender and ethnicity.

Confidence in a particular candidate disease gene is increased substantially if it can be shown to map to the same sub-chromosomal region as the disease gene (positional candidate gene approaches). So genome-wide searches for the mapping of sub-chromosomal regions harbouring major susceptibility genes are the first steps in the strategy to uncover the unknown molecular mechanisms in the pathophysiology of complex diseases. In parallel with case-control studies, we had recruited families with premature CHD which were potentially informative in view of carrying out a genome wide scan. A genome scan was planned, with 400 microsatellite markers initially spaced every 10 centimorgans, to look for major susceptibility genes which might contribute to CHD, T2D and HBP and lipid traits in these families. The genome-wide scan was carried out as a collaborative work between SSR Centre for Medical Studies and Research (SSRC), University of Mauritius and CNRS UPRES A 8090 in Lille (France). Model-free linkage analyses were carried out in Lille on sib-pairs from 99 complex families (541 individuals). Some of the most interesting results of this collaborative work have been recently submitted for publication to Human Molecular Genetics. Second-stage mapping has already been carried out in three of the best multi-point analyses in the first-stage genome scan on chromosomes 3, 8 and 16.

Our best linkage result was found on chromosome 16p13 with a suggestive lod-score of 3.06 ($p=0.00017$) for linkage with CHD.

Another region on chromosome 3q27 showed a suggestive lod-score of 2.13 ($p=0.0009$) with CHD, the same locus was linked to T2D in French families (Vionnet et al, 2000)[25] and to the metabolic syndrome in another Caucasian population (Kissebah et al, 2000)[26].

Linkage was found with CHD on chromosome 10q23 (lod score=2.03, $p=0.0011$) as well as with the age of onset for CHD, and lipid values such as HDL and the LDL/HDL ratio. It seems that the underlying genetic factors predisposing to CHD in this region may be related to lipid metabolism.

Another locus on chromosome 8q23 gave evidence for overlapping linkage with T2D and CHD in the initial genome scan as well as with high HBP in the second-stage mapping, a lod-score of 2.55 was found with T2D ($p=0.00058$) in this region.

We also replicated previous findings of a susceptibility locus to T2D in Mexican-American families (named NIDDM1) on chromosome 2q37 (Hanis et al, 1996)[27], we found a lod score of 3.03 for this locus in Mauritian families with T2D and the lowest BMI (using ordered-subset analysis).

Once a disease has been mapped to a subchromosomal region, it is possible to use database searches to identify candidate genes. Now that the Human Genome Project is completed, it is providing the necessary tools for genetic epidemiology to uncover the molecular mechanisms for variation in the distribution of disease among families and populations as expected (Ellsworth al, 1997)[28].

Methodology

Identification of the major genes contributing to CHD constitutes the next phase of our work after the completion of a genome scan in Indo-Mauritian families with premature coronary heart disease (CHD). However, before the search for candidate genes, the candidate regions can be further narrowed:

- Either by using fine-structure genetic mapping with more closely spaced microsatellite markers flanking the initial markers showing linkage to the disease, in families studied in the initial genome scan. This has been carried out in Lille for three regions already.
- Or by association analyses using single nucleotide polymorphisms (SNPs) to further delimit the interval of interest in case-control studies. A reasonable interval to screen for genes is 1 centimorgan (around 1 million base pairs). This can be carried out in Mauritius.

(a) Mutation screening

After a thorough inventory of genes and expressed sequences within the region, mutation screening is conducted to identify the causative gene. Candidate genes are best tested in the framework of a biological hypothesis. Screening for patient-specific point mutations in the candidate gene is a popular method. Identifying mutations in multiple affected individuals suggests that the correct gene has been identified. Some teams directly sequence exons, exon-intron boundaries and promoters of candidate genes in members of families showing linkage to the locus and compare their results to findings in families which did not show linkage and in around 100 DNA samples from unaffected individuals.

An automatic sequencer would be useful for these kinds of studies. Two automatic ABI sequencers currently exist in Mauritius, one high throughput slab gel electrophoresis instrument (ABI Prism™ 377 DNA Sequencer) in the Forensic Laboratory in the National Laboratories Complex on the Reduit campus, and another one using capillary technology (ABI Prism 310) at the MSIRI. Timesharing could be a useful alternative to cut down on the costs of acquiring such a machine, otherwise we have to rely on our foreign partners to carry out this part of the work.

(b) Mutation detection

Mutations in candidate genes have to be tested individually to determine the likelihood that they are associated with the disease. Results of mutation screening must be confirmed in association studies, mutations are analysed either in case-control cohorts or in family trios. This activity can be done in Mauritius.

(c) Typing of coding SNPs

Another method which could be used and could obviate the need for sequencing would be to directly type SNPs existing in exons and promoters of candidate genes in the vicinity of loci showing linkage to the disease, and to look for linkage disequilibrium between these SNPs and the disease in association studies. A catalogue of a million or more SNPs regardless of disequilibrium levels has been developed by an effort of the SNP Consortium in the human genome project. For this methodology and for association studies in general, there is a need to recruit additional patients affected by premature CHD and additional controls as comparisons should be made within subgroups defined by ethnicity and gender. We already have constituted a database including a total of 500 patients (recruited from outpatient clinics of the Ministry of Health in 1996/1997) and 500 controls, we need to triple these figures for association studies. We would recruit male patients affected before the age of 50 and female patients affected before the age of 60. Moreover to date we have phenotyped 300 families with at least one person affected by premature CHD.

Resource Requirements

Financial

MUR 5, 000, 000

This figure represents the costs of consumables, of purchase of equipment (Light Cycler which costs around MUR 1 500 000), and for recruiting a medically qualified person on a sessional basis.

Cost of consumables

Phenotyping per individual (and DNA extraction): Rs 600 for clinical and biochemical phenotyping (Oral Glucose Tolerance Tests, insulin profile, lipid profile including Lp(a), ApoB and ApoA, CRP etc...).

- Molecular biology studies: Rs 1000 per individual.

Total for consumables: 1600 x 2000 individuals = Rs. 3 200 000

Manpower

Further training of technicians at the SSR Centre to acquire new skills in sequencing.

Help of an additional medically qualified person for recruitment of controls and patients.

Bioinformatician to help in the maintenance of our clinical and genotypical database and help in search of available on-line databases.

Equipment

Acquisition of a Light Cycler (PCR and genotyping based on ICT) would be most useful in this study as it enables rapid and reliable SNP typing of individuals. There would be no need to heavily use gel technology and ethidium bromide which is potentially toxic for the environment. This equipment is versatile and can also be used for other type of studies.

Time-share an automated sequencer for sequencing putative candidate genes (mutation screening), this equipment could also be useful for genotyping microsatellites for linkage analyses.

Institutional Support

- Mauritius Research Council: for support to look for sponsors, sort out IPR issues and for being a facilitator.
- Ministry of Health: for giving access to OPD hospital departments, and cardiologists of Ministry of Health from whom prior permission must be sought to screen patients for this research work.
- SSR Centre, University of Mauritius: which has developed facilities for phenotyping of patients (available space, nursing staff trained in these procedures), DNA extraction and mutation detection analyses (technical staff already trained in some technology already available). The project (including the genome scan) started as a PhD project of a member of staff in the SSR Centre.
- Other possible collaborators abroad who could help in technology transfer and increase our perspectives of scientific knowledge in Mauritius. One such collaborator was Pr Philippe Froguel who financed the genotyping costs of our genome scan.

Time Frame

Recruitment phase for 2000 persons over 2 years.

SNP mapping and mutation detection in case-control studies (and sequencing): 2 years

Expected Results

Find the major genes conferring susceptibility to premature CHD in Mauritians. Better knowledge of the pathophysiology of the disease can help devise better targeted prevention strategies. Identification of new pathways through genetic studies can also potentially help in the development of new drugs against the disease or its risk factors.

Beneficiaries

- The Mauritian population at large and specially families at risk for the disease;
- The medical and the scientific community in Mauritius, by helping to foster a biomedical research culture. We should be involved as fully and as much as possible in this kind of research and avoid that Mauritius be perceived only as post office for DNA and clinical data; and
- Future PhD students wanting to carry out their research in Mauritius could benefit from the resources gathered in this study, and build on it to develop it still further.

7.9 Establishing a Quality System in Blood Transfusion Through Hemovigilance Network in Mauritius.

(Dr Mrs J Sonoo)

Objectives

This project aims at establishing a hemovigilance network to monitor the safety of transfusion in the country. This in turn will enable corrective actions to be initiated to prevent recurrences, thus improving the quality of blood transfusion.

Background

Blood transfusion is an important aspect of acute hospital care. In Mauritius, transfusion of blood and blood components has steadily increased over the past years. A total of 27,262 units were transfused in the year 2000 as compared to 13,905 in 1994. Although transfusion requirements in routine elective surgery have been more or less stable, increased use of blood and blood products can be attributed to introduction of such services as cardiac surgery and dialysis on a routine basis. Moreover, side effects such as bone marrow suppression, associated with treatment of malignancies, particularly haematological, also creates specific transfusion requirements.

Safety of blood transfusion can be compromised at many points, starting from the collection of blood to its final use. Although such spectacular events as a death resulting from an ABO mismatched transfusion are widely reported, many less fatal but highly morbid adverse transfusion events may not be reported or investigated.

In the recent years, increasing number of pathogens are being reported which could be transmitted through blood transfusion. Bacterial contamination is responsible for more immediate morbidity and mortality than viral infections. Moreover, immuno modulatory effects of transfusion are well known. Thus, if blood transfusion is life saving it can also be the cause of mortality and morbidity.

Notification and investigation of adverse transfusion events presently are erratic and do not help in monitoring the safety of blood transfusion.

Scope of the Project

This project will analyse the current incidence of major complications due to blood transfusion. This will be done by collecting data from all hospitals and private health care institutions on any adverse effects following transfusion of blood and blood products, investigate the causative mechanisms and take corrective measures where feasible. Hemovigilance network will also include a viral look back program.

Design and Setting

Project will involve both public and private health care institutions providing secondary and tertiary care to the patients. The reporting of adverse events would be done by these institutions to Blood Transfusion Service, Candos on a voluntary basis. This will involve medical, nursing and laboratory staff. The reports of adverse events sent would be kept confidential. The causes would be investigated and a report sent to the institution.

The reporting system would be done under these categories:

- Incorrect blood component transfused;
- Acute transfusion reaction;
- Delayed transfusion reaction;
- Transfusion related acute lung injury;
- TAGVHD;
- Post transfusion purpura; and
- Transfusion transmitted infections.

Methodology

- Situation Analysis of Current transfusion practice in the country;
- Policy and legislation pertaining to transfusion of blood and blood product;
- System of reporting adverse transfusion events;
- Facilities for technical and procedural investigations;
- Report on situation analysis;
- Develop, implement and monitor hemovigilance network;
- Analysis of results; and
- Implementation corrective measures.

Resource Requirements

Financial

1million rupees per year

Time Frame

Situation Analysis	6 Months
Report	2 months
Developing hemovigilance network	6 months
Implementation and monitoring	2 years
Report	3 months

Beneficiaries

Whole population

7.10 Prevalence of Hereditary Thrombophilia in Selected High Risk Patients.

(Dr Mrs. J Sonoo)

Objectives

Study prevalence of hereditary thrombophilia in selected cases of thromboembolism, recurrent first trimester abortions, young patients (<40yrs) with myocardial infarctions. Take preventive measures in high-risk groups (thromboprophylaxis, family and genetic counseling)

Background

Thrombophilia indicates an increased tendency to arterial or venous thrombosis that is recurrent and presents at unusual sites or at young age. (usually <50 years).Thrombosis can be catastrophic, leading to death or permanent disability, pregnancy losses and chronic limb venous insufficiency.

Thrombophilia may occur without any precipitating cause. Majority of inherited risk factors for thrombosis affect the natural balance between pro and anticoagulant forces. Common inherited factors for thrombophilia include factor V Leiden, AT III deficiency, Protein C and S deficiency, Homocystinaemia, Dysfibrinogenemia, Raised factor VIII, Fibrinogen and Factor II level and Plasminogen deficiency.

Patients with recurrent thrombotic events as a result of hereditary disorders appear generally to respond well to chronic anticoagulation.

A small study carried out on prevalence of FVL in a selected group of patients (n=10) with thromboembolism or recurrent first trimester abortions showed presence of FVL in 1 patient (10percent). However, as this study group was very small, results cannot be extended to the whole population. Moreover other causes of hereditary thrombophilia were not investigated. This study is proposed to as a continuation of previous study with wider base.

Methodology

- Selection of patients and controls through questionnaire;
- Assays of coagulant and anticoagulant factors; and
- Molecular analysis.

Resource Requirements

Technical including training of technicians;

Clinical: involvement of medical and nursing staff; and

Financial: purchase of equipment, reagents and other consumables.

Approximate cost Rs. 1 million for first year and Rs. 1 million for the next two years.

Time Frame

3 years

Beneficiaries

All patients in high risk groups

7.11 Association of Types 1 Diabetes Mellitus with other Autoimmune Diseases.

(Dr Mrs J Sonoo & Dr I Oozeerally)

Objectives

To study the prevalence of other autoimmune diseases associated with Type 1 Diabetes, like Hypothyroidism, Pernicious anaemia, Addison's Disease, Coeliac Disease.

To alert the Clinician about the prevalence so as not to attribute symptoms of these diseases to Diabetes.

Background

It has been known for many years that Type 1 Diabetes is a chronic autoimmune disease. Autoimmune aggression is not limited to pancreas, other endocrine system like thyroid and adrenal can be affected as well as gastrointestinal mucosa.

As the incidence of other autoimmune diseases seems to be relatively quite common, the above association can be significant here

In clinical practice, features of associated diseases are often wrongly attributed to Diabetes. Loss of weight can be secondary to malabsorption or hyperthyroidism; hypoglycaemia is not always iatrogenic and at times of stress can be due to Addison's Disease. Atrophic gastritis may lead to either iron deficiency or pernicious anaemia, and is a risk for carcinoma of stomach.

Methodology

To include all diabetic children and adults below 40 years.

Full Blood Count, HbA1C, thyroid function test, Serum iron, TIBC.

Indirect immunofluorescence or Radiobinding assay for: Thyroid peroxidase antibodies, Parietal Cell antibody, Antibodies to Intrinsic Factor, Anti adrenal antibodies, Anti endomysium antibodies.

Resource requirements

Training of technicians

Cost to be worked out later

Time frame

One year

7.12 Smoking and Lung Function Among Adolescents in Mauritius

(Dr Mrs G Daby)

Objectives

- To measure lung function in smoking adolescents attending school; and
- To correlate lung function with the number of cigarettes smoked.

Background

This study seeks to examine lung function among adolescent smokers attending school in Mauritius and to compare this with the norms for non-smokers. It is hypothesised that smoking impairs lung function early enough and that the degree of impairment is directly related to the number of cigarettes smoked. The health consequences of smoking generally take time to become obvious so those young smokers may fail to see the benefits of not smoking and are therefore not motivated to stop. The demonstration of impaired lung function may provide the necessary stimulus for these youngsters to quit smoking or to engage them in a programme aimed at the prevention of smoking.

Methodology

- Survey type
A representative sample of students aged 13-19 attending school.
- Data to be collected:
 1. Demographic data;
 2. Smoking status; and
 3. Number of cigarettes smoked.
- FEV1 and FEVc and comparison with norms for sex, age, height, weight, race and number of cigarettes smoked.

Resource requirements

Financial

Rs. 150 000-200 000

Manpower

1 doctor and 2 nurses for “data” collection

1 data entry clerk

1 typist/secretary

Equipment

- Electronic weighing scale
- Height metre
- Wright’s spirometer

Institutional support

- Mauritius Research Council;
- Ministry of Education and Science; and
- Ministry of Health.

Time Frame

12 months.

Expected results

Demonstration of impaired lung function in young smokers.

Beneficiaries

The results can be used to encourage youngsters who have started smoking to stop. The data can be shared with all organizations engaged in health promotion and substance abuse prevention. The population at large will eventually benefit both from the health and economic perspectives.

7.13 Beliefs about Benefits and Barriers to Treatment Compliance among Diabetic Mauritians Attending Health Centres.

(Dr Mrs G Daby)

Objectives

To identify beliefs about the benefits and barriers to treatment compliance among diabetic patients attending health centres.

Background

One in 5 Mauritians aged 30 and above suffers from Type 2 diabetes and metabolic control remains poor in 4 out of every 5 of these diabetics. (1998 NCD survey preliminary report, MOH). The reasons for failure of adherence to treatment are not known.

To reduce the percentage of poorly controlled diabetes through improved metabolic control, a better understanding is needed of the factors which influence compliance to diabetes treatment. This study seeks to identify factors which determine compliance to treatment, patients' beliefs about the benefits and barriers to compliance, difficulties they encounter in managing their diabetes and support they require to achieve better control of their disease.

Methodology

A sample of 100 diabetic patients will be interviewed from 2 (or more) health centres. Data will be generated using a Demographic and Health Status Form and in-depth semi-structured interviews and will try to determine psychosocial factors, health beliefs and cultural differences on how this group views diabetes, the support they need to comply with regimens and the difficulties they encounter in managing their disease. Study objectives will help determine if beliefs about benefits and barriers to dietary adherence are related to glycemic control (GHbA1c). Focus groups with clinic patients will provide preliminary data for the study.

Resource requirements

Financial

Rs. 250 000

Manpower

2 doctor-researchers 2 nurses; 1 data entry clerk; and 1 typist/secretary.

Institutional support

Mauritius Research Council;
Central Lab Candos for biochemistry; and
Ministry of Health and Quality of Life.

Time frame

12-15 months.

Expected results

Research outcomes will be applied to the field of adult learning to develop a suitable comprehensive education package to facilitate Mauritian diabetics' adherence to their treatment plans.

Beneficiaries

Diabetics and their caregivers including health care providers

7.14 A Study of the Impact of Training on Health Care Assistants' (HCA) Competence in Managing Selected NCD Problems.

(Dr Mrs G Daby)

Objectives

To measure the impact of a specially designed training programme in the preparation of HCA's for the management of selected NCD problems in primary care; and

To make recommendations for the review of the programme and for its application to other health care sectors.

Background

NCD's are the commonest cause of morbidity and mortality in the community. Improving the quality of care provided to NCD patients at the primary care level would require massive additional human resource input, viz, doubling the physician and nurse manpower. Currently, it is both impossible and unreasonable to expect the Ministry of Health and Quality of Life to envisage such a measure. Health care assistants are a category of health workers assisting nurses in the hospital set-up. It is postulated that with adequate and appropriate training, HCA's will be able to take up considerable responsibilities in the management of NCD's and contribute to the improvement of the quality of care given to NCD patients and therefore help curb the ongoing NCD epidemic in Mauritius, without impinging too severely on human resources.

Methodology

This study aims to look at the effect of training health care assistants in selected aspects of NCD management on patient outcome. The first part of the study will determine the need for training. HCA's, physicians, nutritionists, nurse educators, community nurses, cardiologists and policy makers will be asked about the training needs of HCA's. A training programme will be mounted and monitored. The difficulties HCA's encounter in delivering their duties will also be determined. Several workshops combining theory and practical skills will be run, covering common problems such as coronary heart disease, diabetes, hypertension, overweight and obesity, exercise, nutrition, health education, promotion and disease prevention and adult education methods, guided by the information gained from the first part of the study. Following these, the effect of the training will be assessed. Participants' knowledge and skills will be tested before and after the programme. This will comprise of self-assessment and objective assessment. HCA's confidence in managing the selected NCD problems will be assessed before, immediately after the workshops and one-year later. The baseline clinical and lifestyle scores of patients treated by HCA's will be compared before and after the workshops to see if the treatment and outcome of patients has improved.

Resource requirements

Financial

Rs. 500 000

Manpower

1 medical/health educationalist with experience in curriculum design and development in the health sector;

2 research assistants;

1 typist/secretary;

1 data entry clerk; and

Physicians and nurses

Equipment

Research questionnaire; and
Learning /training resources.

Institutional support

- 1.Mauritius Research Council;
2. Ministry of Health and Quality of Life; and
- 3.Mauritius Institute of Health.

Expected results

As above

Beneficiaries

The health personnel of the Ministry of Health and Quality of Life; and
Users of health services of the Ministry of Health and Quality of Life.

7.15 The Identification and Rank Ordering of Essential Competencies in Non Communicable Diseases (NCD) for Health Care Assistants (HCA) Education In Mauritius.

(Dr Mrs G Daby)

Objectives

- To identify essential competencies in NCD's for interpersonal communication for HCA's in the Ministry of Health and Quality of Life in Mauritius;
- To rank order these competencies; and
- To make recommendations for the design of a training programme to prepare HCA's in assisting primary health care teams in the management of selected NCD problems.

Methodology

The study will use the Delphi technique to reach consensus on what major stakeholders in HCA education recognize as the essential competencies required by our HCA's in order to enhance the quality of care given to NCD patients at primary care level.

Resource requirements

Financial

Rs. 200 000

Manpower

- 1 medical educationalist with experience in curriculum design and development in the health sector;
- 1 research assistant;
- 1 typist/secretary; and
- 1 data entry clerk.

Equipment

- Research questionnaire;
- Software for data entry and analysis; and
- PC.

Institutional support:

- Mauritius Research Council;
- Ministry of Health and Quality of Life; and
- Mauritius Institute of Health.

Expected results

As above

Beneficiaries

The health personnel of the Ministry of Health and Quality of Life
Users of health services of the Ministry of Health and Quality of Life

7.16 Knowledge, Attitude, Behaviour and Practice (KABP) Study on Abortion.

(Mr S Joosery)

Objective

The objective of this study is to gather empirical data and information on the knowledge, attitude, behaviour and practice of abortees, abortionists, gatekeepers and stakeholders on the sequelae of abortion.

Background

Abortion, unlike many countries, is illegal in Mauritius is not permitted under any circumstance. Despite these strict legal parameters, clandestine illegal abortions are being performed in all corners of the island, by untrained doctors, nurses, midwives and “wise women”, and mostly under unsafe conditions. More than 2,800 post abortion complication cases have been registered in Government hospitals in 2000. The number of abortion is estimated to range between 15,000 to 20,000 and almost equal to the number of live births annually.

There have been some sporadic attempts at advocating legal reforms to make abortions easily accessible and safe, but with very little impact. Lack of empirical evidence and documentation on the extent and incidence of the problem, low political commitment and an almost total absence of mass mobilization campaign has infringed organized efforts for advocacy. Empirical data are not be available to demonstrate the need for action. Unfortunately most of the evidences on the sequelae are anecdotal, which make sensational news at the media desk, but are not adequate enough to trigger political decisions.

This project hence proposes to conduct a nation-wide community based **Knowledge, Attitude, Behaviour and Practice (KABP) Study on Abortion** in Mauritius and is expected to throw light on the following:

- The Knowledge of men and women in the reproductive age 15-44 on the extent of the abortion problem, the risk and complications involved in unsafe practices, and the legal status of abortion;
- The *Attitude* of parliamentarians, policy makers, health professionals, abortion seekers, abortionists on the present status of abortion law and practices;
- The sexual and reproductive health *Behaviour* and risk of women in reproductive age group, the method of contraception used; and
- The *Practice* and incidence of abortion - when, how, why, where, and how many abortions are performed.

Design and Methodology

This Proposed Study will attempt to have a more comprehensive picture of the sequelae of abortion in Mauritius. Drawing on the limitations of previous studies, this study will be undertaken among three specific groups:

- A. Men and Women of reproductive age (15-44) living in the community;
- B. Health Professionals (doctors and nurses); and
- C. Policy and decision makers (Parliamentarians and Permanent Secretaries).

A. Men and Women in the Community

This study intends to document, inter alia, on the knowledge of both men and women in the community on the status and risk of abortion, and their attitudes and perceptions on abortion practices. It is felt important not only to investigate on women, but also on men because unwanted pregnancies leading to abortions are also the consequence of irresponsible sexual behaviour among men and that given that Mauritius is a patriarchal society, power is still in the hands of men who continue to influence Reproductive Health decision making of women.

The sample of men and women in the Community will be recruited from Community Health Centres (CHCs), which are dispersed all around the island in Mauritius and Rodrigues, and which cater for the general health care services of both married and unmarried men and women in the locality.

Selection of Subjects from the Community in Mauritius and Rodrigues

The island of Mauritius is divided into 9 districts and are serviced by a number of CHCs. Rodrigues constitutes the 10th district of the Republic of Mauritius. 10 CHCs will be selected in Mauritius (2 from Port Louis which is the mostly densely populated district – 1 in Roche Bois and 1 in Plaine Verte where Catholics and Muslims are in majority in the respective places); and one in each of the remaining 8 districts. It must also be noted that in Triolet the majority of the population are Hindus.

In Rodrigues, two CHCs will be selected- 1 in Port Mathurin and the other in La Ferme. Hence a total of 12 CHCs will be selected in both Mauritius and Rodrigues.

In each of the CHCs, 15 men will be randomly selected (5 from from each ethnic group, with the exception of Roche Bois, Plaine Verte, Triolet and Rodrigues, where the total will be from one ethnic group, as explained earlier).

12 Community Health Workers (one from each selected CHC) will be recruited and trained to conduct 720 semi-structured interviews with women aged 15-44 in the community.

The interview questionnaire for women will be divided into 4 main sections:

1. Socio-Demographic Variables (Questions 1-10);
2. Contraceptive Knowledge and Use (Questions 11-13);
3. Attitudes Towards Abortion (Questions 14- 21); and
4. Abortion Experiences (Questions 22-30).

The questionnaires will be piloted prior to the study proper. All questionnaires will be anonymous and the interviewers will be trained to collect relevant information and ensure that information are collected in full confidentiality.

B. Health Professionals

Reluctance from health professionals to face interviews is understandable. Hence, impersonal mail responses will be used to ensure confidentiality and anonymity. From the list of licensed medical practitioners and nurses of the Ministry of Health, a list of random numbers will be drawn and 75 doctors and 25 nurses will be recruited. A self-administered questionnaire, together with a prepaid return envelope will be posted to the selected medical professionals.

C. Policy and Decision Makers

Hence, a questionnaire will be developed, and will be posted to all Parliamentarians and Permanent Secretaries together with a prepaid envelope, as for the Health Professionals. A covering letter will ascertain confidentiality and anonymity of the exercise.

The questionnaire will consist of open ended, unstructured questions seeking opinions about the status, practice and sequelae of abortion and on its legality.

The data collected will be coded and analysed using the SPSS package by an experienced and trained Statistician. The Statistician will discuss preliminary findings with the Principal Investigator, and make verifications as and when deem necessary. The Principal Investigator, will be assisted by the Medical Coordinator of MFPA who will advise on all health related responses, the Research Officer and the Research Assistant who will monitor all fieldwork, data management and analysis and ensure that the study is both valid and reliable.

Number of Subjects

The study will reach a total of 905 subjects - 720 Men and Women in the community, 75 Doctors and 25 Nurses, 65 Parliamentarians and 20 Permanent Secretaries. The subjects will be randomly selected as cited above.

Resource Requirements

Financial

Rs. 1.975.18

Manpower

The Main Investigator in this study will be **Mr. Sangeet H Jooseery**, the Executive Director of MFPA who possesses a **Bachelor of Arts** Honors degree in Economics, a **Post Graduate Certificate in Education** and a Research Based **Master of Science** degree in Reproductive Health from the **University of Edinburgh**, UK. He has been a **National and International Consultant** for the United Nations in several instances on Sexual and Reproductive Health and has several years of experience in Youth Sexual and Reproductive Health Programme Planning and Implementation. He has also been involved in the several previous studies, including one on abortion conducted by the MFPA in Mauritius.

The Main Investigator will be assisted by:

1. **Dr. Reshad Rajabally**, *Gynaecologist and the Medical Coordinator* of MFPA Family Health Clinic;
2. A **Research Officer** with appropriate background and experience in Research and Social Science who will be recruited to assist in the training of interviewers and in the supervision of all field works;
3. A **Research Assistant** who will be recruited, oriented and trained by the Investigators to oversee all fieldwork;
4. 10 **Community Workers** who will be recruited and trained to conduct interviews among women in the community; and
5. A **Statistician** who will be recruited to assist the investigators to analyse the Data, conduct validity tests at different stages of the study and draft the report.

A **Technical Committee**, comprising of the main Investigators and field staff will be constituted to meet fortnightly to coordinate and monitor all activities planned under the study. A quarterly report of progress will be issued to funding agency.

Equipment

Computer, printer and software.

Audio-Equipment – Cassette Recorder and etc.

Time Frame

One year

Expected Results

This study is expected to provide additional information and data on the extent, incidence and prevalence of abortion in Mauritius and also an understanding of the perceptions and attitudes of all those concerned in the practice of abortion in Mauritius. The results will be disseminated to all sectors of the economy and will help to sensitise public opinion on the issue of Abortion in Mauritius, and also to develop an advocacy programme for both Mauritius and Rodrigues. The MFPA will take the lead to disseminate the findings to all stakeholders.

Beneficiaries

This study will benefit all medical and paramedical personnel, the media personnel, parliamentarians and policy makers, education officers, advocates and lobbyists on the issue of abortion and also grassroot men and women in Mauritius and Rodrigues. MFPA will use the findings to develop an IEC and advocacy strategy to address the issue of abortion an also to rekindle the debate on abortion. Flyers and booklets will be produced and will be used as back up materials for both advocacy and Information campaign. A series of radio and Television programmes will be organised for members of the public.

7.17 Socio Epidemiological Study into the Incidence and Causes of Prostate Cancer and Disorders in Mauritius.

(Mr S Joosery)

Objectives

- To determine incidence and prevalence of benign prostatic disease and cancer, erectile sexual dysfunction among 1000 men between the age of 50-80; and
- To document on the physical, socio-economic and cultural factors that are likely to be associated with the risk of prostate disorders and sexual dysfunction among 1000 men between the age of 50-80.

Background

There are many variables that are likely to increase the risk of this disease. The more we can learn about these risk factors, the better the chance of finding ways to prevent and treat prostate cancer. It is thought that whatever the causal factors are, they act by altering the balance of male hormones in the body. The following are the possible variables:

- Age
- Race
- Family history
- Diet
- Vasectomy
- Occupational Exposure

Early prostate cancer does not cause pain and has no symptoms. When symptoms of prostate cancer do occur, they may include some of the following problems:

- A need to urinate frequently, especially at night;
- Difficulty starting urination or holding back urine;
- Inability to urinate;
- Weak or interrupted flow of urine;
- Painful or burning urination;
- Painful ejaculation;
- Blood in urine or semen; and/or
- Frequent pain or stiffness in the lower back, hips, or upper thighs.

If symptoms occur, the doctor asks about the patient's medical history, performs a physical exam, and may order laboratory tests. The exams and tests may include the following:

- **Digital Rectal Exam**
- **Blood Tests** – laboratory measurement of the levels of Prostate-Specific Antigen (PSA) and Prostatic Acid Phosphatase (PAP) in the blood.
- **Urine Test** – urine detection of blood or infection
- **Transrectal ultrasonography** -

In Mauritius unfortunately many men are diagnosed of prostate cancer at a late stage when death cannot be prevented. In Rodrigues the situation is different as a result of poor knowledge on the disease, inadequate care for the males and also because of a completely different social setting than in Mauritius. In fact very little has been done on the issue of Male Reproductive Health, and in particular on Male Reproductive Cancer that is now becoming a serious cause of concern. For long Reproductive Health programme has essentially targeted only women in both Mauritius and Rodrigues. Men with prostate disorders suffer depression and frustration as a result of related sexual dysfunctions and impotency. These Psycho-sexual problems together with the medical complications including death could be avoided if prostatic disorders could be detected and treated early.

1. This study hence will attempt to document on the incidence and risk factors for prostate disorders and cancer so as to enable programme managers, medical and paramedical personnel and all stakeholders be equipped with tools that will enable them develop appropriate.

A questionnaire will be developed and administered by trained interviewers to 1000 men between 50-80 years of age. The Questionnaire will be based on the International Continence Society questionnaire (No. 1-34, ICS- Male) and the International Prostate Symptom Score (IPSC). A team of 10 trained interviewers (2 in Rodrigues) will conduct the interviews.

The respondents will be randomly selected from the list of workers in selected male dominant sectors like the transport, police, fire brigade, docks, and also from MFPA male clients attending the Well Men Clinic and those who have had Vasectomy in Mauritius and Rodrigues. The respondents will be selected according to their socio-demographic background to reflect the diversity of ethnic background of Mauritius and Rodrigues.

The clinical test will be conducted at MFPA Family Health Clinic and Laboratory situated at Desforges Street, Port Louis, and at MFPA Family Health Clinic in Rodrigues. The samples of specimen collections in Rodrigues will be sent for investigation in MFPA Lab in Mauritius. These activities will be under the supervision of MFPA biochemist and Urologist.

Confidentiality and privacy will be maintained all throughout the investigations. All the data and information will be coded and analysed by a professional statistician, using WHO Standards and the EPI INFO package which enables analysis of both qualitative and quantitative variables.

Resource Requirements

Financial

Rs. 6.394.300

Manpower

- MFPA's Urologist and Executive Director will be the main Investigators. The urologist will conduct and supervise all clinical investigations, while the Executive Director will be responsible for collection and analysis of socio-economic data and information. The main investigators will develop the questionnaire in creole and set up a calendar of activities, which will be closely monitored at fortnightly meetings with the Research Officers and Interviewers. The Investigators will be responsible for submitting quarterly reports on accomplishments and the final report to the funding agency.
- Two Research Officers with appropriate research background will be recruited to assist the main investigators to carryout field work, collect data and write reports.
- 10 male interviewers will be recruited, and will be trained to conduct 1000 interviews with men at work site, at the Family Health Clinic and in the community in both Mauritius and Rodrigues.
- A statistician will be recruited for a period of 3 months to analyse the data and information collected and submit a report to the principal investigators.
- One bio-chemist will be recruited on part time to conduct the lab test, analysis and provide report to the main investigators.

Equipment

One computer, one printer, floppy, and compact readable and writeable discs will be purchased MFPA Ecography equipment will be put at the disposition of the investigators. A Transrectal Ultrasound Probe will be purchased to enable transrectal prostate imaging. A Uroflow Metre will be purchased to measure the degree of prostatic obstruction during mecturition.

Institutional Support

MFPA will provide secretarial and other logistic support. One vehicle in Mauritius and another in Rodrigues will be put at the disposition of the Research Team to carryout and supervise fieldwork. The Rodrigues MFPA Project Officer will assist the Research Team for the recruitment of respondents. MFPA Family Health Clinic and laboratory will provide logistic support for the screening of 1000 men in both Mauritius and Rodrigues.

Time Frame

One Year

Expected Results

The findings will be disseminated at a national workshop for 75 medical and para-medical personnel. Another similar workshop will be organised for 20 in Rodrigues. The findings together with recommendations from participants at the workshops will be compiled into a report, which will be published and circulated, to leading agencies involved in the medical and socio-medical practice and also to media personnel. The Findings will also be the basis for a series of sensitization sessions, which MFPA will organise in the community and on TV and Radio for both Mauritius and Rodrigues. Press interviews will be organised by the Principal investigators on the findings of the study.

Beneficiaries

- Personnel of the medical and paramedical working in both Government and private practice;
- Programme managers for the development of appropriate intervention programme for the prevention, care and treatment of men with prostatic disorders, cancer and psycho-sexual dysfunction;
- The Ministry of Health and Quality of Life and Private Clinics for the improvement of Quality of Care for men;
- Social scientist and researchers for a deeper understanding of the factors that are likely to inhibit men from seeking appropriate services in different social settings and ethnic background;
- Men in general for a deeper understanding of their own risk factors and possible prevention measures; and
- The Media Personnel for a better understanding of the issue of Prostatic disorders and its psycho-sexual implications.

8. Summary and Recommendations.

The aim of the study was to look at the following dimensions in biomedical research:

- (a) Objectives and scope of biomedical research;
- (b) Relative Importance of Biomedical Research in Mauritius;
- (c) Current status of Biomedical Research activities;
- (d) Constraints and challenges facing the field; and
- (e) Current and Proposed Areas of Biomedical Research

In order to achieve the above, biomedical indicators were initially discussed and these included population statistics indicating mortality and morbidity, notifiable diseases, hospital attendances and admissions, and non-communicable diseases. These indicators were correlated with the Mauritian statistics as at year 1999. Subsequently areas of priority of research were identified. The main themes were thus on Nutrition, Maternal and Perinatal issues, Communicable and Non Communicable diseases, and Health Systems. These are summarised in Table 1, on the next page.

The main recommendations of the Group relate to resolving the constraints facing biomedical research and these include:

- The setting up a national coordinating body to identify and set up priorities for biomedical research;
- Increasing capacity building for research through appropriate and systematic training programmes;
- Protection of the works of the researcher through the Intellectual Property rights and
- Making Mauritius and Rodrigues a reference centre for Biomedical Research in the Africa Region.

SUMMARY		
BIOMEDICAL INDICATORS	MAURITIAN STATISTICS BY 1999 ¹	Areas of Research/Research Topic(S)
<p>Population:</p> <p>Fertility</p> <p>Mortality</p>	<p>Estimated population: 1,138,968 <20 Years: 34.9percent; >60 years: 8.8 percent General fertility rate: 60.6 live births per 1000 women aged 15-50 Crude Death rate: 6.8 per 1000 mid year resident population Infant Mortality rate: 19.2 per 1000 Neonatal deaths: 73.3 percent of infant deaths Cause of deaths (all ages): Heart diseases—29.6percent; Cerebrovascular Diseases- 14.4 percent Diabetes: 4.7 percent</p>	<p>Infant and Child helath / Adloescents Health / Health of the elderly Nutrition Treatment of Obesity in Childhood leads to a Decreased Prevalence of Adult Obesity Salt Excretion and Diet in Rodrigues a Follow Up Study Micro Nutrient Deficiency in Elderly Prevalence of Zinc Deficiency in Children Under 5.</p> <p>Maternal and Perinatal Issues KABP Study on Abortion.</p>
Notifiable Diseases	<p>In 1999: Malaria- 73; Tuberculosis - 149; Infectice Hepatitis-24; Typhoid- 2 and HIV- 33</p>	Communicable Diseases
Admissions and Attendances	<p>From 1994-1999: 25.2percent increase in hospital admissions; 50percent increase in operations; 36.1 percent increase in attendance at out patient units; 1.8percent increase of attendance for treatment</p>	<p>Health System Use of Computer Science to Transform Data in a Form Suitable for Study and Use Establishing a Quality System I blood Transfusion Through Hemovigilance Network in Mauritius. A Study of the Impact of Training on HCA Competence in Managing Selected NCD Problems. The Identification and Rank Ordering of Essential Competencies in NCD for HCA education in Mauritius.</p>
Non-Communicable Diseases	<p>Prevalence of Type 2 diabetes has increased by 36 percent since 1987 and rate was about 20 percent in 1998; About 40 percent of diagnosed cases of diabetes are poorly controlled; Diagnosed cases of Hypertension has increased by 20 percent since 1987; Prevalence of obesity has increased by 83 percent since 1987</p>	<p>Non Communicable Diseases Assessment of a Preventive Strategy for NCDs in the Mauritian Population. Type 2 Diabetes: Assessment of Incipient Nephropathy in Mauritian Adults Beliefs and Barriers to Treatment Compliance Among Diabetic Mauritian Attending Health Centres. Search for Genetic Factors Underlying Susceptibility to Premature COronary Heart Disease in Mauritius. Prevalence of Hereditary Thrombophilia in Selected High Risk Patients. Association of Types 1 Diabetes Mellitus in Other Autoimmune disease. . A Socio Epidemiological Study into the Incidence and Causes of Prostrate Cancer and Disorders in Mauritius. Smoking and Lung Function Among Adolescents in Mauritius.</p>

¹Source: Ministry of Health and Quality of Life, 2001.

9. Annex

Annex 1: Composition of Working Group

Chairman

Dr F Hemraj Principal Clinical Scientist, Central Laboratory, Candos

Members

Associate Prof R Choolun Dean, Faculty of Science, University of Mauritius

Dr. (Mrs) G Daby Training Officer, Mauritius Institute of Health

Mr D Doreemeeah Senior Nutritionist, Nutrition Unit, Ministry and Quality of Life

Lord D Fareed, kt, (FRCP) Adviser, Ministry of Health & Quality of Life

Mrs S Seetulsing Ghoorah Lecturer, University of Mauritius

Dr T K Gunness Cardiac Surgeon, Trust Fund for Specialised Medical Care

Mr S Joosery Ag Executive Director, Mauritius Family Planning Association

Dr G Khittoo Associate Professor, Faculty of Science, University of Mauritius

Dr (Mrs) M Manraj Ag. Director, SSR Medical Research Centre

Dr (Mrs) J Maigrot, OSK, MBE Paediatrician

Dr I Oozeerally Specialist in Internal Medicine, Victoria Hospital

Dr N Pyndiah Adviser, Virology Victoria Hospital

Dr U S Ramjuttun Consultant, Cardiac Unit, Victoria Hospital

Dr (Mrs) J Sonoo Specialist/ Senior Specialist(Pathology), Victoria Hospital

Participants

Prof S Bhoojedhur Chairman, Mauritius Research Council
Dr A Suddhoo Executive Director, Mauritius Research Council

Coordinator Mrs P Doman, Mauritius Research Council

Annex 2: References

1. World Health Statistics Annual 1991, WHO, Geneva 1992;300-307.
2. King H, Zimmet P, Wld Hlth Statis quart. 1988;41: 190-196
3. Dowse GD, Gareeboo H, Zimmet PZ, Alberti KGMM, Tuomilehto J, Fareed D, et al. Diabetes 1990;39: 390-396
4. Zimmet P, Collins VR, Dowse GK, Alberti KGMM, et al. Am J Epidem 1991;134:862-875.
5. Dowse Gk, Zimmet PZ, Gareeboo H, Alberti KGMM, et al. Diabetes Care 1991;14:271-282
6. Alberti KGMM, Dowse GK, Finchc et al. J Drug Devel 1990: 3: 23-26
7. Mauritius Non Communicable Disease Intervention Programme. 1987 Disease and Risk Factor Factor Prevalence Survey. Final Report Melbourne Australia 1989.
8. Mauritius Non Communicable Disease Intervention Programme. Report on 1992 Disease and risk Factor Prevalence and Incidence Programme. Melbourne Australia 1993.
9. Mauritius Non Communicable Disease Intervention Programme. Report on 1992 Rodrigues Survey. Dowse G, Kgnight L. Melbourne Australia
10. Mauritius Non Communicable Disease Programme 1998. Preliminary Report. M de Courten, Zimmet Cox et al. Melbourne Australia, Ministry of Health and Quality of Life Mauritius.
11. Rodrigues Non Communicable Disease Programme 1999. Preliminary Report. M de Courten, Zimmet Cox et al. Melbourne Australia, Ministry of Health and Quality of Life Mauritius
12. Garrow JS. Obesity and related diseases. London. Churchill Livingstone 1988:1-16
13. WHO Technical Report Series 894, Geneva .2000
14. Hodge AM et al International Journal of Obesity and Related metabolic Disorders. 1996,20:137-146
15. Hodge AM, Zimmet PZ. Bailleres Clinical Endocrinology and Metabolism, 1994,8: 577-599.
16. Dowse GK et al British Medical Journal 1995,311:1255-1259.
17. Straessen J, Bulpitt CJ, Fagard et al, J Chron Dis 1985; 38: 397-407.
18. Intersalt Cooperative Research Group. Br Med J 1988;297:319-28.
19. Vos T, Gareeboo H, Roussety F (1998) Ethnic differences in ischaemic heart disease and stroke mortality in Mauritius between 1989 and 1994. Ethnicity and Health 3(1/2): 45-54.

20. Tunstall-Pedoe H, Kuulasmaa K, Mähönen M, Tolonen H, Ruokokoski E, Amouyel P, for the WHO MONICA (monitoring trends and determinants in cardiovascular disease) Project (1999) Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA Project populations. *Lancet* 353: 1547-1557
21. Lopez DL, Murray CCJL (1998) The global burden of disease, 1990-2020. *Nature Med* 4: 1241-1243.
22. McKeigue PM, Miller GJ, Marmot MG (1989) Coronary Heart Disease in South Asians overseas: a review. *J Clin Epidemiol* 42 (7): 597-609.
23. The Bypass Angioplasty Revascularisation Investigation (BARI) Investigators (1996) Comparison of coronary bypass surgery with angioplasty in patients with multivessel disease. *N Engl J Med* 335: 217-225.
24. Marenberg ME, Risch Neil, Berman LF, Floderus B, De Faire U (1994) Genetic susceptibility to death from coronary heart disease in a study of twins. *N Engl J Med* 330: 1041-1046.
25. Vionnet N, Hani EH, Dupont S, Gallina S, Francke S, Dotte S, De Matos F, Durand E, Lepretre F, Lecoeur C. *et al.* (2000) Genomewide search for type 2 diabetes-susceptibility genes in French whites: evidence for a novel susceptibility locus for early-onset diabetes on chromosome 3q27-qter and independent replication of a type 2-diabetes locus on chromosome 1q21-q24 [In Process Citation]. *Am. J. Hum. Genet.*, **67**, 1470-1480.
26. Kissebah AH, Sonnenberg GE, Myklebust J, Goldstein M, Broman K, James RG, Marks JA, Krakower GR, Jacob HJ, Weber J *et al.* (2000) Quantitative trait loci on chromosomes 3 and 17 influence phenotypes of the metabolic syndrome. *Proc. Natl Acad. Sci. U S A*, 97, 14478-14483.
27. Hanis CL, Boerwinkle E, Chakraborty R *et al* (1996) A genome-wide search for human non-insulin-dependent (type 2) diabetes genes reveals a major susceptibility locus on chromosome 2. *Nature Genet* 13: 161-166.
28. Ellsworth DL, Hallman DM, Boerwinkle E (1997) Impact of the human genome project on epidemiologic research. *Epidemiol Rev* 19: 3-13.
29. Centres for Disease Control Diabetes Surveillance 1980-1987 Atlanta GA. 1990
30. Mogensen CF. *N Engl J Med* 1984 310:356-60.
31. Jarett Rj *et al.* *Diabetic Med* 1984.1:171.
32. Centres for Disease Control Diabetes Surveillance 1980-1987 Atlanta GA. 1990.
33. Mogensen CF. *N. Engl J Med* 1984 310:356-60.
34. Jarett Rj *et al.* *Diabetic Med* 1984.1:17-19.

Ministry of Health and Quality of Life (2000) Health Statistics, Government Printing.

Annex 3: Studies and Surveys Carried Out in Biomedical Research

(a) 1993: PhD research

Nutrition related Diseases In Mauritian adults: Studies on Secondary Prevention strategy, with reference to Particular Non Communicable Diseases.. Dr F Hemraj

(b) PhD research on-going

Impaired Glucose Tolerance (IGT) : A study of biochemical markers in subjects identified as IGT and undergoing intensive intervention. Mr M. Bhugun

Glycated haemoglobin as an indicator of glycemic control in diabetic patients with haemoglobinopathies. Miss N.Joonas

(c) 1980-1999:Projects completed in Medical Lab Sciences

Health system research, methodology development - Projects at University of Mauritius/Ministry of Health and Quality of Life

- Selection of a method to estimate Total Bilirubin in newborns(1981).
- Comparisons of four methods to estimate Serum Calcium (1981).
- Effect of invitro haemolysis on some serum constituents(1981).
- Evaluation of methods of assay of amylase activity in serum and urine (1981).
- An evaluation of dipstick analysis in cases of Proteinuria and glycosuria (1981).
- Establishing a general procedure for screening pigments in urine and feaces (1981).
- Establishment of reference values of serum uric acid (1981).
- Thin layer chromatography of urinary amino acids: a case study of Phenylketonuria(1986).
- Establishment of reference values for total serum proteins and albumin; effects of age,sex,height,weight,diet and smoking habits.(1986)
- "Normal Ranges" of cardiac enzymes:choice of an enzyme to diagnose myocardial infarction (1986).
- Lipid profile in various sectors of a working population (1986).
- A review of the main biochemical tests perfomed in the emergency service (1991).
- Evaluation of a plate model in subjects with high risk of noncommunicable diseases (1991).
- Development of a screening test for hypothyroidism in neonates at the Victoria Hospital(1991).
- Evaluation of two kits for estimation of blood urea and glucose for the emergency service (1991).
- Optimal test requesting pattern for cardiac patients(1991).
- Measurement of albumin excretion rate in diabetics of hospital(1991).

- Laboratory and field evaluation of a quickread whole blood cholesterol assay system (1993).
- Evaluation of a simple laboratory technique to help in the diagnosis of Gestational diabetes (1993).
- Usefulness of tumour markers in diagnosis and treatment (1993).
- Use of glycated molecules as indicators of the glycemic level of diabetics (1993).
- Assessment of a semiquantitative dry immunochemical screening method to detect low concentration of albumin in diabetic patients (1994).
- Using myoglobin as a marker to detect early myocardial infarction (1994).
- Measure of satisfaction of clinicians with the Clinical Biochemistry Services of the Ministry of Health(1994).
- Redesign of request form: a strategy to improve test requesting patterns of clinicians (1994).
- Non Insulin Dependent Diabetes Mellitus: use of basal serum hCPeptide and insulin as biochemical indicators in insulin therapy (1994).
- Study of salt excretion in Mauritian adult hypertensives (1994).
- Blood glucose analysis at diabetic clinics: assessment of performance of nonlaboratory staff (1994).
- Biochemical parameters in a sample of Mauritian Adolescents (1994).
- Establishment of a National External Quality Assessment Scheme (1994).
- Thyroid Hormones assay: setting up a radioimmunoassay unit and establishing reference range (1996).
- An evaluation of automated system in clinical biochemistry (1996).
- Evaluation of reflectance meters in diabetic clinic (1996).
- Comparison of thyroid hormone estimation in serum by radioimmunoassay and enzymeimmunoassay (1996).
- A study in the workflow of the routine biochemistry service (1996).
- Test for microalbumin in urine of patients attending the diabetic clinic:method comparison and follow up study (1996).
- Haemoglobin interferencein automated system (1996).
- Iodide in urine: evaluation of a screening method to detect iodine deficiency.

(d) Projects under Sponsorship - Biochemistry Ministry of Health and Quality of Life.

- *Mauritius Research Council*

Type 2 Diabetes: Do haemoglobin variants cause misleading results in indicators of glycemic control?
(Completed)

- International Atomic Energy Agency Vienna Austria (on-going)

Consolidation of radioimmunoassay capability for use in Tumour markers (Prostate cancer, colon cancer, breast cancer, cancer of the thyroid, cancer of the liver and trophoblastic tumours)

- Management of Diabetes Mellitus at Victoria Hospital (on-going).

(d) National Surveys by the Ministry of Health and Quality of Life and WHO Collaborating Centres.

- **1988** - Mauritius Non-Communicable Disease Intervention Programme: Disease and Risk Factor Prevalence Survey. FINAL REPORT. Mauritius. Gareeboo H, Brissonnette G, Hemraj F, Tulsidas H, Chitson P, Dowse G, Zimmet P, Finch C, Tuomilehto, Alberti G, Fareed D, Rajcoomar V.
- **1989** - Mass screening Programme *in* Community Health Development in Mauritius .Published by the National Trust Fund for Community Health (Mauritius).
- **1993** - Mauritius Non Communicable Disease Intervention Programme: 1992 Disease and Risk Factor Prevalence and Incidence Study.REPORT.Mauritius. H Gareeboo, A K Purran, F Hemraj, G Brissonnette,P Chitson, J Dabee, D Fareed, G Dowse, P Zimmet, L Knight, J Tuomileto,KGMM Alberti.
- **1993** - Mauritius Non Communicable Disease Intervention Programme.REPORT on Rodrigues Survey.Mauritius. H Gareeboo, A K Purran,F Hemraj, G Brissonnette,J Dabee, F Roussety, G Dowse, P Zimmet, L Knight, J Tuomilehto, KGMM Alberti, D Fareed.
- **1998** - Mauritius Non Communicable Disease Intervention Programme. REPORT on Follow Up study on Mauritius Population.Mauritius. P Chitson,F Hemraj,R Radhakeesoon, M de Courten, P Zimmet, KGMM Alberti.
- **1999** - Mauritius Non Communicable Disease Intervention Programme.REPORT on Second Rodrigues Survey. Mauritius. P Chitson, F Hemraj,A Kowlessur, Mde Courten, P Zimmet, , KGMM Alberti.,

Annex 4: Suggested Themes

Prevalence of clinically detectable CAD in the Mauritian Populations – Age and Sex Wise, Ethnic Etc.

(Dr S Ramjutun)

Background

The prevalence of high blood pressure, diabetes mellitus, hyperlipidaemias has been estimated on the NCD programs.

The complications of these diseases are of coronary artery disease. However there is no epidemiological data on the prevalence of clinically detectable CAD in the various sections of the Mauritian population.

Prevalence of Risk Factors in Patient With Clinically Detectable CAD.

(Dr S Ramjutun)

Background

The standard risk factors of CAD seem to be varied in the Mauritian populations. However the relative weight of each factor is not known. In a significant proportion of patient with Acute Myocardial Infarct (AMI), no major known risk factors is found. Are there other major risk factors present?

(a) Total Cholesterol and HDL Level in Patient with Clinical CAD in Mauritian Populations.

(Dr S Ramjutun)

Background

Is the guideline for hyperlipidemias fully applicable in the Mauritian population? Do we have to have lower cholesterol values? What is the role of raised levels of triglycerides as a major risk factor being given the high prevalence of DM, IGT, obesity etc?

(b) Awareness of Evolution/Complication/Management in NCD's (in the Community, Health Care Professional, Patients).

(Dr S Ramjutun)

Background

Despite the very high prevalence of DM, IGT, hypertension and high mortality rate AMI, it seems that the different subsets of population (doctors, nurses, health educators, pedagogues and politicians) are not conscious of the disease pattern, their natural evolution and complications, there is socio-economic impact, therefore the need to evaluate those indications of health & disease awareness.

(c) Management of Unstable Angina Myocardial Infarction.

(Dr S Ramjutun)

Background

There is controversy on the extent of coronary care that should be made available to the Mauritian population although the principle of equity of access to health care is guaranteed. A survey should be carried out to assess the needs /requirements and evaluate the quality of services in coronary care delivery at various hospitals and centres.

- Immunity against PolioVirus type 1, 2 and 3 among different age groups of the Mauritian population.
- Is Hepatitis A Virus a threat to the Mauritian population?

(Mrs Seetulsing Ghoorah)

8.4.2 Audit of Quality Assurance in Public & Private Medical Laboratories.

(Mrs Seetulsing Ghoorah)

8.4.3 Cancer Diagnosis, Management, Palliative Care.

(Dr Mrs Julia Maigrot)

8.4.4 Study of Development of Low Birth Weight and Very Low Birth Weight Infants Treated in The Neonatal Intensive Care Unit Till at Least School Age for The Detection of Eventual Handicaps Associated With Low Birth Weight. The Study To Include Assessment of Facilities Available for Care of any Such Handicapped Children.

(Dr Mrs Julia Maigrot)

8.4.5 Study of Antibiotic Prescribing in Health Centre and Hospital Casualty Department Combined With Study of Administration of Antibiotics in the Home. “What is a Teaspoon?”