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# N I H BULLETIN

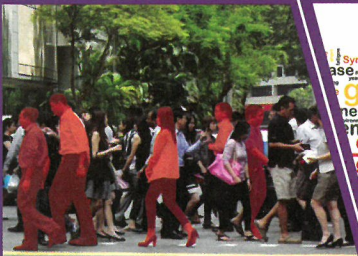
NATIONAL INSTITUTES OF HEALTH, MINISTRY OF HEALTH MALAYSIA



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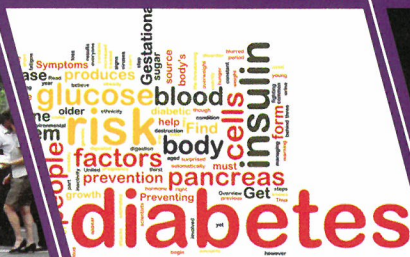
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FROM THE DESK.....  
**CHIEF EDITOR**

Diabetes mellitus is a growing global epidemic, and Malaysia is certainly no exception. Its alarming increase in prevalence is monitored locally by the National Health and Morbidity Survey (NHMS). This is a grave matter considering that about 40% of Malaysians are overweight or obese. This risk factor is a major contributor to diabetes, which is a chronic disease with significant long term complications.



Thought to be due to a combination of both genetic and environmental factors, a lot of research has been conducted on the genes involved in type 2 diabetes. However, the cost effectiveness and implications of introducing routine genetic testing to the population are unknown.

A specific cohort that warrants special care is diabetes in pregnancy, whether previously diagnosed or gestational diabetes mellitus. Considering that hyperglycaemia in pregnancy can cause negative impact on both mother and baby, it is important to manage these women carefully from preconception, throughout gestation, during childbirth and even in the postpartum period.

Diabetes is just one example from many non-communicable diseases all of which share common modifiable risk factors. In 2014, The Malaysian Adult Nutrition Survey found that several recommendations made the article 'Salt, Sugar, Fat : The Top 10 Daily Food Favourites' should be considered if we aim to reduce the amount of salt, sugar and fat we use in our food.

Other interesting reads include a pilot study on carbonated drinks, posters and journal abstracts related to diabetes. I wish to invite all readers to comment on this issue.

*Suraiya Syed Mohamed*

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# National Health and Morbidity Survey : TRENDS IN PREVALENCE OF DIABETES MELLITUS IN MALAYSIA

*Muhammad Fadhli Mohd Yusoff*  
Institute for Public Health

**DIABETES MELLITUS** (DM) is a major lifestyle disease with increasing prevalence globally and it has become a global public health threat. It is one of the major causes of premature illness and death in most countries, mainly through the increased risk of cardiovascular diseases (CVD). The World Health Organization (WHO) estimated that in 2014, 9% of adults 18 years and above had diabetes. The International Diabetes Federation (IDF) reported that in 2013, about 382 million people were diabetic and the number of affected people is expected to increase to 592 million by the year 2035.

In Malaysia, the prevalence of diabetes is monitored through a regular national survey, the National Health and Morbidity Survey (NHMS) by the Ministry of Health (MOH) Malaysia. The NHMS is a representative household health survey of the Malaysian population. The aim is to provide health-related community-based data to support the MOH in reviewing health priorities, programme strategies and activities, and planning for allocation of resources. The non-communicable diseases (NCDs) which include diabetes and NCD risk factors have been studied since the first NHMS in 1986, which reflects the importance of NCD surveillance in the country. This article aims to highlight the rising trend of diabetes in Malaysia.

Based on NHMS, the prevalence of diabetes among adults 18 years and above in Malaysia is on an increasing trend. This trend could be seen from NHMS 2006, 2011 and 2015 as the surveys used a similar methodology and target groups for the diabetic module. As the target group for diabetic module in NHMS 1996 was among adults 30 years and above, the findings could not be included in studying the trend of diabetes among adults 18 years and above. In 2006, the prevalence of diabetes among adults 18 years and above was 11.6%. The prevalence increased to 15.2% in 2011 and 17.5% in the most recent NHMS 2015 (Figure 1). The increase was mainly contributed by undiagnosed cases where the prevalence had increased from 4.5% in 2006, 8.0% in 2011 and 9.2% in 2015. More than half of diabetic patients detected in NHMS 2011 and NHMS 2015 had never been diagnosed before. The increase in prevalence of known diabetes is relatively small compared to undiagnosed cases; which was 7.0% in 2006 and 8.3% in 2015.

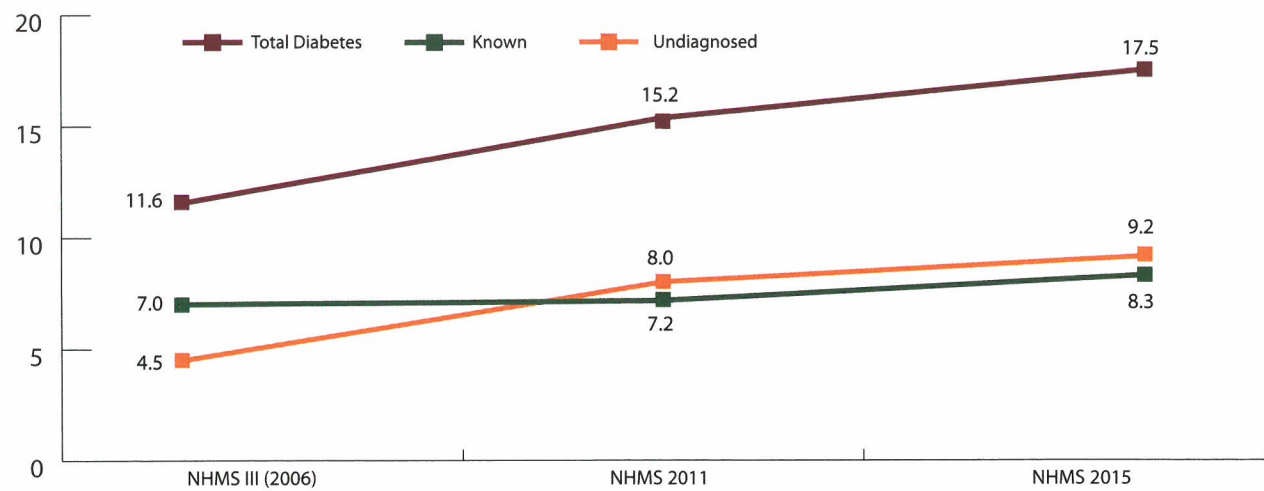


Figure 1: Prevalence of Diabetes among adults 18 years and above  
Source: NHMS 2006, 2011 and 2015

The prevalence of diabetes among adults 30 years and above in Malaysia has shown an increasing trend; from 8.3% in 1996 to 14.9% in 2006, 20.8% in 2011 and 22.5% in 2015 (Figure 2). The increasing trend of the overall prevalence was contributed mostly by previously undiagnosed cases which was at 1.8% in 1996, 5.4% in 2006, 10.1% in 2011 and 11.9% in 2015. It is noted that more than half of the diabetic cases detected in NHMS 2015 had never been diagnosed before. On the other hand, there has not been much change in the prevalence of known diabetic cases for the past 10 years.

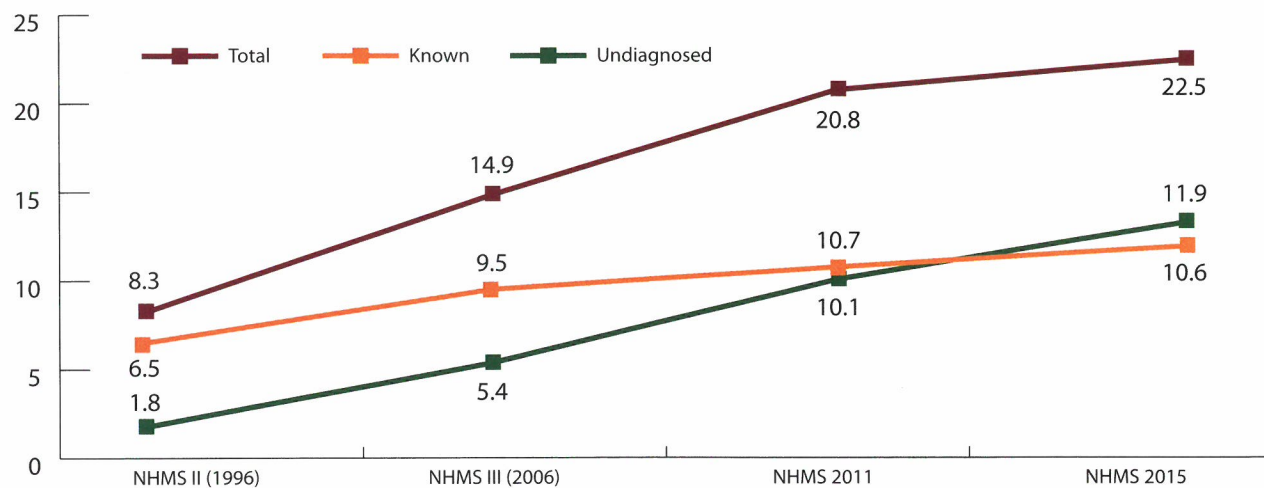


Figure 2: Prevalence of Diabetes among adults 30 years and above  
Source: NHMS 1996, 2006, 2011 and 2015

The increasing trend in the prevalence of diabetes in Malaysia is consistent with the increasing trend of obesity, which is one of the risk factors for diabetes. Obesity or being overweight has been reported as the main reason for Type 2 DM. The prevalence of obesity was 4.5% in 1996, and it increased to 14.0% in 2006, 15.1% in 2011 and 17.7% in 2015. In 2015, almost half (47.7%) of adults 18 years and above in Malaysia were obese or overweight.

# HYPERGLYCEMIA IN PREGNANCY

## from the NATIONAL OBSTETRICS

### REGISTRY Malaysia

Shamala Devi Karalasingam,  
National Clinical Research Centre, Malaysia  
Ravichandran Jeganathan,  
Hospital Sultanah Aminah Johor

**PREGNANCY** is a diabetogenic state manifested by insulin resistance and hyperglycemia. Hyperglycemia in pregnancy is divided into Diabetes Mellitus in pregnancy (Diabetes known before pregnancy) and Gestational Diabetes Mellitus (GDM) which is any degree of glucose intolerance with onset or first recognition in pregnancy. The current definition of GDM is under close scrutiny and a new definition and classification is in the horizon.

There has been many controversies in screening and diagnosing GDM. The most commonly used guidelines for the diagnosis of GDM were from the WHO, American Congress of Obstetricians and Gynaecologists, National Institute for Health and Care Excellence (NICE) and the International Association of Diabetes and Pregnancy Study Groups (IADPSG).

GDM is common in Malaysia and it has significant maternal and fetal implications. From the National Obstetrics Registry (NOR) Malaysia, the incidence of GDM from the Malaysian tertiary hospitals from 2010-2014 was 9.1% with a significant incidence among the Indians. The incidence of Diabetes known before pregnancy was less than 1%.

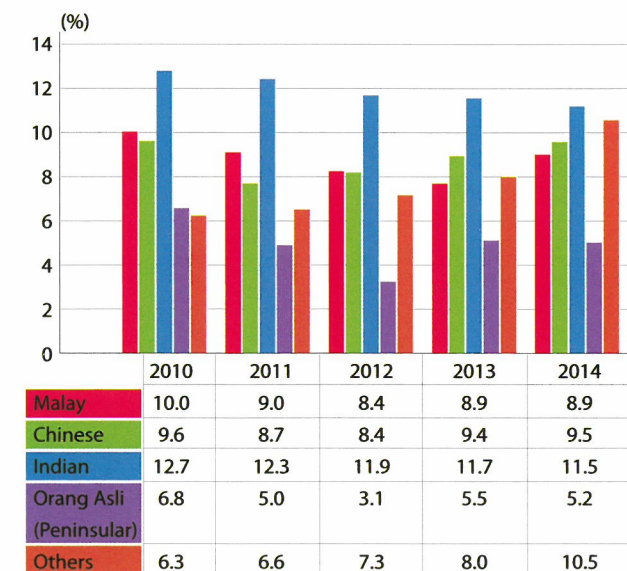


Figure 1: Incidence of GDM by Ethnicity from Malaysian Tertiary Hospitals from NOR

Malaysia has favored selective screening for GDM however the current recommendation by the International Federation of Gynecology and Obstetrics (FIGO) and 5th CPG Management of Type 2 DM, Malaysia 2015 is that all pregnant women should be tested for hyperglycemia in pregnancy. This suggestion for universal screening is yet to be applied nationwide.

Hyperglycemia in pregnancy is associated with higher incidence of Caesarean section, postpartum hemorrhage, shoulder dystocia, birth trauma, stillbirth, congenital anomalies and macrosomia. Obesity is on the rise and these pregnant women are at risk of hyperglycemia and its consequences. The diagnostic criteria for GDM is Fasting plasma glucose  $\geq 5.1$  mmol/L and 2-h value  $\geq 7.8$  mmol/L adapted FIGO, IADPSG and NICE guidelines.

The detection of hyperglycemia in pregnancy offers a window of opportunity for the continued follow up of these women after pregnancy to prevent, delay and detect the early onset of diabetes in the future.

#### Recommendations in the management of Hyperglycemia in Pregnancy

1. Preconception counselling for good glycaemic control before women embark into pregnancy.
2. HbA1c levels should be  $<6.5\%$ .
3. Nutrition and physical activity counselling to encourage women to choose the right quantity of food and the level of physical activity.
4. Folic acid supplementation to be commenced 3 months prior to pregnancy.
5. When lifestyle changes are not adequate in controlling hyperglycaemia, insulin is required.
6. Metformin may be used during the 2nd and 3rd trimesters to achieve glycaemic control.
7. Universal screening for all pregnant women for hyperglycaemia in pregnancy.
8. At the 6 weeks postpartum visit, women who had GDM should be screened for Diabetes.
9. Public health measures to increase awareness of this condition to reduce maternal and perinatal morbidity and mortality is crucial.

# UNDIAGNOSED TYPE 2 DIABETES MELLITUS (T2DM) AMONG MALAYSIANS

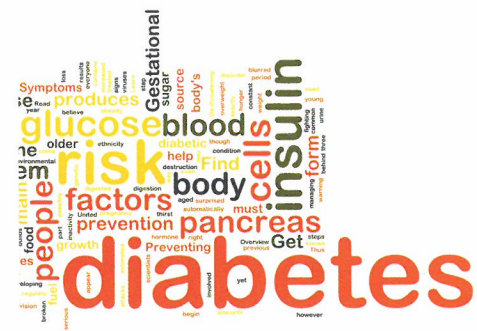
## FINDINGS FROM THE NATIONAL HEALTH AND MORBIDITY SURVEY (NHMS) 2015

Hasimah Ismail and Tee Guat Hiong  
Institute for Public Health (IPH)

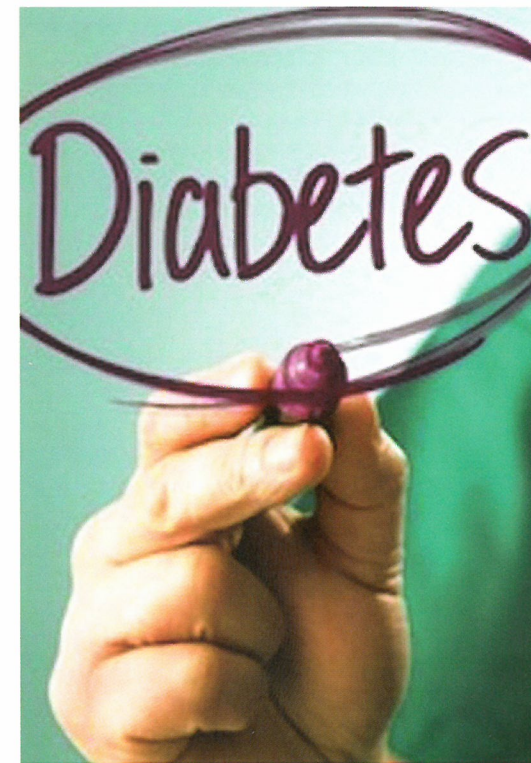
The prevalence of diabetes has increased dramatically in the last decade. A large number of individuals who have T2DM do not realize that they have the disease. Undiagnosed T2DM impose substantial implications because these individuals remain untreated and are at risk for developing fatal complications. Diabetes-related complications including cardiovascular diseases, kidney diseases, neuropathy, blindness and lower extremity amputation are significant causes of increased morbidity and mortality among people with diabetes; and result in a heavy economic burden on the Malaysian health care system. The earlier a person is diagnosed and management of diabetes begin, the better the chances of preventing harmful and costly complications.



The National Health and Morbidity Survey 2015 was a nationwide cross-sectional study involving 19,935 respondents. Two stage stratified sampling design was used to select a representative sample of the Malaysian adult population aged 18 years and above for the survey. Data were obtained from respondents using structured validated questionnaires via face-to-face interviews.



Respondents who claimed to be non-diabetics were tested for their glucose levels by using Accutrend GC machine on fasting blood. For the purpose of this study, a respondent was classified as having "undiagnosed diabetes" when the respondent was not known to have diabetes and had a fasting capillary blood glucose (FBG) of 6.1 mmol/L or more (or non-fasting capillary blood glucose of more than 11.1 mmol/L).



The overall prevalence of diabetes was 17.5%. The prevalence of undiagnosed T2DM increased from 8.7% (n=903) in 2011 to 9.2% (n=2103). The highest prevalence of undiagnosed T2DM was found among females (9.2%), 65-69 years old (13.6%), Indians (11.9%), with no formal educational attainment (12.9%), not working (10.6%), widow/widower/divorcee (12.2%) and smokers (9.5%).

Our study found several risk factors significantly associated with undiagnosed T2DM; namely age, ethnicity, education level, obesity and hypertension. Screening is crucial to detect early signs of diabetes especially among adults aged 30 years and above to prevent more serious complications of this disease.

# GENETICS and TYPE 2 DM



Norhashimah Abu Seman and Sophia Rasheeqa Ismail  
Institute for Medical Research (IMR)

**THE** increasing prevalence rate of Diabetes Mellitus (DM) in the world, including Malaysia has indeed been alarming. Amongst the two types of diabetes, Type 2 Diabetes Mellitus (T2DM) has gained more attention in Malaysia as it is more common. The prevalence rate of DM in Malaysian adults is 16.6% per year<sup>1</sup>, which is almost double the 9% prevalence rate in the world<sup>2</sup>.

This alarming epidemic is presumed to be the result of complex interactions between genetic predispositions and environmental risk factors. In view of the multifactorial contributing factors of T2DM and its complications, increasing rates of morbidity and mortality have been observed. Hence, identification of individuals at high risk of developing diabetes is of great importance and interest.

## Genetic factors

For many years, research has demonstrated a strong hereditary component in T2DM. It has been shown by the high concordance rates of monozygotic twins and increased risk in individuals with family history of diabetes. Based on twins study, heritability of T2DM is estimated to be between 30% and 70%, depending on the age of diabetes onset and the glycaemic status.

Ethnicity is a predisposing factor in the development of T2DM. In Malaysia, Indians have the highest prevalence of T2DM (19.9%) followed by Malays (11.9%) and then Chinese (11.4%).

The Diabetes and Endocrine Unit at the Institute for Medical Research (IMR) conducted studies on a few genes which are associated with T2DM. We investigated the association between plasma long pentraxin 3 (PTX3) levels in patients with cardiovascular and chronic kidney diseases<sup>3</sup>. We concluded that decreased PTX3 levels were associated with T2DM in Malay men with or without diabetic nephropathy, when compared to PTX3 levels in patients with normal glucose tolerance. However, no significant difference in PTX3 levels was seen in Malay women.

In another study, we analysed DNA polymorphism in the solute carrier family 30 member 8 (SLC30A8) gene in Malays. This gene is expressed particularly in the pancreatic beta cells and is essential in the metabolism of insulin.

From our analysis, we found that SNP rs11558471 (A/G) in the SLC30A8 gene was strongly associated with T2DM and moderately associated with diabetic nephropathy<sup>4</sup>. The average DNA methylation levels of the SLC30A8 gene in all the patients were at approximately 81.4%, whereby levels in T2DM patients were higher compared to the non-diabetics. However, there was no significant difference in DNA methylation levels of the SLC30A8 gene between T2DM patients with and without diabetic nephropathy.

Other known genes that contribute to the development of T2DM include :

- The peroxisome proliferator-activated receptor gamma (PPARG), encodes a receptor which is the target of an anti-diabetic drug thiazolidinedione.
- The potassium inwardly-rectifying channel, subfamily J, member 11 (KCNJ11), encodes a membrane protein that allows potassium influx into pancreatic beta cells.
- The transcription factor 7-like 2 (TCF7L2), which affects insulin secretion and glucose production.
- The sulfonylurea urea receptor (ABCC8), which helps regulate insulin.
- The glucose transporter 2 (GLUT2), which helps move glucose into the pancreas.
- The glucagon receptor (GCGR) is a hormone which is involved in glucose regulation.

Recent meta-analysis also concluded the following associations with T2DM :

- NAD(P)H oxidase p22 phox gene 242T allele may be associated with an increased risk of T2DM and diabetic nephropathy, but not carotid atherosclerosis<sup>5</sup>.
- Glucokinase 230G>A polymorphism increases susceptibility to T2DM in Caucasians, which has not been seen in Asians<sup>6</sup>.

- In the recessive model, plasminogen activator inhibitor-1 4G/5G polymorphism was associated with T2DM risk, especially in Asians<sup>7</sup>.
- Interleukin-6 (IL-6) gene -572 C/G (rs1800796) polymorphism<sup>8</sup>.
- GCK (rs1799884), GCKR (rs780094) and MTNR1B (rs10830963) genes in Caucasians, which was not significant in Asians<sup>9</sup>.

## Environmental factors

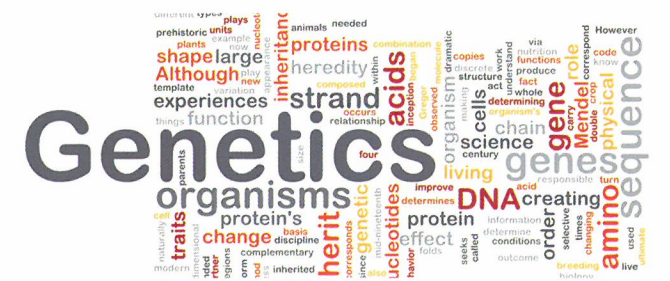
Genetics alone can only explain about 10% of the heritability of T2DM. Recently, epigenetic effects have been introduced to explain the causal link between genetics and environmental exposures. It refers to heritable changes in gene expression that does not change the DNA sequence in the genome. The study of epigenetics focuses on the mechanisms by which the environment interacts with the genotype to produce a variety of phenotypes by either modifying the chromatin structure or controlling the mRNA translation. At least three systems including DNA methylation, histone modification and non-coding RNA (ncRNA)-associated gene silencing are currently considered to initiate and sustain epigenetic changes. Obesity, reduced physical activity, and ageing are among the factors that could increase susceptibility to T2DM.

Developing T2DM may be attributed to modifiable risk factors such as greater body mass index, smoking, hypertension, unhealthy diet and physical inactivity. Changes in body weight and increased physical activity affect DNA methylation levels on certain genes related to obesity and T2DM such as the FTO gene. It has also been suggested that being physically active improves insulin sensitivity. Unfortunately, declining oxidative and mitochondrial function as a result of increasing age also increases the risk of developing T2DM.

## Relevance of genetic testing in clinical medicine

Identification of genetic variants and environmental risk factors affecting the onset of T2DM has created new opportunities in clinical medicine. Early identification and management of people at high risk delays the onset of T2DM as well as its complications. Besides genetic testing, several diabetes risk prediction models have been established and validated<sup>10</sup>. These risk prediction models are commonly incorporated with diabetes risk scores and used with or without biochemical markers.

In a recent observational study, genetic testing in high-risk individuals did not influence any lifestyle changes<sup>11</sup>. A randomized trial also showed that diabetes genetic risk counseling with currently available variants did not significantly alter self-reported motivation or prevention programme adherence for overweight individuals at risk for diabetes<sup>12</sup>.



## Conclusion

Scientific discoveries in genetic endocrinology have been very significant in the past decade. The cost effectiveness of providing routine genetic testing for the population in the long run is unknown. Ethical, legal and social concerns associated with widespread availability and use of predictive genetic tests will have to be addressed. These factors directly relate to other concerns such as insurance and employment discrimination, confidentiality and stigmatization based on knowing that one is at high genetic risk. Personalized interventions based on individual genetic backgrounds needs further evaluation.

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# A PRELIMINARY STUDY ON CONSUMPTION PATTERN OF CARBONATED DRINKS AMONG GENERAL PUBLIC IN MALAYSIA

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## INTRODUCTION

Carbonated drinks are one of the most popular beverages in Malaysia.

However, these beverages are known to have high content of added sugar.

Serious concern has been raised that large consumption of carbonated drinks is associated with obesity and chronic diseases such as diabetes, cardiovascular disease and hypertension.

Therefore, it is important to assess the consumption pattern of carbonated drinks among general public in Malaysia.

## OBJECTIVE

The objective of the study was to determine the consumption pattern of carbonated drinks among general public in Malaysia.

## METHODS

A nationwide cross-sectional study was conducted from March to May 2015 among adults aged 18 to 60 years

The respondents were recruited from various localities frequented by the public using convenient sampling. Data was collected using self-administered questionnaires

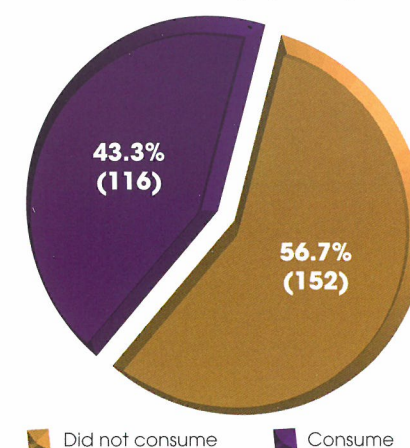
The questionnaire was locally developed based on the PRECEDE-PROCEED Model covering the areas on: demography, consumption frequency, reasons for consumption, types of carbonated drink, place of consumption and knowledge on sugar content

Data entry and analysis were conducted using SPSS version 21

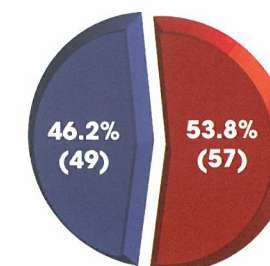


## RESULTS

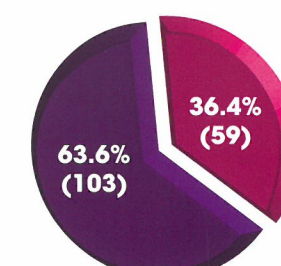
Consumption of carbonated drinks in the last 7 days (N=268)



Male (n1=106)



Female (n2=162)



Did not consume Consume Did not consume Consume

Figure 1 : Carbonated Drink Intake by Sex

## CONCLUSION

- Overall, 116 (43.3%) respondents consumed carbonated drinks in the last seven days.
- Further, the age group with the highest consumption of carbonated drinks was 20 - 24 years old (33.6%) and they were mainly males (69.6%) compared to females (43.4%).
- Majority (87.9%) of those who consumed were ignorant of the high sugar content of carbonated drinks.
- The commonest reasons for the consumption were to quench the thirst (53.4%), for energy (32.8%), flavor/taste (31.9%) and accessibility (24.1%).
- The popular type of carbonated drinks consumed by the respondent were isotonic (52.6%), regular (39.7%) and diet (7.7%).
- The carbonated drinks were commonly consumed during outings (76.7%).
- Overall, 16.4% respondents in the survey, introduced carbonated drink early to their children (12 years old and below).
- The study showed a high prevalence of consumption of carbonated drinks among the general public in Malaysia.
- Therefore, a public health campaign to create awareness on high content sugar in carbonated drinks as well as discouraging habitual consumption of carbonated drink should be implemented. The campaign should give emphasis to younger age group particularly males 20 - 24 years old. In addition, the campaign should promote the healthy habit of drinking 6 - 8 glasses of plain water daily.



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# PRESS MEET NHMS 2015 FINDINGS

A **press meet** was held on 6 June 2016 at Putrajaya to inform the public on the Malaysia current health status based on the findings of the NHMS 2015. Among the invitees were local medias, NGOs related to non-communicable diseases, stakeholders, directors and deputy directors of the State Health Departments.



## TINJAUAN KEBANGSAAN KESIHATAN DAN MORBIDITI NATIONAL HEALTH AND MORBIDITY SURVEY (NHMS)

SESI YANG BERHORMAT MENTERI KESIHATAN BERSAMA MEDIA  
BAGI PEMBENTANGAN HASIL TINJAUAN KEBANGSAAN  
KESIHATAN & MORBIDITI (NHMS) 2015

Dewan Serbaguna, Aras 8, Blok E7 Kompleks E,  
Putrajaya  
6 Jun 2016 (Isnin)  
9.30 Pagi – 12.00 Tengahari

Dibentangkan semula dalam  
Mesyuarat Pengurusan  
dan Kewangan Promosi Kesihatan  
26-28 Julai 2016  
Hotel Grand Continental  
Kuala Lumpur



iku  
INSTITUTE FOR PUBLIC HEALTH



Booth Visiting



Poster Viewing



Group Photo of Press Meet 2016



Speech by YB Minister of Health



Presentation of NHMS 2015 Findings by Director of IPH

# POSTERS

## 'SALT, SUGAR, FAT : TOP 10 DAILY FOOD FAVOURITE' FINDINGS FROM THE MALAYSIAN ADULTS NUTRITION SURVEY (MANS) 2014

Khoo Yi Yi<sup>1</sup>, Mohamad Hasnan<sup>1</sup>, Yusof Sabtu<sup>1</sup>, Foo Leng Huat<sup>2</sup>,  
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### INTRODUCTION

An estimated 73% of total deaths in Malaysia in 2014 were due to non-communicable diseases (NCDs), comprising mainly cardiovascular diseases (36%), cancers (15%), chronic respiratory diseases (7%) and diabetes (3%)<sup>1</sup>.

The probability of dying between ages 30 and 70 years from these 4 main NCD is 20%<sup>1</sup>.

These major diseases share four modifiable behavioural risk factors: unhealthy diet, physical inactivity, tobacco use and harmful alcohol intake.

### OBJECTIVE

To determine the daily intake of top ten foods containing elevated amounts of salt, sugar and fat among Malaysian adults.

### METHODOLOGY

A total of 3,000 adults aged 18 to 59 years were included in a nationwide study of the Malaysian Adult Nutrition Survey (MANS) by using a multi-stage stratified random sampling design.

A semi-quantitative food frequency questionnaire (FFQ) comprising 165 food items was used to determine the habitual in pattern of foods that were high in salt, sugar and fat content among Malaysian adults. Data was analyzed using SPSS version 19.

### RESULTS

Local kuih (79.0%) was the most consumed daily food high in salt content, followed by bread (76.9%), mihun/ kuehteow/ laksa/ laksam/ lohshifun (76.0%), soy sauce (75.6%) and noodles (75.2%), with the mean serving size of 0.8 piece, 0.8 slice, 0.2 cups, 0.7 teaspoon and 0.2 cup, respectively (Figure1).

Regarding consumption of sugary foods, local kuih was still a fast favourite topping the list, then again soy sauce, table sugar (74.3% (2.2 teaspoons, 15.2g)), condensed milk (creamer) (50.7% (0.8 tablespoons, 14.6g)) and ice-cream (38.0% (0.1 slices, 3.3g)) (Figure2).

Cream cracker (64.9% (1.2 pieces, 8.1g)) was the preferred food of the population with the highest fat content, followed by condiment (55.7% (0.5 teaspoon, 4.7g)), fried chicken (50.1% (0.8 piece, 7.8g)), cake (38.0% (0.1 slice, 5.4g)) and ice-cream (32.1% (0.1 slices, 3.3g)) (Figure3).

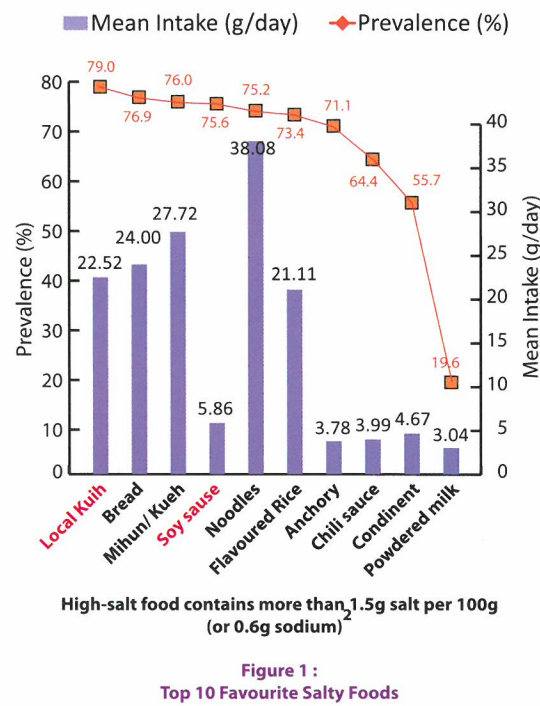


Figure 1 :  
Top 10 Favourite Salty Foods

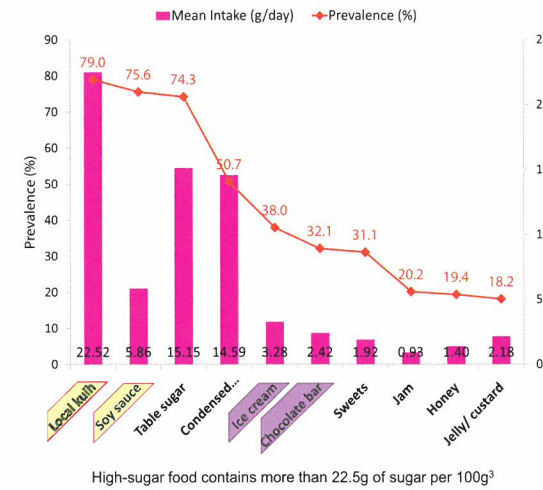


Fig 2: Top 10 Favourite Sugary foods

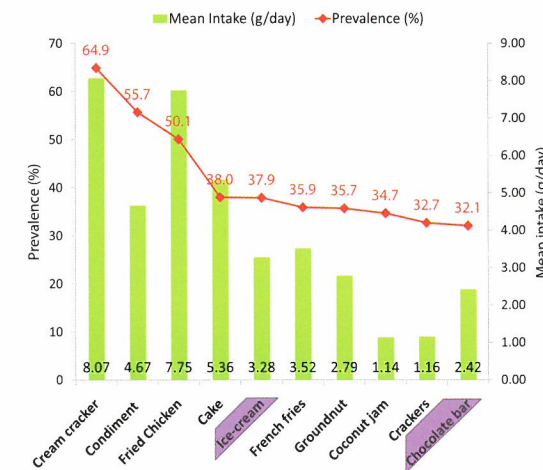


Fig 3: Top 10 Favourite Fatty Foods

### DISCUSSION

Generally, Malaysian adults opted for processed 'ready-made' foods (local kuih, noodles, fried chicken) with added flavours (soy sauce, sambal, condensed milk).

A 'sweet tooth' tendency was displayed as chocolate bars and ice-cream were a favourite of approximately one-third of the Malaysian population.

It is evident that we make discretionary food choices unnecessary for a healthy diet.

Although these optional foods may add variety and enjoyment to eating, they are 'nutrient-poor' foods.

### RECOMMENDATIONS

Universiti Sains Malaysia Globally, the prevalence of NCDs has escalated over several decades 5 of which an important contributor to this rising trend includes urbanization of lifestyle activities involving unhealthy diets. To address NCDs and mitigate their impacts, some recommendations include :

- increasing the knowledge of the general public regarding the hazardous long-term effects of over-consuming salt, sugar and fat via education in schools, health campaigns/ promotions and even utilizing the social media to be more 'Salt, Sugar and Fat Aware'.
- implementing policies for compulsory food labelling of salt, sugar and fat content including their recommended daily limits, on all foods be it processed foods, fast foods, and confectionaries.
- encouraging consumers to read food labels to enable them to make healthier eating choices.
- promoting the consumption of whole fruits as a healthy alternative snack as well as the concept that healthy foods can also be tasty.

### CONCLUSION

Over-consumption eventually leads to increased risks of developing NCDs, whereby :

- elevated amounts of salt lead to increased risk of developing hypertension (which is a major risk factor for cardiovascular and circulatory diseases),
- elevated amounts of sugar lead to increased risk of developing diabetes, weight gain and heart disease, and
- elevated amounts of fat lead to increased risk of developing obesity, joint problems and some cancers.

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## Selection Of Treatment Strategies Among Patients With Type 2 Diabetes Mellitus In Malaysia : A Grounded Theory Approach

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### Abstract

**Background :** Diabetes Mellitus is a multifaceted chronic illness and its life-long treatment process requires patients to continuously engage with the healthcare system. The understanding of how patients manoeuvre through the healthcare system for treatment is crucial in assisting them to optimise their disease management. This study aims to explore issues determining patients' treatment strategies and the process of patients manoeuvring through the current healthcare system in selecting their choice of treatment for T2DM.

**Methods :** The Grounded Theory methodology was used. Twelve patients with Type 2 Diabetes Mellitus, nine family members and five healthcare providers from the primary care clinics were interviewed using a semi-structured interview guide. Three focus group discussions were conducted among thirteen healthcare providers from public primary care clinics. Both purposive and theoretical samplings were used for data collection. The interviews were audiotaped and transcribed verbatim, followed by line-by-line coding and constant comparison to identify the categories and core category.

**Results :** The concept of "experimentation" was observed in patients' help-seeking behaviour. The "experimentation" process required triggers, followed by information seeking related to treatment characteristics from trusted family members, friends and healthcare providers to enable decisions to be made on the choice of treatment modalities. The whole process was dynamic and iterative through interaction with the healthcare system. The decision-making process in choosing the types of treatment was complex with an element of trial-and-error. The anchor of this process was the desire to fulfil the patient's expected outcome.

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IHSR

## Social Influences Of Help-seeking Behaviour Among Patients With Type 2 Diabetes Mellitus In Malaysia

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**Abstract :** This qualitative study aimed to explore the influence of social networks such as family members, friends, peers, and health care providers toward the help-seeking behaviour (HSB) of patients with type 2 diabetes mellitus in the public and private primary care settings. In-depth interviews of 12 patients, 9 family members, and 5 health care providers, as well as 3 focus groups among 13 health care providers were conducted. All interviews were audio-taped and transcribed verbatim for qualitative analysis. Social influences play a significant role in the help-seeking process; once diagnosed, patients source information from people around them to make decisions. This significant influence depends on the relationship between patients and social networks or the level of trust, support, and comforting feeling. Thus, the impacts on patients' help-seeking behavior are varied. However, the help-seeking process is not solely an individual's concern but a dynamic process interacting with the social networks within the health care system.

**Keywords :** type 2 diabetes mellitus, family members, peers, health care providers, social media, primary care setting, qualitative study, Malaysia

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IHSR

## Association Of Physical Activity With Blood Pressure And Blood Glucose Among Malaysian Adults : A Population-based Study

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### Abstract

**Background :** The health-enhancing benefits of physical activity (PA) on hypertension and diabetes have been well documented for decades. This study aimed to determine the association of PA with systolic and diastolic blood pressure as well as blood glucose in the Malaysian adult population.

**Methods :** Data were extracted from the 2011 National Health and Morbidity Survey (NHMS), a nationally representative, cross-sectional study. A two-stage stratified sampling method was used to select a representative sample of 18,231 Malaysian adults aged 18 years and above. The PA levels of the respondents were categorised as low, moderate or high according to the International Physical Activity Questionnaire (IPAQ)-short form. Blood pressure and fasting blood glucose levels were measured using a digital blood pressure-measuring device and finger-prick test, respectively.

**Results :** Systolic blood pressure (SBP) level was positively associated with PA level ( $p = 0.02$ ) whilst no significant association was noted between PA level and diastolic blood pressure (DBP). In contrast, respondents with low (adjusted coefficient = 0.17) or moderate (adjusted coefficient = 0.03) level of PA had significantly higher blood glucose level as compared to those who were highly active ( $p = 0.04$ ).

**Conclusions :** A significant negative association was observed between PA level and blood glucose only. Future studies should employ an objective measurement in estimating PA level in order to elucidate the actual relationship between PA, hypertension and diabetes for the development of effective interventions to combat the increasing burden of premature-mortality and cardiovascular disease-related morbidity in Malaysia.

**Keywords :** Hypertension, Diabetes, Malaysia, NHMS, Physical activity

Teh et al. BMC Public Health (2015) 15:1205, DOI 10.1186/s12889-015-2528-1

IPH/IMR

## Impact Of Vitamin D Replacement On Markers Of Glucose Metabolism And Cardio-metabolic Risk In Women With Former Gestational Diabetes—a Double-blind, Randomized Controlled Trial

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### Abstract

Gestational Diabetes Mellitus (GDM) and vitamin D deficiency are related to insulin resistance and impaired beta cell function, with heightened risk for future development of diabetes. We evaluated the impact of vitamin D supplementation on markers of glucose metabolism and cardio metabolic risk in Asian women with former GDM and hypovitaminosis D. In this double blind, randomized controlled trial, 26 participants were randomized to receive either daily 4000 IU vitamin D3 or placebo capsules. 75g Oral Glucose Tolerance Test (OGTT) and biochemistry profiles were performed at baseline and 6 month visits. Mathematical models, using serial glucose, insulin and C peptide measurements from OGTT, were employed to calculate insulin sensitivity and beta cell function. Thirty three (76%) women with former GDM screened had vitamin D level of <50 nmol/L at baseline. Supplementation, when compared with placebo, resulted in increased vitamin D level (+51.1 nmol/L vs 0.2 nmol/L,  $p < 0.001$ ) and increased fasting insulin (+20% vs 18%,  $p = 0.034$ ). The vitamin D group also demonstrated a 30% improvement in disposition index and an absolute 0.2% (2 mmol/mol) reduction in HbA1c. There was no clear change in insulin sensitivity or markers of cardiometabolic risk. This study highlighted high prevalence of vitamin D deficiency among Asian women with former GDM. Six months supplementation with 4000 IU of vitamin D3 safely restored the vitamin D level, improved basal pancreatic beta-cell function and ameliorated the metabolic state. There was no effect on markers of cardio metabolic risk. Further mechanistic studies exploring the role of vitamin D supplementation on glucose homeostasis among different ethnicities may be needed to better inform future recommendations for these women with former GDM at high risk of both hypovitaminosis D and future diabetes.

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IPH/CRC

## Effects Of Diabetes Definition On Global Surveillance Of Diabetes Prevalence And Diagnosis : A Pooled Analysis Of 96 Population-based Studies With 331 288 Participants

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### Abstract

**Background :** Diabetes has been defined on the basis of different biomarkers, including fasting plasma glucose (FPG), 2-h plasma glucose in an oral glucose tolerance test (2hOGTT), and HbA1c. We assessed the effect of different diagnostic definitions on both the population prevalence of diabetes and the classification of previously undiagnosed individuals as having diabetes versus not having diabetes in a pooled analysis of data from population-based health examination surveys in different regions.

**Methods :** We used data from 96 population-based health examination surveys that had measured at least two of the biomarkers used for defining diabetes. Diabetes was defined using HbA1c (HbA1c  $\geq 6.5\%$  or history of diabetes diagnosis or using insulin or oral hypoglycaemic drugs) compared with either FPG only or FPG-or-2hOGTT definitions (FPG  $\geq 7.0$  mmol/L or 2hOGTT  $\geq 11.1$  mmol/L or history of diabetes or using insulin or oral hypoglycaemic drugs). We calculated diabetes prevalence, taking into account complex survey design and survey sample weights. We compared the prevalences of diabetes using different definitions graphically and by regression analyses. We calculated sensitivity and specificity of diabetes diagnosis based on HbA1c compared with diagnosis based on glucose among previously undiagnosed individuals (ie, excluding those with history of diabetes or using insulin or oral hypoglycaemic drugs). We calculated sensitivity and specificity in each survey, and then pooled results using a random-effects model. We assessed the sources of heterogeneity of sensitivity by meta-regressions for study characteristics selected a priori.

**Findings :** Population prevalence of diabetes based on FPG-or-2hOGTT was correlated with prevalence based on FPG alone ( $r=0.98$ ), but was higher by 2-6 percentage points at different prevalence levels. Prevalence based on HbA1c was lower than prevalence based on FPG in 42.8% of age-sex-survey groups and higher in another 41.6%; in the other 15.6%, the two definitions provided similar prevalence estimates. The variation across studies in the relation between glucose-based and HbA1c-based prevalences was partly related to participants' age, followed by natural logarithm of per person gross domestic product, the year of survey, mean BMI, and whether the survey population was national, subnational, or from specific communities. Diabetes defined as HbA1c  $\geq 6.5\%$  or more had a pooled sensitivity of 52.8% (95% CI 51.3-54.3%) and a pooled specificity of 99.74% (99.71-99.78%) compared with FPG  $\geq 7.0$  mmol/L or more for diagnosing previously undiagnosed participants; sensitivity compared with diabetes defined based on FPG or 2hOGTT was 30.5% (28.7-32.3%). None of the preselected study-level characteristics explained the heterogeneity in the sensitivity of HbA1c versus FPG.

**Interpretation :** Different biomarkers and definitions for diabetes can provide different estimates of population prevalence of diabetes, and differentially identify people without previous diagnosis as having diabetes. Using an HbA1c-based definition alone in health surveys will not identify a substantial proportion of previously undiagnosed people who would be considered as having diabetes using a glucose-based test.

www.thelancet.com/diabetes-endocrinology Vol 3 August 2015

IPH

## Evaluation Of Antidiabetic Effects Of The Traditional Medicinal Plant Gynostemma Pentaphyllum And The Possible Mechanisms Of Insulin Release

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### Abstract

**Aims :** To evaluate the antidiabetic effects of Gynostemma pentaphyllum (GP) in Goto-Kakizaki (GK) rat, an animal model of type 2 diabetes, and to investigate the mechanisms of insulin release.

**Methods :** Oral glucose tolerance test was performed and plasma insulin levels were measured.

**Results :** An oral treatment with GP (0.3 g/kg of body weight daily) for two weeks in GK rats improved glucose tolerance versus placebo group ( $P < 0.01$ ). Plasma insulin levels were significantly increased in the GP-treated group. The insulin release from GP-treated GK rats was 1.9-fold higher as compared to the control group ( $P < 0.001$ ). GP stimulated insulin release in isolated GK rat islets at high glucose. Opening of ATP-sensitive potassium (K-ATP) channels by diazoxide and inhibition of calcium channels by nifedipine significantly decreased insulin response to GP. Furthermore, the protein kinase A (PKA) inhibitor H89 decreased the insulin response to GP ( $P < 0.05$ ). In addition, GP-induced insulin secretion was decreased after preincubation of GK islets with pertussis toxin to inhibit exocytotic G $\alpha$  proteins ( $P < 0.05$ ).

**Conclusion :** The antidiabetic effect of GP is associated with the stimulation of insulin release from the islets. GP-induced insulin release is partly mediated via K-ATP and L-type Ca<sup>2+</sup> channels, the PKA system and also dependent on pertussis toxin sensitive G $\alpha$ -protein.

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IMR

## Comparison Of The Framingham Risk Score, Score And Who/ish Cardiovascular Risk Prediction Models In An Asian Population

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### Abstract

**Background :** Cardiovascular risk-prediction models are used in clinical practice to identify and treat high-risk populations, and to communicate risk effectively. We assessed the validity and utility of four cardiovascular risk-prediction models in an Asian population of a middle-income country.

**Methods :** Data from a national population-based survey of 14,863 participants aged 40 to 65 years, with a followup duration of 73,277 person-years was used. The Framingham Risk Score (FRS), SCORE (Systematic COronary Risk Evaluation)-high and -low cardiovascular-risk regions and the World Health Organization/ International Society of Hypertension (WHO/ISH) models were assessed. The outcome of interest was 5-year cardiovascular mortality. Discrimination was assessed for all models and calibration for the SCORE models.

**Results :** Cardiovascular risk factors were highly prevalent; smoking 20%, obesity 32%, hypertension 55%, diabetes mellitus 18% and hypercholesterolemia 34%. The FRS and SCORE models showed good agreement in risk stratification. The FRS, SCORE-high and -low models showed good discrimination for cardiovascular mortality, areas under the ROC curve (AUC) were 0.768, 0.774 and 0.775 respectively. The WHO/ISH model showed poor discrimination, AUC = 0.613. Calibration of the SCORE-high model was graphically and statistically acceptable for men ( $\chi^2$  goodness-of-fit,  $p = 0.097$ ). The SCORE-low model was statistically acceptable for men ( $\chi^2$  goodness-of-fit,  $p = 0.067$ ). Both SCORE-models underestimated risk in women ( $p < 0.001$ ).

**Conclusions :** The FRS and SCORE-high models, but not the WHO/ISH model can be used to identify high cardiovascular risk in the Malaysian population. The SCORE-high model predicts risk accurately in men but underestimated it in women.

**Keywords :** Cardiovascular disease prevention, Mortality, Risk prediction, Risk score, Validation

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CRC/IPH

## Genetic, Epigenetic And Protein Analyses Of Intercellular Adhesion Molecule 1 In Malaysian Subjects With Type 2 Diabetes And Diabetic Nephropathy

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### Abstract

**Aims :** Recent research has implicated that the inflammation may be a key pathophysiological mechanism in diabetic nephropathy (DN). Intercellular adhesion molecule 1 (ICAM-1) is an acute phasemaker of inflammation. In the present study, we carried out genetic, epigenetic and protein analyses of ICAM-1 in a Malaysian population, including normal glucose tolerance (NGT) subjects and type 2 diabetes (T2D) patients with or without DN in order to evaluate its role in DN.

**Methods :** Analyses of DNA polymorphism and methylation in the ICAM1 gene were performed with TaqMan allelic discrimination and pyrosequencing, respectively. Plasma ICAM-1 levels were determined using an enzyme-linked immune-sorbent assay kit.

**Results :** We found that the ICAM1 K469E(A/G) polymorphism (rs5498) was significantly associated with DN. Particularly, 86.1% of T2D patients with DN carried heterozygous genotype compared to the patients without DN (68.6%). Furthermore, plasma ICAM-1 levels were increased from NGT subjects to T2D patients without and with DN ( $P < 0.001$ ). The NGT subjects carrying heterozygous genotype had significantly lower plasma ICAM-1 levels compared to the K469(A/A) genotype carriers ( $P = 0.009$ ). In the ICAM1 gene promoter, DNA methylation levels of CpG sites were low, and no association of the ICAM1 DNA methylation alteration with DN was detected.

**Conclusion :** The present study provided evidence that the ICAM1 K469E(A/G) polymorphism with high heterozygous index and elevation of plasma ICAM-1 levels were associated with DN in a Malaysian population. Further prospective study of ICAM-1 protein according to the ICAM1 K469E(A/G) genotypes is necessary for predicting the susceptibility to T2D and DN.

**Keywords :** Diabetic nephropathy, DNA methylation, Intercellular adhesion molecule 1, Single nucleotide polymorphism, Type 2 diabetes

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IMR

## Identification Of Effective Screening Strategies For Cardiovascular Disease Prevention In A Developing Country: Using Cardiovascular Risk-estimation And Risk-reduction Tools For Policy Recommendations

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### Abstract

**Backgrounds :** Recent increases in cardiovascular risk-factor prevalences have led to new national policy recommendations of universal screening for primary prevention of cardiovascular disease in Malaysia. This study assessed whether the current national policy recommendation of universal screening was optimal, by comparing the effectiveness and impact of various cardiovascular screening strategies.

**Methods :** Data from a national population based survey of 24 270 participants aged 30 to 74 was used. Five screening strategies were modelled for the overall population and by gender; universal and targeted screening (four age cut-off points). Screening strategies were assessed based on the ability to detect high cardiovascular risk populations (effectiveness), incremental effectiveness, impact on cardiovascular event prevention and cost of screening.

**Results :** 26.7% (95% confidence limits 25.7, 27.7) were at high cardiovascular risk, men 34.7% (33.6, 35.8) and women 18.9% (17.8, 20). Universal screening identified all those at high-risk and resulted in one high-risk individual detected for every 3.7 people screened, with an estimated cost of USD60. However, universal screening resulted in screening an additional 7169 persons, with an incremental cost of USD115,033 for detection of one additional highrisk individual in comparison to targeted screening of those aged  $\geq 35$  years. The cost, incremental cost and impact of detection of high-risk individuals were more for women than men for all screening strategies. The impact of screening women aged  $\geq 45$  years was similar to universal screening in men.

**Conclusion :** Targeted gender- and age-specific screening strategies would ensure more optimal utilisation of scarce resources compared to the current policy recommendations of universal screening.

**Keywords :** Cardiovascular risk, Cardiovascular disease, Policy, Screening

Selvarajah et al. BMC Cardiovascular Disorders 2013, 13:10  
http://www.biomedcentral.com/1471-2261/13/10

IPH/CRC

## Depression, Anxiety And Stress Symptoms Among Diabetics In Malaysia: A Cross Sectional Study In An Urban Primary Care Setting

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### Abstract

**Background :** Diabetes mellitus is a highly prevalent condition in Malaysia, increasing from 11.6% in 2006 to 15.2% in 2011 among individuals 18 years and above. Co-morbid depression in diabetics is associated with hyperglycemia, diabetic complications and increased health care costs. The aims of this study are to determine the prevalence and predictors of depression, anxiety and stress symptoms in Type II diabetics attending government primary care facilities in the urban area of Klang Valley, Malaysia.

**Methods :** The study was cross sectional in design and carried out in 12 randomly selected primary care government clinics in the Klang Valley, Malaysia. A total of 2508 eligible consenting respondents participated in the study. The Depression, Anxiety and Stress Scale (DASS) 21 questionnaire was used to measure depression, anxiety and stress symptoms. Data was analyzed using the SPSS version 16 software using both descriptive and inferential statistics.

**Results :** The prevalence of depression, anxiety and stress symptoms among Type II diabetics were 11.5%, 30.5% and 12.5% respectively. Using multiple logistic regression, females, Asian Indians, marital status (never married, divorced/ widowed/separated), a family history of psychiatric illness, less than 2 years duration of diabetes and current alcohol consumption were found to be significant predictors of depression. For anxiety, unemployment, housewives, HbA1c level of more than 8.5%, a family history of psychiatric illness, life events and lack of physical activity were independent risk factors. Stress was significantly associated with females, HbA1c level of more than 8.5%, presence of co-morbidity, a family history of psychiatric illness, life events and current alcohol consumption. For depression (adjusted OR 2.8, 95% CI 1.1; 7.0), anxiety (adjusted OR 2.4, 95% CI 1.1; 5.5) and stress (adjusted OR 4.2, 95% CI 1.8; 9.8), a family history of psychiatric illness was the strongest predictor.

**Conclusion :** We found the prevalence of depression, anxiety and stress symptoms to be high among Type II diabetics, with almost a third being classified as anxious. Screening of high risk Type II diabetics for depression, anxiety and stress symptoms in the primary care setting is recommended at regular intervals.

**Keywords :** Depression, Anxiety, Stress, Prevalence, Predictors, Diabetes, Outpatients, Urban, Malaysia

Kaur et al. BMC Family Practice 2013, 14:69  
http://www.biomedcentral.com/1471-2296/14/69

IPH

## Increased DNA Methylation Of The Slc30a8 Gene Promoter Is Associated With Type 2 Diabetes In A Malay Population

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### Abstract

**Background :** Recent studies have demonstrated that DNA polymorphisms in the solute carrier family 30 member 8 (SLC30A8) gene confer the risk susceptibility to type 2 diabetes (T2D). The present study aimed to analyze DNA methylation levels of this gene in T2D and diabetic nephropathy (DN).

**Results :** We confirmed the genetic association study of SLC30A8 in 992 Malay subjects with normal glucose tolerance and T2D patients with and without DN. Genotyping was conducted with TaqMan allelic discrimination. SNP rs11558471(A/G) in the SLC30A8 gene was strongly associated with T2D (P = 0.002, OR = 1.334, 95% CI = 1.110 to 1.602) and moderately associated with DN (P = 0.041, OR = 1.399, 95% CI = 1.013 to 1.932). We further performed DNA methylation analysis of six CpG sites in the SLC30A8 gene promoter with bisulfite pyrosequencing protocol. The average DNA methylation levels of the SLC30A8 gene in all Malay subjects were at approximately 81.4%. DNA methylation levels of the SLC30A8 gene in T2D patients were higher compared to non-diabetic subjects (82.9% vs. 80.1%, P = 0.014). But no significant difference of DNA methylation levels of the SLC30A8 gene between T2D patients with and without DN was observed.

**Conclusion :** The present study thus provides the first evidence that increased DNA methylation of the SLC30A8 gene promoter is associated with T2D but not DN in a Malay population.

**Keywords :** DNA methylation, SLC30A8, Type 2 diabetes

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## Undiagnosed Type 2 Diabetes Mellitus And Its Risk Factors Among Malaysians : Findings Of A Nationwide Study

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### Abstract

**Introduction :** The prevalence of Type 2 diabetes mellitus (T2DM) is increasing worldwide and many of these affected individuals remain unidentified. Undiagnosed T2DM may impose substantial public health implications because these individuals remain untreated and at risk for complications. The objective of this study was determine the national prevalence of diagnosed T2DM and to identify the associated risk factors.

**Methods :** A nationwide cross-sectional study was conducted involving 17,783 respondents. Two-stage stratified sampling design was used to select a representative sample of the Malaysian adult population. Structured validated questionnaires with face to face interviews were used to obtain data. Respondents, who claimed that they were not having diabetes, were then asked to perform a fasting blood glucose finger-prick test by Accutrend GC machine.

**Results :** The prevalence of undiagnosed T2DM was 8.9% (n=1587). The highest percentage of diagnosed T2DM was found among males (10.2%), 55-59 years old (13.4%), highest education attainers of primary school (11.1%), Indians (10.3%), married (10.3%), working (8.9%), and living in the urban areas (9.2%). Multivariate analyses showed that factors associated with undiagnosed T2DM were gender, age group, ethnicity, marital status, obesity and hypertension.

**Conclusion :** This study found an increasing trend of undiagnosed T2DM in Malaysia compared to 2006. This finding is alarming as risk factors associated with undiagnosed diabetes were related to most of the socio-demographic factors studied. Therefore, early diabetic screening is crucial especially among adults aged 30 and above to prevent more serious complications of this disease.

**Keywords :** Malaysia - undiagnosed - type 2 DM, prevalence of diabetes, risk factor.

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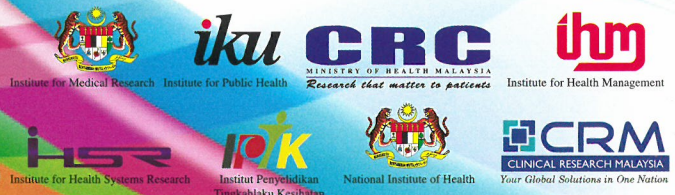
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