

# Discuss the Role of Screening for Diabetes in our Community and which Test would be Cost-Effective

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## ABSTRACT

Chronic degenerative diseases represent the major challenge to public health in the 21st century. Having largely conquered epidemic infectious diseases, in future diabetes and cardiovascular disease, and their underlying risk factors, predominate. Chronic degenerative diseases already cause 70% of deaths worldwide. The chronic hyperglycemia of diabetes is associated with long-term dysfunction, damage, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Individuals with undiagnosed type 2 diabetes have significantly higher risk for stroke, coronary heart disease, and peripheral vascular disease than the non-diabetic population. Linking diabetes screenings with referrals to lifestyle programs for high risk individuals can help reduce the burden of diabetes in the state.

**Keywords:** Screening for Diabetes

## INTRODUCTION

The Miller-Keane encyclopaedia defines screening as the “examination or testing of a group of individuals to separate those who are well from those who have an undiagnosed disease or who are at high risk”<sup>1</sup>

The WHO "Principles of Screening" further describes the purpose of screening as: “It [screening] is systematically offered to a population of people who have not sought medical attention on account of symptoms of the disease for which screening is being offered and is normally initiated by medical authorities and not by a patient's request for help on account of a specific complaint. The purpose of screening is to benefit the individuals being screened.”

## APPROACHES TO SCREENING

Population based screening attempts to screen every person in the entire population.

Selective or target screening targets subgroups of the population with a high prevalence of risk factors for diabetes.

Opportunistic screening screens individuals during routine visits to health care facilities.

Population based screening is costly and inefficient due to the low prevalence of diabetes in the general population and therefore is not favoured. Selective and opportunistic screenings require fewer resources to reach the high risk groups to conduct screening tests and to perform follow up procedures.<sup>2</sup>

## IS DIABETES WORTH SCREENING FOR?

According to the International Diabetes Federation (IDF) update<sup>3</sup> on the prevalence of diabetes, there are 387 million people suffering from diabetes worldwide. By 2035 this number is expected to increase to 592 million people.

Type 2 diabetes, which is the most prevalent form of the disorder, can go asymptomatic for years which explain the high number of undiagnosed cases. According to the IDF

report, 46.3% of diabetics are undiagnosed. Since the disease can be silent for a long latent period and due to unmanaged hyperglycaemia, a substantial proportion of newly diagnosed type 2 patients already have evidence of the associated microvascular complications.

Diabetes and its complications is a substantial economic burden on countries.(Kirigia et al. 2009).<sup>4</sup> This is further substantiated by Dall, Zang, Cheng et al (2010)<sup>5</sup> who took into account higher medical costs as well as the loss of productivity and calculated the cost per US citizen, regardless of being diabetic, as \$700 per annum.

Diabetes is a disease worthy to be screened, as it meets all the disease screening criteria (Table 1) mentioned by Wilson and Junger (Wilson TGM, 1968).<sup>6</sup> It is therefore prudent to undertake diabetes screening tests which are a good preventative method for detecting the development of diabetes at an early stage, therefore preventing the progression of the disease to its debilitating complications which are obviously difficult to manage in all ramifications. Screening should only be done in a clinical setting where results can be reproduced and followed up with clinical interventions (ADA, 2002).<sup>7</sup>

## WHO SHOULD WE SCREEN

The National Institute for Health and Clinical Excellence (NICE) provides a preventive and intervention based approach, targeting people between the ages of 18 and 74 who are at high risk of developing type 2 diabetes. First, a risk assessment should be offered, after which a blood test to confirm whether people are at high risk (NICE, 2012).<sup>8</sup> Risk assessments are done by means of the high risk criteria mentioned in Table 2. Screening of especially overweight adults should be started from 40 years of age (except pregnant ladies) according to the NICE guidelines or 45 years of age according to the American Diabetes Association (ADA, 2014).<sup>7</sup> If the patient is high risk, yearly reassessments should be done, otherwise 3 yearly reassessments are advised.

Overweight children under 18 years with two risk factors (Table 3) should be screened from the age of 10 years or at puberty. Negative tests should also be repeated three yearly (ADA, 2014).<sup>7</sup>

Diabetes UK (2012)<sup>9</sup> in its position statement on the prevention of diabetes identified and targeted addressing obesity. With

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**How to cite this article:** Smita Kumari, Aditya Bhaskar, Surendra Kumar. Discuss the role of screening for diabetes in our community and which test would be cost-effective. International Journal of Contemporary Medical Research 2017;4(5):1142-1144.

this approach it suggested supporting people at high risk with services to encourage healthy living.

### THE ROLE OF HEALTH CARE PROFESSIONALS IN SCREENING

Everyone in the health care team directly or indirectly have a role to play in screening (NICE, 2012).<sup>8</sup> By being aware and on the lookout for high risk patients, the burden of this condition on society can be lightened.

Opportunistic risk assessments can be done by general practitioners, nurses and midwives in their daily scope of practice.

Podiatrists, optometrists and dentists are valuable in noticing early signs and symptoms of diabetic retinopathy, neuropathy and microvascular complications which can sometimes be seen even before diagnosis (Fowler, 2011).<sup>10</sup> They have an important educating role and might even refer patients for diagnosis in rural areas.

Dieticians and biokineticists are vital in compiling intensive lifestyle change programmes to identified high risk patients and educating the community.

Apart from being easily accessible, pharmacists have the advantage of seeing patients more often than doctors or diabetes educators. By implementing risk calculators they can also identify high risk patients for referral and can play a role in educating and raising awareness.

A good example of early intervention in the community will be educating young children to reduce the consumption of sugary drinks, or educating young mothers about the risk of diabetes and obesity in children.

### THE ROLE OF GOVERNMENT, HEALTH WELLBEING BOARDS AND MEDICAL INSURANCE COMPANIES IN SCREENING

According to the IDF Guideline for type 2 diabetes "it's recognised that in many parts of the developing world, the implementation of standards of care is limited due to lack of resources".

Governments are ideal to organize outreaches to high risk communities. They can also implement the use of Community Care Workers to promote and assist their community members in setting, and achieving self-care goals.<sup>11</sup>

It should be the responsibility of local ministries of health to identify high risk communities, which can be done by using the risk assessment questionnaires like the Finnish type 2 risk assessment form or the Diabetes risk score.<sup>12</sup>

Together with non-profit organizations they need to develop a demand for services. This implies that people need to be educated to understand and be aware of, the implications of chronic diseases and seek medical help. Local health authorities could also devise which level of care (Table 4) is most practical and cost-effective for the particular community.

Medical insurance companies could help in identifying high risk individuals by requesting a report from a medical professional regarding the applicant's blood glucose. Identified high risk individuals can be offered value added benefits to include payment for regular screening and exercise programs.<sup>13</sup> Incentive reward programs for healthy choices are a good motivation and awareness strategy.

1	The condition should be an important health problem.
2	There should be a treatment for the condition.
3	Facilities for diagnosis and treatment should be available.
4	There should be a latent stage of the disease
5	There should be a test or examination for the condition.
6	The test should be acceptable to the population.
7	The natural history of the disease should be adequately understood.
8	There should be an agreed policy on whom to treat.
9	The total cost of finding a case should be economically balanced in relation to medical expenditure as a whole.
10	Case-finding should be a continuous process, not just a "once and for all" project.
<b>Table-1:</b> Wilson's criteria for diseases worthy to be screened (Wilson and Junger, 1968 <sup>6</sup> ).	

Obesity *NICE guidelines: Body mass index (BMI) ≥ 30 kg/m <sup>2</sup> or 27.5 kg/m <sup>2</sup> for South Asians and a waist circumference for men of 94cm (90cm for South Asians) and 80cm for women. *ADA guidelines: BMI ≥25 kg/m <sup>2</sup> or 23 kg/m <sup>2</sup> for African Americans
High risk race/ethnicity *NICE guidelines: South-Asian, Chinese, African-Caribbean, Black African and other high-risk black and minority ethnic groups. *ADA guidelines: African American, Latino Native American, Asian American and Pacific Islander
First degree relative
Physical inactivity
Women with babies weighing more than 9 pounds (4kg) or with gestational diabetes mellitus
Hypertension (140/90 mmHg) or on treatment
High density lipoprotein (HDL) of <0.9mmol/L and/or Triglycerides (TG) of >2.82mmol/l
Women with poly cystic ovary syndrome (PCO)
<b>Table-2:</b> High risk factors for screening asymptomatic adults for type 2 diabetes (NICE, 2012) (ADA, 2014) <sup>7,8</sup> .

BMI > 85 <sup>th</sup> percentile for height, weight and sex or Weight > 120% of ideal weight
Family history of type 2 diabetes in first or second degree relatives
High risk race or ethnicity
Signs and symptoms associated with insulin resistance like acanthosis nigrans, hypertension, dyslipidaemia, PCO syndrome, mother had gestational diabetes/diabetes during child's gestation or small for gestational age birth weight.
<b>Table-3:</b> High risk factors for screening asymptomatic children for type 2 diabetes (ADA, 2014).

	FBS	HbA1c	2h OGTT
Normal	≤5.6 mmol/l	< 5.6%	< 7.8mmol/l
Prediabetes	5.6 - 6.9 mmol/l	5.7 -6.4%	7.8 - 11.0 mmol/l
Diabetes	≥7.0 mmol/l	≥ 6.5%	≥ 11.1mmol/l
<b>Table-4:</b> Biochemical cut-off values which used to interpreting the screening results (ADA, 2011).			

### WHICH SCREENING TESTS CAN BE USED

The screening tests include risk assessment questionnaires, biochemical tests or a combination of the two.<sup>3</sup> Risk assessments

questionnaires can be compiled from high risk factors alone or symptoms may be added. Used on its own, it is proven not to be effective.<sup>14</sup>

Biochemical tests include urine glucose testing, venous fasting plasma glucose (FPG), capillary glucose testing, haemoglobin A1c (HbA1c) and oral glucose tolerance tests (OGTT). Urine glucose testing has very low sensitivity<sup>15</sup> and should not be used. Capillary testing using home glucose monitors (finger-stick tests) are seen as inaccurate.<sup>16</sup> Although they are easier to perform and the costs are much less than for approved diagnostic tests<sup>17</sup>, they should not be used for screening or diagnosing. FPG, OGTT and HbA1c tests are being seen as diagnostic tests and can be used for screening as well. Cut-off points stated by the ADA (2011) are listed.

Icks et al. (2004)<sup>18</sup> suggested that HbA1c combined with OGTT was more cost-effective but incurred high costs. Another study (Hoerger et al. 2007)<sup>19</sup> concluded that testing all with OGTT identifies more cases at a lower cost than HbA<sub>1c</sub> screening.

The two step risk assessment approach that includes the identification of high risk groups and a follow up with fasting blood glucose measurements is found to be the most cost-effective method (Chen et al. 2011).<sup>20</sup> The most recent modelling study shows that among individuals attending NHS health checks, screening using a combination of HbA1c and FPG tests could be more cost-effective than using a FPG alone (Gillett M et al, 2015).<sup>21</sup>

## CONCLUSION

In conclusion, the role of screening in the community is a collective duty of the professionals mentioned above. The goal is to identify the number of people at risk of type 2 diabetes and those already suffering from the disease and incur lower costs at reasonable effectiveness. Most utilised is the opportunistic form of screening by professionals for diagnostic and treatment purposes (intervention based). Even though the finger stick method is found to be inaccurate and inconsistent and thus seems to be expensive and time wasting, it is still widely used by professionals to screen. Questionnaires are available for the identification of high risk patients by professionals, following which fasting plasma glucose is done.

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**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 30-04-2017; **Accepted:** 27-05-2017; **Published:** 08-06-2017