MINISTRY OF HEALTH
STATE OF ERITREA

TYPE 2 DIABETES CLINICAL PRACTICES

GUIDELINES FOR ERITREA

MINISTRY OF HEALTH ERITREA **INTERNATIONAL DIABETES FEDERATION AFRICA REGION** **ERITREAN MEDICAL ASSOCIATION (ERIMA)**

TABLE OF CONTENTS

TABLE OF CONTENTS……. … Continued

ACKNOWLEDGEMENT

The Ministry of health state of Eritrea is grateful to the African international Diabetes Federation (IDF) African Region for providing the regional Type 2 Diabetes clinical practice guidelines manual to be adapted for use. The role of the Eritrea Medical Association is very much appreciated as an important landmark that fosters a strong working relationship between the medical fraternity and the Ministry of Health

Acknowledgements are also due to Dr. Mismay Ghebrehiwet & Dr. Beyene Tewolde for co organizing and facilitating the consensus building work shop and editing the adopted manual.
Above all, gratitude is due to all the member association, diabetes educators and clinician in Eritrea for their valuable contribution and constructive criticisms which enriched the quality of the document.

Funding is an essential component of this type of activity. The ministry of Health expresses its gratitude to World Diabetes Federation for its support.

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1. FORE WORD

The Ministry of Health state of Eritrea welcomes this type 2 clinical practice Guidelines for Sub Saharan Africa which adhere to our mission of promoting diabetes care, prevention, control and a cure.

The Ministry of Health has always put in its agenda as propriety the insulin availability and affordability for all those who need it. Be it all people affected by Type 1 diabetes or people with Type 2 diabetes who require insulin to be adequately controlled.

Once thought of as a disease of developed countries type 2 diabetes is now a growing burden on developing countries. More than 80% of the 246 million people with diabetes live in low and middle income countries, where health resources are needed to combat both communicable and non communicable disease. Once thought of as a disease of the elderly, people in younger age groups now form the bulk of those with diabetes. Some 46 % of adults with diabetes are in the 40-59 age groups. Once thought of "as a touch sugar,'' studies show that diabetes at any age, if not properly managed, will lead to serious outcomes, and, in some cases, death.

I would like to express my appreciation and thanks to IDF Africa Region for the production of this manual and making countries to adapt it to their context. I would also like to admire the Eritrean Medical Association for conducting the workshop that facilitated the adaptation of this Diabetes clinical guideline.

I would also like to thank our sponsoring partner World Diabetes Federation (WDF) who has given their support to make this guideline available. I am confident this book will be a significant resource for the health workers who are working to improve the lives of millions touched by diabetes.

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Ministry of Health
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2. INTRODUCTION

The rising burden of non communicable diseases (NCDs) particularly the diabetes and cardiovascular disease (CVD) is affecting the African region which is at the same time continuing to fight with communicable diseases burden.

Although communicable disease burden in the region continue to present the greatest disease burden in the region, non communicable disease, including hypertension and diabetes, are contributing significantly to pattern of multiple disease burdens. Even though the HIV/AIDs epidemic is unfolding in sub Saharan Africa, it is clear that the relative importance of NCD will rise, driven by an ageing population, increasing urbanization and risk factors, such as tobacco smoking, obesity and physical in activity.

In Eritrea, data from the health management information system (HMIS) indicate that, NCD especially diabetes, CVD, chronic respiratory diseases and cancers are emerging as a major public health problem and collectively surpassing some communicable diseases as a major cause of death among the population.

A recent survey report in Eritrea on the NCDs risk factors in 2004 indicates a prevalence of hypertension of 16% with 80% being unaware of their condition.

Similarly, the prevalence of history of diabetes was 2.3 %, tobacco smoking 7.2%, alcohol consumption 39.6%, low fruit consumption 84.7% low vegetable consumption 50.6% and the prevalence of over weight was 10.4%.How ever the prevalence of physical in activity was low, 10% among the general population.

Long considered to be a rarity Diabetes Type 2 is becoming a major cause of morbidity and pre mature mortality and as such is a costly disease to the individual, family and society .Much of the morbidity of diabetes is preventable by good glycaemic control, good blood pressure (BP) control and regular examination for complication and timely intervention.

This document addresses key clinical questions that health care professionals, patients and their families ask about many aspects of Type 2diabetes and its management.

This clinical practice guide line of Type2 is adapted from the generic International Diabetes Federation Africa Region document of Type 2 diabetes to our local context .This document will guide you in the management of diabetes such that our diabetics are able to achieve better out comes in the future.

3. ORGANISATION OF DIABETES CARE

Most of the countries in Sub-Saharan Africa have no formal organized diabetes health-care delivery at the primary level. Inadequately trained paramedical personnel and doctors at primary and secondary health-care facilities generally manage people with diabetes. Furthermore, diagnostic equipment (e.g. glucose meters and sphygmomanometers) is frequently unavailable and drugs are not supplied. There are few health-care facilities that can provide comprehensive tertiary care.

There is sufficient evidence to show that well organized diabetes clinics with appropriately trained staff and well-designed protocols improve the quality of diabetes care. It is therefore suggested that where diabetes clinics do not exist, clinics be established and integrated into the health-care system. Furthermore, where the clinics do exist, an assessment of the quality of care provided should be done and changes instituted to rectify any deficiencies identified.

Table 1. Below is the minimum staffing and equipment requirement at each level of health care for the appropriate management of diabetes mellitus.

Health-care level	Personnel	Equipment
Primary	Nurse Village Health Worker Medical Officer(s) Medical Assistant Diabetes educator	Clinical Care Guidelines Urine Strips for glucose/ketones/proteins Blood glucose meter with appropriate strips Sphygmomanometer with appropriate cuff sizes Weight Scale and Height measure Tape measure Monofilament
Secondary	All above + Diabetes educator Chiropodist Dietician Physician Laboratory technician	All above + Tuning Fork and patellar hammer Ophthalmoscope Biochemistry analyzer for glucose, lipids, renal function and Glycosylated hemoglobin
Tertiary	All above + Internist/diabetologist /cardiologist/ Nephrologists Ophthalmologist Obstetrician Surgeon Pediatrician	All above + Fundal camera Retinal laser unit Theatre facilities Cardiovascular diagnostic facilities Hemodialysis/peritoneal,dialysis/renal transplant

In certain countries, traditional healers are integrated into the primary health-care system. In most cases, traditional medicine does not improve diabetes control, and is not necessarily cheap. However, should the patient choose to attend a traditional healer, it is imperative that the patient be counseled by the health care provider and to continue monitoring of glycaemic control and other process measures of diabetes management.

Table:2. What to do when

PRIMARY LEVEL		
Initial Visit	3 Month visit	Annual visit
History and Diagnosis Physical Examination: * Height & Weight (BMI) * Waist/Hip circumference * blood pressure * Detailed foot examination * Tooth inspection * Eye Examination - Visual acuity + Fundoscopy* * Biochemistry: - Blood Glucose* - Glycosylatted haemoglobin* - Lipids (TC, HDLC, LDLC, TG)* - Creatinine, Sodim, Potassium* - Urine: glucose, ketones, protein Education Nutrition advice Medication if needed	• Relevant history • Weight • Blood pressure • Foot inspection • Biochemistry: - Blood Glucose - Glycosylatted hemoglobin - Urine protein Urine protein Education advice Nutritional advice Review therapy	History and examination – as at initial visit Biochemistry – as at initial visit
SECONDARY LEVEL		
All the above Eye examination ECG • Biochemistry: - Blood Glucose* - Glycosylatted hemoglobin* - Lapids (TC, HDLC, LDLC, TG)* - Creatinine, Sodium, Potassium*		
TERTIARY LEVEL		
All the above and Microalbuminuria	All the above	All the above and microalbuminuria
*if facilities are available – otherwise refer TC = total cholesterol, HDLC = high-density lipoprotein, LDLC = low-density lipoprotein, TG=triglycerides		

Suggestions of how to set up a diabetes clinic and to assess quality of care are provided in the Appendix 1 (page 47) under “Setting up a Primary Level Diabetes Service.”

5. MONITORING THE QUALITY OF CARE

Periodic monitoring of the quality of care provided and instituting changes to rectify deficiencies that are identified should form an integral component of health-care delivery. This requires the setting of target standards usually based on National or Regional guidelines.

Some examples of indicators for monitoring include:

MEASUREMENT	**CALCULATE**
PROCESSES OF CARE	
Blood pressure measurements at every visit	Percent of patients screened in 1 year
Feet examinations	Percent of patients screened in 1 year
Screening for proteinuria/ microalbuminuria	Percent patients screened in 1 year
Screening for retinopathy	Percent of patients screened in 1 year
Education given	Percent of patients educated in 1 year
INTERMEDIAS	
HBA1C levels	Percent of patients achieving target
Blood Glucose levels	Percent of patients achieving target
Blood pressure levels	Percent of patients achieving target
HDL levels	Percent of patients achieving target
Cholesterol levels	Percent of patients achieving target
Triglyceride levels	Percent of patients achieving target
Blood pressure control in hypertensives	Percent of patients achieving target
Retinopathy	Percent of patients with retinopathy
TRUE OUTCOMES	
Leg amputations	Incidence
Stroke	Incidence
Blindness	Incidence
End-stage renal failure	Incidence
Myocardial infarction	Incidence
RISK FACTOR CONTROL	
Smoking	Percent of patients smoking
Obesity	Percent of patients obese
Physical activity	Percent of patients exercising

6. DEFINITION, DIAGNOSIS AND CLASSIFICATION

Diabetes mellitus is a group of metabolic diseases characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action or both. It is associated with acute complications such as ketoacidosis and hypoglycaemia, as well as long-term complications affecting the eyes, kidneys, feet nerves, brain, heart and blood vessels.

DIAGNOSIS

In the majority of people presenting with the classical symptoms of diabetes, the diagnosis of diabetes is straightforward. However, it may pose a problem for those with a minor degree of hyperglycaemia, and in asymptomatic subjects. In these circumstances, two abnormal results on separate occasions are needed to make the diagnosis. If such samples fail to confirm the diagnosis it will usually be advisable to maintain surveillance with periodic retesting until the diagnostic situation becomes clear. The clinician should take into consideration additional risk factors for diabetes before deciding on a diagnostic or therapeutic course of action.

The diagnosis of diabetes must be confirmed biochemically prior to initiation of any therapy.

- The presence of symptoms of hyperglycaemia, such as polyuria, polydypsia, pruritus vulvae, lethargy, loss of weight and a random venous plasma glucose 11.1mmol/L

Or

A fasting venous plasma glucose 7.0mmol/L confirms the diagnosis of diabetes.

In asymptomatic subjects a single abnormal blood glucose result is inadequate to make a diagnosis or diabetes. The abnormal value must be confirmed at the earliest possible date using any of the following: fasting or random blood sample x 2 or a 75 oral glucose tolerance test.

For clinical purposes the diagnosis of diabetes should always be confirmed by repeating the test on another day, unless there is unequivocal hyperglycaemia with acute metabolic decompensation or obvious symptoms. People with impaired glucose tolerance or impaired fasting glycaemia should be retested after 1 year.

TO CONVERT MMOL/LINTOMG/DL, MULTIPLY MMOL VALUE BY 18.0

Table: 3a. Values for the diagnosis of categories of hyperglycaemia, measured in mmol/L (WHO, 1999)

	Venous plasma (mmol/L)	**Venous whole blood (mmol/L)**	**Capillary whole blood (mmol/L)**
DIABETES			
Fasting	≥7	≥6.1	≥6.1
Or 2h post 75g glucose load	≥11.1	≥10.0	≥11.1
IMPAIRED GLUCOSE TOLERANCE			
Fasting	<7.0	<6.1	<6.1
and 2h post 75g glucose load	≥7.8and <11.1	≥6.7 and <10.0	≥7.8 and <11.1
IMPAIRED FASTING GLYCAEMIA			
Fasting	≥6.1and <7.0	≥5.6 and <6.1	≥5.6 and <6.1
Gestational diabetes			
Fasting	≥7		
2h post 75g glucose load	≥7.8		

Table: 3b. Values for the diagnosis of categories of hyperglycaemia measured in mg.dl (WHO, 1999)

	Venous plasma (mg/dl)	**Venous whole blood (mg/dl)**	**Capillary whole blood (mg/dl)**
DIABETES			
Fasting	≥126	≥110	≥110
Or 2h post 75g glucose load	≥200	≥180.0	≥200
IMPAIRED GLUCOSE TOLERANCE			
Fasting	<126	<110	<110
and 2h post 75g glucose load	≥140and <200	≥120 and <180	≥140 and <200
IMPAIRED FASTING GLYCAEMIA			
Fasting	≥110and <126	≥100 and <110	≥100 and <110
Gestational diabetes			
Fasting	≥126		
2h post 75g glucose load	≥140		

DEFINITION,DIAGNOSIS AND CLASSIFICATION … Continued

CLASSIFICATION OF DIABETES MELLITUS

The classification of diabetes has been revised by the WHO and is based on aetiology

Type 1 diabetes	Results from destruction, most commonly autoimmune, of the pancreatic beta cells. Insulin is required for survival.
Type 2 diabetes	Characterized by insulin resistance and/or abnormal insulin secretion, either of which may predominate, but both of which are usually present. It is the most common type of diabetes.
Other specific types of diabetes	These are less common and include genetic disorders, infections, and diseases of the exocrine pancreas, endocrinopathies or as a result of drugs.
Gestational diabetes	Appearing or recognized for the first time in pregnancy.

Figure:1 Shows the types and stages of glycaemic disorders

Stages / **Types**	**Normoglycemia**	**Hyperglycemia**	
	Normal glucose regulation	Impaired Glucose Tolerance Or Impaired Fasting Glucose	Diabetes Mellitus: Not insulin requiring / Insulin requiring for control / Insulin requiring for survival
Type 1* Type 2* Other Specific Types**		←	→
Gestational Diabetes**		←	→

*These patients may briefly return to normal blood glucose levels without requiring continuous therapy, the so-called honeymoon phase.

** In rare cases these patients e.g. Type 1 diabetes first presenting in pregnancy or vacor toxicity may require insulin for survival.

7. PRESENTATION OF DIABETES

Type 1 diabetes

Patients present at a young age (usually their teens or twenties, but earlier presentation may also occur) with rapid onset of severe symptoms, in particular weight loss, thirst and polyuria. Blood glucose levels are high and ketones often present in the urine. If treatment is delayed, diabetic ketoacidosis (DKA) and death may follow. The response to insulin therapy is dramatic and gratifying. However, misclassification of patients as "Type 1" is probably relatively common, as being treated with insulin is not the same as being dependent upon insulin for survival.

Type 2 diabetes

Most patients present with the classical symptoms of diabetes, including polyuria, polydypsia and polyphagia. Additionally, some patients present with sepsis, and/or diabetic coma (hyperosmolar non-ketotic states). The minorities are asymptomatic and are therefore identified at screening. The patients usually do not seek early medical attention because of the insidious nature of the disease and therefore may present at diagnosis with features of diabetic complication, including visual difficulties from retinopathy, pain and/or tingling in the feet from neuropathy, foot ulcerations, and stroke. Some elderly Type 2 patients present with hypersomolar non-ketotic coma that has a high mortality.

Gestational diabetes

Gestational diabetes mellitus (GDM) is, as the name suggests, diabetes that arises in pregnancy. It also reverts to metabolic and clinical normality post-partum, though there is a considerable risk of later Type 2 diabetes (WHO, 1999). Therefore, GDM must be distinguished from existing diabetes in women who become pregnant. The particular importance of GDM is that it is associated with a poor pregnancy outcome, especially if unrecognized and untreated. Particular adverse effects include foetal macrosomia, eclampsia, intra-uterine growth retardation, birth difficulties, neonatal hypoglycaemia and respiratory.

8. PREVENTION OF DIABETES

In view of the significant rise in the prevalence of diabetes in Africa, its well-recognized morbidity. Premature mortality and increasing health costs, prevention is of paramount importance. The major risk factors for diabetes are:

MODIFIABLE	NON-MODIFIABLE
Obesity: general central	Age (≥40 yrs.)
Physical inactivity	First degree relative with diabetes
Impaired glucose tolerance/ Impaired fasting glycaemia	Previous gestational diabetes
Dyslipidaemia	Ethnicity
	Hypertension

Evidence from large trials conducted in China, Finland and the USA has shown that the onset of diabetes can be delayed by active lifestyle modification in people at high risk of diabetes. It is currently unknown whether this intervention can totally prevent the onset of diabetes, or in particular, its cardiovascular complication.
The components of lifestyle modification and their aims should include, but not be limited to, the following list:

- Weight loss of 5%-10%.
- Reduction in fat intake <30% of calories.
- Reduction in saturated fat intake <10% of calories.
- Increase in fiber intake >15g/1000kcal (traditional African diets are high in fiber content).
- Increase in physical activity levels. This type of exercise (e.g. brisk walking) should last for at least 30 minutes and should be undertaken at least three times a week.
- Formal assessment of sedentary adults for underlying physical conditions that may limit the degree and duration of exercise that will require a structured prescription.
- Reduction in high levels of alcohol intake to less than one drink per day of any type
- Stopping smoking

9. METABOLIC SYNDROME AND OBESITY

A) METABOLIC SYNDROME

Preamble

Type 2 diabetes and lesser degrees of hyperglycemia often co-exist with hypertension, obesity (particularly visceral adiposity) and dyslipidaemia. These components comprise the metabolic syndrome, a known cluster of risk factors for ischaemic heart disease, stroke and peripheral vascular disease.

The pathogenesis of the syndrome is strongly linked to central obesity and tissue resistance to insulin action arising from genetic pre-disposition or acquired factors, such as obesity and physical inactivity.

The essential components of the Metabolic Syndrome are:

1. Central obesity
2. impaired fasting glycaemia (IFG) or Type 2 diabetes
3. Hypertension
4. Dyslipidaemia (raised triglycerides and/or low HDL-cholesterol)

Strong associations of the metabolic syndrome include:

1. Polycystic ovary disease
2. Acanthosis nigricans
3. Decreased fibrinolytic activity
4. Hyperuricaemia
5. Proinflammatory state (elevated high sensitivity CRP)
6. Microalbuminuria

The presence of three or more of the above essential components constitutes the metabolic syndrome. Formal assessment of insulin resistance is not required to make the diagnosis. The IDF definition classifies central obesity as measured by waist girth as essential components.

MANAGEMENT OF METABOLIC SYNDROME

Treatment of the syndrome consists of managing the various disease components and targeting the pathophysiological derangements of the syndrome: central obesity and insulin resistance. The first line of treatment for all components is lifestyle change- weight loss and increased physical activity. Insulin sensitivity can be improved by non-pharmacological and pharmacological means.

b) OBESITY

Preamble

Over 70% of the people with Type 2 diabetes are either overweight or obese. Being overweight/ obese significantly increases the risk of morbidity and mortality from Type 2 diabetes and its co-morbidities. Successful reduction has a positive impact on these outcomes. Obesity is a major component of the metabolic syndrome.

METABOLIC SYNDROME AND OBESITY Continued

Measurements for evaluation of obesity are:

1. Calculation of overall obesity, the body mass index (BMI).
2. Determination of central fat distribution by measurement of waist circumference.

BMI represents overall fatness. It is derived from the patient's weight in kilograms (kg) and the height in meters (m) from the following formula:

$$BMI = \frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Clinicians frequently use the following classification of BMI:

Classification of BMI	**(kg/m^2)**
Underweight	<19.0
Normal weight	19 - 24.9
Overweight	25 – 29.9
Obesity (class 1)	30 – 34.9
Obesity (Class 2)	35 – 39.9
Extreme obesity (Class 3)	>40

The pattern of distribution of the fat in the body (whether mostly peripherally or centrally distributed) is assessed by the use of the waist hip ratio (WHR):

$$WHR = \frac{\text{Waist Circumference (cm)}}{\text{Hip Circumference (cm)}}$$

Waist circumference (WC) should be measured midway between the lower rib margin and the iliac crest, while the hip circumference is taken as the largest circumference of the hip. Waist circumference is now recognized as a better indicator of central or upper-body obesity than the WHR, the upper limits being 102 cm and 88 cm in men and women, respectively (at least in Caucasian people I).

GNERAL PRINCIPLES OF THE MANANGEMENT:

1. Assess dietary intake, level of physical activity, BMI, and waist circumference (on presentation and monitor regularly. The socio-economic situation will affect ability to comply with dietary advice.
2. Assess efficacy of weight loss measures.
3. Integrate weight control measures into the overall management of diabetes mellitus and co-morbidities if BMI >25 and/or waist circumference >102 cm and >88 cm in men and women, respectively.
4. Weight loss is difficult to achieve and maintain.
5. Educate people with diabetes, as well as their families.
6. Set realistic goals.
7. Use a multi-disciplinary approach to weight control
8. Dietary changes and increased level of physical activity are the most economical means to lose weight.
9. Maintain records of goals, instructions and weight progress charts.

10. MANAGMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS

a) GOALS:

Improve quality of life and productivity of people with diabetes by:

- Improve quality of life and productivity of people with diabetes by:
- Early diagnosis.
- Prevention of short –term and long term morbidities.
- Prevention of pre mature mortality.
- Promotion of self-care practices and empowerment of people with diabetes.
- Reduction of the personal, family and societal burden of diabetes.

The successful establishment of diabetes health –care team and infrastructure to support it is critical for the achievement of these goals. This includes provision of education for health – care professionals and for people living with diabetes.

b) ESSENTIAL COMPONENTES OF CARE:

1. Treatment of hyperglycaemia

a. Non-pharmacological
   i. Education
   ii. Diet
   iii. Physical activity

b. Pharmacological
   i. Oral glucose lowering agents (oral hypoglycaemic agents)
   ii. Insulin

c. Combination Therapies
   i .Oral Glucose lowering agents and insulin

2. Treatment of hypertension and dyslipidaemia

a Non-pharmacological
   I .Education
   ii. Diet
   iii. Physical activity

b. Pharmacological

3 Prevention and treatment of micro vascular complications

4. Prevention and treatment of macro vascular complications.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

C) OPTIMAL TARGETS FOR GLYCAEMIC, LIPID AND BLOOD PRESSURE CONTROL

Biochemical index	Optimal	
Capillary blood glucose values (finger –prick)	mmol/L	Mg/dl
Fasting	4-6	72—108
2- hour post-prandial	4-8	72-144
Glycated haemoglobin (HbA1C)%		<7
Weight BMI (kg/m2)		<25
Blood pressure (mmHg)		
Systolic Diastolic If persistent, dipstick for proteinuria Systolic Diastolic		<130 <80 < 125 <75
Lipids		
	,mol/L	Mg/dl
Total	<5.2	<93.6
LDL cholesterol	_<2.6	_<46.8
HDL cholesterol	>1.1	>19.8
Triglycerides	<1.7	<30.6

d) METHODS FOR MONITORING GLYCAEMIC CONTROL

Preamble

Clinical and laboratory methods are employed to monitor or assess whether the individualized glycaemic targets are being attained. These monitoring techniques and frequencies may require adaptation to local conditions and resources.HbA1c tests are desirable standard test but are presently unavailable in most of the primary and secondary health facilities in Africa .A combination of fasting and post prandial plasma glucose ideally measured in laboratory is the best alternative .Glycosuria is poor means of assessing glycaemic control but in certain clinics this may be the only available tool. In this situation, the second voided specimen of the day should be tested. Where possible self –blood glucose monitoring (SBGM) should be encouraged .Results of self –urine testing or blood glucose test should be recorded in a log book.

The clinic protocol should set out, in some detail, the parameters to be monitored at the initial, regular follow – up visits, and at the annual review.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

e) DIABETES EDUCATION

Preamble

Diabetes education is the provision of knowledge and skill to people with diabetes that will empower them to render self – care in the management of their diabetes an d associated disorders. This is one of the corner stones of management together with diet, physical activity and pharmacotherapy, and is critical in improving the out come.

General principles

1. Diabetes education programmes that are locally applicable, simple and effective should be available.
2. All members of the diabetes –care team should be trained to provide the education, and be aware of the local myths about diabetes.
3. The programme must empower people with diabetes and their families.
4. The effectiveness of the programme must be evaluated and modified as necessary.

Empowerment of people with diabetes includes their having:

- A broad knowledge of diabetes and its sequelae, and
- The right attitude and resources to provide appropriate self care.

People with diabetes and their families need to know:

- That diabetes is serious ,but can be controlled
- That complication are not inevitable (they can be prevented)
- That the cornerstones of therapy include: education, what foods to eat, how much and how often to eat, how to exercise and its precautions how and when to take medications.
- Their metabolic and blood pressure targets.
- How to look after their feet ,and thus prevent ulcers and amputations
- How to avoid other long term complications
- That regulate medical check ups are essential
- When to seek medical help, e.g how to identify hypoglycaemic and hyperglycaemic emergencies and symptoms, as well as signs of chronic complications.
- That good glucose control is required before and during pregnancy, and how to make informed choices about their use of traditional medicine.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

f) DIETARY MANAGEMENT OF TYPE 2 DIABETES MELLITUS

Preamble

Dietary modification is one of the cornerstones of diabetes management, and is based on the principle of healthy eating in context of social, cultural and psychological influence of food choices. Dietary modification and increasing level of physical activity should be the first steps in management of newly diagnosed people with Type 2 diabetes, and have to be maintained.

Principles of dietary management of Type 2 diabetes mellitus

- All members of the Diabetes –care team must have knowledge about nutrition to be able to education people with diabetes about dietary measures.
- Dietary counseling is best given by a dietitian or nutritionist with an interest in diabetes mellitus.
- To achieve ideal weight loss, an appropriate diet should be prescribed together with an exercise regime.
- Caloric restrictions should be moderate yet provided balance nutrition.
- At least three meals a day should be eaten, and binge eating should be avoided.
- The diet should be individualized, based on traditional eating patterns, be palatable and affordable.
- Animal fat, salt and so-called diabetic foods should be a voided.
- Pure (simple) sugars in foods and drinks should be avoided.
- Eating plans should be higher in complex carbohydrates (starches) and fiber contents, vegetables and limited numbers of fruits should be encouraged.
- Simple explained and written dietary instructions should be provided.
- Food quantities should be measured in volumes using available household items, such as cups, or be countable, such as number of fruits or slices of yam or bread.
- Alcohol should be avoided.
- Sweeteners are not essential but may be used with out concern for their safety.
- Increasingly, diabetes diet and drinks are becoming available, but these may be unaffordable and are not essential.

g) PHYSICAL ACTIVITY AND EXERCISE

Preamble

Physical activity or exercise is one of the essentials in the prevention and management of Type 2 diabetes mellitus .Regular physical activity improves metabolic control ,increase insulin sensitivity, improves cardiovascular health ,and helps weight loss and its maintenance ,as well as giving a sense of well –being.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

There are two types of physical activity :(a) aerobic or endurance exercise (e.g .walking or running) and (b) anaerobic or resistance exercise (e.g. lifting weights).Both types of activities may be prescribed to persons with Type2 diabetes mellitus, but the aerobic form is usually preferred.
In most parts of Africa ,prescribing formal exercise in gyms or requiring special equipment is recipe for non-adherence .There fore ,patients should be encouraged to integrate increased physical activity in to their daily routine .The programme should impose minimum, if any extra financial out lay in new equipment and materials.

General principles and recommendations for physical activity in Type 2 diabetes mellitus

- A detailed physical evaluation cardiovascular, renal, and foot status (including neurological) should performed before starting an exercise programme.
- The presence of chronic complications may preclude certain forms of exercises.
- Prescribed physical activity programmes should be appropriate for the patient's age, socio-economic status, state of physical fitness, life style and level of glycaemic control.
- While exercise generally improves metabolic control, it can also precipitate acute complications like hypoglycaemia and hyperglycaemia.

- The physical activity should be regular (3days/week), last at least 20-30 min. per session, and be of at least moderate activity.
- Activities like walking, climbing steps (instead of taking lifts) should be encouraged.
- For sedentary persons with diabetes, a gradual introduction using a low-intensity activity like walking is mandatory.
- Avoid strenuous exercise if ambient glycaemia is >250 mg/dl (14mmol/L), the patient has ketonuria or blood glucose is less than 80 mg/dl (4.5mmol/l).
- To avoid exercise –induced hypoglycaemia, dosages of insulin secretagogues or insulin may need to reduce and /or peri-exercise carbohydrate intake increased.
- Glycaemia should be monitored (using strips and meters) before and after planned strenuous physical activity as delayed hypoglycaemia may occur.
- Proper foot wear must always be worn.

h) ORAL GLUCOSE –LOWERING AGENTS (OGLAs) ORAL HYPOGLYCAEMIC AGENTS (OHAs)

Preamble
Oral pharmacotherapy is indicated when individualized glycaemic targets are not met by the combination of dietary modification and physical activity/exercise. In some cases, oral pharmacotherapy or insulin is indicated at the first presentation of diabetes ,i.e a fasting blood glucose level >11 mmol/L Or random blood glucose level >15mmol/L.In many parts of Africa ,refusal or failure to prescribe OGLAs early enough ,may cause loss of faith in the system and a resort to parallel therapies .The OGLAs may be used as mono therapy or in combination

therapy targeting different aspects in the pathogenesis of hyperglycaemia in Type 2 diabetes mellitus, i.e increased insulin production and release, decreased insulin resistance and /or decreased hepatic glucose production.
The "Table of Glucose-lowering Agents" in the appendix II (PAGE 48) summarises the characteristics of the OGLAs, which are frequently used in controlling glycaemia in diabetes care .The list is not exhaustive but includes agents that are most commonly used in different parts of Africa.

Comments on oral glucose –lowering agents

In most of the countries in the region, use of cheap proven effective generic drugs instead of proprietary brands, which are usually expensive, should be encouraged.

- The choice of OGLAs should depend on the patient's characteristics, life style, degree of glycaemic control, access to drugs, economic status and mutual agreement between the doctor and the persons with diabetes.
- The sulphonylureas and metformin are the agents most widely available .Stocking these agents would meet the diabetes –care needs of most diabetes facilities.
- Mono therapy with any of the drugs should be the initial choice. Use of the stepped –care approach is recommended, as mono therapy is seldom sufficient, because of the progressive nature of the disease (see Algorithm).
- If over weight (BMI >25kg/m2) metformine should be the first choice. If metformine is contraindicated thiazolidinediones may be used but are very expensive.
- Long –acting sulphonylureas such as tolbutamide, gliclazide (or glitinides or glitazones which are very expensive).
- Metformine should be used with care in the elderly (over the age of 75 years) and is contraindicated in people with elevated serum creatinine, liver disease and severe respiratory, cardiac and peripheral vascular disease.
- Combination therapy using OGLAs with different mechanisms of action is indicated if mono therapy with one of the agents has failed .Never use two drugs from the same class.
- The rapid acting secretagoues (glitinides) and the alpha glucosidase inhibitors allow for flexibility in the glycaemic management but are relatively expensive.
- When oral combination therapy fails, insulin should be added to the treatments regimen or the OGLAs replaced.

Three- drugs combination therapy can be used when two drugs regimes fail to achieve target values. How ever ,such regime are very expensive and difficult to manage .such patients should be referred to a specialist. Use of the combination therapy often results in an increased number of tablets to be taken and creates new adherence problems .Fixed combination therapies inhibit flexibility in dosing prescription.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

i) INSULIN THERAPY IN TYPE 2 DIABETES

Preamble

Insulin therapy is increasingly being introduced, either in combination with OGLAs or as mono therapy in the management of people with Type 2 diabetes, so as to achieve an optimum glycemic target that must be individualized .Initiation of insulin therapy, if indicated, should not be delayed.

Indications for use of insulin in Type 2 diabetes
• Initial presentation with sever hyperglycaemia • Presentation in hyperglycaemic emergency • Per-operative period especially major or emergency surgery • Other medical conditions requiring tight glycaemic control • Organ failure (e.g. renal, liver, heart) • Pregnancy • Latent autoimmune diabetes of adults (LADA) • Contraindications to OGLAs • Failure to meet glycaemic targets with OGLAs

The regimen dose of insulin therapy vary from patient to patient.

1.SUPPLEMENTARY THERAPY:NPH insulin administered 22hoo given as Total Daily Dose calculate by :kgx0.2 IU of insulin (70kg patient x0.2 IU =14IU insulin).The OGLAs are continued (half maximum dose of sulphonylureas and metformin dose of 2 g/day, or the suphonylureas stopped and metformine continued) and the blood glucose levels are monitored (when possible).

2. SUBSTITUTION THERAPY: OGLAs are discontinued (unless the patient is obese where the METFORMIN will be continued), and a PRE-MIXED insulin is introduced B.D at a dosage of 0.2 IU/kg body weight .This is split in to ? in the morning and? in the evening , at 30 minutes before the morning and the evening meals.

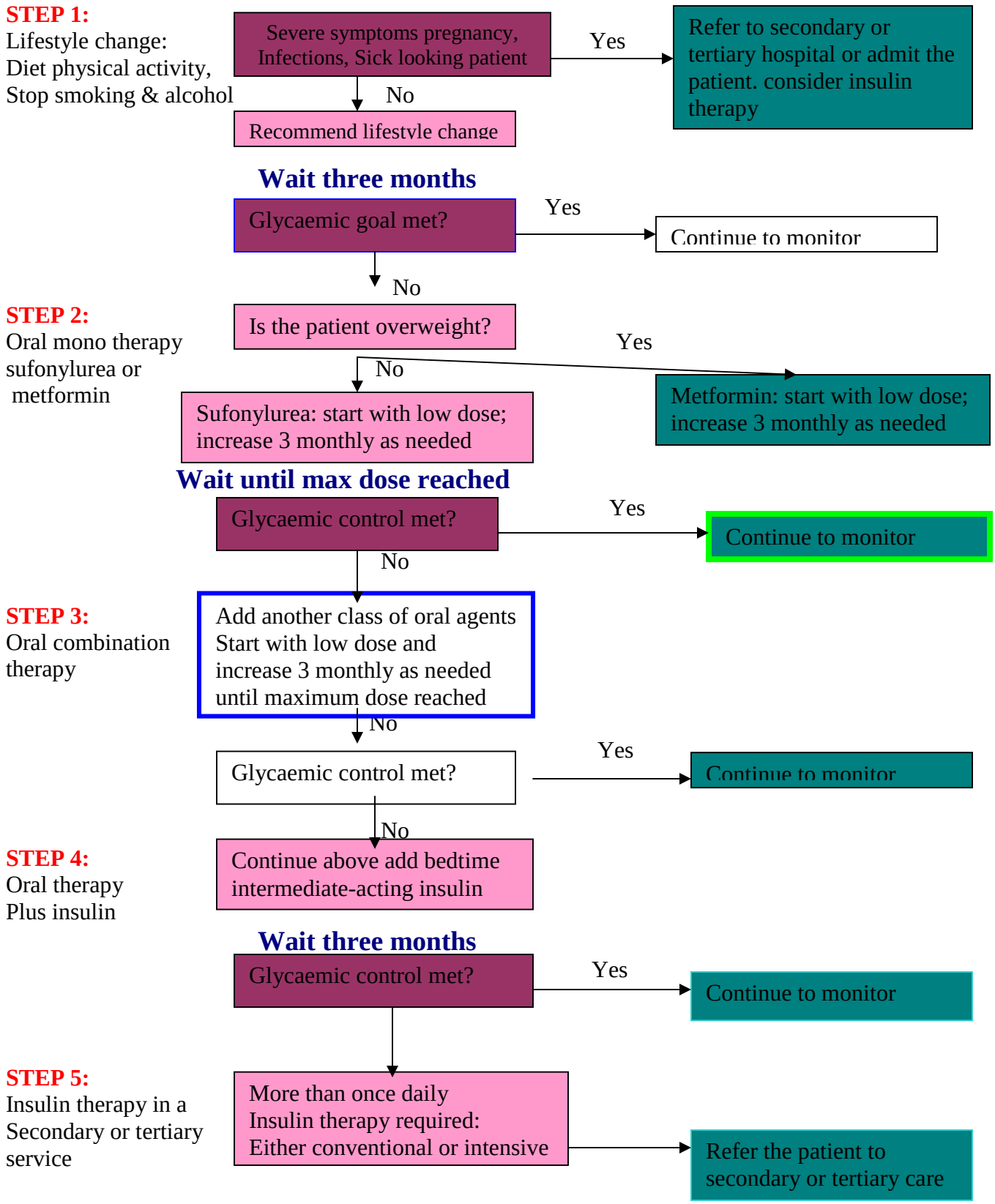
If requirement of insulin exceeds 30 units/day, referral should be considered.

Time course of action of insulin preparations

Insulin preparation	**Onset of action**	**Peak action (h.)**	**Duration of action (h.)**	**Injections per day**
Rapid –acting analogues	10-20 min.	1-2	3-5	Immediately before meals
Soluble	30-60 min.	2-4	6-8	30min.before meals
Intermediate(NPH)	1-2h.	5-7	13-18	Once or twice
Lente	1-3h.	4-8	13-20	Once or twice
Biphasic mixture 30/70	30min.	2-8	Up to 24 h.	Once or twice

At initiation of insulin therapy and thereafter, appropriate advice on hypoglycaemia, sick days, physical activity, SBGM and diet should be given.

Algorism on the glycaemic Management of Type 2 diabetes



j) MANAGEMENT OF HYPERTENSION IN TYPE 2 DIABETES MELLITUS

Preamble

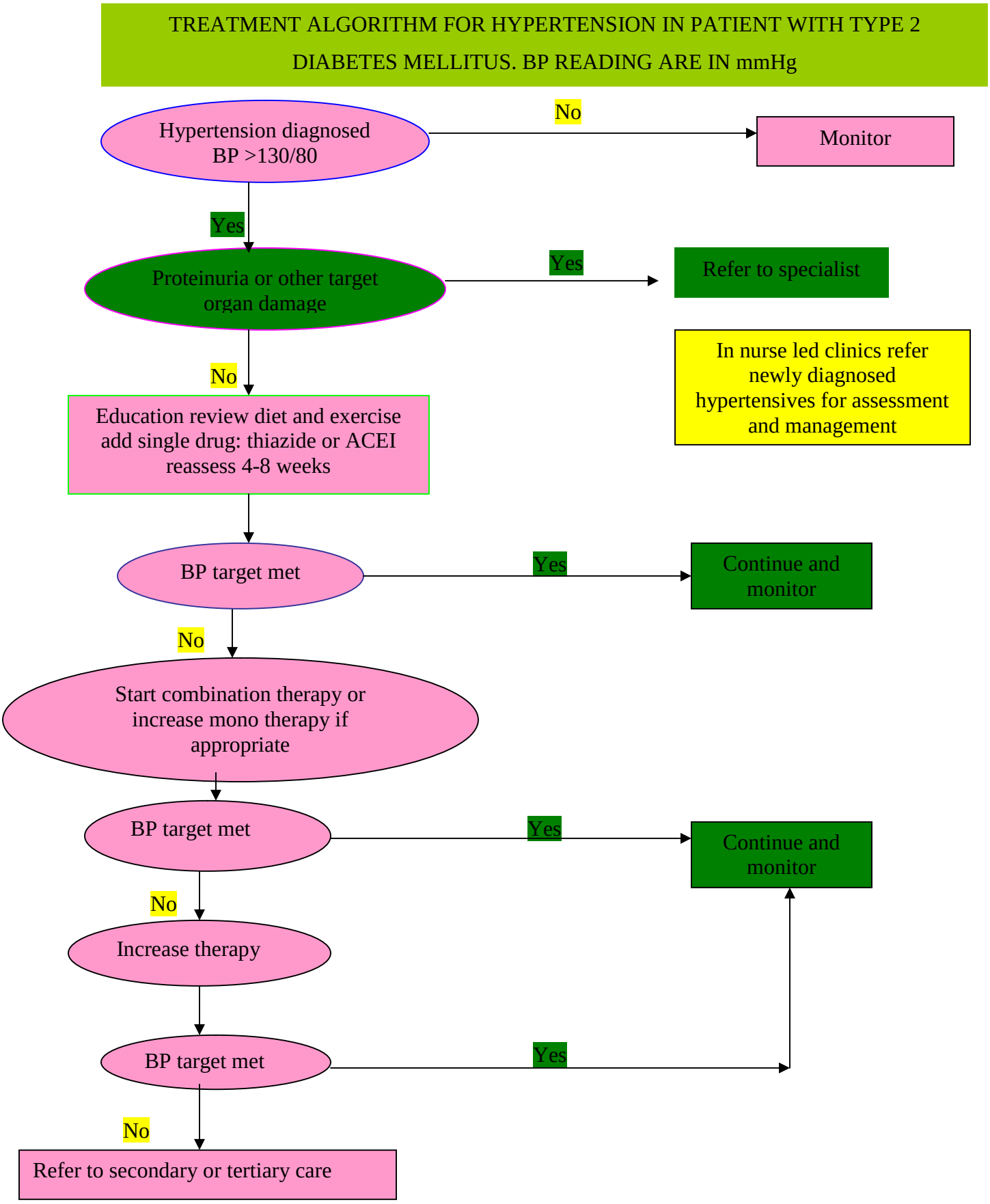
Hypertension is frequently associated with Type 2 diabetes mellitus and is one of the diagnostic components of the metabolic syndrome .Early and effective treatment of hypertension in Type 2 diabetes prevents CVD, reduces morbidity, mortality and the rate of progression of renal and retinal disease.

Principles of management of hypertension in diabetes mellitus

- Determine blood pressure in people with Type 2 diabetes at every visit, using standard techniques (measure with a mercury sphygmomanometer and the right –sized cuff with the patient seated).
- Classify blood pressure status using a BP of 130/80mmHg or more as hypertensive.
- If hypertensive, perform clinical evaluation to exclude secondary causes of hypertension .If a secondary cause is suspected, refer for comprehensive evaluation.
- Assessment should include staging and risk stratification .Look for other components of metabolic syndrome and complication of both diabetes and hypertension.
- Integrate management of hypertension and that of diabetes, starting with education life style modifications (physical exercise, diet and weight loss) and setting goals.
- Diet in people with Type 2 diabetes and hypertension should be low in sodium, rich in vegetables and fruits, and low in dairy products.
- With the initial diagnosis, relevant life style modifications should be instituted .If this fails to control the blood pressure, mono therapy should be commenced and if unsuccessful ,combination therapy will be required to achieve the target blood pressure level.
- If renal impairment is present (serum creatinin>133umol/L).
- Note the potential problems with certain anti hypertensive:
    - Diuretics in large doses inhibit insulin release.
    - Beta blockers may blunt or mask symptoms of hypoglycaemia and exacerbate peripheral vascular disease.
    - Dyslipidaemia may be worsened by beta blockers and diuretics.
    - Impotence and postural hypotension may be precipitated or aggravated by alpha blockers and centrally acting agents (e,g methyldopa).
    - Angiotension converting enzyme (ACE) inhibitors may induce hyperkalaemia, renal failure, a persistent cough and lower glucose levels.

- Individualize hypertensive therapy to achieve good control .Multiple agents are frequently required.
- Monitor serum creatinine and potassium once a year and more frequently if there is evidence of mental impairment.

Refer to the Appendix III (page 49) for Table of Classes of Anti hypertensive.


TREATMENT ALGORITHM FOR HYPERTENSION IN PATIENT WITH TYPE 2 DIABETES MELLITUS. BP READING ARE IN mmHg
Hypertension diagnosed BP >130/80
No
Monitor
Yes
Proteinuria or other target organ damage
Yes
Refer to specialist
In nurse led clinics refer newly diagnosed hypertensives for assessment and management
No
Education review diet and exercise add single drug: thiazide or ACEI reassess 4-8 weeks
BP target met
Yes
Continue and monitor
No
Start combination therapy or increase mono therapy if appropriate
BP target met
Yes
Continue and monitor
No
Increase therapy
BP target met
Yes
No
Refer to secondary or tertiary care

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

k) LIPIDS

Preamble

The risk of coronary artery disease and other macro vascular disorders is 2-5 times higher in people with diabetes than in non –diabetic subjects and increase in parallel with the degree of dyslipidaemia.

Assessment

Measure fasting lipids including total cholesterol, triglycerides and HDLC and LDLC.(For targets see page 15.)

How often

If normal, annually.

If abnormal or on treatment ,every 3-6 months .

What to do if results are abnormal:

Use non –pharmacological interventions as initial treatment:

Improve blood glucose control
Reduce saturated fat intake
Ensure regular weight if indicated
Avoid alcohol intake if triglycerides elevated
Consider referral to dietitian.
Discourage smoking.

If the above interventions are unsuccessful after 6 months, refer for pharmacotherapy:

Statins for raised LDLC
Fibrates for raised triglycerides
Nicotinic acid or fibrates for low HDLC.

l).DIABETES AND OTHER CARDIOVASCULAR DISEASES

Preamble

People with diabetes are 2-4 times more likely to develop cardiovascular disease than people with out diabetes .Two major processes lead to cardiovascular disease: atherosclerosis and hypertension.

The clinical spectrum of cardiovascular disease is:

Coronary heart disease:

- Angina (which may be silent).
- Acute coronary artery syndrome.
- Congestive cardiac failure.
- Sudden death.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

Cerebrovascular accident:

- Stroke.
- Transient Ischaemic Attacks.
- Dementia.

Peripheral vascular disease:

- Intermittent claudication.
- Foot ulcers.
- Gangrene.

Assessment:

Annual assessment for cardiovascular risk factors.

Referral to a secondary and / or tertiary institution for evaluation is required /suggested in people presenting with typical and atypical but suggestive symptoms of angina, features of congestive cardiac failure ,unexplained breathlessness, cardiomegaly, arrythmias, transient ischaemic attacks or intermittent clauication of legs.

Evaluation for coronary artery disease will include ECG, X-ray of the chest (in people with breathlessness) and if warranted an echocardiogram, stress test and coronary angiography
Evaluation for cerebrovascular disease will include carotid Doppler and angiography
Evaluation for peripheral disease will include dopplers and angiography of the lower limbs.

Management:

Manage under lying associated cardiovascular risk factors.

Life –style modification.

Initiate aspirin therapy.

Consider the use of beta –blockers, ACE inhibitors, angiotensin receptor blockers (ARBs) and tight glycaemic control post myocardial infarction.

Coronary angiography, angioplasty or coronary artery by pass graft (CABG) where indicated.

MANAGEMENT OF TYPE 2 DIABETES AND ASSOCIATED CONDITIONS … Continued

m) RECOMMENDATIIONS FOR USE OF ASPIRIN

The use of aspirin in people with Type 2 diabetes reduced vascular events, and is indicated in the following:

1. Secondary prevention for coronary and cerebrovascular diseases.
2. Primary prevention for people with Type 2diabetes over the age of 40 years ,having :
    - Family history of ischaemic heart disease(IHD)
    - Cigarette smoking
    - Hypertension
    - Obesity
    - Proteinuria
    - Dyslipidemia

How ever, contraindications may prevent its use, especially the presence or history of peptic ulcers, dyspepsia, heart burn or bleeding.
Aspirin should not be used in uncontrolled (malignant) hypertension
Hemorrhagic stroke must be ruled out before initiating aspirin therapy in patients with acute cerebrovascular accident.
The recommended daily dose is 75-162 mg of soluble aspirin.

11. MANEGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDEYS,EYES,NERVES)

These complications (diabetic foot ,kidney, eye and nerve) may be present at the time of diagnosis of diabetes because this is frequently delayed .These complications can be prevented or their progression delayed by optimal treatment of hyperglycaemia and hypertension .Screening for the complication and prompt interventions reduce the risk of major out comes such as blindness and leg amputations .Prevention and appropriate management of these chronic complication present a considerable challenge to all African countries as diagnostic methods for their early detection are either not part of current clinical practice or available.

a) NEPHROPATHY (KIDNEY COMPLICATIONS)

Preamble:

- Diabetes is becoming one of the most important causes of chronic renal failure .In Africa most patients with diabetic end –stage renal disease die of uraemic complications because of the unavailability of renal replacement therapy facilities.
- Persistent microalbuminuria is marker of increased cardiovascular risk.
- Patients with microalbuminuria who progress to macroalbuminuria (>300mg/24h.) are likely to progress to end –stage renal disease over a period of years.
- Intervention at the stage of microalbuminuria can retard the progression to end –stage renal disease.
- Over the past several years, a number of interventions have been demonstrated to reduce the risk and slow the progression of renal disease.

Detection and surveillance

Check fro the poteinuria yearly using reagent strips.

Measures urinary microalbumin excretion yearly (if not proteinuric) and if reagents available using:

Semi- quantitative methods (Micral II test strips, Clinitek 50 test strips) or the albumin : Creatinine ratio.

If microalbuminuria is detected, exclude infection by using urine strips to check for Nitrites and leucocytes or urine microscopy and culture .Treat infection if present .Re-evaluate for presence of infection at next visit .If there is no evidence of infection retest for microalbuminuria and confirm its presence during the next visit. If poteinuria (trace or grater) is present and there is no infection, confirm at next visit, and if positive, refer.

Measure serum creatinine annually, and if raised, refer.

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

General recommendations

Intensity management of modifiable risk factors.
Smoking must be stopped.
Metformin should not be used once the serum creatinin is more than 160 umol/l(1.8mg/dL).
Treat urinary infections aggressively.
Avoid drugs toxic to the kidney.

Treatment

Treat blood pressure aggressively with a target of 125/75 mmHg.
Use ACE inhibitors ARBs as first –line drug therapy where possible .These drugs should not be used in pregnancy.
Add diuretics if necessary.
If target blood pressure is not achieved, refer.
Reduce salt intake.
Restrict protein

b) EYE COMPLICATIONS

Preamble

Retinopathy is one of the major causes of blindness .Risk for retinopathy include poor glycaemic control, nephropathy, hypertension and pregnancy, as well as a long duration of diabetes. Diabetic retinopathy is preventable, and its progression retarded by improved blood pressure and glycaemic control .Screening for retinopathy and laser therapy can prevent blindness.

Recommendations

- A full eye examination (preferably after the dilatation of the pupils) including visual acuity and fundoscopy should be performed at the initial visit.
- Examinations should be repeated annually or more frequently if retinopathy is progressing.
- A comprehensive eye examination is required in women planning pregnancy, and during the first trimester. Close follow –up is required during pregnancy and for one year after.(This does not apply to women with GDM).
- If retinopathy is present, intensify the management of blood pressure, glycaemia, lipids and stopping smoking.
- Give attention to the psychosocial aspects of visual loss when this occurs.
- Refer to secondary and /or tertiary care if there is :
    - Unexplained deterioration in visual acuity.
    - Cataract present.
    - Preproliferative, proliferative or exudative retinopathy.

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

C) DIABETIC NEUROPATHIES

Preamble
Neuropathies are common complications of diabetes .they play an important role in the increased morbidity and mortality suffered by people with diabetes. Once present ,it is difficult to reverse, but good glycaemic control can reduce symptoms and slow progression.

There are three major categories:

- Peripheral neuropathy
- Autonomic neuropathy
- Acute onset neuropathies.

Clinical Assessment:

- Detailed history: numbness, tingling, pain.
- Examination of the feet: test for sensation using 10 g monofilament, 128Hz tuning fork or cotton wool.
- Lying/ standing blood pressure (postural hypotension) and pulse.

General measures:
Improve glycaemic control.
Exclude or treat other contributory factors:

- Alcohol excess.
- Vitamin B12 deficiency.
- Chronic renal failure.
- Poor nutrition.

Treatment
Treatment of symptomatic peripheral neuropathy is extremely difficult.

- Once diagnosed refer to secondary and /or tertiary centre.
- Some of the drugs used in the treatment of symptomatic peripheral neuropathy or automatic neuropathy are:
    - Burning pain: Tricyclic drugs (imipramine,amitryptyline),capsacin.
    - Lancinating pain: anticonvulsants (carbamezapine, phenytoin or valproate), tricyclic agents, capsaicain.
    - Gastroparesis: Metoclopropamide and domperidone are worth a trial.

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

d) FOOT PROBLEMS

Preamble

- People with diabetes are at increased risk of foot ulcers and amputations, which are major causes of morbidity and disability.
- Education, early recognition and prompt management can prevent amputations and foot ulcers.
- Most common predisposing factors for ulcers and amputations are:-
  - Peripheral neuropathy with loss of sensation.
  - Poor foot hygiene.
  - Peripheral vascular disease.
  - Deformities and abnormal biomechanics.
  - Unsuitable or no footwear.

CORNERSTONES OF MANAGEMENT OF FOOT PROBLEMS:

Identification of the foot ‘’ at risk’’
Regular inspection and examination of the foot at risk.
Education of health workers, people with diabetes and their families.
Appropriate footwear.
Early treatment of non-ulcerative and ulcerative problems.

HOW TO REDUCE FOOT ULCERATION AND AMPUTATIONS

- Optimise blood glucose, blood pressure and lipid control.
- Help patient to stop smoking.
- Perform a detailed foot evaluation at presentation and annually
- People with demonstrated risk factors should be examined every 6months.
- If there are no symptoms it does not mean that the feet are healthy, since the patient can have neuropathy, peripheral vascular disease or even an ulcer without any complaints.
- The feet should be examined with the patient lying down and standing up.
- The shoes and socks should also be inspected.

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

FULLEXAMINATION ANNUALLY AND ATPRESENTATION

HISTORY

Check for: Symptoms of neuropathy (numbness, tingling or pain) and peripheral Vascular disease (pain in calves on exercise and at rest).
History of previous foot problems, such as ulcers or amputations.
Current foot- care practice including barefoot walking. Footwear and Knowledge.

EXAMINE SKIN: Inspect for ulcers, callus, cracking, fragility, dryness, inter digital, Maceration; and nail pathology.

VASCULAR: Skin colour, foot and ankle pulses.

NEUROPATHY: Check protective sensation using 10 g monofilament

BONES/JOINTS: Deformities, e.g. claw toes and hammer toes.

FOOTWEAE: Check footwear and socks both inside both and outside

How to examine using the 10g (5.07 Semmes –Weinstein) monofilament

This should be done in a quiet and relaxed setting.

First apply the monofilament on the patient's hands (or elbow, or forehead) so that the patient knows what to expect.

The patient must not be able to see if and where the examiner applies the filament.

Apply the monofilament perpendicular to the skin surface with sufficient force to cases the filament to bend or buckle.

Use the three sites shown here.

The total duration of the approach, skin contact, and removal of the filament should be approximately 2 second.

Apply the filament along the perimeter of, and not on an ulcer site, scar or necrotic tissue. Do not allow the filament to slide across the skin or make repetitive contact at the test site.

Press the filament to the skin and ask the patient IF (s) he feels the pressure applied (yes/no_ and then WHERE the applied pressure is felt (left/Right foot).

Repeat this application twice at the same sits, but alternate this with at least one "sham" application, in which no filament is applied (total three question per site). Protective sensation is present at each site if the patient correct answers two out of three applications. Protective sensation is absent with two out of three incorrect answers, and patient is then considered to be at risk of ulceration.

Encourage the patient during testing

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

At the examination each person's feet must be categorized into:

LOW RISK or HIGH RISK

This is an example of easy_-to-use foot-screening sheet for clinical examination. It can be attached to the person's records.

Patient Name: **Hosp:**
Year DM diagnosed:
DM treatment: Diet only/ Oral agents/insulin/Oral agent + insulin
The foot is at risk if any of the below are present in either of the 2 feet

Deformity or bony prominences	Yes/No
Skin not intact (ulcer)	Yes/No
Neuropathy	
- Monofilament undetectable (>1/3 any spot)??	Yes/No
Callus	Yes/No
Foot pulses	
- Tibial posterior artery absent	Yes/No
- Dorsal pedal artery absent	Yes/No
Any other	
- previous ulcer	Yes/No
- Amputation	Yes/No
Inappropriate footwear	Yes/No
	(Tick appropriate box)

RISK Category	Yes/No
Low-risk patient	
None of the five high –risk characteristics below	
High –risk patient	
One or more of the following:	
Loss of protective sensation: Absent pedal pulses; Foot deformity:	Yes/No
History of foot ulcer: prior amputation	
Referral (any foot with neuropathy, both pedal pulses absent, current or Pervious ulcer, gangrene or prior amputation)	Yes/No

MANAGMENT OF CHRONIC (MICROVASCULAR) COMPLICATIONS (KIDNEYS,EYES,NERVES) … Continued

MANAGEMENT

LOW-Risk Foot	Foot-care education. Foot exam annually.
High-Risk Foot	Foot-care education**.** Prescribe special footwear Debridement of callus Examine at each cline visit. Refer to secondary and /or tertiary centre

Active Foot Ulcer Needs **Urgent** assessment and treatment. Refer for:

- Debridement
- Foot casts
- Antibiotics
- Vascular assessment if indicate

e) SEXUAL DYSFUNCTION

Preamble

Sexual dysfunction is a well-recognized complication of diabetes. Little information is valuable on sexual dysfunction in women.
In men, erectile dysfunction increases in prevalence with increasing age and has a major psychological impact.
The common causes of erectile dysfunction are psychogenic factors, medications, neurological and vascular.

Assessment
Ask all people with diabetes wither they are having any sexual dysfunction annually. Refer for vascular investigation appropriate.

Therapy
If sexual dysfunction is present, counsel the patient and partner.
Review medication

Refer for special treatment

12. SPECIAL SITUATIONS

a) PREGNANCY

GESTATIONAL DIABETES

Preamble

- Gestational diabetes mellitus **(GDM)** is any degree of glucose intolerance first recognized in pregnancy.
- If inadequately managed **GDM** is associated with increased risk of perinatal morbidity and mortality.
- Diagnosis and prompt institution of therapy reduces risk of poor outcome

Screening for GDM

When: Between 24 and 28 weeks of gestation

Whom: Women at high risk for GDM:

- BM≥I25kg/m^2
- Previous history of GDM
- Glycosuria
- Previous large baby(>4000g)
- Poor obstetric history
- Family history of diabetes
- Known IGT/ IFG
- Grand multipara.

How: 75 g OGTT- in the morning after a 10h. Overnight fast with blood samples at 0 h. and 2 h. for measurement of blood glucose.

What level is diagnostic for GDM:

- WHO diagnostic criteria for GDM
  - Fasting plasma glucose > 7 mmol/L AND /OR
  - 2h. plasma glucose ≥ 7.8 mmol/L

MANAGEMENT

Refer when diagnosis is confirmed, since a combined health –care team (obstetrician, deontologist or internist, diabetes educator, paediatrician/ neonatologist) is required.

Glycemic targets for pregnancy:

- blood glucose: pre-prandial 3.5-5.5mmol/L
  Postprandial 5-7.5mmol/L

PREGNANCY PRE- PRENANCY COUNSELLING DIABETICS

Preamble

- Major congenital abnormalities are important causes of morbidity and mortality in infants of diabetic mothers.
- Excellent glycaemic control both before pregnancy and during the 1st to 3rd trimesters has resulted in a marked reeducation in the rates of congenital malformation and preinatal morbidity.
- Since3 many pregnancies are unplanned, there is still an unacceptably high rate of congenital malformations in these infants.

Care before pregnancy

- Enquire if pregnancy is intended.
- Educate on the need for metabolic control before and during pregnancy.
- Aim at good glycaemic control (HbA1c,1%above normal range) before pregnancy is planned.
- Teach SBGM if available.
- Tighten glycaemic control
- Use contraception until adequate metabolic control.
- Normalise BP (<130/80mmHg) if hypertensive.
- Discontinue ACE inhibitors if being used.
- Stop smoking.
- Inform that insulin may be required when pregnant and OGLAs stopped.
- Refer when pregnant.

Pregnancy care

- Ste up: joint care- diabetologist, obstetrician, diabetes educator, dietitian, neonatologist.

b) FASTING FOR RELIGIOUS PURPOSES

- All the major religion recommend or command one form of fasting or the other. In Africa, most of religious fasting is associated with Christianity, Islam a and traditional religions.
- Fasting for religious purposes is possible in certain circumstances in people with diabetes.

General principles

- The health provider should be consulted to seek advice whether fasting can be embarked upon on medical grounds.
- Advice from the religious leader should also be sought as to whether (s) he can be exempted.
- Check the level of glycaemic control using HbA1c or fasting blood glucose. Those in every poor control should be discouraged from embarking upon fasting Drug dosage adjustment is required for patients with blood glucose 80mg/dl.
- If on insulin or insulin secretagogues, drugs dosages and timing will require adjustment during the period of food denial to meet calorie intake.
- A total fast is not recommended for any one with diabetes. Adequate hydration is important even during the period of fasting.
- Self-blood glucose monitoring is mandatory for people with diabetes who elect to fast. Once-a-day monitoring is adequate for patients on diet only with metformin. In patients on insulin secretagogues, SBGM should be done at least three times a day. Doctor and patients should agree on how to handle abnormal result of SBGM before start of fast. If hyperglycemia is marked, retesting should be more frequent and the urine tested for ketones.
- Vigorous activity should be avoided during period of fast.
- People who fast should have ready access to their health-care providers during the period of fast.
- Clear guidelines should be set as to when to terminate the fast, e.g. frequent hypoglycaemia, inter current infection.

RAMADAN

People treated with oral hypoglycaemic agent and dietary modification

- Fasting is possible in this situation.
- Usual dietary advice should be followed at this time.
- Patients on metformin, alpha glucosidase inhibitors and thiazolidinediones can continue taking the usual doses at the usual times.

SPECIAL SITUATIONS … Continued

Patients on Sulphonylureas:

- If on chlorpropamide, this should be stopped and substituted with a shorter-acting agent.
- If on a second or third generation sulphonylurea (glibenclamide, glicazide, glipizide, glimepiride), this should be taken before breaking the fast and not before dawn.
- If on tolbutamide, both morning and evening does can be taken, but the smaller dose should be taken before dawn.

Type 2 patients on Insulin:

- If on once daily insulin before bed:
  - This can be given as usual
- If on twice daily short –and intermediate-acting insulin:
  - Before the sawn meal, give the usual evening dose of short acting insulin without any intermediate acting insulin.
  - Before the evening meal give the usual morning dose of short-acting and intermediate-acting insulin.
- If on basal bolus regimen:
  - Usual does of the short-acting insulin can be given before the dawn and evening meals, and usual doses of the intermediate-acting can still be given at 10Pm.
- Regular SBGM is essential to ensure prevention of hypoglycaemia, and titration of doses should occur according to SBGM results.
- Neither the insulin injection nor the breaking of the skin for SBGM will break the fast.

FASTING IN OTHER RELIGIOUS TRADITONS

The following three basic types encompass most forms of fast: partial fast and normal fast.

Absolute fast or what Christians call “Esther fast ’’ imposes total abstinence from both food (solid or liquid) and water. This should not go beyond a maximum of three days and is not recommended for those people taking insulin secretagogues or insulin.

In **Partial** fast, the so-called “ , the subjects abstain from selected foods and drinks. The foods consumed usually consist of fruits, vegetables and water. Choosing to fast or to omit a certain meal each of the fasting day is also taken as partial fast.

Normal fast pr the common fast is when the fasting person abstains from all foods (solid or liquid) but take for a limited time.

The purpose of fasting can also be met by denying oneself other pleasures and entertainment. The pleasure fasting involves aside one’s favorite form of entertainment such as watching TV, listening to radio news papers, etc. for the fasting period

SPECIAL SITUATIONS … Continued

If person with diabetes to fast:

1. If the type of diabetes or treatment precludes any of the traditional type of fasting, then another form of fasting, e.g., pleasure fast, can be chosen.
2. If medically eligible to fast, the fast that best suits the person's type of diabetes should be selected in consultation with the health-care provider.
3. If patient is on insulin, a partial fast is preferred to absolute or normal forms of fasting.

Summary of advice to fasting Christians with Type 2 diabetes

The table below summarises broad suggestions to Christians and other who elect to embark on fasting during lent similar occasions.

Treatment regimen	**Fasting regimen**	**When to take ant diabetic agents**
Diet only	Total normal of partial fast	Not applicable
Metformin/thiazolidinediones	Normal or partial fast	With meals
Insulin secrtagogues sulphonylureas	Partial fast	Before meals
Daily intermediate or long acting insulin	Partial fast	Before first meal
Glinides	Normal or partial fast	With meals
Multiple insulin doses using intermediate and short acting	Avoid fasting or pleasure fasting	Not applicable
Long-acting plus bolus fast acting	Avoid fast or partial fast	Lantus am and analogue with meals
Complex medications	Pleasure fasting	No change indicated

c) MANAGMENT OF TYPE 2 DIABETES DURING SURGERY

No surgery should be undertaken in a person with diabetes at a primary level clinic. Refer all these patients, as specialist care is required.

MANAGEMNT

PRE-OPERATIVELY

Delay surgery if possible if glycaemic control is poor:

- HbA1c>9%
- FBG>10mmol/L
- RBG>13mmolL

Optimise glycaemic control if surgery is elective.

Screen for complications that may affect surgical risk:

- Nephropathy, cardiac disease, proliferative retinopathy, neuropathy.

Inform surgical team of the complications.

If on diet and or oral agent therapy and well controlled and surgery is minor:

- Omit therapy on morning of surgery.
- Resume therapy when eating normally.

If on insulin therapy or poor glycaemic control or major surgery

- Use continuous IV insulin (GIK) infusion.
- Start at 8 am and stop when eating normally.
- Monitor blood glucose before, during and after surgery using quality assured method.
- Aim for blood glucose levels of 6-10mmol/l.

GLUCOSE- INSULIN- POTASSIUM REGIMEN

Add 16 U short –acting insulin and 10mmol/l potassium chloride to 500 ml 10% dextrose.
Infuse IV at 80 ml/h. using a volumetric pump.
If obese or initial blood glucose is high consider higher dose (20U)
If very thin or usual insulin dose is low consider lower dose (12U)
If blood glucose is low or falling reduce dose by 4U
If blood glucose is high or rising increase dose by 4U
Continue the infusion until 60 min. after the first meal.
Resume usual therapy just after first meal.
Check daily for dilutional hyponatreamia.

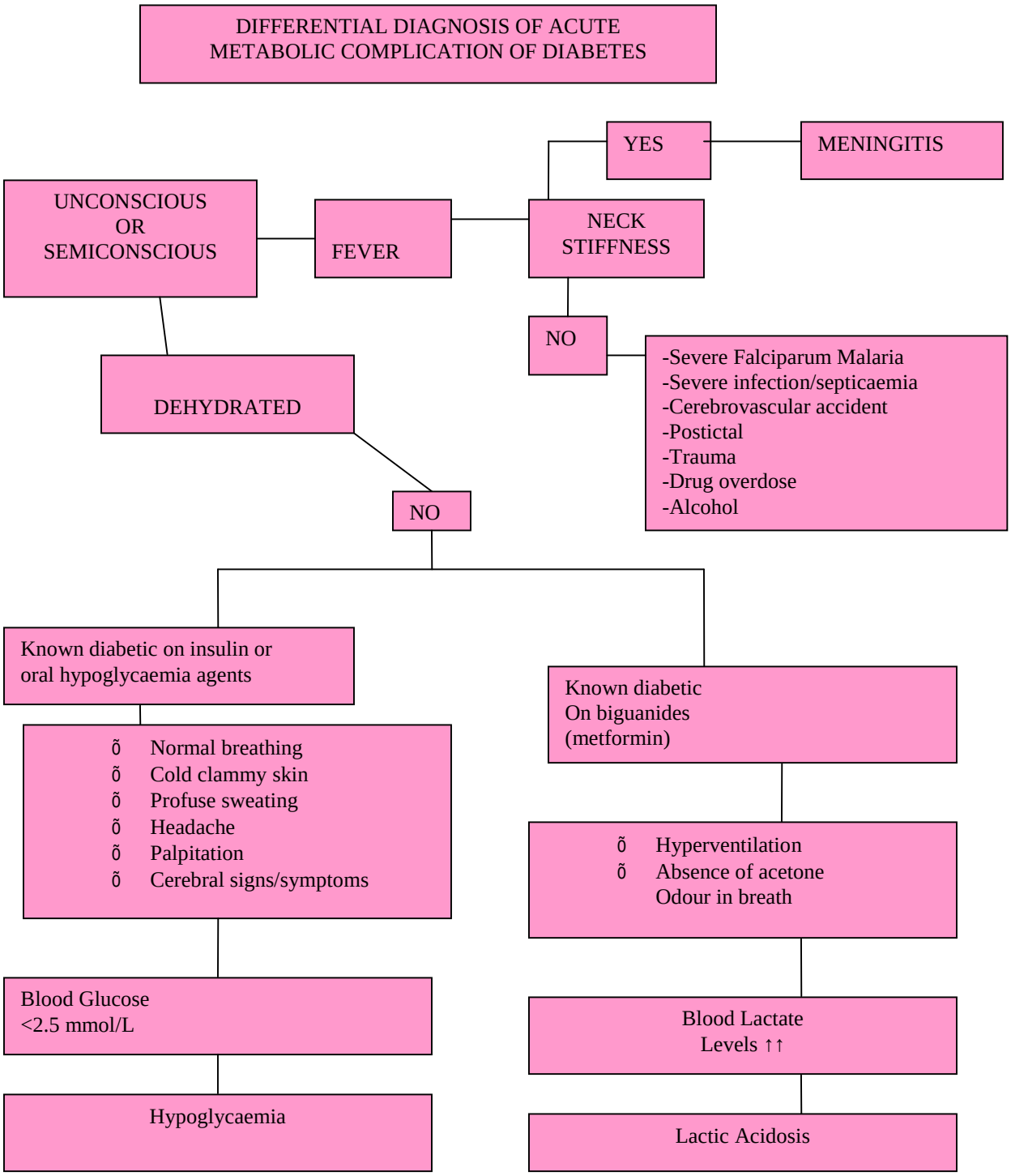
d) DIABETES AND HIV

There have been reports those persons, who are HIV positive and not on anti- retroviral therapy, have double the rates of diabetes, compared to persons who are HIV negative.

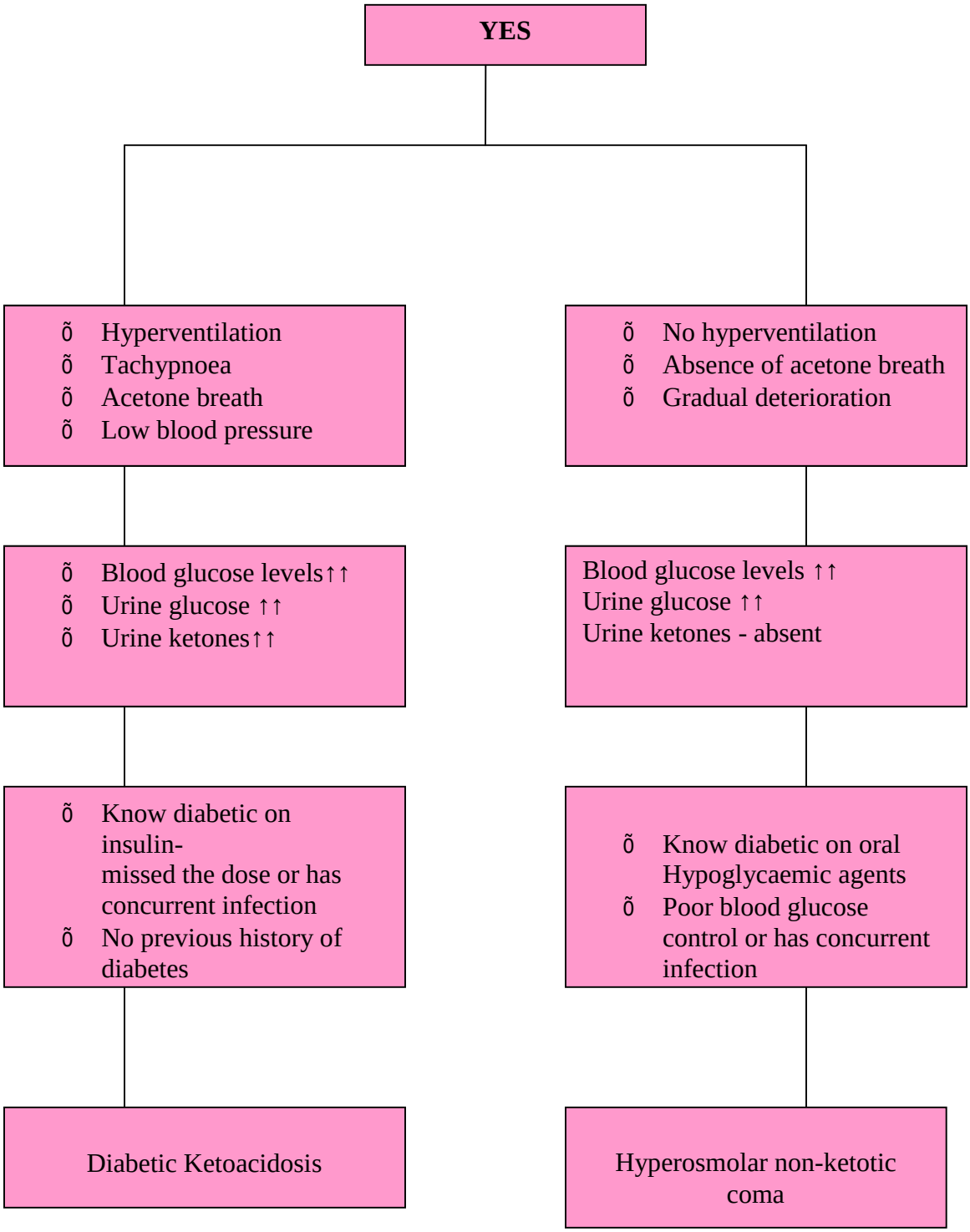
This may be attributable to a direct effect of HIV on the pancreas, leading to the development of autoimmune disease causing –cell destruction, or to opportunistic viral infection that can affect the pancreas, such as hepatitis C, Cytomegaloviruses, adenoviruses and cocksackie B viruses. Highly active antiretroviral therapy (HAART), including protease inhibitors, have dramatically improved morbidity and mortality rates in HIV infected patients, but may also induce intolerance and diabetes in those at risk.

13. ACUTE METABOLIC COMPLICATION OF DIABETES

The acute metabolic emergencies of diabetes ketoacidosis, non-ketotic hyperosmolar states, hypoglycaemia and lactic acidosis may present with a coma or altered levels of consciousness in people with diabetes. Other considerations include stroke, seizures, trauma, drug overdose, infection, and ethanol intoxication.



ACUTE METABOLIC COMPLICATIONS OF DIABETES. Continued



ACUTE METABOLIC COMPLICATIONS OF DIABETES Continued

a). DIABETETIC KETOACIDOSIS

Preamble

DKA is severe uncontrolled diabetes (high blood glucose, urine ketones present and serum ketones present if measured) requiring emergency treatment with insulin and intravenous fluids. In Africa, DKA carries a high mortality through delayed diagnosis, inadequate treatment and late presentation. It presents at any age although there is a well-defined peak at puberty. The common precipitating causes are infection, management errors and new cases of diabetes, but there is no obvious cause in about 40% of episodes.

Initial treatment at primary level

- Insert IV cannula and start IV normal saline, minimum of 1 liter in the first hour unless contraindicated.
- Give 10 U short-acting insulin IM.
- Arrange immediate transfer to an emergency unit.
- Inform the referral unit.

b) DIABETIC NON –KETOTIC HYPEROSMOLAR STATE

Preamble

Non-ketotic hyperosmolar state is characterized by the slow development of marked hypeglycaemia (usually> 50 mmol/L or 900mg /dl) and dehydration and pre-renal uraemia. Ketonuria may be slight or absent.

Two-thirds of cases are in previously undiagnosed cases of diabetes. Infections, diuretic treatment, and drinking glucose-rich beverages may all be precipitating factors.

The condition usually affects middle-aged or elderly patients and carries a high mortality. Initial treatment is the same as for DKA

c) HYPOGLYCAEMIA

Hypoglycaemia is a medical emergency and should be treated promptly if serious complications are to be a voided.

The commonest causes of hypoglycaemia are:

Taking more exercise than usual.
Delay or omission of a snack or main meal.
Poor injection technique.
Administration of too much insulin.
Eating insufficient carbohydrate.
Over-indulgence in alcohol.
Mistake in sulphonylurea dosage.

ACUTE METABOLIC COMPLICATIONS OF DIABETES Continued

Acute management:

1. Oral glucose if patient is conscious.
2. If patient is unconscious, an IV 50% glucose bolus (40-50ml) or 100-150ml of 20% dextrose followed by 8-10% glucose infusion if necessary.
3. Injectable glucagons also be administered in unconscious patients.
4. On recovery, give long-acting carbohydrate snack.
5. Prolonged IV dextrose infusion (5-10% for 12-24h.) may be necessary if hypoglycaemia is as a result of long-acting sulphonylureas/long and intermediate-acting insulin or alcohol.
6. If IV access is impossible, consider nasogastric or rectal glucose; or if available glucagon 1 mg IM.
7. On recovery, attempt to identify the cause of hypoglycaemia and correct it.
8. Assess the type of insulin used, injection sites (since lipohypertophy can alter the rate of absorption) and injection techniques.
9. Enquire into and correct inappropriate habits of eating, exercise and alcohol consumption.
10. Review of other drug therapy and renal function.
11. Adjustment of insulin or OGLA dosages if appropriate.

    - Give IV glucose 20-30gm (e.g. 200-300 ml of 10% dextrose, 100-150ml 20% dextrose, or 40-60ml 50% dextrose)*
    - If hypoglycaemia is as a result of sulphonylureas, or if alcohol is strongly implicated, put up a slow dextrose drip (5-10%) for 12-14 hours

14. LIVIING WITH DIABETES

Employment

A person with diabetes, particularly if treated with insulin, faces many problems in ordinary daily life.
Health-care providers should be aware of these problems so that they can give appropriate advice.
The commonest problem is prejudice from employers. Such prejudice is usually because of ignorance and the belief that all people with diabetes have poor work performance and have regular interruptions as a result of hypoglycaemia.
This prejudice causes some people with diabetes to try and conceal their diabetes from their employers and workmates. This must be discouraged as concealment may result in grave consequences in case of attacks of hypoglycaemia.
Shift work and irregular working hours can present problems but can be overcome.
A person with diabetes, depending on his or her qualifications, could apply or be eligible for most jobs.

Driving

Hypoglycaemia is one of the common medical causes of road accidents.

There is often discrimination against a person with diabetes applying for a driving license. All drivers must act responsibly and schedule their medications and eating pattern to avoid hypoglycaemia.
Commercial drivers on insulin and insulin secretagogues should be advised to inform their employers and the licensing authorities.

Advice to drivers:

- Inform Insurance Company
- Always keep glucose or sweet eatables in the vehicles
- Never drink alcohol and drive
- Never drive if a meal has been missed.

Insurance

Most people with diabetes are asked to pay additional premiums for life assurance and sickness insurance. Some are denied insurance outright.

There should be unbiased access to insurance policies (life or sickness) at reasonable cost.

Sports, recreational and occupational exercise.

Treatment with insulin and OGLAs do not preclude vigorous sports and exercise, unless underlying IHD or significant microvascular complications, e.g. advanced retinopathy is present. There is a possibility of hypoglycaemia as a consequence of exercise or vigorous sports. Hypoglycaemia may even occur some hours after exercise, possibly because the liver and muscles are still replenishing glycogen stores.

Exercise or sports may need to be accompanied by extra food or adjustment in OGLA or insulin dosage.

If vigorous sporting activity is being considered, the person should not have any contraindication to such activity and be in good metabolic control. Detailed advice from a health provider should be sought to reduce the risk of hypoglycaemia.

15. APPENDIX I
SETTING UP A PRIMARY LEVEL DIABETES SERVICE

Requirement for a diabetic clinic

- **Staff**
  At any given time at least one of the following:
  - At least one or two doctors- medical officer, clinical officer or assistant medical officer
  - Trained Nurses
  - Health attendant
- Clinic requirements
  1. Clinic room(s) with nearby toilet
  2. Furniture and fittings
  - doctors table
  - nurse table
  - examination couch with sheets and screen
  - storage cupboard/cabinet
  3. Equipment
  - Clinical practice guidelines
  - Glucometer with appropriate strips
  - Urine test strips
  - Earthernware pot (if no fridge) for storage of insulin
  - Tape measure
  - Weight scale
  - Height measure
  - Sphygmomanometer with 2 cuff sizes
  - Stethoscope
  - Monofilament
  - Education posters and leaflets
  - Emergency treatment tray
  4. Manitaining an inventory and statistics
  - An inventory book detailing all clinic equipment, including literature available, should be kept and reviewed weekly or monthly. This will allow the clinic to be adequately equipped at all times
  - Keeping monthly clinic statistics-new patients and follow-ups

APPENDEIX II
TABLE OF ORAL GLUCOSE LOWERING AGENTS

NAME OF DRUG	STARTING DOSE	MAXIMAL DOSE	MAJOR SIDE EFFECTS	CONTRAINDICATIONS
SULPHONYL				
Glibenclamide	2.5	20mg	Hypoglycaemia weight gain, skin rashes	Pregnancy, caution in liver and renal disease
Gliclazide	40mg	320mg	’’	’’
Glimepiride	1mg	8mg	’’	’’
Glipizide	5mg	40mg	’’	’’
Chlorpropamide	100mg	500mg	’’	’’
Tolbutamide	500mg	2500mg	’’	’’
Tolazomide	100mg	1000mg	’’	’’
Acetohexamide	250mg	1500mg	’’	’’
BIGUANIDES				
Metformin	500mg	2550mg	Abdominal pain, nausea, loose bowel motions, lactic acidosis	Renal, heart and liver failure; pregnancy
THIAZOLIDINE DIONES				
Rosiglitazone	4mg	8mg	Liver impairment, fluid retention, weight gain, dilutional anaemia	Renal, heart and liver failure; pregnancy
Pioglitazone	15mg	45mg	’’	’’
MEGLITINIDES				
Nateglinide	180mg	360mg	Hypoglycae mia, weight gain, dyspepsia	Heart and liver failure, pregnancy
Repaglinide	1.5mg	16mg	’’	
ALPHAGLUCOSIDASE INHIBITORS				
Acarbose	25mg	300mg	Dyspepsia loose bowel motions	None
Meglitol	25mg	300mg	’’	’’

APPENDEIX III
TABLE OF RECOMMENDED ANTI-HYPERTENSIVES FOR MANAGEMENT OF HYPERTENSION AND PERSONS WITH DIABETES MELLITUS

CLASS	INDICATION	CONTRA-INDICATION	SIDE EFFECTS
ACE *inhibitors*	LVH, Nephropathy, Cardiac failure, Myocardial infarction	Renal A. Stenosis End stage renal Disease, Pregnancy	Cough, First dose hypotension, Angioneurotic oedema, Hyperkalaemia, Skin rashes, Neutropenia, thrombocytopenia
Angiotensin11 receptor blockers	LVH, Nephropathy, Cardiac failure, Myocardial infarction	Renal A. Steno sis End stage renal disease, Pregnancy	Hyperkalaemia
Thiazide diuretics	High volume hypertension	Pregnancy	Hyperglycaemia, Hyperuricaemia, Hypercalcaemia, Hypokalaemia, Dyslipidaemia
Loop diuretics	Nephropathy, Heart failure	Pregnancy	Hypokalaemia, Hypomagnesaemia, Hyponatraemia, Hypocalcaemia, Hyperuricaemia, Hypochloraemic acidosis Ototoxicity
***Beta blockers* (Preferably selective B1 antagonists)**	Ischaemic heart disease, Arrythymias, Hyperthyroidism, Migraine, Essential tremors, Hypertrophic obstructive cardiomyopathy	Obstructive airway Disease, Heart block, Severe heart failure, Raynauds phenomenon, Active peripheral vascular disease, Severe liver disease, Pregnancy	Bronchial constriction, Heart failure
Dihydropyridine (Calcium channel blockers	Obstructive airway disease, Peripheral vascular disease	Unstable angina, Acute Myocardial infarction, Aortic stenosis, Hypertrophic obstructive cardiomyopathy Pregnancy	Palpitations, Headaches, Peripheral oedema
Non-dihydropyridine (Calcium channel blockers a-1 adrenoreceptor blocker	Arrythmias BPH, Raynauds phenomenon, Phaechromocytoma	WPWS, Heart block, Heart failure Pregnancy	Worsening of heart failure and heart block First dose hypotension, Urinary frequency and incontinence, Palpitations
Centrally acting anti-Adrenergic agents	Pregnancy	Parkinsons disease, Phaechromocytoma	Postural hypotension, Drowsiness, Impotence

16. REFERENCES.

1. World Health Organisation, Definition, Diagnosis and Classification of Diabetes Mellitus and its Complications. Report of a WHO Consultation. Part 1: Diagnosis and Classification of Diabetes Mellitus. Geneva: WHO Department of Non communicable Disease Surveillance, 1999; 1-59
2. World Health Organisation. Screening for Type 2 Diabetes. Report of a World Health Organisation and International Diabetes Federation meeting. WHO/NMH/MNC/03.1 Geneva: WHO Department of Non communicable Disease Management, 2003.
3. UKPDS Group. UK prospective Diabetes Study 30: Diabetic retinopathy at diagnosis of Type 2 diabetes and associated risk factors. Arch Opthalmol 1998; 116:297-303
4. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 Clinical practice Guidelines for the prevention and Management of Diabetes in Canada. Canadian Journal of Diabetes 2003;27(Suppl2); S14-s16
5. European Diabetes Policy Group 1999. A desktop guide to Type 2 Diabetes Mellitus. Diabet. Med 1999;16716-30
6. American Diabetes Association. Standards of Medical Care in Diabetes, Diabetes Care 2005;28 (Suppl 1); S4-S36.
7. Canadian Diabetes Association. Standards of Medical Care in Diabetes Association 2003 Clinical Practice Guidelines for the prevention and Management of Diabetes in Canada. Canadian Journal of Diabetes 2003; 27(Supp12).
8. Canadian Diabetes Association Clinical Practice Guidelines Expert Committee. Canadian Diabetes Association 2003 Clinical Practice Guidelines for the prevention and Management of Diabetes in Canada. Canadian Journal of Diabetes 2003 ; 27 (Supp12) ; S18 –S23.
9. The Diabetes Control and Complications Trial Research Group. The relationship of glycemic exposure (HbA), to the risk of development and progression of retinopathy in the Diabetes Control and Complications Trial. Diabetes 1995;44;968-83.
10. IDF position statement. The role of urine glucose monitoring in diabetes. March 2005 http:WW.idf.org.
11. UK prospective Diabetes Study (UKPDS) Group.
    Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS3). Lancet 1998;352:857-53.
12. European Society and Hypertension European Society of Cardiology. 2003 European Society of Hypertension European Society of Cardiology guideline for the management of arterial hypertension. J.Hypertens 2003;21;1011-53
13. UP Prospective Diabetes Study Group. Tight blood pressure control and risk of macrovascular and microvascular complications in Type 3 diabetes: UKPDS 38;BMJ 1998;317:703-13.
14. Newman H. Colagiuri S, Chen M, Colagiuri., Evidence Based Guidelines for Type 2 Diabetes: Macrovascular disease. Canberra: Diabetes Australia & NHMRC, 2004. http://www.diabetesaustralia . com.au
15. Best J. Colagiuri S, Chen M, Colagiuri E., Evidence Based Guideline for Type 2 Diabetes: Lipid Control. Canberra. Diabetes Australia & NHMRC,2004 http://www.diabetessaustralia.com.au.
16. Samad Shera A. Diabetes Mellitus. National Clinical Practice Guidelines. Pakistan.1999.

REFERENCES. … Continued

17. NSW Health Department Expert panel on Diabetes. Principles of care & Guidelines for the management of Diabetes Mellitus.1996.
18. Colagiuri S. A National Consensus Position. Guidelines for the Prevention and Management of Diabetes in Tonga. 2000
19. International Diabetes Federation, Western Pacific Region (WPR). Type 2 Diabetes practical Targets and Treatments Guidelines. 2001.
20. Mbanya JC, BonniciF, NagatiK. Guidelines for the Management of non-insulin dependent diabetes mellitus (NIDDM) in Africa. 1996.
21. American Diabetes Association: Clinical Practice Recommendations 2003. Diabetes Care, Vol26, Supplement 1. January 2003.