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Oral Health Problems among Heart Diseases Patients Attending Governmental Health Centers in Gaza Governorates

Wissam Abdullah Ali Alborsh

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Oral Health Problems among Heart Diseases Patients Attending Governmental Health Centers in Gaza Governorates

Prepared By**:**
Wissam Abdullah Ali Alborsh

Bachelor of Dental Surgery

Supervisor: Prof. Dr. Yousef Ibrahim Aljeesh

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Prepared by: Wissam Abdullah Ali Alborsh
Registration No: 21912327

Supervisor: Prof. Dr. Yousef Ibrahim Aljeesh

Master thesis submitted and accepted. Date: 30/7/2022
The names and signature of the examining committee members are as follows:

1. Head of committee: Prof. Dr. Yousef Aljeesh Signature .....
2. Internal Examiner: Dr. Khitam Abu Hamad Signature .....
3. External Examiner: Dr. Waseem Mushtaha Signature .....

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Dedication

To my father and mother who encouraged me all the way

My wife, sons and daughters, for their support and patience.

To everyone who helped me during the preparation of the study.

Wissam Abdullah Ali Alborsh

Declaration

I certify that this thesis submitted for the degree of Master, is the result of my own research, except where otherwise acknowledged, and this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed:

Wissam Abdullah Ali Alborsh

30/7/2022

Acknowledgement

First of all, praise is to Allah, for giving me the courage and energy to complete this study.

I had the great fortune to accomplish this research under the supervision of Prof. Dr. Yousef Aljeesh.

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I would like to thank all the patients who agreed to participate in the study.

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Abstract

Oral health is a significant indicator of the overall-health and quality of life. Oral health problems are common public health concerns because many people can't pay for oral and dental health services. Generally speaking, oral health problems are common among patients with heart problems.

This study aimed to assess the oral health problems among heart diseases patients attending governmental primary health centers in Gaza governorates. The study utilized descriptive, cross-sectional design. The sample of the study consisted of 392 patients with chronic heart diseases recruited from five governmental primary health care centers, one from each governorate. The selected primary health centers provide services to clients with heart diseases. The participants who met the inclusion criteria were included in the study. The Researcher used proportional, stratified sampling method according to the number of patients attending each clinic. The Oral Health Assessment developed by the World Health Organization (2013) was used to collect the data from the study participants. The researcher used SPSS (version 25) to analyze data, statistical analysis included frequencies, percentage, mean scores, (t) test and One-way ANOVA test.

The results showed that 55.1% of study participants were males, their mean age was 60.04 years, and 89% were below the deep poverty line. Only 13% were within normal body mass index and the rest were either overweight or obese, 56.1% of the study participants have cardiac disease for 5 years and less. The results of the study also showed that 42.83% of study participants consume foods and drinks that contain sugar, and 24.33% were smokers. About 41.8% of study participants did not have any oral health assessment done in the past two years, 52% suffered from teeth pain or discomfort during the past 12 months. Oral health assessment indicated that 13.62% of study participants have dental caries, 17% have missing teeth, the mean number of teeth showing gingival bleeding was 14.56, and the mean number of teeth showing pocket of 4 – 5 mm was 10.75, 6.4% have partial dentures, 15.1% have full upper dentures and 12.8% have full lower dentures.

In addition, 20.9% of study participants showed enamel lesion, 6.1% have dental lesion, and 20.7% have enamel and dentine fracture. The results also showed that there were statistically no significant differences in DMFT index, presence of gingival bleeding and pocket related to sociodemographic factors ($P > 0.05$). Also, there were statistically no significant differences in periodontal status related to number of years having chronic heart disease ($P > 0.05$), and there were statistically no significant differences in periodontal status related to frequency of cleaning teeth ($P > 0.05$). Common challenges of seeking dental health services included unavailability of all oral health services at primary health centers, followed by crowded dental clinics, and unavailability of advanced dental treatment at governmental primary health centers. The study concluded that the practice of teeth cleaning was poor, the periodontal diseases are prevalent among cardiac patients, and the frequency of oral health assessment was suboptimal. The study recommended the need to increase public awareness about the importance of teeth cleaning and oral hygiene, and the need to have periodic oral health assessment for early discovery and treatment of any oral disease at early stage.

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List of Abbreviations

AAP	American Academy of Periodontology
ADA	American Dental Association
ADR	Adverse Drug Reaction
AHA	American Heart Association
ANOVA	Analysis of Variance
BSAC	British Society of Antimicrobial Chemotherapy
CAD	Coronary Artery Disease
CDC	Center for Disease Control and Prevention
CHD	Chronic Heart Disease
CVD	Cardiovascular Disease
DMFT	Decayed, Missing, Filled teeth
GG	Gaza Governorates
GS	Gaza Strip
HD	Heart Disease
INR	International Normalized Ratio
MI	Myocardial Infarction
MoH	Ministry of Health
NCDs	Non-Communicable Diseases
NGOs	Non-governmental Organizations
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
OD	Oral Disease
ODRs	Oral Drug Reactions
OH	Oral Health
OHRQoL	Oral Health-Related Quality of Life
PCBS	Palestinian Central Bureau of Statistics
PHC	Primary Health Care
PHCC	Primary Health Care Center
PHIC	Palestinian Health Information Center
PVD	Peripheral Vascular Disease
SES	Socio-Economic Status
UNRWA	United Nations Relief and Work Agency for the refugees of Palestine
WB	West Bank
WHO	World Health Organization

Chapter One

Introduction

1.1 Background

Oral health (OH) is an important component of quality of life parameters. OH is defined as "a condition of having mouth and face free of pain, tumors, infection and ulcers, gum disease, tooth decay and loss" (World Health Organization - WHO, 2012). Oral disease (OD) is a serious global public health concern due to its high prevalence as it affects more than 3.5 billion people in the world (Vos et al., 2017). Among OD, dental caries (DC) is the most occurring problem in permanent teeth, and Periodontal Diseases (PD) (Vos et al., 2017). Patients with ODs are usually complaining of pain, difficulty falling sleep, decrease in eating (Petersen et al., 2005). In addition, OD can impose systemic effects, especially among individuals with medical problems and weak immune system, bacteria from the mouth could be transferred to other parts of the body and cause further infection (Wolf, 2021).

Heart diseases (HDs) are a systemic diseases that could be associated with ODs. People with PD have two to three times the risk of having a heart attack, stroke, or other serious cardiovascular event, but there may not be a direct connection. Many patients with HDs have healthy gums, and not everyone with gum disease develops heart problems. Shared risk factors, such as smoking or an unhealthy diet, may explain the association (Harvard Health Publishing, 2021).

Periodontal infections are also linked to the risk pattern of several systemic diseases such as CVD (Oscarsson & Johansson, 2019). In a study investigating the association between oral hygiene and CVD found that the presence of PD was related to greater tooth loss, which, in turn, was associated with increased risk of future major cardiovascular events, including death, acute myocardial infarction, heart failure and stroke (Park et al., 2019). Another study

found an association between tooth loss and several prognostic biomarkers, suggesting that tooth loss and its underlying mechanisms may be involved in multiple pathophysiological pathways also implicated in the development and prognosis of CHD (Vedin et al., 2017).

In Palestine, PDs are prevalent among different age groups; a study on high school students found that the prevalence of gingivitis was 97.1%. of them, 27% were of severe gingivitis (Elshanti et al., 2020)). Another study reflected that about one-third of participants have periodontal lesions (Habash et al., 2020). Another study conducted in GS found that PD was prevalent among Diabetic mellitus (DM) patients, and the mean decayed missing filled teeth (DMFT) score was 18.6, and only 16.4% of participants have no gingival bleeding (Al-qedra & Aljeesh, 2020).

The above studies suggested an association between PD and chronic disease such as DM and CVDs, but there is inadequate evidence to confirm an association between PD and HD. So, this study aimed to examine the association between oral and PD and HDs, and highlight the importance of OH to avoid occurrence of systemic disease such as HDs.

1.2 Problem statement

Oral health is a significant indicator of the overall-health, and quality of life. In Gaza governorates (GGs) with high poverty rate, OH problems are common public health concerns because many people can't pay for oral and dental health services. OH problems is highly associated with heart problems (AlJehani, 2014), and DM (Al Qedra & Aljeesh, 2020).

From the experience of the researcher as a dentist, despite the growing public awareness about the importance of oral and dental health as a component of overall health and well-being, OH continues to be neglected, and requires greater attention and assessment.

Up to my knowledge, there are rare studies done in GGs to examine the association between periodontal health and chronic disease. Therefore, this study is an attempt to assess the OH problems among HD patients to bridge the gap in this area, and to gain insight about the incidence and extent of OH problems among HD patients. in addition, the study raised the importance of OH as a determinant factor in reducing the possibility of HDs.

1.3 Justification of the study

Oral hygiene and regular check up by a dentist are key factors to maintain healthy mouth and teeth. Gingivitis is a preventable disease, and that could be attained by good oral hygiene, brush, floss, and periodic professional cleaning. In severe cases of PD, more extensive treatment may be needed by a dentist (Center for Disease control and Prevention – CDC, 2013). Gingivitis and accumulation of bacteria in the mouth, could spread to other organs and lead to systemic disease. Some studies suggested a relationship between PD and CVD such as heart and CAD.

High prevalence of OH problems has been reported in developing countries. OH studies did not gain adequate attention from researchers in the Palestinian community. In Palestine, there is a need to establish a surveillance system for monitoring and evaluation of OH problems (WHO, 2012).

In GS, many screening activities for OH problems are carried out in primary health centers and in school health department for epidemiological purposes, but no studies examined the association between PD and other health problems except the study of Al Qedra and Aljeesh (2020) which examined the association between OH problems and T2DM. Therefore, this study focused on assessing and identifying the scope of oral and PD among patients with HDs, in order to gain accurate information about the extent and severity of oral conditions,

which will help in future plans to reduce its prevalence and avoid further health problems that may occur as a result of PDs.

1.4 General objective

To assess the oral health problems among patients with heart diseases attending governmental primary health centers in Gaza governorates.

1.5 Specific objectives

- To determine the frequency of dental and oral health assessment and interventions performed among patients with heart disease attending governmental primary health centers in Gaza governorates.
- To describe the dentition and periodontal status among patients with heart disease attending governmental primary health centers in Gaza governorates.
- To identify the challenges that face patients with heart disease in seeking oral health services at governmental primary health centers in Gaza governorates.
- To determine the extent of having dental erosion and mucosal lesions among patients with heart disease.
- To determine the association between periodontal diseases and sociodemographic factors.

1.6 Research questions

- What is the number of dental and oral health assessment and interventions done for patients with heart disease in the last two years?
- What is the dentition and periodontal status of patients with heart disease attending governmental primary health centers in Gaza governorates?
- What are the challenges that face patients with heart disease in seeking oral health services at governmental primary health centers in Gaza governorates?

- What is the extent of having dental erosion and mucosal lesions among patients with heart disease?
- Is there an association between periodontal diseases and sociodemographic factors?

1.7 Context of the study

1.7.1 Demographic context

Palestine is a small country, with a total land of about 27,000 km^2. After the 1967 war, Israel occupied Palestine in 1948, and the remaining two portions West Bank (WB) and Gaza Strip (GS) were divided geographically. Palestine is bordered by Lebanon and Syria from the north, Jordan from the east, Egypt from the south, and the Mediterranean Sea from the west (Palestine Central Pureu of Statistics - PCBS, 2020). GS is about 365 km^2, whereas the total area of the WB is 5,655 km^2, totaling about 22% of the Palestinian territories. The GS consists of five governorates; The North Governorate with 362,772 people, Gaza Governorate with 625,824 people, Middle Governorate with 314,393 people, Khan Yunis Governorate with 264,455 people, and Rafah Governorate with 225,538 people (PCBS, 2020).

1.7.2 Socioeconomic Context

In GS, the general economic status is marked by high poverty and low income, the unemployment rate is among the highest in the world. More than half of the population live below the poverty line. Most of the population lack access to safe water and regular electricity supply. As a result of the long-term siege and high inflation rate, there was a collapse of Gross Domestic Product (GDP), since 2007, the poverty rate in the GS increased from 40% to 56%. The poverty gap rose from 14% to 20%, and the annual cost of lifting individuals out of poverty quadrupled from 209 million dollars to 838 million dollars. The siege against GS inflicted great destruction of the economy. Last year, GS witnessed the

pandemic of COVID-19, which caused about 11.5% decline in economy and 12% reduction of Gross Domestic Product due to the policy measures and restrictions during the times of corona outbreaks (The World Bank, 2020). In addition, gross consumption in Palestine dropped down by 6%, whereas gross investment decreased by 36%, and the unemployment rate reached 41.7% in GS (PCBS, 2021).

1.7.3 Health care system

The health care system in Palestine consists mainly from five healthcare providers; Ministry of Health (MoH), Military Medical Services (MMS), United Nations Relief and Work Agency for the Palestinian Refugees (UNRWA), non-governmental organizations (NGOs), and the private sector. MoH is the dominant provider of healthcare with 13 hospitals and 52 PHCCs in GS (MoH, 2019).

1.7.4 Oral health services

In Palestine, OH care services are divided into three sectors: governmental, private and UNRWA sectors. OH services are provided mainly by PHCCs. In GS, the MoH operated 27 dental clinics. Periodontal services are distributed as the following: dental and gingival treatment (47%), fillings (23.4%), minor operations (0.3%), cleaning of teeth (0.8%), and extraction of teeth (19.1%). The total number of visits to dental clinics at governmental PHCCs was 176,600 visits, and the number of visits to UNRWA dental clinics was 559,104 visits (MoH, 2020).

1.8 Operational definitions

Oral Health

The researcher defines HD operationally as having full natural teeth without dental caries, healthy gingiva, and absence of pockets or lesions in the periodontal area.

Chapter Two

Conceptual framework and Literature review

2.1 Conceptual framework

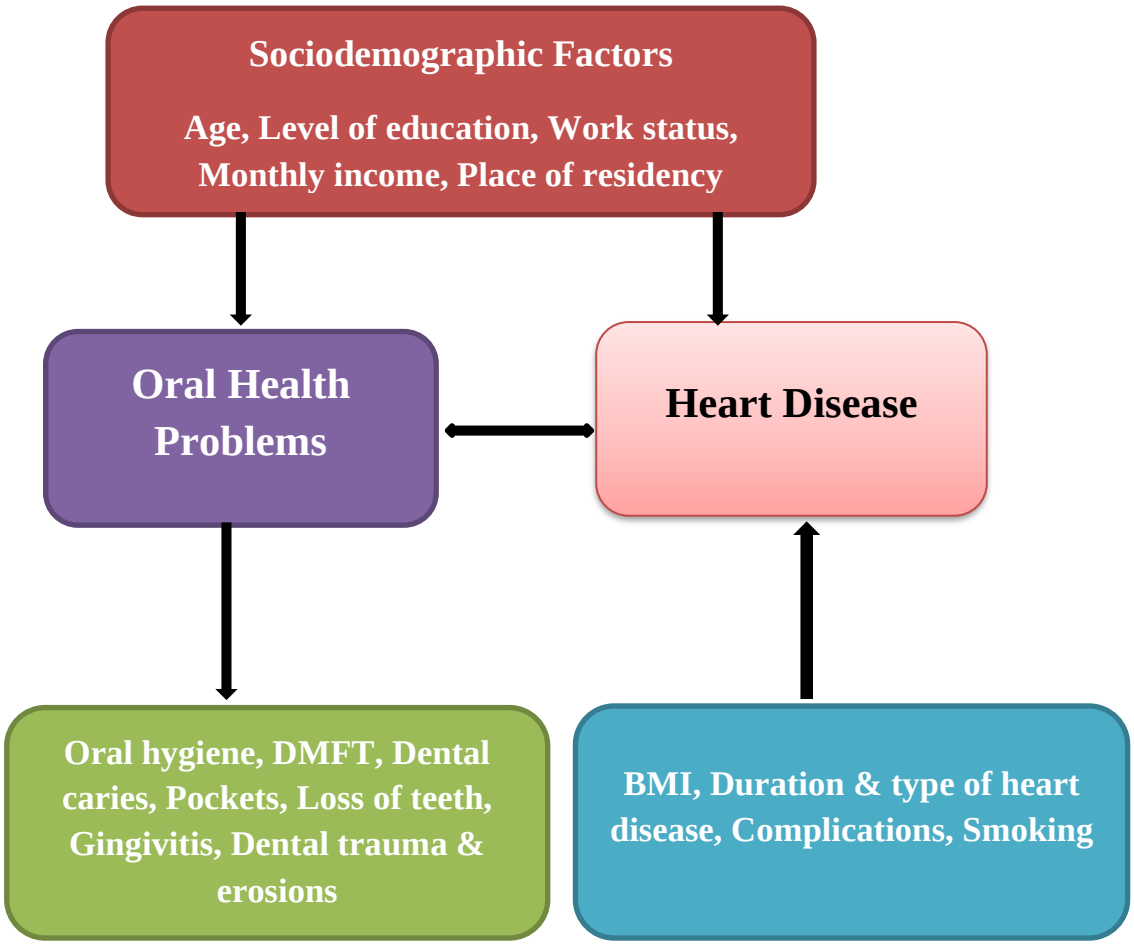

Figure (2.1): Conceptual framework (Self-developed)

The above diagram denotes the inter-relation between OH problems and HD, as one condition may provoke the occurrence of the other condition. OH problems include presence of dental caries and pockets, inflammation and bleeding of gingiva, pain and discomfort which may affect ability to eat and chew food. These OH problems are affected by sociodemographic variables such as gender and age. Work status and income are important factors as individuals who are not working and have low income may be can't pay for oral

and dental health services. In addition, level of education is another determinant factor of OH, as it is suggested that well-educated individuals have higher awareness about the importance of OH as part of the overall health and well-being.

2.2 Literature review

Poor oral health is common and is usually characterized by chronic inflammation. Advanced stages presented as periodontitis with irreversible damage to oral bone and tissue (Kinane et al., 2017). Earlier stages of PD include gingivitis, which is a reversible inflammation of the gingiva started by dental plaque. This phenomena from gingivitis to periodontitis, is termed as periodontal diseases (CDC, 2013). Although, the exact causal mechanism is not fully-identified, the development of a microbial biofilm, over-activation of inflammatory process and genetic susceptibility are all implicated.

2.2.1 Periodontal status of heart diseases patients

Cardiovascular disease is a general term used for atherosclerotic diseases, principally coronary heart disease (CAD), cerebrovascular disease and peripheral vascular disease (PVD). A variety of chronic infectious, inflammatory and immune diseases are associated with significantly higher risks of adverse cardiovascular conditions, including rheumatoid arthritis, psoriasis, systemic lupus erythematosus and periodontitis (Roth et al., 2015), consistent with the assumption that chronic elevations in the systemic inflammatory burden are causally related to CVD development and its sequelae. Although, there is evidence for over 50 gene polymorphisms playing a role in the modulation of atherogenesis (Holdt & Teupser, 2015), effect sizes are small and the major traditional risk factors for CVD remain the lifestyle factors, principally tobacco smoking, dyslipidemia, hypertension and altered glucose metabolism, which is correlated strongly with diets high in saturated fats, salt and refined sugars and contribute to obesity and T2DM, major attributable risk factors for MI

(Joseph et al., 2017). The same risk factors account for over 90% of the stroke burden (O'Donnell et al., 2016), yet all are modifiable through improved lifestyles including reducing salt, saturated fat and refined carbohydrate intake, exercising, increasing intake of antioxidant micronutrients and regular moderate alcohol consumption (Joseph et al., 2017).

The American Academy of Periodontology (AAP) described PD as an inflammation of the soft and hard tissues that support the teeth. As a result of the inflammatory process, the gums swollen and became red-colored. As gingivitis progress, the gums-tissue become weak and are separated from the tooth. Furthermore, loss of bone may happen, leading to loosening of teeth and falling out. Chronic conditions of PD develop gradually overtime and may appear in adulthood. Factors that may contribute to PD include heredity, tobacco-smoking, inappropriate oral hygiene, age progress, diet, and some medication (Devanoorkar & Rajeshwari, 2016).

PDs are classified as a group of chronic inflammatory diseases, induced by bacterial invasion especially Gram-negative anaerobes, resulting in inflammation, that leads to chronic periodontitis if not properly treated along with good oral hygiene.

Over time, accumulation of plaque enriches the biofilm, causing chronic inflammation, which is characterized by irreversible destruction of gingival connective tissue, ligament, and alveolar bone. In severe states, this destruction may end with loss of tooth (Pihlstrom et al., 2005).

Literature reports indicated that there is an association between PD and systemic diseases such as CVD, malignant tumors of GI tract, DM, RTI and pregnancy adverse-outcomes. The metabolic by-products of the bacteria in the mouth may modulate the immune response beyond the oral cavity, thus promoting the development of systemic conditions. A better

understanding of the systemic impact of oral pathogens will support the idea of using the oral cavity to diagnose and treat systemic disease (Bui et al., 2019).

Recent studies reflected a significant association between PD and HD as many of HDs, strokes, and plaque buildup occurred after the onset of PD. Researchers also trying to find a causal link between PD and CVD, which would give more insight on how to prevent any condition, because it would reflect more in-depth information about how PD affects the body and causes HD (Humphrey et al., 2008; Joshipura et al., 2002). Other studies indicated associations between PD, loss of teeth, and CVD (Lockhart et al., 2012; Tonetti & Van Dyke, 2013). In addition, consensus studies reported a correlation between periodontal health and CVDs (Sanz et al., 2010; Lockhart et al., 2012; Tonetti& Van Dyke, 2013). Furthermore, chronic oral infections, caries and periodontitis, and losing teeth, have been linked with CVD morbidity and mortality (Holmlund et al., 2010; Xu & Lu, 2011).

Individuals with PD are more likely to develop CVD, and clients who received treatment for CVA have higher chance for developing PD (Oberoi et al., 2016). This strong link between PD and CVD revealed that PD is a major risk-factor for developing CVDs.

Association between PD and CVD has been identified, but causal relationship is not confirmed yet. For instance, untreated gingivitis can lead to periodontitis. PD has been associated with some systemic diseases such as atherosclerosis. One possible association that was reported in literature is that inadequate mouth hygiene leads to bacteremia, which in turn can enhance growth of bacteria over atherosclerotic coronary artery plaques, and possibly worsen CAD (Priyamvara et al., 2020).

The alveolar gained special consideration; researchers found that every 20% increase in alveolar bone-loss increased the risk of death from CVDs by 51%, which suggests that

deterioration of bone from bacterial plaques will increase the risk of developing CVDs (Goulart et al., 2017).

Atherosclerotic CVD is an inflammatory disease of the CAs associated with atheroma formation, which can cause disability and death. Periodontitis is ranked as the sixth most prevalent disease affecting humans affecting about 740 million people worldwide. Recently, researchers have focused on the effect of PD on CVD. Two mechanisms were proposed to explain such association, either periodontal pathogens directly invade bloodstream or indirectly by increasing systemic level of inflammatory mediators. It has been suggested that improvement in the condition of one disease positively impact the condition of the other one. Highlighting the association between these two diseases, the importance of early diagnosis and treatment of PD and its impact on CV status may be of great importance in reducing the complications of athero-scleroted CVDs (Zardawi et al., 2021).

2.2.2 Assessing risk factors of periodontal disease

A healthy periodontium is manifested by maintenance of a functional periodontal attachment level, minimal or no recession with no loss of interproximal bone; and, where present, functional dental implants, all in the absence of inflammation (Worthington et al., 2013).

Figure (2.2): Healthy gums

Since PD has been identified as an independent risk-factor, researchers focused on the risk factors for PD to see what signs in the mouth could be prevented that could lead to the onset of CVD symptoms. Therefore, if PD is a cause of HD, then avoiding PD is important in prevention of developing HD. Moreover, the widespread inflammation in the body, and accumulation of bacterial plaque within the coronary arteries are two HD signs that can be prevented, providing a more clear picture of the connection between the two diseases (Genco & Borgnakke, 2013).

It is worth to say that not only there is a connection between PD and HD, but PD also plays a role as a possible independent riskfactor for CVD along with socio-economic characters, which may increase the risk of HD (Humphrey et al., 2008). Other PD risk factors include older age, smoking, hypertension, diabetes, and high Body Mass Index (Joshipura et al., 2002). In developing countries, PD has been associated with poor access to health services, poor lifestyle, poor oral hygiene practice, low-economic situation, and health-related risk

behaviors including smoking, obesity, alcohol intake, diets high in carbohydrate (Tefera & Bekele, 2020).

According to the American Academy of Periodontology (AAP), risk factors for PD include older age, smoking and tobacco use, genetics, stress, certain heart medications, Clenching or grinding of teeth, and poor nutrition or obesity (AAP, 2022). In addition, Madiba & Bhayat (2018) reported that PD is modified by several risk factors including smoking, medications, alcohol, age, gender and systemic diseases. Recent studies did not find a cause and effect correlation between those factors, but these risk factors were described in the study of Oberoi et al. (2016) as closely related to PD and could be considered as predictors of periodontal infections. Among these factors: age, tobacco-smoking, alcohol consumption, DM, high BMI, osteoporosis, stress, and genetic tendency are all associated with PD (Oberoi et al., 2016; Tettamanti et al., 2017). Another study conducted by Moon et al. (2020) showed that oral health status reflected a significant difference in relation to gender, age, educational level, average monthly income, and marital status. The appearance of experiencing toothache in the past year was seen a significant difference in age and marital status. A statistically significant difference was indicated in gender, age, educational level, and average monthly income as for whether or not using oral care products.

It is known that smoking is a risk factor for HD, and researchers found that it can also cause PD. Also, there is a link between gum recession and the number of cigarettes smoked per day and the number of years of smoking (Genco & Borgnakke, 2013). Exposure to tobacco smoke can cause changes in the oral microbiota (Beghini et al., 2019). The microbiota of the mouth is believed to have an important role in protecting the oral cavity from disease development. Several epidemiological studies reflected that PD is more common in smokers compared to nonsmokers (Antal et al., 2014; Gupta et al., 2016). Kim et al. (2017) mentioned that chronic renal disease is a risk factor associated with PD, proving that the presence of

chronic inflammation and infection may influence in systemic conditions. The periodontal risk assessment is a useful approach to create individualized periodontal therapies and to improve general health condition. In their study, Kim et al. (2017) found that 34.58% of patients with chronic renal disturbances had low risk for PD, 32.71% had moderate risk and 32.71% had high risk. Patients with severe PD showed 104.5 more possibility of high risk compared with low risk individuals (odds ratio: 104.5; 95%CI: 10.7-1017.2; $p<0.0001$).

2.2.3 Bacteremia related to oral bacteria

Bacteremia resulted from periodontal micro-organisms, and systemic host responses to plaque accumulation are two determinants that have been strongly connected with CHD pathogenesis. The involvement of oral pathogens in atheromatous plaques can be interpreted in the same way (Padilla et al., 2006).

In periodontitis, the damage of the integrity of periodontal tissues may end with bacteremia, and infections, such as endocarditis. It has been assumed that 8–10% of bacterial endocarditis is caused by oral infections in the absence of dental manipulations. In this regard, oral activities can cause small tooth and gingival movements, developing microscopic vascular lesions through which bacteria gain access to the bloodstream (Artese et al., 2017).

Figure (2.3): Periodontal infection

The link to oral bacteria has been known for many decades and has caused ongoing concern for dentists, patients and cardiologists. The cause of microorganisms, in 90% of cases, are staphylococcus, streptococcus and enterococcus. As they are part of dental plaque, they could enter the bloodstream causing bacteremia through daily habits like chewing or tooth brushing. In addition, poor periodontal health appears to increase the risk of CVD, infective endocarditis, and pulmonary disease (Carinci et al., 2018).

Oro-dental treatment, and tooth-brushing may cause transient bacteremia and oral bacteria from the phyla firmicutes (e.g. *Streptococci*) and bacteroidetes (e.g. *Porphyromonas*) are found in CVD lesions. Research of blood bacterial DNA content found Proteobacteria DNA to be the dominant microbiome component, suggesting a gut origin. Blood donated by those with active, severe periodontitis revealed that about half of bacterial species in blood are classified as oral. Firmicutes, consisting largely of members of the *Streptococcus mitis* group and *Staphylococcus epidermidis*, were predominant at 63.5% of all bacterial sequences detected in periodontal health and, about 66.7% in periodontitis (Emery et al., 2021).

Oral bacteria can contribute to the incidence of atherosclerosis through formation of atheroma, and majority of the inflammatory symptoms linked with periodontitis and HD, such as C-reactive protein (Schenkein & Loos, 2013). In addition, bacteria that have already entered the bloodstream will then penetrate other tissues via the blood vessels due to the fact that the microorganisms leak out of the blood vessels (Pereira et al., 2011).

2.2.4 Oral complications and manifestation of heart diseases

Before starting dental treatment to HD patients, the dentist have to evaluate the possible complications, and its leading factors. During treatment, patients should be in semi-fowler or upright position. In addition, patients who are on Warfarin treatment should have a record of their international normalized ratio (INR) less than 3.5 (January et al., 2018).

Adverse drug reactions are considerable reasons of morbidity, mortality, and CVD medications are the drugs that involve in many ADEs (Torpet et al, 2004). The number of HD patients is increasing, therefore, the number of drugs is expected to increase, with possibility of higher rate of ADEs (Daniel et al., 2008). Oral drug reaction (ODR) may occur, and it involves the oral mucosa (Torpet et al., 2004).

The number of medication used in treatment of CVDs is rising, and many CVDs provoke ODR such as dry mouth, burning sensation in the mouth, absence of taste, and hemorrhage, as well as extra oral symptoms (Daniel et al, 2008). ADEs, such as sialadenosis is not curable, but the dentist can treat or formulate appropriate changes to decrease morbidity induced by oral symptoms, giving the patient more enjoyable life (Pamlona et al., 2011).

Arunkumar et al. (2016), reported a correlation between some cardiovascular drugs and oral manifestations, as 67.4% of HD patients who take CV drugs exhibited oral symptoms and 39.7% of patients exhibited oral signs. These oral signs and symptoms included dysgeusia, xerostomia and burning sensation, lichenoid reactions, gingival enlargement, aphthous ulcer

and xerostomia. In addition, Little et al. (2018) found that medications used to treat HD may cause taste changes, stomatitis, gingival bleeding, petechiae, xerostomia or lichenoid mucosal lesions, and calcium channel blockers may produce gingival overgrowth. A case-control study carried out in United Kingdom (UK) found that the mean age was 45 years, the median follow-up was 3.4 years. The exposed group had an increased likelihood of having CVD, and cardio-metabolic disease compared to the control group. During the follow-up of clients the exposed group had an increased risk of developing CVD (Zemedikun et al., 2021).

2.2.5 Oral health problems and life quality and socio-demographic characteristics

Oral health is essential to general good health and well-being. However, many people have untreated oral diseases, resulting in preventable pain, infection and decreased QoL. Good oral health is also important for the health of alder ages, playing a crucial role with regard to nutrition, employment, self-esteem and continued social interaction (WHO, 2020). Oral health-related quality of life (OHRQoL) may be influenced by oral health conditions, demographic and socioeconomic characteristics, and contextual factors such as political and cultural aspects. PD may produce psycho-social problems that may affect the overall quality of life. OHRQoL has many predisposing factors, and these factors are multidimensional. Shao et al. (2018) found that the General Oral Health Assessment Index mean score was48.23, females had fair or poor self-rated oral health, decayed, missing and filled teeth, fair or poor self-rated general health, and those who have ≥ 2 teeth with root caries had worse OHRQoL, while participants who were edentulous expressed better OHRQoL. In addition, Amilani et al. (2021) reported that older age, low income, brushing teeth only once per day, and increased number of decayed teeth were associated with poor overall OHRQoL, while male gender, frequent oral healthcare seeking patterns and absent dento-facial anomalies were associated with good OHRQoL, while the results of Mohamed & Vettore

(2018) indicated that family monthly income was found to play a role as an intermediary between PD and OHRQoL. Moreover, Thirunavukkarasu et al. (2022) reported that 24.9% of the respondents had poor or fair oral health. Poor oral health was significantly associated with male gender, smokers, chocolate and candies intake more than once a day, and participants who did not seek periodical dental care. Additionally, Choi et al. (2021) found that self-reported amount of saliva in usual, everyday life and the presence of a speaking difficulty had significant negative effect on the OHRQoL in patients with xerostomia.

2.2.6 Epidemiology of periodontal disease

Prevalence of PD is categorized as a public health problem as it affects adolescents, adults, and older individuals. PDs are prevalent both in developed and developing countries and affect about 20-50% of global population. Robust evidence shows the association of PDs with systemic diseases such as CVDs. PD is likely to cause 19% increase in the risk of CVDs, and this increase in relative risk reaches to 44% among individuals aged 65 years and over. The reduction in the incidence and prevalence of PD can reduce its associated systemic diseases and can also minimize their financial impact on the health-care systems (Nazir, 2017). Another study carried out by Nocini et al. (2020) showed that the incidence, prevalence and disability-adjusted life year (DALYs) of PD have constantly increased during the past 3 decades, making it the 12th more prevalent pathology globally. Women have a 13% higher risk of incident and prevalence of PDs. The highest burden of PDs is recorded in South-East Asia and Western Pacific, whilst the prevalence was the lowest in Africa. Furthermore, the results of Peter et al. (2014) pointed out that there was a high rate of PDs with about 72% of the clients having at least one site with CAL ≥3mm, PD worsened with age. Analysis of the extent and severity of disease indicated that 41% of individuals had at least one site with CAL ≥5mm whereas almost 21% had at least three sites with CAL ≥5mm.

Information about oral health conditions obtained from the Global Burden of Disease indicated that caries, PD, edentulism, oral cancer and cleft lip/palate collectively accounted for 18,814,000 disability-adjusted life-years, and the global burden of PD, oral cancer and caries increased by about 45.6% from 1990 to 2010. Oral diseases and non-communicable diseases are closely interlinked through sharing common risk factors, and underlying infection and inflammatory mechanisms (Jin et al., 2016). Furthermore, Nocini et al. (2020) reported that the incidence, prevalence and DALYs of PD have constantly increased during the past 3 decades, making it the 12th more prevalent pathology worldwide.

In Palestine, a study carried out by Elshanti et al. (2020) revealed that the prevalence rate of gingivitis among high school students was 97.1%. According to gingival index (GI), the average of GI was (1.5+0.80), where 28.5% of gingivitis cases were mild cases, while 44.5% of them were moderate, and 27% were of severe gingivitis. Another study conducted in GS found that about one-third of respondents have lesions. Recurrent traumatic ulceration was the most common oral lesion especially on the tongue. The study reflected high incidence of pathologic and traumatic ulcers, while malignant lesions “leucoplakia and erythroplakia” were observed in smoker clients (Habash et al., 2020).

2.2.7 Summary

PD is a health problem that can easily be diagnosed through full-mouth periodontal examination. Periodontal screening by a dentist should be performed in each visit to the dental clinic. Missed or delayed diagnosis usually results in increases the burden and cost of treatment and management. Bleeding is an early sign of PD and a leading risk factor for subsequent inflammation and development of periodontitis. The effects of PDs can spread beyond the mouth through the dissemination of bacteria and its products originating in the oral biofilms. Periodontitis interacts with various systemic diseases such as DM,

atherosclerosis and HDs. Loss of periodontal attachment and tooth-loss caused by severe periodontitis will result in loss of masticatory function which will affect nutrition, which will worsen the general health condition among patients with HDs. Therefore, patients with HDs should have periodic periodontal examinations by health professionals to discover any abnormality at early stage and provide appropriate treatment to avoid development of further systemic complications.

Chapter Three

Methodology

3.1 Study design

The researcher used descriptive, cross-sectional, analytical design. Cross-sectional studies are suitable to describe the phenomena under study or for investigating correlations among phenomena. It is used to prove or disprove assumptions, not costly to perform and does not require a lot of time. It includes the collection of data in a considerable short period of time, and many findings and outcomes can be analyzed to create new studies or in-depth research (Polit and Beck, 2017).

3.2 Study population

All the patients with heart diseases, who attended the governmental PHCCs during 2021. The total number of patients that have a confirm diagnosis by a physician was about 2530 HD patients (Abu Jamee et al., 2019).

3.3 Study setting

The study was conducted at level (4) governmental PHCCs (which have cardiac clinic) in the Gaza governorates; Jabalia Martyrs PHCC, Al Rimal Martyrs PHCC, Der Al Balah Martyrs PHCC, Khanyounis Martyrs PHCC, and Rafah Martyrs PHCC.

3.4 Period of the study

The study started on June 2021 and completed on July 2022. Data was collected from December 2021 to end of March 2022.

3.5 Sample size and sampling method

Epi-Info program (v 3.1.1) and sample size calculator program was used to determine the sample size, the calculated number was 334 subjects (Annex 1). The researcher increased the sample to 400 patients who visited the PHCCs. The appropriate filled questionnaires were 392, and 8 questionnaires were excluded because of inappropriate filling. The sample of the study was proportional, stratified sample. The number of participants from each PHCC has been determined according to density. The main PHCC from each governorate was selected as presented in the following table.

Table (3.1): Distribution of subjects according to living area

Governorate	Number of participants	Percent (%)
North (Jabalia Martyrs PHCC)	80	20.0
Gaza (Al Rimal Martyrs PHCC)	120	30.0
Middle (Der Al Balah Martyrs PHCC)	60	15.0
Khanyounis (Khanyounis Martyrs PHCC)	80	20.0
Rafah (Rafah Martyrs PHCC)	60	15.0
Total	**400**	**100.0**

3.6 Eligibility criteria

1.6.1 Inclusion criteria

- Patients with any type of heart disease.
- Having follow up appointment in governmental PHCCs at GGs.
- Older than 25 years old.

3.6.2 Exclusion criteria

- Children and youths younger than 25 years old with heart diseases.

3.7 Instrument of the study

3.7.1 Oral Health Questionnaire

The researcher used the WHO Oral Health Assessment (OHA) Questionnaire (adults form) for data collection (Annex 2). The researcher modified the questionnaire to suit the patients with heart disease.

Assessment of oral health status

Standard coding

For all parts of the form, standard codes have been used. According to WHO and WDF, the two-digit numbers above or below each box pointed to individual teeth. The first digit is identifying the quadrant of the mouth and the second digit identifies the tooth. For example, the upper right second incisor (12) is named as “one-two” rather than "twelve”; the lower left third molar (38) should be called out as “three-eight” rather than “thirtyeight”.

Oral health assessment form

The standard adult OHA form includes the following (WHO, 2013).

• 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.

Clinical examination

Examination should include observing any abnormalities in the tissues of the face, nose, cheek, or chin.

3.8 Scientific rigor

3.8.1 Reliability

The researcher got help from 5 dentists to assist in performing periodontal examination and recording data. The assistants received instructions and training on OHA to unify the method of filling the questionnaires. Data entry was performed promptly on daily basis to ensure quality of entry and the possibility for re-filling the questionnaire when needed.

3.9 Ethical and administrative considerations

First, the researcher got administrative approval from Al Quds University to carry out this study. Also, ethical approval was obtained from Helsinki Committee (Annex 3) and from MoH (Annex 4). Before filling the questionnaire, all the participants were notified about the study goal, objectives, and asked for their voluntary agreement to participate in the study.

3.10 Data collection

The researcher collected the data by help of 4 dentists. The questionnaire was modified (WHO oral health questionnaire for adults) for HD patients visiting the selected governmental PHC clinics. Periodontal assessment was performed at the same time of filling the questionnaire. Data collection lasted for 4 months to obtain the target number of 400 HD patients. Eligible participants have been selected from 5 governmental PHCCs, this would assure equal chances for sample selection.

3.11 Data management and data analysis

The researcher used SPSS program version 25 for data entry and analysis. Data were coded, then entered into the computer. The researcher used frequencies, percentage, and mean scores. Also: (t) test, and One-way ANOVA has been used. P value of 0.05 and less was considered statistically significant.

3.12 Limitation of the study

This research was limited to cardiac patients who have oral health problems, and registered at governmental PHCCs which have cardiac clinics and dental clinics. UNRWA health centers and private dental clinics were not included in the study.

Chapter Four

Results and discussion

This chapter presents the findings of data analysis. It begins with description of demographic characteristics of study participants, followed by descriptive results, then inferential results for selected variables. The results were discussed in accordance of literature and previous studies. The results were presented in the form of figures and tables.

4.1 Sociodemographic characteristics of the study participants

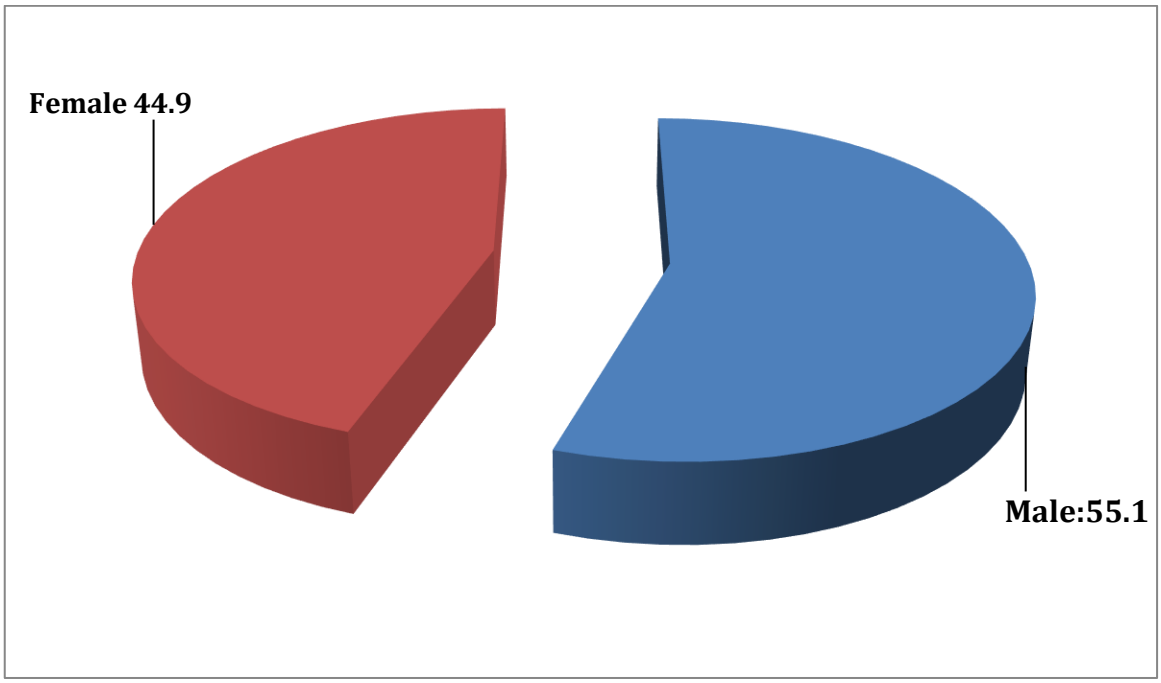

Figure (4.1): Distribution of study participants according to gender

The study included 392 participants, 216 (55.1%) were males and 176 (44.9%) were females. During data collection, the researcher tried to have similar number of male and female patients, but many female patients refused to participate in the study, which made the male participants more than the female participants.

Table (4.1): Socio-demographic characteristics of the participants (n=392)

Variable	Frequency	Percent
Age		
Less than 50 years	58	14.8
50 – 59 years	99	25.3
60 – 69 years	154	39.3
70 years and more	81	20.7
Total	392	100.0
Mean= 60.04, SD= 10.129 years (Min – Max: 25 – 84 years)		
Level of education		
Primary school	119	30.4
Preparatory school	73	18.6
Secondary school	85	21.7
High education	115	29.3
Total	392	100.0
Work status		
Working	87	22.2
Do not work	305	77.8
Total	392	100.0
Monthly income		
Below deep poverty line (1974 NIS)*	349	89.0
Above deep poverty line	43	11.0
Total	392	100.0
Mean= 949.39, SD= 894.827 NIS		

*PCBS 2022

The mean age of respondents was 60.04±10.129 years, 154 (39.3%) aged between 60 – 69 years, 99 (25.3%) aged 50 – 59 years, 81 (20.7%) aged 70 years and more, and 58 (14.8%) were less than 50 years old. The results also showed that 119 (30.4%) have low education of primary school, 110 (28.1%) have university education, 85 (21.7%) have prep school education, and 85 (21.7%) have secondary school education. In addition, 87 (22.2%) are working, while 305 (77.8%) are not working. Furthermore, the mean monthly income was 949.39 NIS, and 349 (89%) were below the deep poverty line of 1974 NIS (PCBS, 2022). These results agreed with the results of Butt et al. (2019) which indicated that smoking and ageing are factors that are all likely to increase the burden of periodontitis. Also, the results of Wang et al. (2017) showed that participants with high level of education and high family income had significant lower OH problems. Generally speaking, as patients with chronic

heart disease are usually from the older age, and the majority of them either not working or retired (above 60 years old), which explained the high number of respondents with low income below the poverty line.

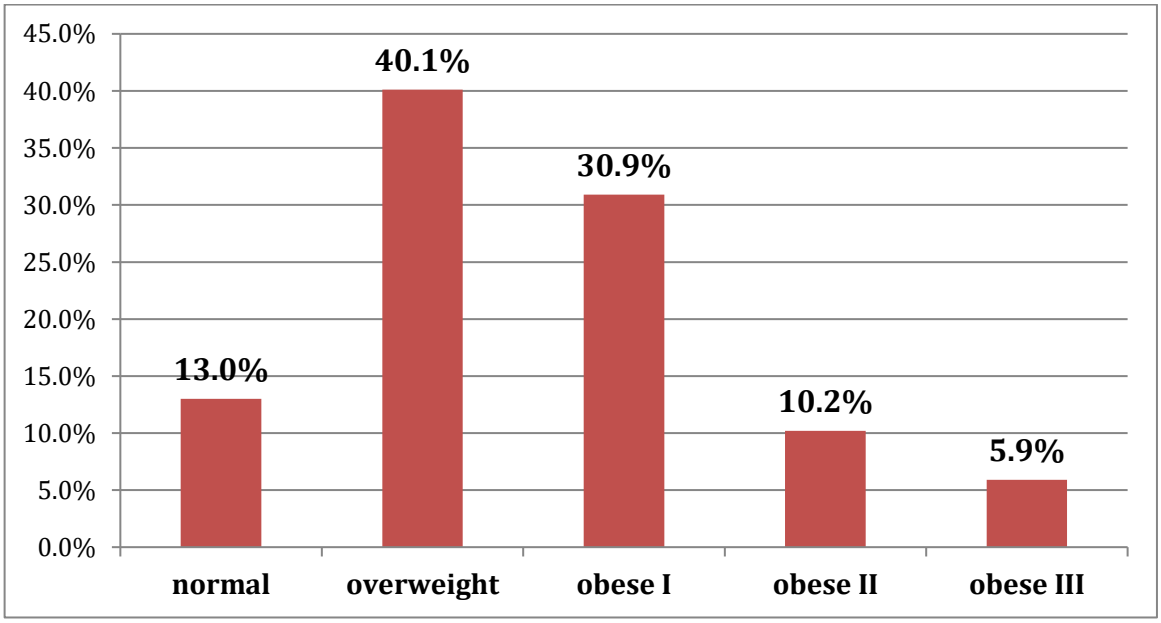

Figure (4.2): Distribution of study participants according to BMI

BMI is classified as: underweight (less than 18.5), normal (18.5 – 24.9), overweight (25.0 – 29.9), obese (30 and above). Obesity is subdivided into three categories: obese I (30.0 – 34.9), obese II (35.0 – 39.9), obesity III (40.0 and higher) (CDC, 2022).

According to figure (4.2) the mean BMI was 30.227±5.599. Only 51 (13%) of study participants have normal BMI (18.5 – 24.9), 157 (40.1%) were overweight (25.0 – 29.9), 121 (30.9%) were obese I (30.0 – 34.9), 40 (10.2%) were obese II (35.0 – 39.9), and 23 (5.9%) were obese III (40.0 and higher). This result reflected that overweight or obesity are prevalent among persons who shared in the study. This result agreed with Al-qedra & Aljeesh (2020) who found that the majority of study participants were overweight or obese, and the results of Butt et al. (2019) which indicated that overweight/obesity is likely to increase the burden of periodontitis. High BMI is considered a risk factors for CVD and it is categorized among the most contributors to disability-adjusted life years (Bourne & GBD 2015 Risk Factors Collaborators, 2016).

Obesity is a risk factor that contributes directly to the development of CVDs (Powell-Wiley et al., 2021). In this study, all the participants were patients with HDs, recruited from the chronic clinics during their follow up in the PHCCs. It was noticed that more than 85% of the study participants were overweight or obese, which suggests strong link between obesity and HDs. Therefore, there is a high priority to increase people awareness about obesity as a risk factor for the development of heart problems, and the need to weight reduction and weight control.

4.2 Heart disease related information

Table (4.2): Information related to heart disease (n=392)

Variable	Frequency	Percent
Duration of having heart disease		
≤ 5 years	220	56.1
6 – 10 years	114	29.1
11 – 15 years	28	7.1
≥ 16 years	30	7.7
Total	392	100.0
Mean= 6.838, SD= 5.307 years		
Type of heart disease		
Coronary artery disease	243	62.0
Heart failure	56	14.3
Myocardial infarction	93	23.7
Total	392	100.0
Complication of health condition		
No	279	71.2
Yes	113	28.8
Total	392	100.0
When was the last complication		
No complication	279	71.2
1 – 3 months ago	66	16.8
4 – 6 months ago	32	8.2
7 months and more	15	3.8
Total	392	100.0
Presence of systemic complications		
No	276	70.4
Yes	116	29.6
Total	392	100.0

Table (4.2) demonstrated that 220 (56.1%) of respondents have heart disease for less than 5 years, and 114 (29.1%) have HD for 6 – 10 years, the mean years of having HD was 6.838±5.307 years. Among the study participants, 243 (62%) have coronary artery disease, 93 (23.7%) have myocardial infarction, and 56 (14.3%) have heart failure. These three categories were the most prevalent in the patients' records, therefore, the researcher selected the study participants from these categories and did not include in the study less frequent types of HDs such as rheumatic heart disease, or patients with valve dysfunction. In addition, 113 (28.8%) sustained complications along with HD, of them 66 (16.8%) had the complication since 1 – 3 months, 32 (8.2%) had the complication since 4 – 6 months, and 15 (3.8%) had the complication since 7 months or more, while 279 (71.2%) did not have complications. Moreover, among the study participants 116 (29.6%) developed systemic complications such as hypertension, renal dysfunction, and general weeekness.

CVD is a major cause of global morbidity and death, representing about 32% of all deaths (WHO, 2021). Among these diseases ischemic heart disease was the major cause of years of life lost, highlighting the shift in the global burden of disease from communicable to chronic disease (Lozano et al., 2012). According to the reports of MoH, CVDs are prevalent and considered the highest cause of mortality accounting for about 29.9% of deaths among the Palestinian population (MoH, 2020).

In this study, more than half of study participants had HD for less than 5 years, and this reflects the nature of the target group of heart disease with least possible complications as the duration of the HD is relatively low, and according to our results about 71.2% of the study participants do not have complications.

Table (4.3): Information about current treatment (n=392)

Variable	Frequency	Percent
Treatment regime		
Oral medication only	236	60.2
Diet + oral medication	85	21.7
Oral medication + pacemaker	32	8.2
Oral medication + exercise	14	3.6
Diet + oral medication + pacemaker	16	4.1
Diet + oral medication + exercise	9	2.3
Total	392	100.0

As shown in table (4.3), 236 (60.2%) of respondents consume oral medication only, 85 (21.7%) take oral medication along with dietary regime, 32 (8.2%) take oral medication and have a pacemaker, 14 (3.6%) take oral medication and follow exercise program, 16 (4.1%) take oral medication, have a pacemaker and follow dietary regime, 9 (2.3%) take oral medication, diet regime, and follow exercise program.

This result reflected that the best treatment is a combination of diet, medication, and exercise which accounted for 2.3% of study participants, while the percentage of patients who depend on oral medication only was 60.2%, which increase the risk of adverse drug events, and may interact with drugs or interventions to treat oral health problems.

4.3 Dental and oral health assessment and intervention

Table (4.4): Distribution of study participants according to dental health assessment and interventions (n=392)

Variable	Frequency	Percent
Number of oral health assessment done during 2020 and 2021		
No assessment has been done	164	41.8
1 – 3 times	154	39.3
4 times and more	74	18.9
Total	392	100.0
Intervention after oral health assessment		
No intervention has been done	234	59.7
Yes, at governmental PHCC	59	15.1
Yes, at other clinics	99	25.3
Total	392	100.0

Table (4.4):Continued

Number of natural teeth		
No natural teeth	57	14.5
1 – 9 teeth	47	12.0
10 – 19 teeth	91	23.2
20 teeth and more	197	50.3
Total	392	100.0
Did you have teeth pain or discomfort during the past 12 months?		
Yes	204	52.0
No	188	48.0
Total	392	100.0
Having partial dentures		
Yes	25	6.4
No	367	93.6
Total	392	100.0
Having full upper denture		
Yes	59	15.1
No	333	84.9
Total	392	100.0
Having full lower denture		
Yes	50	12.8
No	342	87.2
Total	392	100.0

Table (4.4) demonstrated information related to dental health assessment and interventions. 154 (39.3%) of subjects had 1 – 3 oral health assessments during the last two years 2020 and 2021, 74 (18.9%) had 4 oral assessments and more, while 164 (41.8%) did not have any oral health assessment in the last two years, 59 (15.1%) had intervention done at governmental PHCC, 99 (25.3%) had intervention done at other clinics, while 234 (59.7%) did not have any intervention. These results were significantly higher than the results of Al-qedra & Aljeesh (2020) which showed that 25.4% of study participants had one oral health assessment in the past two years, and 0.5% had four oral health assessments. Also, 2.8% had interventions done at UNRWA health centers, 6.4% had interventions done at other health-care clinics, while 90.8% did not have any intervention.

It is worth to say that the participants of this study were selected from the patients who come to the heart clinic for treatment and follow up, and most of the collected data about dental visits and dental care depends on the information given by the patients. Also, about one-

fourth of them received dental care in other dental clinics (UNRWA or private clinics), therefore, there was inadequate data about dental visits and dental care in patients' files, as these files are primarily for cardiac treatments, progress, and follow up.

Concerning the status of teeth, the results showed that 197 (50.3%) had 20 natural teeth and more, 91 (23.2%) had 10 – 19 natural teeth, 47 (12%) had 19 natural teeth, while 57 (14.5%) had no natural teeth. These results were inconsistent with Al-qedra & Aljeesh (2020) who reported that 68.7% of study participants have 20 natural teeth or more, while 7.9% of study participants have no natural teeth.

During the past 12 months, 204 (52%) experience tooth pain or discomfort. The results also showed that 25 (6.4%) have partial dentures, 59 (15.1%) have full upper dentures, and 50 (12.8%) have full lower dentures.

It is expected that Many individuals will experience tooth pain and discomfort after intervention or tooth loss. In addition, loss of tooth leads to difficulties with eating, and talking, and eventually, the remaining teeth shift in order to fill in the space left after missing a tooth, which will lead to serious biting problems that require correction by orthodontics. Moreover, because the teeth support each other, thus, losing of teeth may weaken the mouth-structure, resulting in further tooth-loss or injury that may become worse with time (Al-qedra & Aljeesh, 2020).

These results indicated that only half of patients with HD have 20 natural teeth and more, while the rest of patients have less number of natural teeth or no natural teeth, which reflected high percentage of periodontal problems among HD patients. This result was in line with the results of Oberoi et al. (2016) who reported that people with periodontal disease are twice as likely to develop cardiovascular disease, and patients who are treated for a stroke are often more likely to be diagnosed with periodontal disease at the same time.

Table (4.5): Oral and dental assessment (n=392)

Variable	Frequency	Percent
Description of the state of teeth		
Excellent	30	7.7
Very good	53	13.5
Good	103	26.3
Average	82	20.9
Poor	82	20.9
Very poor	33	8.4
Do not know	9	2.3
Total	392	100.0
Description of the state of gums		
Excellent	34	8.7
Very good	50	12.8
Good	111	28.3
Average	78	19.9
Poor	72	18.4
Very poor	44	11.2
Do not know	3	0.8
Total	392	100.0

Table (4.5) described the state of teeth and gums: 30 (7.7%) of study participants described their teeth as excellent, 53 (13.5%) very good teeth, 111 (28.3%) good teeth, 78 (19.9%) average teeth, 72 (18.4%) poor teeth, and 44 (11.2%) very poor teeth. In addition, 34 (8.7%) of study participants described their gums as excellent, 50 (12.8%) very good gums, 111 (28.3%) good gums, 78 (19.9%) average gums, 72 (18.4%) poor gums, and 44 (11.2%) very poor gums. As reported by CDC (2013), in the early stage of PD, plaque and gingivitis occur which are reversible, but if these conditions advanced without treatment, damage to oral bone and tissue, and tooth loss will take place (Kinane et al., 2017). These results disagreed with the results of Al-qedra & Aljeesh (2020) which indicated that only 1.6% of study participants described their teeth as excellent, 4.8% described their teeth as very good, 20.6% described their teeth as good, 2.4% described their gums as excellent, 5.3% described their gums as very good, and 20.1% described their gums as good. This disagreement may be attributed to differences in participants' characteristics and place of the study. In the study of Al-qedra & Aljeesh (2020), the participants were patients who have PDs, and they were

interviewed during their presence in the dental clinics at UNRWA health centers. While the participants of this study were interviewed in the cardiac clinic, and they did not come to the clinic for dental care. In addition, the perception of the participants about their teeth was worse than their perception about their gums, and this could be because the teeth are tangible issue from functional perspective as the teeth are used for eating and chewing the food, therefore, most of the people pay attention to their teeth rather than their gums.

Table (4.6): Oral and dental hygiene (n=392)

Variable	Frequency	Percent
Frequency of cleaning teeth		
Never	87	22.2
Once / month	20	5.1
2 – 3 times / month	23	5.9
Once / week	38	9.7
2 – 6 times / week	53	13.5
Once / day	113	28.8
Twice or more / day	58	14.8
Total	392	100.0
Usage of oral hygiene aids		
Toothbrush	288	73.5
Wooden toothpicks	80	20.4
Plastic toothpicks	7	1.8
Thread (dental floss)	15	3.8
Charcoal	27	6.9
Chew stick	28	7.1
Others	34	8.7
Usage of toothpaste to clean teeth		
Yes	259	66.1
No	133	33.9
Total	392	100.0
Usage of toothpaste that contains floride		
Yes	192	49.0
No	200	51.0
Total	392	100.0

Table (4.6) pointed that 87 (22.2%) of respondents had never clean their teeth, 20 (5.1%) clean their teeth one time per month, 23 (5.9%) clean their teeth 2 – 3 times per month, 38 (9.7%) clean their teeth one time per week, 53 (13.5%) clean their teeth 2 – 6 times per week, 113 (28.9%) clean their teeth one time daily, and 58 (14.8%) clean their teeth two times or more daily. Concerning the methods of cleaning teeth, 288 (73.5%) of study participants said

that they use tooth brush, 80 (20.4%) use wooden tooth-picks, 7 (1.8%) use plastic tooth-picks, 15 (3.8%) use thread (dental floss), 27 (6.9%) use charcoal, 28 (7.1%) use chew stick, and 34 (8.7%) use other methods to clean their teeth. Moreover, 259 (66.1%) use toothpaste, and 192 (49%) use tooth paste that contains fluoride. From Researchers' perspective, the majority of the study participants were from the old age group, and they usually have less concern about oral hygiene and do not go to the dentist for check-up of their teeth, also, a considerable number of these patients have some teeth lost, and others have dentures, and they do not perform oral hygiene frequently.

The above results indicated that practicing of oral and dental hygiene was poor. This result agreed with the results of Kumar & Rai (2018) which indicated low oral hygiene practices. These results were considerably better than the results of Al-qedra & Aljeesh (2020) which revealed that 36.3% of participants never cleaned their teeth and only 16.5% used to clean their teeth twice or more a day. On the other hand, the results of Al-qedra (2018) showed that the majority of study participants (96.2%) used toothbrush for teeth cleaning, 97.1% used toothpaste, and 24.3% use toothpaste that contain fluoride.

Oral and dental health and cleaning is very important for the overall health of individuals. Infective teeth may lead to introduction of bacteria from the oral cavity to blood stream, leading to bacteremia, which subsequently may lead to endocarditis. In addition, periodontal infection disturbs the coagulation mechanism, and activates the pathologic process in the coronary arteries. Also, there may be damage to the endothelium and initiation of fibro-proliferative process in the artery, leading to atherosclerosis Kumar & Rai (2018).

Table (4.7): Frequency and reasons of visiting a dentist (n=392)

Variable	Frequency	Percent
Length of time since the last visit to a dentist		
Less than 6 months	91	23.2
6 – 12 months ago	92	23.5
13 – 24 monthss ago	63	16.1
25 – 60 months ago	70	17.9
For more than 5 years	76	19.4
Total	392	100.0
Reasons for the last visit to the dentist		
Consultation / advice	32	8.2
Pain or trouble with teeth, gums, or mouth	276	70.4
Treatment / follow up	59	15.1
Routine check up	15	3.8
Do not know / do not remmember	10	2.6
Total	392	100.0

From the above table, 91 (23.2%) of respondents visited their dentist since less than 6 months, 92 (23.5%) visited their dentist 6 – 12 months ago, 63 (16.1%) visited their dentist 1 – 2 years age, 70 (17.9%) visited their dentist 2 – 5 years ago, and 76 (19.4%) stated that the last visit to a dentist was more than 5 years ago. In regard to the reasons for the last visit to the dentist, 32 (8.2%) said that they visited the dentist for consultation or advice, 276 (70.4%) visited the dentist due to pain or trouble with teeth, gums, or mouth, 59 (15.1%) visited the dentist for treatment and follow up, 15 (3.8%) visited the dentist for routine check up, and 10 (2.6%) of study participants do not remember the reason for visiting the dentist.

In addition, 14.5% visited the dentist for consultation, 18.7% visited the dentist due to pain, and 62.6% visited the dentist for treatment and follow up. These results were inconsistent with the results of Sanchez et al. (2017) which showed that there was high prevalence of poor oral health especially those from socioeconomic disadvantaged background, and there was poor awareness about the importance of oral health care and its impact on CVD outcomes. Moreover, Al-qedra & Aljeesh (2020) reported that 29.6% of study participants have been examined by a dentist one-time in the last 6 months, 27.8% have been checked by a dentist minimum one time in the last 6 to 12 months, 27.3% have been seen by a dentist at least once in more than one year, and 12.3% % have been examined by a dentist at least once

in two years or more but less than five years, 2.5%have been evaluated by a dentist at least one time in 5 years or more.

Regular visits to a dentist is very important behavior to maintain periodontal health, and discovering caries and pockets at early stage. It is obvious to say that regular oral health assessment by a dentist along with daily cleaning of teeth and gums will promote periodontal health and avoid complications that may occur as a result of poor adherence to oral hygiene. In addition, during the visit to the dentist, it is an appropriate time for heath education to enforce oral health practices among patients.

4.4 Experience of problems during the past 12 months

Table (4.8): Experience of problems or difficulties due to the state of teeth (n=392)

Variable	Don' t know	No	Sometimes	Fairly often	Very often	Mean
	n(%)	n(%)	n(%)	n(%)	n(%)	
Difficulty in biting food	0	197(50.3)	118(30.1)	39(9.9)	38(9.7)	1.79
Difficulty chewing food	0	184(46.9)	128(32.7)	37(9.4)	43(11.0)	1.84
Difficulty with speech	0	285(72.7)	66(16.8)	27(6.9)	14(3.6)	1.41
Dry mouth	2(0.5)	155(39.5)	150(38.3)	54(13.8)	31(7.9)	1.89
Felt embarrassed due to appearance of teeth	0	284(72.4)	71(18.1)	15(3.8)	22(5.6)	1.43
Felt tense because of problems with teeth or mouth	0	286(73.0)	75(19.1)	15(3.8)	16(4.1)	1.39
Have avoided smiling because of teeth	0	313(79.8)	55(14.0)	7(1.8)	17(4.3)	1.31
Had sleep that is often interrupted	0	301(76.8)	73(18.6)	6(1.5)	12(3.1)	1.31
Have taken days off work	0	325(82.9)	55(14.0)	1(0.3)	11(2.8)	1.23
Difficulty doing usual activities	0	304(77.6)	71(18.1)	4(1.0)	13(3.3)	1.30
Felt less tolerent of spouse or people who are close to you	0	323(82.4)	51(13.0)	4(1.0)	14(3.6)	1.26
Have reduced participation in social activities	0	312(79.6)	63(16.1)	1(1.0)	13(3.3)	1.28
Overall mean						**1.45**

Table (4.8) showed that 38 (9.7%) of patients said that they have difficulty in biting food very often and 39 (9.9%) said that they have difficulty in biting food fairly often, while 197 (50.3%) do not have difficulty in biting food. 43 (11%) mentioned that they have difficulty in chewing food very often and 37 (9.4%) have difficulty in chewing food fairly often, while 184 (46.9%) do not have difficulty in chewing food. 14 (3.6%) have difficulty with speech very often and 27 (6.9%) have difficulty with speech fairly often, while 285 (72.7%) do not have difficulty with speech.

In addition, 31 (7.9%) of study participants have dry mouth very often, 54 (13.8%) have dry mouth fairly often, while 155 (39.5%) do not have dry mouth. 22 (5.6%) of respondents stated that they felt embarrassed due to appearance of teeth very often, and 15 (3.8%) felt embarrassed fairly often, while 284 (72.4%) do not feel embarassed due to appearance of teeth. 16 (4.1%) felt tense because of problems with teeth or mouth very often, and 15 (3.8%) felt tense fairly often, while 286 (73%) do not feel tense because of problems with teeth or mouth. In addition, 17 (4.3%) of study participants have avoided smiling because of teeth very often, and 7 (1.8%) have avoided smiling because of teeth fairly often, while 313 (79.8%) do not avoid smiling because of teeth.

The results also showed that 12 (3.1%) of study participants have sleep interruption very often, 6 (1.5%) have sleep interruption fairly often, while 301 (76.8%) do not have sleep interruption. Furthermore, 11 (2.8%) of study participants have taken days off work very often, 1 (0.3%) have taken days off work fairly often, while 325 (82.9%) have not taken days off work. Moreover, 13 (3.3%) of study participants have difficulty in doing usual activities very often, and 4 (1%) have difficulty in doing usual activities fairly often, while 304 (77.6%) of study participants do not have difficulty in doing usual activities.

The results also showed that 14 (3.6%) of study participants felt less tolerant of spouse or people who are close to them very often, and 4 (1%) felt less tolerant of spouse or people who are close to them fairly often, while 323 (82.4%) do not feel less tolerant of spouses or closed people. Moreover, 13 (3.3%) of study participants have reduced participation in social activities very often, and 4 (1%) have reduced participation in social activities fairly often, while 312 (79.6%) of study participants did not reduce their participation in social activities.

The overall weighted mean was 36.25% which indicated that about one-third of study participants experienced different problems and difficulties as a result of the state of their teeth or mouth.

These results were comparable to the results of Al-qedra & Aljeesh (2020) which showed that 1.5% of study participants faced difficulties in biting food very often and 3.2% faced difficulty in biting food fairly often, while 76.6% did not face difficulty in biting foods. Also, 2% of study participants faced difficulty in chewing food very often, 4.2% faced difficulty in chewing food fairly often, while 69.7% facing no difficulty in chewing foods. Moreover, 2.2% faced difficulty in speech fairly often, while 92.9% facing no difficulty with speech, 1.2% had sleep interruption fairly often, while 89.7% had no sleep interruption. In addition, PD is one of the major causes of tooth loss which can affect mastication, esthetics, self-confidence, and quality of life (Tonetti et al. (2017); Reynolds & Duane 2018).

Progressive PD leads to reducing QOL due to loss of teeth and subsequent difficulty in biting and chewing, aesthetics, and verbal communication (Kinane et al., 2017). PD also results in a systemic pro-inflammatory state which is implicated in the etiology of chronic diseases as CVD, Therefore, a high rate of PD could increase the morbidity and mortality rate.

In my opinion, periodontal problems do not only affect the physical health status of the individual, but also they have psychosocial impact on the affected individuals. Changes in

appearance, speaking and smiling in front of others, and feeling embarrassed will affect the social interaction of individuals who have missed teeth.

To avoid these problems, it is important to maintain oral hygiene and periodic visits to a dentist. It is important to clarify that many of the dental health services such as filling teeth and cosmetic services are not available at governmental or UNRWA health centers, and most of these services are available at the private dental clinics, but due to the hard economic status, many people cannot pay for dental services and ignore the dental health services, which will lead to deterioration of their condition with more dental caries and subsequent loss of teeth.

4.5 Consumption of sugar-containing foods and drinks

Table (4.9): Frequency of consuming sugar-containing foods and drinks (n=392)

Variable	Seldom / never	Several times / month	Once a week	Several times / week	Every day	Several times / day
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Fresh fruits	22(5.6)	115(29.3)	62(15.8)	75(19.1)	108(27.6)	10(2.6)
Biscuits, cakes, cream cake	109(27.8)	130(33.2)	74(18.9)	48(12.2)	27(6.9)	4(1.0)
Sweet pies, buns	147(37.5)	122(31.1)	58(14.8)	40(10.2)	20(5.1)	5(1.3)
Jam or honey	166(42.3)	122(31.1)	47(12.0)	34(8.7)	21(5.4)	2(0.5)
Chewing gum containing sugar	205(52.3)	89(22.7)	46(11.7)	24(6.1)	22(5.6)	6(1.5)
Sweets/candy	181(46.2)	81(20.7)	60(15.3)	41(10.5)	23(5.9)	6(1.5)
Lemonade, Coca Cola or other soft drinks	106(27.0)	68(17.3)	70(17.9)	71(18.1)	62(15.8)	15(3.8)
Tea with sugar	86(21.9)	21(5.4)	13(3.3)	25(6.4)	151(38.5)	96(24.5)
Coffee with sugar	186(47.4)	25(6.4)	23(5.9)	16(4.1)	90(23.0)	52(13.3)
Arabian delights ka`aek, Baklawa, Numora, etc.	174(44.4)	171(43.6)	20(5.1)	14(3.6)	8(20)	5(1.3)

Table (4.9) showed that 108 (27.6%) of study participants eat fresh fruits every day while 22 (5.6%) never or seldom eat fresh fruits, 27 (6.9%) eat biscuits, cakes, or cream cake every day while 109 (27.8%) never or seldom eat biscuits, cakes, or cream cake, 20 (5.1%) eat sweet pie every day while 147 (37.5%) never or seldom eat sweet pie, 21 (5.4%) eat jam or honey every day while 166 (42.3%) never or seldom eat jam or honey, 22 (5.6%) chewing gum containing sugar every day while 205 (52.3%) never or seldom chewed gum containing sugar, 23 (5.9%) eat sweet or candy every day while 181 (46.2%) never or seldom eat sweet or candy.

In addition, 62 (15.8%) of study participants drink lemonade or soft drinks every day while 106 (27%) never or seldom drink lemonade or soft drinks, 151 (38.5%) drink tea with sugar every day while 86 (21.9%) never or seldom drink tea with sugar, 90 (23%) drink coffee with sugar every day while 186 (47.4%) never or seldom drink coffee with sugar, 8 (2%) eat Arabian delights, baklawa or Numora every day while 174 (44.4%) never or seldom eat Arabian delights, baklawa or Numora.

Several studies reported that dietary patterns are factors associated with dental caries. The composition of meals and the frequency of food intake are considered to be the strongest factors associated with the cariogenic effect of the diet. The frequent consumption of food containing sugars, especially between meals, contributes to the increase in caries prevalence, particularly in people with poor oral hygiene (Moynihan & Kelly 2014; Hujoel & Lingstrom 2017; Giacaman 2018).

In this regard, Ocwia et al. (2021) reported that consumption of sugar containing foods are common risk factor for oral disease.

Oral flora use the sugar as energy, and release acid as a waste product, this acid plays a major role in the development of dental caries by gradual dissolving the enamel in the teeth. The

effects of added sugars on 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 (Oral Health Foundation, 2015).

One of the main problems in GS is the high rate of drinking tea with sugar. In this study more than two-thirds of study participants stated that they drink tea with sugar, which is a high rate, and more efforts are needed to increase public awareness about the dangers of artificial sweetings such as white sugar, and the need to decrease the consumption of food that contain sugar, and try to find alternatives that are healthy and avoid the risks of consuming sugar.

Dietary patterns are an important factor in the progress of CVDs, and poor dietary habits is an important risk factor for developing CVDs (Gholizadeh et al., 2020). The researcher believes that healthy diet containing all the nutrients is the optimal way to maintain health and avoid the development of chronic disease. Consumption of foods low in sugar and fats is essential to avoid health problems including HD complications and oral health problems. Therefore, health education about the consequences of unbalanced diet is necessary, to increase awareness of patients about the risks of consuming high sugar and high fatty foods.

4.6 Smoking status

Table (4.10): Frequency and types of smoking (n=392)

Variable	Never	Seldom	Several times/ month	Once / week	Several times/ week	Every day
	n(%)	n(%)	n(%)	n(%)	n(%)	n(%)
Cigarettes	177(45.2)	171(43.6)	21(5.4)	16(4.1)	5(1.3)	2(0.5)
Pipe	363(92.6)	4(1.0)	1(0.3)	0	2(0.5)	22(5.6)
Chicha	389(99.2)	2(0.5)	0	0	1(0.3)	0

Table (4.10) showed that 177 (45.2%) of study participants never smoked cigarettes and 171 (43.6%) seldom smoked cigarettes, 363 (92.6%) never smoked pipe and 4 (1%) seldom smoked pipe, 389 (99.2%) never smoked chichi and 2 (0.5%) seldom smoked chichi.

The above results reflected that most of patients were non-smokers or seldom smoke. This result was consistent with the results of Al-qedra & Aljeesh (2020) which showed that most of the study participants (86%) were not smokers, which reflected high awareness about the risk of smoking on general health and periodontal health in particular. In addition, Ocwia et al. (2021) reported that about half of the study participants identified smoking as a risk factor for oral disease.

Smoking has a negative impact on OH. The outcome of tobacco use on OH is linked with method, frequency, and duration of use. Moreover, smoking contributed to loss of teeth, PD, changes in soft-tissue, and possibly oropharyngeal tumors (American College of Prosthodontists, 2015). Literature suggests that smoking facilitates early acquisition and colonization of periodontal pathogens, resulting in an “at-risk-for-harm” subgingival microbial community in the healthy periodontium. In PD, the subgingival microflora in smokers is characterized by a pathogen-enriched community with lower resilience compared to that in non-smokers, which increases the difficulty of treatment. Biological changes in

key pathogens, such as Porphyromonas gingivalis, together with the ineffective host immune response for clearance, might contribute to alterations in the subgingival microflora in smokers (Jiang et al., 2020).

In my opinion, smoking is one of the modifiable risk factors of OH problems. It has an effect on the initiation, extent and severity of PD. In this study, the percentage of smokers was very low, which reflects that most of the study participants are aware about the risks of smoking. In addition, about half of the study participants are female, and usually females are not smoking in GS, which make the percentage of smokers low.

4.7 Challenges of seeking oral health care at governmental PHCC

Table (4.11): Challenges of seeking oral health care at governmental PHCC (n=392)

Variable	n	%	Rank
Lack of time	86	21.9	4
Unavailability of all oral health services	262	66.8	1
No advanced dental treatment at governmental PHCC	103	26.3	3
Multi- visits procedures	62	15.8	6
Transport problems	17	4.3	9
Fear from dental treatment	58	14.8	7
No one is free to company me to dental clinic	3	0.8	12
Time consuming procedures	15	3.8	10
Double services (NCD and Dental) is not allowed	7	1.8	11
Far appointment	37	9.4	8
Unfriendly staff	81	20.7	5
Crowded dental station	162	41.3	2

Table (4.11) showed that the most common challenge of seeking oral health care at governmental PHCCs was unavailability of all oral health services (66.8%), followed by crowded dental station (41.3%), no advanced dental treatment at governmental PHCC (26.3%), lack of time (21.9%), unfriendly staff (20.7%), multi-visits procedures (15.8%), and fear from dental treatment (14.8%), while least common challenges included

unavailability of a free person to company me to dental clinic (0.8%), combination of NCD and Dental service is not permitted (1.8%), and time consuming procedures (3.8%).

The result of this study showed that the most common challenge of seeking OH care was absence of some OH services at the clinic, which was consistent with the result of Al-qedra (2018). In this study, the second most common challenge was crowded dental station, while the results of Al-qedra & Aljeesh (2020) showed that the second most common challenge was far appointment. The third common challenge in this study was no advanced dental treatment at governmental PHCC, which was the same in Al-qedra study. The results of Ocwia et al. (2021) reported that the most common challenges of seeking oral health services included cost of the treatment and long waiting time.

Within my knowledge, there are no written protocols for dental services in the governmental PHCCs, also, the MoH do not pay adequate attention to dental services, and usually there is shortage of supplies in the dental clinics, compared to UNRWA and private dental clinics. In addition, among the 52 governmental PHCCs in GS, only 27 PHCCs have dental clinics.

It is important to act towards overcoming the challenges of seeking oral health service because these challenges act as barriers that may hinder seeking and utilization of oral health care, which in turn will worsen the periodontal status and increase the complications such as dental caries, pockets, gingival bleeding, and loss of teeth. Stakeholders in the health system should pay more attention towards advanced oral and dental services at PHCCs.

4.8 Oral health assessment

4.8.1 Dental status

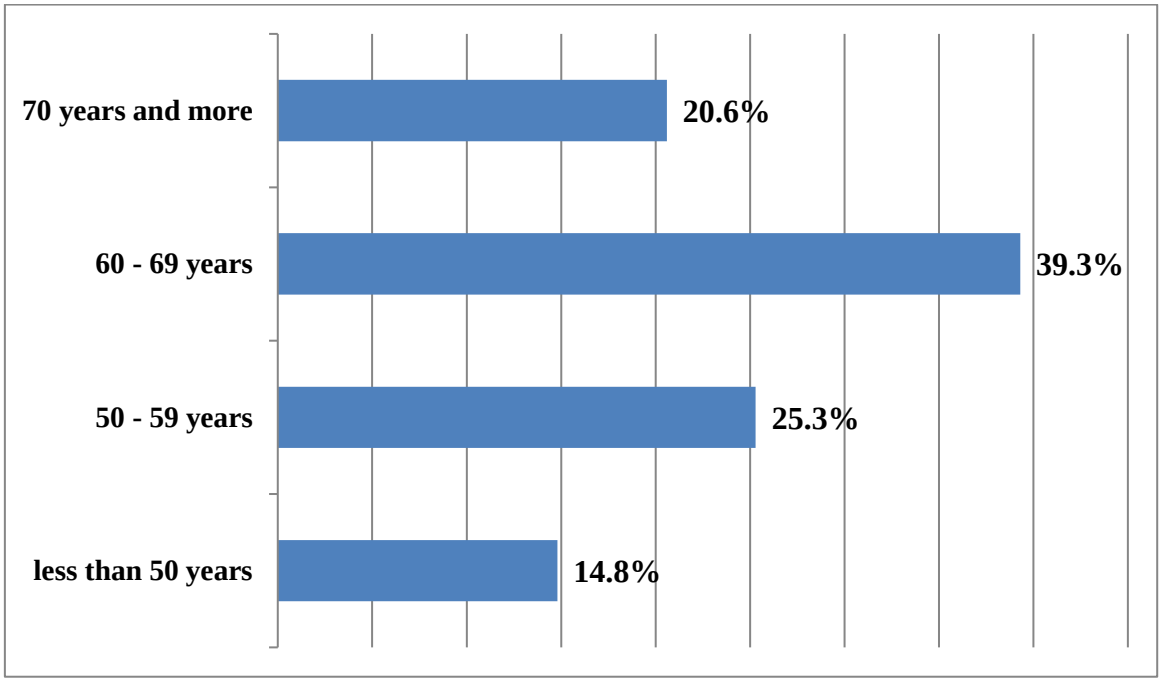

Figure (4.3): Distribution of DMFT index according to age

Decayed, Missed, Filled Teeth (DMFT) is calculated as the sum of the number of decayed, missing due to caries, and filled teeth in the permanent teeth.

Figure (4.3) showed that the DMFT index was 14.8% for the participants aged less than 50 years old, 25.3% for the participants aged 50 – 59 years old, 39.3% for the participants aged 60 – 69 years old, and 20.6% for the participants aged 70 years old and more. Lower results obtained by Al Qedra and Aljeesh (2020) which showed that DMFT index was 14.7 for the participants aged less than 50 years, 17.2 for participants from the age group 51 – 55 years, 20.2 for participants from the age group 56 – 60 years, and 21.9 for participants aged more than 60 years old.

According to figure (4.3), the distribution of study participants according to their DMFT index clearly demonstrates the positive relationship between age and DMFT index since the index increases with increased age.

The mean number of DMFT is the sum of individual DMFT values divided by the sum of the population (WHO, 2022). The DMFT 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).

In my opinion, this result is logic because the number of decayed, filled, and lost teeth increase as the individual become older. In this study, the highest number of participants were from the age group 60 – 69 years old, which explained the high percentage of DMFT among this group of participants. In addition, individuals above 70 years old are assumed to have more teeth loss, and that will be reflected on DMFT index.

Table (4.12): Distribution of study participants according to dentition status

Items	**Mean**	**SD**
Sound teeth	10.487	7.837
Caries	4.359	2.848
Filled, with caries teeth	1.135	1.417
Filled without caries teeth	0.324	0.681
Missing teeth due to caries	2.617	3.812
Missing teeth due to another reason	2.609	6.731
Teeth protected by fissure sealants	0	0.00
Teeth with fixed dental prosthesis/crown abutment, veneer, implant	5.015	8.271
Un-erupted teeth	0.403	1.218
Unrecorded teeth	4.982	6.849

As shown in table (4.12) the mean number of sound teeth was 10.487, decayed teeth 4.359, teeth with fixed dental prosthesis or crown abutment, veneer, implant was 5.015 teeth, missing teeth due to caries was 2.617, missing teeth due to other reasons was 2.609, while the mean number of filled teeth with caries was low 1.135 (3.54%), and filled teeth without caries 0.324.

These results disagreed with Al-qedra & Aljeesh (2020) who found that the mean number of decayed teeth was 6.1, the mean number of teeth with fixed dental prosthesis or crown abutment, veneer, implant was 1%, and the mean number of missed teeth due to caries was 7.2, and the mean number of teeth filled with caries was 0.6. Higher results obtained by Nazir et al. (2020) who found that 50.3% of adolescents, 44.6% of adults, and 31.9% older persons demonstrated the occurrence of calculus. Other studies found a link between PD as a determinant factor of chronic inflammation, subsequent tooth loss, and CVD (Sanz et al., 2010; Lockhart et al., 2012; Tonetti & Van Dyke, 2013). Other studies found that chronic oral infections including caries and periodontitis, as well as subsequent tooth loss, have been linked to not only CVD morbidity but also mortality (Holmlund et al., 2010; Xu & Lu, 2011).

There is growing evidence of an association between oral health, specifically dental status, and chronic systemic diseases. A study carried out by Oluwagbemigun et al. (2015) found that increasing number of teeth is inversely related to risk of myocardial infarction. Participants with 18–23 teeth and those without teeth were at higher risk of myocardial infarction compared to those with nearly all teeth (28–32 teeth).

In my opinion, having a mean sound teeth of 10.487 means that only about one-third of the natural permanent teeth are present in the patients' mouth, while the other two-thirds either lost, decayed or filled. These results revealed that most of the study participants have periodontal problems including presence of dental caries, filled teeth, and missing some teeth, which reflected a strong link between periodontal disease and HD.

4.8.2 Periodontal status

Table (4.13): Distribution of study participants according to gingival bleeding and periodontal pockets

Gingival bleeding	**Mean**	**SD**
Number of teeth showing no gingival bleeding	6.971	8.163
Number of teeth showing gingival bleeding	14.568	10.153
Number of teeth excluded	2.183	2.913
Number of teeth not present	8.244	8.693
Periodontal pocket	**Mean**	**SD**
Number of teeth showing absence of pocket	8.015	8.371
Number of teeth showing pocket 4-5 mm	10.757	7.891
Number of teeth showing pocket 6 mm or more	2.528	4.842
Number of teeth excluded	2.206	2.816
Number of teeth not present	8.721	9.352

Table (4.13) showed that the mean number of teeth showing no gingival bleeding was 6.971 and the mean number of teeth showing gingival bleeding was 14.568. in addition, the mean number of teeth with no pocket was 8.015, and the mean number of teeth with pocket of 4 – 5 mm was 10.757 and the mean number of teeth with pocket-of-6 mm or more was 2.528. These results were higher than the results of Al-qedra & Aljeesh (2020) which indicated that the mean number of teeth with gingival-bleeding was 9.91, the mean number of teeth showing pocket 4 – 5 mm was 7.84, and the mean number of teeth with pocket-of-6 mm or more was 4.96. in addition, the results of Nazir et al. (2020) showed that 18.8% of adolescents, 8.9% of adults, and 5% of older persons had bleeding on probing, and older persons demonstrated the highest incidence of pocket 4 – 5 mm and 6 mm or more compared to adults and adolescents.

These results indicated that periodontal bleeding and pocket formation is prevalent among study participants, which reflected a considerable link between chronic periodontitis and CVDs. These results were in accordance with the results of Lockhart et al. (2012) who found a significant association between periodontal disease and atherosclerotic vascular. In addition, Bahekar et al. (2007) reported that the prevalence of chronic HD was higher among

people with periodontal disease compared to people without HD. In addition, if inflammation of gingiva left untreated, it can turn into periodontal disease; the gums become loose around the root of the tooth, creating a gum pocket that gradually deepens. Eventually, the infection and inflammation can cause the tooth to loosen and possibly fall out (Harvard Medical School, 2021). These results emphasized that while oral health was considered relevant, there was high prevalence of poor oral health among participants, especially those from low socioeconomic background. Awareness regarding the importance of OH care, and its impact on cardiovascular outcomes was poor among participants. Oral health issues were rarely discussed in the cardiac setting. Main barriers deterring participants from seeking oral health care included lack of awareness, high cost of dental care and difficulties in accessing the public dental service. Findings also revealed that participants were interested in receiving further information about oral health and suggested various mediums for information delivery (Sanchez et al., 2017).

4.8.3 Loss of attachment and enamel fluorosis

Table (4.14): Distribution of study participants according to severity of loss of attachment & enamel fluorosis

Severity of loss of attachment	**Mean**	**SD**
0 – 3 mm	0.798	1.480
4 – 5 mm	1.961	1.353
6 – 8 mm	1.234	1.539
9 – 11 mm	0.199	0.747
12 mm or more	0.000	0.000
Excluded sextant	1.727	2.072
Not recorded	0.051	0.220
Enamel fluorosis	**n**	**%**
Normal	109	27.8
Questionable	65	16.6
Very mild	15	3.8
Mild	48	12.2
Moderate	71	18.1
Severe	66	16.8
Exclude	11	2.8
Not recorded	7	1.8
Mean= 2.561, SD= 2.285		

Table (4.14) presented the severity of loss of attachment among study participants. The mean number of 0 – 3 mm loss of attachment was 0.798, the mean number of 4 – 5 mm loss of attachment was 1.961, the mean number of 6 – 8 mm loss of attachment was 1.234, the mean number of 9 – 11 mm loss of attachment was 0.199. The mean number of excluded sextant was 1.727, and the mean number of not recorded teeth was 0.051.

The results also showed that 109 (27.8%) of study participants have normal enamel fluorosis, 65 (16.6%) have questionable enamel fluorosis, 15 (3.8%) have very mild enamel fluorosis, 48 (12.2%) have mild enamel fluorosis, 71 (18.1%) have moderate enamel fluorosis, 66 (16.8%) have severe enamel fluorosis, and the mean number of teeth with enamel fluorosis was 2.561.

Clinical attachment loss is the primary manifestation of periodontal disease. The subsequent retraction of gingival tissues will result in a visible marginal recession, which testifies for an older bone loss. Beside the irreversible loss caused by periodontitis, the inflammation and gum swelling in gingivitis is defined as reversible, without bone loss and deep pockets. Following this model, it was early questioned if the transition from gingivitis to periodontitis was due to a change in the microbiota and, more precisely, to the colonization by a pathogen, as opposed to a model in which gingivitis would be an initial, lower-grade periodontitis with undetectable irreversible damage, though possibly existent (Santi-Rocca, 2021).

A study conducted by Kim et al. (2017) found that in 93% of patients the plaque index was 1.53±0.78, the gingival index was 0.95±0.85, the probing depth was 2.2±0 6mm and the clinical attachment level was 3.18±1.75mm. Assessment of oral cavity reflected that 0.94% did not have PDs, 51.40% had slight, 26.17% had moderate and 21.49% had severe PD (Kim et al., 2017). The results of our study disagreed with the results of Al-qedra & Aljeesh (2020) which confirmed that 9.4% of study participants have severe enamel fluorosis, and 11% have

moderate enamel fluorosis. Another study performed in GS reported that the incidence of enamel fluorosis ranged between 60 - 78%, dental fluorosis was 60%. The highest rate (94%), was in Khanyounis, followed by Rafah (82%), middle zone (68%), Gaza (29%), and the north (9% (Shomar et al., 2004), and the results of Abu-haloob & Abed (2013) showed that the prevalence of dental fluorosis was 78.0%.

4.8.4 Dental erosion and trauma and oral mucosal lesions

Table (4.15): Distribution of study participants according to dental erosion and trauma & mucosal lesions

Dental erosion	**No.**	**%**
No sign of erosion	286	73.0
Enamel lesion	82	20.9
Dental lesion	24	6.1
Pulp involvement	0	0
Total	392	100.0
Number of teeth affected	**n**	**%**
No teeth affected	306	78.1
One tooth affected	13	3.3
Two teeth affected	49	12.5
Four teeth affected	24	6.1
Total	392	100.0
Dental trauma	**No.**	**%**
No sign of injury	264	67.3
Treated injury	2	0.5
Enamel fracture only	38	9.7
Enamel and dentine fracture	81	20.7
Pulp involvement	0	0
Missing tooth due to trauma	0	0
Other damage	0	0
Excluded tooth	7	1.8
Total	392	100.0
Number of teeth affected	No.	%
No teeth affected	271	69.1
One tooth affected	26	6.6
Two teeth affected	95	24.3
Total	392	100.0
Oral mucosal lesion	**n**	**%**
Vermilion border	352	89.8
Lips	38	9.7
Buccal mucosa	2	0.5
Total	392	100.0

Table (4.15) demonstrated the status of dental erosions and dental trauma. 82 (20.9%) of study participants have enamel lesions and 24 (6.1%) have dental lesion, 13 (3.3%) have one tooth affected by dental lesion, 49 (12.5%) have two teeth affected, and 24 (6.1%) have four teeth affected. These results were approximately similar to the results of Al-qedra & Aljeesh (2020) which showed that 76.2% of study participants do not have sign of erosion while 23.7% have some degree of dental erosion, about 25.8% of study participants have between 1 – 5 teeth affected, 33.7% have 6 – 7 teeth affected, 28% have more than 10 teeth affected.

In regard to dental trauma, 264 (67.3%) of study participants do not have signs of injury, 2 (0.5%) have treated injury, 38 (9.7%) have enamel fracture only, 81 (20.7%) have enamel and dentine fracture, 26 (6.6%) have one tooth affected, and 95 (24.3%) have two teeth affected. These results were considerably lower than the results of Al-qedra (2018) which showed that 84% of study participants have no sign of injury, 19.3% have one tooth injured, and 45.6% have two teeth injured.

Also, the results showed that 352 (89.8%) of study participants have normal vermilion border, 38 (9.7%) have lips lesion, and 2 (0.5%) have buccal mucosa lesion.

4.8.5 Dentures

Table (4.16): Distribution of study participants according to usage of dentures

Dentures (Upper)	**n**	**%**
No dentures	331	84.4
Complete dentures	61	15.6
Total	392	100.0
Dentures (Lower)	**n**	**%**
No dentures	359	91.6
Partial denture	15	3.8
Complete dentures	18	4.6
Total	392	100.0

As presented in table (4.16), 61 (15.6%) of clients have complete upper dentures, 15 (3.8%) have partial lower dentures, and 18 (4.6%) have complete lower dentures. Similar study among diabetic patients showed that 9.4% of study participants have complete upper dentures and 7.9% have complete lower dentures (Al-qedra & Aljeesh, 2020).

Dentures are used to replace missing teeth. Difficulty in eating may be the most common problem attributed to missed-teeth, which can provoke long-term effect on overall dental health, which can include: increased the possibility of gum disease, jaw deformity, loss of bone, and teeth shifting (Rye, 2015).

It is expected that the periodontal problems are more prevalent among patients with heart diseases. Some studies reported a possible link between tooth loss and heart disease. The results of Bokhari et al. (2012) showed that tooth loss was significantly higher among cardiac patients compared to healthy individuals (9.8 vs. 6.8 respectively). In addition, the results of Parker et al. (2020) showed that among the prevalence of edentulism and severe tooth loss were higher among persons with chronic heart disease.

4.8.6 Intervention urgency

Table (4.17): Distribution of study participants according to their need for urgent intervention

Intervention urgency	n	%
No treatment needed	354	90.3
Preventive or routine treatment needed	1	0.3
Prompt treatment (including scaling) needed	37	9.4
Total	392	100.0

Table (4.17) showed that 1 (0.3%) of study participants needed preventive or routine treatment, 37 (9.4%) needed prompt treatment, while 354 (90.3%) did not need urgent intervention. This result was inconsistent with the results of Al-qedra (2018) which showed that only 8.4% of study participants did not need treatment, 13.8% needed preventive or

routine treatment, and 70.1% needed prompt treatment, and 7.7% needed immediate (urgent) treatment.

These results are attributed to the periodontal problems accompanied CHD, where most of patients suffer from caries, bleeding gums, periodontal pockets, dental trauma and dental erosion and some of these conditions may need immediate treatment.

4.9 Inferential results

4.9.1 Association between dental and periodontal status and sociodemographic factors

Table (4.18): Association between DMFT and sociodemographic factors

Factor	Category	n	Mean	Test	P value
Gender	Male	216	19.189	T 0.086	0.932
	Female	176	19.068		
Age	< 50 years	58	19.810	F 0.550	0.649
	50 – 59 years	99	17.858		
	60 – 69 years	154	19.987		
	≥ 70 years	81	18.592		
Education	Primary school	119	19.210	F 0.128	0.972
	Prep school	73	19.794		
	Secondary school	85	18.752		
	University	110	19.063		
	postgraduate	5	15.800		
Work status	Working	87	18.632	T -0.380	0.704
	Not working	305	19.278		
Monthly income	Below deep poverty line (1974 NIS)	349	18.856	T -1.124	0.262
	Above deep poverty line	43	21.395		

Table (4.18) showed that there was statistically insignificant differences in DMFT index related to gender (t= 0.086, P= 0.932), age of participants (F= 0.550, P= 0. 649), level of education (F= 0.128, P= 0.972), work status (t= -0.380, P= 0.704), and monthly income (t= -1.124, P= 0.262). These results indicated that there was statistically no significant differences in DMFT index related to sociodemographic factors of study participants.

From my experience, I think that gender and education are not major factors that affect DMFT index, but patterns and frequency of oral hygiene are important determinants of oral health status. In addition, the issue of oral hygiene is linked mainly to culture and health behaviors regardless of educational level of individuals. In addition, according to the results in table (4.18), there was a considerable difference in MDFT index related to income (18.658 *vs*. 21.395), but this difference was not significant. In this study, the majority of study participants were elderly, which is considered a vulnerable group, and usually poor oral health is observed in these age groups. Some studies showed significant association between socioeconomic (ESE) status and DMFT. According to the study of Wang et al. (2017), only adjusting gender, high educational level, high household income were protective factors against dental caries, and living in agricultural families was risk factor. After adjusting other confounders, SES was partly related to the dental caries. Moreover, an interaction existed among SES indicators.

The results agreed partially with the results of Al-qedra & Aljeesh (2020) who found that there were no statistical significant differences in DMFT related to gender and monthly income, but significant differences existed in relation to age, education, and work. In addition, these results were in line with the results of Humphrey et al. (2008) who mentioned that not only there is a link between PD and HD, but PD also acts as a risk factor for CVD that is independent of other CVD risk factors. Also, the results of Cho et al. (2014) showed that there was no significant association between family economic status and mean DMFT.

In contrary, these results were inconsistent with the results of Oberoi et al. (2016) which found that sociodemographic factors such as age, smoking, obesity and metabolic syndrome, osteoporosis, stress, and genetic factors are all separately linked to periodontal disease. Furthermore, the results of Wang et al. (2017) showed that participants with a higher educational level and family income, had the lower severity of DMFT, and Schwendicke et al. (2015) who found that lower SES is significantly associated with a greater risk of caries lesions, and this relationship was partly mediated by oral health-related behaviors and health awareness.

The results of this study reflected that patients with HD have approximate prevalence of periodontal disease regardless of sociodemographic factors, which could be interpreted as periodontal disease is an independent risk factor for HD.

In my opinion, socioeconomic factors may affect the periodontal status, but in this study, the socioeconomic factors were not associated with DMFT index. This result may be attributed to narrow gap between participants in work and income factors as most of the study participants were not working and the majority of them were below the deep poverty line, which will affect their ability to pay for oral and dental services, and as a result more caries and inflammation will occur caused by delay or ignorance of seeking treatment. In addition, other factors may contribute to PD such as life style, dietary patterns, metabolic syndrome, genetic factors, and drinking water.

Table (4.19): Association between gingival bleeding and sociodemographic factors

Factor	Category	n	Mean	Test	P value
Gingival bleeding					
Gender	Male	216	15.254	T 1.484	0.139
	Female	176	13.727		
Age	< 50 years	58	14.362	F 0.424	0.736
	50 – 59 years	99	13.666		
	60 – 69 years	154	15.103		
	≥ 70 years	81	14.802		
Education	Primary school	119	15.000	F 0.747	0.560
	Prep school	73	14.904		
	Secondary school	85	13.164		
	University	110	14.754		
	postgraduate	5	19.200		
Work status	Working	87	15.551	T 1.024	0.307
	Not working	305	14.288		
Monthly income	Below deep poverty line*	349	14.501	T -0.374	0.708
	Above deep poverty line	43	15.116		
Periodontal pocket					
Gender	Male	216	11.194	T 1.215	0.225
	Female	176	10.221		
Age	< 50 years	58	11.172	F 0.084	0.969
	50 – 59 years	99	10.535		
	60 – 69 years	154	10.792		
	≥ 70 years	81	10.666		
Education	Primary school	119	11.218	F 0.978	0.420
	Prep school	73	11.000		
	Secondary school	85	9.552		
	University	110	10.836		
	postgraduate	5	15.000		
Work status	Working	87	11.827	T 1.436	0.152
	Not working	305	10.452		
Monthly income	Below deep poverty line	349	10.736	T -0.152	0.879
	Above deep poverty line	43	10.930		

*Deep poverty line = 1974 NIS (PCBS, 2022)

Table (4.19) presented the association between presence of gingival bleeding and sociodemographic factors. The results reflected insignificant differences in gingival bleeding related to gender (t= 1.484, P= 0.139), age of participants (F= 0.424, P= 0.736), level of education (F= 0.747, P= 0.560), work status (t= 1.024, P= 0.307), and monthly income (t= -

0.374, P= 0.708). These results indicated that there was statistically no significant differences in presence of gingival bleeding related to sociodemographic factors of study participants.

The results also indicated non-significant differences in periodontal pocket related to gender (t= 1.215, P= 0.225), age of participants (F= 0.084, P= 0.969), level of education (F= 0.978, P= 0.420), work status (t= 1.436, P= 0.152), and monthly income (t= -0.152, P= 0.879).

These results indicated that there was statistically no significant differences in presence of periodontal pocket related to sociodemographic factors of study participants.

In my opinion, the association between gingival bleeding and periodontal pockets and sociodemographic variables is indirect association; other factors such as adverse drug reactions (aspirin and anticoagulants), smoking, and systemic disease may have direct effect on gingival bleeding. In addition, the number of teeth not present for gingival examination and pocket measurement could be another reason.

These results agreed with the results of Al-qedra & Aljeesh (2020) which indicated insignificant association between periodontal status and sociodemographic factors. On the other hand, the results of this study disagreed with the results of AlJehani (2014) which showed that male participants had higher rate of periodontal destruction. Reports from WHO (2022), indicated that untreated dental caries in permanent teeth is the most common oral health condition, and treatment for oral health conditions is expensive and usually not part of universal health coverage, adding to that, most low- and middle-income countries are unable to provide services to prevent and treat oral health conditions, and this will provoke the oral health problems. PDs are caused by a variety of modifiable risk factors, including sugar consumption, tobacco use, alcohol use and poor hygiene, along with social and low economic status and inability to pay for OH services.

The risk for developing PD increases with age as over half of the adults worldwide has gingivitis with 3 - 4 teeth involved, and about 30% have significant PD (Koshi et al., 2012). In a study included elderly individuals over 70 years old, 86% had at least moderate periodontitis or a severe state of PD, and over 25% of them had lost their teeth. Also, the disease accounted for a majority of tooth extractions in clients above 35 years old (Muzzi et al., 2006).

Table (4.20): Association between periodontal status and heart disease

Factor	Years of having heart disease	n	Mean	F	P value
DMFT	5 years and less	220	19.627	0.346	0.792
	6 – 10 years	114	18.666		
	11 – 15 years	28	19.357		
	16 years and more	30	17.100		
	Total	392	19.135		
Gingival bleeding	5 years and less	220	14.713	0.375	0.771
	6 – 10 years	114	13.850		
	11 – 15 years	28	15.000		
	16 years and more	30	15.833		
	Total	392	14.568		
Periodontal pocket	5 years and less	220	10.859	0.034	0.992
	6 – 10 years	114	10.570		
	11 – 15 years	28	10.785		
	16 years and more	30	10.7000		
	Total	392	10.757		

Table (4.20) showed that there was statistically no significant differences in DMFT index related to number of years having HD (F= 0.346, P= 0.792), gingival bleeding (F= 0.375, P= 0.771), and periodontal pocket (F= 0.034, P= 0.992).

These results indicated that there were statistically no significant differences in periodontal status related to number of years having HD. This result explains the inter-relationship between periodontal disease and heart disease. In this regard, Goulart et al. (2017) reported that progressive deterioration and loss of the alveolar bone in the mouth where the teeth are located increase the risk of developing CVD.

The results of the study were supported by the study of Holm-Pedersen et al. (2007) which reported that there was a significant correlation between periodontal disease and cardiovascular disease. In addition, the results of Gor et al. (2021) found that 95.6% of patients with CHD had periodontal disease with a predominance of generalized periodontitis in its structure, present in 84.3% patients with CHD. A more severe clinical course distinguishes generalized periodontitis in patients with CHD than those without comorbid CHD. Moreover, it is characterized by a higher mean number of tooth loss, more teeth defects, higher caries intensity level, clinical attachment loss, and greater depth of periodontal pocket.

It is clearly noticed that the highest percentage of study participants were above 60 years old and they have the heart disease for 5 – 10 years, and our results showed higher DMFT index among older age participants as presented in figure (4.3), and there were some differences in the mean score in DMFT, gingival bleeding, and periodontal pockets in relation to years of having HD, but these differences were not significant. Also, during the oral assessment of the study participants, clinical examination reflected that about one-third of the participants have mild gingival bleeding (according to gingival bleeding scale used in dentistry), which has no effect or association with duration of having HD.

The same situation is noticed in periodontal pockets as more than one-third of participants have 4 – 5 mm dental pockets which is considered mild, adding to that about one-fourth of study participants did not have gingival bleeding, which reflected no direct relation with the number of years having HD.

Table (4.21): Association between periodontal status and frequency of teeth cleaning

Factor	Frequency of teeth cleaning	n	Mean	F	P value
DFMT	Never	87	19.574	0.511	0.800
	Once a month	20	20.150		
	2 – 3 times / month	23	16.782		
	Once a week	38	18.500		
	2 – 6 times / week	53	17.471		
	Once / day	113	18.973		
	Twice or more / day	58	21.310		
	Total	392	19.135		
Gingival bleeding	Never	87	15.804	1.564	0.156
	Once a month	20	18.350		
	2 – 3 times / month	23	14.000		
	Once a week	38	13.000		
	2 – 6 times / week	53	14.339		
	Once / day	113	15.061		
	Twice or more / day	58	11.913		
	Total	392	14.568		
periodontal pocket	Never	87	11.287	1.776	0.103
	Once a month	20	13.850		
	2 – 3 times / month	23	10.782		
	Once a week	38	10.078		
	2 – 6 times / week	53	10.735		
	Once / day	113	11.354		
	Twice or more / day	58	8.189		
	Total	392	10.757		

Table (4.21) indicated non-significant differences in DMFT index related to frequency of cleaning teeth (F= 0.511, P= 0.800), gingival bleeding (F= 1.564, P= 0.156), and periodontal pocket (F= 1.776, P= 0.103). These results indicated that there were statistically no significant differences in periodontal status related to frequency of cleaning teeth.

The results of this study reflected that frequency of cleaning mouth was not associated with periodontal disease. Looking back to table (4.6), very few of study participants stated that they clean their teeth daily and about 22% of them never cleaned their teeth. These results reflected poor practice of teeth cleaning, which will provoke the periodontal problems and increase the possibility of developing dental caries, gingivitis, and pockets.

This result was inconsistent with the results of Al-qedra & Aljeesh (2020) which indicated significant association between DMFT and frequency of teeth cleaning. In addition, the results of Milona et al. (2021) found that dental caries was significantly inversely associated with tooth brushing after meals, and the daily use of dental floss. Most of the studies indicated improvement of DMFT with frequent teeth cleaning, but in this study there were no association between DMFT index and frequency of teeth cleaning.

This result is most probably due to uncooperation of study participants in this aspect as they did not give accurate information about teeth cleaning. Also, the percentage of DMFT was low among elderly participants (above 60 years old), which reflected absence of natural teeth. In addition, when we look back to the results in table (4.6), we find that about 28.8% of study participants clean their teeth once daily and 14.8% clean their teeth twice a day, while the rest of participants clean their teeth less frequent or never clean their teeth, therefore, we did not find significant association between DMFT and teeth cleaning.

Furthermore, according to measurement scaling of gingival bleeding in dentistry, more than one-third of the study participants had mild gingival bleeding and about one-fourth did not have bleeding, while the rest of them have different levels of gingival bleeding, taking into consideration that most of the participants were from the old age with a considerable loss of natural teeth, therefore, the association was not significant.

Regarding periodontal pocket, it was noticed in oral assessment during data collection that more than one-third of the participants had pockets of 4 – 5 mm, which is classified in the gingival histology as mild pockets, and about one-fourth of the participants did not have pockets, and the rest of participants have a variant degrees of pockets. Due to the nature of the study participants as most of them were old age, with absence of a considerable number of natural teeth, which led to a considerable reduction in periodontal pockets, therefore, the results of the study did not prove significant association between frequency of teeth cleaning and periodontal pockets.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

This study aimed to assess the oral health problems among heart diseases patients attending governmental primary health centers in Gaza governorates. The study recruited 392 cardiac patients attending PHCCs in Gaza governorates. The study found that:

- Less than half of respondents did not have any oral health assessment in the past two years.
- About half of them have 20 or more natural teeth, and about one-third described the state of their teeth and gums as poor or very poor.
- About half of the participants experienced dental pain or discomfort during the last year, and about one-fifth stated that they never cleaned their teeth.
- Less than half of study participants visited the dentist in the past 12 months, and the most common reason for visiting the dentist was pain or trouble with teeth or gums.
- Oral health assessment indicated that about one-third of study participants have sound teeth, and less than one-fifth have dental caries or missing teeth.
- Few participants exhibited gingival bleeding and periodontal pockets, about one-fifth showed enamel lesion and enamel and dentine fracture.
- There was statistically no significant differences in DMFT index, presence of gingival bleeding and pocket related to sociodemographic factors of study participants.
- There were statistically no significant differences in periodontal status related to number of years having chronic heart disease.

- There were statistically no significant differences in periodontal status related to frequency of cleaning teeth.
- The common challenges that facing the study participants in seeking dental health services included unavailability of all oral health services at PHCCs, crowded dental stations, and unavailability of advanced dental treatment at governmental PHCC.

5.2 Recommendations

In the light of the study results, the researcher recommends the following:

Recommendations to the primary health care administration

- The need to perform oral health assessment for all the patients with chronic heart disease every six months to discover periodontal problems early and avoid the resulted complications.
- Expand oral health services to cover all the primary health care centers, to decrease crowd and waiting time in the dental clinics.
- To provide all the necessary oral and dental health services in the dental clinics at primary health care centers because many patients can't pay for private dental care services.
- Use the media to increase public awareness about the scope of dental problems, and its negative effects on the general health.

Recommendations for the patients

- Increase patients' awareness about the importance of teeth cleaning at least once daily or after meals to prevent the possibility of dental caries.
- The need to visit the dentist every six months to have oral health assessment and consultation.

- To decrease the consumption of food-containing sugar, and use other alternative natural sweetening.

5.3 Suggestions for further research

- To conduct a case-control study to compare the periodontal status between patients with chronic heart disease and healthy individuals.
- To conduct studies to assess oral health status among other groups of the population such as pregnant women, patients with hypertension, children and young age population.
- To carry out a study to evaluate the impact of periodontal disease on the quality of life.

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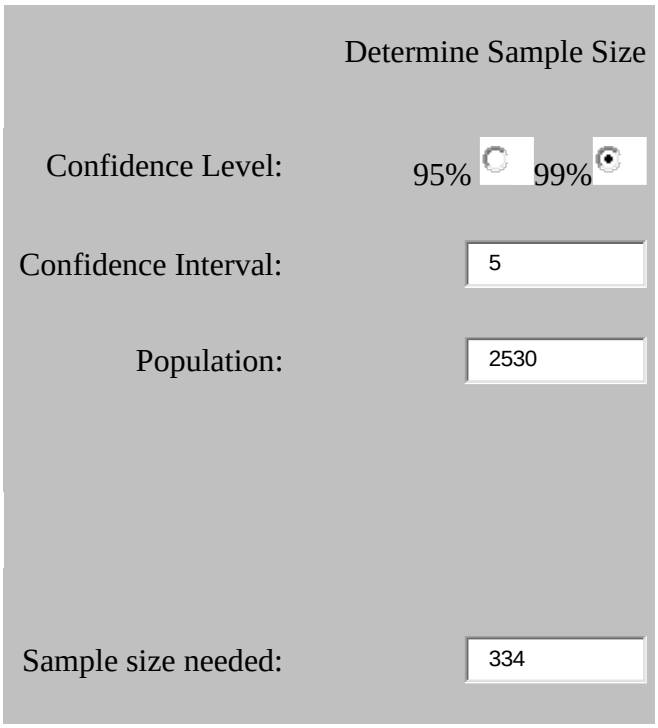
Annexes

Annex (1): Sample size calculator



Annex (2): Oral Health Assessment Form

Serial Number:

1.	**Age:** How old are you? _____Years		
2.	**Gender:**	1-□Male	2-□Female
3.	**What level of education have you completed?**	Primary school completed.... ..... □1 Preparatory school completed..... □2 Secondary school completed .... □3 College/University completed ..... □4 Postgraduate degree..... □5	
4.	**Do you currently work?**	1-□Yes	2- □No
5.	**Do you have health insurance?**	1-□Yes 2-□No	If yes, what type: 1- Government 2- UNRWA 3- NGO 4- private sector
6.	**Monthly income: _____** NIS		
7.	**body height: _____ cm. body weight: _____ kg.** **Body Mass Index: _____**		
8.	**How many years with HD: _____**Years **Which type you were diagnosed? _____** Type		
9.	**Complication of health conditions last time**: _____		
10.	**What is your current treatment?**	1. □ Diet 2. □ Oral medications 3. □ pacemaker 4. □ Exercise 5. □ others	
11.	**Presence of HD systemic complication**	1- □No If Yes Enumerate: _____ 2- □Yes	
12.	**<u>Dental Health:</u>** **During the year 2020 and 2021, how many times have you done oral health assessment at dental station? _____**		
13.	**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 Governmental PHCC? 1- □No 2- □Yes	
14.	**How many natural teeth do you have?**	1. □ No natural teeth 2. □ 1–9 teeth 3. □ 10–19 teeth 4. □ 20 teeth or more
15.	**During the past 12 months, did your teeth or mouth cause any pain or discomfort?**	1. □ Yes 2. □ No 3. □ Don't know
16.	**Do you have any removable dentures?**	**Yes 1** / **No 2** A partial denture..... □ □ A full upper denture..... □ □ A full lower denture ..... □ □
17.	**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
18.	**How often do you clean your teeth?**	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
19.	**Do you use any of the following to clean your teeth?**	**Yes 1** / **No 2** Toothbrush..... □ □ Wooden toothpicks. □ □ Plastic toothpicks? ... □ □ Thread (dental floss) □ □ Charcoal ..... □ □ Chew stick/miswak. □ □ Other ..... □ □ Please specify.....

20.	**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	
21.	**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 - If the answer is no. 6th, why? .....
22.	**What was the reason of your last visit to the dentist?**	Consultation/advise..... □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

23. **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	□	□	□	□	□
(i) Have taken days off work	□	□	□	□	□
(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	□	□	□	□	□

24. How often do you eat or drink any of the following foods, even in small quantities?

	Several times a day 6	Every day 5	Several time a week 4	Once a week 3	Several times a month 2	Seldom /never 1
Fresh fruit	□	□	□	□	□	□
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	□	□	□	□	□	□

25. How often do you use any of the following types of tobacco?

	Every day 6	Several time a week 5	Once a week 4	Several times a month 3	Seldom 2	Never 1
Cigarettes	□	□	□	□	□	□
Cigars	□	□	□	□	□	□
A pipe	□	□	□	□	□	□
Chicha	□	□	□	□	□	□
Other	□	□	□	□	□	□

Please specify _____

26. what are the most common challenges facing you seeking oral health care at governmental PHCC?

1. □lack of time.
2. □unavailability of all oral health services.
3. □NO advanced dental treatment at governmental PHCC
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 _____

27. Any Comments?

Oral Health Assessment Form

Dentition status

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

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Crown	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Root	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Crown	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Root	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	48	**47**	**46**	**45**	**44**	**43**	**42**	**41**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**

Periodontal status (CPI Modified)

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

	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**

Loss of attachment

Index teeth

17/16 11

☐ ☐ ☐

☐ ☐ ☐

47/46 31

26/27
Severity

36/37
0= 0-3mm
1= 4-5mm Cemento-enamel junction(CEJ) within black band
2= 6-8 mm CEJ between upper limit of black band and 8mm ring
3= 9-11mm CEJ between 8.5 mm and 11.5 mm ring
4=12mm or more CEJ beyond 11.5 mm ring
X= excluded sextant
9=Not recorded

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

Dental trauma

Severity ☐

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

Number of teeth affected

☐☐

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 toot

Number of teeth affected

☐☐

Oral mucosal lesions

☐
☐
☐

Condition

0=No abnormal condition
1=Malignant Tumor (oral cancer)
2=Leukoplakia
3=Licken planus
4=Ulceration (aphthous, herpatic, traumatic)
5=Acute necrotizing ulcerative gingivitis (ANUG)
6=Candidiasis
7=Abscess
palate
8=Other condition (specify if possible)
ridges/gingiva
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

8=Alveolar

9=Not recorded

Denture(s)

Upper ☐ **Lower** ☐

0=No denture
1=Partial denture
2=Complete denture
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 (3): Approval from Helsinki Committee

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: 2021/08/02 **Number:** PHRC/HC/944/21

Name: Wissam A. A. Alborsh 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 Heart Diseases Patients Attending Governmental Health Centers in Gaza Governorates

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/944/21 in its meeting on 2021/08/02 و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

Signature

Member Member

For Chairman

Dr. Yehia Abed

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 (4): Approval from MoH

State of Palestine
Ministry of health

دولة فلسطين
وزارة الصحة

السيد : رامي عيد العبادله المحترم

التاريخ:30/08/2021
رقم المراسلة 759051

مدير عام بالوزارة /الإدارة العامة لتنمية القوى البشرية/وزارة الصحة

السلام عليكم ,,,

الموضوع/ تسهيل مهمة الباحث/ د. وسام البرش

التفاصيل //
بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحث/ د. **وسام عبد الله البرش (طبيب اسنان)**
الملتحق ببرنامج ماجستير الصحة العامة – مسار علم الاوبئة – جامعة القدس أبوديس بغزة في إجراء بحث بعنوان:
"Oral Health Problems among Heart Diseases Patients Attending Governmental Health Centers in Gaza Governorates"
حيث الباحث بحاجة للاطلاع على الملف الطبي وتعبئة استبانة وتعبئة نموذج تقييم لصحة الفم والاسنان من عدد من مرضى القلب المترددين على عيادات الامراض المزمنه في مراكز الرعاية الصحية الأولية.
نأمل توجيهاتكم لذوي الاختصاص بضرورة الحصول على الموافقة المستنيرة من المرضى الذين هم على استعداد للمشاركة في الدراسة ومن ثم تمكين الباحث من التواصل معهم، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسئولية.
وتفضلوا بقبول التحية والتقدير،

1- البحث حاصل على موافقة لجنة اخلاقيات البحث الصحي (لجنة هلسنكي)
2- تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 6 أشهر من تاريخه.

محمد ابراهيم السرساوي
مدير دائرة/الإدارة العامة لتنمية القوى البشرية

التحويلات

■ محمد ابراهيم محمد السرساوي(مدير دائرة)	← رامي عيد سليمان العبادله(مدير عام بالوزارة)	إجراءاتكم بالخصوص(30/08/2021)
■ رامي عيد سليمان العبادله(مدير عام بالوزارة)	← ماهر محمود عبد الهادي شامية(مدير عام بالوزارة)	إجراءاتكم بالخصوص(30/08/2021)
■ ماهر محمود عبد الهادي شامية(مدير عام بالوزارة)	← موسى رجب حمدان عابد(طبيب بشري أخصائي)	لعمل اللازم(30/08/2021)

Gaza Tel. (+970) 8-2846949 Fax. (+970) 8-2826295
غزة تلفون. (+970) 8-2846949 فاكس. (+970) 8-2826295

عنوان الدراسة: المشاكل الصحية الفموية لدى مرضى القلب المترددين على مراكز الرعاية الصحية الأولية الحكومية في محافظات غزة.

إعداد: وسام عبد الله علي البرش

إشراف: أ. د. يوسف الجيش

ملخص الدراسة

صحة الفم هي مؤشر مهم على الصحة العامة ونوعية الحياة. تعتبر مشاكل صحة الفم الشائعة مخاوف تتعلق بالصحة العامة لأن العديد من الأشخاص لا يمكنهم دفع ثمن خدمات صحة الفم والأسنان. بشكل عام ، تعتبر مشاكل صحة الفم شائعة بين المرضى الذين يعانون من مشاكل في القلب. هدفت الدراسة الحالية إلى تفحص الأمراض الصحية الفموية لدى مرضى القلب في محافظات غزة. تكونت عينة الدراسة من 392 مريضاً ومريضة من مرضى القلب المزمنين المترددين على مراكز الرعاية الصحية الأولية الحكومية في محافظات غزة. أجريت الدراسة في خمسة مراكز للرعاية الصحية الأولية الحكومية التي يوجد بها عيادة لأمراض القلب، حيث تم اختيار مركز صحي من كل محافظة من محافظات غزة، تم اختيار أفراد عينة الدراسة بالطريقة الطبقية النسبية بناءً على عدد المرضى المترددين على كل مركز صحي. استخدم الباحث في هذه الدراسة المنهج الوصفي المقطعي، ولجمع البيانات فقد تم استخدام نموذج منظمة الصحة العالمية (WHO, 2013) لفحص الصحة الفموية. لتحليل البيانات استخدم الباحث برنامج الرزم الإحصائية للعلوم الإنسانية (SPSS (version 25، وتضمنت المعالجات الإحصائية التكرارات، النسب المئوية، المتوسطات الحسابية، اختبار (ت) واختبار تحليل التباين الأحادي.

أظهرت نتائج الدراسة أن 55.1% من المشاركين في الدراسة كانوا من الذكور و49.9% كانوا من الإناث، بلغ متوسط العمر 60.04 سنة، 30.4% حاصلين على التعليم الابتدائي، 77.8% من المشاركين في الدراسة لا يعملون، و89% كانوا مصنفين تحت خط الفقر المدقع. وبينت النتائج أن 13% فقط من المشاركين في الدراسة كانوا ضمن الوزن الطبيعي في حين أن بقية المشاركين في الدراسة كانوا ضمن تصنيف الوزن الزائد أو السمنة. كما ان 56.1% كانوا يعانون من أمراض القلب منذ 5 سنوات فأقل، و53.8% تم تشخيصهم ضمن أمراض الشرايين التاجية.

أظهرت النتائج أن 42.83% من المشاركين في الدراسة يتناولون أغذية ومشروبات تحتوي على السكر الصناعي، كما ان 24.33% كانوا مدخنين.

وبينت النتائج أن 41.8% من المشاركين في الدراسة لم يخضعوا للفحص الفموي خلال السنتين الماضيتين، 52% عانوا من الألم خلال السنة الماضية. بينت نتائج الفحص الفموي أن 13.62% من المشاركين في الدراسة يعانون من تنخر الأسنان، 17% لديهم أسنان مفقودة، وبلغ متوسط عدد الأسنان التي أظهرت نزيف لثوي 14.56، ومتوسط عدد الأسنان التي أظهرت وجود جيوب لثوية 10.75، كما أن 6.4% من المشاركين في الدراسة لديهم أسنان صناعية بشكل جزئي، 15.1% لديهم أسنان صناعية كاملة في الفك العلوي، و12.8% لديهم أسنان صناعية كاملة في الفك السفلي.

بينت النتائج أيضاً أن 20.9% من المشاركين في الدراسة يعانون من عيوب في المينا، 6.1% لديهم عيوب في الأسنان، و20.7% لديهم كسور في المينا والأسنان.

وبينت النتائج عدم وجود فروق ذات دلالة إحصائية في مؤشر النخر، الفقدان، والحشو تعزى للعوامل الديموغرافية، كما لم توجد فروق ذات دلالة إحصائية في النزيف اللثوي والجيوب اللثوية تعزى للعوامل الديموغرافية للمشاركين في الدراسة. كما تبين عدم وجود فروق ذات دلالة إحصائية في حالة اللثة تعزى لكل من عدد سنوات الإصابة بأمراض القلب وعدد مرات تنظيف الأسنان.

وتبين أن أهم التحديات التي تواجه المرضى في البحث عن خدمات الصحة الفمية تمثلت في عدم توفر كل خدمات الصحة الفمية، ازدحام عيادات الأسنان، وعدم توفر العلاجات الصحية السنية المتقدمة في مراكز الرعاية الصحية الأولية الحكومية في محافظات غزة.

خلصت الدراسة إلى تدني مستوى نظافة الأسنان، انتشار أمراض الأسنان واللثة بشكل واضح بين مرضى القلب، كما أن مرضى القلب لا يقومون بإجراء فحص فموي بشكل منتظم. أوصت الدراسة بالحاجة إلى رفع مستوى الوعي بأهمية تنظيف الأسنان بشكل يومي، والحاجة لإجراء الفحص الفموي بشكل دوري بهدف اكتشاف وعلاج مشاكل الأسنان واللثة بشكل مبكر في مراحله الأولى.