health

2012 clinical audit of diabetes care among Palestine refugees

WORLD **DIABETES** FOUNDATION

unrwa
الاونروا

health

2012 clinical audit of diabetes care among Palestine refugees

WORLD **DIABETES** FOUNDATION

unrwa

Table of Contents

List of Tables

List of Figures

Abbreviations

BMI	Body Mass Index
CDP&C	Chief Disease Prevention and Control (HQ, Amman)
DM	Diabetes Mellitus
FHT	Family Health Team
HTN	Hypertension
HbA1c	Glycosylated Hemoglobin
KAP	Knowledge, Attitude and Practice
MO	Medical Officer
NCD	Non-Communicable Disease
OHA	Oral Hypoglycemic Agents
PPG	Post Prandial Glucose
TI	Technical Instructions
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WDF	World Diabetes Foundation
WHO	World Health Organization

Foreword

It is my great pleasure to present the 2012 clinical audit of diabetes care in UNRWA health centres. This report is a summary of the hard work completed by medical providers at health centres, field offices and headquarters.

Diabetes is a major health problem for the Palestine refugees we serve. There are over 110,000 refugees living with diabetes, and the numbers are steadily increasing by 3-5% every year. The financial pressure to maintain and expand diabetes care is significant. Insulin alone, for example, accounts for 15% of the budget for medicines.

This clinical audit is very important. The 2012 audit was the first extensive assessment of UNRWA diabetes care in recent years. This was a collaboration of the World Diabetes Foundation and international diabetes care experts. The audit results provide priceless lessons to further improve UNRWA diabetes care.

Medical officers caring for diabetes patients follow UNRWA's diabetes Technical Instructions properly and have adequate knowledge and understanding. The audit found two critical issues. One is the importance of introducing HbA1c testing, the global standard for measuring diabetes control status. UNRWA has not yet introduced this testing because of budget constraints. However, the audit results highlight the limitations of the current testing of 2-hr postprandial glucose (2-hr PPG). The other critical issue is the urgent need to promote a healthier lifestyle. The vast majority of diabetes patients were either obese (64.0%) or overweight (26.3%). Without a healthier lifestyle, diabetes cannot be properly controlled. UNRWA will work to address these challenges in diabetes care.

I would like to express my sincere appreciation to all the partners for their immense support, in particular the World Diabetes Foundation (WDF) and the Managing Director, Dr. A Kapur. I would also like to thank Prof. J Nerup (Dan Church Aid, Denmark), Dr. T Nasser and Mr. A Abu Halaweh (Augusta Victoria Hospital, East Jerusalem), Prof. K Ajlouni and Dr. M Khateeb (National Diabetes and Endocrinology Centre, Jordan) and Dr. F Riccardo (Italy). The work done by UNRWA staff, particularly Chief Disease Prevention and Control and Field Disease Control Officers, was truly invaluable. I appreciate all the contributions and hard work.
We are expanding the Family Health Team (FHT) approach with e-health as part of UNRWA health reform. The clinical audit on diabetes care is an important milestone of our reform.

Dr. A. Seita
WHO Special
Representative
Director of the UNRWA
Health Programme

Executive Summary

Background

UNRWA has been providing diabetes and hypertension care in its health centres since 1992. Diabetes care includes screening of high-riskgroups, diagnosis and treatment. Treatment includes promoting a healthy lifestyle and medical assistance such as insulin therapy. In addition, UNRWA invests in primary and secondary prevention activities through health education and screening of complications. A total of 114,911 diabetic patients were registered with UNRWA health centres in 2011 in five Fields (Gaza Strip, Jordan, Lebanon, West Bank and Syria).

Objective and Methodology

The clinical audit of diabetes care was conducted to acquire evidence-based information on quality of diabetes care. It was originally scheduled to cover all five UNRWA Fields. However, Syria could not be included due to the on going conflict. The clinical audit covered the Gaza Strip, Jordan, Lebanon and the West Bank.

The audit included 1,600 diabetic patients from 32 of the largest UNRWA health centres (8 clinics from each Field with 50 patients at each clinic). Patients were interviewed and examined according to a WDF-UNRWA data collection procedure that included questions on past medical history, current findings, laboratory tests, clinical management and diabetes complications. The Chief Disease Prevention and Control at headquarters in Amman and the Field Disease Control Officers conducted examinations. Blood samples were collected and tested for HbA1c at Augusta Victoria Hospital. Data was entered and analysed with Epi-info 2000. Patients provided informed written consent.

The UNRWA medical officers caring for diabetes patients at NCD clinics were also assessed. A questionnaire was developed and distributed to 66 medical officers before the start of the clinical audit in each health centre. The questionnaire analysed the medical officers' knowledge of the different aspects of diabetes care such as the demographic characteristics of patients, the prevalence of risk factors, correct clinical management and follow up of diabetic patients.

Results

A total of 1,600 patients were enrolled in the audit. Sixty-eight (4.3%) were affected by type 1 diabetes and 1,532 (95.7%) by type 2 diabetes. A considerably high proportion (1,102 or 68.9%) has comorbidity with hypertension.The majority (1,109 or 69.3%) were females. The high proportion of female patients is a reflection of the general patient population at UNRWA health centres. A high proportion of patients were obese (1,024 or 64.0%) or overweight (421 or 26.3%). There were 313 (19.6%) smokers.

Clinical management of diabetes is largely in line with UNRWA Technical Instructions (TIs) on diabetes care. Of 1,600 patients, 63 (3.9%) received lifestyle support only, 1,529 (95.6%) received diabetes medicines and 8 (0.5%) received treatment from non-UNRWA health facilities. Of those receiving medicines, the most commonly used was oral hypoglycaemic agents (OHA). The majority (1,192 or 74.5%) received OHA only, followed by combined therapy of OHA and insulin (231 or 14.4%), and insulin therapy alone (207 or 12.9%). Diabetes monitoring examinations are routinely done. Two-hour postprandial glucose, cholesterol, creatinine and urine protein tests were regularly completed for patients (94.7%, 96.4%, 91.4% and 87.5%, respectively).

The Knowledge, Attitude and Practice (KAP) assessment of the 66 medical officers revealed a good knowledge of diabetes care and proper adherence to Technical Instructions. Between 80-90% have correct knowledge of frequency of patient follow up as well as laboratory tests for cholesterol and creatinine. More than 70% of medical officers have a correct understanding of the proportion of insulin therapy.

Treatment outcomes based on the current criteria with 2-hr postprandial blood glucose (2-h PPG) testing were found within the Technical Instruction criteria. Of 1,600 patients, 716 (44.8%) have 2h-PPG equal or less than 180mg/dl. This proportion is 42.6% among patients with type 1 diabetes, 42.6% with type 2 diabetes only, and 45.7% with type 2 diabetes and hypertension. However, as discussed below, these results were quite different when HbA1c testing was conducted.

Late complications were found among 204 (12.8%) of patients: 149 (9.3%) with myocardial infarction, 34 (2.1%) with cerebral stroke, 23 (1.4%) with total blindness, 6 (0.4%) with above-ankle amputation and 6 (0.4%) with end-stage renal disease. Peripheral neuropathy was the most common early complication (842 or 52.6%). Among all patients assessed during this audit, 400 (25.0%) reported one or more episodes of hypoglycaemia during the previous year.

Two main shortcomings were identified in the clinical audit. First, the control rate for diabetes based on the HbA1c tests is much lower than that measured using 2-h PPG. While 44.8% of patients have 2-h PPG ≤ 180mg/dl, only 452 (28.3%) have HbA1c < 7%. This difference is seen in all types of diabetes. For patients with type 1 diabetes, 42.6% with 2-h PPG ≤ 180mg/dl vs. 7.4% with HbA1c < 7%; for patients with type 2 diabetes only, 42.6% vs. 25.1%, and for patients with type 2 diabetes and hypertension, 45.7% vs. 30.8% respectively. Estimating diabetes control through 2-h PPG as per UNRWA Technical Instructions is misleading as it over-estimates control rates.

The second critical shortcoming was the inadequate lifestyle support activities. More than 90% of patients are either obese (64.0%) or overweight (26.3%). Among female patients, the proportion is much higher at almost 95%, of which 73.4% are obese. Health education is not universal. Only 361 (22.6%) patients received four or more health education sessions in the last year, while the Technical Instructions indicate patients should receive at least four health education sessions per year.

Conclusions

The availability of competent medical providers and updated, scientifically documented protocols (Technical Instructions) are the main strengths of the diabetes care programme in UNRWA health centres. The clinical audit confirmed that UNRWA medical providers follow the Technical Instructions. The medical officers have appropriate knowledge of diabetes care and are able to correctly prescribe lifestyle and drug based treatments. Follow up blood and urine examinations are also conducted regularly as indicated in the UNRWA protocols.

At the same time, the audit demonstrated the poor sensitivity of 2-hr PPG testing in measuring diabetes control compared with HbA1c. This could mean that UNRWA has systematically over-estimated control rates ofpatients. Immense needs for lifestyle support were also identified. More than 90% of patients are either obese or overweight. Without addressing healthy lifestyle issues, UNRWA may not achieve positive results in diabetes care.

UNRWA's extensive experience in diabetes care in primary health care settings and the capacity, experience and rigour of UNRWA's medical providers are a solid foundation on which to improve diabetes care. A comprehensive and strategic response that goes beyond the activities of the NCD care programme alone is needed to address such fundamental issues and the recently applied Family Health Team reform offers an ideal reference framework.

Action points

UNRWA is cognizant of the low control rates for patients affected by Diabetes Mellitus. Using the Family Health Team (FHT) approach, UNRWA has initiated major health reform to improve efficiency, effectiveness and health outcomes. Key strategic action points are as follows:

- Increase comprehensive medical treatment and lifestyle support for patients living with types 1 and 2 diabetes.
- Update Technical Instructions to introduce modern technologies and medicines for care of diabetes and comorbidity.
- Expand comprehensive prevention activities for populations at risk of diabetes and other comorbidities.
- Expand partnerships with local, national and international stakeholders.
- Strengthen staff capacity development in all areas, including nurses and other paramedical staff. Focus on proactive diabetes care delivery for health promotion, education and adherence. This may require redefining roles and duties.

1. Introduction

UNRWA has delivered comprehensive primary health care services to Palestine refugees in the Gaza Strip, West Bank, Jordan, Lebanon and Syria for over 60 years and has achieved some remarkable health gains, particularly in maternal and child health and communicable diseases. For example, the infant mortality rate among UNRWA beneficiaries has declined from 160 per 1,000 live births during the 1950s, to less than 25 in the first decade of the 21st century.

However, the context in which UNRWA's health program operates is evolving, bringing with it new challenges that require new ways of providing health services. One significant change is the epidemiological transition of disease burden. The main causes of mortality and morbidity among Palestine refugees are non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases and cancer. Behaviour risk factors like unhealthy diets, physical inactivity and smoking are unfortunately prevalent among Palestine refugees.

Among NCDs, diabetes is a major health problem. The number of patients with diabetes has been steadily increasing (Figure 1). At the end of 2011, a total of 114,911 patients with diabetes were cared for in UNRWA health centres. This is almost twice the number cared for in 2004.[3]
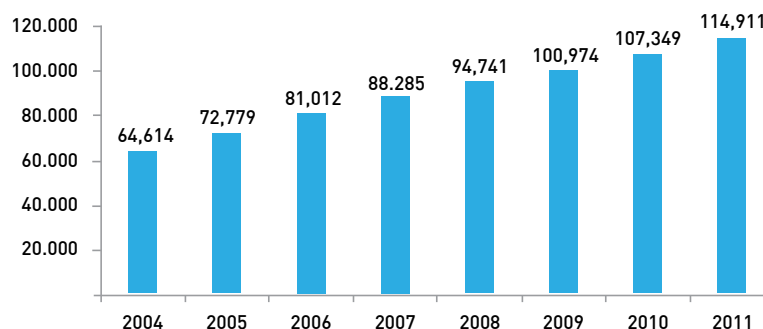
Figure 1 – Number of Diabetes Patients under UNRWA Care (2006 – 2011)

The exact prevalence of diabetes among Palestine refugees is not known. However, it is presumable that the epidemiology of diabetes among refugees is similar to that of the population of the countries where they live. Diabetes prevalences known to be 10.1% in Jordan, 7.8% in Lebanon, 8.6% in Palestine and 10.8% in Syrian (1 & 2). Therefore, the prevalence among Palestine refugees is probably as high as 10% among adults 20-79 years.

UNRWA has been providing diabetes and hypertension care since 1992 in their primary health care centres. The NCD strategy has been revised four times with the latest developed in 2009[1].

The current strategy is structured around three main elements. Healthy life style promotion emphasizes the importance of weight control and regular exercise. Early detection of diabetes is achieved by actively screening at risk individuals.[1] Effective case management includes dietary management, physical exercise programmes to promote weight reduction and improve insulin sensitivity and treatment protocols. In addition, cardiovascular and cerebrovascular disease risk is assessed among diabetic patients to prevent secondary complications.

Recently, UNRWA has started implementing a large health care reform by introducing the Family Health Team (FHT)[1] approach. FHT approach is a family and person-centred approach to provide comprehensive primary health care at UNRWA health centres. Families are assigned to a provider team consisting of doctor(s), nurse(s) and a midwife. The team is responsible for health care needs of the family. This approach is essential for chronic, lifestyle related conditions like diabetes. Moreover, with help of e-health and electronic medical records, an innovative cohort analysis for diabetes is in place to systematically monitor the progress and outcome of patients with this disease[1]

Some aspects of diabetes care in UNRWA health centres can be improved and the agency faces challenges in upgrading services.UNRWA medical providers are generalists, not specialists in diabetes care. In addition, they are often overwhelmed by the number of patients, and may not have enough time to dedicate to health education, prevention and outreach activities in the communities.

The ever-increasing cost of diabetes care is an additional challenge given UNRWA's scarce resources. The agency was unable to introduce HbA1c testing due to its high price, even though it is the accepted standard for patient monitoring. The current 2-hr postprandial glucose level test may not be accurate enough to define glycaemia control. In addition, widely used lipid lowering agents (statins) are not used due to financial constraints.

In order to address these challenges and assess the quality of diabetes care in UNRWA, the agency has performed a clinical audit in collaboration with the World Diabetes Foundation (WDF). This is the first step of a three-year WDF-supported project (WDF Project 10-555). The goals are to acquire evidence based information on current diabetes care in UNRWA health centres, develop core technical and managerial capacity for diabetes care, improve diabetes awareness among Palestine refugees and review improvement in care through a second clinical audit in the third year of the project.

This report includes the process, results and recommendations of the first clinical audit. The audit was prepared in collaboration with WDF and Dan Church Aid in Jerusalem, the National Centre of Diabetes and Endocrinology in Jordan and Augusta Victoria Hospital in East Jerusalem. UNRWA headquarters and all five Fields (Gaza Strip, West Bank, Jordan, Lebanon and Syria) actively participated in the preparation of the audit. Unfortunately, Syria could not conduct the audit due to the ongoing conflict.

UNRWA is a United Nations agency established by the General Assembly in 1949 and is mandated to provide assistance and protection to a population of some 5.2 million registered Palestine refugees. Its mission is to help Palestine refugees in Jordan, Lebanon, Syria, West Bank and the Gaza Strip to achieve their full potential in human development, pending a just solution to their plight. UNRWA's services encompass education, health care, relief and social services, camp infrastructure and improvement, microfinance and emergency assistance. UNRWA is funded almost entirely by voluntary contributions.

2. Objective

The objective of this clinical audit was to acquire evidence-based information on quality of diabetes care in the five Fields served by UNRWA (Gaza Strip, West Bank, Jordan, Lebanon and Syria). However, it was not possible to conduct the study in Syria due to the ongoing conflict.

The findings of the audit will be used to define a strategy to improve technical and managerial capacity within UNRWA's health service and increase diabetes awareness among Palestine refugees.

Specifically the audit will:
- Examine UNRWA health care services provided to diabetic patients.
- Collect data on process, outcome and treatment indicators to establish baseline and current status.
- Identify areas and means to improve the quality of clinical care provided at health centre level.
- Identify the training needs of health staff in diabetes care.

3. Methodology

The audit focused on two areas. The first step was to assess the quality of health services provided to DM patients. The second step assessed UNRWA medical officerDM careby evaluating knowledge, attitude and practice as well as perceptions about patients and services.

3.1   UNRWA Health Centres Quality of DM Care:

3.1.1 Study type

Cross sectional study.

3.1.2 Study population

There were 114,911 diabetic (DM) patients receiving care in UNRWA health centres during 2011.

3.1.3 Sampling Method and Size

The sample size was predefined in the audit project proposal as 100 patients from each one of the largest eight health centres in each country. However, Syria could not participate due to concomitant security constraints.

After piloting the investigation and consulting with the World Diabetes Foundation (WDF) and international experts from Norway, the sample size was decreased to 50 patients for each target health centre (400 from each Field for1,600 patients total). This convenience sample was considered sufficient by WDF experts and reduced the efforts and cost of this investigation.

The first 50 DM patients meeting the inclusion criteria, mentioned at 3.1.4, were recruited. The questionnaire was completed during a comprehensive clinical examination that included patient interview and record review.

3.1.4 Inclusion Criteria

The following criteria were considered for patient enrolment:
- Patients visiting the clinic on assessment day with confirmed Diabetes Mellitus (DM) and/or Diabetes Mellitus and Hypertension (DM/HTN) who had received care at UNRWA NCD clinics for at least one year.
- Patients who were willing to participate accepted HbA1c testing and signed a consent form.

3.1.5 Data Collection Instruments

The main audit tools were provided by WDF, revised during expert meetings and adapted to UNRWA guidelines and procedures. These tools included two structured questionnaires: a patient data collection form and a review of medical officer Knowledge, Attitude and Practice (KAP) (Annexes 1 and 2).

The patient data collection form collected socio-demographic status, DM type, risk factors, weight/height/waist measurements, blood pressure, prior year medical records, complications, current medication, self-monitoring and health education.

The questionnaire was completed in the patient's presence. To ensure proper assessment, the following procedures were followed:
- During the audit day, the first 50 DM patients meeting the inclusion criteria at the enrolled health centres were included.
- Patients were informed about participation at interview and examination and a consent form was signed.
- To ensure privacy, two rooms inside each health centre were prepared for the examination.
- The following equipment/ instruments were made available:
  - Adult scale for weight
  - Stadiometer for height
  - 1.5 meter tape measure for waist
  - Standardized blood pressure machine
  - Stethoscope
  - Tuning fork
  - Sterile needles for sensation evaluation
  - Dry cotton
  - Alcohol cotton balls
  - EDTA tubes, sterile syringes, and alcohol swaps

The Chief Disease Prevention and Control from HQ in Amman (CDP&C) and the Field Disease Control Officers examined patients. Twenty-five patients from each health centre were assigned to each. A staff nurse or a trained NCD nurse assisted with the examination and a laboratory technician withdrew blood samples and was in charge of sample storage until transportation for laboratory testing was performed.

3.2   Health Centre DM Care Assessment:

3.2.1 Study type

Cross sectional study.

3.2.2 Study Population

In total, 66 medical officers providing DM care in 32 participating health centres completed the questionnaires.

3.2.3 Data Collection Instruments

A questionnaire was developed and distributed to the medical officers prior to the start of the clinical audit in each health centre. The questionnaire analysed the medical officers' knowledge of the different aspects of diabetes care such as patient demographics, risk factors, treatment and monitoring of diabetes (Annex 2).

The standardized questionnaire aimed to collect data to assess medical officers' Knowledge, Attitude and Practice, their perception about patients and services provided in addition to competency in the field of DM care.

The questionnaire was available in Arabic and English and medical officers completed it in their preferred language. Medical officers were briefed on the main study objectives before completing.

3.3   Audit Pilot:

The tools and methodology were piloted in Zarqa health centre in Jordan on March 14, 2012. Issues identified during the pilot were used to refine the tools.

3.4   Setting

The eight largest health centres in each one of the Fields studied[2] were selected to conduct the clinical audit as follows:

Table 1 - Clinical Audit Health Centres

Jordan	West Bank	Gaza	Lebanon
Amir Hassan Quarter	A/ Jaber	Beach	Borj Al Barajneh
Amman New Camp	Ama'ry	Jabalia	Beddawi
Amman Town	Arroub	Khan-Younis	Beirut Poly Clinic
Baqa'a	Balata	Ma'en	Buss
Irbid	Camp no. 1	Nuseirat	Eean Al Hilweh 1
Jabal El Husain	Hebron	Rafah	Eean Al Hilweh 2
Nuzha	Jenin	Rimal	Naher Al Bared
Zarka	Tullkarem	Zaitoun	Saida Poly Clinic

2. The study was not performed in Syria due to prevailing armed conflict and security reasons.

3.5   Time Frame:

The following time frame was followed despite visa and logistic constraints:
- April 2012 (18-26): Jordan
- June 2012 (20-28): Lebanon
- July 2012 (11-19): West Bank
- September 2012 (3-11): Gaza Strip
- September 2012: Field and HQ Data Entry
- October – November 2012: Data Analysis
- December 2012 – July 2013: Draft Report

3.6   Ethical Considerations:

Patients were informed that inclusion in the study was voluntary and that refusal to participate would in no way impact their medical assistance. Patients were under no pressure to sign the informed consent. All procedures ensured participant confidentiality and no names were included. All processing of samples and records ensured confidentiality.

3.7   HbA1c Testing:

Due to financial constraints, the HbA1c test is not used in UNRWA even though HbA1c is the global standard for diabetes control assessment. The test is too expensive (3-5 USD per test) to be provided regularly and extensively in an UNRWA setting.

To acquire useful information on control rates and compare this test with the current 2-h PPG monitoring protocol in UNRWA, all patients also received HbA1c testing. As no standardized cut off for HbA1c is yet available, 7% was used. This was based on the criteria of the International Diabetes Federation and the American Diabetes Foundation.

Samples were collected from all participating patients for HbA1c testing. Blood sample collection was performed according to the following procedures:
- Blood samples for each patient were collected in two vacutainer vials (EDTA tubes of 13x75 mm size). Each had at least 1ml well mixed whole blood.
- Patient ID numbers were included on the blood tube and the rack. No names were used in the report or communicated to others. Confidentiality and ethical considerations were a priority throughout the process.
- All blood samples were labelled with patient sample numbers and kept under cold chain conditions until they arrived to the Augusta Victoria Laboratory for testing.
- To confirm results and for UNRWA staff capacity building, 100 samples from Jordan (Baqa'a and Irbid health centres) and 100 samples from Lebanon (Beirut and Saida Polyclinics) were also double tested at UNRWA laboratories in Jordan (Baqa'a H/C laboratory). One hundred samples from the Gaza Strip (Rimal and Jabalia health centres) and 100 samples from the West Bank (Hebron and Arroub health centres) were also double tested at UNRWA laboratories at Shams health centre in the West Bank.
- The second set of tubes was kept frozen in each Field until the first set was processed at Augusta Victoria Hospital and the results were communicated to UNRWA HQ in Amman. If no longer needed, the reserve tubes were discarded according to UNRWA disposal instructions.

Local authorization was obtained to transfer samples from Lebanon to Jordan by plane, as the UNRWA courier was not functioning due to the conflict in Syria. The cold chain conditions were followed throughout the process.

3.8 Indicators

The following indicators are examples of those measured during the audit:

Table 2 - Example Indicators

	Process	Outcome
1	Number and percentage of patients with 2-hr PPG measured	Number and percentage of patients withcontrolled glycaemia according to UNRWA criteria
2	Number and percentage of patients with total blood cholesterol measured annually	Number of patients with acceptable cholesterol level (below 200mg/dl)
3	Number and percentage of patients whose blood pressure was measured	Control rate among patients according to blood pressure (equal to or below 140/90)
4	Number of patients who received annual fundoscopic exams	Percentage of patients with diabetic retinopathy reported by the ophthalmologist
5	Number and percentage of patients who had annual diabetic foot exams on both feet	Percentage of patients affected by diabetic foot
6	Number of annual health education sessions (individual and/or group counselling by medical provider)	Number and percentage of patients who receive at least one annual health education session
7	Insulin injections administered	Percentage of patients on insulin therapy

3.9 Data Handling and Statistical Analysist

The Assistant of the Chief Disease Prevention and Control performed data entry at UNRWA HQ. The Health Statistics Officer and CDP&C at HQ in Amman conducted data and statistical analysis.

Data entry started immediately after the data collection for each location in May and was completed by the end of October 2012. Data was analysed at UNRWA HQ by the Health Statistical Officer. Epi-info2000 version 3 and SPSS version 13.5 were used.

All data was tabulated and presented and sub-groupings were made according to health centre, location, disease duration, treatment type, HbA1c levels and other relevant variables. The response rate to all the variables assessed was presented as percentage and numbers; mean, average and standard deviation of quantitative data was calculated.

4. Standards

The main objective of the audit is to evaluate diabetes care provided in UNRWA health centres following UNRWA guidelines. The clinical audit assessed the service performance against the latest UNRWA Technical Instructions (Technical Instructions and Management Protocol on Prevention and Control of Non-Communicable Diseases, 2009).

The Technical Instructions (TIs) have four main sections: NCD Prevention and Control, Diabetes Patients, Hypertension Patients and Patients with Diabetes and Hypertension.

This clinical audit assessed the clinical management of diagnosed diabetic patients currently undergoing treatment. The first two chapters of the TIs (General Prevention and Diabetic Patients) were considered relevant. The content of the two chapters is outlined below and the parts relevant to the clinical audit references are underlined. The chapter on Patients with Diabetes and Hypertension primarily describes the nature of complications and does not focus on patient management.

Table 3 - NCD Prevention and Control

NCD Prevention and Control	Diabetic Patients
Burden Prevention Intervention Strategy Organization Duties and Responsibilities Recording and Reporting Evaluation	Definition Classification Diagnostic Criteria Case Assessment Management Drug Therapy Monitoring Specialist Referral Self Care Gestational Diabetes

NCD Prevention and Control
- Intervention Strategy: Promoting healthy lifestyle, dietary management and physical exercise.
- Duties and Responsibilities: Medical officer responsibilities in monitoring and follow up of patients including regular assessment and check ups.
- Recording and Reporting: The content including results of assessment and referrals.
- Evaluation: Key indicators including rates of control, complications, smoking, etc.

Diabetic Patients:
- Classification: Defines diabetes mellitus types 1 and 2.
- Management: Outlines general objectives and management strategies including lifestyle modifications and treatment sequences (diet and physical exercise followed by drug therapy).
- Drug Therapy: Recommended treatment protocols for types 1 and 2 diabetes, including oral hypoglycaemic agents, insulin, and how to manage diabetic emergencies.
- Monitoring: Control criteria based on 2-hr PPG, fasting total serum cholesterol, blood pressure and quality and frequency of follow up examinations.
- Specialist Referrals: Indications for referral to specialists.
- Self Care: Content of self care including instructions to relevant medical providers.

The UNRWA TIs also include a flow chart (Annex 3) for the management of diabetes mellitus indicating when to start drug therapy and treatment protocols including: oral mono-therapy, oral combination therapy, insulin treatment and oral drugs in combination with insulin.

4.1 UNRWA Diabetes Care:

Based on the current Technical Instructions, UNRWA provides diabetes care in all 139 primary health centres. All patients attending health centres are screened annually for diabetes mellitus (DM) if they are 40 years or older, at risk for NCD or if they are pregnant or planning to conceive. DM screening is performed by measuring random blood glucose (RBG) during one week through two fasting blood glucose measurements. If both measurements are ≥ 126 mg/dl, DM is diagnosed. If results are below 100 the patient is checked again the following year. If the readings are between

100-125 mg/dl, an oral glucose tolerance test (OGTT) is performed to confirm or exclude diabetes. Patients diagnosed with diabetes are managed at the NCD clinic located in each health centre. The NCD clinic is staffed with medical officer(s) and nurse(s), and provides care for patients with diabetes and/or hypertension. As part of UNRWA's 2011 health reform, Family Health Teams (FHTs) were introduced in health centres and services were integrated into one comprehensive service rather than disease specific. Nevertheless, the following setting for diabetes care is in principle the same.

Once diagnosis is made, patients are clinically assessed for complications and co-morbidities such as hypertension (blood pressure of 140/90 mmHg or above). This, along with written notes and clinical information (including lab results), is recorded in a patient registration file. Patients are categorized into three main groups: type 1 diabetes, type 2 diabetes or diabetes with hypertension. Patients are managed according to a standard algorithm with diet and lifestyle advice. Treatment can include oral hypoglycaemic agents (OHA) only (Glibenclamide, Glicazide and Metformin) either in a one or a two-drug regimen (Metformin and Glibenclamide or Gliclazide), insulin or a combination of both OHA and insulin.

Control status is assessed based on 2-hr PPG measurements[3]. Patients with uncontrolled DM are seen weekly or monthly until the control status is reached. The follow-up schedule for patients with controlled DM is a clinical check up every 3 months. During this visit, patients are assessed by the medical providers as follows: clinical examination, body mass index, urine for glucose and albumin, measurement of 2-hr PPG, blood pressure and the presence or absence of late complications.

Once a year, all DM patients are expected to receive a foot examination and are referred to an ophthalmologist for a fundoscopic examination. They may be also referred to a cardiologist for further evaluation if required.

5. Results

5.1 UNRWA DM Care Quality Assessment:

5.1.1 Patient demographics

A total of 1,600 patients with type 1 or 2 diabetes from 32 health centres in the four locations (Jordan, Lebanon, Gaza Strip and West Bank) were enrolled in the clinical audit. The patient demographics of these patients are as follows.

5.1.1.1 Patient Age and Sex

The mean age of the patients was 56.6 ± 12.6 years, ranging between 2-90 years of age. Similar to other settings, DM is the disease of the elderly. However, findings indicate that it is becoming more prevalent in younger ages. Among patients with type 2 diabetes, 37.5% (or 574/1,532) were younger than 55 years old.

3. If two out of three readings in a one-year period are below 180 mg/dl, the patient is considered controlled. If two out of three readings are 180 mg/dl or above, the patient is defined as uncontrolled. Patients with two readings or less are considered at an undetermined control status.

The majority of patients were female (63.7%), which is a reflection of the general population of UNRWA health centre patients. In UNRWA health centres, 63.8% of patients are female, largely due to the service hours (7:30-14:00) that are more favourable for people who do not work outside the home.

Table 4 - Age and Sex Patient Distribution

Age	Female	Male	Total
0-19	15	21	36
20-39	50	26	76
40-59	527	275	802
60+	428	258	686
Total	1,020 (63.8%)	580 (36.2%)	1,600 (100%)

The age distribution of the sample is consistent with the ¨ UNRWA Annual Report of the Department of Health¨. The majority of patients are female (64%). This distributioninfluenced the findings, especially in the analysis of risk factors, as results are not separated by sex.

5.1.2 Disease Pattern

Out of 1,600 patients, 68 (4.2%) were affected by type 1 diabetes and 1,532 (95.8%) by type 2 diabetes. Of all type 2 diabetic patients, 1,102 were also affectedby hypertension (68.9% of all patients, 71.9% of those with type 2). These percentages are similar to that of the 114,911 UNRWA diabetic patients in 2011. There were 3,418 (3.0%) affected by type 1 diabetes, 32,733 (28.5%) by type 2 diabetes without hypertension and 78,760 (68.5%) by type 2diabetes with hypertension.

Data on the duration of illness was not assessed, as it is not always accurate. We compared the disease pattern with the duration of care received at UNRWA. As UNRWA is the main primary health care provider to Palestine refugees, we can assume that the duration of care is the same as the duration of illness.The duration of care varies considerably among patients, ranging from 1-30 years, with a mean duration of 7.2 years (±4.9 years).

Table 5 - Mean age and duration of care in UNRWA health centers by type of diabetes

Diabetes Type	Number of Patients			Mean Age (Years)	Mean Duration of Care (Years)
	Female	Male	Total		
Type 1	37	31	68	25.2 (± 12.9)	8.1 (± 4.9)
Type 2 alone	270	160	430	53.5 (± 10.4)	5.9 (± 4.3)
Type 2 with hyper-tension	713	389	1,102	59.8 (± 10.2)	7.8 (± 5.0)
Total	1,020	580	1,600	56.6 (± 12.6)	7.2 ± 4.9

Patients with type 1 diabetes are the youngest (25.2 years) and have the longest duration of care (8.1±4.9 years). Such patients develop diabetes at an early age and require life long treatment.

Among patients with type 2 diabetes, those with hypertension comorbidity are on average older (59.8 years) and have a longer duration of care (7.8 years) than those without (53.5 years old and 5.9 years of duration of care). With the progression of the disease, the likelihood of complications or other concomitant diseases increases.

Table 6 - Care Duration

Duration	1-5 years	6-10 years	11-15 years	>15 years	No record	Total
Patients	688	514	284	103	11	1,600
Percentage	(43.0%)	(32.1%)	(17.8%)	(6.4%)	(0.7%)	(100%)

The overall mean duration of UNRWA care was 7.2 years. UNRWA has provided diabetes care for the last 20 years. This 7.2 year mean duration of disease may be considered short and could be interpreted as possible premature deaths occurring among patients. This will necessitate further investigation and analysis.

Findings indicate that UNRWA patients are diagnosed with diabetes in their late 40s, about a decade earlier than in the western world where people develop diabetes in their mid to late 50s.

The results also show quite a high population of DM and HTN comorbidity. As no global reference of this variable is available, it is not possible to speculate if this finding is in line with regional trends. With this high proportion of comorbidity, increased cardiovascular and kidney complications are expected, especially if control rates are low. This should be considered when evaluating the hypothesis of possible premature deaths among patients under UNRWA DM care.

5.1.3 Risk factors

5.1.3.1 Smoking

Out of 1,564 patients over 20 years old, 311 (19.9%) were current smokers and 60 (3.8%) were ex-smokers. Of the 36 patients younger than 20, only four were smokers. Smoking is more prevalent among male patients as shown below:

Table 7 - Patient Smoking Rates by Sex

	Current smoker	Ex-smoker	Non-smoker	Total
Female	115 (11.3%)	15 (1.5%)	890 (87.3%)	1,020 (100%)
Male	198 (34.1%)	47 (8.1%)	335 (57.8%)	580 (100%)
Total	**313 (19.6%)**	**62 (3.9%)**	**1225 (76.6%)**	**1,600 (100%)**

It is possible that some woman smokers may deny smoking, leading to an underestimation of this risk factor. When we compare the data in Jordan and Lebanon with the host-country data4, the above patterns are similar to the host-country general population. Female patients in Jordan smoke more than the host-country general population, while in Lebanon male patients smoke more.

Table 8 - Tobacco Smoking Prevalence in Jordan and Lebanon (Audit and Host Country Data)

	Male		Female	
	Clinical Audit	Host Country	Clinical Audit	Host Country
Jordan	39.1%	48.8%	11.5%	4.1%
Lebanon	52.6%	44.1%	26.8%	30.0%

Smoking is a risk factor and should be addressed in the coming awareness campaigns.

5.1.3.2 Alcohol Intake

Alcohol intake was found to be very low among patients. Only 7 patients (0.4%) reported some kind of alcohol intake. This low rate is not surprising as the audit was performed mostly among Islamic patients, in a cultural and religious context that does not permit alcohol consumption. It is possible that some patients might not be at ease admitting alcohol intake.

5.1.3.3 Overweight and Obesity

A high prevalence of obesity was found among UNRWA diabetic patients. There were 1,024 obese (BMI ≥ 30) patients (64.0%). The mean Body Mass Index (BMI) was 32.1 (Table 9).

Table 9 - Diabetic Patient BMI by Gender

	Under weight (BMI <18.5)	Normal weight (BMI: 18.5-24.9)	Overweight (BMI: 25-29.9)	Obese (BMI: 30+)	Total
Female	8 (0.8%)	51 (5.0%)	215 (21.1%)	746 (73.1%)	1,020 (63.8%)
Male	10 (1.7%)	86 (14.8%)	206 (35.5%)	278 (47.9%)	580 (36.2%)
Total	**18 (1.1%)**	**137 (8.6%)**	**421 (26.3%)**	**1024 (64.0%)**	**1,600 (100%)**

The prevalence of obesity is much higher than the host-country's general populations in Jordan and Lebanon, where such data is available[6].

In the Jordan general population, the prevalence of obesity is 24.0% among males and 36.4% among females. Among the audit patients it was 47.9% among males and 73.1% among females, almost double. The data from Lebanon shows the same situation.

Note:
Host country (Jordan) data is from WHO NCD Country Profile 2011
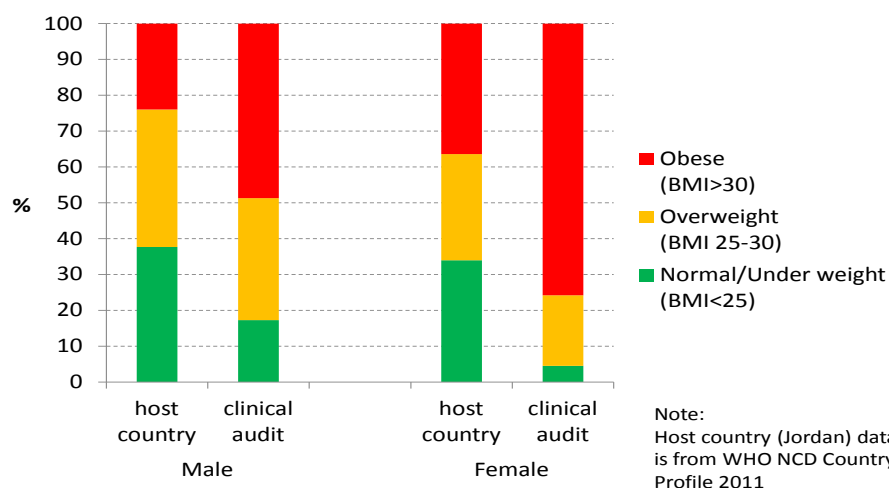
Figure 2 – Palestine Refugee Body Weight Status (UNRWA 2012 Clinical Audit) and Host-country Population (Jordan – WHO 2011 data)

This very high percentage of obese patients is consistent with data collected annually by UNRWA and could be related to unhealthy dietary habits and sedentary life styles. Immediate interventions promoting regular physical activity and adherence to a healthy diet are needed. Practical and culturally acceptable health education sessions could include walking tours, regular exercise at home, promotion of healthy diet through cooking shows and sharing patient success stories.

The situation is particularly alarming among females, as three quarters of all female diabetic patients are obese as shown in Figures 3 and 4.
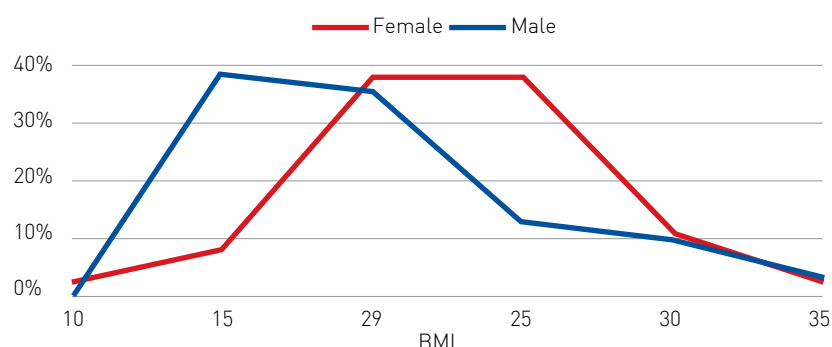
Figure 3 – Type 1 Diabetes Patient BMI
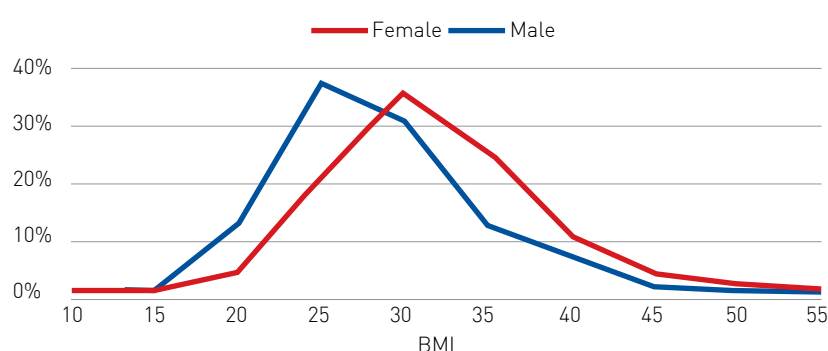
Figure 4 - Type 2 Diabetes Patient BMI

Looking at all female type 2 diabetes patients, 95.8% are either obese (75.3%) or overweight (20.5%).

This situation may be linked to prevailing cultural conditions and multiparity. There is a need to focus on lifestyle education (diet and exercise) with special attention to the needs of women. In the FHT, lifestyle improvement should be linked to post pregnancy care and this should also be addressed during health education sessions in campaigns. As 90% of doctors are male, there may be obstacles in discussing diabetes and obesity with female patients.

5.1.4 Diabetes Management

UNRWA Technical Instructions describe an intervention strategy composed of lifestyle modifications (e.g. dietary management and physical exercise) as a base and drug therapy oral hypoglycaemic agents (OHA) with or without insulin injection as needed.

5.1.4.1 Healthy Lifestyle Promotion and Patient Support

The following tables show the number and type of health education sessions diabetic patients received according to patient memory during the year prior to the audit interview.

Table 10 - Health Education Sessions Received

	Health Education Sessions						Total
	0	1	2	3	4	5	
Patients	283 (17.7%)	308 (19.3%)	324 (20.3%)	324 (20.3%)	164 (10.3%)	197 (12.3%)	1,600 (100%)

Table 11 - Type of Health Education Session Received

Education Type	Number of Patients	Percentage
Diet	256	16.0%
Exercise	393	24.6%
Chronic complications	257	16.1%
Foot care	263	16.4%
Hyperglycemia	47	2.9%
Hypoglycemia	9	0.6%
Unknown	92	5.8%
None	283	17.7%
Total	**1,600**	**100.0%**

According to UNRWA Technical Instructions[3], patients should receive at least four heath education sessions during assessment visits each year. This audit revealed that only 361 (22.6%) patients received four or five health education sessions, reflecting poor adherence to guidelines. As health education is a core element of primary health care, this is an issue of concern. This may be related to short contact time affected by high workload, lack of privacy in some health centres and poor counselling skills. These findings need to be addressed during staff capacity building courses next year.

Few patients recalled receiving relevant lifestyle health education sessions (exercise and diet). Although complication rates are high (e.g. very high peripheral neuropathy), only 16% of patients could recall receiving foot care advice. The same applies for counselling on hypoglycaemia, even though 20-30% of patients are receiving insulin treatment.

There is a need to empower nurses for health education and support. The role of nurses is crucial, as medical officers are very busy (90 patients a day) and may not be able to dedicate enough time to consultation with diabetic patients. Producing simple educational materials and a diabetes handbook could also be of benefit.

5.1.4.2 Clinical Management

The following table shows the clinical management of UNRWA patients by type of diabetes.

Table 12 - Treatment versus Diabetes Type

Treatment	Diabetes Type			Total
	Type 1	Type 2	Type 2 + HTN	
Lifestyle	-	11	52	63 (3.9%)
OHA	-	306	785	1,091 (68.2%)
OHA and Insulin	9	69	153	231 (14.4%)
Insulin	59	43	105	207 (12.9%)
Outside UNRWA	-	2	6	8 (0.5%)
Total	**68**	**431**	**1,101**	**1,600 (100%)**

The most commonly used treatment was oral hypoglycaemic agents (OHA). The majority of patients were treated with OHA only (1,091, 68.2%), followed by combined therapy (231 patients, 14.4%) and insulin alone (207 patients, 12.9%).

Table 13 - OHA Types Prescribed

Type	Medicines	Number	Percentage
OHA Monotherapy			
	Metformin	279	21.1%
	Gliclazide	40	3.0%
	Glibenclamide	84	6.4%
	Subtotal	403	30.5%
OHA Combination Therapy			
	Metformin + Gliclazide	179	13.5%
	Metformin + Glibenclamide	509	38.5%
	Subtotal	688	52.0%
OHA & Insulin			
	Insulin + Metformin	178	13.5%
	Insulin + Gliclazide	5	0.4%
	Insulin + Glibenclamide	12	0.9%
	Insulin + Metformin + Gliclazide	14	1.1%
	Insulin + Metformin + Glibenclamide	22	1.7%
	Subtotal	231	17.5%
Grand total		**1322**	**100%**

A small number of patients (63, 3.9%) patients were not taking any medication and followed lifestyle management only, adhering to diet and exercise. This pattern of treatment is reasonable and conforms to UNRWA guidelines that are very similar to those applied in other countries. The percentage of patients on insulin therapy is reasonable at 27%. Although all 68 patients with type 1 diabetes receive insulin, 9 (13%) also receive OHA (Metformin).

As shown in Table 13, 77% of patients are treated with metformin. This is quite reasonable as metformin is the drug of choice in obese and overweight diabetic patients. Almost all patients could receive metformin first, if there are no contraindications (e.g. severe kidney disease) or tolerance issues (e.g. severe GI side effects). Medical officers also prescribe sensible medical combinations.

Table 14 - Patient Insulin Units per Day

Unit / Day	<=30	31-60	61-90	>90	Total
Patients	117	202	97	24	440
%	(26.6%)	(45.9%)	(22.0%)	(5.5%)	(100%)

The distribution of patients by daily insulin dose looks reasonable. There are few patients who receive high doses, possibly due to obesity. Dosing is usually linked to each individual patient case and so assessment is beyond the objective of this audit. We can conclude that MOs have a reasonable understanding of proper insulin use.

Table 15 - Insulin Injection Practice

Insulin Injection	Self Injection	Family Assistance	Paramedic Assistance	Total
Patients	337	92	4	433
%	(77.8%)	(21.2%)	(0.9%)	(100%)

The majority (77.8%) of patients manage insulin injection by self-injection. This is acceptable and appropriate. Those depending on family may be too young or too old or have complications or conditions that prevent them from self-injecting. In general, self-injection is better for the management of diabetes. Patient injection education is important and needs to be addressed in counselling sessions.

5.1.5 Diabetes Monitoring

UNRWA Technical Instructions indicate that diabetic patients should be monitored as follows if disease is controlled:
- Every three months
  - 2-hr Postprandial Blood Glucose (2-hr PPG)
  - Blood Pressure (BP)
  - Body Mass Index (BMI)
  - Urine Protein
- Once a year
  - Fasting Cholesterol
  - Creatinine
  - Fundoscopy Exam
  - Foot Exam

All 1,600 patient medical records were checked for 2-hr PPG, cholesterol, creatinine, urine protein and fundoscopy results. Assessment results are as follows.

Table 16 - Implementation Status of Monitoring Examinations

Monitoring Exams	Results Recorded	No Results Recorded	Total
Postprandial Blood Glucose (PPG)	1,515 (94.7%)	85 (5.3%)	1,600 (100%)
Fasting Cholesterol	1,543 (96.4%)	57 (3.6%)	1,600 (100%)
Creatinine	1,463 (91.4%)	137 (8.6%)	1,600 (100%)
Urine Protein	1,400 (87.5%)	200 (12.5%)	1,600 (100%)
Fundoscopy	757 (47.3%)	843 (52.7%)	1,600 (100%)

2-hr PPG, cholesterol, creatinine and urine protein were regularly recorded for most patients (94.7%, 96.4%, 91.4% and 87.5% compliance, respectively). However, the low rate of recorded fundoscopy examinations is of concern. While UNRWA guidelines recommend an annual fundoscopy, more than half the patients (52.7%) were not referred to an ophthalmologist.

On average, 87.5% of patients had at least one macro albuminuria test recorded in their file, although UNRWA guidelines recommend checking for macro albuminuria on a quarterly basis for all diabetic patients. There were no results recorded for the entire year for 12.5% of patients.

The audit assessed patient use of glucose self-monitoring tools (blood and urine) at home. UNRWA relies on patients to obtain such tools, as they are not provided at the health centres. These tools

help patients manage their diabetes, using glucometers for blood glucose or urine strips. Home monitoring is crucial in the first year of diabetes treatment, particularly for those with type 1 diabetes. It is a learning process that helps people understand the consequences of life style and how to adjust according to metabolic needs. The following table shows the patient utilization rate of self-monitoring tools. For blood glucose monitoring (glucometer), we separated patients with type 1 diabetes, as the test is particularly critical.

Table 17 - Blood and Urine Glucose Self-Monitoring

	Patients Self-Monitoring	Patients not Self-Monitoring	Total
Blood Glucose			
All Patients	521 (32.6%)	1,079 (67.4%)	1,600 (100%)
Type 1 Patients	45 (66.2%)	23 (33.8%)	68 (100%)
Urine Glucose			
All patients	2 (0.2%)	1,598 (99.8%)	1,600 (100%)

A glucometer for blood glucose monitoring is used by only a third (32.6%) of all diabetic patients but is used by the majority (66.2%) of type 1 diabetes patients. There are still 33.8% type 1 diabetes patients who do not use a glucometer and do not practice self-monitoring at home.

The reasons behind this finding could be complex, but are probably due in part to economic difficulties in acquiring a glucometer. UNRWA needs to explore how to ensure all type 1 diabetes patients have access to a glucometer for self-monitoring.

Urine monitoring using strips is virtually unused. Urine monitoring is becoming obsolete for diabetes self-monitoring and findings suggest that patients no longer prefer this type of monitoring.

5.1.6 Diabetes Treatment Outcome

5.1.6.1 Postprandial Blood Glucose Test Results

UNRWA uses 2-hr postprandial glucose (2-hr PPG) results for diabetes monitoring and control. As per UNRWA Technical Instructions, diabetes control is achieved when 2-hr PPG becomes equal or less than 180 mg/dl (≤10.0 mmol/L). The audit reviewed patient medical records for previous 2-hr PPG results. Information was available for 1,515 out of 1,600 patients.

The mean 2-hr PPG was 200.2 mg/dl, ranging from 65-632 mg/dl. The control rate by type of diabetes is described in Table 18.

Table 18 - Diabetes Control Status via 2-hr PPG by Type

Diabetes Type	Controlled (≤180 mg/dl)	Uncontrolled (>180 mg/dl)	No Data	Total
Type 1	29 (42.6%)	34 (50.0%)	5 (7.4%)	68 (100%)
Type 2	183 (42.6%)	226 (52.5%)	21 (4.9%)	430(100%)
DM with Hypertension	504 (45.7%)	539 (48.9%)	59 (5.4%)	1102 (100%)
Total	**716 (44.8%)**	**799 (49.9%)**	**85 (5.3%)**	**1,600 (100%)**

Approximately 45% of patients achieved the glycaemic control level for a 2-hr PPG. This is within an acceptable range of glycaemic control. The control rates are similar among different types of diabetes.The audit analysed the data based on treatment type (Table 19).

Table 19 - Treatment Type by 2-hr PPG Control Status

Treatment	Controlled (≤180 mg/dl)	Uncontrolled (>180 mg/dl)	No Data	Total
Lifestyle	51 (81.0%)	4 (6.3%)	8 (12.7%)	63 (100%)
OHA	523 (47.9%)	516 (47.3%)	52 (4.8%)	1091 (100%)
OHA and Insulin	73 (31.6%)	149 (64.5%)	9 (3.9%)	231 (100%)
Insulin	64 (30.9%)	128 (61.8%)	15 (7.2%)	207 (100%)
Outside UNRWA	5 (62.5%)	2 (25.0%)	1 (12.5%)	8 (100%)
Total	**716 (44.8%)**	**799 (49.9%)**	**85 (5.3%)**	**1,600 (100%)**

The control rate was highest among those with improved lifestyle (81%), followed by OHA (47.9%). The high control rate among those with lifestyle treatment is predictable. Patients under lifestyle management tend to be affected by milder forms of diabetes and have a shorter clinical history of disease. Patients on insulin therapy have lower rates of control: 31.6% for those with insulin and OHA and 30.9% for those with insulin only. This is not a reflection of treatment but a reflection of the life course of DM. The more complicated the disease, the lower the control rate.

5.1.6.2 HbA1c Test Results

The mean HbA1c is 8.3% (the defined threshold for diabetes control is 7%) ranging from 3.4-15.1%.Table 20 shows the control status of UNRWA patients using the HbA1c test by diabetes type.

Table 20 - HbA1c Control Status by Diabetes Type

Type of diabetes	Controlled (HbA1c< 7%)	Uncontrolled (HbA1c ≥ 7%)	Total
Type 1	5 (7.4%)	63 (92.6%)	68 (100%)
Type 2	108 (25.1%)	332 (74.9%)	430 (100%)
DM with Hypertension	339 (30.8%)	763 (69.2%)	1102 (100%)
Total	**452 (28.3%)**	**1148 (71.7%)**	**1600 (100%)**

HbA1c testing indicated much lower control rates than 2-hr PPG. Using HbA1c, the control rate was 28.3%. Using 2-hr PPG, the control rate was 44.8%. Using HbA1c, control rates were lower among type 2 diabetes (25.1%) and patients with both diabetes and hypertension (30.8%) compared to the2-hr PPG testing.

The control rate was particularly low among patients with type 1 diabetes (7.4% with HbA1c vs. 42.6% with 2-hr PPG). This is particularly alarming as type 1 diabetes affects younger patients who are totally insulin dependent.

Analysing these results by type of treatment (excluding patients on lifestyle management and following treatments prescribed outside UNRWA), all control rates were lower when measured with HbA1c compared to 2-hr PPG. Again what observed were particularly poor control rates among patients in mono or combination therapy with insulin (Table 21).

Table 21 - HbA1c Control Status by Treatment Type

Treatment	Controlled (HbA1c< 7%)	Uncontrolled (HbA1c:≥ 7%)	Total	P value
Life style only	55 (87.3%)	8 (12.7%)	63 (100%)	0.000
OHA only	355 (32.5%)	736 (67.5%)	1,091 (100%)	0.000
OHA & Insulin	19 (8.2%)	212 (91.8%)	231 (100%)	0.000
Insulin only	18 (8.7%)	189 (91.3%)	207 (100%)	0.000
Treated outside UNRWA	5 (62.5%)	3 (37.5%)	8 (100%)	0.310
Total	**452 (28.3%)**	**1,148 (71.7%)**	**1,600 (100%)**	**0.000**

Patients under exclusive lifestyle management also had high control rates (87.3%) when measured with HbA1c tests. This is predictable.

Patients treated outside UNRWA also have mean higher control rates (62.5%) both when tested with 2-hr PPG and HbA1c. This finding is more difficult to interpret. It is unclear if this finding is the result of a more heterogeneous grouping of patients that includes individuals with milder and more severe forms of disease or the impact of quality of care. Further investigations are not possible as treatments prescribed outside UNRWA are diverse and often not recalled by patients.

Alerted by these results and in order to acquire a clearer picture, the audit investigators conducted further analysis of this data. HbA1c percentage results were disaggregated into three categories (<7%, 7-8%, and ≥8%). HbA1c results and 2-hr PPG results were compared to highlight any possible correlation.

The aim of the first analysis was to assess how many patients presented borderline HbA1c control results (7-8%). Tables 22 and 23 show HbA1c results by patient and treatment types broken down into these three categories.

Table 22 - HbA1c Results by Diabetes Type

Diabetes Type	HbA1c< 7%	HbA1c: 7-8%	HbA1c ≥8%	Total
Type 1	5 (7.4%)	8 (11.8%)	55 (80.9%)	68 (100%)
Type 2	108 (25.1%)	93 (21.6%)	229 (53.3%)	430 (100%)
DM with Hypertension	339 (30.8%)	221 (20.1%)	542 (42.2%)	1102 (100%)
Total	452 (28.3%)	322 (20.1%)	826 (51.6%)	1600 (100%)

Table 23 - HbA1c Results by Treatment Type

Treatment Type	HbA1c< 7%	HbA1c: 7-8%	HbA1c ≥8%	Total
Life style only	55 (87.3%)	6 (9.5%)	2 (3.2%)	63 (100%)
OHA only	355 (32.5%)	272 (24.9%)	464 (42.5%)	1091 (100%)
OHA & Insulin	19 (8.2%)	20 (8.7%)	192 (83.1%)	231 (100%)
Insulin only	18 (8.7%)	24 (11.6%)	165 (79.7%)	207 (100%)
Treated outside UNRWA	5 (62.5%)	0 (0%)	3 (37.5%)	8 (100%)
Total	452 (28.3%)	322 (20.1%)	826 (51.6%)	1600 (100%)

There are 322 patients (20.1%) with borderline HbA1c results. This proportion remains roughly the same among patients with type 2 diabetes and with diabetes and hypertension but was lower (11.8%) among patients with type 1 diabetes. This difference is more evident when analysed by treatment type.

Almost a quarter (24.9%) of patients treated exclusively with OHA presented borderline HbA1c results. More than half (57.4%) had HbA1c results below 8%.

Among patients treated with insulin (with or without OHA), however, the proportion of borderline patients was below 10%. Less than 20% of these patients had HbA1c results below 8%.
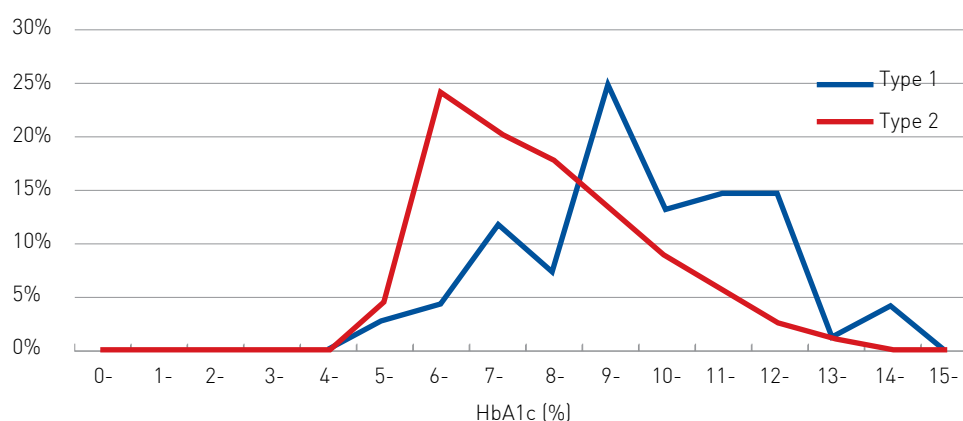
Figure 5 – HbA1c Results by Diabetes Type

Almost half (48.5%) of all patients with type 1 diabetes had HbA1c >10%, indicating uncontrolled diabetes. Among patients with type 2 diabetes, the proportion of patients with HbA1c >10% was 18.9%.
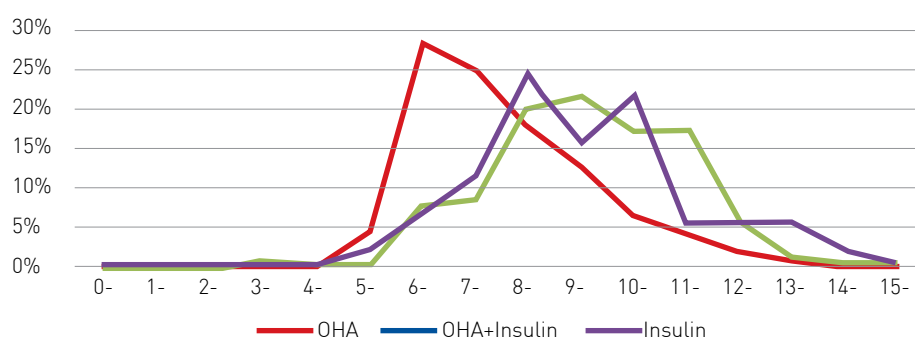
Figure 6 – Type 2 Diabetes Patient HbA1c Results by Treatment Type

Reviewing HbA1c results by treatment type, the HbA1c mode was around 6.0% among patients receiving only OHAs. Again, patients receiving insulin had a higher HbA1c mode (about 9.0%) with 40.8% reporting HbA1c >10%. Interestingly, similar curves were found for patients on insulin only treatment and patients receiving insulin in combination with OHA (Figure 6).

This finding could be in part a reflection of the severity of the disease. Patients treated with insulin (in mono or combination therapy) normally have a more severe form of diabetes. HbA1c control rates were therefore analysed by type of diabetes and duration of care, confirming that among patients with type 2 diabetes (with or without hypertension), higher HbA1c test results seem to be associated with longer disease duration. However, this pattern was not confirmed among type 1 diabetic patients (95% of whom receive premixed 70/30 insulin).

Table 24 – Average HbA1c Results by Diabetes Care Duration and Type

Care Duration	0-4 years	5-9 years	10-14 years	>15 years
Type 1	10.2	10.6	9.1	10.1
Type 2	7.8	8.7	9.6	9.2
DM with Hypertension	7.7	8.3	8.6	8.8

Results indicate that UNRWA care for insulin dependent patients is not optimal. The control rate (HbA1c >7%) is only around 8.0%, and even when borderline results (HbA1c 7-8%) are included, it is below 20.0%. Drastic improvement of diabetes care, including better use of medical treatments, counselling and self-care education and lifestyle support is needed. Table 24 illustrates that type 2 diabetes is a progressive condition where beta cell loss with time necessitates intensified treatment. Many patients may need insulin, perhaps in combination with metformin.

Audit investigators compared 2-hr PPG and HbA1c results to better understand the evident differences observed in the control status results. Although 2-hr PPG and HbA1c results are not directly comparable, comparison was made for 1,515 patients who have both PPG results and HbA1c results (Table 25 and Figure 7).

Table 25 – Comparison between 2-Hour PPG and HbA1c Results

		HbA1c		Total
		≥ 7%	<7%	
PPG results	≥ 180 mg/dl	702	112	814
	<180 mg/dl	391	310	701
	Total	1,093	422	1,515
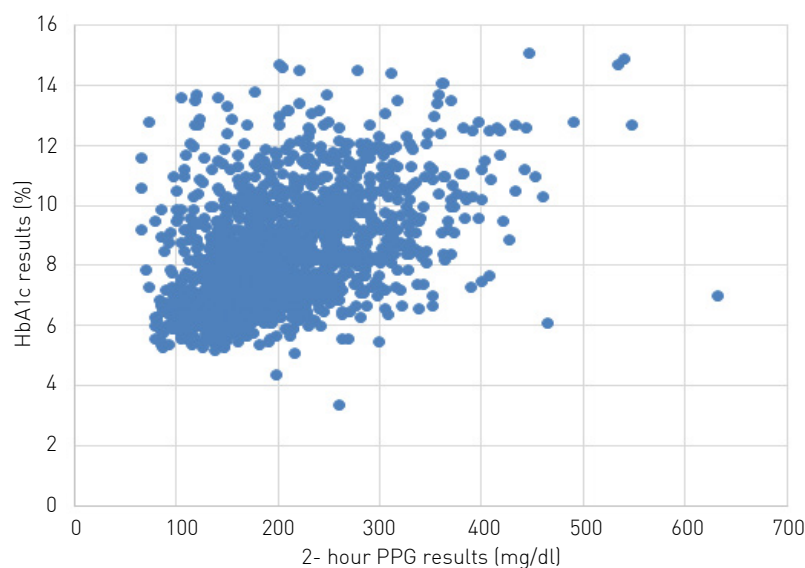
Figure 7 - Correlation between 2-hr PPG and HbA1c Results

No strong correlation between 2-hr PPG and HbA1c results were highlighted. Among 701 patients with 2-hr PPG below 180mg/dl (controlled based on 2-hr PPG results), 391 (55.8%) had HbA1c >7% (uncontrolled based on HbA1c results).

This finding strongly reflects the limitation of 2-hr PPG testing. The 2-hr PPG test shows a one-time level of blood glucose only. Patients can impact results by not eating 2 hours before the test. Changing 2-hr PPG criteria (i.e. lowering the threshold) would not improve the accuracy of 2-hr PPG testing.

5.1.7 Hypertension Management among Diabetes Patients

UNRWA Technical Instructions define blood pressure below 140/90 mmHg as the control target for diabetic patients also affected by hypertension. Among the 1,102 patients with diabetes and hypertension assessed in this audit, the mean systolic and diastolic blood pressures were 131.7 mmHg (84 – 200mmHg) and 80.2 mmHg (42-120 mmHg), respectively.

Table 26 - Antihypertensive Medications

Medicines	Number of Patients
ACE Inhibitors	750
Beta Blocker	647
Calcium Antagonists	146
Diuretics	354
Treated outside UNRWA	246

Please note: Some patients were on combination treatments with more than one type of drug.

The most commonly used antihypertensive drugs were ACE inhibitors (750), followed by beta-blockers (647) and diuretics (354).

These treatment patterns are in line with UNRWA guidelines and recommendations. ACE inhibitors are the drugs of choice for diabetic patients with elevated BP. The use of diuretics is rather low considering that the recommendation is to add diuretics to an ACE inhibitor. When this is not sufficient, combination treatments are recommended using three types of drugs (ACE, diuretics and calcium or beta blockers).

Table 27 - Blood Pressure Control Status (140/90 mmHg)

Diabetes Type	Control (< 140/90 mmHg)	Uncontrolled (≥ 140/90 mmHg)	Total	P value
DM with hypertension	612 (55.5%)	490 (44.5%)	1,102 (100%)	0.000

The hypertension control rate among these 1,102 patients was 55.5%. Although there is no international target, current UNRWA standards anticipate a 40-60% control rate. Acontrol rate of 55.5% is acceptable.

The target for blood pressure control has recently changed in many countries and international organizations from 140/90 mmHg to 130/80 mmHg to reduce cardiovascular and kidney complications[5].

Table 28 - Updated Blood Pressure Control Status (130/80 mmHg)

Diabetes Type	Control (< 130/80 mmHg)	Uncontrolled (≥ 130/80 mmHg)	Total	P value
DM with hypertension	310 (28.1%)	792 (71.9%)	1102 (100%)	0.000

Using the new criteria for HTN control, UNRWA patient control statusis quite low at 28.1% (Table 28). Of DM patients with hypertension assessed, 71.9% are at increased risk of having complications of hypertension, and a subset of those (27.4%) were at an unrecognized risk because their hypertension was considered controlled based on UNRWA standards.

5.1.8 Risk Factor Management: Cholesterol, Creatinine and Proteinuria

5.1.8.1 Cholesterol

UNRWATechnical Instructions define the target for total serum cholesterol control at <200 mg/dl or <6.5 mmol/L. Cholesterol test results were recorded for 1,543 patients. The mean fasting cholesterol was 191.8 mg/dl (ranging from 80- 783 mg/dl). Mean cholesterol levels by diabetes type are shown in Table 29.

Table 29 – Mean Cholesterol Levels by Diabetes Type

Diabetes Type	Control (< 200 mg/dl)	Uncontrolled (≥ 200 mg/dl)	Total
Type 1	46 (75.4%)	15 (24.6%)	61 (100%)
Type 2	248 (60.5%)	162 (39.5%)	410 (100%)
DM with Hypertension	635 (59.2%)	437 (40.8%)	1,072 (100%)
Total	**929 (60.2%)**	**614 (39.8%)**	**1,543 (100%)**

UNRWA adopted a secondary prevention strategy targeting patients with diabetes and hypertension focused on life style management with Aspirin, Atenolol and Enalepril, but not statins. Given UNRWA's current approach on cholesterol management, the observed control rate of 60% is acceptable.

In comparison with host-country's data, the Jordan profile showed a prevalence of hypercholesterolemia of 46.4%[6], while according to a study on cardiovascular diseases, diabetes mellitus and cancer[7] in the occupied Palestinian territory (oPt), the prevalence of hypercholesterolemia was at 34.8%. The mean fasting HDL cholesterol was at 50.8 mg/dl (18.0 - 312.0 mg/dl), and the mean fasting triglycerides value was 193.7 mg/dl (50.0 - 979.0 mg/dl)[8].

Statins are the standard of care for high cholesterol. Due to financial constraints, statins have not been introducedin UNRWA, except on a limited scale in some Fields. Statin use among 614 patients with high cholesterol (≥ 200 mg/dl) was analysed. Of those, 328 (53.4%) were being treated with statins or other lipid-lowering agents as shown in the following table. The situation is similar in all four Fields.

Table 30 - Patients on Anti-Hyperlipidaemia Medication

Medication	Jordan	West Bank	Gaza	Lebanon	Total
Statin	65 (44.2%)	58 (40.3%)	46 (32.0%)	99 (55.3%)	268 (43.6%)
Other Lipid-Lowering Agents	14 (9.5%)	10 (6.9%)	34 (23.6%)	2 (1.1%)	60 (9.8%)
None	68 (46.3%)	76 (52.8%)	64 (44.4%)	78 (43.6%)	286 (46.6%)
Total	147 (100%)	144 (100%)	144 (100%)	179 (100%)	614 (100%)

Among 328 patients undergoing statin or other lipid-lowering drug treatment, information on the source of medications was acquired from 241 patients.

Table 31 - Anti-Hyperlipidaemia Medication Source

Source	Jordan	West Bank	Gaza	Lebanon	Total
MoH	31 (44.9%)	18 (34.0%)	1 (2.5%)	2 (2.5%)	52 (21.6%)
Private	23 (33.3%)	16 (30.2%)	32 (80.0%)	66 (83.5%)	137 (56.8%)
UNRWA	0 (0%)	19 (35.8%)	0 (0%)	11 (13.9%)	30 (12.4%)
Others	15 (21.7%)	0 (0%)	7 (17.5%)	0 (0%)	22 (9.1%)
Total	69 (100%)	53 (100%)	40 (100%)	79 (100%)	241 (100%)

The source of statin and other lipid-lowering agents (or anti-hyperlipidaemia agents) varies considerably among Fields. It was offered primarily by The Ministry of Health in Jordan, while in West Bank, it was covered equally by the Ministry of health, the private sector and UNRWA In the Gaza Strip and Lebanon, more than 80% of these drugs are purchased from the private sector.

Pending availability of resources, UNRWA needs to consider introducing statin treatment for patients most in need. Currently only half of patients with high cholesterol have access to statin treatment and among those who do, the majority pay for the drugsout-of-pocket. This is particularly problematic in the Gaza Strip and Lebanon where refugees are economically vulnerable.

5.1.8.2 Creatinine

Serum creatinine levels were available for 1,534 patients (91.4% in all Fields). This response rate is acceptable and reflects the correct implementation of UNRWA Technical Instructions.

Abnormal creatinine is defined in the TIs as a serum creatinine level above 1.2 mg/dl. The mean serum creatininein the UNRWA audit sample was 0.86 mg/dl, ranging between 0.6 - 8 mg/dl.

Table 32 - Creatinine Level by Diabetes Type

Diabetes Type	Controlled (< 1.2 mg/dl)	Uncontrolled (≥ 1.2 mg/dl)	Total
Type 1	58 (95.1%)	3 (4.9%)	61 (100%)
Type 2	393 (96.3%)	15 (3.7%)	408 (100%)
DM with Hypertension	985 (92.5%)	80 (7.5%)	1,065 (100%)
Total	**1436 (93.6%)**	**98 (6.4%)**	**1,534 (100%)**

Of 1,543 patients with creatinine results recorded, 98 patients (6.4%) had uncontrolled results(≥1.2 mg/dl). This percentage is reasonable and in line with the rate of kidney complications found among patients. Special attention needs to be paid to patients with both DM and HTN, as they are more likely to have abnormal creatinine levels and develop renal failure.

5.1.8.3 Urine Proteins

UNRWA Technical Instructions indicate that urine tests for macro-albuminuria should be carried out on a quarterly basis for diabetes patients. The results were available from 1,400 patients.

There were negative results for 1,256 (89.7%) patients. This high percentage of negative results suggests good clinical management.

The care provided for the remaining 10.0% of patients with positive results needs careful assessment. Urine testing for macro-albumin is limited by the fact that it is not very specific. Macro-albuminuria could appear due to infection and other conditions, and therefore this finding alone does not provide strong evidence of renal function impairment.

Micro-albuminuria could be an important test to perform, as it is an early sign of kidney dysfunction. UNRWA may opt for a focused introduction of micro-albumin testing targeting first patients with uncontrolled DM and HTN.

5.1.9 Complication Management

5.1.9.1 Eye

All patients (1,600) were interviewed to investigate their vision. There were 23 blind patients (1.4%).

UNRWA Technical Instructions indicate annual fundoscopy exams for diabetes patients. Fundoscopy exam results were available for 757 patients (47.3%). The remaining 843 (52.7%) had no record of fundoscopy exam. Fundoscopy exam rate (47.3%) is low.

Among 757 patients who underwent fundoscopy exams, UNRWA ophthalmologists examined 408 (53.9%) and ophthalmologists outside UNRWA examined the remaining 349 (46.1%). There were 83 patients (11%) with retinopathy.
There is a clear need to expand collaboration with ophthalmologists outside UNRWA to ensure higher coverage of annual fundoscopy exams.

5.1.9.2 Foot

The clinical audit team examined the lower limbs and/or the feet of all 1,600 patients enrolled in the clinical audit. The examinations included an assessment of peripheral pulses, sensation and pathological changes, if any, including skin infection. The results are reported in the table as follows.

Table 33 – Lower Limb Complications

	Patients
Skin Fungal Infection	209 (13.1%)
Skin Bacterial Infection	63 (3.9%)
Healed Ulcer / Gangrene	30 (1.9%)
Absence of Foot Pulse	8 (0.8%)
Above Ankle Amputation	6 (0.4%)
No Symptoms / Signs	1,284 (80.2%)
Total	**1,600 (100%)**

Skin mycosis were found in 13.1% of patients, which exceeds the expected infection rate and has prompted UNRWA medical providers to focus on promoting adherence to personal hygiene during individual counselling and group health education sessions on foot care. Other findings are within expected range and are mostly related to the duration of disease and poor control status.

Trained nurses who could refer abnormal findings to medical officers can perform foot exams. Patient education prevents patient injuries and infections. The management of early signs can prevent further complications.

5.1.9.3 Hypoglycemia

Hypoglycaemia is one of the most common acute complications among patients with diabetes, particularly those on insulin treatment (both types 1 and 2).

Among 1,600 patients assessed, 400 (25%) reported one or more episodes of hypoglycaemia during the prior year. Among those, 154 (38.5%) had clinically documented hypoglycaemic incidences.

Among 400 patients who experienced hypoglycaemia, 211 were being treated with insulin. Considering that among 1,600 patients assessed in this audit, 438 patients receive insulin (either in mono or combination therapy), this finding indicates that 48% (211/438) of all patients treated with insulin experienced at least one episode of hypoglycaemia in the prior year. This could be related to quantity/quality of food, exercise,etc.

Although the global proportion of hypoglycaemia episodes is within an expected rate, it indicates low patient compliance to instructions and/or of insufficient health education provided by medical providers on hypoglycaemia causes and sequences.

In addition to case management factors, drug/insulin dosing and quality of meals should also be targeted inhypoglycaemia health education.
Most UNRWA medical officers in UNRWA do not consider hypoglycaemia important. In addition, as shown in Table 11, mostpatients do not remember hypoglycaemia health education, even though hypoglycaemia is an immediate threat, particularly for patients treated with insulin.

5.1.9.4 Peripheral Neuropathy

Peripheral neuropathy is the most common early complication among examined patients. There were 842 patients (52.6%) who showed symptoms/signs of peripheral neuropathy: subjective feelings and/orabnormal findings upon examination of superficial and deep sensation.

The prevalence of peripheral neuropathy is high considering that this early complication is usually observed in uncontrolled patients. The prevalence of peripheral neuropathy was almost the same among controlled and uncontrolled diabetes patients. With a 2-hr PPG criteria of 180mg/dl, it is 44% vs. 51% respectively (312 out of 712 vs. 405 out of 797, respectively. Data was missing for 91 patients).

As shown in Table 11, little attention is given to foot care education. Health centres, particularly thoseequipped with monofilaments, Dopplers and physiotherapy units,should regularly screen patients for early diagnosis and management of neuropathy.
Late Complication Management
UNRWATechnical Instructions define late complications of diabetes as total blindness, cerebral stroke, myocardial infarction and end stage renal disease.

5.1.9.5 Late Complication Management

UNRWA Technical Instructions define late complications of diabetes as total blindness, cerebral stroke, myocardial infarction and end stage renal disease.

Table 34 - Late Complications

Late Complications	Patients	Percentage
Myocardial Infarction	149	9.3%
Cerebral Stroke	34	2.1%
Total Blindness	23	1.4%
Amputation	6	0.4%
End Stage Renal Disease	6	0.4%

(Note: Patients may have more than one late complication)

There were 204 patients in the audit sample (12.8%) with late complications, and of those 186 patients had one complication and 18 patients had two. No patients experiencedmore than two different types of late complications.

The percentage of late complications is not high (0.4-2.1%) except for myocardial infarction (9.3%). The high percentage of myocardial infarction reflects the need to address underlying factors and strictly follow UNRWA's secondary prevention strategy for patients with diabetes and hypertension with stricter monitoring of glycaemia control with HbA1cand the introduction of statins.

Patients with late complications may not choose to access UNRWA services. They may go to hospitals or institutions where specialized care is available. The currently observed low rate of late complications in UNRWA health centres is not necessarily indicative of low prevalence. Patients with late complications could also be defaulters who are unable to attend health centres or among those who have unfortunately passed away.

5.2   UNRWA Health Centre Medical Officer DM Care Assessment:

5.2.1 Background

There were 66 medical officers from 32 health centres involved in the clinical audit. There were 20 from the Gaza Strip, 18 from Jordan, 18 from the West Bank and 10 from Lebanon. Among those, 62 (93.9%) were male and 4 (6.1%) were female. This male predominance is a reflection of UNRWA staff in 2012, where 392 out of 504 medical officers (77.8%) were male.

The mean duration of diabetes care experience for these medical officers was 7.6 years (1-30 years). There were 28 (42.4%) with less than 5 years of experience, 23 (35.5%) had 5-10 years, 7 (10.6%) had 11-15 years and 8 (12.1%) had more than 15 years. The high proportion with less than five years of experience (42.4%) may mirror a high turnover rate or internal rotations among medical officers within health centres.

5.2.2 Diabetes Training Attendance

There were 56 (84.4%) medical officers who attended at least one UNRWA diabetes training the prior year. Of those, 34 attended 1-2, 12 attended 3-4 and 10 attended 5 or more training sessions.

Ten medical officers attended diabetes training outside UNRWA facilities. Of those, 5 medical officers attended 1-2, 3 attended 3-4 and 2 attended 5 or more training sessions.

The attendance rate was reasonably high. Eighty four percent of the medical officers attended UNRWA trainings and another ten medical officers attended training outside UNRWA. The quality and more importantly the impact of training have been the object of this KAP audit.

5.2.3 Medical Officer Knowledge of Diabetes Prevalence

Sixty-five medical officers answered: "How many diabetes patients are affected by type 1 diabetes?". Forty-eight (73.8%) indicated it was less than 10% while 17 (26.2%) indicated more than 10%. The majority of medical officers have knowledge of the proportion of type 1 and type 2 diabetes. In the clinical audit, 4.3% of patients were affected by type 1 diabetes, and this low proportion was consistent in all 32 health centres that participated.

5.2.4 Diabetes Patient Characteristics (Obesity Percentages)

Fifty-eight medical officers answered: "How many diabetes patients are obese (BMI ≥ 30)?" Only 19 doctors (32.8%) indicated more than 50%.

In the clinical audit, 64% diabetic patients were obese. This is consistent in all 32 health centres. There is a clear lack of knowledge among medical officers of the high prevalence of obesity among diabetes patients. This could result in less intervention or insufficient health education for these patients.

5.2.5 Diabetes Management Knowledge

Sixty-four medical officers responded to: "How many patients are being treated with insulin therapy only?". Forty-six(71.8%) indicated that itwas below 20%, while 18 (28.1%) indicated it was above.

In the clinical audit, 12.9% of patients were treated exclusively with insulin. This proportion has remained below 20% in all 32 health centres engaged in the clinical audit. Medical officer treatment knowledge is quite good.As over 70% answered correctly, this is a good indication of the understanding of diabetes treatment from a clinical standpoint. However,there is still a need for further training.

5.2.6 Insulin Injection Management (Self-Injection)

Sixty-five medical officers answered:"How many patients manage self-injection of insulin?". In the clinical audit, 77.8% of patients managed insulin by themselves (self-injection). This trend was the same in all 32 health centres. However,only 26 doctors (39.5%) indicated the correct range of self-injection (i.e. 70-90%). This proportion is low, particularly because UNRWA recommends self-injection.

Moreover, in another question, 37 doctors (70%) stated that they think patients depend on paramedics for insulin injections.

These findings reflect adiscrepancy between medical officerperception and patient behaviour. Self-injection percentage is high (80%), but medical officers think it is much lower and thatpatients may have difficulty managing.

5.2.7 Oral Therapy to Insulin Shift

Medical officers were asked: "When should we shift treatment from oral hypoglycaemic agents to insulin injection?". The responses are shown in Table 35.

Table 35 - Reasons for OHA to Insulin Shift

Reasons	Reply Numbers (Percentages)
Uncontrolled Diabetes	53 (80.3%)
Complications	32 (48.5%)
Pregnancy	38 (57.6%)
Prior to Surgery	21 (31.8%)
OHA Side Effects	15 (22.7%)
OHA Noncompliance	8 (12.1%)
Infection	6 (9.1%)
Hospitalization	4 (6.1%)
Specialist Opinion	2 (3.0%)

Fifty-three medical officers cited uncontrolled status (80%), followed by complications in 32 (49%) responses. These findings are consistent with guidelines and practices in UNRWA health centres.

5.2.8 Diabetes Control Rate

Medical officers were asked: "What is the control rate of diabetes?". In the clinical audit, the overall diabetes control rate was 47.3% (716/1515) using the current UNRWA criteria with 2-hr PPG (180 mg/dl). This percentage (i.e. around 40-50% control rates) is similar in all 32 health centres. Nineteen (29.2%) indicated less than 40%, 25 (38.5%) between 40-50% and 21 (32.3%) more than 50%.

Only 38.5% indicated the correct range of 40-50% control rate, and the remaining 61.5% indicated lower or higher. Because 32.3% indicated the control rate was more than 50%, this indicates the need for training on the realistic picture and difficulties in diabetes control. This will be particularly important once HbA1c is introduced, as the control rate would be around 32%, which is even lower.

5.2.9 Diabetes Monitoring Labs and Exams

Sixty-four medical officers answered: "How often do you think laboratory examinations like urine protein, cholesterol and creatinine, and fundoscopy should be done for diabetes patients?".The UNRWA Technical Instructions indicate that diabetic patients should have a quarterly urine protein test and annual cholesterol, creatinine and fundoscopy exams.

Correct responses were, respectively 87.5% (56/64), 92.0% (61/64), 78.0% (50/64) and 84.4% (54/64). The responses were in line with the Technical Instructions (almost 80-90% correct).These results were compared with the clinical audit results (percentage of exams performed according to defined frequency).

Table 36: Estimated Laboratory and Fundoscopy Results

Test		Clinical Audit Results (Percentages Performed Correctly)	Medical Officer Knowledge (Percentage with Correct Knowledge of Test Frequency)
	Frequency of test		
Urine Protein	Quarterly	89.0%	87.5% (56/64)
Cholesterol	Annually	96.4%	92% (61/64)
Creatinine	Annually	91.4%	78% (50/64)
Fundoscopy	Annually	47.3%	84.4% (54/64)

Above findings reflect that Technical Instructions for annual cholesterol and creatinine measurements are followed. Of great concern was the discrepancy found in practice for patient referral to ophthalmologists. While 84.4% of medical officers reportedly referred patients for annual fundoscopy, the audit revealed only 47.3% were referred.

5.2.10 Diabetes Complications

Medical officers were asked: "What are the common complications of diabetes?" The Technical Instructions define common complications of diabetes as Cerebrovascular Accident (CVA), ischemic heart disease, nephropathy, neuropathy and retinopathy. Medical officers were asked to list common complications of diabetes.

Table 37 - Diabetes Common Complications

Medical Officer Response	Reply Number (Percentage)
Neuropathy	65 (98.5%)
Nephropathy	48 (72.2%)
Retinopathy	44 (66.7%)
Ischemic heart disease	37 (56.1%)
Cerebro-vascular attack	29 (43.9%)
Wrong answers	20 (30.3%)

Among the 66 medical officers who responded, neuropathy was the first complication cited. This confirmstheaudit findings that peripheral neuropathy is the most common early complication of diabetes patients in UNRWA.

Medical officersranked nephropathy as second (72.7%), although end stage renal failure complication rate was only 0.4%. Twenty medical officers (30%) provided one or more wrong answers for complications. Complications were mixed with signs and symptoms of diabetes and other conditions.

Hyperglycaemia and/or hypoglycaemic coma were not listed as complications. Medical officer knowledge seems to be sufficient, although 30% wrong responses are a concern.

5.2.11 Medical Officer Information (Insulin Acceptability)

Medical officers were also asked why patients sometimes refuse to follow insulin therapy (Table 37).

Table 38 – Medical Officer Perceived Reasons to Refuse Insulin Therapy

Reason	Number (Percentage)
Painful	19 (29.7%)
Depend on Others for Injection	15(23.4%)
Complicated and Difficult	12 (18.8%)
Unaware of Insulin Advantage	6 (9.4%)
Believe Possible to Manage without Insulin	5 (7.8%)
Unaware of Sequence of Uncontrolled Diabetes	5 (7.8%)
Causes Hypoglycaemia	3 (3.1%)

The responses were painful (29.7%) followed by need to depend on others for injecting (23.4%). What was striking was that hypoglycaemia was rarely indicated (3.1%) even though hypoglycaemia was reported by 25% of patients (400/1,600) and by 48.2% of those using insulin. Medical officers may not have a proper perception of patient ideas and fears related to insulin use.

Insulin rejection causes, in particular hypoglycaemia, need to be addressed during counselling sessions with patients and during training for medical providers.

6. Study Limitations

- The audit was designed to cover many aspects of diabetes care provided to refugees. The following points will be considered in 2014.

- The study could not be conducted in Syria due to prevailing armed conflict.

- Except for control status, the audit studied type 1 and type 2 diabetes together and did not go in depth analyzing separate data.

- The study could not analyze outside treatment (why patients go to other health care providers, what treatment they receive, compliance to treatment, etc.).

- The audit did not analyze why among the 757 patients who underwent fundoscopy, UNRWA ophthalmologist examined 408 (53.9%) and outside ophthalmologist examined 349 (46.1%).

- The audit did not measure some process indicators such as the number and readings of blood pressure measurements in UNRWA health centers in the prior year and depended only on one reading taken by the audit examiner during the assessment.

- Although HbA1c was the main reference for control status, no previous data was available on control status according to this parameter, so comparisons were not possible. The audit also depended only on the latest reading of 2-hr PPG for control status and did not follow UNRWA Technical Instructions to consider two out of three readings for the prior year.

- Knowledge, Attitude and Practice assessments, such as the one conducted among UNRWA medical officers, are subjective and scoring may vary according to experience and practice.

7. Conclusions and Recommendations

The clinical audit of the UNRWA Non Communicable Disease (NCD) care programme, with a focus on diabetes care, was a relevant exercise. It validated the general UNRWA approach to health service delivery and confirmed its capacity to manage diabetes care in a primary health care setting. At the same time, it conducted an in depth assessment of protocols, procedures and performance in NCD care, documenting in particular the strengths of UNRWA diabetes care and, more importantly, some critical shortcomings that will help identify priorities for further improvement.

The availability of competent health staff and of updated, scientifically documented protocols (Technical Instructions) are the main strengths of diabetes care in UNRWA health centres. The clinical audit confirmed that UNRWA medical providers working in diabetes care follow the Technical Instructions rigorously. Diabetes knowledge and care is appropriate as well as the capacity to correctly prescribe lifestyle and drug based treatments. Follow up blood and urine examinations are also conducted regularly as indicated in the UNRWA Technical Instructions.

Risk factors like high blood cholesterol and creatinine among diabetic patients are within an acceptable range of control. The proportion of patients developing late complications of diabetes is reasonable, though not low. According to UNRWA Technical Instructions, diabetes and hypertension are reasonably well controlled, around 45% for diabetes and 55% for hypertension.

Two main shortcomings were identified. The diabetes control rate among UNRWA patients as a result of HbA1c tests is lower than that measured using the currently applied method of 2-hr PPG (28% vs. 45%). Control rates are even lower among patients receiving insulin treatment (7.4% among type 1 diabetes patients). This result is an alarm bell. Estimating diabetes control through 2-hr PPG is misleading as it over-estimates control rates. Using HbA1c tests, control rates among UNRWA diabetes patients were found to be low. Improvement is needed for UNRWA diabetes care to be more effective.

The second shortcoming was the failure of lifestyle support activities. More than 90% of UNRWA diabetic patients are either obese (64%) or overweight (26.3%). If only female patients are considered, this proportion increases to almost 95%, of which 73.4% are obese. Reducing the prevalence of patients who are overweight or obese is a priority for UNRW. Lifestyle support activities need to be strengthened.

A comprehensive and strategic response that goes beyond the activities of the NCD care programme alone is needed to address such fundamental issues. The recently introduced Family Health Team reform offers an ideal framework.

UNRWA's extensive experience in diabetes care in primary health care settings and the capacity, experience and rigour of their medical providers are a solid foundation on which to improve diabetes care. In order to guide further actions aimed at modernizing and broadening diabetes care, action points conducive to addressing priorities for improvement have been elaborated by the UNRWA Health Department.

7.1 Action Points:

UNRWA will take comprehensive and strategic actions to address the fundamental shortcomings identified in the clinical audit by building on the historical capacity of UNRWA diabetes care in 139 health centres and the recently introduced Family Health Team reform.
Quick actions are needed to disseminate the clinical audit findings within and outside of UNRWA: By the end of 2013, UNRWA should finalize, publish and disseminate the clinical audit findings to all UNRWA Fields and national and international partners.
Dissemination aims to improve awareness of UNRWA's good basic capacity in diabetes care, and also highlight two major shortcomings (control rate and lifestyle support). Ongoing diabetes campaigns in the Fields are excellent opportunities for dissemination.
By the end of 2013, UNRWA will ensure quick improvement of the identified technical shortcomings, particularly the lack of regular fundoscopy examinations.

Strategic actions are needed in four areas:
1- Comprehensive support to patients living with diabetes (1 and 2) including medical treatment and lifestyle support,
2- Introduction of modern technologies and medicines for care of diabetes, comorbidity and co-conditions and related update of the Technical Instructions,
3- Comprehensive prevention activities for populations at risk of diabetes and other comorbidities: expansion of partnerships with local, national and international stakeholders, and, most importantly,
4- Staff capacity development in all these areas. UNRWA should consider involvement of nurses and other paramedical staff in a more proactive way in diabetes care delivery particularly for health promotion, education and adherence. This may require redefining their role with specific assigned duties.

7.1.1 Comprehensive Support for Diabetes Patients

There is a need to highlight the importance of lifestyle support in light of the extremely high obesity and overweight rates among type 2 diabetes patients. On going lifestyle support campaigns in 2013 need to be expanded and, more importantly, institutionalized. A comprehensive package of lifestyle support activities are needed that can be implemented in health centres with virtually no additional cost.

Special focus would also be given to the most vulnerable young type 1 diabetes patients.

- By the end of 2013, UNRWA will develop a comprehensive package of lifestyle support activities that can be implemented in health centres with virtually no additional cost.
- By the end of 2013, UNRWA will introduce new technologies (see below) and update the specific care package for young type 1 diabetes patients.

7.1.2 New Technology Introduction

The introduction of HbA1c testing, glucometers (for self-monitoring) and new medicines like statins are critical for the improvement of UNRWA diabetes care. It is unfortunately obvious that the current 2-hr PPG may not enable an optimal improvement of diabetes care. Such technologies and medicines are significantlyexpensive for UNRWA and need to be well prepared for and strategized.

- By the end 2013, UNRWA will develop a stepwise implementation plan for the introduction of modern technologies (HbA1c &glucometer) and medicines (statins) for patients who needand would benefit from them the most. This plan will need detailed costing estimates.
- By mid 2014, based on the possible stepwise introduction of new technologies and medicines, UNRWA willupdate the current Technical Instructions accordingly.

7.1.3 Comprehensive Prevention Activities

Comprehensive prevention activities for the general population at risk of diabetes and other comorbidities are critical. UNRWA will continue to care for patients living with diabetes. However, unless diabetes primary prevention is boosted, this effort will become overwhelming (both technically and financially) due to the increase in patients. There is a need for a comprehensive package of prevention activities which is doable with less cost implications as the backdrop of the on going diabetes campaigns. Partnerships are essential. UNRWA primary health care centres cannot make any decisive improvement in diabetes prevention and care by themselves.

- By the end 2014, through a critical assessment on the experience and possible impact of on going diabetes campaigns, UNRWA needs to develop a comprehensive package of preventive activities for diabetes and comorbidities for the general population at risk.
- By mid 2014, building on the partnerships developed for the 2013 diabetes campaigns,UNRWA needs to develop a wide-range of partnerships for diabetes care for Palestine refugees. The partnerships should be institutionalized and have established collaboration modes in the Fields.

7.1.4 Staff Capacity Development

Staff capacity development is the most critical strategic point. The clinical audit indicated a good knowledge of diabetes care among medical providers. However, there are shortcomings, particularly for lifestyle support and activities.

Before the introduction of new technologies and medicines, medical providers needproper training,particularly on HbA1c testing as it will drastically change the control status of patients and thus the need for counselling and changes in medical treatments.

- By the end of 2013, UNRWA needs to develop a comprehensive training package for UNRWA medical providers to update and improve their knowledge and skills on diabetes care.
- By mid 2014, UNRWA needs to begin comprehensive training activities based on the training package.

8. Annex 1: Patient Data Collection Form

WDF/UNRWA CLINICAL AUDIT ON DIABETES CARE

Data Collection Form

Basic Patient Data

Field [   ]

H/C [   ]   Centre ID [   ]   NCD No [   ]

Patient [   ]   Initials [   ]   Year of Birth [   ]

Year [   ]

SEX: Male [   ]   Female [   ]   Treated for diabetes in this clinic since:

[   ]

Residence: In Camp [   ]   out Camp [   ]

Type of Dm/Risk Factors

Type 1   Smoker: yes   No   Ex

                     Alcohols   yes   No   UK

Type 2

DM &HTN

Measurement

Weight (Kg) (last visit)   Height (cm)   BMI   waist   Blood Pressure (sitting) mm/hg

[   ]   [   ]   [   ]   [   ]   [   ]

Most recent within last 12 months

FPG (mg/dl: ....   Fasting Cholesterol (mg/dl: ....

2hr,PPG(mg/dl): ....   Fasting HDL Chol(mg/dl) : ....

No of BG Measurement: ....   Fasting triglyceride(mg/dl): ....

Hb1c done in 12 months   Yes   No   If Yes HBA1C

Serum Creatinine Tested   Yes   No   If Yes .... mg/dl

Urine albumin   Yes   No   If Yes Result   Neg + ++ more

Diabetes Complications

Legal Blindness   yes   No   UK

Fudoscopy   yes   No   UK

                            Yes   No   UK   If yes Self   Referred

Background Retinopathy	Yes	No	UK			
Advance Diabetic Eye Disease (specify)	Yes	No	UK			
Absent Foot Pulse	Yes	No	UK			
Acute Ulcer/Gangrene	Yes	No	UK			
Healed Ulcer	Yes	No	UK			
Peripheral Neuropathy	Yes	No	UK			
Amputation	If Yes	AK		BK		Toes
Hypertension	Yes	No	UK	If Yes	Treated	

Untreated

Cerebral Stroke	Yes	No	UK			
MI/Angioplasty	Yes	No	UK			
End Stage Renal Disease	Yes	No	UK	If Yes	Transplant	

Dialysis

Skin Infections	Yes	No	UK	If Yes	Bacterial	Fungal
Hypoglycaemia	Yes	No				

If yes – Number of Episodes Last month   Last 1 year

Documented by Blood sugar

Based on symptoms alone

Requiring third party assistance   Yes   No

Current Medication

Diabetes   Yes   No   If Yes   OHA   Insulin   Others

If OHA Glibenclamide Gliclazide   Metformin

Others ....   Traditional Herbal Medicine

If Insulin   Number of injection per Day

Dose units/day   Syringe   Pen

Injection Self   Assisted by family   Assisted by paramedics

Hypertension Yes   No   If Yes   ACE Inhibitors   B Blockers   Ca antagonists

a Blockers   Diuretics   Others

Hyperlipidemia   Yes   No   If Yes   Statins   Others .... From where?

.MOH / Private / Others

Self –Monitoring and Education

Home Blood Glucose   Yes   No   UK   If Yes -1 Fast blood Glucose

                                                        - 2 hr. blood Glucose

Home urine Glucose   Yes   No   UK   If Yes -1 Fast urine Glucose

                                                        - 2 hr. urine Glucose

Number of Home Urine Glucose/month ....

Number of Home Blood Glucose/month ....

Education episodes last year   1   2   3   4   5

Education   Diet   Hyperglycemia   Exercise   Foot care

Chronic Complications

                     Hypoglycemia   Others   UK

Physicyan (Compulsory)

.... / .... / ....   Signature   of   Physician

Date Month Year

Instructions
1- Write in English
2- Prefer Blue/Black Point Pen
3- One character in one Box
4- Do not write outside the boxes
5- Cross(X) only one
6- The Centre ID will be filled by the person supplying the forms
7- You have to enter only the patients three letter initials in the boxes provided
8- If only the patients Age is known instead of date of birth, please calculate the approximate year in the boxes
9- For all measurements enter the values right justified. For example, if the weight is 75kg, enter if as:
075.0 or 75.5
10- DO NOT USE PHOTOCOPY OF THIS FORM

9. Annex 2: Questionnaire for Medical Officers on Knowledge, Attitude and Practice (KAP)

Age .... Sex ....

Qualification..

Years of Practice .... Years of active Diabetes(NCD) Practice............................

Educational Programs /Conferences attended in last two years. Specify

- Workshop ....
- Courses ....
- Conferences ....

No. of patients seen/day .... No. of diabetic patients seen/day.........................

No. of new diabetics seen/week ....

Proportion of patients with different type of Diabetes

- Type1   .... %
- Type2   .... %
    - Norma   .... %
    - Overweight   .... %
    - Obese   .... %

Others   .... %

Proportion of patients receiving different forms of treatment for diabetes

- Diet and Exercise only   .... %
- Oral drugs only   .... %
    - Glibenclamide   .... %
    - Gliclazide   .... %
    - Metformin   .... %
    - Combination of two or more   .... %
- Insulin only   .... %
- Combination of insulin and oral drugs   .... %

Proportion of your insulin using patients who

- Self inject   .... %
- Depend of family   .... %
- Depend on paramedics   .... %

Proportion of patients using Insulin

Average vials per month/Patient   ....

Proportion of patients who self monitor at home

- Blood Glucose   .... %
- Urine Glucose   .... %

Proportion of patients who monitor at UNRWA clinic only

- Blood Glucose   .... %
- Urine Glucose   .... %

Frequency of blood glucose monitoring: Proportion of patients who monitor blood glucose

- Several times a day   .... %
- Once a day   .... %

- Once a week .... %
- Monthly .... %
- Bimonthly .... %
- Quarterly .... %
- Half yearly .... %
- Once a year .... %

When advising monitoring you recommend / rely more on

- FBS
- 2h PPG
- RBS
- OGTT

How often do you advice the following tests for your patients with diabetes

Test   Frequency e.g., never, monthly; weekly, yearly etc

- Hb1AC(outside UNRWA) ....
- Serum Cholesterol ....
- Serum triglycerides ....
- S. Creatinine ....
- Urine sugar and proteins ....
- ECG ....
- Chest X-ray ....
- Fundoscopy ....

How often do you check for the following in your patients with diabetes?

- Examination   Frequency e.g., never, monthly; weekly, yearly etc
- Foot Pulses ....
- Foot Sensation ....
- Blood Pressure ....
- Injection site ....
- Compliance to diet ....

Your patients are provided education/information about diabetes. Tick the box/s that best describes the situation in your clinic

- Never
- Always at the first visit
- At each visit
- As and when required
- When the patient asks questions
- When a patient develops a new problem

Who provides the education? ....

Name four most common clinical problems (among your patients) that you encounter in your practice?

....
....
....
....
....

Tick three of the following statements that best describe your practice on review of treatment options

- Every visit
- When blood sugar values are high
- When patient is symptomatic
- When a new complication sets in
- When patient develops side effects
- Every year based on results of annual checks
- When a new potentially beneficial therapy is introduced

How often do you refer your diabetic patients to other doctors (Specialist)?

- Always (at least 3 referrals per year)
- Never (Zero referral)
- Sometimes (one or two referrals per year)

Most common referrals are to:

 (tick the applicable)

- Ophthalmologists
- Diabetologists
- Nephrologists
- Cardiologist
- Gynaecologist
- Neurologist
- Others. Specify
- ....

When people are diagnosed to have diabetes what are the common problems/symptoms they present to you with

- Routine check / Pre surgical check   .... %
- Not feeling well/ Vague symptoms   .... %
- Tiredness / Bodyache   .... %
- Overweight   .... %
- Classic symptoms of diabetes   .... %
- Symptoms suggestive of complications   .... %
- Symptoms of associated conditions
 Tuberculosis; hypertension; CAD etc   .... %

Name the five most common complications of diabetes that you see in your practice?

- ....
- ....
- ....
- ....
- ....

You set goals and targets for control. Give values in the below table which according to your practice standard signify Good, Satisfactory and Poor control

Parameter	Good	Satisfactory	Poor
• FBS			
• 2HPPG			
• HbA1c			
• BP			

You modify the patients' treatment from time to time. In your view what % of your patients every year move from OHAs to Insulin ....

Reasons

- ....
- ....
- ....
- ....
- ....

Insulin to OHAs .... %

Reasons

- ....
- ....
- ....
- ....
- ....

Arrange the following reasons why patients resist insulin therapy even when they should be on it, in order of importance according to you

- It is painful
- It is complicated and difficult to understand
- It causes hypoglycemia
- Because they have to depend on someone to inject
- Because they are unaware of its advantage
- Because they are unaware of the consequences of uncontrolled diabetes
- Because others tell them they can manage without insulin

Arrange the following reasons why patients resist home monitoring, in order of importance according to you

- It is unnecessary
- It is costly
- It is painful
- It is unreliable
- To complex for them to understand
- They are afraid

Do you have anyone of the following to assist you in your diabetes practice?

- Dietician
- Nurse /Educator
- Podiatrist

How frequently do your patients visit you?

Frequency	Proportion of patients
• Weekly	.... %
• Monthly	.... %
• Bimonthly	.... %
• Quarterly	.... %
• Half yearly	.... %
• Yearly	.... %

Indicate the proportion patients managed by you for different duration of time

Frequency	Proportion of patients
• < 1 year	.... %
• >1 <3 years	.... %
• >3<5 years	.... %
• >5<7 years	.... %
• >7<10 years	.... %
• >10 years	.... %

Tick what apply, the reasons why patients do not comply with given instructions

- They cannot understand the instructions/ reason
- It is an attitudinal problem
- Changes required are too much to cope with
- No family/ societal support/resources
- They seek alternate sources/ are lured by alternate sources
- Doctors are unable to provide time/understanding/proper knowledge
- They are uneducated/poor
- They don't care till complications set in.

According to already used criteria for control status of Diabetes ,patients can be rated as having

- Controlled .... %
- Uncontrolled .... %

In terms of BP control proportion of patients in your practice that can be rated as having

- Controlled .... %
- Uncontrolled .... %

In your view what proportion of your diabetic patients, (more than 1 year with you) have the following

- BMI > 25
- S.Triglycerides > 150mg/dl
- S. Cholesterol > 200mg/dl
- S Creatinine > 2mg/dl
- BP above 140/90 mm of Hg
- Retinopathy
- Peripheral Neuropathy

10 Annex 3: UNRWA flow chart for the management of diabetes mellitus

Failure of non-pharmacological measures, (education, diet and excercise) within 2 - 4 months

Reassess lifestyle interventions to maximize benefits

BMI≥30

No →

Monotherapy
Start either:
1. Glibenclamide 2.5-5 mg once daily, increasing dose to maximum daily dose 20 mg (two divided doses)
2. Metformin 500 mg once daily, increasing dose over 3-4 weeks (maximum daily dose 3 grams in divided doses (3 times/day)
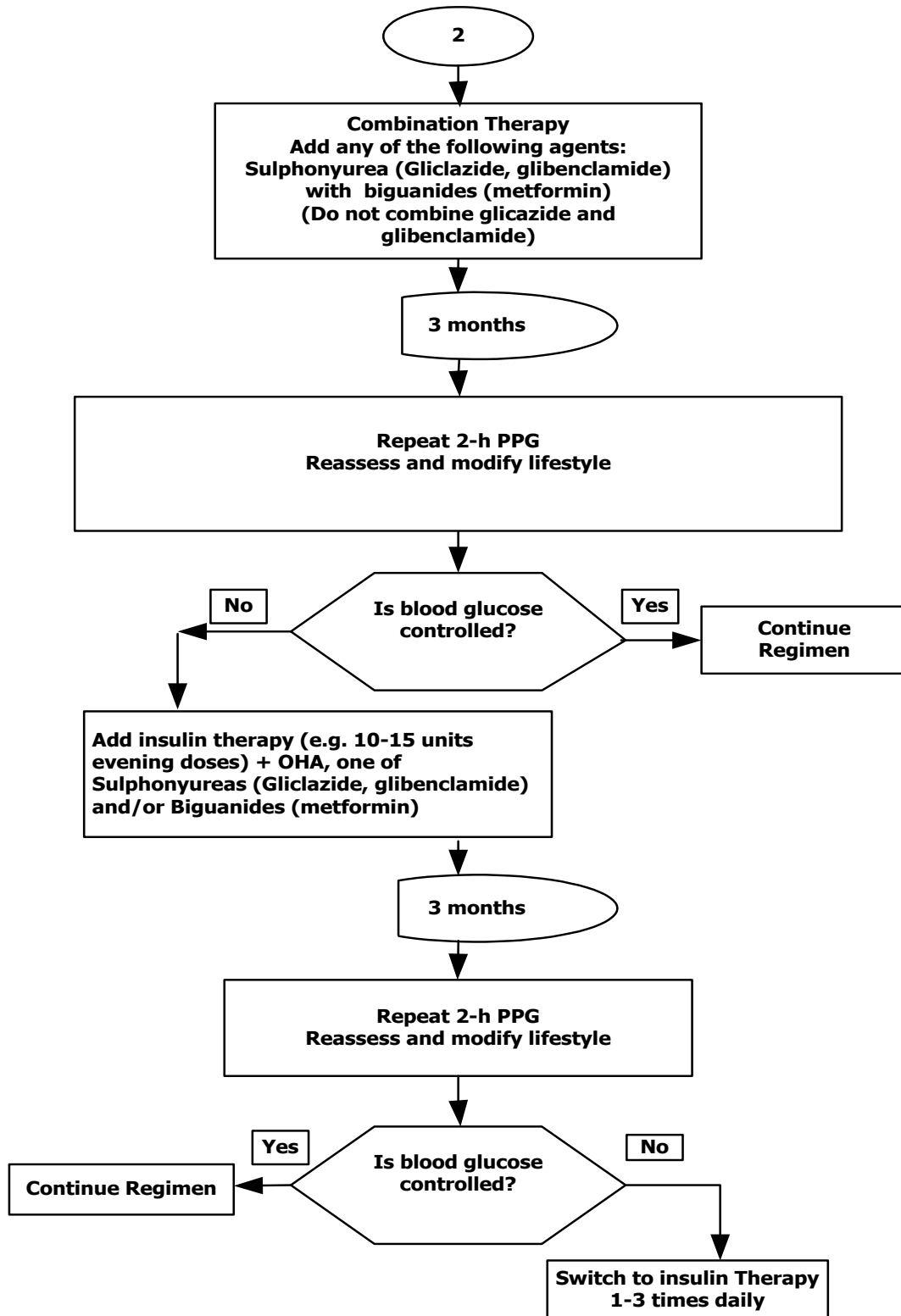3. Gliclazide 40-80 mg once daily, increasing to maximum of 320 mg over 3-4 weeks doses higher than 160mg should be divided.

Yes →

Monotherapy
Start metformin 500 mg once daily, increasing dose over 3-4 weeks (maximum daily dose 3 grams in divided dosage (3 times/day)

3 months

Repeat 2-h PPG
Re assess and modify lifestyles

Is blood glucose controlled?

No → **Combination Therapy** → 2

Yes → **Continue Regimen**

2

Combination Therapy
Add any of the following agents:
Sulphonyurea (Gliclazide, glibenclamide)
with biguanides (metformin)
(Do not combine glicazide and
glibenclamide)

3 months

Repeat 2-h PPG
Reassess and modify lifestyle

No **Is blood glucose controlled?** **Yes** → **Continue Regimen**

Add insulin therapy (e.g. 10-15 units evening doses) + OHA, one of Sulphonyureas (Gliclazide, glibenclamide) and/or Biguanides (metformin)

3 months

Repeat 2-h PPG
Reassess and modify lifestyle

Yes **Is blood glucose controlled?** **No**

Continue Regimen

Switch to insulin Therapy 1-3 times daily

REFERENCES

1   Diabetes Atlas, International Diabetes Federation 2012 (available at **http://www.idf.org/diabetesatlas/5e/Update2012)**

2   Modern and efficient UNRWA Health Services. Family Health Team Approach. 05 July 2011 (available at **http://www.unrwa.org/userfiles/file/publications/Health%20Reform%20Strategy.pdf)**

3   Technical instructions on Non-communicable Diseases.The United Nations Relief and Works Agency for Palestine Refugees in the Near East (2009).4th revision.

4   The United Nations Relief and Works Agency for Palestine Refugees in the Near East, Annual report Department of Health, 2012 (available at **http://www.unrwa.org/userfiles/file/publications/HealthReport2012.pdf)**

5   The United Nations Relief and Works Agency for Palestine Refugees in the Near East, Annual report Department of Health, 2011

6   Non communicable diseases country profiles 2011. WHO global report (available at **http://www.who.int/nmh/publications/ncd_profiles2011/en/)**

7   Guidelines of the International Diabetes Federation (available at **http://www.idf.org/guidelines)**

8   WHO Jordan NCD Country Profile (available at **http://www.who.int/nmh/countries/jor_en.pdf)**

9   Husseini A, Abu-Rmeileh NM, Mikki N, Ramahi TM, Ghosh HA, Barghuthi N, Khalili M, Bjertness E, Holmboe-Ottesen G, Jervell J. Cardiovascular diseases, diabetes mellitus, and cancer in the occupied Palestinian territory. Lancet. 2009 Mar 21;373(9668):1041-9. doi: 10.1016/S0140-6736(09)60109-4.

10 Al-Hazzaa H. M.,(2012). Prevalence and risk factors associated with nutrition-related non-communicable diseases in the Eastern Mediterranean region. International Journal of General Medicine.Vol 5: 199–217.