Deanship of Graduate Studies
Al-Quds University

Oral Health Problems among Type 2 Diabetic Patients Attending UNRWA Health Centers in Gaza Governorates

Emad Ibrahim Al-qedra

MPH Thesis

Jerusalem-Palestine

1439 / 2018

Oral Health Problems among Type 2 Diabetic Patients Attending UNRWA Health Centers in Gaza Governorates

Prepared by

Emad Ibrahim Al-qedra

Bachelor of Dental surgery- LUMHS Sindh, Pakistan

Supervisor: Prof.Dr.Yousef Ibrahim Aljeesh

PhD, Dean of the Faculty of Nursing Islamic University

Gaza, Palestine

Thesis Submitted in Partial Fulfillment of Requirements for the Degree of Master of Public Health/Health Management

School of Public Health- Al-Quds University

1439 / 2018

Dedication

I dedicate this dissertation to the memory of my late father, who was my inspiration for this study

To my extraordinary mother and my beloved wife "Shaimma" for being the greatest source of inspiration, continuous support, kind words, and encouragement

To my brothers and sisters for giving me the faith and passion to complete my dissertation.

To the light of my eyes... my kids

I dedicate this research for all of them…

Emad Ibrahim Al-qedra

Declaration

I certify that this thesis submitted for the degree of master is the result of my own research, except where otherwise acknowledged, and that this thesis or any of its parts has not been submitted for higher degree to any other university or institution.

Signed:

Emad Ibrahim Al-qedra

Date: 11/8/2018

Acknowledgment

It is very hardto find words too humble to express the deep and sincere appreciation and gratitude to be extended to my supervisor Prof.YousefAljeesh, for his guidance and continued support.

Deep thanks are extended to Dr. Ghada Al Jadba, the chief health director in UNRWA health program for her support in conducting and collecting the data of the study and all my colleague; senior medical officers, dentists and practical nurses for their great efforts in the process of data collection Special gratitude also to Dr. Mohammed UbaidandDr.ZohirElkhateebfor their valuable and great efforts.

Special thanks and respectful appreciation to Dr.Khitam Abu Hamad, Dr.Bassam Abu Hamad,Dr.IssaSaleh,andDr.SalwaElmajdalawy for their guidance and for their kind support in reviewing the study instrument. Deep thanks must also go for the experts who reviewed the study tools and provided fruitful feedback.

I would also like to thank my wife and my family for unlimited support, appreciationand continuousencouragement.

Finally, my appreciation is presented to all who provide me an advice, support, information, or encouragement in order to complete my master study.

Sincere thanks to my colleagues; staff and friends at the school of public health and UNRWA health department.

Yours faithfully

Emad Ibrahim Al-qedra

Abstract

Oral health is an essential component of general health, oral diseases have a negative social impact and adverse consequences on the quality of life, while their treatment places a considerable economic burden on individuals, communities and countries. Oral diseases are related to a number of risk factors and determinants that are common to diabetes mellitus which have oral implications. This study aimed to highlight oral health problems among type 2 diabetic patients attending UNRWA health centers in Gaza Governorates. The type of the study is an analytical cross-sectional study, 406 patients with type 2 DM selected through systematic random sampling from 5 UNRWA health centers. The World Health Organization's basic methods tools were used to collect data and assess oral health.

Results showed 36.3% of participants never brush their teeth, only 16.5% brush their teeth twice or more a day, (53.9%) hadn't faced teeth/mouth pain or discomfort during the past 12 months. The mean decayed missing filled teeth (DMFT) score was 18.6, only 16.4% of participants have no gingival bleeding, the mean number of teeth showing no gingival bleeding is (9.79), showing gingival bleeding (9.91), and not present for bleeding test (9.14). While 2.4% have no periodontal pockets, the mean number of teeth showing absence of pocket (7.15), showing pocket 4-5 mm (7.84), showing pocket 6 mm or more (4.96) and not present for pocket measurement (9.13). No treatment was needed for 8.4%, while prompt treatment including scaling was needed for 70.1% of participants. Unavailability of all oral health services and far appointment were the most common challenge facing participants at UNRWA health centers.DMFT index was a statistically significant associatedwith Age, educational level, employment status, frequency of teeth brushing, diabetic duration, andglycatedhemoglobin (HbA1c). DMFT index was higher among males' participants and participants under the deep poverty line. Gingival bleeding was statistically significant associated with gender, and frequency of teeth brushing, but there was no statistically significant association between gingival bleeding and periodontal pocket, and socio-demographic, glycated hemoglobin (HbA1c) and diabetic duration.

The present study concluded that patients with type 2 DM have many oral health problems, and unaware of oral implications of diabetes, a new UNRWA strategy for oral health must be devised for non-communicable disease patients based on increasing awareness of diabetic patients and health providers about oral implication of diabetes mellitus, furthermore more similar studies should be conducted at national level and among school students, pregnant women, and preconception women.

List of contents

Chapter (4) Results and discussion

Chapter (5) Conclusion and Recommendations

Chapter (6)

List of tables

List of figures

List of annexes

List of abbreviations

ANOVA One way Analysis of Variance

CPI Community Periodontal Index(modified)

CPITN Community Periodontal Index and Treatment Need

DM Diabetes Mellitus

DMF Decayed, Missing and Filled

DMFT Decayed, Missing and Filled Teeth Index

FDI Federation DentaireInternationale

GG Gaza Governorates

GS Gaza Strip

GB Gingival Bleeding

HC Health Center

MOH Ministry of Health

NCD Non Communicable Disease

OPT Occupied Palestinian Territory

OH Oral Health

OHA Oral Health Assessment

PCBS Palestinian Central Bureau of Statistics

PD Periodontal Diseases

PP Periodontal Pocket

SPSS Statistical Package for Social Science

SES Socioeconomic Status

UNRWA United Nations Relief and Works Agency for Palestine Refugees in the Near East

WHO World Health Organization

Chapter 1

Introduction

1.1 Background

As a basic human right, an essential component of general health and important determinant factor for quality of life, oral health provides clues of overall health and reflects well-being of people. Poor oral health is accompanied by poor general health, so oral health and general health are related to each other and should be integrated rather than separated from each other. However the impairment of the ability to breath, eat, swallow, speak, and smile will interfere with the ability to interact with others, attend school, and work (WHO, 2016a). Furthermore, oral diseases have a negative social impact and adverse consequences on the quality of life of affected people, while their treatment places a considerable economic burden on individuals, communities and countries (WHO, 2016b).

The World Health Organization (WHO) defines oral health as " a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being" (WHO, 2012).

The most common oral diseases are dental cavities, periodontal (gum) disease, oral cancer, oral infectious diseases, trauma from injuries, and hereditary lesions. The mouth is a "Gate" of the body, reveals signs of general health disorders.However oral conditions have an impact on overall health and disease. Bacteria from the mouth can cause infection in other parts of the body when the immune system has beencompromised by disease or medical treatments (DHF, 2017).Systemic conditions and their treatment have an impact on oral health (e.g., reduced saliva flow, an altered balance of oral microorganisms). Periodontal disease has been associated with a number of systemic conditions. Major chronic diseases – for instance, cancer, diabetes mellitus and heart disease – share common risk factors with oral disease; so it is obvious that oral health is a basic component of health and must be considered and included in the provision of healthcare and the design of community programs(DHF, 2017).

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period (WHO, 2016c). Symptoms of elevated blood sugar include frequent urination, increased thirst, and

increased hunger. If left untreated, diabetes can cause many complications(WHO, 2013a), acutecomplications can include diabetic ketoacidosis, non-ketotic hyperosmolar coma, or death(Kitabchiet al., 2009). Serious long-term complications include heart disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes(WHO, 2013a).

During 2016, 422 million people have diabetes worldwide, up from an estimated 382 million people in 2013and from 108 million in 1980 (WHO, 2016c). Accounting for the shifting age structure of the global population, the prevalence of diabetes is 8.5% among adults, nearly double the rate of 4.7% in 1980(Shi and Hu, 2014). Type 2 makes up about 90% of the cases(Shlomo et al., 2011).On Gaza strip, with over 2 million population, more than 70% are refugees, and 90% of them served by UNRWA health centers, about 40000 diabetic patients are followed by 22 health centers at Gaza field according to UNRWA health report 2015, with a prevalence of 15.1% among served population over 40 years old (UNRWA, 2016 a).

Oral complications of DM include xerostomia (mouth dryness), periodontal disease, dental caries, sialosis, taste impairment, fungal infections, oral lichen planus, geographical and fissured tongue, and severe temporomandibular joint dysfunction(Al-Maskariet al., 2011).

Several soft tissue abnormalities have been reported to be associated with diabetes mellitus in the oral cavity. These complications include periodontal diseases (periodontitis and gingivitis); salivary dysfunction leading to a reduction in salivary flow and changes in saliva composition, and taste dysfunction. Oral fungal and bacterial infections have also been reported in patients with diabetes(Al-Maskarietal., 2011). There are also reports of oral mucosal lesions in the form of stomatitis, geographic tongue, benign migratory glossitis, fissured tongue, traumatic ulcer, lichen planus, lichenoid reaction and angular cheilitis. (Sandbergetal., 2000; Guggenheimeretal., 2000). Furthermore, delayed mucosal wound healing, mucosal neuro-sensory disorders, dental carries, and tooth loss has been reported in patients with diabetes(Lamster and Lalla, 2008). The prevalence and the chance of developing oral mucosal lesions were found to be higher in patients with diabetes compared to healthy controls(Sainietal., 2010).

Many studies have revealed that periodontal infection and DMhave a two-way relationship(Lalla and Lamster, 2012;Taylor, 2001).Löestated that periodontal disease is the sixth most common complication of DM(Löe, 1993),whereasLalla and

Lamsterreported that DM is the strongestrisk factor for periodontal infection compared to the other systemicconditions such as hypertension(Lalla and Lamster, 2012).

Because of increased awareness that oral health is important component of general health, and because oral health sharing non communicable diseases same risk factors, along with desire to improve general health, wellbeing of the patients and promote oral health of patients with NCD; in 2012 oral health assessment of NCD patients was introduced into UNRWA primary health care centers. The scarcity of studies about diabetes oral health status and needs is enhancing this study to assess the oral health of diabetic patients attending UNRWA health centers in Gaza governorates in order to identify their dentition and periodontal status for determining their oral health needs and discover challenges facing them to maintain their oral health.

1.2 Research problem

It's known that oral health is a crucial element of general health and play a major role in the quality of life that is why oral health presents clues of overall health.Diabetes is certain to be one of the most challenging health problems in the 21st century. Uncontrolled diabetes has several oral complications, awareness regarding maintenance of oral health is important for long-term control of diabetes(Lacopino, 2001; Pradeepa and Mohan, 2002).

To date, in Palestine no studies were conducted about diabetic patients' oral health or oral complications of DM. Generally, studies concerning oral health care of the population are scarce in Palestine.

Despite the increased awareness that oral health is an important component of general health, combined with a desire to improve health services provided to diabetic patients attending UNRWA health centers, still oral health is ignored and still, oral health needs more attention and assessment.

The concept of needs, demands and challenges are crucial for the planning, provision, and evaluation of health services. Where there is a gap in information about oral health needs and demand of diabetic patients attending UNRWA health centers Accordingly, this study will try to determine oral health needs of diabetic patients and identify common challenges facing them seeking oral health care in order to improve the overall health services provided for diabetic patients.

1.3 Justification

Oral health is essential to general health and well-being at every stage of life. A healthy mouth enables not only nutrition of the physical body, but also enhances social interaction and promotes self-esteem and feelings of well-being(DHF, 2017).

Living without teeth severely affects the quality of life and can lead to unhealthy diets, malnutrition and social isolation, oral diseases resulting in millions of days of work lost in many countries thus oral diseases are major causes of economic and social loss of individuals and countries(FDI, 2014)

Oral diseases are related to a number of risk factors and determinants that are common to many other chronic diseases particularly cardiovascular diseases, cancer, respiratory diseases and, diabetes. Tackling such a common risk factor as tobacco use, high sugar intake and lack of physical activity will reduce the burden of a number of high-impact diseases. Major risk factors as well as broader determinants such as socioeconomic status which affects oral and general health.That is why, a common approach to reduce and prevent these risks will not only improve oral health but will also have a vast impact on the global burden of NCDs, health system and general development progress(FDI, 2014).

Despite most oral diseases are preventable, almost everyone is likely to be affected by during the lifetime. oral diseases have a significant impact in the quality of life of individuals, their participation in the society and economic productivity as well as on the health system, making oral diseases a significant public health concern(FDI, 2014).

Even though there is no comprehensive data of the economic coast of oral diseases globally or locally, the WHO estimates that they are the fourth most expensive condition to treat- if a curative approach is taken, rather than a focus on prevention. The expenditure on dental care as a percentage of total health expenditure is often lower than 6%(Petersen, 2003).

Diabetes mellitus is a systemic disease with several complications affecting the quality of life. Diabetes is certain to be one of the most challenging health problems in the 21st century.Uncontrolled diabetes has several oral complications. Awareness regarding maintenance of oral health is important for long-term control of diabetes(Lacopino, 2001; Pradeepa and Mohan, 2002).

In Gaza strip, with over 2 million population, more than 70% are refugees, and 90% of them served by UNRWA health centers, About 40000 diabetic patients are followed by 21 health centers at Gaza field. According to UNRWA health report 2015,the prevalence is 15.1% among the served population over 40 years old(UNRWA, 2016 a).

Palestinian refugees passing into epidemiological transition period toward non-communicable diseases, mainly diabetes, where the impact of diabetes on morbidity and mortality is severe and increasing (UNRWA, 2016 a). There are many oral sequences and complications of diabetes mellitus, and periodontal infection which is the sixth most common complication ofDM the and DMhave a two-way relationship(Preshawet al., 2012).

Despite the magnitude of oral diseases and their systemic linkage with others illnesses, oral health is commonly neglected and studies concerning oral health care of thepopulation are scarce in UNRWA. There are only a few reports providing information about dental care procedures provided for registered refugees, and statistical report about oral screening which include patients with NCD, those reports do not give us any information about dentition status, periodontal status and oral health needs of such population.

The concept of need and challenges are central to the planning, provision and, evaluation of health services. For effective planning and evaluation of any health service, both estimates of levels of need, as well as challenges on seeking behavior for treatment, should be taken into account.

The aim of the present study will determine oral health problems and challenges of oral health after assessment of the dental and periodontal status of type 2diabetic patients attending UNRWA health centers in Gaza governorates patients.

The study could be able to provide the public health decision makers a baseline for a new strategy for oral health services for non-communicable disease patients or retrieves the excitant services where epidemiological data are valuable.

1.4 Study objectives

1.4.1 General objective

The aim of this study is to highlightoral health problems among type 2 diabetic patients attending UNRWA health centers in Gaza Governorates in order to know oral health problems of type 2 diabetes mellitus and determine their oral health need along exposing

the most common challenges facing them on seeking oral health services at UNRWA health centers.

1.4.2 Specific objectives

1- To assess oral health of type 2 diabetic patients attending UNRWA health centers.

2-To determine oral health needs of type 2 diabetic patients attending UNRWA health centers.

3-To identify the common challenges faced by type 2diabetic patients seeking oral health in UNRWA primary health centers in Gaza governorates

4-To develop recommendations to improve the oral health services provided to diabetic patients attending UNRWA health centers.

1.5 Research questions

1) What are the oral health problems of type 2 DM patients attending UNRWA health centers?

2) What are the dental and periodontal health status of type 2 DM patients attending UNRWA health centers?

3) Is there an association between dental caries and periodontal diseases, and socio-demographic characteristics oftype 2 DM patients attending UNRWA health centers?

4) Is there an association between dental caries and periodontal diseases, and diabetic duration or HbA1c?

5) Is there an association between dental caries and periodontal diseases, and frequency of teeth-brushing?

6) What are the oral health needs among type 2 DM patients attending UNRWA health centers in Gaza governorates?

7) What are the most common challenges faced by type 2diabetic patients seeking oral health in UNRWA primary health centers in Gaza governorates?

1.6 Context of the study

1.6.1 Demographic Context

The Gaza Strip is a narrow band of land; lying on the Mediterranean Sea; According to **P**alestinian **C**entral **B**ureau of **S**tatistics (PCBS) it is 45 kilometers long and 6-12 kilometers wide with an area of 378 square kilometers(PCBS, 2015). The Gaza Strip comprises a narrow zone of land located in the southwest part of Palestine with about 1.91 million inhabitants.It is composed of five governorates: North Gaza, Gaza, Deir El-Balah, Khan Younis, and Rafah. In the occupied Palestinian territories (OPT), Gaza governorate has the second highest number of population with 13.4% of the total population, which comes after Hebron with 15,1% of the total population.According to the PCBS, the high population density in Palestine in general and especially in the GS is due to the concentration of about 2.1 million people in an area not exceeding 365 km^2. Those people are mostly Palestinian refugees who had to abandon their families to flee from the occupied towns in 1948, in addition to high natural increase of the Gaza Strip population. In 2018 the estimated population density was 823 individual/km^2 in Palestine, 532 person/km^2 in the West Bank versus 5324 individual/km^2 in the GS (PCBS, 2018a).After the end of the First World War, historical Palestine was placed under the British Mandate and from 1948 to 1967 the GSwas under the Egyptian Administration, then it was occupied by the Israeli army in June 1967. Then according to Oslo agreement the Israelis officially handled the GS to the Palestinian Authority in 1994 with partial autonomy that lead to improvement of the social and economic status of the Gazan people till the setting up of Intifada in 2000 where the political and socioeconomic situation started to deteriorate and reached to the maximum disaster in June 2007 where a terrible event occurred “the internal division” and Gazan people started to suffer from its sequences, a tight siege has been imposed on the GS to control borders, movement of goods and travelers and form that terrible event Israel launched three large scale aggressions on the GSwhich resulted in thousands of deaths and injuries among people and damage of thousands of houses, manufacture compounds, agricultural resources(Elshaer, 2015).

During 2018, the total population who live in the Gaza Strip and West Bank was about 5 million, including about 2.1 million in the GS. Based on these estimates the urban population is accounted for 73.9% in 2016 and the percentage of the population living in the rural area is 16.6%, while in the refugee camps accounted for 9.5%. The Palestinian

community in the GS residents' young more heavily than it is in the West Bank, estimated the proportion of individuals in the age group (0-14) in the middle of the year 2017 was 38.9% of the total population in Palestine, by 36.6% lived in reality in the West Bank and 42.6% in the Gaza Strip (PCBS, 2018a).

The Occupied Palestinian Territories has a young population as the percentage of individuals aged (0-14) constituted 39.4% of the total population. The elderly population aged (60 years and over) constituted only 2.9% of the total population(MOH, 2016).

1.6.2 Socioeconomic Context

The economic situation in the Gaza Strip is terriblycharacterized by poor and low income, the complicated political and economic situation worsen the life of peopledue to the high grade of uncertainty and recurrent disasters(Elshaer, 2015). People suffer from the tight siege that restricts passing of goods and aids across the borders, both importing and exporting goods to and from Gaza are restricted. The Palestinian economy has severely damaged because of the current political situation and the siege imposed on the Gaza Strip. Since the end of the second intifada, Israel has imposed ablockade on the GS in addition to recurrent wars and other invasive attacks on the territory resulted in degraded economic conditions and mass destruction of infrastructure and industry. Israeli-imposed border closures, which became more restrictive after Hamas seized control of the GS in June 2007, have resulted in high unemployment, elevated poverty rates, and a sharp contraction of the private sector that had relied primarily on export markets. According to the Labour Force Survey Results Fourth Quarter (January– March, 2018) Round, the labour forceparticipation rate of individuals aged 15 years and above was 45.4%, The number of individuals participating in the labour force in Palestine was 1,340,200 in the 1st quarter 2018; 820,900 in the West Bank and 519,300 in Gaza Strip. The labour force participation rate in the West Bank was 44.9% and 46.2% in Gaza Strip, the gap in the participation rate between males and females in Palestine still very big where it reached 70.3% for males compared with 19.9% for females. Furthermore, 30.2% the unemployment rate among labour force participants where the number of unemployed was 404,800 in the 1stquarter 2018; distributed as 255,000 in Gaza Strip and 149,800 in the West Bank. The unemployment rate in Gaza Strip was 49.1% compared with 18.3% in the West Bank in the 1stquarter 2018, and the unemployment rate for males in Palestine was 25.0% compared with 48.9% for females.The highest unemployment rate in the 1stquarter 2018 was 49.6% among youth aged 20-24 years. For years of schooling, the highest

unemployment rate among females with 13 years of schooling and more was 52.2%. (PCBS 2018b).

Due to the closures and blockade imposed on the GS and the beginning of serious crackdown on the tunnels that ran under the Egyptian border to bring in fuel, construction materials, and consumer goods in July 2013, the population in GS has experienced a decline in living conditions, with deteriorating infrastructure and poor quality of vital services such as health, shelter, education, water and sanitation. About 54% of Gazans are food insecure and a further 12% are vulnerable to food insecurity (PCBS, 2016).

1.6.3 Health Care System

Palestinian health care system is complex as there are four main providers for healthcareservices; MOH, UNRWA, Non-Governmental Organizations (NGOs) and the private for-profit serviceproviders. MOH is the main health care provider; it provides primary, secondary, and tertiary services and purchase advanced medical services through referring patients to the neighboring countries and other private and NGO healthcare facilities, it also plays a role in providing and controlling immunization scheme, public health activities, licensing and registration of health facilities. MOH is the main PHC provider that operates 472PHCs; 54 in GS and 418 in WB, While NGOs manage210PHCs; 81 in GS and 129 PHCs in WB(MOH, 2014). Compare to UNRWA that operates 64 PHCs; 22 in GS and 42 in WB (UNRWA, 2016 b).

In the GS the provision of health care services is adversely affected by the continuous Israel siege and the internal political division, while the primary and secondary health sector continue to function it faces many challenges as shortage of essential drugs and consumable at MOH facilities.

Despite of previous, it is worth to mention that the health sector has exerted significant efforts not only to maintain health services but also to improve and present some new services such as opening of new specialized services at MOH hospitals as cardiac surgery and cardiac catheterization, introducing new schemes for health services as Family Health by UNRWA (MOH, 2014).

According to Palestinian Health Information Center (PHIC), life expectancy at birth for Palestinians in the occupied Palestinian territory was 73.7 years in 2016; in the same year, infant mortality for Palestinians in the occupied Palestinian territory, including east Jerusalem was 10.5 per 1000 live births and under 5 mortality was 12.2 per 1000

(PHIC,2017).Health inequalities exist with generally worse health outcomes in the Gaza Strip compared to the West Bank: for instance, the Ministry of Health reported maternal mortality to be 15.5 per 100 000 births in the Gaza Strip compared to 12.4 in the West Bank in 2016. The year 2017 marked 10 years of blockade of the Gaza Strip, with a concerning stagnation or deterioration of several health indices, including infant and neonatal mortality. There also exist considerable health inequalities between the Palestinian population and the 611 000 Israeli settlers in the West Bank (OCHA, 2017).

While the occupied Palestinian territory boasts consistently high rates of childhood vaccination and well-established systems for the surveillance of communicable diseases, the burden of non-communicable diseases is rising. Cardiovascular disease, cancer and cerebrovascular disease cause just over half of all deaths among Palestinians in the occupied Palestinian territory, according to data from the Ministry of Health (PHIC, 2017). The Palestinian Women living in Gaza Strip showing high Fertility Rates, the mean number of children ever born for women ever married in Palestine in 2017 is 4.4 births, of which 4.3 births for women living in the West Bank and 4.5 births for women in Gaza Strip (PCBS, 2018a).

1.6.4 UNRWA

UNRWA is the United Nations Relief and Works Agency for Palestine Refugees in the Near East that provides health, education and relief services that becomes the largest humanitarian operation in the occupied Palestinian territory. Originally it intended to provide jobs on public works projects and direct relief for 652,000 Palestinian Arabs who fled or were expelled by Israel gangs during the fighting that followed the end of the Britishmandate over Palestine. Today it provides education, health care, social services and emergency aid to some 5 million Palestinian refugees and it has been the main health care provider over 65 years that provides a comprehensive health care from maternal and child health care, infant care and immunizations, school health, oralhealth, consultations, diagnostic or laboratory services for management of non-communicable diseases (UNRWA, 2016 b).

UNRWA is the second primary health care provider in the GS that plays an important role in health services delivery, providing free of charge PHC and purchasing secondary and tertiary services for the registered Palestinian refugees. The mandate of its health program is to protect, preserve and promote the health status of Palestinian refugees within the

agency’s five areas of operation (Jordan, Lebanon, Syria, Gaza Strip and West bank) through 138 PHC centers and 1 hospital in Qalgelia in WB. In the recent years UNRWAhealth program faced many challenges, the main of them was its vertically-oriented health services through maternal and child care, non-communicable disease care and general clinical care such services are not integrated, this challenge faced the epidemiological transition among Palestinian people including refugees with a shift of diseases from communicable ones to non-communicable which appears in the higher rates of diseases including heart diseases, cancer, hypertension and cardiovascular diseases and diabetes mellitus which become the leading causes of death to general population including Palestinian refugees and account for 70 to 80% of causes of deaths (UNRWA ,2016 a). Addressing the above challenges UNRWA has begun the health reform in June 2011 by adopting the family health team (FHT) approach and e-health asthe core strategy of the reform to strengthen primary health care. FHT is a family-centered,continuous and comprehensive primaryhealth care delivery, focusing not only on curativecare but also on the promotion of healthand healthy lifestyle. E-health iscomposed of the electronic medical records developed by UNRWA to improve patients’datamanagement and the improvement of theoverall health services (Elshaer, 2015).

1.7 Operational definitions

1.7.1 Diabetes mellitus.

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period.

Type 1 DM results from the pancreas's failure to produce enough insulin. This form was previously referred to as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The cause is unknown.

Type 2 DM begins with insulin resistance, a condition in which cells fail to respond to insulin properly (WHO, 2016d).

1.7.2 Oral Health Assessment

1.7.2.1 Oral Health;

It is a state of being free from the mouth and facial pain, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that

limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial well-being(WHO, 2012).

1.7.2.2 DMF Index;

The DMFI (Decayed-Missing-Filled Index) is one of the simplest and most commonly used indices in epidemiologic surveys of dental caries. DMF was introduced by Klein,Palmer,and Knutsonin 1938 and modified by WHO 1987 and 1997 (WHO, 1997).

1.7.2.3 The community Periodontal Index Treatment NeedCPITN

The CPITN Index was developed by the **F**ederation **D**entaire**I**nternationale(FDI) and World Health Organization in 1982. This index was designed to assess the treatment needs of specific groups. It can be used as a screening or monitoring tool to determine the periodontal treatment needs of either a community or an individual. Only six measurements per a person are recorded, so it is time efficient when assessing a large group(Khamrco, 1999).

1.7.2.4. Dentition *Status*

The examination for dental caries was conducted with a plane mouth mirror. The use of radiography for detection of approximal caries is not recommended because the equipment is impractical to utilize in most field situations. Likewise, the use of fibreoptics is not recommended. Although it is recognized that both these diagnostic aids reduce the underestimation of dental caries, logistical complications and frequent objections on the part of subjects to exposure to radiation outweigh any potential gains.Examiners adopted a systematic approach to the assessment of the dentition status, bearing the following points in mind:

• The examination proceeded in an orderly manner from one tooth or tooth space to the adjacent tooth or tooth space.

• Atooth wasconsidered present in the mouth when any part of it is visible

• If a permanent and primary tooth occupies the same tooth space, the status of the permanent tooth only should be recorded.

Code			Condition/status
Primary teeth	Permanent teeth		
Crown	Crown	Root	
A	0	0	Sound
B	1	1	Caries
C	2	2	Filled, with caries
D	3	3	Filled, no caries
E	4	–	Missing due to caries
–	5	–	Missing for any other reason
F	6	–	Fissure sealant
G	7	7	Fixed dental prosthesis abutment, special crown or veneer/implant
–	8	8	Unerupted tooth (crown)/unexposed root
–	9	9	Not recorded

Table 1.1. Coding the dentition status – primary and permanent teeth

The criteria for diagnosing a tooth status and the coding were as follows:

0 Sound *crown.* A crown was coded as sound if it showed no evidence of treated or untreated clinical caries. The stages of caries that precede cavitation, as well as other conditions similar to the early stages of caries, were excluded because they cannot be reliably identified in most field conditions in which epidemiological surveys are conducted. Thus, a crown with the following defects, in the absence of other positive criteria, was coded as sound:

• White or chalky spots; discolored or rough spots that are not soft to touch with a metal CPI probe;

• Stained enamel pits or fissures that did not have visible cavitation or softening of the floor or walls detectable with a CPI probe;

• Dark, shiny, hard, pitted areas of enamel in a tooth showing signs of moderate to severe enamel fluorosis;

• Lesions that, on the basis of their distribution or history, or on examination, appeared to be due to abrasion.

1 Carious crown. Caries was recorded as present when a lesion in a pit or fissure, or on a smooth tooth surface, has an unmistakable cavity, undermined enamel, or a detectably softened floor or wall. A tooth with a temporary filling, or one which was sealed but also decayed, was included in this category. In cases where the crown has been destroyed by caries and only the root is left, the caries was judged to have originated in the crown and is therefore scored as crown caries only.

The CPI probe was used to confirm visual evidence of caries on the tooth surface(s). Where any doubt exists, caries was not recorded as present.

2 Filled crown, with caries. A crown was considered filled, with decay, when it had one or more permanent restorations and one or more areas that were decayed. No distinction was made between primary and secondary caries and the same code applied regardless of whether the carious lesions were in contact with the restoration(s).

3 *Filled crown, with no caries.* A crown was considered filled, without caries, when one or more permanent restorations were present and there was no caries anywhere on the crown. A tooth that has been crowned because of previous decay was recorded in this category. A tooth that has been crowned for reasons other than caries by means of a fixed dental prosthesis abutment was coded 7.

4 *Missing tooth, due to caries.* This code was used for permanent teeth that had been extracted because of caries and were recorded under coronal status. Code 4 was not used for teeth deemed to be missing for any reason other than caries.

5 Permanent *tooth missing due to any other reason.* This code was used for permanent teeth deemed to be absent congenitally or extracted for orthodontic reasons or because of periodontal disease, trauma, etc.

6 Fissure *sealant.* This code was used for teeth in which a fissure sealant had been placed on the occlusal surface, in pits or for teeth in which the occlusal fissure had been enlarged with a rounded or "flame-shaped" bur, and a composite material placed. If a tooth with a sealant had caries, it was coded as 1.

7 Fixed *dental prosthesis abutment, special crown or veneer.* This code was used under coronal status to indicate that a tooth forms part of a fixed bridge abutment. This code was also used for crowns placed for reasons other than caries and for veneers or laminates covering the labial surface of a tooth, on which there was no evidence of caries or a restoration.

Note: *Missing teeth replaced by fixed partial denture pontics are coded 4 or 5 under coronal status, while root status is scored 9.*

Implant. This code was used under root status to indicate that an implant has been placed as an abutment.

8 Unerupted *tooth (crown).* This classification was restricted to permanent teeth and used only for a tooth space with an unerupted permanent tooth but no primary tooth. Teeth scored as unerupted were excluded from all calculations concerning dental caries. This category did not include congenitally missing teeth, or teeth lost as a result of trauma etc.

9 *Not recorded.* This code was used for an erupted permanent tooth that cannot be examined for any reason such as orthodontic bands, severe hypoplasia, etc. This code wasused under root status to indicate either that the tooth has been extracted or that calculus is present to such an extent that root examination is not possible.

Dental Caries Index: (DMFT)

Decayed, Missing and Filled Teeth Index (DMFT), the D component included all teeth with codes 1 or 2. The M component comprised teeth coded 4 in subjects under 30 years of age, and teeth coded 4 or 5 in subjects 30 years and older, i.e. missing due to caries or for any other reason. The F component included teeth only with code 3. The basis for DMFT calculations is 32 teeth, i.e. all permanent teeth including wisdom teeth. Teeth coded 6 (fissure sealant) or 7 (fixed dental prosthesis/ bridge abutment, special crown or veneer/implant) were not included in calculations of the DMFT index.

1.7.2.5 *Periodontal Status: Community Periodontal Index (CPI) modified*

Two indicators of periodontal status are used for this assessment: gingival bleeding and periodontal pockets. A specially designed, lightweight CPI metallic probe with a 0.5-mm ball tip was used, with a black band between 3.5 and5.5 mm, and rings at 8.5 and 11.5 mm from the ball tip (**Fig. 3.1.**). All teeth present in the mouth were examined for absence or presence of gingival bleeding and absence or presence of periodontal pockets; pocket depth was measured with the WHO CPI periodontal probe.

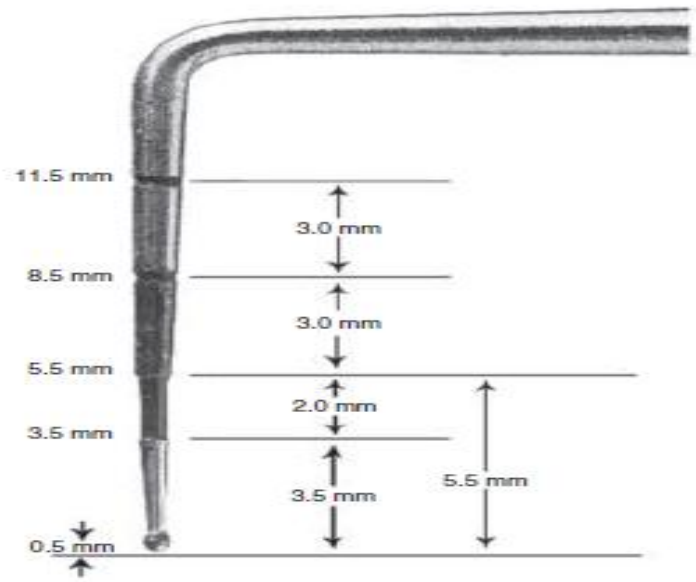

Figure 1.1.The WHO Community Periodontal Index probe recommended for clinical examination

Assessing for gingival bleeding and measuring periodontal pockets

Gingivae of all teeth present in the mouth was examined by carefully inserting the tip of the WHO CPI probe between the gingiva and the tooth to assess absence or presence of bleeding response. The sensing force was used not more than 20 g. When the probe was inserted, the ball tip followed the anatomical configuration of the surface of the tooth root. The probe tip was inserted gently into the gingival sulcus or pocket and the full extent of the sulcus or pocket explored. For example, the probe used to place in the pocket at the distobuccal surface of the second molar, as close as possible to the contact point with the third molar, keeping the probe parallel to the long axis of the tooth. The probe moved gently, with short upward and downward movements, along the buccal sulcus or pocket, to the mesial surface of the second molar. A similar procedure was carried out for lingual surfaces, starting on the distolingual aspect of the second molar. All teeth present were probed and scored in the corresponding box. The codes for scoring bleeding and pocketing are given below.

Gingival bleeding scores

0 = Absence of condition.

1 = Presence of condition.

9 = Tooth excluded.

X = Tooth not present.

Pocket scores

0 = Absence of condition.

1 = Pocket 4–5 mm.

2 = Pocket 6 mm or more.

9 = Tooth excluded.

X = Tooth not present.

1.7.2.6 Loss *of Attachment*

Information on loss of attachment may be collected from the index teeth. The CPI system is designed to obtain an estimate of the lifetime accumulated destruction of the periodontal attachment and thereby permits comparisons between population groups. Because it is not designed to describe the full extent of loss of attachment in an individual., and because of the absence of previous studies, researcher satisfied with gingival and periodontal pocket assessment.

1.7.2.7*Enamel Fluorosis*

Fluorotic lesions are usually bilaterally symmetrical and tend to show a horizontal striated pattern across the tooth. The premolars and second molars are most frequently affected, followed by the maxillary incisors. The mandibular incisors are least affected. The examiner should note the distribution pattern of any defects, using Dean's index criteria, and make a decision as to whether they are typical of fluorosis. Defects falling into the "questionable" to "mild" categories – theconditions most likely to be encountered – may consist of fine white lines or patches and tend to fade into the surrounding enamel. To facilitate differentiating fluorosis lesions from other opacities not related to fluoride, it is important to remember that fluorosis lesions are usually observed near the edges of incisors or cusp tips; however, depending on severity, the lesions maybe readily apparent on other areas of the tooth and be readily visible in premolars and molars. Non-fluoride related opacities can be localized to the center of the smooth surface, although they can affect the entire crown. Fluorosis lesions generally appear as fine lines, frosted in appearance and non-fluoride opacities appear round or oval in shape. Fluorosis lesions also can be more easily observed with the light directed in a tangential direction whereas non-fluoride opacities can be easily observed with the light directed perpendicularly to the tooth surface. Coding was done on the basis of the two most severely affected teeth. If the two teeth are not equally severely affected, the score was based on the appearance of the less affected tooth. When the teeth were scored, the examiner started at the higher end of

the index, “severe”, and eliminated each score until examiner arrived at the condition present. If there was any doubt, the lower score was taken.

The codes and criteria are as follows:

0 = *Normal.* Enamel surface is smooth, glossy and usually a pale creamy white colour.

1 = *Questionable.* The enamel shows slight aberrations in the translucent normal enamel and which may range from a few white flecks to occasional spots.

2 = *Very mild.* Small, opaque, paper-white areas scattered irregularly over the tooth but involving less than 25% of the labial tooth surface.

3 = *Mild.* White opacities of the enamel involving more than 25% but less than 50% of the tooth surface.

4 = *Moderate.* The enamel surfaces show marked wear, and brown staining is frequently a disfiguring feature.

5 = *Severe.* The enamel surfaces are severely affected and the hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance.

8 = *Excluded* (e.g. a crowned tooth).

9 = *Not recorded.*

1.7.2.8 Dental *Erosion*

Data on prevalence, severity, and number of teeth affected by dental erosion would assist public health administrators in estimating whether this condition is a public health problem. Dental erosion results from the progressive loss of calcified dental tissue by chemical processes not associated with a bacterial action. Enamel tissue is lost by exposure to acids which may come from dietary sources or may be intrinsic, i.e. in individuals suffering from bulimia, gastro-oesophageal reflux or heavy alcohol consumption and chronic vomit.

The following codes 1–3 are used where the crown of a tooth shows an erosion lesion at different levels:

0 = No sign of erosion.

1 = Enamel lesion.

2 = Dentinal lesion.

3 = Pulp involvement.

The severity of dental erosion was recorded according to the tooth with the highest score of erosion. In addition, the number of teeth involved was recorded.

1.7.2.9 Traumatic *Dental Injuries*

Teeth affected by dental trauma are coded as follows:

0 = No sign of injury.

1 = Treated injury.

2 = Enamel fracture only.

3 = Enamel and dentine fracture.

4 = Pulp involvement.

5 = Missing tooth due to trauma.

6 = other damage.

9 = Excluded tooth.

In addition to the degree/status of trauma, the severity of dental trauma can be measured in terms of the number of teeth involved.

1.7.2.10 Oral *Mucosal Lesions*

The oral mucosa and soft tissues in and around the mouth were examined in every subject. The examination was performed in the following sequence:

1. Labial mucosa and labial sulci (upper and lower).
2. Labial part of the commissures and buccal mucosa (right and left).
3. Tongue (dorsal and ventral surfaces, margins).
4. Floor of the mouth.
5. Hard and soft palate.
6. Alveolar ridges/gingiva (upper and lower).

Either two plane mouth mirrors or one mirror and the handle of the periodontal probe were used to retract the tissues. The following codes applied to adults:

0 = No abnormal condition.

1 = Malignant tumour (oral cancer).

2 = Leukoplakia.

3 = Lichen planus.

4 = Ulceration (aphthous, herpetic, traumatic).

5 = Acute necrotizing ulcerative gingivitis (ANUG).

6 = Candidiasis.

7 = Abscess.

8 = other condition (specify if possible) (e.g. keratosis and Koplick spots).

9 = Not recorded

In addition, all the main locations of the oral mucosal lesion were recorded as follows:

0 = Vermillion border.

1 = Commissures.

2 = Lips.

3 = Sulci.

4 = Buccal mucosa.

5 = Floor of the mouth.

6 = Tongue.

7 = Hard and/or soft palate.

8 = Alveolar ridges/gingiva.

9 = Not recorded.

1.7.2.11 Denture *Status*

The presence of removable dentures was recorded for each jaw. The codes were as follows:

0 = No denture.

1 = Partial denture.

2 = Complete denture.

9 = Not recorded.

1.7.2.12 Intervention *Urgency*

The following intervention urgency codes were recommended:

0 = No treatment needed.

1 = Preventive or routine treatment needed.

2 = Prompt treatment including scaling needed.

3 = Immediate (urgent) treatment needed due to pain or infection ofdental and/or oral origin.

4 = Referred for comprehensive evaluation or medical/dental treatment (systemic condition).

1.7.3 Oral Health Needs

The term need is used by a range of both health and non-health professionals in different and varying contexts. Jonathon Bradshaw defines four ways in which need is perceived:

- Normative need, based on professional judgment (such as the need for medical treatment).
- Felt need, which comprises individual's perceptions of variations from normal health.
- Expressed need, which can be the vocalization of need or how people use services.
- Comparative need, based on judgments by professionals as to the relative needs of different groups (Stevens et al., 1991).

Chapter 2

Conceptual framework and literature review

2.1 Conceptual framework

The researcher drew the conceptual framework based on literature and personal experience, the framework shows that the researcher is going to perform an oral health assessment of type 2 diabetic patients, where oral health effects the diabetic status and the diabetic status can worse the oral health status. This assessment will enable the researcher to address oral health problems among type 2 diabetic patients attending UNRWA health centers in Gaza Governorates and determine oral health needs of type 2 diabetic patients along with common challenges faced by type 2 diabetic patients seeking oral health in UNRWA primary health centers in Gaza governorates as shown in figure 2.1

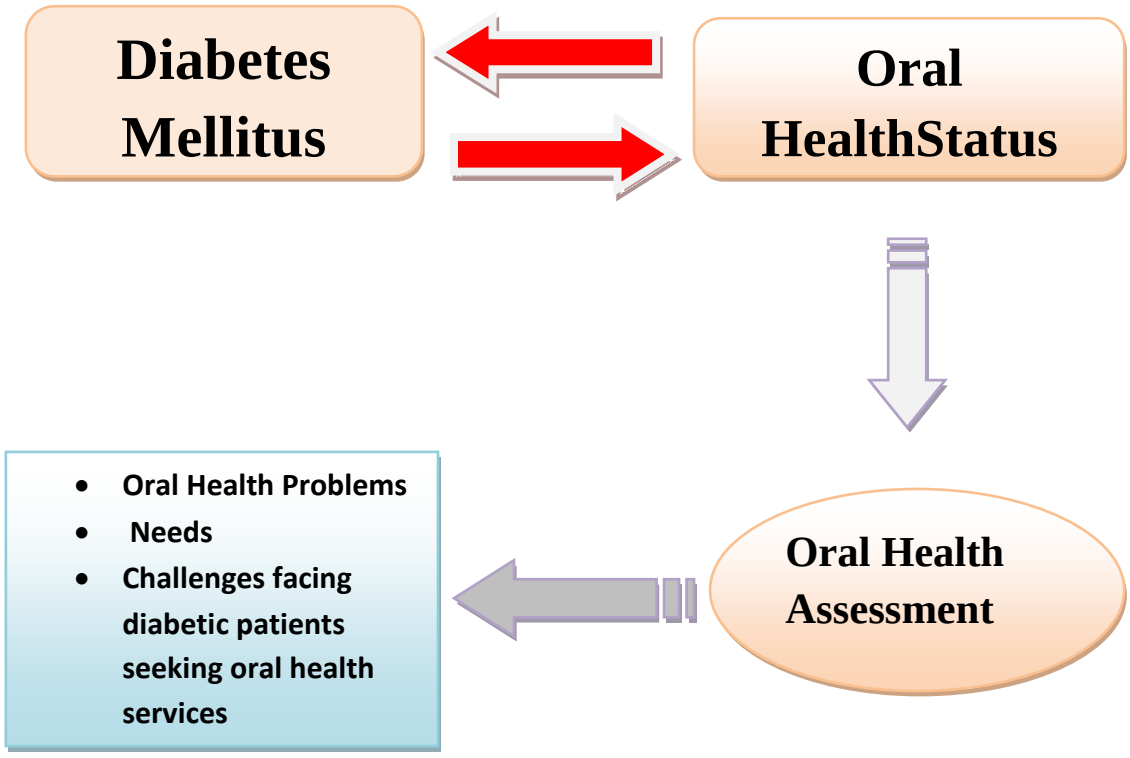

Figure2.1 Conceptual framework-self-constructed

2.2 literature review

Diabetes affects millions of people each year, it is one of the leading causes of mortality and morbidity worldwide. Many chronic macrovascular and microvascular complications of diabetes have been reported in the literature with few reports about oral complications. The five classic complications associated with DM include retinopathy, neuropathy, and cardiovascularcomplications (coronary artery disease, stroke, and peripheral vascular disease) and delayed wound healing. Periodontal disease has recently been recognized as the "sixth complication" of DM(Löe, 1993).The most common oral health problems associated with diabetes are tooth decay and periodontal diseases(ADA, 2002).

Studying oral complication and manifestation of DM is very rare in the region, and not present at all in Palestine despite that periodontal diseases are the sixth complication of DM.

2.2.1 Oral Complications and Manifestation of Diabetes Mellitus

Oral complications of DM include xerostomia (mouth dryness), periodontal disease, dental caries, sialosis, taste impairment, fungal infections, oral lichen planus, geographical and fissured tongue, and severe temporomandibular joint dysfunction(Al-Maskariet al., 2011).

Several soft tissue abnormalities have been reported to be associated with diabetes mellitus in the oral cavity. These complications include periodontal diseases (periodontitis and gingivitis); salivary dysfunction leading to a reduction in salivary flow and changes in saliva composition, and taste dysfunction. Oral fungal and bacterial infections have also been reported in patients with diabetes(Al-Maskariet al., 2011). There are also reports of oral mucosal lesions in the form of stomatitis, geographic tongue, benign migratory glossitis, fissured tongue, traumatic ulcer, lichen planus, lichenoid reaction and angular cheilitis(Sandberget al., 2000; Guggenheimeret al., 2000). Furthermore, delayed mucosal wound healing, mucosal neuro-sensory disorders, dental caries, and tooth loss has been reported in patients with diabetes(Lamster and Lalla, 2008). The prevalence and the chance of developing oral mucosal lesions were found to be higher in patients with diabetes compared to healthy controls(Sainiet al., 2010).

By major salivary glands (parotid, sub-mandibular and sub-lingual) and numerous minor salivary glands distributed in the oral cavity, saliva is produced to maintain a healthy oral cavity. Salivary dysfunction has been reported in patients with diabetes(Mooreetal., 2001;

Linet al., 2002),manycross-sectional epidemiological study was conductedto determine the relationship between salivary dysfunction and diabetes complications and the prevalence of hyposalivation and xerostomia (dry mouth). One of these studies was conducted in 2001 to study the salivary flow rate and xerostomia among type 1 diabetics and control subjects without diabetes, it found that symptoms of reduced salivary flow rate and xeorstomia were more frequently reported by patients with diabetes than the controls, especially by those diabetics who had developed neuropathy(Sandberg and Wikblad, 2003), type 2 diabetics also showed that xerostomia and hyposalivation were more prevalent among them in another study(Chávezet al., 2001).Furthermore,poorly controlled type 2 diabetics have a lower stimulated parotid gland flow rate compared to well-controlled patients and patients without diabetes, Patients with diabetes usually complain of xerostomia and the need to drink very often (polydipsia and polyuria)(Chávezet al., 2001). The constant dryness of the mouth would irritate the oral soft tissues, which in turn will cause inflammation and pain. Patients with diabetes with xerostomia are more predisposed to periodontal infection and tooth decay. The cause of this is not yet fully understood in patients with diabetes but may be related to polydipsia and polyuria or alternation in the basement membrane of the salivary glands. It is known that diabetes mellitus is associated with chronic complications such as neuropathy, microvascular abnormalities and endothelial dysfunction that lead to deterioration of microcirculation and this may play a role in the reduction of the salivary flow rate and composition(Conneret al., 1970; Chomkhakhaiet al., 2009).Sialosis is defined as asymptomatic, non-inflammatory, non-neoplastic, bilateral chronic diffuse swelling mainly affecting the parotid glands, 35 cases of persistent parotid swelling from two countries were studied by Scully et al., in 2008 and according to their study sialosis has been found to be more prevalent in patients with diabetes mellitus(Scullyet al., 2008).

Poorly controlled diabetes compared to healthy controls usually having taste dysfunction, where diabetic patients with neuropathy have a higher taste threshold. Taste disturbance has also been reported to lead to poor glycaemic control by inhibiting the ability to maintain a good diet (Lalla and D'Ambrossio, 2000;Ship, 2003).

Oral candidosis is a fungal infection caused by *Candida albicans* species, predisposing factors could be smoking, xerostomia and endocrine and metabolic diseases, other predisposing factors can lead Oral candidosis; old age, medications, Cushing's syndrome, malignancies, and the use of dentures(McIntyre, 2001).

Many studies have been confirmed that candidal infection is more prevalent in patients with diabetes especially in those patients having predisposing factors such as who smoking, wearing dentures, having poor glycaemic control and using steroids and broad-spectrum antibiotics where salivary dysfunction in patients with diabetes can exaggerate the fungal infection(Willis et al., 1999).

The management and treatment of patients with diabetes undergoing oral surgery is complicated because of poor soft tissue regeneration and delayed osseous healing, this occurred due to delayed vascularisation, reduced blood flow, a decline in innate immunity, decreased growth factor production, and psychological stress may be involved in the protracted wound healing of the oral cavity mucosa in patients with diabetes(Abiko and Selimovic, 2010).

Fissured tongue, irritation fibroma, and traumatic ulcer are more prevalent in diabetes compared to the controls(Sainietal., 2010), lichen planus and recurrent aphthous stomatitis have been reported to occur in patients with diabetes, oral lichen planus is reported to occur more frequently in patients with type1 diabetes compared to type 2 diabetes because type 1 and oral lichen planus are both autoimmune mechanism (Petrou-Amerikanouet al., 1998).

Oral dysesthesia or burning mouth syndrome (BMS) is a painful condition affecting the oral cavity (palate, tongue, throat, and gingivae). The exact cause of BMS is unknown, but it has been attributed to several conditions such as dry mouth, menopause, candidal infection, diabetes mellitus, cancer therapy, psychological problems and acid reflux.BMS is classified into two types: primary idiopathic, and secondary as a result of a systemic process; secondary BMS has been reported to occur with diabetes mellitus. It could adversely affect the ability to maintain good oral hygiene in patients with diabetes. Diabetic neuropathy could be the underlying cause of BMS in patients with diabetes. The nerve damage in diabetic neuropathy has been reported to show an increase in the Langerhans cells that are associated with immune disturbance(Moore et al., 2007; Tavakoliet al., 2010).

2.2.2 Periodontal Status of Diabetic Patients

American Academy of Periodontology (AAP) defines periodontal disease as an inflammatory disease that affects the soft and hard structures that support the teeth. In its early stage, called gingivitis, the gums become swollen and red due to inflammation, which is the body's natural response to the presence of harmful bacteria. In the more serious form

of periodontal disease called periodontitis, the gums pull away from the tooth and supporting gum tissues are destroyed. Bone can be lost, and the teeth may loosen or eventually fall out.Chronic periodontitis, the most advanced form of the disease, progresses relatively slowly in most people and is typically more evident in adulthood. Although inflammation as a result of a bacterial infection is behind all forms of periodontal disease, a variety of factors can influence the severity of the disease. Important risk factors include inherited or genetic susceptibility, smoking, lack of adequate home care, age, diet, health history, and medications(Devanoorkar and Rajeshwari, 2016).

The periodontal diseases are a group of chronic, microbial-induced inflammatory disease that most commonly occurs in two major forms, gingivitis and chronic periodontitis. Both forms of the periodontal disease have bacterial etiologies in which Gram-negative anaerobes predominate as major periodontal pathogens. Gingivitis is a biofilm or plaque-induced inflammation of the gingiva that is reversible but can progress to chronic periodontitis, if not treated, in susceptible individuals. Gingivitis resolves clinically after mechanical disruption of the biofilm, usually by effective, regular oral hygiene. Chronic periodontitis occurs in susceptible individuals with long-term supra- and sub-gingival plaque accumulation. The chronic presence of plaque results in enrichment and maturation of the biofilm leading to sustained inflammation (or constant wounding). Chronic periodontitis is characterized by irreversible loss of the supporting tooth structures, including the connective tissue fibers of the gingiva, periodontal ligament, and alveolar bone. This local., irreversible destruction of periodontal tissues, in severe cases, may lead to partial or complete tooth loss(Genco, 1990; Pihlstromet al.,2005).

Strong evidence supporting the long-held belief by dental clinicians and some medical care providers that diabetes has an adverse effect on periodontal health. Recognizing that the relationship between diabetes and periodontal disease is actually bi-directional(Lalla andPapapanou, 2011; Taylor and Borgnakke, 2010).

Diabetes and poor control ofdiabetes can lead to greater periodontal disease in susceptible individuals, this evidencepresented from observational studies includes population-based studiesand longitudinal studies that providea basis for causalinference. The evidence from in vitro and animal studies provides further evidence tosupport the adverse impact of diabetes on periodontal health as well as evidence for thebiologic plausibility of this relationship by illuminating inter-related explanatorymechanisms(Lamster, 2014).

Using medline database for published studies from January 1970 through October 2003 with themanual search for references in relevant studies. A meta-analysis was based on 18 comparative cross-sectional studies, three prospective cohort studies and baseline data of two clinical trials that compared oral hygiene, gingival and periodontal status between diabetics and non-diabetics. A study demonstrated that diabetics had significantly worse oral hygiene as measured by the average of plaque index, higher severity of gingival disease as measured by the average of gingival index and higher severity of periodontal disease as measured by the average of probing pocket depth and clinical attachment loss. However, diabetics had similar extent of oral hygiene, gingival and periodontal disease as measured by percentages of surfaces or sites with specific scores of plaque index, gingival index, bleeding on probing, pocket depth and clinical attachment loss. The study reveal that there was significantly higher severity but the same extent of periodontal disease than non-diabetics(Khaderet al., 2006).

Many studies confirm that periodontal disease is considered to be one of the main reasons for tooth loss among individuals with diabetes(Al-Shammarietal., 2005; Oliver and Tervonen, 1993; Kauretal., 2009).The alterations of host response, collagen metabolism and vascularity increasing susceptibility to periodontal diseases among patients with uncontrolled DM, patients with poorly controlled DM will react to bacteria causing periodontitis by an exaggerated inflammatory response, later one along with impaired wound healing and repair will increase the inflammatory response and periodontal tissues destruction among the poorly controlled DM patients(Lalla and Papapanou, 2011; Lakschevitzetal., 2011). Many controlled clinical trials have confirmed that patients diagnosed with diabetes have a greater prevalence of periodontal diseases compared to healthy individuals(Fernandeset al., 2009; Hugosonet al., 1989; Lallaet al., 2007), severe periodontitis may increase the risk of poor glycemic control, furthermore there is evidence suggesting that periodontitis-induced bacteremia will cause elevations in serum proinflammatory cytokines, and reactive oxygen species leading to etiopathogenesis of metabolic syndrome and increased insulin resistance(Collin et al., 1998; Williams and Offenbache, 2000).

In 2013 a studyconclude that periodontal diseases and diabetes mellitus are closely associated and are highly prevalent chronic conditions. Inflammation is a critical player in the association. Diabetes clearly increases the risk of periodontal diseases as demonstrated by several plausible mechanisms. Less clear is the impact of periodontal disease on glycemic control and the mechanisms through which this occurs(Leite et al., 2013).

Another Paper have studied the relationship between DM and PD, the result supported the scientific evidence which revealed that DM having an adverse effect on periodontal health and periodontal disease (PD) having an adverse effect on glycemic control and on diabetes-related complications (Negratoet al., 2013).

A Sudanese study revealed that chronic periodontitis, tooth mobility, furcation involvement and oral impacts on daily performance are more prevalent among T2DM patients compared to their non-diabetic controls. A total of 457 individuals participated in the study (154 T2DM cases and 303 non-diabetic controls), the T2DM group was sub-divided according to metabolic control [(well-controlled: glycosylated haemoglobin test <8%), (poorly controlled: glycosylated haemoglobin test > 8%)] and according to duration of T2DM [(long duration: >10 years), (short duration: <10 years)]. Participants were interviewed using a structured questionnaireincluding socio-demographics,lifestyle and oral health-related quality of life factors. The clinical examination comprised full mouth probing depths, plaqueindex, tooth mobility index, furcation involvement and coronal and root surface caries. The result showing that type 2 DM patients presented with more probing depths >4mm, furcation involvement, tooth mobility, missing teeth, and oral impacts on daily performance (OIDP). The corresponding adjusted odds ratios and their 95% confidence intervals were 4.07 (1.74–9.49), 2.96 (1.36–6.45), 5.90 (2.26–15.39), 0.23 (0.08–0.63) and 3.46 (1.61–7.42), respectively. Moreover, the odds ratio was 2.60 (1.21–5.55) for the poorly controlled T2DM patients to have high levels of mobility index and 2.94 (1.24–6.94) for those with long duration of T2DM to have high decayed, missed and filled teeth (DMFT) values(Mohamed et al., 2013).

Another study of 100 diabetic patients (63 males and 37 females)visiting the out-patient department of Sri Sai College of Dental Surgery and Hospital in India were participated in cross-sectional study with purposive sampling, showing that majority (99%) of the participants had gingival bleeding, 47% had 6-8 mm attachment loss with 40% having shallow pockets(Mocherla et all, 2016).

Australian Research Centre for Population Oral Health, The University of Adelaide, South Australia studied the relationship between diabetes and oral health among Australian adults, the study clear that prevalence of periodontal disease was almost two times greater in diabetics than in non-diabetics, without any adjustment for age. However, periodontal disease prevalence was also strongly associated with age, affecting fewer than 10 percent of people aged less than 25 years, but more than 50 percent of people aged75 years or

more. For the two age groups in the 35–54 year age range, diabetics had 1.7 times the prevalence of periodontitis compared to non-diabetics However, this difference was inverted in the two oldest groups (65–74 and 75+)(Kapellas and Slade, 2008).

2.2.3 Dental Status of Diabetic Patients

Shafer (1993) defined dental caries as an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the organic substance of the tooth, which often leads to cavitations(Raajendran and Sivapathasundharam, 2009).According to WHO dental caries is defined as localized, post-eruptive, pathological process of external origin involving softening of the hard tooth tissue and proceeding to the formation of a cavity (Raajendran and Sivapathasundharam, 2009).

Dental caries is the result of acid demineralization of the teeth. Four components are required for dental caries to develop: a susceptible host (the tooth surface), specific bacteria that colonize the host (Streptococcus mutans, Lactobacillus species),available for metabolism (fermentable carbohydrates in the diet), and time. The metabolism substrate of carbohydrates by bacteria yields lactic acid as a byproduct. Lactic acid acts on the tooth surface to cause demineralization. Time is important because the frequency of acid exposure is related to demineralization of the tooth surface.Dental caries can be broadly grouped as coronal caries and root caries. Coronal cariesaffects the crown portion of the teeth, which is covered by enamel and is the part of the tooth generally visible in the oral cavity. Enamel is inert. Below the enamel is the dentin, which contains cell process from odontoblaststhat line the pulp chamber. Dentin has the capacity to repair(Lamster, 2014).
Dental caries is common chronic disease conditions that cause pain and disability across all age groups. If left untreated, dental caries can lead to pain, infection, tooth loss, and, eventually, edentulism. These oral problems and complaints can worse quality of life, nutrition, and, potentially, glycemic control. It is important to know that patients with DM are susceptible to other oral conditions, such as periodontal and salivary disorders (dry mouth), which could increase their risk of developing new and recurrent dental caries. A review of the literature indicates that there is no clear association between DM and dental caries, but several studies have reported a greater history of dental caries in people with DM(Moore et al., 2001; Lin et al., 1999). Decreased salivary secretion, increase of carbohydrate in the parotid gland saliva, growth of oral yeasts, increased counts of mutans

streptococci and lactobacilli are some of the factors implicated to be responsible to predispose diabetics to a higher incidence of dental caries(Karjalainenet al., 1996)**.**It is well-known that the cleansing and buffering capacity of the saliva is diminished in patients with diabetes mellitus resulting in increased incidence of dental caries, especially in those patients who suffer from xerostomia. Patients with 1 and type 2 diabetes can be expectedto demonstrate a high caries rate, especially if the diet is high in cariogenic food. For adults, it appears that the prevalence of root caries is higher in patients with diabetes versus age-related controls, this may relate to exposure of root surfaces secondary to periodontal disease and loss of periodontal tissues. The caries prevalence also may be linked to reduced salivary flow or altered salivary chemistry, which in turn may be secondary to neuropathy affecting the salivary glands. The situation is further complicated by the fact that patients with diabetes mellitus do not access oral health care services as frequently as individuals without diabetes mellitus, and studies suggest that patients with diabetes mellitus are not knowledgeable about the oral complications of the disease(Lamster, 2014).
Among 100 diabetic patients of study conducted byDepartment of Public Health Dentistry, Sri Sai College of Dental Surgery, Vikarabad, Telangana, India40% had decayed teeth, 73% had missing teeth, and only 5% have filled teeth, shows the total DMFT score of diabetic patients who participated in the study. Among 100 diabetic patients, 29% of the individuals had 1-3 DMFT and 4-6 DMFT was seen in 28% individuals.Mean number of decayed permanent teeth per person 1.18; mean number of filled permanent teeth per person 0.11; mean number of permanent teeth missing due to caries per person 4.41 and mean DMFT was 5.7 ± 5.7(Mocherla et al., 2016), in contrast to another study where the mean DMFT score of diabetic people was 22.9 and filled teeth were higher, that is, 66%, when compared to present study whereas filled teeth, were only 5%(Bacicet al., 1989).
A studyconfirmed higher levels of DMFT among individuals with than without T2DM(Jawed et al., 2012). Whereas another study found a significantly higher prevalence of root surface caries among T2DM patients compared to non-diabetic controls(Hintaoet al., 2007).

2.2.4 Oral Health Problems and Socio-demographic Characteristics

Differences in the dental health status were associated with a number of socio-demographic factors - age, gender, educational background and general health status. Generally, younger people had lower values of DMFT index than older ones. Females had higher values of DMFT index than males. Adults with poor general health had worse

dental health status than these with excellent general health. Also, level of education could be a prerequisite for good dental health. People with higher education had a lower chance of having decayed, missing and filled teeth than those with lower education. Many studies showed that DMFT index is associated with different socio-demographic factors (Boyko Bonev, 2015).

The increased severity of periodontal disease and bone loss with age is probably related to the length of time, where the periodontal tissues have been exposed to bacterial plaque and is considered to reflect individual's cumulative oral history (Löeet al., 1986).Several studies show that the prevalence and severity of periodontal disease increase with age(AlJehani, 2014; Genco, 1996; Axelsson & Lindhe, 1981). A stuydy demonstrated that the mean annual rate of bone loss among the initially 70-year-old subjects was 0.28 mm compared to 0.07 on the 25-year-old individuals (Papapanou and Wennström, 1989). Numerous studies reported higher periodontal destruction among males compared to the female population (AlJehani, 2014). The reasons for these sex differences are not clear, but they are thought to be related to the ignorance of oral hygiene, which is usually observed among males (Albandar and Kingman, 1999;Slade and Spencer, 1995). When education levels were compared to periodontal status in a study conducted by Gundala and Chavathe results showed a positive association between higher education levels and better periodontal status, identified education level also a strong indicator of periodontal status. When the socioeconomic status was compared to the periodontal status in the same study, it showed a positive association between higher socioeconomic groups and better periodontal status (Richard and Chava, 2000). According to AlJehani study, the gingival condition is clearly related to lower SES, but the relationship between socioeconomic status and periodontitis is less direct. It can be certain that gingival health is better among individuals with higher education and with more secure income. SES is a modifiable factor and it can be examined in multivariate models for the disease (AlJehani, 2014). The possible relationship between periodontal disease and socioeconomic status was found in several studies (Gilbert, 2005; Susinet al., 2005; Locker et al., 1993; Beck et al., 1990).

2.2.5 Oral Health Problems and Diabetic Duration

Generally, poor oral hygiene, a long history of diabetes, greater age, and poor metabolic control are associated with more severe periodontal disease(Katz et al., 1991).Duration of DM might play an important role when the relation between DM and oral diseases is investigated,the level of coronal caries was significantly higher in the long- compared to

the short duration. This relation is reasonable because, like other complications of diabetes, the risk of oral and periodontal disease tends to increases over time. This relation is in agreement with the normal pathogenesis of dental caries as “time” is an important factor for the development of the disease (Selwitzet al., 2007). A study showed that gingival index and DMFT index increased significantly with duration of diabetes(Rafatiouet al., 2016), this conclusion is in agreement with a Sudanese study which showed that those with long duration of T2DM to have high decayed, missed and filled teeth (DMFT) values (Mohammed et al., 2013).According to another study, the mean DT and MT was significantly increasing as the duration of disease increased, whereas mean FT was significantly higher among people having diabetes less than 2 years. Mean DMFT component was higher among people having diabetes more than 5 years but it did not show any statistical significant difference (Malvania et al., 2016). Many studies concluded that DMFT index increasing with duration of DM (Singh A, 2014; Kanjirath PP, 2011),while other studies reported that there was no relationship between the duration of diabetes and caries experience (Hawraa, 2012; Arrieta -Blanco et al., 2003; Lin et al., 1999).However, other studies had concluded that the duration of diabetes was a significant factor for the severity of periodontal disease (Cerda et al., 1994; Firatli et al., 1996), morover, another study had also demonstrated that as the age of the diabetic increases, the prevalence and severity of periodontal disease increases(Rajhanset al., 2011).

2.2.6 Oral Health Problems and HbA1c

Severity of dental caries increased with increase in the blood glucose, a study concluded that the severity of dental caries increased with increase in the blood glucose level with positive correlation, and dental caries prevalence was significantly higher in metabolically uncontrolled patients compared to metabolically well-controlled patients(Malvaniaet al., 2016). The results are in agreement with the studies reported by Chavez *et al*.(Chavez et al., 2000), and not in agreement with the studies reported by Hawraa KA. (Hawraa, 2012), Arreita-Blannco *et al*. (Arrieta -Blanco et al., 2003),and Sandberg *et al*(Sandberg et al., 2000).Another study in Japan revealed a significant association between HbA1c levels and dental caries, severity of dental caries increased with increase in the blood glucose level (Yonekuraet al., 2017). Moreover, a study stated that the diabetic status was significantly and strongly related to both prevalence and severity of periodontal disease(Emrich et al., 1991). According to another study, the severity of periodontal disease was more prevalent in diabetics who had the disease for >5 years, patients with poor glycemic level had more

severe periodontitis as compared to patients having a fair glycemic level (Faulconbridgeet al., 1981).Another study had also demonstrated that poorer the control and longer the duration of diabetes, the greater will be the prevalence and severity of periodontal disease (Rajhanset al., 2011).

2.2.7 Summary of literature View

Oral complications of DM include xerostomia (mouth dryness), periodontal disease, dental caries, sialosis, taste impairment, fungal infections, oral lichen planus, geographical and fissured tongue, and severe temporomandibular joint dysfunction. Strong evidence supporting the long-held belief by dental clinicians and some medical care providers that diabetes has an adverse effect on periodontal health. Recognizing that the relationship between diabetes and periodontal disease is actually bi-directional. Many studies confirmed higher levels of DMFT among individuals with than without T2DM whereas others found a significantly higher prevalence of root surface caries among T2DM patients compared to non-diabetic controls.

Differences in the dental health status were associated with a number of socio-demographic factors - age, gender, educational background and general health status. .- Generally, younger people had lower values of DMFT index than older ones. Females had higher values of DMFT index than males. Adults with poor general health had worse dental health status than these with excellent general health. Also, level of education could be a prerequisite for good dental health. Several studies show that the prevalence and severity of periodontal disease increase with age. Numerous studies reported higher periodontal destruction among males compared to the female population, a positive association between higher education levels and better periodontal status, and a positive association between higher socioeconomic groups and better periodontal status

Duration of DM might play an important role when the relation between DM and oral diseases, increasing the diabetic age will increase both caries and periodontal diseases prevalence.The severity of dental caries increased with increase in the blood glucose, the diabetic status is significantly and strongly related to both prevalence and severity of periodontal disease.

Chapter 3

Methodology

This chapter provides comprehensive details of all aspects of the research methodology. It explains the study design and the method, the tool of data collection and analysis. In addition, the study population, the population sample as well as the sample frame. Furthermore, this chapter will include the instrument which was used during data collection. Finally, we will consider the ethical issues and the limitation of the study as well.

A total of 381 type 2 diabetic patients from five UNRWA health centers were examined and interviewed. The World Health Organization's (WHO) basic methods were used to assess the oral health status of type 2 diabetic patients,determine their normative needs and explore the common challenges faced by them seeking oral health at UNRWA health centers in Gaza Governorates.

3.1 Study Design

The design of this study is analytical., cross-sectional design to assess the oral health of type 2 diabetic patients attending UNRWA healthcare centers at Gaza Governorates. This design is chosen because it is the best design to identify oral health needs and challenges facing type 2diabetic patients attending UNRWA primary health care centers. Analytic research generates new knowledge about concepts and identifies relationships between variables (Burns and Grove, 2001).Cross-sectional design reflects the existing facts at the same point of time of data collection, it is less expensive and it consumes less time than other longitudinal studies.

3.2 Study Setting

For more representativeness and accuracy, the study had taken place at the UNRWA health centers distributed across the Gaza Strip. A representative sample had taken fromthe health centers according to systematic random sampling.

3.3 Study Population

All type 2 diabetic patients attending UNRWA primary health care centers (39448 type 2 DM)with active DM file during 2017.

3.4 Eligibility Criteria

Inclusion Criteria:

- All type 2 diabetic patients having active type 2 DM file in UNRWA health care centers at Gaza governorates, aged 35-65 years old.

Exclusion Criteria:

- Pregnant type 2 diabetic patients (to exclude the oral consequences of pregnancy).

-All type 2 diabetic patients above 65 years old.(those participants have separated assessment)

3.5 Period of the Study

The study took 14 months to be completed; it started in February 2017 and completed March 2018. Annex (1) describes the activities of the research and duration for each activity.

3.6 Sample Size and Sampling Process

In order to calculate the required sample, original table by Krejeci& Morgan 1970 P 608(Sansneeet al., 2014) was used to estimate the sample size of about 40 000 population(39448), the table was used and the result indicates that the representative sample should be 381 participants. The researcher used the following parameters for sample calculation:

- Maximum acceptable percentage points of error (confidence interval 5%)
- Confidence level 95%
- Total eligible population about 40000 patients according to UNRWA health department (UNRWA, NCD annual report, 2015).

Unfortunately, UNRWA didn't have a clear classification for its clinic but the most accepted one is related to the size of the clinic, there are big health center, and few number of small health centers.Another classification of health centers is related to geographic place of the health center, where Gaza Governorates is divided into five geographic areas; North area, Gaza area, Middle area, Khan Younis area and Rafah area. The researcher used the geographic classification of the health centers, where the size of the clinic was considered and do the following:

- The researcher selected five health centers that distributed over the GS.
- The GS was divided into five areas Gaza, North, Middle, KhanYounisand Rafah area, one health center from each area was selected randomly.

- The sample size was calculated to be 381 (in order to make the sample more representative, decrease type 2 errors, and to increase power of statistical test, the researcher added the 25 pilots' participants to the sample to become 406).
- The sample in each health center was calculated according to the number of active type 2 diabetic patients in each center(Annex 2).
- Out of 22health centers, 5 health centers were selected randomly one health centers from each geographic area, of them, 3 health centers should be big health centers and 2 health centers should be small health centers. Namely, the health centers wereBeitHannounHC 39 participants, RimalHC 131 participants,Maghazi HC 40 participants, Maen HC 80 participants and Rafah HC 91 participants (Table 3.2).

3.7 Study Instruments

For collecting data the researcher used the World Health Organization's (WHO) basic methods5th Edition(WHO, 2013b):

3.7.1 Oral Health Questionnaire

Interview questionnaire with such modification (WHO oral health questionnaire for adults) to fit local context and additional questions was added to include all study variables such as challenges faced by participants seeking oral health, diabetic status and socio-demographic characteristics (Annex 4).

3.7.2 Assessment of Oral Health Status

3.7.2.1 Standard Forms

Suitable standardized forms for recording clinical oral health assessments as described in this study are provided in Annex 5.

3.7.2.2 Standard Codes

Standard codes were used for all sections of the form. The two-digit numbers above or below some of the boxes indicate specific teeth according to the tooth notation system developed by WHO and FDI (previously called FédérationDentaireInternationale, now World Dental Federation). The first digit indicates the quadrant of the mouth and the second digit the actual tooth. In designating a tooth, the examiner should call the quadrant number and then the tooth number, e.g. the upper right second incisor (12) is called out as "one-two" rather than "twelve"; the lower left third molar (38) should be called out as "three-eight" rather than "thirty-eight".

3.7.2.3 Oral Health Assessment Form

The standard oral health assessment form for adults (**Annex 5**) includes the following sections(WHO, 2013b):

• Dentition Status (crown, root)

• Periodontal Status

• Enamel Fluorosis

• Dental Erosion

• Dental Trauma

• Oral Mucosal Lesions

• Denture Status (fixed or removable dentures)

• Intervention Urgency and Need for Referral

• Notes.

3.7.2.4 Clinical Examination

The oral cavity is a part ofthe orofacial complex and examiners should record any evident abnormality of the tissues of the face, nose, cheek or chin.

3.7.3 Instruments and Supplies

Sufficient numbers of instruments were available to avoid the need to temporarily stop examinations while used ones are being sterilized.

The following instruments and supplies were required for each examination;

• instruments for oral examination: plane mouth mirrors; metallic periodontal probes (Community Periodontal Index (CPI) probe) that conform to WHO specifications, i.e. 0.5 mm ball tip; a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip; and several pairs of tweezers;

• Containers (one for used instruments and one for disinfecting or sterilizing instruments) and concentrated disinfecting solution in sufficient quantity;

• Rubber gloves;

• wash basin with either water and soap or disinfectant solution

• Cloth or paper hand towels; and

• Gauze.

Generally, 30 mouth mirrors and 30 periodontal probes were available, as this permitted some instruments to be sterilized while the others were being used. Used instruments was

placed in disinfectant solution (Sodium hypochlorite solution), then washed and drained well before sterilization.

3.7.4 Infection Control

The researcher was aware of the possibility of cross-infection when conducting examinations or handling contaminated instruments current UNRWA recommendations and standards were responsibly followed for both infection control and waste disposal.Researcher was responsible for maintaining adequate infection control in assessment procedures. Use of disposable masks and gloves and wearing of protective glasses are also recommended along with sufficient quantity of disinfecting solutions.

3.7.5 Examination Area

The area for conducting examinations should be planned and arranged for maximum efficiency and ease of operation. The examination and interview were carried at NCD nursing stations

3.7.6 Examination Position

Participants examined seated in a desk chair with a high backrest with the examiner standing behind or in front of the chair.

3.7.7 Table or Platform

A table or platform to hold the dental instruments and basins was within easy reach of the examiner.

All study instruments, methods and codes based on WHO Oral Health Survey basic methods 5th edition 2013(WHO, 2013b).

3.8 Ethical and Administrative Considerations

In order to lunch this study, this proposal was submitted to Al Quds University-School of public health research committee for discussion and academic approval. An ethical approval was obtained for fromHelsinki Committee (Annex 8). Another administrative approval was obtained from the chief of UNRWA health department.
All participants were informed about the study aim and objectives a special consent form (Annex 6 & 7) was prepared before conducting the study. With enrolment in this study, we didn't anticipate any risks to the participants and data was treated anonymously. There was only minimal burden of time. Participation in the study was voluntary.Only a Few patients refused to participate because of lake of time.

3.9 Pilot Study

A pilot study on (25) participants from the 5 health centerswas conducted to explore the appropriateness of the study instruments and let the researcher train for data collection, the clarity of meanings and scales and the time taken to fill the questionnaire and for expecting response rate. As a result of piloting, the ranking of the few questions were modified and in order to make the sample more representative, they were added to sample.

3.10 Data Collection

The researcher collected the data and performed assessment duringAugust and September 2017, 25 then 381 type 2 DM participants were selected from 5 UNRWA health centers as shown in table 3.2.

No	Health Center	No of Type 2 DM Clients	No of Participants
1	***BeitHanoun H C***	1108	39
2	***Rimal HC***	3720	131
3	***Maghazi HC***	1121	40
4	***Maen HC***	2273	80
5	***Rafah HC***	2586	91
Total		10808	381

Table 3.2 Health centers and the corresponding number of representative sample

3.11 Scientific Rigor

3.11. (Questionnaire)

Validity

Experts in public health field evaluated all the components and the context of the instrument, in order to ensure that it is highly valid and relevance and their comments were taken in consideration (Annex 3). Also, a pilot study was conducted before the actual data collection to examine participants' response to the questionnaire and how they will deal with it. The questionnaire was nicely formatted in order to ensure face validity, this

including appealing layout, and logical sequences of questions and clarity of instructions. Also, a pilot study was conducted before the actual data collection to examine patients' response to the questionnaire and how they understand it.

Reliability

The following steps were done to assure instruments reliability:

.

- Training of data collectors on oral health assessment and the way of asking questions to assure standardization of questionnaire filling.
- Then, the data entry in the same day of data collection would allow possible interventions to check the data quality or to re-fill the questionnaire when required.
- Re-entry of 5% of the data after finishing data entry will assure correct entry procedure and decrease entry errors.

3.12 Data Entry and Analysis

The researcher used Statistical Package of Social Science (SPSS) program for data entry and analysis. Data analysis was done by the researcher with support from the supervisor.

• Cross-tabulation was done for specific study variables.

• An advanced statistical analysis was used to explore the potential relationship between the study variables.

3.13 Study Limitations

The study faced some limitations such as; place of the examination was at NCD nursing room not at the dental station, in addition to the burden of the time.Moreover, if the study conducted in all UNRWA health centers in Gaza strip, the financial costwill be increased. There were others limitations such as exclusion of pregnant type 2 diabetic patients because pregnancy itself have oral consequences, and exclusion of all type 2 diabetic patients above 65 years old because they have separated assessment.

Chapter 4

Results and Discussion

4.1 Introduction

This chapter presents the result of statistical analysis of the data and interpretation of these results through descriptive and inferential analysis.

4.2 Descriptive Analysis

4.2.1 Socio-demographic characteristics.

Table (4.1) Distribution of the study participants according to their Socio-demographic characteristics.

Items	No.	%
Age		
Less than 50 Years	100	24.6
From 51 to 55 years	95	23.4
From 56 to 60 years	103	25.4
From 60-65 years	108	26.6
Total	**406**	**100.0**
Mean= 54.6 , MD = 56.00 , SD= 8.02		
Education		
No formal schooling	37	9.1
Less than primary school	59	14.5
Primary school completed	57	14.0
Preparatory school completed	90	22.2
Secondary school completed	77	19.0
College/University completed and above	86	21.1
Total	**406**	**100.0**
Work		
Yes	80	19.7
No	326	80.3
Total	**406**	**100.0**
Monthly Average Income		
Under Deep poverty line (1832 NIS)	347	87.2
Above Deep poverty line	51	12.8
Total	**398**	**100.0**
Mean= 959.55, MD = 600.00, SD= 839.25		

The total number of study participants was 406 type 2 DM patients. Among them; 59.9% were female and 40.1% were male. The mean age for participants was 54.6 years with a

standard deviation (SD) 8.02, 24.6% of participants were of age group less than 50 years old, while 23.4% were of age group from 51-55 years old, 25.4% were of the age group 56-60 years, and 26.6% were of the age group more than 60 years which was the highest percentage among all group. This distribution was consistent with UNRWA field disease control report which showed that26% of patients were more than 60 years(Saleh, 2018a), another report showing that 43.3% of all type 2 DM patients are more than 55 years old(Saleh, 2018b). The discrepancies in percentages are attributed to the difference in the age group where UNRWA field disease control reports for all patients while the age group of this study is limited from 35-65 years only.

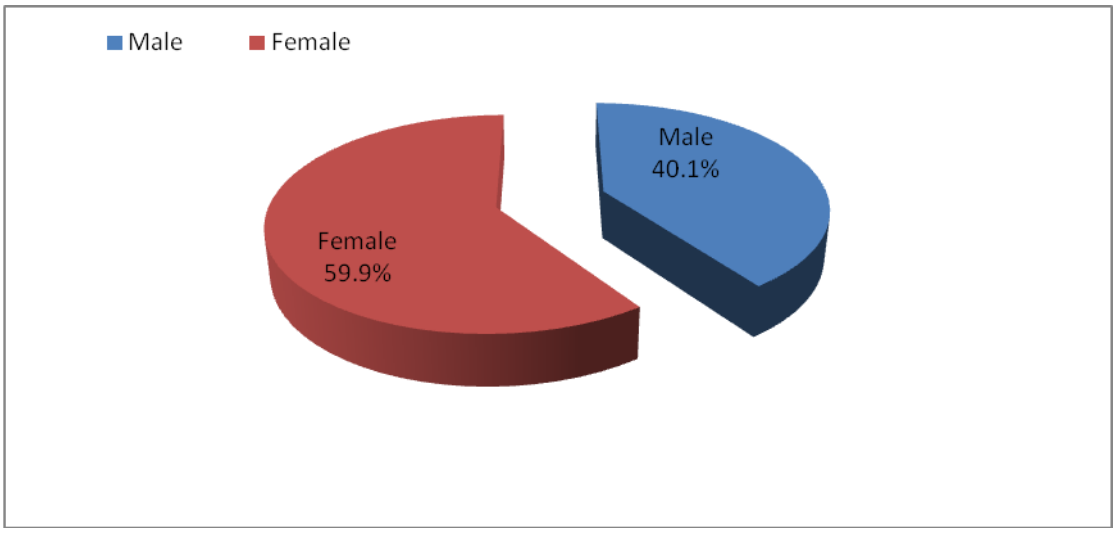

Figure (4.1) Distribution of participants by gender

Figure (4.1) showing that females represent 59.9% of study participants, UNRWA field disease control report showed that females percentage among DM type 2 is 51%, 61% among diabetes and hypertension and 60% among all NCD patients (Saleh, 2018a). Gender differences arise from socio-cultural processes, such as different behaviors of women and men, exposition to specific influences of the environment, different forms of nutrition, life styles or stress, or attitudes towards treatments and prevention. Moreover, women show more dramatic changes in hormones and body due to reproductive factors during lifetime(Kautzky-Willer et al., 2016).

Table (4.1) showing that approximately 90% of participants have formal schooling, only 9.1% have no formal schooling, 14.5% less than primary school, 14.0% primary school completed, 22.2% preparatory school completed, 19.0% secondary school completed, and 21.1% college/university completed and above.

The researcher noted that despite the majority of participants are less than 60 years old (73.4%), only 19.7% of participants were working and 80.3% were not working, moreover the meanof monthly income of participant'swas959.55 NIS.

When the researcher categorized the participants according to deep poverty line: *the poverty line and deep poverty line for the reference household (two adults and three children) stood at 2,290 New Israeli Shekels (NIS) and 1,832 NIS respectively (PCBS 2014),* the result was 12.8% of participants above deep poverty line and 87.2%underdeep poverty line many of themtheir monthly income was zero and eight participants refused to declare their monthly income.

Most of participants were refugees living in poor and crowded refugee camps. This explains why the majority of them were not working and don't have sustainable sources of income, also this is in line with current conditions in the Gaza Strip due to the siege, unemployment and low wages (Obaid and Eljedi, 2015).

The socio-demographic distribution of study participants is almost identical to the official statistics of Field Disease Control UNRWA, some differences emerged as a result of the inclusion criteria of the study;where age is limited from 35-65 years old.

4.2.2 Diabetes mellitus related characteristics.

Table (4.2) Distribution of the study participants according to their DM related characteristics.

Items	No.	%
Diabetic duration		
Less than 5 Years	134	33.0
From 5 to 9 years	109	26.8
From 10 to 14 years	90	22.2
15 years and above	73	18.0
Total	**406**	**100.0**
Mean= 8.45, MD = 7.0, SD= 6.45		
Items	**No.**	**%**
current treatment		
Diet	16	3.9
Oral	230	56.7
Insulin	65	16.0
Oral and insulin	35	8.6
Diet and oral	9	2.2
Diet and exercise	3	0.7
Insulin and exercise	19	4.7
Oral and exercises	29	7.1
Total	**406**	**100.0**
Presence of the diabetic systemic complication		
No	317	78.1
Yes, Early complication	87	21.4
Yes, late complication	2	0.5
Total	**406**	**100.0**

By a quick look to BMI distribution of participant figure (4.2), only 9.6% of participants having normal BMI(18.50 - 24.99) while 27.6% overweight (25.0 – 29.9) and 62.8% obese varying from obese I (30.0-34.9) 35.2%, or Obese II (35.0-39.4) 19.2%, or obese III (more than 40.0) 8.4% . UNRWA disease control reports showing obesity among type DM is 49.5% of all patients with DM type 2 and 61.8% among all patients with hypertension and DM type 2 (Saleh, 2018b), again the researchers believe that these discrepancies are attributed to different categorizations of UNRWA patients and the study participants where the age is limited from 35-65 years old andparticipants with type 2 DM only.

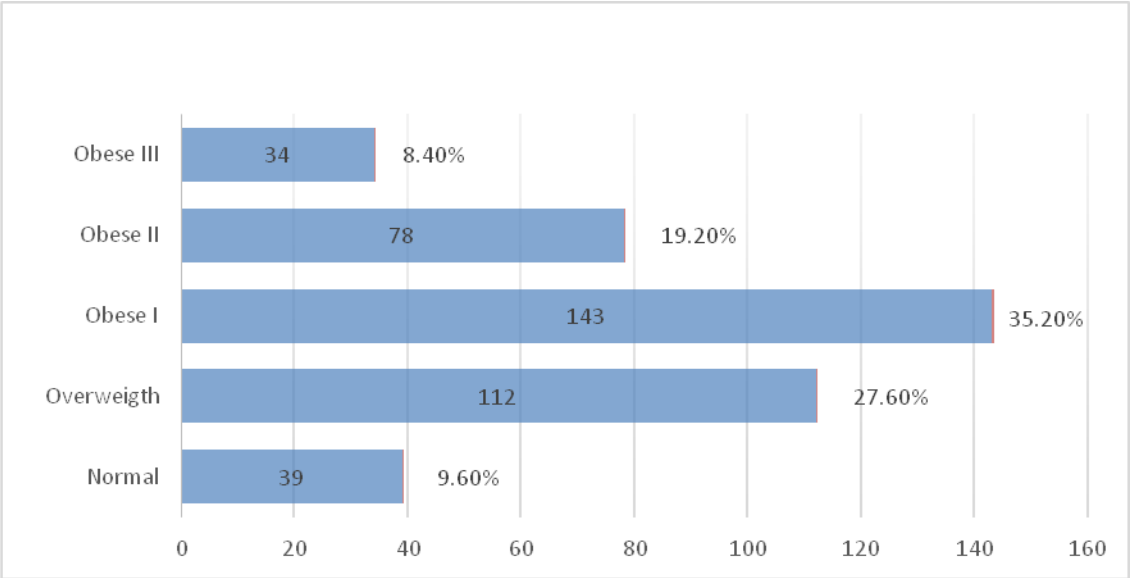

Figure (4.2): Distribution of participants by BMI

According to the annual report of UNRWA health department 2016; The number of patients with NCDs is increasing consistently by approximately 5.0% per year(UNRWA, 2017).This is quite obvious when researcher note that the number of DM patients is almost doubled last 10 years, where participants had DM type 2 since less than 5 years were 33.0%, and those who had DM type 2 since 5-9 years were 26.8%, while 22.2% of them from 10-14 years, and 18.0% 15 years and more.

The HbA1c test is an important blood test that gives a good indication of how well your diabetes is being controlled. Depending UNRWA categorization of participants according to their HbA1c, participants were divided into two major groups; controlled DM equal or less than 7% and uncontrolled more than 7%.The results showed that 21.4% of participants were controlled while 78.6% were uncontrolled figure (4.3). This result is almost running with UNRWA reports where the percentage of controlled DM participants was 30 % in 2016, and 27% in 2017 and they are targeting 30 % in 2018 (Saleh, 2018b), the difference between the result of the study and UNRWA reports is attributed to limited age group of the study.

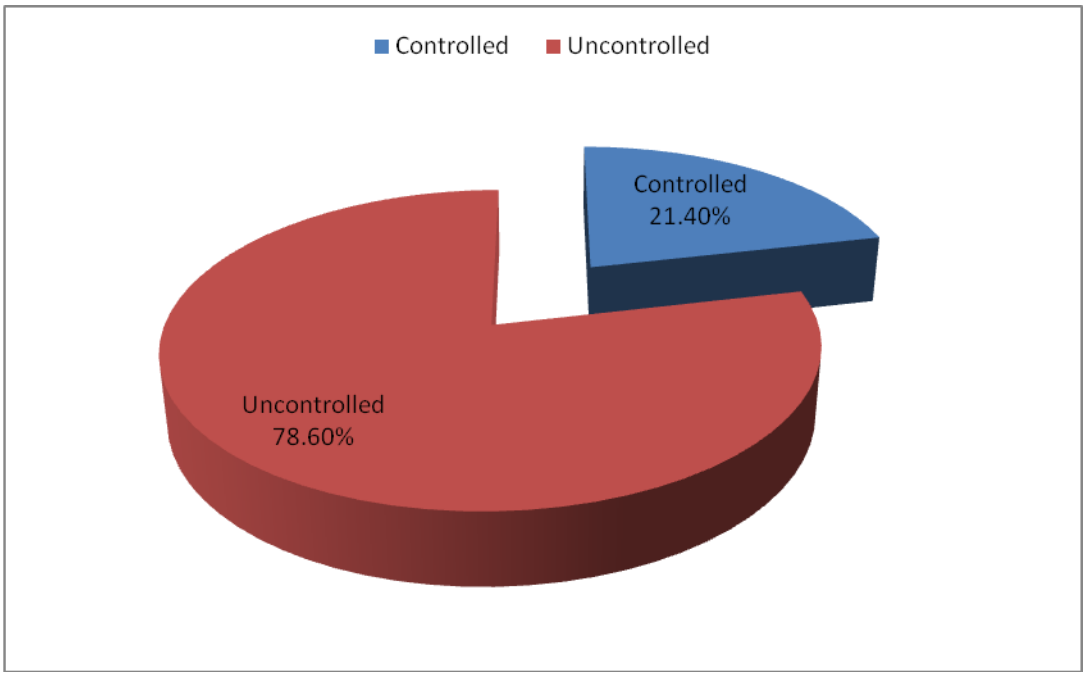

Figure (4.3): Distribution of participants by DM control status

A cross-sectional study of 369 patients with type 2 diabetes mellitus (T2DM) from four Ministry of Healthhealth centers in 2016 showed the mean of HbA1c was 8.97 and one fifth of patients had good glycemic control (HbA1c⩽7%) (Radwanet al., 2018), the result is consistent with our study findings.

Table (4.2) showed the distribution of participants according to their current DM management, the lowest percentage was "lifestyle only" 4.6% (3.9% diet and 0.7% diet and exercises), and the highest percentage was oral hypoglycemic agent 66% (oral 56.7%, diet and oral 2.2%, oral and exercises 7.1%), followed by insulin 20.7% (insulin 16.0%, and insulin and exercise 4.7%), then followed by combination of oral hypoglycemic agent and insulin 8.6%.To a certain extent, it suits the reports on disease control where "lifestyle only" 5%, oral hypoglycemic agent 73%, combination of oral hypoglycemic agent & insulin 15%, and insulin only was 8% (Saleh, 2018a).

When participants have been asked whether DM caused any systemic complications, it was clear that their knowledge about systematic complications of DM is limited to eyes complications and foot ulcers, this has been completely reflected in their answers as most of them said they have no systemic complication of DM (78.1%) but 21.9% of participants have been said they have systemic complication, almost all of them were unable to differentiate between early and late complication. According to UNRWA 2018 reports the

late complication among DM type 2 is 5.8%.Theresearcher believes that the reason for this may be attributed to inappropriate or inadequate health education (Saleh, 2018b).

4.2.3 Oral health assessment.

Table (4.3) Distribution of the study participants according to their oral health assessment at UNRWA dental station.

Items	No.	%
Number of oral health assessment performed during 2016, 2017		
Zero times	157	38.7
One	103	25.4
Two	93	22.9
Three	51	12.6
Four	2	0.5
Total	**406**	**100.0**
Intervention after the oral health assessment		
No, intervention has been done	226	90.8
Yes, intervention out UN HCs	16	6.4
Yes, intervention at UN HCs	7	2.8
Total	**249**	**100.0**
The reason for no intervention		
The Dentist told me nothing	104	46.0
Have been told that I have no oral problem	17	7.5
Only oral health education	14	6.2
Ignored	7	3.1
Need private clinic	84	37.2
Total	**226**	**100.0**
Type of intervention		
Extraction	8	34.7
Filling	11	47.8
Scaling	4	17.5
Total	**23**	**100.0**

Because oral health is an important component of general health, and sharing non-communicable diseases same risk factors, to improve general health, the wellbeing of the patients, and to promote oral health maintenance of patients with NCD, in 2012 oral health assessment of NCD patients was introduced into UNRWA primary health care centers.All patients with NCD should undergo oral health assessment once a year, study participants have been asked, how many times oral health assessment was done during last 2 years, the answer should be once or twice (data collection was in August 2017), but only 48.3. % have done oral health assessment once or twice between 2016 and 2017, 38.7% of

participants have not done any oral health assessment, 13.1% have done more than required three or four times. This imbalance may be due to lack of clear instruction or follow up of referral from NCD nursing station to dental station for annual oral health assessment. Unfortunately 90.8% of participants who have done oral health assessment have not done any intervention after the assessment and only 23 participants have done post oral health assessment intervention(11 filings, 8 extractions, and 4 scaling) seven of them at UNRWA dental station and 16 participants their post oral health assessment intervention was out UNRWA dental station.

The goal of oral health assessment is to give adequate oral health education and clinical examination of patients to give immediate appointment for intervention. When participants who have done oral health assessment have been asked about the reasons behind ignorance of post oral health assessment;46.0% of them informed nothing by dentist,37.2% redirected to private dental clinic due to unavailability of required oral services,7.5% have no oral problems,6.2% have given oral health education and 3.1% have ignored the dentist`s request to have an appointment for intervention.

The researcher believes that these unacceptable results occurred because of the absence of clear technical instruction for NCD patient’s oral health assessment and because of the way of referral of them to dental station for assessment "*Go to dentist just to count your teeth, it will take few seconds and you're not requested to follow queue*".

Moreover, one of the main objectives of oral health assessment is to determine the oral problems faced by NCD patients, then patients should be given short oral health education, discussing patients about their oral problems and immediate appointment for intervention should be given but actual assessment is performed by registering number of decayed, missed, and filed teeth.

4.2.4 Oral hygiene and Lifestyle characteristics.

4.2.4.A Self-oral assessment.

Table (4.4.A) Distribution of the study participants according to their self-reported number of teeth and self-assessment of teeth and gums.

Number of natural teeth	**No.**	**%**
No natural teeth	32	7.9
1–9 teeth	28	6.9
10–19 teeth	67	16.5
20 teeth or more	279	68.7
Total	**406**	**100.0**
Self-assessment of teeth state		
Excellent	6	1.6
Very good	18	4.8
Good	77	20.6
Average	121	32.4
Poor	103	27.5
Very poor	46	12.3
Do not know	3	0.8
Total	**374**	**100.0**
Self-assessment of gums state		
Excellent	9	2.4
Very good	20	5.3
Good	75	20.1
Average	114	30.5
Poor	103	27.5
Very poor	50	13.4
Do not know	3	0.8
Total	**374**	**100.0**

Many people experience tooth pain or sensitivity immediately after tooth loss. Tooth loss can cause immediate problems with eating, speech, and other basic activities that may worsen with time. Eventually, the remaining teeth in the jaw shift in an attempt to fill in the gap left by a missing tooth. The resulting crooked teeth can cause serious bite problems that require orthodontics to correct. Further, because each tooth is supported by those around it, missing teeth can weaken the overall structure of the mouth, causing additional tooth loss or injury that may worsen with time. Participants have been asked to report the number of natural teeth they have,68.7% of participants having 20 teeth or more, 16.5% 10-19 teeth, 6.9% 1-9 teeth and 7.9% have no natural teeth. Results showed a clear high teeth lost rate, therefore many patients still require teeth replacement services.

Participants have been requested to describe the state of their teeth and gums,gums the answer was average 32.4% for teeth and 30.5% for gums, poor 27.5% for both teeth and gums, good 20.6% for teeth and 20.1% for gums, very poor 12.3% for teeth and 13.4% for gums, very good 4.8% for teeth and 5.3% for gums, excellent 1.6 % for teeth and 2.4% for gums and finally 3 participants said do not know.

4.2.4.BOral hygiene maintenance.

Table (4.4.B) Distribution of the study participants according to their Frequency of tooth cleaning and Usage of aids for oral hygiene.

Items	No.	%
Usage of oral hygiene aids		
Toothbrush	225	96.2
Wooden toothpicks	7	3.0
Plastic toothpicks	6	2.6
Thread (dental floss)	4	1.7
Chewstick/miswak	21	9.0
Usage of toothpaste to clean teeth		
Yes	231	97.1
No	7	2.9
Total	**238**	**100.0**
Usage of toothpaste that contains fluoride		
Yes	56	24.3
No	5	2.1
Don't Know	170	73.6
Total	**231**	**100.0**

Regarding the frequency of teeth cleaning, more than one third of participants (36.3%) never clean their teeth while only 16.5% of participants used to clean their teeth twice or more a day (minimum required) and 24.8% once a day, rest of participants varying from 2-6 times a week(8.0%), to 2-3 times a month(1.8%), or once a month(1.8%).Generally, the patients need two thorough brushings a day. Studies have shown that to a achieve gingival health, the interval between tooth cleaning session should be not less than 12 hours but not greater than 48 hours (Marya, 2001).

The distribution of participants according to their frequency of teeth cleaning, confirms the lack of awareness for oral health maintenance, lack of knowledge about oral complications of DM and absence of appropriate health education.

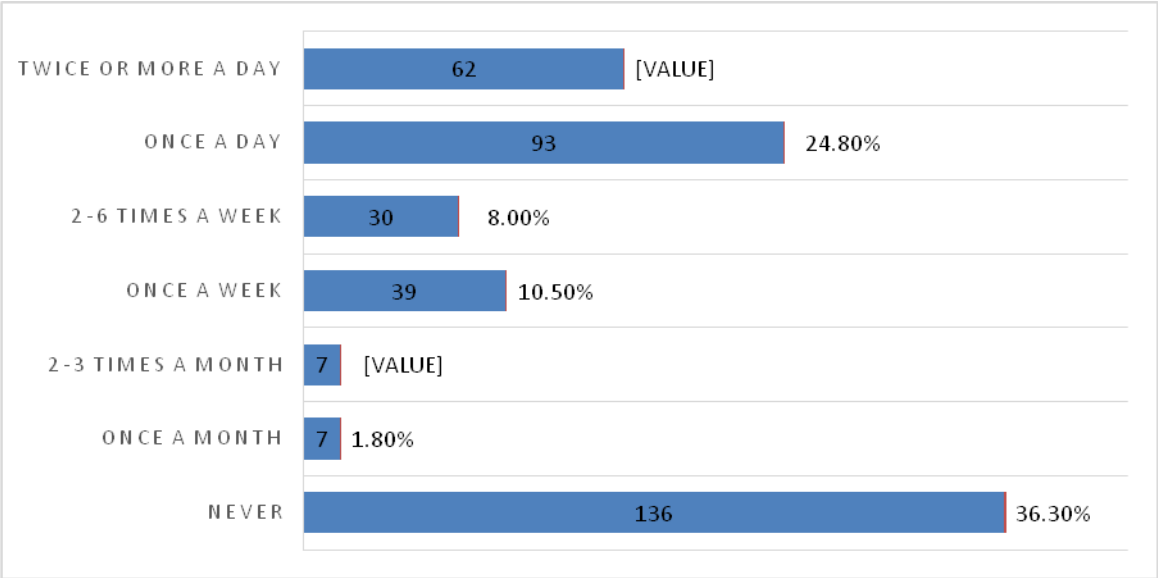

Figure (4.4) Frequency of teeth cleaning

Majority of participants (96.2%) were using toothbrush, 6 participants using plastic toothpicks , 6 participants using wooden toothpicks, 21 using miswak and 97% of participants using toothpaste but 73.6% of them do not know whether the toothpaste contains fluoride or not; this confirms their lack of knowledge of benefits of fluoride, due to absence of health education.

4.2.4.CDental visit.

Table (4.4.C) Distribution of the study participants according to their frequency and reasons of the dental visit.

Period of time since the last dentist visit	**No.**	**%**
Less than 6 months	120	29.6
6-12 months	113	27.8
More than 1 year but less than 2 years	111	27.3
2 years or more but less than 5 years	50	12.3
5 years or more	10	2.5
Never received dental care	2	0.5
Total	**406**	**100.0**
The reason for the last dentist visit		
Consultation/advise	59	14.5
Pain or trouble with teeth, gums or mouth	76	18.7
Treatment/ follow-up treatment	254	62.6
Routine check-up/treatment	3	0.7
Don’t know/don’t remember	14	3.4
Total	**406**	**100.0**

Among study participants, 29.6% stated that they have been seen by a dentist at least once in last six month period, 27.8% of them have been seen by a dentist at least once in last 6-12 months, 27.3% have been seen by a dentist at least once in more than one year but less than two years, 12.3% have been seen by a dentist at least once in two years or more but less than five years, 2.5%have been seen by a dentist at least once in five years or more and only 2 participants never received dental care. Continuing unexpected results showing that only three participants have been seen by a dentist for routine check-up/treatment. The reason for dental visit of the majority of participants was(62.6%) Treatment/follow-up treatment while 14.5% for consultation/advise, 18.7% pain or trouble with teeth/gums/mouth and 14 participants either don't know or don't remember.

A regular dental checkup is keeping teeth and gums healthy. Because it is essential element of oral hygiene maintenance, regular a dental visit should be performed at least every 6 months or as recommended by dental professional. Two parts of regular dental visit examination and the cleaning, by seeing dentist on a regular basis and following daily good oral hygiene practices at home, keeping teeth and gums healthy

This undoubtedly convinced the researcher that DM type 2 patients in Gazaare not fully aware about the importance of the regular visit to a dentist and reemphasized the inadequacy of health education.Dental visiting is still not considered a preventive dental behavior; at present it only depends on treatment needs. Another reason could be lack of awareness on the part of patients with diabetes regarding the oral complications of the disease and a perceived lack of time for this additional healthcare activity when patients are busy with the management of their diabetes.

4.2.4.D Smoking status.

Table (4.4.D) Distribution of participants according to smoking status.

Smoking		
Yes	57	14.0
No	349	86.0
Total	**406**	**100.0**
Number of Cigarettes smoked daily		
10 Cigarettes and less	19	33.3
From 11 to 20 Cigarettes	28	49.1
Above 20	10	17.5
Total	**57**	**100.0**
Mean= 17.09, MD = 20.0, SD= 10.029		

Smoking is considered as a common risk factor for non-communicable disease and oral health problem, the majority (86%) of study participants were nonsmokers The mean for cigarettes per day participants used to smoke is 17.09 Cigarettes with standard deviation 10.029, 49.1% of participants smoke from 11 to 20 cigarettes per day, 33.3% 10 cigarettes and less and 17.5% used to smoke more than 20 cigarettes per day.The conclusion that participants in our study mainly nonsmokers but smokers participants smoke aggressively which give us a clue to focus on smoker diabetics in order to reduce the smoking rate instead of speaking to all DM patients.

Majority of people are now aware that smoking is a bad habit for their health. It can cause many serious medical problems and, in some cases, fatal diseases. However, many people don't realize the damage that smoking does to their mouth, gums, and teeth. Smoking has a potentially significant and negative impact on oral health. The local and systemic outcome of tobacco use on oral health depends upon method, frequency, and duration of use. Smoking has been associated with tooth loss, caries, periodontal disease, oral soft tissue changes, dental implant failure, and oropharyngeal cancer(ACP, 2015).

4.2.4.E Experience of Pain/discomfort or difficulties.

Table (4.4.E) Distribution of the study participants according to their experience of pain/discomfort or difficulties due to oral problems.

Teeth/mouth pain or discomfort during the past 12 months							
Yes				156		38.4	
No				219		53.9	
Don't know				5		1.2	
No Answer				26		6.4	
Total				**406**		**100.0**	
Because of the state of your teeth or mouth, experience of any of the following problems during the past 12 months?							
Items		**Don't Know**	**No**	**Sometimes**	**Fairly often**	**Very Often**	**Weighted Mean**
Difficulty in biting foods	**N**	1	311	75	13	6	25.8
	%	0.2	76.6	18.5	3.2	1.5	
Difficulty chewing foods	**N**	1	283	97	17	8	27.6
	%	0.2	69.7	23.9	4.2	2.0	
Difficulty with speech/trouble pronouncing words	**N**	1	377	19	9	0	21.8
	%	0.2	92.9	4.7	2.2	0.0	
Dry mouth	**N**	2	71	166	145	22	45.6
	%	0.5	17.5	40.9	35.7	5.4	
Felt embarrassed due to appearance of teeth	**N**	6	354	22	17	7	23.4
	%	1.5	87.2	5.4	4.2	1.7	
Felt tense because of problems with teeth or mouth	**N**	6	355	26	13	6	23.2
	%	1.5	87.4	6.4	3.2	1.5	
Have avoided smiling because of teeth	**N**	6	367	20	8	5	22.2
	%	1.5	90.4	4.9	2.0	1.2	
Had sleep that is often interrupted	**N**	6	364	31	5	0	21.8
	%	1.5	89.7	7.6	1.2	0.0	
Difficulty doing usual activities	**N**	7	382	15	2	0	20.6
	%	1.7	94.1	3.7	0.5	0.0	
Felt less tolerant of spouse or people who are close to you	**N**	6	387	11	2	0	20.4
	%	1.5	95.3	2.7	0.5	0.0	
Have reduced participation in social activities	**N**	8	386	11	1	0	20.2
	%	2.0	95.1	2.7	0.2	0.0	
Mean = 24.81 , MD = 23.64 , SD= 5.65							

Most of the participants declared that dental problems did not impact on their life activities such as biting foods, chewing foods, smiling, sleeping…etc. Actually, by a quick look to the available references, the oral health quality of life (OHQOL) shares the same elements as quality of life (QOL) and health-related quality of life (HRQOL) and is the effect of oral

health on a person`s QOL, describing people`s perspectives of the ways in which oral diseases, conditions, and treatment affect their lives(Betty, 2017). A link between oral health and QOL has been reported for a number of oral health conditions, including dental caries, poor oral hygiene, severe periodontitis, craniomandibular pain, xerostomia, partial tooth loss and edentulism, diseased teeth, untreated disease, malocclusion, orodental trauma, craniofacial anomalies, oral cancer, unmet dental needs, and occasional and episodic dental treatments. OHQOL considers how these conditions affect a person`s QOL based on 5 dimensions (Betty, 2017)which are;

- Oral health dimensions (pain or discomfort either acute or chronic dental or facial).Results show approximately half of participants (53.9%) said they had no any pain or discomfort during last 12 months.
- Functional dimensions (ability and comfort related to biting, chewing, swallowing, speaking, relaxing, sleeping, and cleaning one`s teeth).Table (4.4.E) showing that 76.6% of participants(Weighted Mean 25.8) facing no difficulty in biting foods, 69.7% of them (Weighted Mean 27.6) facing no difficulty chewing foods, 92.9% of them (Weighted Mean 21.8) facing no difficulty with speech, 89.7% (Weighted Mean 21..8) had no sleep interruption, and only 16.7% of them used to clean their teeth twice or more a day.
- Psychological factors (self-steam, self-concept/sense of self, smiling without embarrassment, eating or speaking in front of others, facial appearance, intimacy, personal contact/social integrations/social interaction, and emotional ability).Table (4.4.E) showing that 87.2% (Weighted Mean 23.2)felt no tense because of problems with teeth or mouth,87.2% (Weighted Mean 23.4) have not felt embarrassed due to appearance, 90.4%(Weighted Mean 22.2) have not avoided smiling because of teeth, 95.3% (Weighted Mean 20.4)have no problem intolerance with spouse or people close to them and 95.1%(Weighted Mean 20.2)have not reduced their participation in social activities.
- Social factors (ability to work/study and subsequent direct and indirect economic impact). Table (4.4.E) showing that 94.1%(Weighted Mean 20.6) of participants doing their usual activities without difficulty.
- Treatment expectation (satisfaction with respect to oral health and treatment outcomes)(Betty, 2017).

The weighted mean of the domain is 24.81% with a standard deviation 5.65which shows fewerparticipants facingdifficulties because of state of their teeth or gums. The researcher believes that the tough circumstances in Gaza can be the most important factor that contributes to the high level of resilience and self-confidence. There is a Gazan coping mechanism of feeling good about things that are definitely have negative impact on humans. Gazans tend to complain less about issues that can stigmatise them as "disabled" or "unable to cope" and this can be translated into a bizarre thinking style such as "I have no teeth in my mouth but I can Lough freely" or "losing many teeth does not affect my ability to chew". The researcher considers a different way to obtain such data about human behavior. In this context, qualitative data can be much more satisfying in order to describe what DM patients with dental problems really feel, how they perceive themselves and what they do to cope with these problems.

4.2.4.F Consumption of sugary foods and drinks.

Table (4.4.F) Distribution of the study participants according to their frequency of consumption of sugary foods or drinks

Frequency of eating or drinking any of the following foods, even in small quantities?								
Items		**Seldom/ never**	**Several times a month**	**Once a week**	**Several times a week**	**Every day**	**Several times a day**	**Weighted Mean**
Biscuits, cakes, cream cake	**N**	81	84	127	60	50	4	47.0
	%	20.0	20.7	31.3	14.8	12.3	1.0	
Sweet pies, buns	**N**	90	109	107	56	43	1	44.2
	%	22.2	26.8	26.4	13.8	10.6	0.2	
Jam or honey	**N**	290	70	26	14	6	0	24.3
	%	71.4	17.2	6.4	3.4	1.5	0.0	
Chewing gum containing sugar	**N**	235	48	22	26	74	1	36.0
	%	57.8	11.9	5.4	6.4	18.3	0.2	
Sweets/candy	**N**	115	144	108	17	21	1	37.2
	%	28.4	35.3	26.7	4.2	5.2	0.2	
Lemonade, Coca Cola or other soft drinks	**N**	56	88	185	29	47	1	47.0
	%	13.8	21.7	45.6	7.1	11.6	0.2	
Tea with sugar	**N**	146	8	9	4	224	15	58.2
	%	36.0	2.0	2.2	1.0	55.2	3.7	
Coffee with sugar	**N**	331	14	5	5	49	2	26.7
	%	81.5	3.5	1.2	1.2	12.1	0.5	
Arabian delights ka`aek, Baklawa,Numora, etc	**N**	125	264	12	4	1	0	29.2
	%	30.8	65.0	3.0	1.0	0.2	0.0	
Nuts	**N**	101	217	56	21	11	0	34.5
	%	24.9	53.4	13.8	5.2	2.7	0.0	

Mean = 38.41 , MD = 38.33 , SD = 10.60

The weighted mean of the domain is 38.4% with a standard deviation 10.60 which shows low consumption of sugary foods and drinks among study participants. Unfortunately, no studies have been conducted on the relationship between diabetes and oral health in the Gaza Strip, the rate of consumption of sugary foods and drinks among diabetic patients remains unknown, and therefore there is no room for any comparison.

The highest mean recorded for the consumption of "tea with sugar" and it was the only mean above 50% (58.2%). The researcher assumed that it is a part of our food culture to drink tea with sugar, This was clearly mentioned in the study ofdietary behaviors and dentalfluorosis among Gaza Strip childrenin 2012 as, the study of Abuhaloob and Abed find the majority(98.1%) of children drankonly 1 cup of tea per day while at ages 4–7 years 58.1% drank 1–2 cups of tea per day(Abuhaloob and Abed, 2013).

The next highest mean scores recorded for questions about "biscuits, cakes" and "sugary beverages" (47%). Although it is harmful to the level of blood sugar and oral health, as a result of the availability there is increased consumption of Biscuits, cakes, cream cake Lemonade, Coca Cola or other soft drinks.

The weighted mean for consumption of "sweet pies, buns" is 44.2%, while the weighted means for consumption of "Sweets/candy","Chewing gum containing sugar", and "Nuts" are very close together, they are respectively 37.2%, 36.0%, and 34.5%. Moreover, the weighted means for consumption of "Arabian delights","Coffee with sugar", and "Jam or honey" are also convergent, they are respectively 29.2%, 26.7%, and 24.3%.

According to the American Dietetic Association, "nutrition is an integral component of oral health. …". Oral health and nutrition have a synergistic relation (Touger-Decker and Mobley, 2007).Oral flora use the sugar as energy and release acid as a waste product, that acid plays a major role in the development of dental caries by gradual dissolving the enamel in the teeth. The effects which added sugars are having on both our general and dental health can be highly damaging, especially when consumed frequently.When sugar reacts with the bacteria in plaque, the acids which are formed attack the teeth and destroy the enamel. If this occurs often, the tooth enamel may break down, forming a hole or 'cavity' and causing tooth decay. This almost always leads to fillings and could even result in teeth having to be extracted(OHF, 2015).

The researcher believes that this low percentage can be a normal as result of a long and intensive course of health education program about DM, Microclinic International (MCI) program and good quality of DM services provided in UNRWA HCs.A joint project between UNRWA Health Program and MCI was launched in 2015, with the financial support by World Diabetes Foundation (WDF). The project aims to scale up diabetes prevention at UNRWA health centers, basically through training of all nursing staff and recruiting patients and their social network in health education interactive sessions aiming at helping them to follow a healthy lifestyle (UNRWA, 2016a). By the way, researcher believes that low consumption of sugary foods and drinks because patients desire to decrease blood sugar level more than their awareness of the consequences of sugary foods and drinks consumption on oral health.

4.2.5 Oral Health status

4.2.5. A Dental status

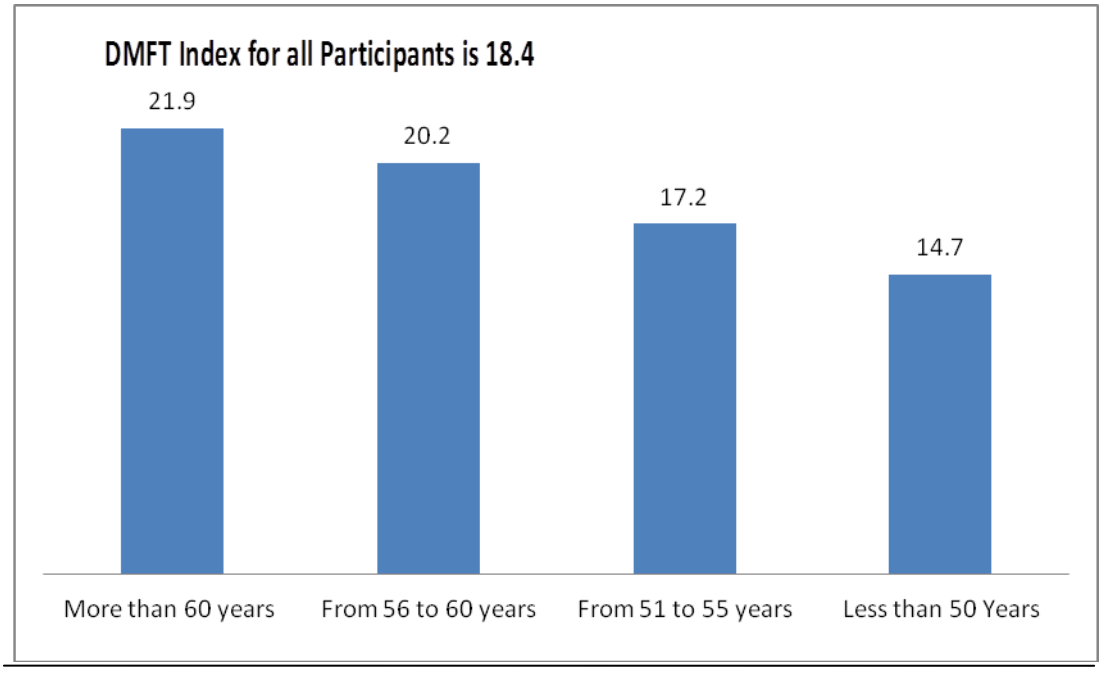

Figure 4.5 DMFT index of age groups

Table (4.5.A) Distribution of the study participants according to dentition status by subject

Items	Mean	MD	SD
Sound teeth	12.2	13.0	7.9
Carious teeth	6.1	5.0	5.3
Filled with caries teeth	0.6	0.0	1.3
Filled without caries teeth	1.6	0.0	3.3
Missing teeth due to caries	7.2	5.0	7.4
Missing teeth due to another reason but not from caries	3.3	0.0	8.0
Teeth protected by fissure sealants	0.0	0.0	0.1
Teeth with fixed dental prosthesis/crown abutment, veneer, implant	1.0	0.0	1.9
Un-erupted teeth	0.1	0.0	0.5
Unrecorded teeth	0.0	0.0	0.1

The **De**cayed, **M**issing, **F**illed (**DMF**) index has been used for more than 70 years and is well established as the key measure of caries experience in dental epidemiology. The DMF Index is applied to the permanent dentition and is expressed as the total number of teeth or surfaces that are decayed (D), missing (M), or filled (F) in an individual. When the index is applied to teeth specifically, it is called the DMFT index, and scores per individual can range from 0 to 32(Larmas, 2010).Table (4.5.A) showed that. the mean number of decayed teeth was high (6.1), while mean number of missed teeth was extraordinarily high (7.2 due to caries and 3.3 due to another reason but not from caries), whereas the mean number of filled teeth appear to be very low (1.6).These findings suggest that oral health care in Gaza Strip consist of radical treatment in term of tooth extraction, and reflects the lack of interest of participants in the treatment of teeth decayed.

Figure (4.5) showed that, DMFT index for all participants is 18.6 teeth, which considered extraordinarily high, with mean of sound teeth 12.2 teeth, caries teeth 6.1 teeth, filled with caries 0.6 teeth filled without caries1.6 teeth, missing because of caries7.2 teeth, missing because of another reason but not from careies3.3 teeth.The distribution of study participants according to their DMFT index clearly illustrates the positive relationship between age and DMFT index since the index increases with increased age.

According to The World Oral Health Report 2003, decayed missing filled permanent teeth of 35-44 years old worldwide very low (less than 5.0), low (5.0 -8.9), moderate (9.0-

13.9), high (more than 13.9)(Petersen, 2003).Few published research investigated oral health among Palestinians and the available ones assessed dental caries experience among school children only. Dental caries experience data available for preschoolers and school children show high dental caries experience in both primary teeth (dmft of 2.5) and permanent teeth (DMFT of 6.5). No data is available about oral health of Palestinian adults, study to assess dental and periodontal health status of a convenience sample of 370 subjects participated in an oral health awareness campaign in the center of the busiest cities in the West Bank, Palestine, (Mean age of the sample was 32 ±12 year) showed that the mean DMFT score was 9± 5(Kateebet al., 2015).Another study to measure the distribution of dental caries in a group of Palestinian adolescents, sample of 677 individuals of both sexes (411 were females and 266 were males) their ages ranged from 12 to 15 year old randomly selected from schools in northern west bank in Palestine, they study showed that, the prevalence of dental caries was higher in females with DMFT 5.39 ± 2.854 than males with DMFT 5.26 ± 2.891 (Mahfouz and Esaid, 2014),119 Pregnant women visiting prenatal programmes at Ministry of Health centersin Jerusalem governorates were screened using the Decayed, Missed and Filled Teeth (DMFT) index to quantify their dental caries experience, women were housewives with mean age 26 years, the result showed that the mean DFMT index is 14(Kateeb and Momany, 2018). A study Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health, Faculty of Graduate Studies, at AnNajah National University, Nablus Palestine,conducted by BaraaNaji Mustafa Sabha, in April 2007 to determine dental caries prevalence among representative sample of 12-year-old schoolchildren (357 children) in Northern West-Bank, Palestine, result showed that, mean DMFT for the overall of the sample was3.45 and only 16% of children were caries free.

The DMFT index values observed in this study (18.6 in 35–65 year old with type 2 DM) are higher than those found in more developed countries and almost same as developing countries. For example, in New Zealand, the mean DMFT in 35–44-year-old was 10.0 and24,2 in 65–74-year-old adults. In the second National Survey of Oral Health in China (2002), the mean DMFT in 35–44-year-old adults was 2.1 and 12.4 in the 65–74-year-old group. In Spain, the national surveys in the 35–44-year old group made in 1984, 1993, 2000, and 2005 showed a DMFT of 11.6, 10.9, 8.4, and 9.6, respectively, whereas for 65–74-year-old adults, the 3 national surveys in 1993, 2000 and 2005 showed a mean DMFT of 21.16, 18.10, and 16.8, which shows a decrease in the caries experience. Only two South American countries have carried out surveys with national samples with oral exam in

adults: Colombia (1999) with a DMFT of 15.00 in the 35–44-year-old group and 19.6 in the "older than 55" group and Brazil with a mean DMFT of 20.1 for 35–44-year-olds and 27.3 for the 65–74-year-old group in 2003 and a 16.3 and 27.0 DMFT for the 35–44 and the 65–74 adults, respectively, in 2010. In Chile, the mean DMFT was 15.06 and of 21.57 for the 35–44 and the 65–74 adults, respectively(Urzua and el al., 2012).

In the light of the results of previous studies, and considering the age difference, and the oral effects of DM, the researcher believes that mean score of DMFT of the study participants which was 18.6 is acceptable.

4.2.5.B Periodontal status

Table (4.5.B1) Distribution of the study participants according to their prevalence of gingival bleeding and periodontal pocket.

Periodontal status		
Gingival bleeding	**No.**	**%**
Individuals Showing no gingival bleeding	61	16.4
Individuals Showing gingival bleeding	312	83.6
Total	373	100.0
Pocket		
Individuals showing absence of pocket	9	2.4
Individuals showing presence of pocket	364	97.6
Total	373	100.0

Table (4.5.B2) Distribution of the study participants according to their gingival bleeding status and pocket measurement.

Items	Mean	MD	Std
Periodontal status (CPI Modified)			
1. Gingival bleeding			
Number of teeth Showing no gingival bleeding	9.97	0.00	7.96
Number of teeth Showing gingival bleeding	9.91	14.00	13.56
Number of teeth excluded from bleeding test	0.00	0.00	0.00
Number of teeth not present for bleeding test	9.14	7.00	10.49
2. **Pocket**			
Number of teeth showing absence of pocket	7.15	0.00	4.50
Number of teeth showing pocket 4-5 mm	7.84	12.00	11.81
Number of teeth showing pocket 6 mm or more	4.96	5.00	5.16
Number of teeth excluded from pocket measurement	0.18	0.00	0.01
Number of teeth not present for pocket measurement	9.13	7.00	10.47

People with diabetes are more likely to have periodontal disease than people without diabetes. In fact, periodontal disease has often considered a complication of diabetes. Table (4.5.B1) showing that only 16.4% of participants have no gingival bleeding and 9 participants representing 2.4% have no periodontal pockets.Moreover, the mean number of teeth showing absence of bleeding was9.97 while the mean number of teeth showing presence of gingival bleeding was 9.91 and mean number of teeth not present for bleeding test was 9.14. In addition to that, the mean number of teeth showing absence of pocket 7.15, mean number of teeth showing pocket of 4-5mm 7.84, mean number of teeth showing pocket of 6 mm or more 4.96 and the mean number of teeth not present for pocket measurement 9.13.These results, although frustrating, are in line with global studies, one of these studies indicated that the prevalence of periodontal disease in diabetic patients was 86.8% among fifteen hundred patients with diabetes mellitus were examined(Rajhanset al., 2011).A study reported the prevalence of periodontitis to be 39% in individuals aged 19

years and older, while in patients above 35 years of age(Cianciolaet al., 1982), while another studyreported the prevalence of periodontitis to be 87% (Rylanderet al., 1987), but study of Bacic *et al.* reported the prevalence to be 50%(Bacicet al., 1988).

4.2.5. C Dental trauma

Table (4.5.C) Distribution of the study participants according to their severity of dental trauma and number of teeth affected.

Dental trauma	No.	%
No sign of injury	317	84.7
Treated injury	6	1.6
Enamel fracture only	31	8.3
Enamel and dentine fracture	6	1.6
Pulp involvement	3	0.8
Missing tooth due to trauma	11	2.9
Total	**374**	**100.0**
Number of teeth affected		
One	11	19.3
Two	26	45.6
Three and above	20	35.1
Total	**57**	**100.0**
Mean 2.54, MD = 2.0, SD= 1.34		

Table (4.5.C) shows that 84.7% of participants have no sign of dental trauma and only 15.3% had dental trauma, 6 participants had treated their injuries, 31 have enamel fracture, 6 participants have enamel and dentine fracture, 3 participants have pulp involvement, and 11 participants had lost teeth due to trauma.

The dental trauma of 11 participants affected single tooth, while 2 teeth affected by dental trauma occurred among 26 participants and 20 participants showing dental trauma of 3 teeth or more.

Many studies confirm the relation between DM and history of failing down, Karchooet al. studied the association between hypoglycemia and fall-related events in type 2 diabetes mellitus, the conclusion of that study was the risk of fall-related events over 365 days increased 2-fold among elderly patients with diabetes who experienced hypoglycemia (Kachooet al., 2015). Another study conducted at community university of the region of chapeco (unochapeco) Brazil, comparative analysis of risk for falls in patients with and without type 2 diabetes mellitus showed that DM is associated with reduced mobility, reduced visual acuity than non-diabetic patients (Oliveira et al., 2011).

Since falls and accidents are the most important causes of dental Trauma, the researcher believes that falling as a result of hypoglycemic attacks and reduced both mobility and visual acuity are the main reason behind dental trauma among diabetic patients.

4.2.5.D Enamel fluorosis

Table (4.5.D) Distribution of the study participants according to their enamel fluorosis severity

Enamel FluorosisSeverity	No.	%
Normal	90	24.1
Questionable	73	19.5
Very mild	71	19.0
Mild	64	17.1
Moderate	41	11.0
Severe	35	9.4
Total	**374**	**100.0**

Dental fluorosis is a change in the appearance of the tooth's enamel surface.Although they may be of cosmetic concern, in moderate to severe fluorosis, teeth are physically damaged(CDC, 2016).

The distribution of participants according to enamel fluorosis severity showed that 75.9% of participants have enamel fluorosis varying from questionable to very mild, mild, moderate, and severe. The highest percentages were questionable 19.5% and very mild19% then followed by mild 17.1% then moderate11.0% and finally severe 9.4%.

Dental fluorosis is a condition that causes changes in the appearance of tooth enamel. It may result when children regularly consume fluoride during the teeth-forming years, age 8 and younger(CDC, 2016), because of that, all studies available about fluorosis are among children in Gaza Strip and there is ascarcityof fluorosis among adult.

The result of many studies is in the line with obtained result where the enamel fluorosis among Gazan children is 60-78%, one of these studies performed in 2003 among 353 school children of the five geographic areas of the Gaza Strip, the prevalence of dental fluorosis was 60%, and 40% had no signs of fluorosis in their permanent dentitions. The highest occurrence,94%, was in Khan Yunis,followed by 82%in Rafah, 68% in the middle area, 29% in Gaza and the lowest occurrence of 9% was in the northern area (Shomaret al., 2004).Another study among school children showed thatthe prevalence of dental fluorosis was 78.0%. Children aged 12–18 years and their mothers **(**Abuhaloob and Abed, 2013).

4.2.5.E Dental erosion

Table (4.5.E) Distribution of the study participants according to their dental erosion severity and number of affected teeth.

Dental Erosion Severity	No.	%
No sign of erosion	285	76.2
Enamel lesion	55	14.7
Dentinal lesion	32	8.5
Pulp involvement	2	0.5
Total	**374**	**100.0**
Number of teeth affected		
5 and less	23	25.8
From 6 to 7	30	33.7
From 8 to 10	20	22.4
More than 10	25	28.0
Total	**98**	**100.0**

The researcher verified that some of the individuals (23.7%) of the sample researched presented some degree of dental erosion/erosive dental wear, 14.7% were limited to the enamel, while 8.5% of the participants showed erosive wear extending into the dentine and only 2 participants showed pulp involvement. The great difference in the percentage of enamel lesion and both dentinal lesion and pulp involvement is the enamel lesion is asymptomatic while dentinal lesion cause sensitivity and pulp involvement is very painful, so the treatment of enamel lesions can be postponed while participants can't afford pulp involvement pain**.**

A large number of diseases and syndromes are associated with dental erosion. One of these disease is DM, as result of deterioration in the quantity/quality of saliva, a reduction of Oro-motor function (Johansson et al., 2012).

4.2.5.F Dentures

Table (4.5.F) Distribution of the study participants according to their wearing denture(s).

Items	No.	%
Denture(s) Upper		
No denture	360	88.6
Partial denture	8	2.0
Complete denture	38	9.4
Total	**406**	**100.0**
Denture(s) Lower		
No denture	365	89.9
Partial denture	9	2.2
Complete denture	32	7.9
Total	**406**	**100.0**

Dentures replace missing teeth and restore tooth function. Acrylic dentures represent the common treatment for total and, in some cases, partial loss of teeth(Peracini et al., 2010;Apratimet al., 2013). While difficulty eating and aesthetics may be patients' main problems,missing multiple teeth or a single tooth can have a long-term detrimental impact on one's overall dental health, so it is highly recommended to treat this problem as early as possible in order to avoid additional dental health problems, which can include:increased risk of gumdisease and decay, jaw misalignment, bone loss, shifting of the teeth(Rye, 2015).

The study showed that the rate of tooth loss among diabetics is very high,therefore many patients still require teeth replacement services for their missing teeth. Since we have 32 edentulous participants (Total loss of teeth), to some extent, it is acceptable that we have 38 upper complete dentures and 32 lower complete dentures,But it is not logical that the mean of missing teeth due to caries is 7.2 and the mean of missing teeth due to another reason but not from caries is 3.3 while the number of partial dentures is 9 upper partial dentures and 8 partial lower partial denturesand the mean of teeth with fixed dental prosthesis/crown abutment, veneer, implant is only1.

The researcher believes that participants are not willing to replace their lost teeth by partial denture because of economic issues or they do not know the sequences of not replacing the lost teeth.

4.2.5.G Oral mucosal lesions

Diabetes mellitus is associated with a greater likelihood of developing certain oral mucosal disorders. A cross-sectional observational study between August and October 2012 with a convenience sampling was performed for 51 patients with diabetes mellitus (type 1 and type 2)showed that the prevalence of oral lesions was 78.4%, traumatic ulcers (16.4%) and actinic cheilitis (12.7%) were the most prevalent lesions, the lips (35.3%) and tongue (23.5%) were the most common location (Silva et al., 2015).Another study to evaluate the prevalence of oral mucosa lesions among diabetic patients in South Kerala India showed that most of the patients (57, 76%) subjects had oral mucosal lesions, denture stomatitis observed in 18 (24%), followed by angular chelitis in 11 (14.6%), fissured tongue in 9 (12%), lingual varicosities in 7 (9.3%), sialosis among 5 (6.6%), xerostomia in 4 (5.3%) and oral lichen planus in 3 (4%) subjects (Mathew et al., 2017).

This is absolutely inconsistent with the results obtained, where only two oral lesions occurred among participants (Malignant Tumor) at vermillion border and commissures.The researcher believes that this results occurred because the interview and assessment of participants had taken place at NCD nursing station, where patients used to come for diabetes and general health problems management rather than oral problems. Creation of dental visit in case of any oral problem taken place at general Clark office but not NCD nursing station.

4.2.6Intervention urgency needs

Table (4.6) Distribution of the study participants according to their intervention urgency needs

Items	No.	%
Intervention urgency		
No treatment needed	34	8.4
Preventive or routine treatment needed	56	13.8
Prompt treatment (including scaling) needed	285	70.1
Immediate (urgent) treatment needed due to pain or infection of dental and/or oral origin	31	7.7
Total	**406**	**100.0**

Among the 406 participants, no treatment was needed for 34 (8.4%) participants while, 56 (13.8%) needed preventive or routine treatment, prompt treatment including scaling was needed for 284 (70.1%) participants and, immediate treatment (urgent treatment needed

due to pain or infection of dental and or oral origin) was needed for 31 (7.7%) participants.These results correspond to the oral problems of participants where most of them suffering from caries, bleeding gums, periodontal pockets, dental trauma and dental erosion but immediate treatment percentage would be more if the interview performed at the dental station.

4.2.7 Oral health services seeking pattern

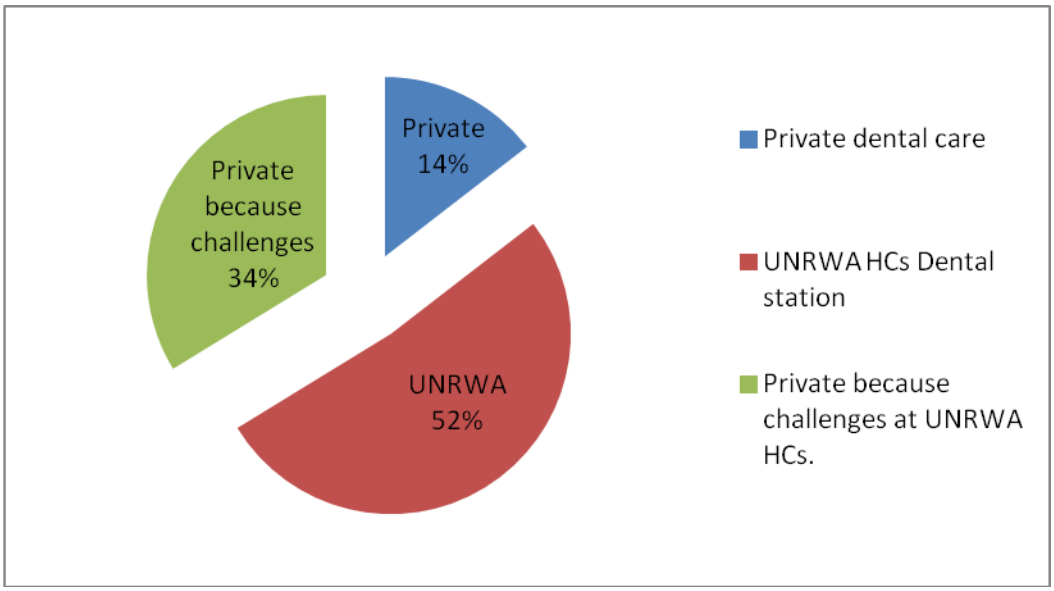

Figure 4.6 Place of oral health services

Participants have been asked about the place that they seek oral health services, about half of participants(52%) used to seek oral health services at UNRWA dental station, while 34% seeking at private sector because they used to face many obstacles or barriers at UNRWA and 14 % preferred private sector without given reasons (figure 4.6).

Table (4.7.A) Distribution of the study participants according to challenges facing them seeking oral health care at UNRWA health centers.

Items	N0.	%
Lack of time	6	1.7
Unavailability of all oral health services	285	81.4
NO advanced dental treatment at UNRWA	191	54.6
Multi- visits procedures	33	9.4
Transport problems	75	21.5
Fear from Dental treatment	52	14.9
No one is free to company me to dental clinic	11	3.1
Time consuming procedures	84	24.1
Double services (NCD and Dental) is not allowed	4	1.1
Far appointment	205	58.6
Unfriendly staff	32	9.2
Crowded dental station	186	53.1

The participants who used to get oral health services at UNRWA station or at private sector because challenges at UNRWA station were asked to choose one or more challengeswhich they heard from the interviewer and mentioned any other challenges if they may be faced it at UNRWA dental station. The results (Table 4.7.A) showed that unavailability of all oral health services at UNRWA dental station was the most common challenges facing participants followed by "far appointment", "no advanced dental treatment", and "crowded dental station" while "double services not allowed', "lack of time", "no one free to company me to dental station" to some extent did not constitute challenges.

Unavailability of all oral health services was considered as the most common challenges of 81.4% of participantswho used to get oral health services at UNRWA or at private sector because challenges at UNRWA, since the most requested services like root canal treatment(RCT), deep scaling, and delivery of prosthesis are not available at UNRWA.

"Far appointment" was considered as a common obstacle of 58.6% of participants, According to most of the participants, the nearest appointment was at least after 1 week while dental pain cannot be postponed. "NO advanced dental treatment" at UNRWA. Was the obstacle of 54.6%, where most of the participants believed that UNRWA dental station

is for delivery of medication or for extraction only "Crowded dental station" was the obstacle of 53.1%since the dental station is used to be crowded due to the presence of a high number of beneficiaries and long waiting time "Time consuming procedures" was an obstacle of 24.1%. Participants believed that dental procedures taking much time long they cannot save. “Transportproblems" was the obstacle of 21.5%, participants can't offer transport expenses.

Barriers to oral health utilization are many, but those that are significant for our environment are not yet clear. The current study was designed to identify the most common challenges seeking oral health services at UNRWA health centers, researcher believed that qualitative approach is more suitable to identify the main difficulties and obstacles and roots causes of them and moreover, participants and health providers can suggest solutions.

4.3 Inferential Statistics

4.3.1 Relationship between Dental and periodontal status, and socio-demographic characteristics

Table (4.3.1.A) Distribution of DMFT of participants regarding their socio-demographic characteristics

Items	N0.	DMF	DMFT	Test	Sig
Age					
Less than 50 Years	100	1468	14.7	F 3.189	0.001
From 51 to 55 years	95	1631	17.2		
From 56 to 60 years	103	2080	20.2		
From 60-65years	108	2369	21.9		
Total	**406**	7548	18.6		
Gender					
Male	163	3112	19.1	T 1.079	0.273
Female	243	4436	18.3		
Total	**406**	**7548**	**18.6**		
Education					
No formal schooling	37	815	22.0	F 2.016	0.001
Less than primary school	59	1334	22.6		
Primary school completed	57	1018	17.9		
Preparatory school completed	90	1610	17.9		
Secondary school completed	77	1293	16.8		
College/University completed and above	86	1478	17.2		
Total	**406**	**7548**	**18.6**		
Work					
Yes	80	1214	15.2	T - 4.249	0.001
No	326	6334	19.4		
Total	**406**	**7548**	**18.6**		
Monthly Average Income					
Under Deep poverty line (1832 NIS)	347	6522	18.8	T 1480	0.140
Above Deep poverty line	51	875	17.2		
Total	**398**	**7397**	**18.6**		

The mean value of DMFT index was assessed for the whole study sample, it was 18.6 teeth. Considering the age structure of the study sample, it was found that DMFT index had the highest level (21.9) in the adults aged 60 years and over (Tab.4.3.1.A). The index value was lower(20.2) in the age group of less than56-60 year old,(17.2) in the age group of 51-55 years old, and it was the lowest in the youngest age group less than 50 year olds.

The values of the DMFT index were statistically significantly associated with age ($p<0.05$). Post hoc analysis was done usingScheffe Test (also called Scheffe's procedure or Scheffe's method) showed that the difference between the distribution of DMFT and their age in favor for participants their age more than 60 years old (Annex 9).Caries experience was highly prevalent in our sample. With the increase in age, there was an upward trend in caries prevalence and mean DMFT, this is in the line with many studies of adult non-diabetic populations(Eslamipour et al., 2010; Boyko Bonev, 2015; Kamberi et al., 2016; Urzua and el al., 2012).

There was no a statistically significant association between the value of DMFT index and the gender of the participants of the study sample (p 0.273). Generally, females showed more decayed, missing and filled teeth than males but result showing mean value of DMFT index of males(19.1) was higher than mean value of DMFT index of females (18.3), this is not consistent with study of BoykoBonev,where hefound the DFMT index of females higher than males with a statistically significant association between DMFT index and gender(Boyko Bonev, 2015).According to study of John R. Shaffer, Sex disparities in dental caries have been observed across many populations, with females typically exhibiting higher prevalence and more affected teeth(shafferet al., 2015). The researcher believes that males have higher DMFT index than females because adult women utilize dental health care to a greater degree than men and males are more daring to extract teeth than females.

Obvious statically significant association between educational level and DMFT index (p 0.001). The values of the DMFT index were statistically significantly associated with educational level ($p<0.05$).Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their educational level in favor for participants with education level "College/University completed and above" (Annex 9).DMFT index is inversely proportional to the educational level,this is consistent with many studies, one of these studies study showed that people with low levels of education have less knowledge toward oral health and have a higher DMFT index (Mohammed et al., 2014). Clinical study was conducted in Turkey to assess the oral and dental health status of hemodialysis (HD) and peritoneal dialysis (PD) patients on the basis of educational status, showed that patients who were found to be in a higher educational level, are more caring of for their oral health (Bayraktaret al., 2009). The researcher believes thateducational level, as a traditional SES variable, affects the type of job and income, and thus access to

preventive measures such as tooth cleaning habits, health service use and a low-carbohydrate diet. In this study, an educational level higher than primary school was a protective factor against dental caries, and the higher the educational level, the stronger was the protectiveeffect.

Another statistically significant association between DMFT index with employment status had accrued (p 0.001) while there was no statistically significant association between DMFT index and income of participants (p 0.140).the researcher believes that, the big gap between both groups (1832 NIS) could be the reason fornon-statistically significance, this is not the line with a study by Linyan Wanget al., showed that participants with a higher educational level and family income, had the lower severity of DMFT (Wang et al., 2017).Another study found that lower SES is significantly associated with a greater risk of caries lesions. This relationship was partly mediated by oral health-related behaviours and health awareness (Schwendickeet al., 2015).Generally, income has a direct effect on material resources and may subsequently affect clinical decisions and the ability to pay for services, and the deep poverty line which was 1875 created large gaps between participants.

Table (4.3.1.B) Distribution the Prevalence of gingival bleeding of participants regarding their socio-demographic characteristics (n=373)

Items	No Gingival bleeding		Gingival bleeding		X^2	Sig.
Age	**No.**	**%**	**No.**	**%**		
Less than 50 Years	19	5.1	81	21.7	3.891	0.273
From 51 to 55 years	17	4.6	75	20.1		
From 56 to 60 years	16	4.3	73	19.6		
From 60-65 years	9	2.4	83	22.3		
Total	**61**	**16.4**	**312**	**83.6**		
Gender	**No.**	**%**	**No.**	**%**		
Male	17	4.6	132	35.4	4.434	0.023
Female	44	11.8	180	48.3		
Total	61	16.4	312	83.6		
Education	**No.**	**%**	**No.**	**%**		
No formal schooling	1	0.3	29	7.8	5.949	0.311
Less than primary school	6	1.6	46	12.3		
Primary school completed	9	2.4	44	11.8		
Preparatory school completed	16	4.3	66	17.7		
Secondary school completed	13	3.5	62	16.6		
College/University completed and above	16	4.3	65	17.4		
Total	61	16.4	312	83.6		
Work	**No.**	**%**	**No.**	**%**		
Yes	14	3.8	62	16.6	0.298	0.348
No	47	12.6	250	67.0		
Total	61	16.4	312	83.6		
Monthly Average Income	**No.**	**%**	**No.**	**%**		
Under Deep poverty line (1832 NIS)	49	13.1	269	72.1	3.015	0.068
Above Deep poverty line	12	3.2	35	9.4		
Total	61	16.4	312	83.6		

Table (4.3.1.C) Distribution the Prevalence of periodontal pocket of participants regarding their socio-demographic characteristics

Items	Absence of pocket		Presence of pocket		X^2	Sig.
Age	**No.**	**%**	**No.**	**%**		
Less than 50 Years	2	0.5	98	26.3	2.186	0.535
From 51 to 55 years	4	1.1	88	23.6		
From 56 to 60 years	1	0.3	88	23.6		
From 60-65 years	2	0.5	90	24.1		
Total	9	2.4	364	97.6		
Gender	**No.**	**%**	**No.**	**%**		
Male	3	0.8	146	39.1	0.168	0.483
Female	6	1.6	218	58.4		
Total	9	2.4	364	97.6		
Education	**No.**	**%**	**No.**	**%**		
No formal schooling	0	0.0	30	8.0	9.350	0.096
Less than primary school	0	0.0	52	13.9		
Primary school completed	4	1.1	49	13.1		
Preparatory school completed	3	0.8	79	21.2		
Secondary school completed	1	0.3	74	19.8		
College/University completed and above	1	0.3	80	21.4		
Total	9	2.4	364	97.6		
Work	**No.**	**%**	**No.**	**%**		
Yes	0	0.0	76	20.4	2.360	0.125
No	9	2.4	288	77.2		
Total	9	2.4	364	97.6		
Monthly Average Income	**No.**	**%**	**No.**	**%**		
Under Deep poverty line (1832 NIS)	8	2.1	310	83.1	0.026	0.674
Above Deep poverty line	1	0.3	46	12.3		
Total	9	2.4	364	97.6		

Tables (4.3.1.B) and (4.3.1.C) showed no statically significant association between periodontal status (gingival bleeding and periodontal pockets) with all socio-demographic characteristics of participants except gingival bleeding was statistically significant with gender (P 0.023), where female participants showing no bleeding (44) higher than male

participants showing no bleeding (17), the main reason behind this result could be increased number of teeth not present for gingival examination or pockets measurement, moreover the early onset of chronic periodontitis among most of the participants. The results are in disagreement with most available studies.

Regarding age of participants, despite there is no statistically significant association between age and both gingival bleeding and periodontal pickets, a quick look to both mentioned tables showing that only 2.4 %of participants showing no gingival bleeding and0.5% absence ofperiodontal pockets among participants more than 60 years old, while participants less than 50 years old, 5.1% showing no gingival bleeding and 0.5% showing no periodontal pockets.

The increased severity of periodontal disease and bone loss with age is probably related to the length of time, where the periodontal tissues have been exposed to bacterial plaque and is considered to reflect individual's cumulative oral history (Löe H, 1986). Several studies show that the prevalence and severity of periodontal disease increase with age(AlJehani, 2014; Genco, 1996; Axelsson & Lindhe, 1981).A study demonstrated that the mean annual rate of bone loss among the initially 70-year-old subjects was 0.28 mm compared to 0.07 on the 25-year-old individuals (Papapanou and Wennström, 1989).

Numerous studies reported higher periodontal destruction among males compared to the female population (AlJehani, 2014), this inconsistent with this study, where males participants with no gingival bleeding were 17 while female participants were 48, moreover males participants showing no periodontal pocket were only 3 but females participants 6. The reasons for these gender differences are not clear, but they are thought to be related to the ignorance of oral hygiene, which is usually observed among males (Slade and Spencer, 1995;Albandar and Kingman, 1999). However, the relationship observed between gender and periodontal pockets is not statistically significant but statistically significant with gingival bleeding.

Tables (4.3.1.B) and (4.3.1.C) showed clearly that among all educational level the number of participants showing gingival bleeding and periodontal pockets is greater than number of participants showing no gingival bleeding and absence of periodontal pockets. However, the observed relationship between educational level and the disease is not apparent and is not considered as statistically significant. Thus, educational level may be a demographic factor, which may interfere with the effects of other factors.Periodontal disease has a

reciprocal relationship with educational level. The higher the educational level, the lower the periodontal diseases (Beck et al., 1990).When education levels were compared to periodontal status in a study, the results showed a positive association between higher education levels and better periodontal status (Gundala and Chave, 2010).This is in accordance with another study which identified education level also a strong indicator of periodontal status (Richard and Chava, 2000).

Tables (4.3.1.B) and (4.3.1.C) showed that unemployed participants showing no bleeding (47) more than employed participants showing no bleeding (14). And unemployed participants showing absence of periodontal pockets were 9 and no employed participants showing absence of periodontal pockets. Againthe relationship observed between employment status and the disease is not apparent and is not considered as strong, statistically significant, and consistent. Thus, employment status may be a socio-economic factor, which may interfere with the effects of other factors.

Among participants under deep poverty line, 72.1% of participants showed gingival bleeding and 13.1% showed no gingival bleeding while 83.1% of them showed periodontal pockets and 2.1% showed absence of pockets and regarding participants above deep poverty line 9.4% showed gingival bleeding and 3.2% showing no gingival bleeding while 12.3% of participants above deep poverty line showed periodontal pockets and only 0.3% showed no periodontal pocket.

This result is not consistent with many studies, when the socioeconomic status was compared to the periodontal status by RupasreeGundala and Vijiay K Chava, the study showed a positive association between higher socioeconomic groups and better periodontal status(Richard andChava, 2000).According to another study,the gingival condition is clearly related to lower SES, but the relationship between socioeconomic status and periodontitis is less direct. It can be certain that gingival health is better among individuals with higher education and with more secure income. SES is a modifiable factor and it can be examined in multivariate models for the disease(AlJehani, 2014).The possible relationship between periodontal disease and socioeconomic status was found in several studies(Gilbert, 2005; Susinet al., 2005; Locker et al., 1993; Beck et al., 1990). The researcher believes that the reason behind such gaps because socioeconomic factors are related to many other factors mainly the oral health awareness.

4.3.2 Relationship between Dental and periodontal status, and Diabetic characteristics

Table (4.3.2.A) Distribution of DMFT of participants regarding their diabetic characteristics

Diabetic duration	No.	DMF	DMFT	Test	Sig.
Less than 5 Years	134	2243	16.7	F 56.752	0.038
From 5 to 9 years	109	1968	18.1		
From 10 to 14 years	90	1808	20.1		
15 years and above	73	1529	20.9		
Total	**406**	**7548**	18.6		
HbA1c reading	**No.**	**DMF**	**DMFT**		
Controlled equal or less than7%	87	1421	16.3	T - 3.168	0.002
Uncontrolled more than 7%	319	6127	19.2		
Total	**406**	**7548**	18.6		

There was statistically significant association between DMFT index value and diabetic duration (P 0.038). The values of theDMFT index were statistically significantly associated with Diabetic duration ($p<0.05$). Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their diabetic duration in favor for participants had diabetic duration less than 5 years(Annex 9).

table (4.3.2.A) showing increasing DMFT index with increasing diabetic duration, 16.7 teeth for participants diagnosed as diabetes less than 5 years,18.1 teeth from 5-9 years, 20.1 from 10 -14 years and 20.9 teeth for 15 years and above. A clear and statistically significant association (p 0.002) occurred between the DMFT index value and HbA1c level, where participants with control DM and their HbA1c equal and less than 7%, showing lower DMFT index value than participants with uncontrolled DM with HbA1c more than 7 %, DMFT index for control group was16.3 teeth and for uncontrolled group was 19.2 teeth. The results revealed that poor glycaemic control and the early onset of DM may increase the risk of dental caries, which is consistent with most available studies where,duration of DM might play an important role when the relation between DM and oral diseases is investigated,The level of caries was significantly higher in the long- compared to the short duration. This relation is reasonable because, like other complications of diabetes, the risk of caries tends to increases over time. This relation is in agreement with the normal pathogenesis of dental caries as “time” is an important factor

for the development of the disease (Selwitzet al., 2007). A study showed that gingival index and DMFT index increased significantly with duration of diabetes(Rafatiouet al., 2016), this conclusion is in agreement with a Sudanese study which showed that those with long duration of T2DM to have high decayed, missed and filled teeth (DMFT) values (Mohammed et al., 2013).According to another study, the mean DT and MT were significantly increased as the duration of disease increased, whereas mean FT was significantly higher among people having diabetes less than 2 years. Mean DMFT component was higher among people having diabetes more than 5 years but it did not show any statistically significant difference(Malvaniaet al., 2016).Many studies are consistent with the result of the study which concluded that DMFT index increasing with duration of DM (Singh et al., 2014; Kanjirath et al., 2011),while other studiesare inconsistent with the result of the study which reported that there was no relationship between the duration of diabetes and caries experience(Hawraa, 2012; Arrieta -Blanco et al., 2003; Lin et al., 1999).

Regarding DM control status, results of the studyare consistent with many studies, one of these studies conducted by Malvaniaet al., concluded that the severity of dental caries increased with increase in the blood glucose level with positive correlation, and dental caries prevalence was significantly higher in metabolically uncontrolled patients compared to metabolically well-controlled patients (Malvaniaet al., 2016).The results are in agreement with the studies reported by Chavezet al., (Chavez et al., 2000) and not in agreement with the studies reported by Hawraa (Hawraa, 2012), Arreita-Blannco (Arrieta -Blanco et al., 2003), and Sandberg *et al*.(Sandberg et al., 2000).Another study in Japan revealeda significant association between HbA1c levels and dental caries, the severity of dental caries increased with increase in the blood glucose level (Yonekuraet al., 2017).

Table (4.3.2.B) Distribution of prevalence of gingival bleeding regarding diabetic characteristics

Items	No Gingival bleeding		Gingival bleeding		X^2	Sig.
Diabetic duration	**No.**	**%**	**No.**	**%**		
Less than 5 Years	26	7.0	104	27.9	5.186	0.159
From 5 to 9 years	11	2.9	93	24.9		
From 10 to 14 years	11	2.9	67	18.0		
15 years and above	13	3.5	48	12.9		
Total	61	16.4	312	83.6		
HbA1c reading	**No.**	**%**	**No.**	**%**		
Controlled equal or less than7%	18	4.8	56	15.1	2.219	0.095
Uncontrolled more than 7%	43	11.6	247	66.5		
Total	61	16.4	312	83.6		

Table (4.3.2.C) Distribution of prevalence of periodontal pocket regarding diabetic characteristics

Items	Absence of pocket		Presence of pocket		X^2	Sig.
Diabetic duration	**No.**	**%**	**No.**	**%**		
Less than 5 Years	4	1.1	126	33.8	0.967	0.809
From 5 to 9 years	2	0.5	102	27.3		
From 10 to 14 years	1	0.3	77	20.6		
15 years and above	2	0.5	59	15.8		
Total	9	2.4	364	97.6		
HbA1c reading	**No.**	**%**	**No.**	**%**		
Controlled equal or less than7%	4	1.1	159	42.6	2.625	0.116
Uncontrolled more than 7%	5	1.3	205	55.0		
Total	9	2.4	364	97.6		

Contrary to expectations, there was neither a clear relationship norstatistically significantassociation between periodontal status (gingival bleeding and periodontal pockets) and diabetic duration, and control status of DM as showed by tables (4.3.2.B) and (4.3.2.C). Contrary to supposed to be, the number of participants showing no gingival bleeding among participant with diabetic duration less than 5 years, from 5 to 9 years, from 10-14 years and 15 years and above were 26, 11, 11, and 13 respectively. While number of participants showing no gingival bleeding among the controlled group were 18 participants and the uncontrolled group were 43 participants. Moreover, participants showing no periodontal pockets among participants with diabetic duration less than 5 years, from 5 to 9

years, from 10-14 years and 15 years and above were 4, 2, 1, and 2 respectively. While the number of participants showing no periodontal pockets among the controlled group were 4 participants and the uncontrolled group were 5 participants.

The researcher believes thatthe differences in the numbers of patients between diabetic duration categories and the differences in the missed teeth(Number of teeth not present for gingival examination or pockets measurement) behind these results and moreover, improvement of the HbA1c level will prevent further progress of already chronic periodontal diseases rather than eliminating the condition. The results are in disagreement with most available studies. One of these studies had conducted by Cerdaet al. and another study conducted by Firatliet al., theyconcluded that the duration of diabetes was a significant factor for the severity of periodontal disease (Cerda et al., 1994; Firatli et al., 1996), while another study stated that the diabetic status was significantly and strongly related to both prevalence and severity of periodontal disease (Emrichet al., 1991).The severity of periodontal disease was more prevalent in diabetics who had the disease for >5 years, according to Faulconbridge et al., Patients are having poor glycemic level had more severe periodontitis as compared to patients having a fair glycemic level (Faulconbridge et al., 1981),a study had also demonstrated that as age of the diabetic increases, the prevalence and severity of periodontal disease increases, poorer the control and longer the duration of diabetes, the greater will be the prevalence and severity of periodontal disease (Rajhanset al., 2011). Collagen is the predominant component of gingival connective tissue accounting for approximately 60% of connective tissue volume and 90% of the organic matrix of alveolar bone. Oliver and Tervonen had stated that the properties of human collagen are changed during aging and with the metabolic abnormalities of diabetes mellitus. Thus, altered collagen metabolism in diabetics would be expected to contribute to the progression of periodontal disease (Oliver and Tervonen, 1994).Periodontitis also progresses more rapidly in poorly controlled diabetics (Seppälä et al., 1993), and early age of onset of the disease is seen as a risk factor for more severe diseases (Thorstensson and Hugoson,1993).

4.3.3 Relationship between dental and periodontal status, and frequency of tooth cleaning

Table (4.3.3.A) Distribution of DMFT index regarding frequency of teeth cleaning

How often do you clean your teeth	No.	DMF	DMFT	Test	Sig.
Never	136	2842	21.2	2.321	0.001
Once a month	4	53	13.3		
2-3 times a month	7	94	13.4		
Once a week	39	655	16.8		
2-6 times a week	30	494	16.5		
Once a day	93	1327	14.4		
Twice or more a day	62	975	15.7		
Total	371	6440	17.5		

A statistically significant association between DMFT index value and frequency of teeth cleaning or brushing (p 0.001),the values of theDMFT index were statistically significantly associated with frequency of teeth-brushing ($p<0.05$). Post hoc analysis was done using Scheffe test and shows that the difference between the distribution of DMFT and their frequency of teeth-brushing in favor for participants who never clean the teeth (Annex 9).

table (4.3.3.A) showed that the highest DMFT index value(21.2) among participants who never brush their teeth, while participants used to brush their teeth daily either once, or twice or more showed the lowest DMFT index value among all which was respectively 14.4 and 15.7. The relationship is inverse, the increase in the frequency of teeth-brushingdecreasingthe DMFT index value.

The obtained result is consistent with, and confirmed by many studies, according to Chestnuttet al. study, caries experience was inversely related to tooth-brushing frequency, tooth-brushing frequency and rinsing method after brushing were found to be strongly correlated with caries experience and caries increment (Chestnuttet al., 1998).Clinical and interview data were obtainedfrom 212 males, showed that the values of caries prevalence indicator were consistently higher for sporadic tooth-brushers. It was concluded that the current study provides evidence in favor of a positive association between tooth-brushing and low caries prevalence (Mattiet al., 1980). Regular tooth-brushing is important for the maintenance of oral health and the prevention of caries and periodontal disease. Brushing

effectively twice a day with a fluoridated toothpaste has been a key recommendation from dental organizations for many years. Individuals who state that they brush their teeth infrequently are at greater risk for the incidence or increment of new carious lesions than those brushing more frequently (Kumar et al., 2016).

Table (4.3.3.B) Distribution of prevalence of gingival bleeding regarding the frequency of teeth cleaning

Items	No Gingival bleeding		Gingival bleeding		X^2	Sig.
How often do you clean your teeth	**No.**	**%**	**No.**	**%**		
Never	9	2.4	127	34.2	24.552	0.000
Once a month	0	0.0	4	1.1		
2-3 times a month	1	0.3	6	1.6		
Once a week	4	1.1	35	9.4		
2-6 times a week	5	1.3	25	6.7		
Once a day	23	6.2	70	18.9		
Twice or more a day	19	5.1	43	11.6		
Total	61	16.4	310	83.6		

Table (4.3.3.C) Distribution of prevalence of periodontal pocket regarding the frequency of teeth cleaning

Items	Absence of pocket		Presence of pocket		X^2	Sig.
How often do you clean your teeth	**No.**	**%**	**No.**	**%**		
Never	1	0.3	135	36.4	3.617	0.728
Once a month	0	0.0	4	1.1		
2-3 times a month	0	0.0	7	1.9		
Once a week	1	0.3	38	10.2		
2-6 times a week	1	0.3	29	7.8		
Once a day	4	1.1	89	24.0		
Twice or more a day	2	0.5	60	16.2		
Total	9	2.4	362	97.6		

A statistically significant association between gingival bleeding and frequency of teeth cleaning or brushing (p 0.000), while there was no significant association between periodontal pockets and frequency of teeth-brushing, table (4.3.3.B) showed that 42 of 61 participants showed no gingival bleeding used to brush their teeth on daily basis (either once or twice or more). The relationship is inverse, thedecrease in the frequency of teeth brushing,increase teeth showing bleeding, this relationship is unclear in the table (4.3.3.b) because of big differences in the number of participants of each category. Table (4.3.3.C) showed increased number of participants without periodontal pockets with increasing the

frequency of teeth cleaning and brushing where 4 of 6 participants who have no periodontal pockets used to brush their teeth on daily basis, the relationship is strong but not a statistically significant because most of the participants showed chronic periodontitis.Plaque-induced gingivitis is the most common oral disease in dentate persons and the most common type of periodontal disease. Gingivitis is implicated as a precursor of periodontitis, so preventing gingivitis may indirectly prevent periodontitis and loss of tooth support. The principal method used to prevent gingivitis is the regular removal of plaque from all tooth surfaces via tooth brushing. The American Dental Association (ADA) recommends that brushing is performed twice a day (Pinto et al., 2013).

Chapter 5

Conclusion and Recommendations

5.1. Conclusion

In this cross-sectional study, the researcher aimed to identifyoral health problems and oral health needs among type 2 diabetic patients attending UNRWA health centers in Gaza Governorates, and to determine the most common challenges faced them seeking oral health in UNRWA primary health centers in Gaza Governorates. Also, the study determined the association between DM and oral health problems. Most of the participants were refugees living in poor and crowded refugee camps, the majority of them were not working and don't have sustainable sources of income in line with current conditions in the Gaza Strip due to the siege, unemployment, and low wages.

Participants were selected from 5 UNRWA health centers (3 large, 2 small HCs) from all 5 geographic areas. 406 DM type 2 patients aged from 35-65 years old participated in this study.

The researcher noted that the number of DM patients is almost doubled last 10 years, and the majority of participants are either overweight or obese, one five of participants were uncontrolled DM, it was clear that there is lack of knowledge about systematic complications of DM. Because of the absence of a clear technical instruction for NCD patients oral health assessment only one-third of participants have done oral health assessment at UNRWA dental stations but most of them have not done any intervention because either has not told anything by UNRWA dentists or redirected to private clinics because unavailability of required services.

Most of the participants described the stated of their teeth and gums either average or poor and majority showing a high number of lost teeth. The participant`s frequency of teeth cleaning, confirms the lack of awareness for oral health maintenance, lack of knowledge about oral complications of DM and absence of appropriate health education. Lack of knowledge of benefits of fluoride confirmed by the study results confirmed that dental visiting is still not considered a preventive dental behavior; at present, it only depends on treatment needs. Another reason could be lack of awareness on the part of patients with

diabetes regarding the oral complications of the disease and a perceived lack of time for this additional healthcare activity when patients are busy with the management of their diabetes.

Most of the participants declared that dental problems did not impact on their life activities, the researcher believes that the tough circumstances in Gaza can be the most important factor that contributes to the high level of resilience and self-confidence. There is a Gazan coping mechanism of feeling good about things that definitely have a negative impact on humans. Gazans tend to complain less about issues that can stigmatize them as "disabled" or "unable to cope" and this can be translated into an unusual thinking style

The researcher believes that this low percentage of sugary food and drinks can be a normal as result of a long and intensive course of health education program about DM, and good quality of DM services provided in UNRWA HCs, but patients fear higher blood sugar rather than fear of the consequences of sugary foods and drinks consumption on oral health.

The results showed a high DMFT index and few participants have no gingival bleeding and periodontal pockets, falling as a result of hypoglycemic attacks and reduced both mobility and visual acuity are the main reason behind dental trauma among diabetic patients, andthe majority of participants have a different degree of enamel fluorosis,. The study showed that the rate of tooth loss among diabetics is very high, therefore many patients still require teeth replacement services for their missing teeth but participants are not willing to replace their lost teeth by partial denture because of economic issues or they do not know the sequences of not replacing the lost teeth. The interview and assessment of participants had taken place at NCD nursing station, where patients used to come for diabetes and general health problems management rather than oral problems because of that only two participants showed diagnosed oral lesion. Prompt treatment including scaling was needed for most of the participants, unavailability of all oral health services and advanced treatment along with far appointments were the most common challenges facing DM patients seeking oral health services at UNRWA dental stations.

DMFT index value was significantly associated with age, educational level, employment status but not with gender and monthly income of participants, the researcher believes that males have higher DMFT index than females because adult women utilize dental health care to a greater degree than men and males are more daring to extract teeth than females.

no statically significant between periodontal status (gingival bleeding and periodontal pockets) with all socio-demographic characteristics of participants except gender (statistically significant association between gingival bleeding and gender P 0.023), the main reason behind this result could be increased number of teeth not present for gingival examination or pockets measurement, moreover the early onset of chronic periodontitis among most of participants. The results are in disagreement with most available studies.

There is astatistically significant relationship between DMFT and diabetic duration (0.038), A clear and statistically significant association (p 0.002) occurred between the DMFT index value and HbA1c level, where participants with control DM showing lower DMFT index value than participants with uncontrolled DM. Contrary to expectations, there was neither a clear relationship nor statistically significant association between periodontal status(gingival bleeding and periodontal pockets), and diabetic duration, and control status of DM, Participants used to brush their teeth daily either once, or twice or more showed the lowest DMFT index value, the current study provides evidence in favor of a positive association between tooth-brushing and low caries prevalence. A statistically significant association between gingival bleeding and frequency of teeth cleaning or brushing (p 0.000), while there was no significant association between periodontal pockets and frequency of teeth cleaning or brushing.

5-2 Recommendations

According to the study findings, the researcher recommends the following points regarding improving the oral health of DM patients.

5.2.1 Recommendations to UNRWA health department

- Participants were mostly unaware of the link between oral health and diabetes, it is critically important to educate health providers and diabetes patients about the oral implications of diabetes and need for proper preventive care as well as regular assessment and follow-up oral health. Dental practitioners have an opportunity and a responsibility to educate diabetic patients about the oral complications of diabetes and to promote proper oral health behaviors.
- Oral health assessment should be performed once yearly for all NCD patients on WHO tools basis and preferred to perform in the day of annual general assessment,

a clear technical instruction should be given to dentists and NCD nurses.Patients should be given an immediate appointment for intervention in case of required.

- NCD patients should be given a priority in appointment system for oral health curative procedures.
- Periodic scaling for DM patients, this services can be purchased from the private sector.
- Electronic medical records (E-health program) could be designed to give oral health indicators of NCD patients, school pupils and pregnant women such as DMFT index, CPITN index and oral health behavior patterns.
- Most Oral health services for NCD patients could be exclusively available.
- More effort to ensure that diabetes is wellcontrolled, as uncontrolled diabetes increases the risk of developing gum disease.

5.2.2 Recommendations for further researchers studies

- To conduct a similar study at the national level.
- To conduct a similar study among school students, pregnant women and preconception women.
- To conduct an in-depth study on challenges faced NCD patients, school students, pregnant women and preconception care women seeking oral health services at UNRWA health centers to identify the main causes of challenges.
- To conduct a study to identify the impact of oral health on quality of life of DM patients.
- More studies should be conducted using a qualitative approach to identify main causes of low oral health awareness and proper ways of enhancing oral health awareness among different Gazan populations.

Chapter 6

6.1 References

Abdul-Rahim, H.F., Husseini, A., Giacaman, R., Jervell, J.,& Bjertness, E. (2001). Diabetes mellitus in an urban Palestinian population: prevalence and associated factors. *East Mediterr Heal J* Rev Santé Méditerranée Orient, 7:67–78.

Abiko, Y.,& Selimovic, D. (2010). The mechanism of protracted wound healing on oral mucosa in diabetes. Review. Bosn J Basic Med Sci., 10:186–91

Abuhaloob, L., & Abed ,Y. (2013). Dietary behaviours and dental fluorosis among Gaza Strip children. EMHJ - Eastern Mediterranean Health Journal.,19, 657–663.

Adelman, H., & Barkan, E. (2011).No Return, No Refuge: Rites and Rights in Minority Repatriation. Columbia University Press , New York.

Alabed, S., Guul, A., Crighton, C., Alahdab, F., Fares, M., Morad, M., Sonbon, MB., Madmani, ME., Sasa, A., & Unwin, N. (2014). An assessment of diabetes care in Palestinian refugee camps in Syria. Avicenna J Med, 4:66-70.

Albandar, JM., & Kingman, A. (1999). Gingival recession, gingival bleeding, and dental calculus in adults 30 years of age and older in the United States,1988-1994. J Periodontol,70:30–43

AlJehani, YA. (2014). Risk factors of periodontal disease: review of the literature. Int J Dent, 2014:182513.

Al-Maskari, AY., Al-Maskari, MY., &Al-Sudairy, S. (2011). Oral manifestations and complications of diabetes mellitus: a review. Sultan Qaboos University Medical Journal 11, 179–86.

Al-Shammari, KF., Al-Khabbaz, AK., Al-Ansari, JM., Neiva, R.,& Wang, HL. (2005). Risk indicators for tooth loss due to periodontal disease. J. Periodontol. 76, 1910–1918 .

American College of Prosthodontists (2015).position statements . Chicago: ACP.

American Dental Association(2002).For the Dental Patient:Diabetes and oral health. The Journal of the American Dental Association.133 (9) 1299http://jada.ada.org/article/S0002-8177(14)63602-3/fulltext

Apratim, A., Shah, SS., Sinha, M., Agrawal., M., Chhaparia, N.,& Abubakkar, A. (2013). Denture hygiene habits among elderly patients wearing complete dentures. J Contemp Dent Pract, 14:1161–4.

Arad, Y., Fonseca, V., Peters, A., & Vinik, A. (2011). Beyond the monofilament for the insensate diabetic foot: a systematic review of randomized trials to prevent the occurrence of plantar foot ulcers in patients with diabetes. Diabetes Care, 34: 1041–1046.

Arrieta -Blanco, JJ., Bartolomé-Villar, B., Jiménez-Martinez, E.,Saavedra-Vallejo, P., &Arrieta-Blanco, FJ. (2003). Bucco-dental problems inpatients with Diabetes Mellitus (I) : Index of plaque and dental caries.Med Oral., 8:97-109.

Axelsson, p.,& Lindhe, J. (1981). Effect of controlled oral hygiene procedures on caries and periodontal disease in adults. Results after 6 years. J Clin Periodontol,8(3):239–248

Bacic, M., Cigar, I., Granic, M., Plancak. D.,& Sutalo, J. (1989). Dental status in a group of adultdiabeticpatients. Community Dent Oral Epidemiol, 17:313–316.

Bacic, M., Plancak., D., Granic, M. (1988). CPITN Assessment of Periodontal Disease in Diabetic Patients. Journal of Periodonlogy, 59:816–22.

Bayraktar, G., Kurtulus, I., Kazancioglu, R., Bayramgurler, I. Cintan, S., Bural., C., Besler, M., Trablus, S., Issever, H., Aysuna, N., Ozkan, O., &Yildiz, A. (2009). Effect of Educational Level on Oral Health in Peritoneal and Hemodialysis. Int J Dent,(10):1–5.

Beck, JD., Koch, GG., Rozier, RG., &Tudor, GE. (1990).Prevalence and risk indicators for periodontal attachment loss in a population of old community-dwelling blacks and whites. J Periodontol, 61: 521–528

Betty, C. F. (2017)Community Oral Health Practice for the Dental Hygienist 4th Edition. St.Louis Missuori: Elsevier.

Boulton, A.J., Armstrong, D.G., Albert, S.F., Frykberg, R.G., Hellman, R., Kirkman, M.S., Lavery, L.A., LeMaster, J.W., Mills, J.L., Muller, M.J.,Sheehan, P.,& Wukich, D.K. (2008) .Comprehensive foot examination and risk assessment: a report of the task force of the foot care interest group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. Diabetes Care 31, 1679–1685 10.2337/dc08-9021

Boyko Bonev, N. A. (2015). Dental Caries and Associated Socio-Demographic Factors in Adult People in Bulgaria. Balk J Dent Med, 19:33-7

Burns, N., & Grove, SK. (2001). The practice of nursing research: Conduct, critique &utilization. 4th edition. Philadelphia: WB Saunders.

Centers for Disease Control and Prevention (2016). Community Water Fluoridation .Retrieved Feb 27, 2018, from https://www.cdc.gov/fluoridation/faqs/dental_fluorosis/index.htm

Cerda, J., Vazquez de la Torre, C., Malacara, J.,& Nava, L.(1994) Periodontal disease in non-insulin dependent diabetes mellitus (NIDDM): the effect of age and time since diagnosis. J Periodontol,65:991–995

Chavez, EM., Borrell, LN., Taylor, GW.,& Ship, JA. (2001) A longitudinal analysis of salivary flow in control subjects and older adults with type 2 diabetes. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 91:166–173.

Chavez, EM., Taylor, GW., Borrell, LN.,& Ship, JA.(2000). Salivary function and glycemic control in older persons with diabetes. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 89:305–311.

Chestnutt, IG., Shäfer, F., Jacobsen, APM.,& Stephen, KW.(1998) .The influence of toothbrushing frequency and post-brushing rinsing on caries experience in a caries clinical trial. Community Dent Oral Epidemiol, 26:406–411.

Chomkhakhai, U., Thanakun, S., Khovidhunkit, S-P., Khovidhunkit, W.,& Thaweboon, S. (2009). Oral health in Thai patients with metabolic syndrome. Diabetes Metab Syndr, 3:192–7.

Cianciola, LJ., Park, PH., Bruck, E., Mosovich, L., &Genco, RJ. (1982). Prevalence of periodontal disease in insulin-dependent mellitus (juvenile diabetes). J Am Dent Assoc, 104:653–60.

Collin, HL., Uusitupa, M., Niskanen, L., Kontturi-Närhi, V., Markkanen, H., Koivisto, AM., &Meurman, JH.(1998). Periodontal findings in elderly patients with non-insulin dependent diabetes mellitus. J Periodontol, 69: 962–966.

Conner, S., Iranpour, B.,& Mills, J. (1970) Alteration in parotid salivary flow in diabetes mellitus. Oral Surg Oral Med Oral Pathol, 30:55–59.

Dental Health Foundation (2017). links between oral health and general health. Retrieved April 16, 2017,from: http://www.dentalhealth.ie/dentalhealth/causes/general.html

Devanoorkar A, Rajeshwari K. (2016). Profile of Patients with Periodontal Disease: A Descriptive Study.Ann. Int. Med. Den. Res,2(5):DE25-DE27.

Donovan, J., & Sanders, C. (2005). Key issues in the analysis of qualitative data in health services research. In A. Bowling, & S. Ebrahim (Eds.), Handbook of Health Research Methods (pp. 515 - 532). Open University Press.

Dorresteijn, JA., Kriegsman, DM., Assendelft, WJ.,& Valk, GD. (2012). Patient education for preventing diabetic foot ulceration. Cochrane Database Syst Rev, 10:CD001488

Dowty, A. (2012). Israel/Palestine. 3rd ed. Cambridge: Polity

Elshaer, T. (2015). The Relationship between Leader-Member Exchange, Organizational Citizenship Behavior and Organizational Commitment among UNRWA Health Staff-Gaza Governorates. Master degree thesis, Al-Quds University, Gaza, Palestine

Emrich, LJ., Shlossma, M.,& Genco, RJ. (1991). Periodontal disease in non-insulin dependent diabetes mellitus. J Periodontol, 62:123–131

Eslamipour, F., Borzabadi-Farahani, A.,& Asgari, I. (2010). The relationship between aging and oral health inequalities assessed by the DMFT index. Eur J Paediatr Dent, 11:193–9.

Faulconbridge, AR., Bradshaw, WC., Jenkins, PA.,& Baum, JD. (1981). The dental status of a group of diabetic children. Brit Dent J, 151:253-5.

Fernandes, JK., Wiegand, RE., Salinas, CF., Grossi, SG., Sanders, JJ., Lopes-Virella,MF.,& Slate, EH. (2009). Periodontal disease status in Gullah African Americans with Type 2 diabetes living in South Carolina. J Periodontol, 80: 1062–8

Firatli, E., Yilmaz, 0., &Onan, U.(1996). The relationship between clinical attachment loss and the duration of insulin-dependent diabetes mellitus. (IDDM) in children and adolescents. J Clin. Periodontol, 23:362-6.

Frechtling, J. (2002).The 2002 User Friendly Handbook for Project Evaluation. National Science Foundation, 2002.

Gale, E.A., &Gillespie, K.M. (2001). Diabetes and gender. Diabetologia, 44:3–15.

Gardner, D.,& Shobeck, D.(2007) .Greenspan's Basic and Clinical Endocrinology. 8th ed. New York: McGraw-Hill.

Genco, R. (1990). Contemporary Periodontics Classification and clinical and radiographic features of periodontal disease. Mosby, St. Louis

Gengo, R.J. (1996). Current view of risk factors for periodontal diseases. Journal of Periodontolog, 67(10):1041–1049.

Gilbert, GH.(2005). Racial and socioeconomic disparities in health from population-based research to practice-based research: the example of oral health. J Dent Educ, 69:1003–1014

Guggenheimer, J., Moore, PA., Rossie, K., Myers, D., Mongelluzzo, MB., Block, HM.,Weyant, R., &Orchard, T. (2000). Insulin-dependent diabetes mellitus and oral soft tissue pathologies. I. Prevalence and characteristics of non-candidal lesions. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 89:563–569

Gundala, R.,& Chava, VK. (2010). Effect of lifestyle, education and socioeconomic status on periodontal health. Contemp Clin Dent, 1:23–6.

Hawraa, KA. (2012). The relationship between the dental caries and the blood glucose level among type II non insulin dependent diabetic patients. J Bagh Coll Dent, 24:108–14

Hintao, J., Teanpaisan, R., Chongsuvivatwong, V., Dahlen, G.,& Rattarasarn, C. (2007). Root surface and coronal caries in adults with type 2 diabetes mellitus. Community Dent Oral Epidemiol, 35 (4): 302-309.

Hugoson, A., Thorstensson, H., Falk, H., &Kuylenstierna, J. (1989). Periodontal conditions in insulin-dependent diabetics. . Journal of clinical periodontology. 16(4):215–23.

International Diabetes Federation .(2018).IDF MENA Members.Retrieved April 6, 2018, fromhttps://www.idf.org/our-network/regions-members/middle-east-and-north-africa/members/44-palestine.html

Irwin, R. and Rippe, J. (2012). Irwin and Rippe's intensive care medicine. 1st ed.Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins.

Jawed, M., Khan, RN., Shahid, SM., &Azhar, A. (2012). Protective effects of salivary factors in dental caries in diabetic patients of Pakistan. Exp Diabetes Res,2012:947304. doi: 10.1155/2012/947304. Epub 2012 Jun 24.

Johansson, AK., Omar, R., Carlsson, GE., &Johansson, A. (2012). Dental erosion and its growing importance in clinical practice: from past to present. Int J Dent,2012:632907.

Jones, NJ., and Harding, K.(2015). 2015 International Working Group on the Diabetic Foot Guidance on the prevention and management of foot problems in diabetes. International Wound Journal., 12(4):373-374.

Joseph, J.G., Emmons, C., Kessler, R.C., Wortman, C.B., O'Brien, K., Hocker, W.T., &Schaefer, C. (1984). Coping with the threat of AIDS: an approacj to phychosocial assessment.Am. Psychol.,39(1984) 1279-1302.

Kachoo, S., Kawabata, H., Colilla, S., Shi, L., Zhao, Y., Mukherjee, J.,Iloeje, U., & Fonseca, V. (2015). Association between hypoglycemia and fall-related events in type 2 diabetes mellitus: Analysis of a U.S. commercial database. Journal of Managed Care Pharmacy: JMCP, 21:243–253.

Kamberi, B., Koçani, F., Begzati, A., Kelmendi, J., Ilijazi, D., Berisha, N.,& Kqiku, L. (2016). Prevalence of dental caries in Kosovar adult population. Int J Dent, 2016:4290291.

Kanjirath, PP., Inglehart, MR.,& Habil, P. (2011). Diabetes and oral health: The importance of oral health related behavior. The Journal of Dental Hygiene,85:264-72

Kapellas, K. and Slade, GD. (2008). Australian Research Centre for Population Oral Health. The relationship between diabetes and oral health among Australian adults. Aust Dent J, 53:93–96.

Karjalainen, K.M., Knuuttila, M.L., & Kaar, M.L. (1996). Salivary factors in children and adolescents with insulin-dependent diabetes mellitus. Pediatr. Dent, 18, 306–311

Kateeb, E., and Momany, E. (2018). Palestinian women's oral health status, knowledge, practices, and access to dental care during pregnancy: a cross-sectional study. THE LANCET , 2018 Feb 21;391 Suppl 2:S11. doi: 10.1016/S0140-6736(18)30377-5. Epub 2018 Feb 21.

Kateeb, E., Sarhan, M.,&Gannam, I. (2015). Oral Health Status among Convenient Sample of Palestinian Adults.International Dental Journal., 65 (Suppl. 2): 55--85

Katz, PP., Wirthlin, MR., Szpunar, SM., Selby, JV., Sepe, SJ.,& Showstack, JA. (1991). Epidemiology and prevention of periodontal disease in individuals with diabetes. Diabetes Care,14:375–85.

Kaur, G., Holtfreter, B., Rathmann, W., Schwahn, C., Wallaschofski, H., Schipf, S., Nauck, M.,& Kocher, T.(2009). Association between type 1 and type 2 diabetes with periodontal disease and tooth loss. J Clin Periodontol, 36:765–774pmid:19622096

Kautzky-Willer, A., Harreiter, J., & Pacini, G. (2016). Sex and gender differences in risk, pathophysiology and complications of type 2 diabetes mellitus. Endocr. Rev 37(3), 278–316

Khader, A., Farajallah, L., Shahin, Y., Hababeh, M., Abu-Zayed, I., Kochi, A., Harries, AD., Zachariah, R., Kapur, A., Venter, W.,& Seita, A. (2012). Cohort monitoring of persons with diabetes mellitus in a primary healthcare clinic for Palestine refugees in Jordan. Trop Med Int Health, (12):1569-76

Khader, YS., Dauod, AS., El-Qaderi, SS., Alkafajei, A.,&Batayha, WQ. (2006). Periodontal status of diabetics compared with nondiabetics: a meta-analysis. J Diabetes Complicat 20:59–68

Khamrco, TY. (1999) .Assessment of periodontal diseases using the CPITN index in a rural population in Ninevah, Iraq. East Mediterr Health J, 5: 549-55

Kitabchi, AE., Umpierrez, GE., Miles, JM., and Fisher, JN. (2009). Hyperglycemic crises in adult patients with diabetes. Diabetes Care 32, 1335–1343.

Kumar, S., Tadakamadla, J., &Johnson, NW. (2016). Effect of tooth brushing frequency on incidence and increment of dental caries: a systematic review and meta-analysis. Journal of Dental Research, 95, 1230–1236.

Lacopino, A. (2001). Periodontitis and Diabetes Interrelationships: Role of Inflammation. Ann Periodontol, 6:125–37.

Lakschevitz, F., Aboodi, G., Tenenbaum, H.,& Glogauer, M.(2011) Diabetes and periodontal diseases: interplay and links. Curr Diabetes Rev, 7:433–439

Lalla, E., and Lamster, IB. (2012). Assessment and management of patients withdiabetes mellitus in the dental office. Dent Clin North Am , 56: 819–829.

Lalla, E., and Papapanou, PN. (2011). Diabetes mellitus and periodontitis: a tale of two common interrelated diseases. Nat Rev Endocrinol, 7:738–748

Lalla, E., Cheng, B., Lal., S., Kaplan, S., Softness, B., Greenberg, E., Goland, RS.,& Lamster, IB. (2007). Diabetes mellitus promotes periodontal destruction in children. J Clin Periodontol, 34:294–298

Lalla, RV., and D'Ambrosio, JA. (2000). Dental management considerations for the patient with diabetes mellitus. J Am Dent Assoc, 132:1425–32.

Lamster, IB. (2014). Diabetes mellitus and oral health: an interprofessional approach. Ames, IA: Wiley-Blackwell; 2014

Lamster, IB., and Lalla, E. (2008). The relationship between oral health and diabetes mellitus. J Am Dent Assoc, 139:19–24.

Larmas, M. (2010). Has dental caries prevalence some connection with caries index values in adults? Caries Res. 44(1):81-4.

Leite, RS., Marlow, NM.,& Fernandes, JK. (2013). Oral health and type2 diabtes. The American Journal of the Medical Sciences, 345(4):271-274.

Lin, BP., Taylor, GW., Allen, DJ.,& Ship, JA.(1999). Dental caries in older adults with diabetes mellitus.Spec Care Dentist,19:8–14.

Lin, CC., Sun, SS., Kao, A.,& Lee, CC. (2002). Impaired salivary function in patients with noninsulin-dependent diabetes mellitus with xerostomia. J Diabetes Complications, 16:176–9.

Locker, D., and Leake, JL.(1993). Periodontal attachment loss in independently living older adults in Ontario, Canada. . Journal of Public Health Dentistry. 53(1):6–11.

Löe, H. (1993). Periodontal disease. The sixth complication of diabetes mellitus. Diabetes Care, 16:329–34

Löe, H., Anerud, A., Boysen, H.,& Morrison, E. (1986). Natural history of periodontal disease in man. Rapid, moderate and no loss of attachment in Sri Lankan laborers 14 to 46 years of age.Journal of Clinical Periodontology,13(5):431–45.

Mahfouz, M., and Esaid, AA. (2014). Dental caries prevalence among 12 to 15 years old Palestanian children. Inter Schorlar Res Notices, 2014. doi:10.1155/2014/785404.

Malvania, EA., Sheth, SA., Sharma, AS., Mansuri, S., Shaikh, F., and Sahani, S. (2016) Dental caries prevalence among type II diabetic and nondiabetic adults attending a hospital. J Int Soc Prev Community Dent, 6: S232-S236.

Mark, M.M., Cooksy, L.J., & Trochim, W.M.K. (2009). Evaluation policy: An introduction and overview. In W. M. K. Trochim, M. M. Mark, & L. J. Cooksky (Eds.), Evaluation policy and evaluation practice. New Direction for Evaluation (Vol. 123, pp. 3-11). Hoboken, NJ: Wiley Periodicals, Inc.

Marya, CM. (2001) A textbook of Public Health Dentistry. Japee Brothers Medical publishers: New Delhi India.

Mathers, CD., and Loncar, D. (2006). Projections of global mortality and burden of disease from 2002 to 2030.PLoS Me, 3(11):e512.

Mathew, AL., Daniel, MP., Cherian, SA.,& Joseph, BB. (2017). Prevalence of oral mucosal lesions among diabetic patients in south kerala, India. J Oral Med Toxicol,1(1);20-22

Matti, R., Kalevi, S., and Ilkka, P. (1980). Relationship between reported toothbrushing and dental caries in adults. Community Dent Oral Epidemiol, 8:128–131.

McIntyre, G. (2001). Oral candidosis. Dent Update. 28:132–9.

Ministry Of Health (2014). Annual primary health report 2013. Gaza, Palestine: Ministry of Health

Ministry Of Health (2016). Annual primary health report 2015. Gaza, Palestine: Ministry of Health

Mocherla, M., Reddy, P., Anjum, S., Rao, K., Abbas, I.,&Priya, F. (2016). Assessment of oral health status and self-perceived oral health in diabetic patients attending a Dental College in Vikarabad - Telangana. Universal Research Journal of Dentistry, 6:29-33.

Mohamed, HG., Idris, SB., Ahmed, MF., Bøe OE., Mustafa, K., Ibrahim, SO., &Åstrøm, AN. (2013). Association between oral health status and type 2 diabetes mellitus among Sudanese adults: a matched case-control study. PLoS One,12:e82158

Mohammad, T., Mirza, AJ., and Jahngir, SM.(2014). Effects of Educational attainment on dentition status in socioeconomically deprived population of Karachi.Pakistan Oral & Dental Journal.,34 (1), 105-8

Moore, PA., Guggenheimer, J., and Orchard, T. (2007). Burning mouth syndrome and peripheral neuropathy in patients with type 1 diabetes mellitus. J Diabetes Complications, 21:397–402.

Moore, PA., Guggenheimer, J., Etzel, KR., Weyant, RJ., &Orchard, T. (2001) Type 1 diabetes mellitus, xerostomia, and salivary flow rates. Oral Surg Oral Med Oral Pathol Oral Radiol Endod, 92:281–91.

Morgan, D.L. (1996). Focus groups. Annual review of sociology . (22)129-152, Stable URL: http://www.jstor.org/stable/2083427. 129-152.

National Eye Institute (2015) Facts About Diabetic Eye Disease. Retrieved April 7, 2018, from https://nei.nih.gov/health/diabetic/retinopathy.

Negrato, CA., Tarzia, O., Jovanovič, L., &Chinellato, LE. (2013). Periodontal disease and diabetes mellitus. J Appl Oral Sci, 2013;21:1–12.

Obaid, H., and Eljedi, A. (2015). Risk factors for the development of diabetic foot ulcers in Gaza Strip: a case–control study. Int J Diabetes Res, 2015;4:1–6.

Oliveira, PP., Fachin, SM., Tozatti, J., Ferreira, MC.,& Marinheiro, LP.(2011). Comparative analysis of risk for falls in patients with and without diabetes mellitus. Revista Da Associacao Medica Brasileira, 58(2):234-239.

Oliver, RC., and Tervonen, T. (1994) Diabetes - A risk factor for periodontitis in adults? . J Periodontal., 65:530–8.

Oliver, RC., and Tervonen, T. (1993) Periodontitis and tooth loss: comparing diabetics with the general population. J Am Dent Assoc,124(12):71–6.

Oral Health Foundation(2015). How much sugar is in your foods and drinks? Retrieved Feb 26, 2018, from https://www.dentalhealth.org/blog/blogdetails/170

Organ, W. (1988) Organizational citizenship behavior: The good soldier syndrome. Lexington, Massachusetts, USA: Lexington Books.

Palestinian Central Bureau of Statistics (2014). Statistical review on the status of the Palestinian Population, On the Eve of the International Population Day 11/07/2014, The Poverty Rate Among Individuals. Ramallah, Palestine: PCBS.

Palestinian Central Bureau of Statistics (2015). http://www.pcbs.gov.ps. Accessed on 23.06.2016

Palestinian Central Bureau of Statistics (2016). http://www.pcbs.gov.ps. Accessed on 02.11.2016

Palestinian Central Bureau of Statistics(2017).Palestinian at the end of 2016. Ramallah, Palestine: PCBS.

Palestinian Central Bureau of Statistics (2018a). The Population, Housing andEstablishments Census 2017. On the Occasion of the International Population Day 11/07/2018. ttp://www.pcbs.gov.ps. Accessed on 03.08.2018

Palestinian Central Bureau of Statistics (2018b). The Labour Forces Survey Results Fourth quarter (January- March, 2018) Round. http://www.pcbs.gov.ps. Accessed on 03.08.2018

Palestine Health Information Centre (2017). Health Annual Report: Palestine; 2016.

Papapanou, PN., and Wennström, JL. (1989). Radiographic and clinical assessments of destructive periodontal disease. Journal of Clinical Periodontology, 16(9):609–612.

Peracini, A.,Andrade, IM., Paranhos, Hde F., Silva, CH.,& de Souza, RF.(2010). Behaviors and hygiene habits of complete denture wearers. Braz Dent J. 21(3):247–52.

Petersen, PE. (2003). The World Oral Health Report:*Continuous improvement of oral health in the 21st century. the approach of the WHO Global Oral Health Programme*.Geneva, Switzerland: WHO.

Petrou-Amerikanou, C., Markopoulos, AK., Belazi, M., Karamitsos, D.,& Papanayotou, P. (1998) .Prevalence of oral lichen planus in diabetes mellitus according to the type of diabetes. Oral Dis, 4:37–40.

Picot, J., Jones, J., Colquitt, JL., Gospodarevskaya, E., Loveman, E., Baxter, L.,& Clegg, AJ. (2009). The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation. Health Technology Assessment, 13: 1–190, 215–357, iii–iv.

Pihlstrom, BL., Michalowicz, BS.,&Johnson, NW. (2005) Periodontal diseases. Lancet 2005;366:1809-1820

Pinto, TM., Freitas, GC., Dutra, DA., Kantorski, KZ.,& Moreira, CH. (2013). Frequency of mechanical removal of plaque as it relates to gingival inflammation: A randomized clinical trial. J Clin Periodontol, 40:948-54.

Pradeepa, R., and Mohan, V. (2002) Changing scenario of the diabetes epidemic: Implications for India. Indian J Med Res, 116:121–32.

Preshaw, P.M., Alba, A..L., Herrera, D., Jepsen, S., Konstantinidis, A., Makrilakis, K., and Taylor, R. (2012). Periodontitis and diabetes: a two-way relationship.Diabetologia, 55: 21–31

Public Health Agency of Canada (2011). Diabetes in Canada: Facts and figures from a public health perspective. Ottawa, Canada.

Raajendran, R., and Sivapathasundharam, B.(2009) Shafer's Textbook of Oral Pathology.6th Edition, Elsevier India. Published Date: 15th July 2009.

Radwan, M., Elsous, A.,Al-Sharif, H., and Abu Mustafa, A. (2018) Glycemic control among primary care patients with type 2 diabetes mellitus in the Gaza Strip, Palestine. Therapeutic Advances Endocrinology and Metablism, 9(1): 3–14.

Rafatjou, R., Razavi, Z., Tayebi, S., Khalili, M.,& Farhadian, M.(2016). Dental Health Status and Hygiene in Children and Adolescents with Type 1 Diabetes Mellitus. Journal of Research in Health Sciences. 16(3):122-126.

Rajhans, NS., Kohad, RM., Chaudhari, VG.,& Mhaske, NH. (2011) A clinical study of the relationship between diabetes mellitus and periodontal disease. J Indian Soc Periodontol, 15 (4): 388-392.

Richard, P GT., and Chava, V. (2000) Influence of lifestyle, gender and socioeconomic status as determinants of dental health behavior, periodontal status awareness. JPFA ; 14: 21-5. 27

Rye, G. (2015). What Happens if You Don't Replace a Missing Tooth? Retrieved Febrauray 28, 2018, from Smile: https://yourdentalhealthresource.com/what-happens-if-you-dont-replace-a-missing-tooth.

Rylander, H., Ramberg, P., Blohme, G., &Lindhe, J. (1987). Prevalence of perio-dontal disease in young diabetics. J Clin Periodontol, 14(1): 38−43.

Saini, R., Al-Maweri, SA., Saini, D., Ismail, NM., &Ismail, AR.(2010). Oral mucosal lesions in non oral habit diabetic patients and association of diabetes mellitus with oral precancerous lesions. Diabetes Res Clin Pract. 89:320–6.

Saleh, I. (2018a). Annual Report On Special Care for Non-Communicable Disease. Gaza: Field Disease Control, Health department, Gaza Field.

Saleh, I. (2018b). Management Health Information System - Non-communicable Disease Care. Field Disease Control, Health Department, Gaza Field.

Sandberg, GE., and Wikblad, KF. (2003). Oral dryness and peripheral neuropathy in subjects with type 2 diabetes. J Diabetes Complications. 17:192–8.

Sandberg, GE., Sundberg, HE., Fjellstrom, CA., &Wikblad, KF. (2000).Type 2 diabetes and oral health. A comparison between diabetic and non-diabetic subjects. Diabetes Res Clin Pract, 50:27–34.

Sansnee, J., Maree, J., & Anthony, W. (2014). Research Methods in Nursing and Midwifery: Pathways to Evidence-based. Practice. (2nd ed.). South Melbourne, Victoria, Australia: Oxford University Press.

Schwendicke, F., Dörfer, CE., Schlattmann, P., Foster page, L., Thomson, WM., & Paris, S. (2015). Socioeconomic inequality and caries: a systematic review and meta-analysis. J Dent Res, 94:10–18.

Scully, C., Bagan, J., Eveson, J., Barnard, N., & Turner, F. (2008). Sialosis: 35 cases of persistent parotid swelling from two countries. Br J Oral Maxillofac Surg, 46:468–72

Selva, OA., Barajas-Nava, LA., Gianneo, OD., Solà, I., Bonfill, CX., and Lipsky, BA. (2015). Systemic antibiotics for treating diabetic foot infections. Cochrane Database Syst Rev, 9:CD009061

Selwitz, RH., Ismail, AI., & Pitts, NB. (2007). Dental caries. The Lancet, 369: 51–59.

Seppälä, B., Seppälä, M., & Ainamo, J. (1993). A longitudinal study on insulin-dependent diabetes mellitus and periodontal disease. Journal of Clinical Periodontology, 20(3):161–5.

Shaffer, JR., Leslie, EJ., Feingold, E., Govil, M., McNeil, DW., Crout, RJ., Weyant, RJ., and Marazita, ML. (2015). Caries Experience Differs between Females and Males across Age Groups in Northern Appalachia. Int J Dent,2015:938213

Shahin, Y. (2016). UNRWA`s NCD Programme. Amman: UNRWA Health Department.

Shi, y., & Hu, FB. (2014). The global implications of diabetes and cancer. Lancet. 2014 Jun 7;383(9933):1947-8.

Ship, J. (2003). Diabetes and oral health: An overview. J Am Dent Assoc. 134:4–10s.

Shlomo, M., Kenneth, P., ReedLarsen, P., and Kronenberg, H. (2011). Williams textbook of endocrinology, 12 th Edition. Philadelphia: Elsevier/Saunders.

Shomar, B., Mulle, G., Yahya, A., Askar, S. and Sansur, R. (2004). Fluoride in Groundwater, Soil and Infused-black tea and the Occurrence of Dental Fluorosis among school children of the Gaza Strip. Journal water Health, 2, 23-35.

Silva, MFA., Barbosa, KGN., Pereira, JV., Bento, PM., Godoy, GP.,& Gomes, DQC. (2015). Prevalence of oral mucosal lesions among patients with diabetes mellitus types 1 and 2. The journal Brazilian Annals of Dermatology. 90(1): 49–53.

Singh, A., Thomas, S., Dagli, RJ., Kaţ, R., Solanki, J.,& Bhateja, GA.(2014). To access the effects of salivary factors on dental caries among diabetic patients and non diabetic patients in Jodhpur City. J Adv Oral Res, 5:10–4.

Singh, N.,Armstrong, DG., & Lipsky, BA. (2005). Preventing Foot Ulcers in Patients With Diabetes. JAMA, 12;293(2):217-28.

Slade, GD., and Spencer, AJ. (1995). Periodontal attachment loss among adults aged 60+ in South Australia. Community Dent Oral Epidemiol, 23: 237-242.

Stevens, A., Raftery, J., & Mant, J. (1991). Implementing joint strategic need assessment lessons from healthcare need assessment. Birmingham: university of Birmingham.

Susin, C., Oppermann, RV., Haugejorden, O., & Albandar, JM. (2005). Tooth loss and associated risk indicators in an adult urban population from south Brazil. . Acta Odontologica Scandinavica. 63(2):85–93.

Tavakoli, M., Boulton, AJ., Efron, N.,& Malik, RA.(2010) Increased Langerhans cell density and corneal nerve damage in diabetic patients: Role of immune mechanisms in human diabetic neuropathy. Cont Lens Anterior Eye. 2011 Feb; 34(1): 7–11.

Taylor, GW. (2001). Bidirectional interrelationships between diabetes andperiodontal diseases: an epidemiologic perspective. Ann Periodontol. 6: 99–112.

Taylor, GW. and Borgnakke, WS.(2010). Treatment of established complications: periodontal disease. In:Herman. W, Kinmouth. AL., Wareham, NJ, Williams R, eds. The Evidence Base in Diabetes Care, 2nd edition. Chichester, The United Kingdom: John Wiley & Sons

Thorstensson, H. and Hugoson, A. (1993). Periodontal disease experience in adult long-duration insulin-dependent diabetics.Journal of Clinical Periodontology, 20(5):352–358.

Touger-Decker, R., and Mobley, C.C. (2007). Position paper of the American Dietetic Association: oral health and nutrition. J Am Diet Assoc, 103:615–625.

Tripathy, B., Chandalia, HB., Das, AK., Rao, PV., Madhu, SV.,& Mohan, V. (2012) RSSDI textbook of diabetes mellitus (Rev. 2nd ed.). New Delhi: Jaypee Brothers Medical Publishers.

United Nations for the Coordination of Humanitarian Affairs(2017). OCHA, Humanitarian facts and figures. Occupied Palestinian Territory, 2017, p 2 (https://www.ochaopt.org/content/humanitarian-facts-and-figures, accessed 9 April 2018).

United Nations Relief and Works Agency for Palestine Refugees in the Near East (2016a). Annual Health Report 2015. Amman: UNRWA Health Department.

United Nations Relief and Works Agency for Palestine Refugees in the Near East (2016b).What we do. Retrieved November 18, 2016, from http://www.unrwa.org/what-we-do/health.

United Nations Relief and Works Agency for Palestine Refugees in the Near East (2017). Annual Health Report 2016. Amman: UNRWA health department.

Urzua, I., Mendoza, C., Arteaga, O., Rodríguez, G., Cabello, R., Faleiros, S., Carvajal., p., Munoz, A., Espinoza, I., Aranda, W., and Gamonal., J. (2012). Dental caries prevalence and tooth loss in Chilean adult population: First national dental examination survey. Int J Dent 2012. 2012810170.

Wang, L., Cheng, L., Yuan, B., Hong, X.,& Hu, T. (2017). Association between socio-economic status and dental caries in elderly people in Sichuan Province, China: a cross-sectional study. BMJ Open 7:e016557.

Wild, S., Roglic, G., Green, A., Sicree, R., & King, H.(2004). Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care, 27(5):1047-53

Williams, RC. and Offenbacher, S. (2000). Periodontal medicine: the emergence of a new branch of periodontology. Periodontology. 23:9–12.

Willis, A.M., Coulter, W.A., Fulton, C.R., Hayes, J.R., Bell, P.M., and Lamey, P.J. (1999) Oral candidal carriage and infection in insulin-treated diabetic patients. Diabet Med, 16: 675–679.

World Health Organization (1962). standarisation of reporting of dental diseases and conditions. Geneva: WHO.

World Health Organization (2005). The Liverpool Declaration: Promoting Oral Health in the 21st Century. A call for action.Liverpool: International Association for Dental Research (IADR), World Health Organization (WHO), European Association of Dental Public Health (EADPH) and British Association for the Study of Community Dentistry (BASCD).

World Health Organization (2012). Oral Health. Fact sheet no 318. World Health Organization, Geneva

World Health Organization (2013b). Oral Health Surveys- Basic Methods. 5 th ed. Geneva; 2013.

World Health Organization (2016d). Diabetes programme, Diabetes action online.Retrieved May 18, 2017, from https://web.archive.org/web/20140331094533/http://www.who.int:80/diabetes/action_online/basics/en/

World Health Organization. (1997). Oral Health Survey Basic Methods. 4. Delhi: ITBS. Publishers and Distributors

World Health Organization. (2016c). Global Report on Diabetes. Geneva: WHO.

World Health Organization.(2016a). Promoting oral health in Africa: Prevention and control of oral diseases and noma as part of essential non-communicable disease intervention. http://www.who.int/iris/handle/10665/205886

World Health Organization.(2013a). Fact sheet no 312; Diabetes, updated March 2013. World Health Organization, Geneva

World Health Organization.(2016b). Regional oral health strategy 2016-2025; Addressing oral diseases as part of non-communicable diseases. Addis Ababa: WHO Regional Committee for Africa.

World Dental Federation (2014). Oral Health Worldwide. [online] London: FDI. Available at:https://www.fdiworlddental.org/sites/default/files/media/documents/2015_wohd-whitepaper-oral_health_worldwide.pdf [Accessed 6 Apr. 2018].

Yonekura, S., Usui, M.,& Murano, S. (2017). Association between numbers of decayed teeth and HbA1c in Japanese patients with type 2 diabetes mellitus. Ups J Med Sci, 122(2): 108–113

6.2 Annexes

Annex (1) Study activities time table

Activity	Duration	Date
Proposal writing	3 months	Feb-April 2017
Proposal defense and approval	1 month	May 2017
Expert committee check for the validity of instruments	1 month	June 2017
Pilot study	2 weeks	August 2017
Modifications	2 weeks	August 2017
Data Collection	1 month	Sept 2017
Data Entry	1 month	Nov 2017
Data Analysis	1month	Dec 2017
Research writing	3Months	Jan-March 2018

Annex (2) UNRWA health centers type 2 DM patientsand Sample size:

Source of data: UNRWA Health Department.

Health Centers according to geographic area			
No.	Health Centers	No. of Type 2DM patients	% of total Type 2 DM.
North Gaza Area			
1	BeitHanoun	1108	2.8%
2	Jabalia and	5543	14.5%
3	Fakhoura		
Gaza			
4	North Gaza	1819	4.61%
5	Beach	1495	3.78%
6	Rimal	3720	9.41%
7	Sheikh Radwan	1357	3.43%
8	Daraj (Gaza Town)	2042	5.17%
9	Sabra	2134	5.40%
Middle Zone			
10	Bureij	1355	3.43%
11	Nuseirat	2944	7.46%
12	Maghazi	1121	2.84%
13	Dair El-Balah	2209	5.59%
14	West nusirat	621	1.57%
Khanyounis			
15	Ma'En	2273	5.76%
16	Kh/Younis	3202	8.11%
17	Kh/Younis (Japanese)	1030	2.61%
Rafah			
18	Rafah	2586	6.55%
19	Tal Sultan	1730	4.38%
20	Shaboura	1086	2.75%
21	El-Nasser	293	0.7%
22	El-Shouka	339	1.01%
	Total	**39448**	**381**

Annex 3 List of arbitrators

	Name
1	Dr.Yahia Abed
2	Dr.Bassam Abu Hammed
3	Dr.Khitam Abu Hammed
4	Dr.IsaSaleh
5	Dr.ZohirElkhateeb
6	Dr.MohammedUbaid
7	Dr.HananDiab
8	Dr.SalwaElmajdalawy
9	Dr.Amal Batch
10	Dr.AhmedShaaer
11	Dr.AshrafAljedy

Annex 4

Oral Health Problems among Type 2 Diabetic Patients Attending UNRWA Health Centers in Gaza Governorates.

Interviewed Questionnaire

1.	**Age:** How old are you? _____Years		
2.	**Gender:**	1-□Male	2-□Female
3.	**What level of education have you completed?**	No formal schooling..... □1 Less than primary school..... □2 Primary school completed…..... □3 Preparatory school completed..... □4 Secondary school completed .... □5 College/University completed ..... □6 Postgraduate degree..... □7	
4.	**Do you currently work?**	1-□Yes	2- □No
5.	**Monthly income:**_____ NIS		
6.	**Body Mass Index:_____**		
7.	**Diabetic age (How many years with Diabetes):** _____Years		
8.	**HbA1c last reading**: _____		
9.	**What is your current treatment?**	1. □ Diet 2. □ Oral 3. □Insulin 4. □Exercise	
10	**Presence of diabetic systemic complication**	1- □No 2- □Yes If Yes Enumerate _____ 1- □Early complication 2- □Late complication	
11	**During the year 2016 and 2017, how many times have you done oral health assessment at dental station? _____** *(If participant have not done any oral heal assessment go to Q 13)*		
12	**Have you done any intervention after any oral health assessment?** 1. □No Why ?----------		

	2. □Yes What Type of intervention have you done? ---------- Was the intervention at UNRWA HC? 1- □No 2- □Yes	
13	**How many natural teeth do you have?** *(If participant have no natural teeth go to question 18)*	1. □No natural teeth 2. □1–9 teeth 3. □10–19 teeth 4. □20 teeth or more
14	**How would you describe the state of your teeth and gums?**	**Teeth** **Gums** Excellent □1 □1 Very good □2 □2 Good □3 □3 Average □4 □4 Poor □5 □5 Very poor □6 □6 Don't know □7 □7
15	**How often do you clean your teeth?** *(If participant never clean his/her teeth go to question 18)*	Never ..... □ 1 Once a month ..... □ 2 2–3 times a month ..... □ 3 Once a week ..... □ 4 2–6 times a week ..... □ 5 Once a day..... ..... □ 6 Twice or more a day ..... □ 7
16	**Do you use any of the following to clean your teeth?** (Read each item)	**Yes No** **1** **2**Toothbrush..... □ □ Wooden toothpicks. □ □ Plastic toothpicks. □ □ Thread (dental floss) □ □ Chewstick/miswak. □ □
17	**Yes No** a) Do you use toothpaste to clean your teeth .....□1 □2 b) Do you use a toothpaste that contains fluoride? .....□1 □2 Don't know.....□ 9	
18	**During the past 12 months, did your teeth or mouth cause any pain or discomfort?**	1. □ Yes 2. □ No 3. □ Don't know 4. □ No answer
19	**How long is it since you last saw a dentist?**	Less than 6 months..... □1 6–12 months..... □2 More than 1 year but less than 2 years..... □3 2 years or more but less than 5 years..... □4

		5 years or more .... □5 Never received dental care ..... □6
20	**What was the reason of your last visit to the dentist?**	Consultation/advice..... □1 Pain or trouble with teeth, gums or mouth □2 Treatment/ follow-up treatment ..... □3 Routine check-up/treatment..... ... □4 Don't know/don't remember..... □5
21	**Are you smoke cigarettes?**	1-□Yes 2-□No If yes how many cigarettes per day.....

22 **Because of the state of your teeth or mouth, how often have you experienced any of the following problems during the past12 months?**

	Very Often 4	Fairly Often 3	Some-times 2	No 1	Don't know 0
(a) Difficulty in biting foods	□	□	□	□	□
(b) Difficulty chewing foods	□	□	□	□	□
(c) Difficulty with speech/trouble pronouncing words	□	□	□	□	□
(d) Dry mouth	□	□	□	□	□
(e) Felt embarrassed due to appearance of teeth	□	□	□	□	□
(f) Felt tense because of problems with teeth or mouth	□	□	□	□	□
(g) Have avoided smiling because of teeth	□	□	□	□	□
(h) Had sleep that is often interrupted	□	□	□	□	□
(j) Difficulty doing usual activities	□	□	□	□	□
(k) Felt less tolerant of spouse or people who are close to you.....	□	□	□	□	□
(l) Have reduced participation in social activities	□	□	□	□	□

How often do you eat or drink any of the following foods, even in small quantities? (Read each item)

	Several times a day 6	Every a day 5	Several times a week 4	Once aweek 3	Several times a month 2	Seldom /never 1		
Biscuits, cakes, cream cakes	☐	☐	☐	☐	☐	☐		
Sweet pies, buns		☐	☐	☐	☐	☐	☐	
Jam or honey	☐	☐	☐	☐	☐	☐		
Chewing gum containing sugar		☐	☐	☐	☐	☐	☐	
Sweets/candy		☐	☐	☐	☐	☐	☐	
Lemonade, Coca Cola or other soft drinks	☐	☐	☐	☐	☐	☐		
Tea with sugar		☐	☐	☐	☐	☐	☐	
Coffee with sugar		☐	☐	☐	☐	☐	☐	
Arabian delights..... (ka`aek, Baklawa,Numora, etc	☐	☐	☐	☐	☐	☐		
Nuts	☐	☐	☐	☐	☐	☐		

23 **In case of any oral health problem, are you seeking oral health care at;**

1-□ Private Dental Care

2-□ UNRWA HCs Dental Care?

If at UNRWA HCs, what are the most common challenges facing you seeking oral health care at UNRWA health centers?

1. □Stuff are not professional **.**
2. □unavailability of all oral health services**.**
3. □NO advanced dental treatment at UNRWA
4. □Multi- visits procedures**.**
5. □Transport problems.
6. □Fear from Dental treatment.
7. □No one is free to company me to dental clinic.
8. □Time consuming procedures**.**
9. □Double services (NCD and Dental) is not allowed.
10. □Far appointment.
11. □Unfriendly staff.
12. □Crowded dental station.
13. □Others

Please specify _____

Annex 5
Oral Health Assessment Form

Dentition status

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

Crown ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Crown ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Permanent teeth

Status
0 = Sound
1 = Caries
2 = Filled w/caries
3 = filled, no caries
4 = Missing due to caries
5 = Missing for any another reason
6 = Fissure sealant
7 = fixed dental prosthesis/crown abutment, veneer, implant
8 = unerupted
9 = not recorded

Periodontal status (CPI Modified)

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

Bleeding ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Pocket ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Bleeding ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Pocket ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Gingival bleeding

Score
0 = Absence of condition
1 = Presence of condition
9 = Tooth excluded
X = tooth not present

Pocket

Score
0 = Absence of condition
1 = pocket 4-5 mm
2 = pocket 6 mm or more
9 = tooth excluded
X = tooth not present

Dental trauma

Status ☐

0=No sign of injury
1=Treated injury
2=Enamel fracture only
3=Enamel and dentine fracture
4=Pulp involvement
5=Missing tooth due to trauma
6=other damage
9=Excluded tooth

Number of teeth affected ☐☐

Enamel fluorosis ☐

Severity
0=Normal
1=Questionable
2=Very mild
3=Mild
4=Moderate
5=Severe
8=Exclude (crown, restoration, brackets)

9=Not recorded (unerupted tooth)

Dental erosion

Severity ☐

1= No sign of erosion
2=Enamel lesion
3=Dentinal lesion
4=pulp involvement

Number of teeth affected

☐☐

Denture(s)

Upper ☐ **Lower** ☐

0=No denture
1=Partial denture
2=Complete denture
9=Not recorded

Oral mucosal lesions

☐
☐
☐

Condition

0=No abnormal condition
1=Malignant Tumor (oral cancer)
2=Leukoplakia
3=Lickenplanus
4=Ulceration (aphthous, herpatic, traumatic)
5=Acute necrotizing ulcerative gingivitis (ANUG)
6=Candidiasis
7=Abscess
8=Other condition (specify if possible)
9=Not recorded

☐
☐
☐

Location

0=Vermillion border
1=Commissures
2=Lips
3= Sulci
4=Buccal mucosa
5=Floor of mouth
6=Tongue
7=Hard and/or soft palate
8=Alveolar ridges/gingiva
9=Not recorded

Intervention urgency ☐

0=N0 treatment needed
1=Preventive or routine treatment needed
2=Prompt treatment (including scaling) needed
3=Immediate (urgent) treatment needed due to pain or infection of dental and/or oral origin
4=Refereed for comprehensive evaluation or medical/dental treatment (systemic condition)

Annex 6 Consent form (English)

Al-Quds University

School Of Public Health

Oral Health Problems among Type 2 Diabetic Patients Attending UNRWA Health Centers In Gaza Governorates.

Dear participant;

I am Emad Ibrahim Alqedra, and now collecting data for a research study about oral health problems among type 2 diabetic patients attending UNRWA health centers in Gaza governorates. You have been randomly selected to participate in this study and your participation has no direct or indirect negative implications on you.

Participation in this study requires filling an interviewed questionnaire and setting for oral health assessment which are a part of a study conducted by me as a requirement for the master degree in public health at Al-Quds University. The study is self-funded; and findings will be used only for the research purposes. The study is completely independent and has no connection to any government, authority or official body.

The findings and conclusions of this study may help for better understanding of the oral health problems among type diabetic patients, determining their oral health needs and exploring challenges facing them on seeking oral health services at UNRWA health centers for developing such recommendations in order to improve oral health services delivered to type 2 diabetic patients.

Even though I welcome and appreciate your participation, participating is optional; you may refuse to participate, stop interview or assessment, skip questions or withdraw the questionnaire anytime you wish. Your answers will be kept completely confidential and no individual respondent will be identified in any report based on the study.

The questionnaire and assessment may take 15 minutes of valuable time. Please answer all questions as much as possible and don't hesitate to ask for any clarification regarding this questionnaire.

Thank you very much for taking the time to complete this questionnaire.

Yours faithfully

Emad Al-qedra

Annex 7Consent form (Arabic)

جامعة القدس – فلسطين

كليــة الدراســات العليــا

كليــة الصحــة العامـــة

استبانه

الأخت الفاضلة: /الأخ الفاضل

تحية تقدير واحترام وبعد،،،

أنا الباحث عماد إبراهيم القدرة طالب ماجستير بجامعة القدس كلية الدراسات العليا– برنامج الصحة العامة تخصص إدارة صحية أقوم بإجراء هذا البحث كمتطلب رئيسي من متطلبات الحصول على شهادة الماجستير، حيث أن الدراسة تهدف إلى **التعرف على مشاكل الفم و الأسنان لمرضى السكر من النوع الثاني الذين يتلقون خدماتهم الصحية في عيادات وكالة الغوث في محافظات قطاع غزة.**

حيث أن هذه الدراسة ستساهم في تحسين وضع صحة الفم و الأسنان لمرضي السكر في قطاع غزة. لقد تم اختيارك للمشاركة في هذا البحث عشوائيا و لمطابقتك لشروط البحث العلمي .إن إجراء هذا البحث لا يتطلب عمل أي تحاليل مخبريه أو تناول أي نوع من الأدوية.

لذلك يرجى التكرم بالموافقة على إجراء تقيم صحة الفم و الأسنان و الإجابة على جميع أسئلة المقابلة بكل أمانة وصدق، مع العلم أن مشاركتك في هذه الدراسة طوعية، كما يمكنك الإجابة على كل أو بعض الأسئلة أو التوقف متى شئت كما أن البيانات التي سيتم جمعها منك أو من الملف الطبي الخاص بك سيتم استخدامها للبحث العلمي فقط ولن يطلع عليها احد.
علما أن التقييم و المقابلة يحتاجان بحد أقصى 15 دقيقة لاستكمالهما مهما تكن المعلومات التي تعطيها سوف تبقى سرية وطي الكتمان.

مع جزيل الشكر والتقدير لسيادتكم

عماد إبراهيم القدرة
0599686372

Annex 8An official letter of Approval from the Helsinki Committee in the Gaza Strip

المجلس الفلسطيني للبحث الصحي
Palestinian Health Research Council

تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار

Developing the Palestinian health system through institutionalizing the use of information in decision making

Helsinki Committee
For Ethical Approval

Date: 2017/08/07 **Number:** PHRC/HC/245/17

Name: EMAD I. ALQEDRA الاسم:

We would like to inform you that the committee had discussed the proposal of your study about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Oral Health Problems among Type 2 Diabetic Patients Attending UNRWA Health Centers In Gaza Governorates.

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/245/17 in its meeting on 2017/08/07

و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

Signature

Member **Member**

Chairman

7/8/17

Genral Conditions:-

1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed.

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين
شارع النصر - مفترق العيون

Annex 9Scheffe Test

Age and DMF

Multiple Comparisons

Dependent Variable: DMF

Scheffe

(I) Age.	(J) Age.	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1 Less than 50 years	2 From 50 to 55	-2.48842-	1.05599	.137	-5.4530-	.4762
	3 From 56 to 60	-5.71216-*	1.03724	.000	-8.6241-	-2.8002-
	4 Above 60	-7.46019-*	1.02517	.000	-10.3383-	-4.5821-
2 From 50 to 55	1 Less than 50 years	2.48842	1.05599	.137	-.4762-	5.4530
	3 From 56 to 60	-3.22374-*	1.05093	.025	-6.1741-	-.2733-
	4 Above 60	-4.97177-*	1.03902	.000	-7.8887-	-2.0548-
3 From 56 to 60	1 Less than 50 years	5.71216*	1.03724	.000	2.8002	8.6241
	2 From 50 to 55	3.22374*	1.05093	.025	.2733	6.1741
	4 Above 60	-1.74803-	1.01996	.403	-4.6115-	1.1154
4 Above 60	1 Less than 50 years	7.46019*	1.02517	.000	4.5821	10.3383
	2 From 50 to 55	4.97177*	1.03902	.000	2.0548	7.8887
	3 From 56 to 60	1.74803	1.01996	.403	-1.1154-	4.6115

*. The mean difference is significant at the 0.05 level.

ScheffeTest
Education Level and DMF

Multiple Comparisons

Dependent Variable: DMF

Scheffe

(I) Education.	(J) Education.	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1 No formal schooling	2 Less than primary school	.02872	1.61308	1.000	-5.3657-	5.4231
	3 Primary school completed	4.77924	1.62377	.126	-.6509-	10.2094
	4 Preparatory school completed	4.75000	1.50413	.079	-.2800-	9.7800
	5 Secondary school completed	5.62573*	1.54320	.022	.4650	10.7864
	6 College/University completed and Postgraduate degree	5.45284*	1.51409	.025	.3895	10.5162
2 Less than primary school	1 No formal schooling	-.02872-	1.61308	1.000	-5.4231-	5.3657
	3 Primary school completed	4.75052*	1.41657	.049	.0133	9.4877
	4 Preparatory school completed	4.72128*	1.27767	.019	.4486	8.9940
	5 Secondary school completed	5.59701*	1.32345	.004	1.1712	10.0228
	6 College/University completed and Postgraduate degree	5.42412*	1.28938	.004	1.1122	9.7360
3 Primary school completed	1 No formal schooling	-4.77924-	1.62377	.126	-10.2094-	.6509
	2 Less than primary school	-4.75052-*	1.41657	.049	-9.4877-	-.0133-
	4 Preparatory school completed	-.02924-	1.29114	1.000	-4.3470-	4.2885
	5 Secondary school completed	.84649	1.33645	.995	-3.6228-	5.3158
	6 College/University completed and Postgraduate degree	.67360	1.30273	.998	-3.6829-	5.0301
4 Preparatory school	1 No formal schooling	-4.75000-	1.50413	.079	-9.7800-	.2800

completed	2 Less than primary school	-4.72128-*	1.27767	.019	-8.9940-	-.4486-
	3 Primary school completed	.02924	1.29114	1.000	-4.2885-	4.3470
	5 Secondary school completed	.87573	1.18822	.990	-3.0979-	4.8493
	6 College/University completed and Postgraduate degree	.70284	1.15016	.996	-3.1435-	4.5491
5 Secondary school completed	1 No formal schooling	-5.62573-*	1.54320	.022	-10.7864-	-.4650-
	2 Less than primary school	-5.59701-*	1.32345	.004	-10.0228-	-1.1712-
	3 Primary school completed	-.84649-	1.33645	.995	-5.3158-	3.6228
	4 Preparatory school completed	-.87573-	1.18822	.990	-4.8493-	3.0979
	6 College/University completed and Postgraduate degree	-.17289-	1.20081	1.000	-4.1886-	3.8428
6 College/University completed and Postgraduate degree	1 No formal schooling	-5.45284-*	1.51409	.025	-10.5162-	-.3895-
	2 Less than primary school	-5.42412-*	1.28938	.004	-9.7360-	-1.1122-
	3 Primary school completed	-.67360-	1.30273	.998	-5.0301-	3.6829
	4 Preparatory school completed	-.70284-	1.15016	.996	-4.5491-	3.1435
	5 Secondary school completed	.17289	1.20081	1.000	-3.8428-	4.1886

*. The mean difference is significant at the 0.05 level.

Scheffe test

Diabetic Duration and DMF

Multiple Comparisons

Dependent Variable: DMF

Scheffe

(I) Diabetic Duration.	(J) Diabetic Duration	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1.0 Less than 5 Years	2.0 From 5 to 9 Years	-1.48342-	1.00140	.534	-4.2948-	1.3279
	3.0 From 10 to 14 Years	-3.57580-*	1.05893	.010	-6.5487-	-.6029-
	4.0 Above 15 years	-4.20640-*	1.12651	.003	-7.3690-	-1.0438-
2.0 From 5 to 9 Years	1.0 Less than 5 Years	1.48342	1.00140	.534	-1.3279-	4.2948
	3.0 From 10 to 14 Years	-2.09238-	1.10864	.314	-5.2048-	1.0200
	4.0 Above 15 years	-2.72298-	1.17335	.147	-6.0171-	.5711
3.0 From 10 to 14 Years	1.0 Less than 5 Years	3.57580*	1.05893	.010	.6029	6.5487
	2.0 From 5 to 9 Years	2.09238	1.10864	.314	-1.0200-	5.2048
	4.0 Above 15 years	-.63060-	1.22282	.966	-4.0636-	2.8024
4.0 Above 15 years	1.0 Less than 5 Years	4.20640*	1.12651	.003	1.0438	7.3690
	2.0 From 5 to 9 Years	2.72298	1.17335	.147	-.5711-	6.0171
	3.0 From 10 to 14 Years	.63060	1.22282	.966	-2.8024-	4.0636

*. The mean difference is significant at the 0.05 level.

Scheffe test

Times of teeth-brushing and DMF

Multiple Comparisons

Dependent Variable: DMF

Scheffe

(I) Times of teeth-brushing	(J) Times of teeth-brushing	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1 Never	2 Once a month	7.95896	3.31530	.452	-3.8754-	19.7933
	3 2-3 times a month	7.78038	2.53322	.154	-1.2623-	16.8231
	4 Once a week	4.41408*	1.18879	.034	.1706	8.6576
	5 2-6 times a week	4.74229*	1.31970	.047	.0315	9.4531
	6 once a day	6.78504*	.88465	.000	3.6272	9.9429
	7 Twice or more a day	5.48315*	1.00356	.000	1.9008	9.0655
2 Once a month	1 Never	-7.95896-	3.31530	.452	-19.7933-	3.8754
	3 2-3 times a month	-.17857-	4.09527	1.000	-14.7972-	14.4400
	4 Once a week	-3.54487-	3.43034	.983	-15.7899-	8.7002
	5 2-6 times a week	-3.21667-	3.47788	.990	-15.6314-	9.1981
	6 once a day	-1.17391-	3.33716	1.000	-13.0863-	10.7385
	7 Twice or more a day	-2.47581-	3.37063	.997	-14.5077-	9.5561
3 2-3 times a month	1 Never	-7.78038-	2.53322	.154	-16.8231-	1.2623

	2 Once a month	.17857	4.09527	1.000	-14.4400-	14.7972
	4 Once a week	-3.36630-	2.68203	.954	-12.9401-	6.2075
	5 2-6 times a week	-3.03810-	2.74256	.975	-12.8280-	6.7518
	6 once a day	-.99534-	2.56177	1.000	-10.1399-	8.1492
	7 Twice or more a day	-2.29724-	2.60522	.993	-11.5969-	7.0025
4 Once a week	1 Never	-4.41408-*	1.18879	.034	-8.6576-	-.1706-
	2 Once a month	3.54487	3.43034	.983	-8.7002-	15.7899
	3 2-3 times a month	3.36630	2.68203	.954	-6.2075-	12.9401
	5 2-6 times a week	.32821	1.58671	1.000	-5.3358-	5.9922
	6 once a day	2.37096	1.24846	.729	-2.0856-	6.8275
	7 Twice or more a day	1.06907	1.33536	.996	-3.6977-	5.8358
5 2-6 times a week	1 Never	-4.74229-*	1.31970	.047	-9.4531-	-.0315-
	2 Once a month	3.21667	3.47788	.990	-9.1981-	15.6314
	3 2-3 times a month	3.03810	2.74256	.975	-6.7518-	12.8280
	4 Once a week	-.32821-	1.58671	1.000	-5.9922-	5.3358
	6 once a day	2.04275	1.37370	.899	-2.8608-	6.9463
	7 Twice or more a day	.74086	1.45312	1.000	-4.4463-	5.9280
6 once a day	1 Never	-6.78504-*	.88465	.000	-9.9429-	-3.6272-
	2 Once a month	1.17391	3.33716	1.000	-10.7385-	13.0863
	3 2-3 times a month	.99534	2.56177	1.000	-8.1492-	10.1399
	4 Once a week	-2.37096-	1.24846	.729	-6.8275-	2.0856

	5 2-6 times a week	-2.04275-	1.37370	.899	-6.9463-	2.8608
	7 Twice or more a day	-1.30189-	1.07358	.961	-5.1342-	2.5304
7 Twice or more a day	1 Never	-5.48315-*	1.00356	.000	-9.0655-	-1.9008-
	2 Once a month	2.47581	3.37063	.997	-9.5561-	14.5077
	3 2-3 times a month	2.29724	2.60522	.993	-7.0025-	11.5969
	4 Once a week	-1.06907-	1.33536	.996	-5.8358-	3.6977
	5 2-6 times a week	-.74086-	1.45312	1.000	-5.9280-	4.4463
	6 once a day	1.30189	1.07358	.961	-2.5304-	5.1342

*. The mean difference is significant at the 0.05 level.

6.2 Summary of study (Arabic) ملخص الدراسة

الصحةالفمويةهيمكونأساسيللصحةالعامة،وأمراضالفملهاتأثيراجتماعيسلبيوآثارسلبيةعلىنوعيةالحياة،فيحينأنعلاجهايضعبئاقت صادياكبيراعلىالأفرادوالمجتمعاتوالبلدان.

ترتبطالأمراضالفمويةبعددمنعواملالخطروالمحدداتالشائعةفيداءالسكريوالتيلهاتبعاتفموية.

هدفتهذهالدراسةإلىالتعرفعلىمشاكل صحة الفم والأسنان بينمرضىالسكريمنالنوع الثاني في

مراكزالأونرواالصحيةفيمحافظاتغزة. دراسةتحليليةلـ 406 مريض و مريضة يعانونمن مرض

السكريالنوعالثانيتماختيارهممنخلالعينةعشوائيةمنهجيةمن 5 مراكزصحيةتابعةللأونروا. حيث تماستخداماالأدوات

والأساليبالأساسيةلمنظمةالصحةالعالميةلجمعالبياناتوتقييمصحة الفم و الأسنان.

أظهرتالنتائجأن 36.3% منالمشاركينلميفرشواأسنانهمأبدا،بينما 16.5٪ فقطمنهماعتادوا على أن

يفرشواأسنانهممرتينأوأكثرفياليوم، (53.9٪) لميواجهوا عدم الراحة أو أيآلام سنية أو فمويةخلالال 12 شهرالماضية. كان

مؤشر النخر , الفقدان, و الحشو 18.6, فقط 16.4٪ منالمشاركينليسلديهمنزيف لثوي،متوسط

عددالأسنانالذيلايظهرنزيف لثوي (9.79) ،ويظهر نزيف لثوي (9.91) ومتوسط عددالأسنانالغيرموجودة لاختبارنزيف

اللثة (9.14). فيحينأن 2.4٪ ليسلديهمجيوب لثوية،فإنمتوسط عددالأسنانيظهرغيابالجيوب اللثوية (7.15)،ويظهرجيوب

لثوية 4–5 ملم (7.84) ، بينما جيوب لثوية 6ممأوأكثر (4.96) و متوسط عددالأسنانالغيرموجودةلقياسالجيوب اللثوية

(9.13). لمتكنهناكحاجةلأي نوع من العلاجبنسبة 8.4 ٪،فيحينأنالعلاجالسريعبمافيذلكتنظيف الترسبات الجيرية

كانضروريًالـ70.1٪ منالمشاركين.

وكانعدمتوفرجميعخدماتالصحةالفمويةوالمواعيدالبعيدةهوالتحديالأكثرشيوعاالذييواجههالمشاركونفيالمراكزالصحيةللأونروا عند

طلبهم للخدمات السنية.

كان مؤشر النخر , الفقدان, و الحشو مرتبط ارتباطا

ذودلالةإحصائيةبالعمر ،والمستوىالتعليمي،وحالةالعمل،وتواترتنظيفالأسنانبالفرشاة،ومدة الإصابة بمرضالسكري، و أخيرا

بمستوي مخزون السكر بالدم.

بينماكانالمؤشرأعلىبينالمشاركينمنالذكوروالمشاركينتحتخطالفقرالعميق. كانالنزيف اللثوي مرتبط ارتباطا

ذودلالةإحصائيةالمرتبطةبجنس المريض،و تواترتنظيفالأسنانبالفرشاة،ولكنلميكنهناكارتباطذودلالةإحصائيةبينوالنزيف اللثوي

و الجيوب اللثوية،والحالةالاقتصادية، مخزون السكر بالدم ومدة الإصابة بمرضالسكري.

وخلصتالدراسةالحاليةإلىأنالمرضىالذينيعانونمن مرض السكريالنوع الثانييعانون

أيضامنالعديدمنمشاكلالصحةالفموية،وغيرمدركينللآثار السنية و

الفموية المترتبةعلىمرضالسكري،يجبوضعإستراتيجيةجديدةللأونروالصحةالفم والأسنانلمرضىالأمراضغيرالمعدية.