Asymptomatic Diabetes: The Difference Between Population-based and Office-based Screening

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ABSTRACT

Aim: *to compare the results between population-based and office-based diabetes screening.*

Methods: *in 1997, a population-based screening was performed on a group of government employees and retired subjects in the Makassar Municipality. Since the year 2000, we performed screening at the clinic. For clinical-based screening, we focused the screening on those with high risks for developing diabetes mellitus, i.e. all subjects aged ≥45 or those aged <45 with one or more of the following abnormalities: obese (BMI >25 kg/m^2), elevated blood pressure (≥140/90 mmHg in adults), family history of diabetes, previous identified IFG or IGT, HDL-cholesterol ≤ 35 mg/dl and/or triglyceride ≥ 250 mg/dL, and history of gestational diabetes mellitus or delivery of babies ≥ 4000 gram. For population-based screening, the criteria for diabetes mellitus was based on a single test 2-hours post load (75 gram glucose), while for office-based screening, the WHO l999 was used i.e. fasting and 2-hours post 75 gram glucose load (OGTT).*

Results: *during the screening in the population, 941 subjects were screened, 290 women and 651 men. There were 51 diabetic subjects, or a prevalence of 5.42%, 21 women or 7.24% of all women, and 30 men or 4.60% of all men. At the clinical setting, 907 were screened, 483 women and 424 men. Among these subjects, 155 fulfilled the diabetes criteria, with a prevalence of 17.1%. There were 78 diabetic women or 16.1% of all women, and 77 men or 18.2% of all men. If the diagnosis of diabetes mellitus in the clinical setting is based only on 2 hours post load (the same as for population-based) only 70 patients can be detected, for a prevalence of 7.7%, which is still higher compared to the results of the population-based screening. All figures obtained from the office-based screening were higher as compared to the population-based results.*

Conclusion: *these results show that office-based screening detected more asymptomatic diabetes compared to population-based screening. It is suggested that early detection of asymptomatic diabetes is performed at the clinic, either at the hospital or doctor's private office.*

Key words: *asymptomatic diabetes, population-based screening, office-based screening.*

INTRODUCTION

The main problem among diabetes mellitus patients at present is how to avoid chronic vascular complications that are almost always concurrently found in diabetes mellitus. Results of the Diabetes Control and Complications Trial (DCCT)[1] and the United Kingdom Prospective Diabetes Study (UKPDS)[2] have proven that tight glycemic control could prevent chronic complications, especially microangiopathic complications such as retinopathy and nephropathy. Therefore, early detection and intensive management of plasma glucose and other risk factors are the main goals in order to prevent or at least delay chronic diabetes mellitus complications.

There is still no consensus on how to conduct screening for early detection of diabetic patients, whether screening should be conducted in the general population or in a clinical setting, for people with high risk for diabetes mellitus. The American Diabetes Association[3] in their position statement for type 2 diabetes mellitus screening stated that: "community screening has not been shown to be beneficial and may result in some harm, therefore this type of screening is not recommended". Almost all previous epidemiological research in Indonesia were conducted through identification of diabetes mellitus patients in the population (community based = population based). We have been checking for diabetes mellitus patients in the clinical setting (clinical setting = office based) since the year 2000.[4] This paper reports the results of both population screening and clinical screening, particularly in the identification of asymptomatic diabetes mellitus patients.

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METHODS

Population screening was conducted in 1997 at the Makassar Municipality, among a group of government employees and retired military officers. Since 2000, the diabetes mellitus screening was relocated to a clinical setting. The clinical screening is recommended for patients with high risk for diabetes mellitus, i.e.those aged > 45, or less than 45 years but accompanied by one of the following: obesity (BMI > 25 kg/m^2), hypertension (adult >140/ >90 mmHg), family history of diabetes mellitus, history of Impaired Glucose Tolerance (IGT) or Impaired Fasting Plasma Glucose (IFPG), HDL-cholesterol level <40 mg/dL and/or triglyceride level >250 mg/dL, and history of GDM or history of delivering a baby of over 4000 gram. Respondents already known to have diabetes mellitus and those consuming oral hypoglycemic drugs were excluded from the study.

For the population screening, due to problems in funding and implementation technique, only a single test was conducted i.e. 2 hours after 75 grams glucose load, in line with the 1985 WHO recommendation.[5] For clinical screening, standard fasting and two hours post 75-gram glucose load Oral Glucose Tolerance Test (OGTT) was performed. Each blood sample analyzed was collected from veins and measured by means of enzymatic methods using a photometer.

Table 1. Risk Factors for Type 2 Diabetes Mellitus[6]

Age ≥45 years
Age below 45 years with:
Obesity, i.e. body mass index ≥25 kg/m^2
Hypertension, systolic blood pressure of ≥140 mmHg and diastolic blood pressure of ≥90 mmHg or currently on antihypertensive drugs
Family history of diabetes mellitus (mother, father, or siblings)
Has been diagnosed with Impaired Glucose Tolerance (IGT) or Impaired Fasting Plasma Glucose (IFPG)
Has a plasma HDL -cholesterol level <40 mg/dl and/or plasma triglyceride level ≥250 mg/dL
For females, history of gestational diabetes mellitus during previous pregnancies or history of delivering babies with >4000 gram birth weight

RESULTS

The Difference in The Prevalence of Diabetes Mellitus Prevalence Identified in The Population and in Our Clinical Setting

Population screening recruited 941 respondents, 290 females and 651 males. The number of asymptomatic diabetes mellitus patients found were 51 (5.42% prevalence), consisting of 21 females or 7.24% of all female patients, and 30 males, or 4.60% of all male patients (Table 2). This number is significantly lower than the number obtained from the clinical setting.

The clinical screening recruited 907 respondents, consisting of 483 females and 424 male patients. The number and prevalence of asymptomatic diabetes mellitus patients found in this clinical setting were as follows: 155 patients, or 17.08% in prevalence, 78 females (16.14% of all female respondents), and 77 males (18.16% of all male respondents). (Table 3)

Population and Clinical Diabetes Mellitus Prevalence Based on 2-hour Post Glucose Load Plasma Glucose Level

Had the clinical diabetes mellitus criteria only measured plasma glucose level 2 hours post glucose load (the same as in population screening) the number of diabetes mellitus patients found were 131 persons or 14.44% as prevalence. This number is significantly higher than the 5.42% population prevalence. In other words, even when the same criteria is used (2-hour post glucose load), the prevalence of identified asymptomatic diabetes mellitus patients obtained in the clinical setting was still higher than that obtained in the population.

Had only 2-hour post glucose load plasma glucose level been assessed, 24 diabetic patients would have been missed in the investigation.

Diabetes Mellitus Prevalence in The Elderly (> 60 years)

From the age point of view, it can be observed that in the population, the prevalence of asymptomatic diabetes mellitus was higher among elderly people (> 60 years old), i.e. 29 patients out of 132 elderly respondents (21.97 %), while there were only 22 patients out of 809 respondents (2.71%) 59 years of age or younger. On the contrary, in the clinical setting there were more asymptomatic diabetes mellitus patients aged less than 59 – 121 patients out of 704 (17.19 %), while among the elderly, only 34 patients were identified out of 203 respondents (16.75 %). (Table 4)

This suggests that clinical screening focusing on the group with high risk for diabetes would be able to find significantly more young asymptomatic diabetes mellitus patients compared to population screening. From 155 asymptomatic diabetes mellitus patients found in our clinical setting, it turned out that 121 (or 78.1% of all asymptomatic diabetes mellitus patients) were aged 59 years or younger. Furthermore, 10.86% of them are very young, 39 years or less. On the other hand, only 22 diabetes mellitus patients identified in the community setting was 59 years of aged or less (or only 43.1% of all asymptomatic diabetes mellitus patients), and among those, and only 1.05% were very young (39 years or less).

Table 2. The Prevalence of Asymptomatic Diabetes Mellitus in The Population*

Age (years)	Sex						Total		
	Male			Female					
	n	DM		n	DM		n	DM	
		n	%		n	%		n	%
≤ 39	202	1	0.49	84	2	2.38	286	3	1.05
40 – 49	256	8	3.13	81	2	2.47	337	10	2.97
50 – 59	139	7	5.04	47	2	4.26	186	9	4.84
60 – 69	40	10	25.00	49	11	22.45	89	21	23.59
70 – 79	10	4	40.00	23	3	13.04	33	7	21.21
≥ 80	4	-	-	6	1	16.67	10	1	10.00
Total	651	30	4.60	290	21	7.24	941	51	5.42

*The diagnosis of diabetes was only based on 2hour post load plasma glucose

Table 3. The Prevalence of Asymptomatic Diabetes Mellitus at The Clinic*

Age (years)	Sex						Total		
	Male			Female					
	n	DM		n	DM		n	DM	
		n	%		n	%		n	%
≤ 39	84	6	7.14	88	12	13.63	172	18	10.46
40 – 49	143	27	18.88	151	18	11.92	294	45	15.31
50 – 59	111	30	27.00	127	28	22.04	238	58	24.35
60 – 69	64	9	14.06	94	15	15.96	158	24	15.18
70 - 79	21	5	23.81	19	5	26.31	40	10	25.00
≥ 80	1	0	0	4	0	0	5	0	0
Total	424	77	18.16	483	78	16.14	907	155	17.08

* The diagnosis of diabetes was based on the 1999 WHO criteria[7]

Table 4. The Number of Elderly Diabetes Mellitus Patients (≥60 years) in The Population and at The Clinic

Age (years)	Population			Clinic		
	N	DM		N	DM	
		n	%		n	%
≤ 59	809	22	2.71	704	121	17.19
≥ 60	132	29	21.97	203	34	16.75
Number	941	51	5.42	907	155	17.08

DISCUSSION

The WHO estimates that from the year 2000 and beyond, the number of diabetes mellitus patients will increase markedly especially in the Asian continent, where the number of diabetes mellitus patients in 2025 will reach around 250-300 million. The last two population screenings conducted in Indonesia (l993 in Jakarta and l997 in Makassar) have shown that the prevalence of diabetes mellitus in Indonesia – especially in larger cities – has increased at least three folds compared to the 1980s. Waspadji et al reported a 5.6% prevalence of diabetes mellitus in Jakarta[8] (private discussion), while Adam et al reported 5.42% in a group of government employees and retired military officers in Makassar[9] (not yet published). These numbers are significantly higher compared to the 1.5% diabetes mellitus prevalence in the 1980s.[10,11]

Diabetes mellitus is currently one of the most costly diseases, due to possible multiorgan complications. The aim of diabetes mellitus screening is to identify as many asymptomatic diabetes mellitus patients as possible to be able to start interventional therapy. Population-based diabetes mellitus screening requires quite a large sum of money and is technically difficult to conduct, especially in Indonesia. On the contrary, diabetes mellitus screening conducted on patients visiting clinics in hospitals and private practices is more practical and should be able to find more patients. Therefore, in 2002, the American Diabetes Association recommended asymptomatic diabetes mellitus patients screening in clinical settings, aimed at those with higher risk of acquiring diabetes mellitus.[12] Clinical screening has several benefits: it is easier to conduct, can be repeated, and could immediately be followed by therapy of patients

identified from the screening. In addition, patients are more cooperative, considering that they have voluntarily visited the outpatient clinic to see the doctor.

In this study, the prevalence of asymptomatic diabetes mellitus found in the clinical setting was significantly higher compared to that in the community setting. Drzewoski et al[13] from Poland studied high risk groups in an outpatient clinic and inpatient ward. Standard OGTT was measured in all subjects, and apparently out of 1306 high risk subjects to diabetes, using the WHO criteria (2-hour post glucose load measurement alone), they found a prevalence of 16.2% for asymptomatic diabetes mellitus, and 25.1% for IGT. These numbers are not very different from the results of this study (17.1% asymptomatic diabetes mellitus and 25.03% IGT).

Generally, population screening generates a lower prevalence of asymptomatic diabetes mellitus compared to clinical screening. A number of Asian population-based researchers found quite similar results. Deepa et al[14] from India reported a population-based diabetes mellitus prevalence of 5.2% out of 1001 patients investigated according to the WHO criteria. Ramachandran et al[15] studied an urban population in India and reported a slightly higher prevalence, i.e. 12.1% diabetes mellitus and 14.0% IGT.

Another important thing is the age difference of asymptomatic patients from clinical settings compared to in the population. Apparently, because clinical screening mainly focuses on those with high risk of diabetes mellitus, there are more young asymptomatic diabetes mellitus patients found aged less than 59 years. This is important, considering that the younger the age when the patient is detected, the greater the chance of chronic complications if diabetic intervention is not optimally performed. Another important thing is the diabetes mellitus diagnostic criteria used in clinical settings is the 1999 WHO criteria, which requires performing oral glucose tolerance test (OGTT). As shown by many studies, when the ADA criteria (fasting plasma glucose alone) is used, a number of diabetic patients, especially elderly ones, would be missed.[4,16,17,18]

CONCLUSION

Based on the results of this study, we could conclude that for early detection of asymptomatic type 2 diabetes mellitus patients, practitioners are advised to do clinical screening. Screening is aimed especially for those considered at high risk of having type 2 diabetes mellitus. Aside from being more practical, clinical screening is able to detect more asymptomatic diabetes mellitus patients compared to population screening. Standard OGTT is recommended in line with the 1999 WHO criteria.

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