Public Awareness of Diabetes Mellitus in Singapore

H L Wee, H K Ho, S C Li

ABSTRACT

Introduction: Much effort has been devoted to educating the public about diabetes. However, the impact of such efforts has yet to be formally evaluated.

Objectives: To identify areas of knowledge that might require additional educational efforts.

Methodology: A cross-sectional survey was conducted to evaluate the general public's knowledge of diabetes. The respondents were required to answer 45 questions from a pre-tested questionnaire divided into five main sections, namely, general knowledge, risk factors, symptoms and complications, treatment and management, monitoring and other miscellaneous questions. A point was awarded for each correct response and zero for wrong or unsure responses. The maximum total score was 41. The miscellaneous questions were not scored.

Results: A total of 1337 subjects were interviewed. The mean score obtained by the respondents was 66.1% of the maximum possible total score (i.e. 27.1 points out of 41). The "correct answer" percentages for the individual questions from each section ranges from 22 to 83% (General knowledge), 31 to 91% (Risk factors), 48 to 81% (Symptoms and complications), 35 to 87% (Treatment and management), and 58 to 93% (Monitoring of condition). With respect to the source of medical information, health care professionals did not feature prominently (20.7%).

Conclusion: The public as represented by the samples in this survey is generally well informed about diabetes except for a few areas. Analysis of these areas would have a significant implication for future public education programme. Health care professionals should be more proactive in disseminating health information about diabetes to the public.

Keywords: diabetes mellitus, knowledge, public sector, health promotion, survey

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Department of
Pharmacy
National University
of Singapore
10 Kent Ridge
Crescent
Singapore 119260

H L Wee, BSc (Pharm)
(Hons) NUS
Graduate Student

H K Ho, BSc (Pharm)
(Hons) NUS
Honours Student

S C Li, B.Pharm,
Cert.Health Econ,
GradDipBus
(Tech Mgt),
MAppSc, MBA, PhD
Assistant Professor

Correspondence to:
Dr S C Li
Tel: (65) 6874 6537
Email: phalisc@
nus.edu.sg

INTRODUCTION

Diabetes mellitus is one of the most commonly encountered diseases by the healthcare professionals. Worldwide, it was estimated that the prevalence rate among adults was 4% in 1995 and this is expected to increase to 5.4% by 2025[1]. Compared to other parts of the world, Singapore has a higher prevalence of diabetes. In 1998, 9% of Singaporeans are diabetic, an increase from 8.6% in 1992. In 1999, diabetes was the sixth most common cause of death, accounting for 2.2% of annual total mortality in Singapore[2].

Besides significant mortality, diabetes-related morbidities such as diabetic retinopathy, neuropathy and cardiovascular disease have also placed a heavy financial burden on society[3-5]. For example, in the United States alone, the total annual economic cost of diabetes in 1997 was estimated to be US$98 billion. This included US$44 billion in direct medical and treatment costs and US$54 billion for indirect costs attributed to disability and mortality[6].

Healthcare professionals as well as public policy makers are well aware of the public health impact of diabetes. Diabetes is a silent disease – many sufferers became aware that they have diabetes only when they develop one of its life-threatening complications[6]. Knowledge of diabetes mellitus can assist in early detection of the disease and reduce the incidence of complications. Thus, considerable efforts had been put in to inform the public about diabetes.

Although much effort has been devoted to educating the public about diabetes through various forms of media, the impact of such efforts has yet to be officially evaluated. It is not known how much the public actually knows about diabetes through the current programmes. An understanding of the level of public awareness is helpful for health educators to plan for future programmes. However, a literature search retrieved no article on the level of diabetes knowledge in the general population. Efforts in this area were directed towards measuring patients' knowledge.

This paper discusses the results of a cross-sectional survey conducted to evaluate the general public's knowledge of diabetes mellitus. The main objective

was to identify areas of weakness and misconception that might require additional educational efforts. The results of the survey would allow improvements of the current programmes to address areas of knowledge deficiency and misconceptions, thus achieving maximum efficiencies with the finite resources devoted to public education.

METHODOLOGY

The survey was conducted in the form of a field interview performed on two afternoons outside several busy Mass Rapid Transit (MRT) stations concurrently during office hours on 5 and 6 March 1999. The inclusion criteria were that subjects must be greater than 16 years old and they must understand the instructions of the survey. The subjects were selected randomly by tossing a coin.

The respondents were required to answer a total of 45 questions from a pre-tested questionnaire using a 'Yes', 'No' or 'Unsure' as the response. The questionnaire, available in the four official languages of Singapore (English, Chinese, Malay and Tamil), was divided into five main sections, with each section focusing on different aspects of diabetes mellitus, namely, general knowledge about diabetes (nine questions), risk factors (four questions), symptoms and complications (11 questions), treatment and management (13 questions), monitoring (four questions) and other miscellaneous questions (four questions). The miscellaneous questions are whether it is advisable for female diabetics to use oral contraceptives, whether it is advisable to get pregnant, where the respondents obtained their medical information and their knowledge of diabetic support groups. A point was awarded for each correct response and zero for wrong or unsure responses.

Table I. Demographics of respondents.

Gender	Number (%)	Age (years)	Number (%)
Male	605 (45.8%)	16-20	225 (17.0%)
Female	716 (54.2%)	21-30	489 (37.0%)
		31-40	194 (14.7%)
		41-50	192 (14.5%)
Income	Number (%)	51-60	144 (10.9%)
No income	544 (41.6%)	>60	77 (5.8%)
<$1000	148 (11.3%)	Educational level	Number (%)
$1000-1999	221 (16.9%)	None	43 (3.27)
$2000-2999	206 (15.7%)	Primary	111 (8.4%)
$3000-3999	79 (6.0%)	Secondary/ITE/JC	467 (35.5%)
$4000-4999	37 (2.8%)	Polytechnics/University	668 (50.8%)
>$5000	73 (5.6%)	Others	26 (1.98%)

The maximum total score for sections one to five was 41. The miscellaneous questions were not scored.

RESULTS

Demographics of Respondents

A total of 1,337 subjects were interviewed at random from the general population. Sixteen subjects were omitted in the analysis due to incomplete data or poor quality data.

Of the 1,321 subjects, 605 were male and 716 were female. The demographic characteristics of the respondents are listed in Table I.

Overall Performance

The distribution of total score obtained by the respondents is shown in Fig. 1. The maximum score, the mean score obtained and its standard
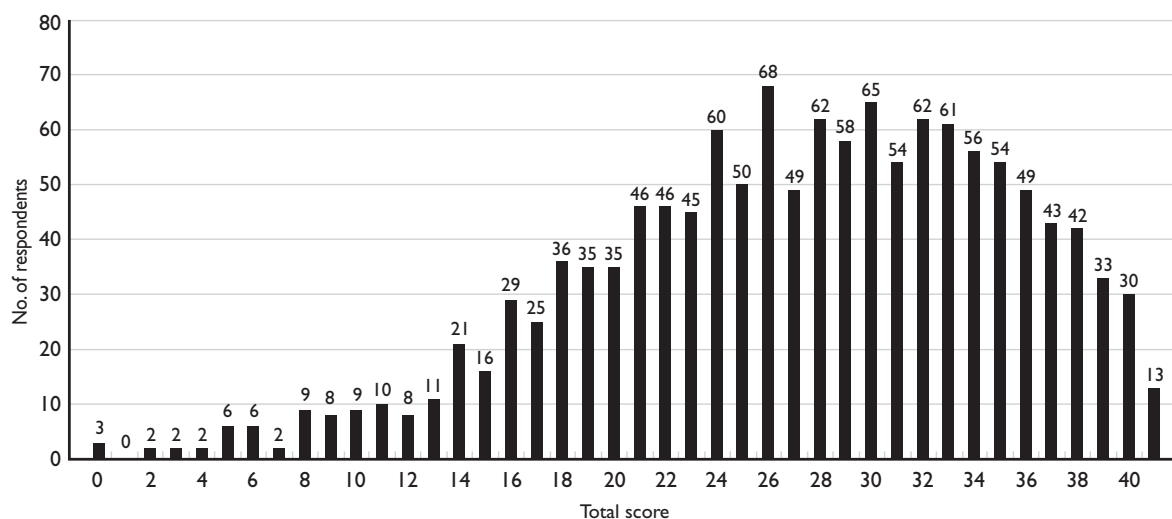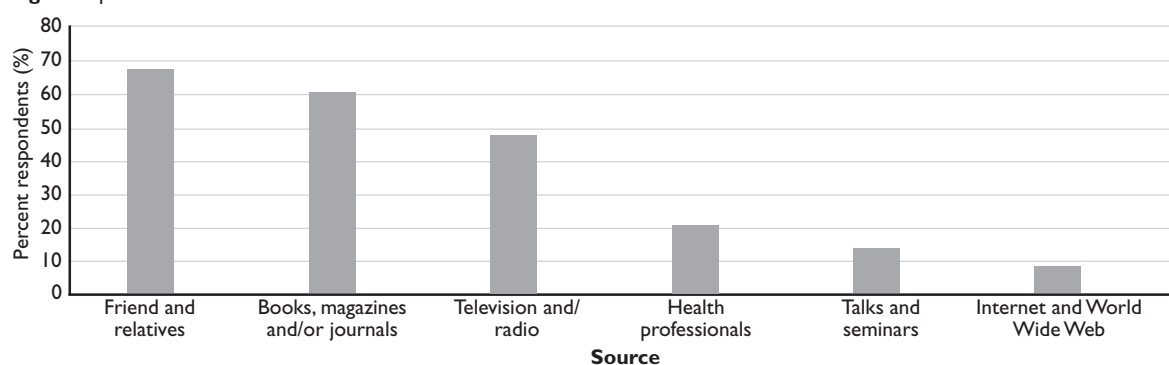
Fig. I Distribution of total score.

Fig. 2 Respondents' source of information.

Table II. Maximum possible score, average score and its standard deviation and mode for each section.

Section	Maximum possible score	Median Score	Standard Deviation	Average score (%)	Mode
General knowledge	9	5.1	2.31	56.4	6
Risk factors	4	2.5	1.16	62.3	3
Symptoms and Complications	11	7.3	3.12	66.6	11
Treatment and Management	13	8.9	3.04	68.2	12
Monitoring	4	3.3	0.86	83.3	4

Table III. General Knowledge of diabetes.

Question	Correct (%)	Wrong (%)	Unsure (%)
Diabetes is a condition of high blood sugar	83.3	5.5	11.2
Diabetes is a condition of insufficient insulin	60.4	7.9	31.6
Diabetes is a condition of the body not responding to insulin	32.4	24.1	43.5
Diabetes is non-contagious	72.9	9.8	17.9
How many types of diabetes are there?	22.1	12.9	65.0
Diabetes is not curable	54.0	25.7	20.4
Insulin is a hormone	40.3	21.8	37.8
Insulin controls blood sugar	74.2	2.5	23.3
Insulin is required for some diabetic patients	68.0	5.7	27.0

deviation and the mode for each section are outlined in Table II.

Performance for individual section

The data were further analysed by examining the percentage of correct response to the questions in each individual section (Tables III to VII). The results showed that there were areas of deficiency even though the average score was reasonable.

There were 18 questions where the "correct answer" percentage was lower than the average (Table VIII). Analysis of these might have a significant implication for future public education design.

Miscellaneous questions

In respect to the source of medical information (Fig. 2), the results from the respondents revealed that the most important source of information on diabetes was their friends or relatives (67.6%). Health care professionals did not feature prominently (20.7%): and very few respondents obtained their information from the Internet (8.7%). The results also showed that very few respondents (17.7%) were aware of the existence of diabetic support groups in Singapore.

DISCUSSION

Generally, the results showed that the respondents' knowledge of diabetes was at an acceptable level but there were areas of deficiency. The respondents performed best in the monitoring section and worst in the section on *risk factors*.

The respondents scored on average more than 60% in each section of the questionnaire (Table II). However, the relatively large proportion of respondents with tertiary education may be a contributing factor to the high average score. This bias in sampling could have been introduced partially due to the locations at which the survey was conducted. The Central Business District, one of the study locations, could have had a higher concentration of tertiary-educated subjects. Performing a subgroup analysis might help to determine if educational level is an important predictor of level of diabetes knowledge. However, it is subject to the caveats of any post-hoc analysis. The authors would also recommend that any repeat of this study be performed at different times of the day and cover wider geographical locations.

Table IV. Knowledge of risk factors of diabetes.

Risk factors	Correct (%)	Wrong (%)	Unsure (%)
Family history of diabetes	90.7	3.1	6.1
Age above 40 years old	59.6	19.9	20.5
Obesity	67.7	13.9	18.5
Pregnancy	31.5	36.6	32.6

General Knowledge on Diabetes Mellitus

The results showed that majority of the subjects did not know there are different types of diabetes. Lack of exposure to diabetic patients and lack of interest in issues unrelated to them may be the possible explanation for the low scores. The respondent's poor knowledge of the pathophysiology of diabetes showed up again in the other questions. Only one-third knew that diabetes could also be due to the body not responding to insulin. As high as a quarter of the respondents thought that diabetes is curable. This misconception may render the general public to be less prudent in taking measures to prevent diabetes. There is a need to highlight the social and economic impact of diabetes in future educational programmes so that the general public would have a better understanding of the severity of the disease.

Risk Factors

This is the section where the respondents recorded the lowest scores, indicating that more effort should be put in to educate the public about risk factors.

Sedentary lifestyle and obesity are two important contributors to increasing prevalence of diabetes. The National Health Survey 1998 revealed that there was an increase in the prevalence of obesity in Singapore from 1992 to1998[2]. The survey also revealed that only 16.8% of the population exercise regularly while more than half did not exercise at all. It is imperative to educate the public about the dire consequences of obesity. By educating individuals about their level of risk, it is hoped that high-risk individuals would be motivated to adopt a healthy lifestyle, undergo routine medical check-ups and be an active player in the prevention of diabetes. The American Diabetes Association suggested that screening for diabetes as

Table V. Knowledge on symptoms and complications of diabetes.

Symptoms	Correct (%)	Wrong (%)	Unsure (%)
Constant feeling of thirst	67.3	7.3	25.4
Frequent urination	61.8	10.4	27.9
Weight loss despite normal appetite	61.2	12.5	26.3
Blurred vision	57.5	12.0	30.4
Slow healing of cuts and wounds	74.6	8.4	16.9
Tiredness and weakness	81.4	3.03	15.5

Complications	Correct (%)	Wrong (%)	Unsure (%)
Decaying limbs that require surgical removal	73.5	8.2	18.2
Eye problems	69.6	9.3	25.1
Kidney problems	70.3	7.7	22.0
High blood pressure	68.6	8.3	23.0
Loss of sensation in arms and legs	47.8	13.6	38.5

Table VI. Knowledge of treatment and management of diabetes.

Question	Correct (%)	Wrong (%)	Unsure (%)
Medications available			
Insulin injections are available for the control of diabetes	85.5	1.4	13.2
Tablets and capsules are available for the control of diabetes	73.0	6.4	20.7
Lifestyle and non-medical measures			
Diabetics should carry sweets and jelly beans when they are out	34.8	44.9	20.3
Diabetics should exercise regularly	86.7	3.1	10.2
Diabetics should have good weight control	85.8	2.5	11.7
Diabetics should go for regular eye check-up	59.0	12.8	28.2
Diabetics should have a low fat and high fibre diet	81.4	3.0	15.7
Diabetics should care for their toes and feet	52.5	17.6	29.6
Things diabetics should not do			
Diabetics should not consume alcohol	80.7	5.5	14.6
Diabetics should not donate blood	60.0	15.8	24.2
Diabetics should not smoke	77.1	7.4	15.5
Diabetics should not wear tight shoes	46.3	20.9	32.9
Diabetics should not skip meals when busy	64.3	14.2	21.4

Table VII. Knowledge of monitoring of diabetic conditions.

Question	Correct (%)	Wrong (%)	Unsure (%)
Diabetics should test for blood glucose	91.8	1.2	6.8
Diabetics should test for sugar in the urine	90.3	3.6	6.1
Diabetics should make regular visits to the eye doctor	57.8	13.4	28.9
Diabetics should go for regular medical check-ups	93.1	1.8	5.1

Table VIII. Questions with percent correct answer less than average (66.1%).

	Correct (%)	Wrong (%)	Unsure (%)
Diabetes is a condition of the body not responding to insulin	32.4	24.1	43.5
Diabetes is a condition of insufficient insulin	60.4	7.9	31.6
How many types of diabetes are there?	22.1	12.9	65.0
Insulin is a hormone	40.3	21.8	37.8
Diabetes is not curable	54.0	25.7	20.4
Age above 40 years old	59.6	19.9	20.5
Pregnancy	31.5	36.6	32.6
Frequent urination	61.8	10.4	27.9
Weight loss despite normal appetite	61.2	12.5	26.3
Blurred vision	57.5	12.0	30.4
Loss of sensation in arms and legs	47.8	13.6	38.5
Diabetics should carry sweets and jelly beans when they are out	34.8	44.9	20.3
Diabetics should go for regular eye check-up	59.0	12.8	28.2
Diabetics should care for their toes and feet	52.5	17.6	29.6
Diabetics should not donate blood	60.0	15.8	24.2
Diabetics should not skip meals when busy	64.3	14.2	21.4
Diabetics should not wear tight shoes	46.3	20.9	32.9
Diabetics should make regular visits to the eye doctor	57.8	13.4	28.9

routine medical care might be appropriate for individuals with one or more risk factors of diabetes. High-risk individuals are recommended to repeat the screening at three-year intervals[7,8]. In Singapore, screening for diabetes is non-routine. The authors urge the healthcare authorities to look into the feasibility of implementing routine screening of high-risk individuals as an important preventive measure.

This section had an open-ended question for respondents to state other risk factors that they knew. Among the responses were problems with pancreas, lack of insulin and defective islets of Langerhans cells. Other risk factors that were mentioned included imbalanced or unhealthy diet (e.g. fatty diet, salty diet, diet without vegetables, too much red meat or viscera), drinking, smoking, lack of exercise, high blood pressure, laziness and irregular meals. These are related to the pathogenesis of diabetes and healthy lifestyle and cannot be considered risk factors. However, it further indicated that the respondents were generally unclear of the risk factors for diabetes and further support the call for more public education.

Symptoms and complications

The results showed that the respondents had a fairly good understanding of the symptoms and complications of diabetes. Early recognition of symptoms may aid in early detection of the disease,

allowing for prompt treatment. The onset of Type 2 diabetes, the predominant form, is usually insidious. Many Type 2 diabetes patients were undiagnosed until they had developed severe complications. At the same time, with knowledge of the severity of complications, the public would not take the symptoms lightly and would seek prompt medical attention. The symptoms of Type 2 diabetes are so mild that patients who are fortunate to be diagnosed early do not see a need for long-term therapy. It is important to educate the public about the complications of diabetes, so that they could encourage their diabetic friends or relatives to comply with therapy. This may reduce the burden of diabetes and its complications[9,10].

Some important symptoms that respondents were not familiar with are blurred vision and a loss of sensation in the extremities. Early recognition reduces the likelihood of loss of vision, and the need for amputation[7,11,12].

Treatment and Management

The respondents did very well for this section. Given that Type 2 diabetes is the more common form of diabetes in Singapore, it is interesting to find that more people actually knew about insulin than oral hypoglycemic agents. The concomitant use of insulin and oral hypoglycaemic agents in many Type 2

diabetics may account for this. One point of contention is that the percentage of population who knew about insulin injection was even higher than those who knew that the lack of insulin is a cause of diabetes. This could be due to the repetitive use of "insulin" in the earlier section of the questionnaire, giving them a preconceived idea of its use in treatment.

Here, in another open-ended question, the respondents were asked to state the other treatment that they know. A variety of answers were given, with diet control being most frequently mentioned. It is interesting to note that traditional medicine, cordyceps, baby bitter gourd and even pumpkin were mentioned. There may be some Asian diabetic patients who would rather rely on traditional medicine than western therapy, due to the deeply-rooted practice of traditional medicine in the Chinese and Malay culture. Unfortunately, there is no conclusive study on the true value of herbal medicines in diabetes treatment and control to-date. Dialysis and gene therapy were also frequently mentioned. The respondents may have confused diabetes with renal failure. On the other hand, perhaps their diabetic friends or relatives may be undergoing dialysis due to kidney complications, and so they mistook it for treatment of diabetes. It is important to determine if this is a true misconception. If so, it must be promptly clarified.

With the hype about the Human Genome project in the mass media, respondents' knowledge of gene therapy is not unexpected. This could imply that the respondents knew there is a genetic component in the pathogenesis of diabetes. Alternatively, it may indicate that the public has a misconception that gene therapy can cure any diseases. This is another area for further investigation.

In terms of knowledge about preventing complications of diabetes, few people knew diabetics should carry sweets and jelly beans for hypoglycaemic episodes, and the need for regular eye check-up and proper foot care. This is congruent with the information obtained from the previous sections.

It is encouraging to find that many respondents knew diabetics should not donate blood. It is unclear however, if they know the reason behind it. It may be necessary to clarify that the real reason for discouraging blood donation is due to the danger of slow wound healing which increases the risk of infection in the diabetic patient. Otherwise, people might have the misconception that diabetes could be transmitted through blood products.

Monitoring

The respondents performed best in this section. However, there is still a major area of concern about eye care. Once again, it was shown that the respondents did not know about the need for regular eye check-up. This reflects the internal consistency of the responses.

Sources of information

It was found that the bulk of the respondents' information is obtained through friends/relatives or books and magazines. Hence, the power of communication through "word of mouth" cannot be underestimated. Diabetic education therefore benefits not just the patients but also their friends and relatives. Since the print and mass media are important sources of information, their involvement in public diabetes education is vital. Television programmes must also portray the disease accurately and in a positive light.

Another important finding is that respondents do not actively seek out information. Only a smaller proportion of respondents obtained their information from the health professionals, talks and seminars. This shows that health professionals must actively provide diabetic information to the general public. The general public comes into frequent contact with the general practitioners and community pharmacists. The authors strongly urge the general practitioners and community pharmacist to play a more proactive role, for example, by providing their patients with educational pamphlets during their visits and by urging high-risk patients to go for screening tests. On a positive note, the low involvement of health professionals could be that the respondents were general healthy and did not often visit the general physicians or the community pharmacists.

Over the last decade, the use of the Internet by Singaporeans has been increasing steadily. Given the large amount of medical information available on the Internet, it was surprising that the Internet was the least exploited source of information. This trend however might change as information technologies continue to grow exponentially. Based on overseas trends, the use of the Internet for medical information is expected to become more popular. Internet access is widely available in all tertiary institutions here in Singapore. Given the large proportion of respondents with tertiary education, it is even more surprising that the Internet was not utilised as a source of health information. This may once again reflect that respondents do not actively seek out health information. Public health educators could consider promoting the use of the Internet as a source of healthcare information in future programmes. Given the wealth of information available on the Internet, however, pubic health educators must provide advice on the selection of appropriate sites.

The respondents were generally unaware of diabetic support groups. Among those who knew, the

Diabetic Society of Singapore, formed since 1971 and which had organised numerous public forum and children diabetic camps, was most frequently cited. In order to gain the support of the public, whether in funding or volunteering service, diabetic support groups must make their presence felt. The results of this survey indicated a need for diabetic support groups need to step up their promotional activities.

CONCLUSION

The results of this survey showed that the public as represented by the samples in this survey is generally well informed about diabetes except for a few areas as mentioned. Therefore, it can be concluded that public education of diabetes had been reasonably successful in terms of passing on knowledge. However, it is not sure how strongly public education had encouraged people to adopt a different lifestyle to reduce their risk of developing diabetes. Future studies could look into this aspect. The mass media and the print media will continue to be important for dissemination of information. It is believed that the Internet will become an important source of healthcare information. The results of this study could contribute positively and meaningfully to the design of future educational programme and materials. An improved educational programme that tackles the areas of weaknesses or misconceptions can potentially increase the level of public awareness of diabetes.

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