EFFECTIVENESS OF MEDICAL-DENTAL COORDINATED CARE FOR DIABETES PATIENTS WITH PERIODONTAL DISEASE AT SELECTED PUBLIC PRIMARY CARE CLINICS, IN KUANTAN, PAHANG

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DECLARATION

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I hereby declare that this dissertation is the result of my own work, except for quotations and summaries which have been duly acknowledged.

Signature: Date: 19th March 2018

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ABSTRACT

In Malaysia, prevalence of diabetes mellitus (DM) has increased almost a two-fold from 11.6% in 2006 to 22.6% in 2013 and among them only 20 % achieved treatment target of HbA1c <6.5%) while healthy periodontal tissues in all age groups decreased from 9.8% in 2000 to 3.2% in 2010 with increasing severe complicated periodontal disease (PD)cases. Medical-dental coordinated care is recommended under the light of bi-directional relationship between DM and PD and effect of periodontal treatment (PT) on glycemic control of DM patients. However, PD assessment and taking treatment for it have been still overlooked by both DM patients themselves and medical professionals. Besides, evidences on effectiveness of medical-dental coordinated care to DM patients with periodontitis from public primary care clinics (PPCCs) and administrative issues to implement it have been still limited. This clinical management intervention study aimed to evaluate the effectiveness of medical-dental coordinated care to DM patients with periodontitis including constraints to implement it. Screening PD among DM patient at diabetic clinics of 3 PPCCs, referring DM patients with periodontitis to PD specialists' clinics, providing standard-DM care and periodontal treatment (PT), sharing glycemic control and PD-status information, tracing defaulters and encouraging for regular DM follow-up and taking PT completely by the medical team and PD specialists were included in the medical-dental coordinated care. Out of 239 DM patients who were screened PD by basic periodontal examination (BPE), 52% (123/239) had periodontitis. Out of 123 DM patients with periodontitis, 44 % (54/123) agreed to seek PT and referred them to two PD specialists' clinics. However, 71% (38/54) took PT and 27% (16/54) declined to PT appointment offered by PD specialists' clinics. Out of 38 patients, 97.4%(37/38) patients adhered to DM care while only 44.7% (17/38) patients completed PT because of having inconvenience to take PT. Achievement of target glycemic control HbA1c $\leq$ 6.5% of the cases who completed PT was significantly highest comparing with that of the positive controls who did not complete PT and the negative controls who did not take PT (47.1% vs 15.8% vs 15.2%). Clinical resolution of periodontitis in PPD significantly reduced after taking PT -probing periodontal depth 3.34 mm (before) vs 2.63 mm (after). Number needed to treat (95%CI) and standardized mean difference of taking PT on achieving glycemic control target in HbA1c were 4.9 (1.3-19.1), and -0.52 respectively. Thus, the medical-dental coordinated care should be provided to DM patients with periodontitis to assist in reducing of DM patients who did not achieve their HbA1c target. A further study should be conducted to explore the inconveniences of the patients to seek PT.

Keywords: Diabetes Mellitus, Periodontal Disease, bi-directional relationship, screening, Malaysian patients, inconveniences for periodontal treatment, Coordinated care

ABSTRAK

Di Malaysia, prevalen penyakit kencing manis (DM) telah meningkat hampir dua kali ganda daripada 11.6% pada tahun 2006 kepada 22.6% pada tahun 2013 dan di antara mereka hanya 20% sasaran rawatan LTH daripada HbA1c <6.5%) manakala tisu periodontal sihat dalam semua kumpulan umur menurun daripada 9.8% pada tahun 2000 kepada 3.2% pada tahun 2010 dengan peningkatan yang teruk kes penyakit periodonal rumit (PD). Penjagaan terselaras perubatan pergigian adalah disyorkan di bawah cahaya hubungan dua arah antara DM dan PD dan kesan rawatan periodontal (PT) pada alat kawalan glisemik pesakit DM. Walau bagaimanapun, penilaian PD dan mengambil rawatan untuk itu telah masih diabaikan oleh kedua-dua pesakit DM diri dan profesional perubatan. Selain itu, bukti-bukti kepada keberkesanan penjagaan diselaraskan perubatan pergigian kepada DM pesakit periodontitis dari klinik awam utama penjagaan (PPCCs) dan isu-isu pentadbiran untuk melaksanakannya telah masih terhad. Kajian klinikal campur tangan bertujuan untuk menilai keberkesanan penjagaan terselaras perubatan pergigian kepada DM pesakit periodontitis termasuk kekangan untuk melaksanakannya. Saringan PD di kalangan pesakit DM di klinik diabtic 3 PPCCs, merujuk pesakit DM dengan periodontitis ke PD klinik speacilaists ', menyediakan penjagaan standard-DM dan rawatan periodontal (PT), yang berkongsi kawalan glisemik dan maklumat PD-status, mengesan peminjam dan menggalakkan untuk tetap DM susulan dan mengambil PT sepenuhnya oleh pasukan perubatan dan pakar PD dimasukkan dalam penjagaan terselaras perubatan pergigian. Daripada 239 pesakit DM yang telah disaring PD melalui pemeriksaan asas periodontal (BPE), 52% (123/239) mempunyai periodontitiis. Daripada 123 pesakit DM dengan periodontitis, 44% (54/123) perjanjian untuk mencari PT dan telah refrerred ke klinik dua pakar PD. Walau bagaimanapun, 71% (38/54) telah mengambil NSPT dan 27% (16/54) merosot kepada PT pelantikan yang ditawarkan oleh klinik specilaits PD. Daripada 38 pesakit, 97.4% (37/38) pesakit mengambil langkah DM penjagaan manakala hanya 44.7% (17/38) pesakit selesai PT kerana mempunyai kesulitan untuk mengambil PT. Pencapaian sasaran kawalan glisemik HbA1C≤ 6.5% daripada kes-kes yang menamatkan PT telah ketara tertinggi dibandingkan dengan yang daripada kawalan positif yang tidak PT lengkap dan kawalan negatif yang tidak mengambil PT (47.1% vs 15.8% vs 15.2%). Resolusi klinikal periodontitis di PPD berkurangan selepas mengambil PT -probing periodontal kedalaman 3.34 mm (sebelum) vs 2,63 mm (selepas). Nombor diperlukan untuk merawat (NNT) dan perbezaan min standard (SMD) mengambil PT untuk mencapai sasaran kawalan glisemik dalam HbA1c masing-masing 4.9 (1,3-19,1), dan -0,52. Oleh itu, penjagaan terselaras perubatan pergigian terutamanya PT perlu disediakan kepada DM pesakit periodontitis untuk membantu dalam mengurangkan pesakit DM yang tidak mencapai sasaran HbA1c mereka. Kajian lanjut perlu menjalankan untuk meneroka incoveninces daripada pesakit untuk mendapatkan PT.

Kata kunci: Diabetes Mellitus, Penyakit periodontal, bi-arah hubungan, pemeriksaan, pesakit Malaysia, kesulitan untuk rawatan periodontal, penjagaan Coordinated

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LIST OF ABBREVATIONS

AAP	= American Academy of Periodontology
ADA	= American diabetes association
AGEs	= Advanced glycation endproducts
ANOVA	= Analysis of variance
AUCs	= Area under the curve
BMI	= Body mass index
BOP	= Bleeding on probing
BPE	= Basic periodontal examination
CAL	= Clinical attachment loss
CI	= Confidence interval
CDC	= Central disease control unit (United State of America)
CRP	= C-reactive protein
CPITN	= The Community periodontal index of treatment need
CVS	= Cardiovascular diseases
DM	= Diabetes Mellitus
EHR	=Electronic health record
GI	= Gingival index
HbA1C	= Haemoglobin A1C
HIE	= Health information exchange
IL-6	= Interleukin -6
IT	= Information technology
IQR	= Inter quartile rate
KOD	= Kulliyyah of Dentistry
LPS	= Lipopolysaccharide
NHMS	= National health and morbidity survey
NNTs	= Numbers needed to treat to prevent one case
NPV	= Negative predictive value
MMPs	= Matrix metalloproteinase(s)
m-RNA	= messenger RNA (Ribonucleic acid)
MOH	= Ministry of health
OR	= Odds ratio

PCR	= O'Leary plaque control record
PDMPD	= Patients with DM and PD
RAGE	= Receptors for Advanced glycation endproducts
ROC	= Receiver operating characteristics curve
PD	= Periodontal disease
PDI	= Periodontal disease index
PI	= Plaque Index
PMPCC	= Public medical primary care clinic
PPD	= Probing pocket depth
PPV	= Positive predictive value
SD	= Standard deviation
SMDs	= Standardized mean differences
SRQ	= Self reported questionnaires
TNF	= Tumour necrotizing factor
UK	= United Kingdom
USA	= United States of America
WHO	= World health organization

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CHAPTER 1

INTRODUCTION

1.1 Background to the study

Diabetes mellitus (DM) and Periodontitis (PD) are common chronic diseases in medical and oral health practices. International DM federation published that global DM prevalence in 2013 was 8.3% of total estimated world population 4572.9 millions - an estimate of 381.8 million adults in 219 countries. Malaysia was included in the highest DM prevalence countries (Guariguata L et al, 2013). Besides, only 23.8% of the DM patients achieved the Malaysian glycemic treatment target HbA1c <6.5% (NDR[1], Malaysia, 2012).

On other hand, the World Health Organization (WHO) published in 2003 that periodontal disease (PD) is one of the two major dental diseases worldwide at high prevalence rate (Pertersen P E, 2003). Gingival bleeding is highly prevalent among adult populations in all regions of the world; advanced disease with deep periodontal pockets (≥ 6mm) affects approximately 10% to 15% of adults worldwide (Pertersen P E, 2005). In Malaysia, the prevalence of both DM and PD are increasing trends. DM has increased almost a two-fold from 11.6% in 2006 to 22.6% in 2013 (MOH, Malaysia, 2013; Wan WM et al, 2014) while that of the healthy periodontal tissues in all age groups decreased from 9.8% in 2000 to 3.2% in 2010 (MOH, Malaysia, 2013).

[1] National Diabetes Registry , Malaysia

For decades, it has been accepted that DM contributed to poor oral health and the increased prevalence of PD. There have been published evidences since late 20th century regarding bi-directional relationship between DM and PD in terms of epidemiological, clinical link and biological plausibility (Bosnjak A et al, 2001, George W T, 2001 and Oana A V et al, 2013). More recently it has been found that PD could adversely affect glycemic control in DM (Simpson TC *et al*, 2010, Wijanad J et al, 2010 & Rutger G, 2011, Carole A (2012), Mikio Ota (2013) and Satheesh E et al (2014)); hence a multi-disciplinary care approach for DM is recommended (EFP, 2012,). In Carole A (2012) and Satheesh E et al (2014) published practice model and framework for physician-dentist collaboration in diabetes and periodontitis in an interprofesional clinics and primary care while Mikio Ota (2013) published the hospital based clinical pathway for closer collaboration between medical and dental professionals in improving the management of DM and PD.

Although, there have been growing evidences of bilateral relationship between DM and PD, medical and oral health profession are enhancing their respective professional resources to reduce burden of DM and PD separately in line with parallel structure of medical and oral health services under respective national health system which are practiced at present in almost all of countries in the world.

In Malaysia, Non-Communicable Diseases (NCDs) Section, Disease Control Division of MOH, Malaysia set the National Strategic plan (2010-2014) for NCDs and has being carried out the prevention and control activities - environmental interventions, life style interventions and clinical interventions- to reduce the burden of NCDs including DM in Malaysia. Regular assessement of risk factors and detection of diabetes complications are included in the clinical practices guideline for diabetes (2015) in Malaysia.

DM screening is carried out among the person with risk such as overweight or obese (BMI >25 kg/m^2), family history of DM, age above 45 years old, among children, adolescents and pregnant women, as a part of routine antenatal care at all medical health care setting. Besides, obesity (BMI), hypertension, dyslipidaemia, physical activities and smoking status are also assessed routinely among registered DM patients in accordance with clinical practices guidelines (CPGs) of DM at medical public primary care clinics and hospitals to detect modifiable risk factors for secondary and tertiary prevention of DM (MoH, Malaysia, 2015).

Nevertheless, oral health (OH) assessment and seeking OH care among DM patients particularly PD have been still overlooked by both DM patients themselves and medical professionals including the public primary care clinics (the PPCCs) of Malaysia. Screening PD as one of modifiable risk factors for DM and coordinated care with oral health professionals for the DM patients with PD has not been recommended in the CPGs of DM in Malaysia (MoH, Malaysia, 2015).

On other side, oral health division of Ministry of Health Malaysia is implementing the National Oral Health Plan (2011-2020) to improve oral health status of the Malaysian population including periodontal health. One of seven key oral health goals of this national health plan is to have healthy periodontium in 50% of 16 year old Malaysian by 2020. To get this achievement, oral health services are currently provided via government, private and university dental clinics. In 2013, Tuti N M & *et al* analysed current periodontal status and provision of periodontal services in Malaysia; and suggested that effective preventive and promotive measures for periodontal health should be continued and be given priority through concerted efforts involving the private sector and higher education providers by emphasising effective implementation

of primary prevention measures through periodontal risk assessment and early detection of PD through effective screening procedures (Tuti N M, 2013).

However, it may be hard to get early detection of PD without patients' awareness on it themselves because of its asymptomatic nature in the initial stages and during most of its course. As it is largely painless, most people with PD are unaware that they have it. As a result, people do not seek dental treatment and the disease remains undetected until the affected teeth become un-saveable by the time the patient sees a dentist; thus PD has long been viewed as a silent disease (Ningseh T, 2013). Besides, increasing trends of DM may make more hidden periodontal cases in community together with undiagnosed DM (Andrei B *et al,* 2012). In 2nd edition of CPG for management of chronic periodontitis in Malaysia, it is one of the recommended practices to educate and motivate the periodontal patients with DM as a part of treatment plan. Nevertheless, screening DM among the all PD patients at dental chair side and coordinated care with medical personals for PD patients with DM has not been included in the current CPG for PD in Malaysia (OH Division, MOH, 2012).

1.2 Problem Statement

Burden of DM and PD are still in increasing trends with high proportion of DM patients with poor glycemic control (HbA1C>6.5%) and the most of the patients who seek treatment at the PD specialists' clinics are in severe periodontitis stage with complications. Epidemiological and clinical evidences for bi-directional relationship between DM and PD and its biological plausibility have been escalating since late 20th century (George W Taylor, 2001; Kalyani D *et al*, 2010, Noor R et al, 2015). Nevertheless, in Malaysia, medical professionals and OH professionals have been providing health care to their respective patients-DM patients and PD patients-separately till now. It may be due to a traditional segregation between dental and medical professions and/or almost all of published articles regarding bilateral relationship between DM and PD were conducted by oral health professional and/or unfamiliarity of PD assessment by medical professionals.

Under the circumstances, screening oral health including PD has still not been included in regular modifiable risk factors and complications assessment for DM patients in medical practices in Malaysia (CPG of DM, Malaysia,2015) like other developed countries (CPG of DM, USA, 2015). It may be due to low awareness of DM-PD bilateral relationship and effect of PT on glycemic control by both medical professionals and community particularly in DM patients who have risk to suffer severe periodontitis and/or overlooking the medical–dental coordinated care for DM patients with periodontitis as the published articles were mostly emphasized on respective professional field rather than dental and medical professional coordination. There may be barriers such as awareness of DM and PD relationships by DM patients and medical professionals, professional services provided by medical and oral health professionals and other personal matter of the patients. Thus, these barriers need to be explored to

initiate medical-dental coordinated care for the DM patients with PD which. If medical-dental coordinated care is initiated, the burden of DM and PD will be reduced in Malaysia in general and particularly to reduce not only the DM patients with periodontitis who did not achieve target glycemic control in HbA1C ≤ 6.5%, but also, late seeking treatment for severe periodontitis cases. However, evidences for effectiveness of the medical-dental coordinated care for the patients with DM and PD are still limited and it has not been found yet till now in Malaysia especially in public primary care clinics .

Thus, promotion and screening OH including PD among DM patients from medical clinics may effect on awareness of DM-PD relationship and effect of PD on glycemic control by DM patients and medical professionals. Screening periodontal health status of the patients is mostly conducted by oral health practitioners in dental clinics; however, there is a self-reported questionnaire (SRQ) for PD assessment which is used for surveillance and screening of PD in community by oral health alliances and non-oral health practitioners. It is possible to apply this SRQ in periodontal risk assessment among DM patients by medical staff in medical primary care setting. Initiating to use the SQR among DM patients as a screening tool for PD at medical clinics may be a starting point and may help to initiate the medical-dental coordinated care of DM with PD. Incorporating the assessments of risk factors including the PD in the management of DM may perhaps help to create awareness among the DM patients and the public to embrace the concept of oral-systemic joint care for DM patients with PD.

However, evidences regarding screening PD at medical clinics and effectiveness of providing the medical –dental coordinated care to the patients with DM and PD in terms of glycemic control status, clinical resolution of periodontitis and changing risk

behaviours such as smoking, exercise and oral hygiene practices (OHP) have been still limited.

Although, yearly dental check-up has been included in DM guidelines of United State of America since 2014, literatures on effectiveness of yearly dental check-up among DM and their perception on routine dental check-up have been still limited particularly in Asia-Pacific region including Malaysia. Before the suggestion to include the PD assessment as part as a modifiable risk assessment among DM patients by medical health staff, there should be an evidence for feasibility of using the SRQ for PD assessment among Malaysian DM patients.

In recent publication in 2013, a preliminary study of medical–dental coordinated care for DM with PD disease was found; however, this study was based on tertiary hospital and not in primary care setting (Mikio, O et al, 2013). In Carole A (2012) and Satheesh E *et al* (2014) published practice model and framework for physician-dentist collaboration in diabetes and periodontitis in an interprofessional clinics and primary care. Nevertheless, oral health (OH) assessment particularly PD and seeking OH care among DM patients have been still overlooked by both DM patients themselves and medical professionals including the public primary care clinics (the PPCCs) of Malaysia.

In Malaysia, Sahril N et al study (2014) published about oral health seeking behaviour among Malaysians with type-2 diabetes. Thus, screening PD co-morbidity among DM patients at medical clinics to provide the medical-dental coordinated care and its effectiveness including responses of the DM patients with periodontitis to medical-dental coordinative care need to be evaluated which were valuable local evidences to initiate the medical-dental coordinated care for the DM patients with periodontitis in Malaysia primary health care setting.

1.3 Aim and objectives of the Study

1.3.1. Aim of the study

Aim of the study is to evaluate effectiveness of providing medical-dental coordinated care to diabetes patients with periodontitis after screening their periodontal disease status using the self-reported questionnaires at public medical primary care clinics.

Specific objectives are as follows:

1. To determine accuracy of modified Malay translated self-reported questionnaires (SRQs- MM) for periodontal diseases assessment to be used as a self-screening tool among DM patients at diabetic clinics of public primary care clinics (PPCCs).

2. To compare prevalence of PD-co-morbidity screened by self-screening using the SRQs-MM with that of professional screening using BPE (basic periodontal examination) among DM patients.

3. To measure the knowledge and perception of DM patients from public medical primary care clinics on screening PD using the SRQs,-MM relationship between DM and PD and benefits of screening PD on general health.

4. To explore responses of DM patients with periodontitis to periodontal treatment appointment given by the periodontal specialists'clinics for management of periodontitis.

5. To assess awareness and perception of the DM patients with periodontitis on the medical-dental coordinated care provided by medical doctors and periodontal specialists for their diabetes and periodontitis.

6. To evaluate effectiveness of the medical-dental coordinated care in terms of adherence of DM patients with periodontitis to periodontal treatment and diabetic care, their changes in glycemic control and periodontal probing pocket depth, and changes in common risk behaviour of diabetes and periodontal disease such as smoking, exercise and oral hygiene practices.

1.4 Research Questions

1.4.1. Whether "Modified Malay translated self-reported questionnaire (SRQs-MM) can be used as a screening tool to identify periodontal diseases status among DM patients at the medical clinics?

1.4.2. What is the awareness and perception of DM patients on screening PD using the SRQs-MM and benefit of screening PD on general health and relationship between DM and PD?

1.4.3. What are the responses of DM patients with periodontitis co-morbidity to the periodontal specialists 'clinics referral for further periodontal treatment?

1.4.4. What are the awareness and perception of the DM patients with periodontitis on the medical-dental coordinated care provided by medical doctors and periodontal specialists for their diabetes and periodontitis?

1.4.5. Is the medical-dental coordinated care effective for the DM patients with Periodontitis to achieve their glycemic control in HbA1c and clinical resolution of periodontitis?

1.5 Significance of the Study

1.5.1 Screening PD status among DM patients using the self-reported questionnaires at Diabetic clinics of the PPCCs and confirmation PD status using BPE at dental clinics of the PPCCs have never been conducted the previous study particularly in Malaysia.

1.5.2 The PD screening results of the SRQs-MM comparing with that of BPE examination and PD symptoms experienced by the DM patients which was obtained from the present study is valuable to modify the SRQs-MM to use as a valid self-screening tool for PD assessment among the DM patients.

1.5.3 Awareness and perception status of DM patients on screening PD status which were explored in the study was in valuable information for both medical and oral health professionals to set a plan for initiation of screening PD among DM patients at medical primary care clinics for early detection of PD among the DM patients that is an important strategy to reduce the burden of both PD and DM.

1.5.4. Response of the DM patients with periodontitis to PT appointment given by the PD specialists' clinics and their reasons for declining PT appointment which were explored in the present study were invaluable information for implementation of the medical-dental coordinated care for DM patients with periodontitis patients in Malaysia public primary care clinics.

1.5.5 The awareness and perception of the DM patients with periodontitis on the medical-dental coordinated care particularly inconvenience to seek PT at the PD specialists' clinics and diabetic clinics of the PPCCs which were explored in the present study pointed out the feasibility and foreseen constraints before initiation of the medical–dental coordinated care for DM patients with periodontitis in primary care setting.

1.5.6 Achievement of targeted glycemic control in HbA1C≤ 6.5%, clinical resolution of periodontitis, improving risk behaviour such as smoking cessation and oral hygiene practices by DM patients with periodontitis who completed periodontal treatment comparing with those who did not take periodontal treatment were valuable local evidences to recommend for including oral health assessment together with other DM risk factors which are regularly assessed in diabetic CPG, Malaysia.

1.5.7 Targeted glycemic control achievement, clinical resolution of periodontitis and the common risk behaviour changes of the DM patients with periodontitis after receiving the medical-dental coordinated care in the present study were an evidence for benefits of moving one step forwards from the concept of integration of medical-dental coordination for diabetic patients with periodontitis especially in primary health care to implementation of the medical-dental coordinated care

1.5.8 Accessibility and availability issues concerned with the PD specialists' clinics, declining PT appointment and inconveniences to seek PT which were found out in the present study were the valuable and significant findings for health care providers and researchers to narrow down the research area for successful implementation of the medical-dental coordinated care in primary care. Besides, these findings had not been found out yet in the other studies.

1.6 Limitations of the study

1.6.1. Understanding and cooperation of both oral health and medical professional in this collaborative research

1.6.2 Nature of unstability of MOs and PD specialist who were members of the medical-dental coordinated care team / transferred them to other health clinics during implementation of the medical-dental coordinated care

1.6.3 Moving the public PD specialists' clinic from Klinik Kesihatan Paya Bersar to other place during implementation of the medical-dental coordinated care

1.6.4 Participation and conforming of the participants on research protocol-low participation of DM patients with periodontitis to take PT; declining PT appointment given by the PD specialists' clinics; frequently postponing of the PT appointment dates and poor conforming two–time HbA1c assessment dates by the patients - and mobile nature of the patients under the study

1.6.5 Time limitation of medical/oral health staff to collect the data (both questionnaires and periodontal health assessment measurement and glycemic level)

1.6.6. In the clinical study on effectiveness of PD treatment on glycemic control of DM patients, biological changes of the patients are unpredictable which affect on the intervention of the study (PT on glycemic control of DM patients with periodontitis). Besides, multiple **influencing** factors of DM and PD also affect on accuracy of the clinical findings.

1.7 Definitions of Terms

Table-1.1: Definitions of Terms

Term	Constitutive definition	Operational Definition
Diabetes Mellitus (DM)	It is a chronic non-communicable disease. It is the chronic accumulation of elevated blood glucose resulting from the body's inability either to produce or to use insulin.	DM status is diagnosed by medical doctor and classified into 1. Controlled DM (HbA1C ≤ 6.5 %) 3. Uncontrolled (HbA1C > 6.5 %)
Periodontal disease(PD)	Periodontal disease (PD) is a disease of periodontium, a supporting structure around the teeth in the oral cavity in which included gingivitis (a gingival inflammation which causes redness, swelling and bleeding) and periodontitis (untreated gingivitis progressively damage the periodontal ligament and alveolar bone)	-PD status is diagnosed by the PD specialists and classified into 1. Healthy Periodontium (No PD) (BPE Score =0) 2. Gingivitis (BPE Score = 1 or 2) 3. Periodontitis (BPE score= 3 0r 4) -BPE score "0" is classified as BPE (-) and BPE score (1-4) is classified as BPE (+) for verification of PD status by the SRQ-M
Screening	Screening is a process of identifying apparently healthy people who may be at increased risk of a disease or condition. They can then be offered information, further tests and appropriate treatment to reduce their risk and/or any complications arising from the disease or condition.	-Screening is done using screening tools to get early detection of disease. - In the study, the self-reported questionnaires was used as a screening tool for PD assessment and

Term	Constitutive definition	Operational Definition
Screening using the Self-reported questionnaires for periodontal diseases assessment	PD is reported by either health practitioners (except dental practitioners) or by patients themselves while questionnaire is using a screening tool (Eke, 2005)	In the study , PD status was screened using the self-reported questionnaires - Malay version -Screening result was classified into positive* and negative based on preset cut-off level as follows: *Screening positive is defined more than "3 " answers which favor to have PD ("yes" in Q 1, 3, 4,6) and ("bad" in Q -2) and "("No" in Q 7& 8)
Validity of a screening tool	It is an accuracy of a screening tool (test) to correctly classify people with pre-clinical disease as positive (sensitivity) and people without pre-clinical disease as negative (specificity). Validity is measured by sensitivity and specificity.	In the study, validity of the SRQ-Malay version was verified by BPE assessment. -Sensitivity of the SRQ-M = the patients with both the SRQ screening Test (+) & BPE (+) divided by all patients with BPE (+) - Specificity of the SQR-M = the patients with both the SRQ screening Test (-) & BPE (-) divided by all patients with BPE (-)
Positive Predictive Value (PPV)	PPV is defined as number who test positive with disease over number with positive result	PPV of the SRQ-Malay version is as follows – PPV the SRQ-M = the patients with both the SRQ screening Test (+) & BPE (+) divided by all patients with the SRQ screening test (+)
Negative Predictive Value (NPV)	NPV is defined as number who test negative without disease over number with negative result.	NPV of the SRQ-Malay version is as follows – PPV the SRQ-M = the patients with both the SRQ screening Test (-) & BPE (-) divided by all patients with the SRQ screening test (-)

Term	Constitutive definition	Operational Definition
Reliability	Reliability of a test / a questionnaire means giving same results on repetition. Reliability is measured by- 1. Inter-rater reliability: The degree to which raters are being consistent in their observations and scoring in instances where there is more than one person scoring the test results. 2. Internal consistency: The degree to which all of the items on a test measure the same construct. It is measured by Cronbach's' alpha value. 3. Alternate forms reliability: In instances where there are two forms of a test that measure the same construct, the degree to which the results on the two tests are consistent. 4. Test-retest reliability: The degree to which the results are consistent over time.	In the study, international consistency (Cronbach's alpha and test-retest (Kappa statistics) will be considered to test reliability of the SRQ-Malay version. Cronbach's α value is interpreted as follows: $\alpha \geq 0.9$: Excellent $0.9 > \alpha \geq 0.8$:Good $0.8 > \alpha \geq 0.7$: Acceptable $0.7 > \alpha \geq 0.6$:Questionable $0.6 > \alpha \geq 0.5$:Poor $0.5 < \alpha$:Unacceptable Test-retest reliability is interpreted as follows: -0.9 and greater: Excellent reliability -Between 0.9 and 0.8: Good reliability -Between 0.8 and 0.7: Acceptable reliability -Between 0.7 and 0.6: Questionable reliability -Between 0.6 and 0.5: Poor reliability -Less than 0.5: Unacceptable reliability
Reliability of the SRQ- Malay version for PD assessment	Reliability of Malay translated self-reported questionnaires for periodontal disease assessment was measured by Cronbach's α coefficient and test-retest reliability	Cronbach's α value more than 0.7 and test-retest (Kappa) more than 0.7 is considered for the SRQ –Malay version to accept its reliability
Coordinated care	Health care provided in team approach by different health care providers such as medical doctors, dentists, specialists , nurses and paramedical staff	In the study, medical-dental coordinated care is provided to the DM patients and PD by a team which is consisted of 5 family physicians and 2 PD specialists from 3 public primary care clinics in Kuantan, Pahang state, standard DM care and periodontal treatment were provided.

Term	Constitutive definition	Operational Definition
Operational Feasibility of the screening program	Possibility to implement the screening program	In the study , operational feasibility of the screening program was assessed by prevalence of screening positive and perception of the patients on the screening test/program
Operational feasibility of PD screening program among DM patients	Possibility to implement the PD screening program among DM patients	Operational feasibility of PD screening among DM patients is measured by -High prevalence of PD screening among DM patients -perception of DM patients on PD screening using the SRQs-MM for PD assessment
Periodontal treatment	Non-surgical periodontal therapy (Scaling, root planning) with or without adjunctive antibiotics and mouth wash, oral hygiene education	Completion of periodontal treatment included non-surgical periodontal therapy with or without completion of 6^{th} month reassessment
Odds	Odds are the number of times an event happens divided by the number of times it does not within a group	In the clinical trial of the study, effectiveness of PD treatment on target glycemic control achievement of DM patients, Odds of PD treatment (cases) are number of DM patients with periodontitis who achieve the targeted glycemic control after completion of periodontal treatment (PT) divided by total number of the patients who completed PT. Odds of the routine DM care /without PD treatment (controls) are number of the patients without PD treatment who achieve the targeted glycemic control 6 months after routine DM care divided by total number of the controls

Term	Constitutive definition	Operational Definition
Odds ratio	The odds ratio is the odds of an event occurring in a one group divided by the odds of the same event in another group.	In the clinical trial of the study, odds ratio was calculated by odds of target glycemic control achievement after completion of PD treatment divided (cases) by odds of routine DM care (controls) without PT
NNTs	NNT is treatment-specific and describes the difference between a treatment and a control in achieving a particular clinical outcome. It can be used to describe any outcome where event rates are available for both a treatment and a control. NNT can be calculated from raw data, published odds ratios and relative risk reduction and prevalence.	In the study, NNTs was calculated by using following formula. $NNTs = \frac{1}{(IMPact/TOTact) - (IMPcon/TOTcon)}$ where: IMPact = number of DM patients given active treatment (PD treatment) achieving the target glycemic control TOTact = total number of DM patients given the active treatment (PD treatment) IMPcon = number of DM patients given a control treatment (routine DM care) achieving the target TOTcon =Total number of DM patients given the control treatment (routine DM care)
SMDs	SMDs are calculated by dividing observed differences in means by the corresponding standard deviation(pooled standard deviation in each trial. in formula, $SMDs = \frac{Mean\ (cases) - Mean\ (control)}{SD\ (pooled)}$ Where : $SD\ (pooled) = \sqrt{sd^2(cases) + sd^2(control)/2}$	In the study, mean (SD) of cases was obtained from HbA1C % of the patients who completed PT whereas mean (SD) of the controls was obtained from HbA1C% of the controls who did not take PT for SMDs computation

Term	Constitutive definition	Operational Definition
HIE	Health information exchange (HIE) is defined as "the electronic movement of healthcare-related information among organizations according to national standards" in USA	In the study, HIE means sharing and exchanging glycemic and PD control status information of the DM with periodontitis between Medical officers/Family physicians and PD specialists who are members of the medical-dental coordinated care team under the study
Medical Record	A medical record is used now in clinical practices to restore the patients' information, treatment plan , investigation and progress of illness under treatment There are two types: Electronic Medical Records (EMRs) and Paper Based Records (PBMRs)	In the study, paper based medical record (PBMRs) was used to record the information regarding DM or/and PD management.
Periodontal pocket probing death (mm) PPD (mm)	Periodontal pocket probing death of each tooth was measured in accordance with 6 sextants and average measurement in mm was computed	In the study , clinical status of periodontitis was confirmed by PD specialists measuring PPD (mm) and classified info <4 mm, 4-6 mm and >6 mm
HbA1c%	HbA1c refers to glycated haemoglobin (A1c) which identifies average plasma glucose concentration in percent (%) The HbA1c test provides an estimate of glycemic control over a period of approximately two to three months before the test, and the normal value is less than 6.5 percent.	In the study, HbA1c ≤6.5% is used as an indicator to measure achievement of target-glycemic control because of its highest accuracy to determine glycemic control among three glycemic control indicators- (fasting blood sugar, random blood sugar and HbA1c)

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction to literature review on previous studies

In the literature review, previous research works mostly from electronic sources and relative published documents from respective organizations and associations, text-books, national and international conferences' proceeding books were reviewed and presented it in accordance with specific objectives of the proposed study. This review covers:

- Global burden of DM and PD and its trends in Malaysia
- Evidences of the bi-directional relationships between DM and PD
- Screening periodontal disease among DM patients
- Oral health seeking behaviour and awareness of DM patients on relationship between DM & PD
- Effect of periodontal treatment on glycemic control of diabetes patients
- Periodontal treatment on clinical resolution of periodontitis
- Effect of glycemic control on periodontitis of type-2 DM patients
- Medication adherence and target glycemic achievement of type-2DM patients
- Periodontal status of DM patients and their oral health knowledge
- Medical and dental coordinated care for the DM patients with PD

References:

American Diabetes Association (2014); Standards of medical care in diabetes-2014; Diabetes Care, volume 37, Supplement1, January 2014

Albandar JM (2011): Underestimation of periodontitis in NHANES surveys. *J Periodontol* 82:337–341, 2011

Andrei Barasch (2012): " Random blood glucose testing in dental practices: A community-based feasibility study from the Dental Practice-Based Research Network. The Journal of American Dental Association; JADA 2012; 143(3): 262-269
Retrieved via http://jada.adaorg

Andreas Stang and Charles Poole (2010): Common problems related to the use of number needed to treat; Journal of Clinical Epidemiology; Volume63, Issue 8. pages 820-825, August 2010

Andrew Moore (2008): What is an NNT? Retrieved via www.whatisseries.co.uk

American Diabetes Association: Standards of Medical Care in Diabetes—2011: *Diabetes Care* 34 (Suppl. 1):S11–S61, 2011

Bala Raghavendra GN & Bhat SG (2010): "Glucometer as a chair-side device to assess blood glucose in periodontal patients"; Journal of the International Clinical Dental Research; September-December 2010; Volume 2-Issue 3- page130-135

Bandyopadhyay D, Marlow NM, Fernandes JK, Leite RS (2010): Periodontal disease progression and glycaemic control among Gullah African Americans with type-2 diabetes. *J Clin Periodontol* 37:501–509, 2010

Bilal Abdul Qayum Mirza, Ayma Syed, Faisal Izhar and Ayyaz Ali Khan (2010): Bidirectional relationship between diabetes and periodontal disease: Review of Evidence.Journal of Parkistan Medical Association; Volume 60, No 9, September 2010.

Brian L Mealey (2006): Periodontal disease and diabetes- A two-way street; JADA, vol 137, October,2006. http://jada.ada.org

Borrell LN, Kunzel C, Lamster I, Lalla E (2007): Diabetes in the dental office: using NHANES III to estimate the probability of undiagnosed disease. *J Periodontal Res* 42:559–565, 2007

Borrell LN, Crawford ND(2008): Social disparities in periodontitis among United States adults 1999-2004. *Community Dent Oral Epidemiol* 36:383–391, 2008

Bosnjak A, Plancak D, Curilovic Z(2001): Advances in relationship between periodontitis and systemic diseases. Acta Stomat Croat] 2001; 35(2):67–71

Bowyer V, Sutcliffe P, Ireland R, Lindenmeyer A, Gadsby R, Graveney M, Sturt J, Dale J (2011): Oral health awareness in adult patients with diabetes: a questionnaire study. British Dental Journel;2011 Sep23; 211(6)

Carda C, Carranza M, Arriaga A, Díaz A, Peydró A, Gomez de Ferraris ME(2005): Structural differences between alcoholic and diabetic parotid sialosis. *Med Oral Patol Oral Cir Bucal* 10:309–314, 2005

Carole A. Timpone (2012). Impelmentation of a coordinated care clinical education and practice model to promote health: the interprofessional diabetes clinic. Health and Interprofessional Practice 1(3):eP1025

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

Chen I (2000): The surgeon General's report on oral health: Implications for research and education. N Y State Dent J. 2000;66:38–42

Christopher James (2009):"Diagnosing diabetes in the dentist chair"; New York University. Retrieved via http://www.futurity.org/diagnosing-diabetes-in-the-dentist-chair/

Chua SS & Chan (2011). Medication adherence and achievement of glycemic target in ambulatory type-2 diabetic patients. Journal of applied Pharmaceutical Science; 01(040:2011:55-59

Consumers Association of Penang(2012): Prevalence of Diabetes in Malaysia: Updated" "34-million-or-149-malaysians-are diabetics"; retrieved on 15th October, 2013 via http://www.consumer.org.my/index.php/health/diseases/81

Correa FO, Gonçalves D, Figueredo CM, Bastos AS, Gustafsson A, Orrico SR(2010): Effect of periodontal treatment on metabolic control, systemic inflammation and cytokines in patients with type 2 diabetes. *J Clin Periodontol* 37:53–58, 2010

Dag A, Firat ET, Arikan S, Kadiroglu AK, Kaplan A (2009): The effect of periodontal therapy on serum TNF-alpha and HbA1c levels in type 2 diabetic patients. *Aust Dent J* 54:17–22, 2009

Darré L, Vergnes JN, Gourdy P, Sixou M (2008): Efficacy of periodontal treatment on glycaemic control in diabetic patients: a meta-analysis of interventional studies. *Diabetes Metab.* 34:497–506, 2008

De Souza Bastos A, Leite AR, Spin-Neto R, Nassar PO, Massucato EM, Orrico SR (2011): Diabetes mellitus and oral mucosa alterations: prevalence and risk factors. *Diabetes Res Clin Pract* 92:100–105, 2011

Ebersole JL, Holt SC, Hansard R, Novak MJ(2008): Microbiologic and immunologic characteristics of periodontal disease in Hispanic Americans with type 2 diabetes. *J Periodontol* 79:637–646, 2008

Ebersole JL, Stevens J, Steffen MJ, Dawson III D, Novak MJ (2010): Systemic endotoxin levels in chronic indolent periodontal infections. *J Periodontal Res* 45:1–7, 2010

Eldarat AH (2011): Awareness and attitude of diabetic patients about their increased risk for oral diseases. Oral Health Preventive Dentistry; 2011;9(3): 235-41

Eun-kyoung Kim,Sang Gyu Lee, Youn Hee Choi & et al (2013). Association between diabetes-related factors and clinical periodontal parameters in type-2 diabetes mellitus. BMC-Oral Health, 2013,13:64

European Federation of Periodontology (EFP, 2012): "EFP Manifesto: Perio and General Health". www.perioworkshop.efp.org

George W. Taylor (2001): "Bidirectional interrelationships between Diabetes and Periodontal diseases: An Epidemiologic Perspective"; Ann Periodontal 2001;6:99-112

Guaiguata L, Whiting D.R, Hambleton I, Beagley J, Linnenkamp U and Shaw JE (2014): Global estimates of diabetes prevalence for 2013 and projections for 2035. Diabetes Research and Clinical Practices 103 (2014) 137-149, International Diabetes Federation Diabetes Atlas

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

Guggenheimer J, Moore PA, Rossie K, Myers D, Mongelluzzo MB, Block HM, Weyant R, Orchard T(2000): Insulin-dependent diabetes mellitus and oral soft tissue pathologies: II. Prevalence and characteristics of non-candidal lesions. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 89:570–576, 2000

Haffajee AD, Socransky SS (2000): Microbial etiologic agents of destructive periodontal diseases. Periodontol. 2000;1994;5:78–111.

Kocgozlu L, Elkaim R, Tenenbaum H, Werner S (2009): Variable cell responses to P. gingivalis lipopolysaccharide. *J Dent Res* 88:741–745, 2009

Hummel J (2011): Health information exchange and care coordination of diabetic patients between medicine and dentistry; Diabetic Spectrum; Volume 24, number 4, 2011

Ian Scott (2008): Interpreting risks and ratios in therapy trials" Australian Prescriber; Volume 31, Number 1, February, 2008

Jones JA, Miller DR, Wehler CJ Rich SE, Krall-Kaye EA, McCoy LC, Christiansen CL, Rothendler JA and Garcia RI (2006): Does periodontal care improve glycemic controls? The Department of Veterans Affairs Dental Diabetes Study

Juliana Casqueiro, Janine Casquerio & Cresio Alves (2012): Infections in patients with diabetes mellitus: A review of pathogenesis ; Indian J Endocrinol Metab, March 2012; 16(suppl): S27-S36

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

Lalla E, Lamster IB, Feit M, Huang L, Spessot A, Qu W (2000): Blockade of RAGE suppresses periodontitis-associated bone loss in diabetic mice. J Clin Invest. 2000; 105:1117–24

Lalla RV, D'Ambrosio JA (2001): Dental management considerations for the patient with diabetes mellitus. *J Am Dent Assoc* 132:1425–1432, 2001

Lalla E, Kaplan S, Yang J, Roth GA, Papapanou PN, Greenberg S (2007): Effects of periodontal therapy on serum C-reactive protein, E-selectin, and tumor necrosis factor-alpha secretion by peripheral blood-derived macrophages in diabetes: a pilot study. *J Periodontal Res* 42:274–282, 2007

Lindenmeyer A, Bowyer V, Roscoe J, Dale J, Sutcliffe P (2012); Oral health awareness and care preferences in patients with diabetes: a qualitative study. Family Practices: an international journal, <http://wrap.warwick.ac.uk/50022

Liew AKC, Punnanithinout N, Lee Y-C and Yang J (2013).Effect of non-surgical periodontal treatment on Hba1C: a meta-analysis of randomized controlled trials. Australian Dental Journal 2013;58:350-357.doi:10.1111/adj.12091

Nazaimoon W M Wan (2013) : Research , Epidemiology " Prevalence of diabetes in Malaysia and usefulness of HbA1C as a diagnostic criterion". Diabetes Medicine.UK DOI10.1111/dme12161

Nishimura F, Iwamoto Y, Soga Y (2007): The periodontal host response with diabetes. Periodontol 2000. 2007; 43:245–53

Noor R, Sayeed F and Chadda V (2015): Diabetes and Periodontal disease- A bidirectional relationship; Annals of Dental Specialty Volume 3; Issue 2. April-June,2015.

Madden TE, Herriges B, Boyd LD, Laughlin G, Chiodo G, Rosenstein D (2008): Alterations in HbA1c following minimal or enhanced non-surgical, non-antibiotic treatment of gingivitis or mild periodontitis in type 2 diabetic patients: a pilot trial. *J Contemp Dent Pract* 9:9–16, 2008

Mafauzy M, Hussein Z, Chan S P (2011): The Status of Diabetes Control in Malaysia: Results of DiabCare 2008". Med J Malaysia Vol 66 No 3 August 2011, p175-181

Maha A bahammam (2015). Periodontal health and diabetes awareness among Saudi diabetes patients; Pateint Perference and Adherence 2015;9 , 225-233

Margaret J (2009)."Dental Care for the Diabetic Patients". The Preventive Angle: Volume 4, Issue 3

Marvin E Herring & Shiwan K Shah (2017). Periodontal Disease and control of Diabetes Mellitus. JAOA, Volume106, No.7, July 2006

Manfredi M, McCullough MJ, Vescovi P, Al-Kaarawi ZM, Porter SR (2004): Update on diabetes mellitus and related oral diseases. *Oral Dis* 10:187–200, 2004

Mastura M Nordin, Syakirah A Rahman, Renukanth PC , Raman & Ratina D Vaithilingan (2014)."Periodontal status and oral health knowledge among a selected population of Malaysian Type-2 Diabetes". Sains Malaysiana 43(8) (2014):1157-1163

Mealey BL, Ocampo GL (2007): Diabetes mellitus and periodontal disease. Periodontol 2000. 2007;44:127–53. [PubMed: 17474930]

Mealey BL(2008): The interactions between physicians and dentists in managing the care of patients with diabetes mellitus. *J Am Dent Assoc* 139 (Suppl. 5):4S–7S, 2008

Mikio Ota, Fumi Seshima. Nobuki Okubo, Takashi Kinumatsu, Sachiyo Tomita, Takeshi Okubo and Ataushi Saito (2013): A collaborative Approach to care for patients with periodontitis and diabetes. Bull Tokyo Dent Coll (2013), 54(1): 51-57

Mine K, Nejat A, Elif U, Faik Murat E (2005): The effect of improved periodontal health on metabolic control in type 2 diabetes mellitus. J Clin Periodontol. 2005; 32:266–72

MOH, Malaysia (2005): Clinical Practice Guidelines for Management of Chronic Periodontitis. Health Technology Assessment Unit, Medical Development Division, Ministry of Health, Malaysia, Putrajaya

MOH, Malaysia (2010): National Strategic Plan for Non-Communicable Disease, Medium Term Strategic Plan to Further Strengthen the Cardiovascular Disease and Diabetes Prevention and Control Program in Malaysia (2010-2014). Non-Communicable Disease Section, Disease Control Division, Ministry of Health Malaysia

MOH, Malaysia (2011): Country l Health Plan for Malaysia; 10th Malaysia Plan (2011-2015). Ministry of Health Malaysia.
www.moh.gov.my/images/gallery/report/country_health.pdf

MOH, Malaysia (2011): National Oral Health Plan for Malaysia (2011-2020). A Lifetime of Healthy Smiles, Oral Health Division, Ministry of Health Malaysia, February, 2011

Mohd Aznan Md Aris, Tin Myo Han & Robiatu Adawiyah Sulong(2014). Primary oral health care: Reasons for seeking treatment for oral health problems at there primary care clinics of Kuantan, Pahnag, Malaysia. www.irep.edu.my/34258

Moore PA, Guggenheimer J, Etzel KR, Weyant R and Orchard T (2001): Type 1 diabetes mellitus, xerostomia, and salivary flow rates. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 92:281–291, 2001

Moore PA, Zgibor JC, Dasanayake AP (2003): Diabetes: a growing epidemic of all ages. *J Am Dent Assoc* 134 (Suppl. 1):11S–15S, 2003

Oana A velea,Caroline Kralev, Dan Onisei, Doina Onisei, Luminita M Nica and Iulian P Velea (2013): Diabetes Mellitus nad Periodontal disease- A two way road: current concepts and future considerations (Literature review". European Scientific Journal, March 2013 edition, Vol 9,No9

Oanta Cornelia, Solomon Sorina, Pasarin Liliana & et al (2015). The effect of poor glycemic control and of non-surgical periodontitis therapy in patients with diabetes mellitus. Journal of Periodotology, Volume-5. Issue 3 July /September, 2015

Paster BJ, Olsen I, Aas JA, Dewhirst FE (2006): The breadth of bacterial diversity in the human periodontal pocket and other oral sites. *Periodontol 2000* 42:80–87, 2006

Peter Stanko & Lydie Izakovicova Holla (2014): Bi-directional association between diabetes mellitus and inflammatory periodontal disease; A review. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub.2014: 158:XX

Petersen P E & Ogawa H (2005): Strengthening the prevention of periodontal disease:

WHO approach; J Periodntal , December 2005; p 2187-2193s

Promsudthi A, Pimapansri S, Deerochanawong C, Kanchanavasita W (2005): The effect of periodontal therapy on uncontrolled type 2 diabetes mellitus in older subjects. *Oral Dis* 11:293–298, 2005

Pontes Andersen CC, Flyvbjerg A, Buschard K, Holmstrup P (2007): Relationship between periodontitis and diabetes: Lessons from rodent studies. J Periodontol. 2007;78:1264–75

Pucher J, Stewart J (2004): Periodontal disease and diabetes mellitus. Curr Diab Rep. 2004;4:46–50

Rafael Lozano *et al* (2012): Global and Regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global burden of diseases study 2010; The lancet, volume 380,Issue 9859, Pages 2095-2128, 15 December 2012; doi:10.1016/S0140-6736(12061728-0, Elsevier Ltd.

Ramasamy R, Vanucci SJ, Yan SS, Herold K, Yan SF, Schmidt AM (2005): Advanced glycation end products and RAGE: A common thread in aging, diabetes, neuro-degeneration, and inflammation. Glycobiology. 2005;15:16R–28R.

Rampal L *et al* (2010): Enhancing Diabetic Care in the Community in Malaysia: Need for a Paradigm Shift. Malaysian Journal of Medicine and Health Sciences Vol.6 (1), January 2011: iii- xi

Ravishankar Lingesha Telgi, Vaibhav Tandon, Pradeep Shankar Tangade, Amit Tirth, Sumit Kumar and Vipul Yadav (2013). Journal of Periodontal & Implant Science 2013;43:177-182. http//dx.doi.org/10.5051/jpis.2013.43.4.177

Rehana Yasmeen Bangash, Abid Ullah Khan, Khalid Mehmood Tariq 7 Ajmal Yousaf (2012): Oral aspects and complications in type-2 Diabetes Mellitus – A study. Parkistan Oral and Dental Journal Volume 32, No2, August, 2012

Renata S Leite, Nicole M Marlow & Jyotika K Fernandes (2013): Oral Health and Type-2 Diabetes; American Journal MedicineScience, 2013, April; 345(4):271-273. Doi:10.1097/MAJ.0b013e31828bdedf

Renukanth Patabi Cheta Raman, Tara Bai Taiyeb-Ali, Siew Pheng Chan, Karuthan Chinna and Rathna Devi Vaithilingan (2014): Effect of nonsurgical periodontal therapy verses oral hygiene instructions on type 2 diabetes subjects with chronic periodontitis: a randomised clinical trial; BioMed Sentral; http://www.biomedcentral.com/1472-6831/14/79

Ribeiro FV, de Mendon A AC, Santos VR, Bastos MF, Figueiredo LC, Duarte PM (2011): Cytokines and bone-related factors in systemically healthy and type 2 diabetic subjects with hronic periodontitis. *J Periodontol* Electronically published ahead of print on 22 August 2011. doi:10.1902/jop.2011.110324

Roberta santos Tunes, Maria Cristina Foss-Freitas, and Getulio da Rocha Nogueira (2010):
Impact of Periodontitis on the diabetes-related inflammatory status. J Canadian Dental Association, 2010; 76a35

Rugayah Bakri (2007): Diabetes epidemic in Malaysia; second national health and morbidity survey- diabetes among adults aged 30 years and above. Volume -9 .<http:www.diabetes.org.my/article.php?aid=63

Rutger G Persson (2011): Diabetes and Periodontal Disease: an update for health care providers. Diabetes Spectrum, Volume 24, Number 4, 2011

Ryan ME, Carnu O, Kamer A (2003):The influence on the periodontal tissues. J Am Dent Assoc. 2003;134:34S–40S

Sahril N, Aris T, Mohd Asari AS, Yaw SL, Omar MA, Tech CH, Abdul Muttalib K, Idzwan MF, Lan LL, Junid NZ, Ismail F, Ismil NA and Abu Talib N (2014) . Oral health seeking behaviour among Malaysians with type II diabetes; J public Health Aspects, 2014; 1:1

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

Satheesh Elangovan, Ruth Hertzman-Miller, Nadeem Karimbux,& Donald Giddon (2014); A Framework for Physician-Dentist Collaboration in Diabetes and Periodontitis; Volume 32, Number 4, 2014 • CLINICAL DIABETES

Saini R, Al-Maweri SA, Saini D, Ismail NM, Ismail AR (2010): Oral mucosal lesions in non-oral habit diabetic patients and association of diabetes mellitus with oral precancerous lesions. *Diabetes Res Clin Pract* 89:320–326, 2010

Saito T, Shimazaki Y, Kiyohara Y, Kato I, Kubo M, Iida M, Koga T (2004): The severity of periodontal disease is associated with the development of glucose intolerance in non-diabetics: the Hisayama study. *J Dent Res* 83:485–490, 2004

Salvi GE, Kandylaki M, Troendle A, Persson GR, Lang NP (2005): Experimental gingivitis in type 1 diabetics: a controlled clinical and microbiological study. *J Clin Periodontol* 32:310–316, 2005

Salvi GE, Franco LM, Braun TM, Lee A, Persson GR, Lang NP, Giannobile WV (2010): Pro-inflammatory biomarkers during experimental gingivitis in patients with type 1 diabetes mellitus: a proof-of-concept study. *J Clin Periodontol* 37:9–16, 2010

Saremi A, Nelson RG, Tulloch-Reid M, Hanson RL, Sievers ML, Taylor GW (2005): Periodontal disease and mortality in type 2 diabetes. Diabetes Care. 2005;28:27–32

Sayaka Katagirl, Hiroshi Nitta, Toshiyuki Nagasawa & et al (2013). Effect of glycemic control on periodontitis in type-2 diabetic patients with periodontal disease. Journal of Diabetes Investigation Volme 4, issue 3, May 2013

Scully C, Bagán JV, Eveson JW, Barnard N, Turner FM (2008): Sialosis: 35 cases of persistent parotid swelling from two countries. *Br J Oral Maxillofac Surg* 46:468–472, 2008

Seppala B, Sorsa T, Ainamo J. Morphometric analysis of cellular and vascular changes in gingival connective tissue in long term insulin-dependent diabetes. J Periodontol. 1997;68:1237–45. [PubMed: 9444601]

Shahida Maqscood, Hasan Baber, Maqsood Ahmed Soomro, Fauzia quadir, Quratul Ain Maqsood, Masood Anwar Qureshi and Sadiqa Syed(2016): Influence of non-surgical periodontal therapy on type-II diabetes mellitus.International Research Journal of Medicine and Medical Sciences; Vol.4(2),pp 24-30, June 2016

Shimada Y, Komatsu Y, Ikezawa-Suzuki I, Tai H, Sugita N, Yoshie H(2010): The effect of periodontal treatment on serum leptin, interleukin-6, and C-reactive protein. *J Periodontol* 81:1118–1123, 2010

Siddhartha Varma, Sarthak Bhola, Nagaraj Kalburgi and et al (2012). Correlation between Metabolic Control and Periodontal Parameters in Diabetic patients; Journal of Periodontology and Implant Dentistry,2012;4(1);19-23

Sims TJ, Lernmark A, Mancl LA, Schifferle RE, Page RC, Persson GR (2002): Serum IgG to heat shock proteins and Porphyromonas gingivalis antigens in diabetic patients with periodontitis. *J Clin Periodontol* 29:551–562, 2002

Simpson TC, Needleman I, Wild SH, Moles DR, Mills EJ (2010): Treatment of periodontal disease for glycaemic control in people with diabetes. *Cochrane Database Syst Rev* 12:CD004714, 2010

Simpson TC, Weldon JC, Worthington HV, Needleman I, Wild SH, Moles DR, Stevenson B, Furness S, Iheozor-EjioforZ (2015), "Treatment of periodontal disease for glycaemic control in people with diabetes mellitus (Review)" .Cochrane Database Syst Rev,2016

Skrepcinski FB, Niendorff WJ (2000): Periodontal disease in American Indians and Alaska Natives. J Public Health Dent; 2000;60: 261–6

Sreebny LM, Vissink A(2010): *Dry Mouth, The Malevolent Symptom: A Clinical Guide*. Hoboken, N.J., Wiley-Blackwell, 2010.

Stewart JE, Wager KA, Friedlander AH, Zadeh HH (2001): The effect of periodontal treatment on glycemic control in patients with type 2 diabetes mellitus. J Clin Periodontol. 2001;28:306–10

Strauss SM, Russell S, Wheeler A, Norman R, Borrell LN, Rindskopf D (2010): The dental office visit as a potential opportunity for diabetes screening: an analysis using NHANES 2003–2004 data. *J Public Health Dent* 70:156–162, 2010

Sophia C, William C H, George L K, Robert J G (2008); Periodontal disease- its impact on diabetes and glycemic control; Joslin Diabetes Center, Harvard Medical School.

Southerland JH, Taylor GW, Moss K, Beck JD, Offenbacher S (2006): Commonality in chronic inflammatory diseases: Periodontitis, diabetes, and coronary artery disease. Periodontol 2000. 2006;40:130–43

Teshome Amare and Yitayeh Asmare(2017): The effect of periodontal therapy on glycemic control and fasting plasma glucose level in type 2 diabetes patients: Systemic review and meta-analysis . BMC Oral Health (2017)17:31.doi 10.1186/s12903-016-0249-1

Tervonen T, Karjalainen K, Knuuttila M, Huumonen S (2000): Alveolar bone loss in type 1 diabetic subjects. J Clin Periodontol. 2000; 27:567–71

Tin Myo Han, Razida Ismail, Munirah Yaacob, Mohd Aznan Md Aris, Iskandar Firzada Osman, Mahendran Thuraiappah, Sorayah Sidek, Fa'iza Abdullah , Than Tun Sein, Roslan Bin Saub (2016): Validation of self-reported questionnaries to screen periodontal disease among diabetes patients: a study at selected health centers in Kuantan; Malaysian Family Physician, 2016, Volume 11, Supplement-1 ,p-9

Tsai C, Hayes C, Taylor GW (2002): Glycemic control of type 2 diabetes and severe periodontal disease in US adult population. Community Dent Oral Epidemiol. 2002;30:182–92.

Tuti N M et al (2013):Periodontal Status and Provision of Periodontal Services in Malaysia : Trends and Way Forward. Malaysia Journal of Public Health Medicine 2013, Vol 13(2):38-47

Umer A et al: Oral Health Care in Malaysia – A Review (2011): Pakistan Oral & Dental Journal Vol 31, No-1 (June 2011).

Wallerstedt E, Sandqvist M, Smith U, Andersson CX (2011): Anti-inflammatory effect of insulin in the human hepatoma cell line HepG2 involves decreased transcription of IL-6 target genes and nuclear exclusion of FOXO1. *Mol Cell Biochem*. 352:47–55, 2011

Wang TT, Chen TH, Wang PE, Lai H, Lo MT, Chen PY, Chiu SY(2009): A population-based study on the association between type 2 diabetes and periodontal disease in 12,123 middle-aged Taiwanese (KCIS No. 21). *J Clin Periodontol* 36:372–379, 2009

Whelton H (2004): Functions of saliva. In Saliva and Oral Health, 3rd ed. Edgar M, Dawes C, O'Mullane D, Eds. London, *British Dental Association*, 2004, p. 3

Wild S, Roglic G, Green A, Sicree R, King H (2004): Estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27:1047–53

Wijnand J T, Victor E A G, Bruno G L(2010). Effect of periodontal treatment on glycemic control of diabetic patients; Diabetes Care, volume 33, Number 2, February 2010, 421-427

Xiaojing Li, Kristin M, Kolltveit, Leif Tronstad & Ingar Olsen (2000): "Systemic Disease caused by oral infection"; Clinical Microbiology Review, Oct 2000, vol 13,no4 p547-558

Xiong X, Buekens P, Vastardis S, Pridjian G (2006): Periodontal disease and gestational diabetes mellitus. *Am J Obstet Gynecol* 195:1086– 1089, 2006

Yoon MS, Jankowski V, Montag S, Zidek W, Henning L, Schlüter H, Tepel M, Jankowski J (2004): Characterisation of advanced glycation endproducts in saliva from patients with diabetes mellitus. *Biochem Biophys Res Commun* 15:377–381, 2004

Yuen HK, Wolf BJ, Bandyopadhyay D, Magruder KM, Salinas CF, London SD (2009): Oral health knowledge and behavior among adults with diabetes. *Diabetes Res Clin Pract* 86:239–246, 2009

Valerie J. H. Powell & Franklin M. Din (2008): Call for an Integrated (Medical/Dental) Health Care Model that Optimally Supports Chronic Care, Pediatric Care, and Prenatal Care as a Basis for 21st Century EHR Standards and Products: EHR Position Paper. Robert Morris University v17b.

Zohaib Akram, Nor A Baharudin, Rathna D. Vaithilingam, Zubaidah H .A (2016). Effect of nonsurgical periodontal treatment on clinical periodontal variables and salivary resistin levels in obese Asians. J-STAGE Advance Pubication:December 28, 2016

APPENDICES:

Appendix- 1: Gantt's chart

Activity	2015							2016												2017							
Months	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J
Proposal writing up & Defence to OUM	x	x	x	x																						
Preparing to conduct the project (administration & academic including a pilot test)				x	x	x	x																			
Collection data (validation of the SRQs)								x	x																	
Collection data Screening DM & PD										x																
Collecting data Coordinated care evaluation (1st time) including clinical trial											x	x														
Collecting data Coordinated care evaluation (2st time) including clinical trials																	x	x								
Data analysis & Presentation at OUM																		x	x	x	X					
Writing up Thesis																					X	x	x	x		
Thesis Defence																									x	x

Appendix 2 -a: Questionnaires to assess the Periodontal Disease among DM patients at Medical Clinics (English version)

Remark: All information collected are kept as confidential one and only use for academic purposive to improve management of Diabetes and Periodontal disease

A-I	General Information of the clinic		
A1-1 A1-2	Name of Clinic: 1. KK Jaya Gading 2. KK Kurnia 3. KK Paya Besar Date of Data Collection (dd/mm/yyyy): / /2015		
	Demographic Background ; DM &HPT profile & Clinical Risk assessment of participant *Data collection method: Face to face interview with participants &* *Timing: after taking consent form for participation*		
No	Questions	Answer	Code
A1-3	Name of Participant		
A1-4	ID Card Number (last 6 digits)	☐☐☐☐☐☐	
A1-5	Participants' Contact No		
A1-6	Birth date (dd/mm/yyyy)	☐☐☐☐☐☐☐☐	
A1-7	Gender	1. Male 2. Female	
A1-8	Race	1. Malay 2. Chinese 3. Indian 4.Other (Please mention)_____	
A1-9	Occupation	----------	
A1-10	Weight (Kg)	----------	
A1-11	Height (m)	----------	
A1-12	Blood pressure (mm Hg)	Systolic: Diastolic:	
A1-13	Year of Diabetes Mellitus diagnosed (yyyy)	☐☐☐☐	
A1-14	Current Diabetes mediation	1. Oral hypoglycaemic agent(OHA) 2. Insulin Injection 3. both OHA and Insulin injection	
A1-15 (OR) A1-16	Fasting blood glucose level Date (dd/mm/yyyy) *	---------- mmol/l (/ /2015)	
	Random blood glucose level Date (dd/mm/yyyy)* *(*On the day of data collection)*	---------- mmol/l (/ /2015)	
A1-17	HbA1C(dd/mm/yyyy) **	-------- % (/ / 2015)	
A1-18	Lipid Profile (dd/mm/yyyy) ** 1.Total Cholesterol (mmol/l) 2.TG (mmol/l) 3.LDL-C (mmol /l) 4.HDL (mmol/l) *(* *within 3 months)*	(/ /2015) 1.---------- 2.---------- 3.---------- 4.----------	

A2	Self- Reported Questionnaires for Periodontal Disease Assessment *Timing & Collection method: Data will be collected after taking Q-A 1 by Self-administered method*		
A2-1	Do you think you have gum disease?	1. Yes 2.No	
A2-2	Overall, how would you rate the health of your teeth and gums?	1. Good 2. Fair 3. Bad	
A2-3	Have you ever had treatment for gum disease, such as scaling and root planning, sometimes called "deep cleaning"?	1. Yes 2.No	
A2-4	Have you ever had teeth become loose on their own without injury?	1. Yes 2.No	
A2-5	Have you ever been told by a dental profession that *you have gum disease?*	1. Yes 2.No	
A2-6	During the past 3 months, have you noticed that "your gum" doesn't look good?	1. Yes 2.No	
A2-7	Did you use "dental floss" or "other devices" to clean between your teeth in the last 7 days?	1. Yes 2.No If Yes, *How many times?* ____ times per day	
A2-8	Did you use *mouthwash or other dental rinse* for treating" *dental problems"* in the last 7 days?	1. Yes 2.No If Yes, *how many times?* ____ times per day	
A2-9	Do you have following symptoms* 1. Bleeding when brushing, flossing or eating food 2. Gums are swollen, red or painful for no apparent reason 3. Teeth look longer and the smile appear more "toothy" 4. Bad breath/halitosis/ a foul odour mouth 5. Loosening or shifting of the teeth in the affected area 6. Pus oozing from between the teeth	 1. Yes 2. No 1. Yes 2. No 1. Yes 2. No 1. Yes 2. No 1. Yes 2. No 1. Yes 2. No	
Based on A2-1-A28	Periodontal Disease screening status	1.Screening Positive 2.Screening Negative	

A3	Participants'' perception on PD screening using self-reported questionnaires at medical clinic *Data collection method & Timing: Face to face interview after answering Q –A2 (PD screening using SRQ)*		
A3-1	Do you know that DM is related to Periodontal disease? (*Please Circle one answer)*	1. Yes 2. No	
A3-2	Do you know that periodontal disease screening can be done using self-reported questionnaires *(Before this survey)*? (*Please Circle one answer)*	1. Yes 2. No	
A3-3	Did you do dental check-up within last 1 (ONE) year? (*Please Circle one answer)*	1. Yes 2. No	
A3-4	Have you ever done Periodontal Disease screening using self-reported questionnaires at medical clinics (*Before this survey)?* *(Please Circle one answer)*	1. Yes 2. No	
A3-5	Do you agree to do Periodontal Diseases screening using self-reported questionnaires at medical clinics? (*Please Circle one answer)*	1. Strongly disagreed 2. Disagreed 3. No comment 4. Agreed 5. Strongly agreed	
A3-6	Do you agree that Periodontal Disease effects on glycemic control of DM patients? *(Please Circle one answer)*	1. Strongly disagreed 2. Disagreed 3. No comment 4. Agreed 5. Strongly agreed	
A3-7	Do you agree that you will get benefit from screening Periodontal Diseases for your general health especially diabetes (*Please Circle one answer)*	1. Strongly disagreed 2. Disagreed 3. No comment 4. Agreed 5. Strongly agreed	

A4	Assessment on Oral Hygiene Practices &Lifestyle related Risk Factors Assessment of participant *Data collection method and Timing : face to face interview with participants at Medical Clinics*		
A4-1-A	Oral Hygiene Practices *Please Circle more than one*	1. Tooth brushing using tooth paste and brush one time per day (morning) 2. Tooth brushing using tooth paste and brush 2 times per day (morning/ before going to sleep) 3. Tooth brushing 3 times per day (morning, before going to sleep & after eating food) 4. Use mouth wash 5. Use flossing 6. Use Xylitol gum 7.Other ----------	
A4-1 B	Have you ever changed your Oral Hygiene Practices during last 3 months	1. Yes 2. No	
A4-2 A	Smoking Status *Please Circle one answer* **Type of smoking (Cigarette, cigar , pipe, e-cigarette, other)*	1. Non-smoker 2. Ex-smoker 2.1 Quit smoking ____months ago 2.2 Duration of smoking ___years 3. Current Smoker 3.1 Duration ____ years 3.2.Type*_____ 3.3 Amount (_____days)	
A4-2 B	Have you ever changed your smoking status during last 3 months	1. Yes 2. No	
A4-3 A	Exercise Status (within 3 months)	<u>Frequency</u> 1. Never exercise 2. Irregular exercise 3.Regular exercise <u>Duration of exercise</u> _____ minute per section ----------section/day _____ days per week <u>Type of Exercise</u> 1. Gardening 2. Housework 3.Walking /jogging in Park 4. Gym 6.Zumba /Aerobic /other ---------- ----------	
A4-3 B	Have you ever changed your exercise status during last 3 months	1. Yes 2. No	

A4-4 A	Diet status (last 24 hours) *Frequency & Type and amount of meal*	1.Breakfast What food & drink with Amount Yesterday 1.1---------- 1.2---------- 1.3---------- 2.Lunch What food & drink with Amount Yesterday 2.1---------- 2.2---------- 2.3---------- 3.Dinner What food & drink with Amount Yesterday 3.1---------- 3.2---------- 3.3---------- 4.Supper What food & drink with Amount Yesterday 3.1---------- 3.2---------- 3.3---------- 5.Snack 5.1 How many times per days ---------- 5.2 What kind of food mostly have & Amount per one time--------- ----------	
A4-4 B	Have you ever changed your diet & habit* during last 3 months (* Changing unhealthy (fatty) food to healthy food , Time of eating, ,frequency of meal)	1. Yes 2. No	

A-5	Periodontal Disease Health Status Assessment to confirm Screening Results At Dental & PD specialists' Clinic *Data collection method: Filled by Dental Profession*		
A-5-1	Date of Periodontal Disease Screening (dd/mm/yyyy)	☐☐☐☐ ☐☐☐☐	
A-5-2	Periodontal Disease screening status by Self Reported Questionnaires	1. PD screening positive 2.PD screening Negative	
A.5-3	Date and Time of PD assessment appointment	Date : / / Time :	
A-5-4	Sign of Periodontal Disease: *(please circle more than one)*	1. Redness of gingiva 2. Bleeding on probing /spontaneous 3. Loose teeth 4 .Spacing between teeth 5.Calculus	
A-5-5	BPE Score (0 to 4)	<table><tr><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td></tr></table>	
A-5-6	Periodontal Health status classified by PD specialist	1. Healthy Gingiva 2. Gingivitis 3. Periodontitis	
A5-7	If Periodontitis is diagnosed , Treatment plan for Periodontitis		
A5-8	If other oral disease is found, suggestion /action for it		

Appendix 2-b: Soal selidik Saringan status PD pesakit DM di Klinik Perubatan Penjagaan Utama

Catatan: Semua maklumat yang dikumpul dan disimpan adalah rahsia dan hanya digunakan untuk tujuan akademik bagi meningkatkan pengurusan pesakit Diabetes dan penyakit gusi.

A-I	Maklumat Am Klinik		
A 1.1 A 1.2	Nama klinik: 1. KK Jaya Gading 2. KK Kurnia 3. KK Paya Besar Tarikh Pengumpulan Data (hari/bulan/tahun): / /2015 Nama Pengumpul Data & Nombor Telefon: _____		
	Latar Belakang Demografi & Profil pesakit DM & Penilaian Risiko Klinikal Peserta *Kaedah pengumpulan data: Temu bual secara bersemuka dengan pesakit dan mengambil profil DM dari rekod DM* *Masa: Data akan dikumpulkan selepas mengambil persetujuan untuk penyertaan*		
No.	Soalan	Jawapan	Kod untuk kemasukan data
A1-3	Nama Peserta	----------	
A1.4	Nombor KP (6 digit terakhir)	☐☐☐☐☐☐	
A1-5	No. Telefon Pesakit		
A1.6	Tarikh Lahir (hari/bulan/tahun)	☐☐☐☐☐☐☐☐	
A1-7	Jantina	1. Lelaki 2.Perempuan	
A1-8	Bangsa	1. Melayu 2. Cina 3. India 4.Lain-lain (nyatakan)-----	
A1-9	Pekerjaan		
A 1-10	Berat (Kg)		
A1-11	Tinggi (m)		
A1-12	Tekanan Darah (mmHg)	Sistolik: mmHg Diastolik: mmHg	
A1-13	Jika anda mempunyai kencing manis, sila sebutkan didiagnosis tahun	Kencing Manis (yyyy) ☐☐☐☐	
A1-14	Ubat DM terkini	1. Pil/Oral Agen hipoglisemik (OHA) 2. Suntikan Insulin 3. Kedua-duanya	
A1-15	Paras gula dalam darah semasa berpuasa Tarikh (hari/bulan/tahun)*	------ -- mmol/l (/ / 2015)	
(OR) A-1-16	Paras gula dalam darah semasa tidak berpuasa Tarikh (hari/bulan/tahun)* (*Pada hari pengambilan data)	------ -- mmol/l (/ / 2015)	
A1-17	HBA1C% terkini Tarikh (hari/bulan/tahun)**	_____ % (__/____/__2015)	
A1-18	<u>Profil Lipid**</u> (terkini (tarikh : hari/bulan/tahun) 1. Jumlah Kolesterol (mmol/l) 2. TG (mmol/l) 3. LDL-C (mmol/l) 4. HDL (mmol/l) (**Dalam masa 3 bulan terakhir)	(/ /2015) 1. _____ 2. _____ 3. _____ 4. _____	

A-2	Soal selidik yang diisikan Sendiri untuk Penilaian Penyakit Gusi *Kaedah kutipan & masa: Data akan dipungut Setelah mengambil Q-A 1 oleh Tadbir sendiri kaedah(Sila bulatkan pilihan jawapan anda)*		
A 2-1	Adakah anda rasa anda menghidap penyakit gusi?	1. Ya 2. Tidak	
A2-2	Secara keseluruhan, bagaimana anda menilai kesihatan gigi dan gusi anda?	1. Baik 2. Sederhana 3. Tidak baik	
A2-3	Pernahkah anda mendapat rawatan untuk penyakit gusi, seperti cuci karang gigi dan perancangan akar, kadang-kadang dikenali sebagai "pembersihan gigi dalam"?	1. Ya 2.Tidak	
A2-4	Pernahkah gigi anda menjadi longgar sendiri tanpa sebarang kecederaan?	1. Ya 2. Tidak	
A2-5	Adakah anda pernah diberitahu oleh doktor gigi yang anda menghi dap penyakit gusi?	1. Ya 2. Tidak	
A2-6	Sepanjang tempoh 3 bulan yang lepas, adakah anda menyedari gusi anda tidak sihat	1. Ya 2. Tidak	
A2-7	Adakah anda menggunakan “floss” gigi atau” alat yang lain” untuk membersih celah gigi anda dalam tempoh 7 hari yang lepas?	1. Ya 2.Tidak Jika Ya, berapa kali; ..... x sehari	
A2-8	Adakah anda menggunakan ubat kumur atau lain2 produkuntuk merawat masalah gigi dan gusi dalam tempoh 7 hari yang lepas?	1. Ya 2.Tidak Jika Ya, berapa kali? ..... x sehari	
A2-91	Adakah anda mempunyai gejala seperti berikut 1. Pendarahan ketika memberus gigi, menggunakan flos atau semasa makan 2. Gusi bengkak, merah atau sakit tanpa sebab 3. Gigi kelihatan lebih panjang dan senyuman yang kelihatan lebih "toothy" 4. Nafas berbau / mulut berbau / mulut bau busuk 5. Gigi longgar atau teranjak dalam kawasan yang terjejas 6. Nanah meleleh diantara gigi	1. Ya 2. Tidak 1. Ya 2. Tidak 1. Ya 2. Tidak 1. Ya 2. Tidak 1. Ya 2. Tidak 1. Ya 2. Tidak	
Ulasan Berdasarkan A2-1-A2-8	Status saringan penyakit periodontal *(Untuk kegunaan Pembantu Penyelidik)*	1.Saringan Positif 2.Saringan Negatif	

A-3	Persepsi Peserta mengenai pemeriksaan PD menggunakan soal selidik yang dijawab sendiri di klinik perubatan *Kaedah pengumpulan data & masa: ditadbir sendiri selepas menjawab Q – A2* *(PD saringan menggunakan SRQ)*		
A3-1	Adakah anda tahu bahawa DM berkait dengan penyakit gusi? *(Sila bulatkan satu jawapan)*	1. Ya 2. Tidak	
A3-2	Adakah anda tahu bahawa saringan penyakit gusi boleh dilakukan dengan menggunakan soal selidik yang dijawab sendiri? (*Sebelum Kajian ini)* *(Sila bulatkan satu jawapan)*	1. Ya 2. Tidak	
A3-3	Adakah anda melakukan pemeriksaan gigi dalam tempoh 1 tahun yang lalu? *(Sila bulatkan satu jawapan)*	1. Ya 2. Tidak	
A3-4	Adakah anda pernah melakukan pemeriksaan bagi penyakit gusi dengan menggunakan soal selidik (yang dijawab sendiri) di klinik perubatan? *Sebelum Kajian ini)(Sila bulatkan satu jawapan)*	1. Ya 2. Tidak	
A3-5	Adakah anda bersetuju untuk melakukan saringan Penyakit gusi menggunakan borang soal selidik yang dijawab sendiri di klinik perubatan? *(Sila bulatkan satu jawapan)*	1. Sangat tidak bersetuju 2. Tidak bersetuju 3. Tiada komen 4 Setuju 5. Sangat bersetuju	
A3-6	Adakah anda bersetuju bahawa Penyakit gusi memberi kesan terhadap kawalan gula pesakit DM? *(Sila bulatkan satu jawapan)*	1. Sangat tidak bersetuju 2. Tidak bersetuju 3. Tiada komen 4 Setuju 5. Sangat bersetuju	
A3-7	Adakah anda bersetuju bahawa anda akan mendapat manfaat dari saringan penyakit Periodontal bagi Kesihatan umum anda terutama penyakit kencing manis *(Sila bulatkan satu jawapan)*	1. Sangat tidak bersetuju 2. Tidak bersetuju 3. Tiada komen 4 Setuju 5. Sangat bersetuju	

A4	Penilaian Amalan Kebersihan oral & Penilaian Faktor Risiko pesakit DM *Kaedah pengumpulan data dan Masa: Temubual secara berhadapan dengan Pesakit di Klinik Perubatan*		
A4-1-A	Amalan Kebersihan oral (dalam mulut) *Sila bulatkan jawapan anda* *(Anda boleh bulatkan lebih daripada 1)*	1. Memberus gigi menggunakan ubat gigi dan berus (pagi) 2. Memberus gigi menggunakan ubat gigi dan berus (pagi / sebelum tidur) 3. Memberus (pagi, sebelum tidur & selepas makan) 4. Penggunaan pencuci mulut 5. Penggunaan flos gigi 6. Penggunaan Xylitol gusi 7.Lain-lain _____	
A4-1-B	Adakah anda menukar amalan kebersihan oral anda dalam masa 3 bulan yang lepas?	1. Ya 2. Tidak	
A-4-2 A	Status Merokok *Sila bulatkan jawapan anda*	1. Bukan perokok 2. Bekas Perokok 2.1 Berhenti merokok ___ bulan yang lalu 2.2 Tempoh merokok ___ tahun 3. Perokok 3.1 Tempoh ____tahun 3.2.Jenis _____ 3.3 Jumlah (_____ / hari)	
A4-2-B	Adakah anda menukar status merokok anda dalam masa 3 bulan yang lepas?	1. Ya 2. Tidak	
A4-3-A	Status Senaman (Sila bulatkan status senaman anda dalam tempoh 3 bulan yang lepas)	<u>Kekerapan</u> 1. Tiada senaman 2. Senaman yang tidak teratur 3. Senaman yang kerap <u>Tempoh Senaman</u> _____minit dalam satu sesi _____sesi dalam sehari _____hari dalam seminggu <u>Jenis senaman</u> 1. Berkebun 2. Kerja rumah 3.Berjalan/ berjoging di taman 4. Gimnasium 6. Zumba/Aerobic/Lain-lain (sila nyatakan)_____ _____	
A4-3B	Adakah terdapat perubahan dalam corak senaman anda dalam tempoh 3 bulan yang lepas?	3. Ya 4. Tidak	

A4-4 A	Status Pemakanan (Dalam masa 24 jam yang lepas/semalam) Jenis dan kuantiti makanan serta kekerapannya	1.Sarapan pagi Nyatakan makanan & minuman yang diambil beserta kuantiti 1.1 _____ 1.2 _____ 1.3 _____ 2. Makan tengah hari Nyatakan makanan & minuman yang diambil beserta kuantiti 2.1 _____ 2.2 _____ 2.3 _____ 3. Makan Malam Nyatakan makanan & minuman yang diambil beserta kuantiti 3.1 _____ 3.2 _____ 3.3 _____ 4. Makan Selepas Makan Malam Nyatakan makanan & minuman yang diambil beserta kuantiti 4.1 _____ 4.2 _____ 4.3 _____ 5. Snek/Makanan ringan 5.1 Berapa kali _____ __5.2 Nyatakan jenis makanan yang diambil & Kuantiti _____	
A4-4B	Adakah anda pernah menukar amalan* pemakanan anda dalam masa 3 bulan yang lepas? (*Penukaran makanan tidak sihat kepada makanan sihat/waktu makan/kekerapan dan kuantiti pemakanan)	1. Ya 2. Tidak Jika ya, nyatakan perubahan _____	

A-5	Periodontal Disease Health Penilaian Status mengesahkan Screening Keputusan daripada SRQs-MM Pada klinik Pergigian PPCCs kaedah pengumpulan data: Diisi oleh Dental Profesion		
A-5-1	Tarikh Penyakit periodontal Saringan (dd / mm / yyyy)	☐☐☐☐☐☐☐☐	
A-5-2	Periodontal Disease saringan status oleh sendiri dilaporkan soal	1. PD Positif 2. PD Negatif	
A.5-3	Date and Time of PD assessment appointment	Date : / / Time :	
A-5-4	Aftar Penyakit periodontal: (Sila bulatkan lebih daripada satu)	1. Kemerahan pada gingiva 2. Pendarahan pada menyelesaikan sesuatu / spontan 3. gigi longgar 4 .Spacing antara gigi 5.Calculus	
A-5-5	Skor BPE (0 to 4)		
A-5-6	Status Periodontal Health didiagnosis oleh pakar PD	1. gingiva Sihat 2. Gingivitis 3. Periodontitis	
A5-7	Jika Periodontitis didiagnosis, pelan Rawatan untuk Periodontitis		
A5-8	Jika penyakit mulut lain ditemui, cadangan / tindakan untuk itu		

Appendix 3-a: Checklist for adherence of DM care provided by the medical team under the medical-dental coordinated care (English Version)

<table>
<tr><td>I</td><td colspan="3">Checklist for the Coordinated care provided by Medical Professions for Glycemic control & Risk Factors Assessment
Data collection method: face to face interview with Patient at Medical clinics
Timing: Data was collected before and after taking PD treatment from PD specialist</td></tr>
<tr><td></td><td colspan="3">Name of Patient: Contact No:</td></tr>
<tr><td></td><td>Baseline
1st time Date :</td><td>PD Treatment Date & Clinics</td><td>(6 months after baseline)
2nd time Date:</td></tr>
<tr><td>1.1</td><td>HbA1C (%)
Result:_____ mmol/l
1.Uncontrolled (> 6.5 mmol/l)
2. Controlled (≤ 6.5 mmol/l)</td><td rowspan="2">PD Specialists ‘Clinic Name
1. KK Paya Besar
2. KOD, IIUM
Date :</td><td>HbA1C (%)
Result:_____ mmol/l</td></tr>
<tr><td>1.3</td><td>Lipid Profile (Baseline)
Total Cholesterol:
TG:
LDL-C:
HDL:</td><td>Lipid Profile
Total Cholesterol:
TG:
LDL-C:
HDL:</td></tr>
<tr><td>1.4</td><td>Waist Circumference (by DM Nurse)</td><td colspan="2">------- cm</td></tr>
<tr><td>1.5</td><td>BMI (Wt in Kg & Ht in meter) (by DM nurse)</td><td colspan="2">-----Kg / ------ meter ; BMI :……..</td></tr>
<tr><td>1.6</td><td>ECG (by MOs/FMS)</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>1.7</td><td>Urine Analysis with microalbuminuria (by MOs/FMS)</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>1.8</td><td>Fundoscopy (by MOs/FMS)</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>1.9</td><td>Diabetes foot Examination (By DM nurse)</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>1.10</td><td>Counseling on Exercise, Quitting smoking (by MOs/FMS)</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>1.11</td><td>Referral to Nutritionist/ Dietician</td><td colspan="2">1. Done 2. Not done</td></tr>
<tr><td>II</td><td colspan="3">Lifestyle related risk factors & DM medication changes assessment
(Method & timing: face to face interview after completion of PD treatment)</td></tr>
<tr><td>2.1</td><td>Have you ever changed your Oral Hygiene Practices during last 6 months</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>2.2</td><td>Have you ever changed your smoking status during last 6 months</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>2.3</td><td>Have you ever changed your exercise status during last 6 months</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>2.4</td><td>Have you ever changed your diet & habit* status during last 6 months
*(unhealthy food to healthy food ,timing & frequency of meal)</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>2.5</td><td>Have your diabetes medication changed during 6 months</td><td colspan="2">1.Yes 2.No
If Yes, please mention changes</td></tr>
</table>

Lampiran 3-b: Senarai Semak untuk pematuhan penjagaan DM disediakan oleh pasukan perubatan di bawah penjagaan terselaras perubatan pergigian (Malay Version)

<table>
<tr><td>I</td><td colspan="3">Senarai Semak untuk penjagaan Coordinated disediakan oleh Profesion Perubatan untuk kawalan glisemik &Penilaian Faktor Risiko
kaedah pengumpulan data: muka ke temuduga muka dengan pesakit di klinik Perubatan
Masa: Data dikumpulkan sebelum dan selepas mengambil rawatan PD dari pakar PD</td></tr>
<tr><td></td><td colspan="2">Nama Peserta</td><td>No telefon Pesakit</td></tr>
<tr><td></td><td><u>Baseline</u>
1 Tarikh masa 1:</td><td>Rawatan PD Tarikh & Klinik</td><td>6 bulan selepas asas
Tarikh masa 2:</td></tr>
<tr><td>1.1</td><td><u>HbA1C (%)</u>
Result:_____ mmol/l
1.Uncontrolled (> 6.5 mmol/l)
2. Kawalan ≤ 6.5 mmol/l)</td><td rowspan="2"><u>PD Specialists</u>
<u>‘Clinic Name</u>
1. KK Paya Besar
2. KOD, IIUM
Date :</td><td><u>HbA1C (%)</u>
Result:_____
1.Uncontrolled (> 6.5
2. Kawalan ≤ 6.5</td></tr>
<tr><td>1.3</td><td><u>Profil Lipid (Baseline)</u>
Jumlah Cholesterol:
TG:
LDL-C:
HDL:</td><td><u>Profil Lipid</u>
Jumlah Cholesterol:
TG:
LDL-C:
HDL:</td></tr>
<tr><td>1.4</td><td>Pinggang lilitan</td><td colspan="2">------- cm</td></tr>
<tr><td>1.5</td><td>BMI (Wt di Kg & Ht dalam meter)</td><td colspan="2">-----Kg / ------ meter BMI:</td></tr>
<tr><td>1.6</td><td>ECG</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>1.7</td><td>Analisis air kencing dengan microalbuminuria</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>1.8</td><td>Fundoscopy</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>1.9</td><td>Peperiksaan kaki Diabetes</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>1.10</td><td>Kaunseling on Exercise, merokok Berhenti</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>1.11</td><td>Rujukan kepada Pakar Pemakanan / Dietician</td><td colspan="2">1.Ya, 2.Tidak</td></tr>
<tr><td>II</td><td colspan="3">Berkaitan dengan gaya hidup faktor risiko & ubat DM perubahan penilaian
(Kaedah & masa: bersemuka temubual selepas selesai rawatan PD)</td></tr>
<tr><td>2.1</td><td colspan="2">Adakah anda pernah berubah Amalan Kebersihan Mulut anda semasa 6 bulan yang lepas</td><td>1.Ya, 2.Tidak</td></tr>
<tr><td>2.2</td><td colspan="2">Adakah anda pernah berubah status merokok anda selama 6 bulan yang lepas</td><td>1.Ya, 2.Tidak</td></tr>
<tr><td>2.3</td><td colspan="2">Adakah anda pernah berubah status latihan anda selama 6 bulan yang lepas</td><td>1.Ya, 2.Tidak</td></tr>
<tr><td>2.4</td><td colspan="2">Adakah anda pernah berubah diet & tabiat anda * status semasa 6 bulan yang lepas * (makanan yang tidak sihat kepada makanan yang sihat, masa & kekerapan makan)</td><td>1.Ya, 2.Tidak</td></tr>
<tr><td>2.5</td><td colspan="2">Adakah ubat kencing manis anda berubah selama 6 bulan</td><td>1.Ya 2.Tidak
Jika Ya, sila sebutkan perubahan</td></tr>
</table>

Appendix 4-a: Checklist for adherence of periodontal treatment care provided by the PD specialists under the medical-dental coordinated care specialists (English version)

I	The Serial Periodontal Health Status Assessment by PD specialist under the coordinated care : *Data collection method: Filled by Dental Profession at Dental Clinics* *(Timing: Data was collected 3 times (3monthly) after accepting Periodontal treatment appointment)*		
	(Baseline (1st Visit) 1st time Date :	(3months after baseline) 2nd time Date:	(6months after baseline) 3rd time Date:
1.1	Sign of PD (Base line) *(please circle or tick if present)* 1.Redness of gingiva 2.Bleeding on probing/spontaneously 3.Loose teeth 4.Spacing between teeth 5.Calculus	Sign of PD (2nd time) 1.Redness of gingiva 2.Bleeding on probing/spontaneously 3.Loose teeth 4.Spacing between teeth 5.Calculus	Sign of PD (3rd time) 1.Redness of gingiva 2.Bleeding on probing/spontaneously 3.Loose teeth 4.Spacing between teeth 5.Calculus
1.2	Total Dentition status =	Total Dentition status =	Total Dentition status =
1.3	BPE score (0-4) =	BPE Score (0-4) =	BPE Score (0-4) =
1.4	BOP (FMBS) % =	BOP (FMBS) % =	BOP (FMBS) % =
1.5	CAL (mean) mm =	CAL (mean) mm =	CAL (mean) mm =
1.6	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =
1.7	PD Diagnosis 1. Localized (mild/ moderate /severe) 2. Generalized (mild/moderate/severe) 3. Generalized periodontitis + localized abscess	PD Diagnosis 1. Localized (mild/ moderate /severe) 2. Generalized (mild/moderate/severe) 3. Generalized periodontitis + localized abscess	PD Diagnosis 1. Localized (mild/ moderate /severe) 2. Generalized (mild/moderate/severe) 3. Generalized periodontitis + localized abscess
1.8	Treatment	Treatment	Treatment
1.9	Remark 1. Completed PD treatment 2. Incomplete PD treatment If not completed by patients → Please ask Reasons for incomplete Tx		

Lampiran 4-b: Senarai Semak untuk pematuhan penjagaan rawatan periodontal disediakan oleh pakar-pakar PD di bawah pakar penjagaan terselaras perubatan pergigian (versi Melayu)

I	Serial Periodontal Health Penilaian Status oleh pakar PD di bawah jagaan yang diselaraskan: Kaedah Pengumpulan data: Diisi oleh Dental Profesion di Klinik Pergigian (Tarikh: Data dikumpulkan 3 kali (3monthly) selepas menerima pelantikan rawatan periodontal)		
	(Baseline (1st Visit) 1st time Date :	(3months after baseline) 2nd time Date:	(6months after baseline) 3rd time Date:
1.1	Asas Tanda-tanda PD: *Sila bulatkan atau tandakan* 1 Kemerahan gusi 2. Pendarahan gusi 3. Gigi longgar 4 .Jarak antara gigi 5. Kehadiran deposit kelabu / kuning pada gigi	3 Bulan Tanda-tanda PD: *Sila bulatkan atau tandakan* 1 Kemerahan gusi 2. Pendarahan gusi 3. Gigi longgar 4 .Jarak antara gigi 5. Kehadiran deposit kelabu / kuning pada gigi	6 Bulan Tanda-tanda PD: *Sila bulatkan atau tandakan* 1 Kemerahan gusi 2. Pendarahan gusi 3. Gigi longgar 4 .Jarak antara gigi 5. Kehadiran deposit kelabu / kuning pada gigi
1.2	Status Jumlah gigi =	Status Jumlah gigi =	Status Jumlah gigi =
1.3	BPE score (0-4) =	BPE Score (0-4) =	BPE Score (0-4) =
1.4	BOP (FMBS) % =	BOP (FMBS) % =	BOP (FMBS) % =
1.5	CAL (mean) mm =	CAL (mean) mm =	CAL (mean) mm =
1.6	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =	PPD (%) <4mm (healthy site) (/) = Site≥ 4mm (/) = Site≥ 6mm (/) =
1.7	Keterukan PD 1. Setempat (ringan / sederhana / teruk) 2. Teritlak (ringan / sederhana / teruk) 3. periodontitis Teritlak + bernanah setempat	Keterukan PD 1. Setempat (ringan / sederhana / teruk) 2. Teritlak (ringan / sederhana / teruk) 3. periodontitis Teritlak + bernanah setempat	Keterukan PD 1. Setempat (ringan / sederhana / teruk) 2. Teritlak (ringan / sederhana / teruk) 3. periodontitis Teritlak + bernanah setempat
1.8	Rawatan	Rawatan	Rawatan
1.9	Catatan 1. rawatan PD Bidang 2. Rawatan PD yang tidak lengkap Jika tidak diselesaikan oleh pesakit ◊ Sila tanya Sebab-sebab yang tidak lengkap Tx		

Appendix 5-a: Checklist of the medical-dental coordinated care provided by the medical team and periodontal specialists (English version)

Project Title : "Effectiveness of Periodontal Disease Treatment on Glycemic Control of DM Patients study
Researchers: 1. Prof. Dr. Mohd Aznan Bin Md Aris(0139388163)2.Dr. Tin Myo Han (0169902895), 3. Dr.Iskandar Firzada Osman (0195576334) , 4.Dr Razida binti Ismail (0199899873) 5. Dr. Munirah Yaacob (0192504226) 6. Dr Wan Hasma (0199315972), 7. Dr Mohd Fairuz Bin Harun (0139831002) , 8. Dr V Siva Nathan (0199366188) 9. Dr Siti Suhaila Suradi (013-9527329),10 . Datin Dr. Sorayah Binti Sidek (0126362303),11 . Datin Dr. Fa'iza Bt Abdullah (0139832404)
Duration of Project: June 2016 to September, 2016
"Sharing Diabetes and Periodontal Status information of DM patients with Periodontal Disease for Dental-Medical Care Coordinated Care by Medical Officers/ Family Medicine Specialists and Periodontal Specialists,

Name of Clinic: KK Jaya Gading/ KK Paya Bersar/KK Kurnia/PD Clinic, KK Paya Bersar, PD Clinic, KOD

No	DM-PD Code (DM Code)	Name, (IC/No)& Contact No	HbA1C& Lipid Profile Results Before PD Tx	PD Treatment Schedule (Clinic) & PD Status	DM-PD Coordinated Care Activities	HbA1C& Lipid Results After PD Tx
1			Test Date: HbA1C = Total Cholesterol = TG= LDL = HDL =	PD clinic (KOD/KKPB) Date of Visit: PD Diagnosis :s	*MOs/FMS: Encourage to take PD treatment & Care for DM Done (Date:) #PD Specialist: Encourage to take regular DM follow-up & Care for PD Done (Date:)	Test Date: HbA1C = Total Cholesterol = TG= LDL = HDL =

Remark by Medical Officer/Family Medicine Specialist / Periodontal Specialist
Name of Dr: Date: / /2016

Lampiran 5-b: format Pengumpulan Data untuk penilaian HbA1C, rawatan periodontal di klinik diabetes klinik dan PD pakar '(versi Melayu)

Tajuk Projek: "Keberkesanan Periodontal Rawatan Penyakit Kawalan glisemik kajian DM Pesakit
Penyelidik: 1. Prof. Dr. Mohd Aznan Bin Md Aris (0139388163) 2.Dr. Tin Myo Han (0169902895), 3. Dr.Iskandar Firzada Osman (0195576334), 4.Dr Razida binti Ismail (0199899873) 5. Dr. Munirah Yaacob (0192504226) 6. Dr Wan Hasma (0199315972), 7. Dr Mohd Fairuz bin Harun (0139831002), 8. Dr V Siva Nathan (0199366188) 9. Dr Siti Suhaila Suradi (013-9.527.329), 10. Datin Dr. Sorayah Binti Sidek (0126362303), 11. Datin Dr. Fa'iza Bt Abdullah (0139832404)
Tempoh Projek: Jun 2016 hingga September, 2016
"Berkongsi Diabetes dan periodontal maklumat Status pesakit DM dengan Penyakit periodontal untuk Dental-Medical Care Care Coordinated oleh Pegawai Perubatan / Pakar Perubatan Keluarga dan periodontal Specialists,

Nama Klinik: KK Jaya Gading / KK Paya Bersar / KK Kurnia / Klinik PD, KK Paya Bersar, PD Clinic, KOD

No	DM-PD Kod (Kod DM)	Nama Peserta Nombor KP & Nombor Telefon Pesakit	HbA1C & Lipid profil Keputusan sebelum Rawatan PD	Rawatan PD Jadual (Clinic) & PD Status	DM-PD Aktiviti Penjagaan Waktu	HbA1C & Lipid profil Keputusan Selepas Rawatan PD
			Tarikh ujian HbA1C = Total Cholesterol = TG= LDL = HDL =	Klinik PD (KOD / KKPB) Tarikh Lawatan: PD Diagnosis :	* MO / FMS: Menggalakkan mengambil rawatan PD & Penjagaan DM Selesai (Tarikh:) # PD Specialist: Menggalakkan mengambil biasa DM follow-up & Penjagaan PD Selesai (Tarikh:)	Tarikh ujian HbA1C = Total Cholesterol = TG= LDL = HDL =

Catatan oleh Medical Pegawai / Pakar Perubatan Keluarga / Periodontal Specialist:
Nama Dr : Tarikh : / / 2016

Appendix 6-a: Checklist for evaluation of the medical-dental coordinated care provided by the medical team and periodontal specialists and confirmation of co-morbidity status (English version)

I	Experiences and Perception of DM patient with PD on Medical –Dental Coordinated care Data collection method: Telephone *interview with Patient by Research Assistant* *(Timing to ask question: Last follow up visit- after finishing coordinated care by PCPs & PD specialists)*		
No	Questions	Answer	Code
1.1	Did you take PD treatment from Periodontal specialist completely? If Yes →How many times/visit within 6 months	1. Yes 2. No _____ times /6 months	
1.2	Did you have any inconvenience to take treatment at Periodontal specialists' clinic?	1. Yes 2.No If Yes, Please mention	
1.3	Did you have any inconvenience to take treatment at Medical Clinics for your Diabetes Mellitus?	1. Yes 2.No If Yes, Please mention	
1.4	Did you receive encouragement of Medical Officers/Family physicians/DM nurses to take PD treatment completely	1. Yes 2. No	
1.5	Did you receive encouragement of Periodontal Specialists to take regular DM follow-up	1. Yes 2. No	
1.6	Do you aware the coordinated care provided by medical doctor and periodontal specialist together for your diabetes and periodontitis?	1. Yes 2. No	
1.7	Do you think that you will get better health for diabetes and periodontitis by receiving coordinated care by medical doctors and periodontal specialist?	1. Strongly disagreed 2. Disagreed 3. No comment 4.Agreed 5. Strongly agreed	
1.8	Do you agree to encourage other DM patients with Periodontal disease to receive coordinated care provided by medical doctor and periodontal specialist for their diabetes and periodontitis?	1. Strongly disagreed 2. Disagreed 3. No comment 4.Agreed 5. Strongly agreed	
II	Co-morbidity Assessment (only one time assessment)		
2.1	Do you have other chronic disease	1. No 2. Yes If Yes, please mention name of disease 1. Hypertension 2. Dyslipidaemia 3. Obesity 4. Ischemic Heart disease (myocardial infarct, TIA) 5. Heart Disease 6. Stoke 7. Eye disease 8.Renal Disease 9. Others ----------	

Lampiran 6-b: Senarai Semak untuk penilaian penjagaan terselaras perubatan pergigian disediakan oleh pasukan perubatan dan pakar periodontal dan pengesahan status ko-morbiditi (Versi Melayu)

I	Pengalaman dan Persepsi pesakit DM dengan PD pada Medical -Dental penjagaan Coordinated kaedah pengumpulan data: temu bual telefon dengan Pesakit oleh Pembantu Penyelidik (Masa untuk bertanya soalan: ikut lepas sehingga visit- selepas tamat penjagaan terselaras oleh doktor perubatan & pakar PD)		
No	Soalan	Jawapan	Kod
1.1	Adakah anda mengambil rawatan PD dari Periodontal pakar sepenuhnya? Jika Ya →How banyak kali / melawat dalam tempoh 6 bulan	1. Ya 2. Tiada _____ Kali / 6 bulan	
1.2	Adakah anda mempunyai apa-apa kesulitan untuk mengambil rawatan di klinik pakar periodontal '?	1. Ya 2.No Jika Ya, Sila nyatakan	
1.3	Adakah anda mempunyai apa-apa kesulitan untuk mengambil rawatan di Klinik perubatan untuk kencing manis anda?	1. Ya 2.No Jika Ya, Sila nyatakan	
1.4	Adakah anda menerima galakan daripada Pegawai Perubatan / doktor Keluarga / jururawat DM mengambil rawatan PD sepenuhnya	1. Ya 2. Tiada	
1.5	Adakah anda menerima galakan Pakar Periodontal mengambil biasa DM susulan	1. Ya 2. Tiada	
1.6	Adakah anda sedar penjagaan diselaraskan disediakan oleh doktor perubatan dan pakar periodontal bersama-sama untuk kencing manis dan periodontitis anda?	1. Ya 2. Tiada	
1.7	Adakah anda berfikir bahawa anda akan mendapat kesihatan yang lebih baik untuk kencing manis dan periodontitis dengan menerima penjagaan diselaraskan oleh doktor perubatan dan pakar periodontal?	1. Sangat tidak bersetuju 2. tidak bersetuju 3. Tiada komen 4.Agreed 5. Sangat bersetuju	
1.8	Adakah anda bersetuju dengan menggalakkan pesakit DM lain dengan penyakit periodontal untuk menerima penjagaan terselaras diberikan oleh doktor perubatan dan pakar periodontal untuk kencing manis dan periodontitis mereka?	1. Sangat tidak bersetuju 2. tidak bersetuju 3. Tiada komen 4.Agreed 5. Sangat bersetuju	
II	Co-morbiditi Penilaian		
2.1	Adakah anda mempunyai penyakit kronik yang lain	1. Tiada 2. Ya Jika Ya, sila sebutkan nama penyakit 1. Hipertensi 2. Dyslipidaemia 3. Obesiti penyakit 4. iskemia jantung (Infarct miokardium, TIA) 5. Penyakit Jantung 6. Stoke penyakit 7. Mata Penyakit 8.Renal 9. Lain-lain ---------- ----------	

Appendix -7: Normal glycemic control level (Ref: The hands-on guide on data interpretation (Sasha Abraham, 2010, Wiley-Blackwell)

HbA1C Range (%)	Suggests average blood glucose of approximate (mmol/l)	Explanation
4.0- 6.5	3-8	Normal for those without DM
6-5-7.5	8-10	target range for DM patients
8-10	11-14	High
>9.5	>15	very high

Appendix 8: National Type -2 DM treatment Guidelines (Malaysia) 2009

Glycemic Control indicators	Level
Fasting	4.4 -6.1 mmol/l
Non- fasting	4.4 -8.0 mmol/l
HbA1C (%)	<6.5 %

Appendix-9: Glycemic control of the DM patients under routine DM care at Primary care clinics (Ref: Type-2 DM records study in Klinik Kasihatan Bandar Kuantan by Dr Fai'za Bt Abdullah, Dr Tin Myo Han and Dr Ida Zuriaty Ismail (2013-2014)

Glycemic Control Indicators	Sample size (n)	Minimum	Maximum	Mean	SD
Fasting (1 year before)	121	3.8	18.6	7.87	3.5
Fasting (after 1 year DM routine treatment)	122	3.4	16.1	7.88	2.3
Non- fasting (1 year before)	80	4.1	26.5	10.06	4.41
Non- fasting (after 1 year DM routine treatment)	75	4.1	24.7	10.10	4.1
HbA1C (%) (1 year before)	176	5.1	14.6	8.24	2.12
HbA1C (%)(after 1 year DM routine treatment)	180	4.2	14.1	8.28	2.21

Appendix-10: Sample size computation based HbA1 C level

```
. sampsi 7.5  9, sd1(2.1) sd2(3.2) power(.8) alpha(0.05)

Estimated sample size for two-sample comparison of means

Test Ho: m1 = m2, where m1 is the mean in population 1
                  and m2 is the mean in population 2
Assumptions:

         alpha =    0.0500  (two-sided)
         power =    0.8000
            m1 =       7.5
            m2 =         9
           sd1 =       2.1
           sd2 =       3.2
         n2/n1 =      1.00

Estimated required sample sizes:

            n1 =        52
            n2 =        52

.
```

Appendix-11-A : Ethical Approval letter for phase-1 of the study from the Research Management Centre, MAHSA University, Malaysia on 19th Januaray, 2015

MAHSA UNIVERSITY

Research Management Centre, MAHSA University
Office of Deputy Vice-Chancellor (Research & Innovation)

19th January 2015

To : **Prof. Datuk Dr. D.M Thuraiappah**
Faculty of Medicine

Dear Datuk,

Final Approval Letter – "A Preliminary Study on Early Detection of Bidirectional Relationships between Diabetes and Periodontal Disease Among the Patients from Public and Private Primary Care and MAHSA University Dental Clinics to Provide Medical-Dental Coordinated Care."
(Ref no: RP 70-10/14).

The research proposal as per above, in which you are the Principal Investigator, has been reviewed by the Joint Research and Ethics Committee on 6th November 2014 and has been approved without any condition.

The Research Management Centre (RMC) is satisfied and would like to extend the final approval for the research proposal and Ethical Clearance for the same project.

Thank you.

Yours Sincerely,

Associate Professor Datuk Dr. Rozaidah Bt. Talib
Deputy Vice-Chancellor (Research & Innovation)

Appendix-11-B : Ethical Approval letter for phase-2 of the study from the IIUM Research Ethicas Committee (IREC) on 17th February, 2015

MAHSA UNIVERSITY

KPT/JPT/DPT/JUS/W18

Research Management Centre, MAHSA University
Office of Deputy Vice-Chancellor (Research & Innovation)

19th January 2015

To : Prof. Datuk Dr. D.M Thuraiappah
Faculty of Medicine

Dear Datuk,

Final Approval Letter – "A Preliminary Study on Early Detection of Bidirectional Relationships between Diabetes and Periodontal Disease Among the Patients from Public and Private Primary Care and MAHSA University Dental Clinics to Provide Medical-Dental Coordinated Care." (Ref no: RP 70-10/14).

The research proposal as per above, in which you are the Principal Investigator, has been reviewed by the Joint Research and Ethics Committee on 6th November 2014 and has been approved without any condition.

The Research Management Centre (RMC) is satisfied and would like to extend the final approval for the research proposal and Ethical Clearance for the same project.

Thank you.

Yours Sincerely,

.....

Associate Professor Datuk Dr. Rozaidah Bt. Talib
Deputy Vice-Chancellor (Research & Innovation)

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الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيورسيتي إسلام انتارابغسا ملسيا
(Company No.1010671-T)

KULLIYYAH OF MEDICINE

Our Ref. : IIUM/305/14/11/2/IREC 308
Date : 17th February 2015

Assoc. Prof. Dr. Mohd Aznan B Md Aris (Principal Investigator)
Department of Family Medicine
Kulliyyah of Medicine,
International Islamic University Malaysia,
Indera Mahkota Campus
25200 Kuantan, Pahang.

Dear Assoc. Prof. Dr. Mohd Aznan B Md Aris,

The IIUM Research Ethics Committee (IREC) has reviewed your study protocol as mentioned below:-

ID NO.	:	**IREC 308**
TITLE	:	**Effectiveness of Periodontal Treatment on Glycemic Control of Diabetes Patients Who Attend at the Selected Public Primary Care Clinics in Kuantan, Pahang**
REGISTRATION DATE	:	**10th November 2014**
CO-INVESTIGATOR	:	**Dr. Tin Myo Han, Dr. Fa'iza BT Abdullah, Dr. Iskandar Firzada Osman (KK Jaya Gading), Dr. Sorayah bt sidek (KK Paya Besar) and Dr Munirah Yaacob**
STUDENT	:	**-**
NAME OF SITE	:	**Public primary care clinics in Kuantan, Pahang**
DURATION	:	**1st August 2014 - 31st July 2016**

The IIUM Research Ethics Committee (IREC) operates in according to the Declaration of Helsinki, International Conference of Harmonization Good Clinical Practice Guidelines (ICH-GCP), Malaysia Good Clinical Practice Guidelines and Council for International Organizations of Medical Sciences (CIOMS) International Ethical Guidelines.

The following documents have been received and reviewed to the above study:-

1. Study Protocol: version 1, dated 10th November 2014
2. Information Sheet:
   i. Version 1, revision 01, dated 5th January 2015 (English)
   ii. Version 1, revision 01, dated 5th January 2015 (Malay)
3. Consent Form:
   i. Version 1, dated 10th November 2014 (English)
   ii. Version 1, dated 10th November 2014 (Malay)

QUALITY SYSTEM
SIRIM
CERTIFIED TO MS ISO 9001:2000
Registration No. AR 3074

Decision by IIUM Research Ethics Committee (IREC):

(√) Approved
( ) Disapproved

Date of Approval: **16th February 2015**

The investigator(s) are required to:

a) **to register the study with National Medical Research Register (NMRR) for any study done in Ministry of Health (MOH) facilities.**
b) notify IREC of any change in protocol and obtaining further ethical approval as appropriate.
c) report any adverse incident during the course of a study to IREC even if the incident is not directly related to the study.
d) to report serious adverse event (SAE) within 24 hours.
e) to report minor adverse event within 2 weeks.
f) complete and return the IREC Progress Report Form on **every six (6) month** to the IREC Secretariat. On every six (6) month the investigator will be given two (2) weeks duration to submit the report and failure to submit, IREC will terminate the ethics approval.
g) complete and submit the End of Project Report Form to the IREC Secretariat's Office.

Thank you.

Yours sincerely,

PROF. DATO' DR. TARIQ ABD RAZAK
Chairman, IREC

Copy : Protocol File - IREC 308