

## DIABETES IN TANZANIA: INSULIN SUPPLY AND AVAILABILITY

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### INTRODUCTION

This is a study looking at diabetes mellitus (DM) in Tanzania. The aim of this project was to determine insulin availability and supply in different regions of the country. Previous studies have indicated that many sub-Saharan African countries do not have the infrastructure or the financial means to ensure a continuous supply of certain drugs and medical services. Diabetes mellitus is an increasing problem in both developed and developing countries, and has the potential to be an increasing burden upon government health expenditure. Since the advent of insulin, developed countries have been fortunate enough to have continuous access to insulin as an essential drug, however, in developing countries this is not always the case. This study focuses on the reasons for this short supply and other aspects of the management of diabetes in Africa.

Diabetes is not a single disease entity but a group of syndromes with common features, of which elevated blood glucose is the most evident. According to the World Health Organisation (WHO) 'Diabetes mellitus is characterized by hyperglycaemia and disturbances of carbohydrate, fat and protein metabolism that are associated with absolute or relative deficiencies in insulin action and/or insulin secretion'.<sup>1</sup>

Diabetes is now one of the most common non-communicable diseases (NCDs) around the world. It is the fourth or fifth leading cause of death in most developed countries and there is evidence to show that it is epidemic in many developing countries.<sup>2</sup> Globally, in the year 2000, the number of people with diabetes was thought to be 151 million, i.e. a prevalence rate of 4·6%. Those with Type I DM accounted for approximately 4·9 million (approximately 0·09% prevalence).<sup>2</sup> Predictions for the year 2010 suggest that the total number of people with diabetes globally will reach 221 million; of which five million will be Type I.<sup>3</sup> Furthermore, the regions with the greatest potential increases are Asia and Africa where diabetes rates could rise by two or three times those experienced today.<sup>3</sup>

Diabetes has until recently been regarded as rare in sub-Saharan Africa.<sup>4</sup> Since the early 1960s, various studies have determined the prevalence of diabetes although work in Tanzania only seriously got underway in the 1980s. Until the study by Elamin *et al.* no information

was available on the prevalence of Type I DM in Africa.<sup>5</sup> A study in Tanzania found that 15–33% of all deaths in adults were due to NCDs<sup>6</sup> and it is expected that by the year 2015 this number will exceed those deaths due to communicable causes in Africa.<sup>7</sup> In addition there has been a significant increase in reported cases of impaired glucose tolerance (IGT), which is thought to be a leading factor in the development of DM. For example, in Tanzania there are approximately 135,000 people aged from 20–79 with DM<sup>2</sup> but there are over one million people with IGT.<sup>3</sup>

Tanzania has a much lower incidence compared with many other countries, however.<sup>8–11</sup> It could be argued that this is simply due to the fact that many patients do not survive without insulin and therefore die undiagnosed.<sup>12</sup> In some parts of Africa, many people with Type I DM under the age of 15 can expect to live for just one year after diagnosis.<sup>13</sup> In one proposal, approximately 400 Type I diabetics in Tanzania were known; if one assumed, however, constant availability of insulin and therefore a minimum five-fold increase in survival, this rose to 2,000 with a corresponding insulin need rising from 5,110 vials to 25,550 vials.<sup>14</sup> In its present situation, Tanzania would be unable to cope with this demand.

### Facts about Tanzania

The United Republic of Tanzania has a population of approximately 30 million and covers an area of 945,000 square km. Its people, mainly of Bantu origin, belong to about 120 tribes.<sup>15</sup> Tanzania has a mixed economy in which agriculture plays a key role and provides the largest share of any sector to the gross domestic product (GDP).<sup>16</sup> Basic medical care is state-funded, although there are also a number of Christian missions. Rural areas are served by local clinics. Despite relatively good medical care, diarrhoea and respiratory diseases, such as tuberculosis and malaria, are still big killers. Human immunodeficiency virus (HIV) is increasing and is around 20% in rural areas.<sup>17</sup> The life expectancy in Tanzania for a male is now 47 and for a female 49 (compared to 75 and 80 years respectively in the UK).<sup>2</sup> In most hospitals English is spoken but the majority of patients speak Swahili only.

While I was in Tanzania, the country celebrated its 40th anniversary of independence. Despite this, Tanzania is a

\*The currency of Tanzania is the Tanzanian shilling (Tsh). The average wage in Tanzania is 18,000 Tsh/month.

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'highly indebted country'<sup>18</sup> and thus one of the poorest countries in the world – ranked 156 in 1999 (compared to 150 in 1998) in the Human Development Index.<sup>19</sup> For example, based on the 1991–2 Household Budget Survey, approximately 27% of people live in households whose total expenditure is insufficient to obtain enough food to meet nutritional requirements.<sup>19</sup>

Tanzania has relied on foreign aid for a long time. External debts in 1999 stood at US\$7,603 million, which represents 71% of the gross national product (GNP).<sup>19</sup> Fifty-eight per cent of Tanzania's recurrent expenditure comes from internal sources and 42% comes from donors – this is a higher degree of dependency than they had before.<sup>20</sup> Despite this, aid flow to Tanzania has been falling: recent figures show aid to Africa fell to US\$14·2 billion in 1999 from US\$24·2 billion ten years earlier.<sup>21</sup> Furthermore, the withdrawal of Danish International Development Agency, and other European Union (EU) aid projects following the disputed Zanzibar election has increased the problem. Luckily, steps have been taken recently to urge the EU to give developing countries greater access to its markets in order to fight poverty.<sup>22, 23</sup> Similarly, a number of organisations have tried to encourage leaders of the eight nations to reduce debt demands.<sup>24</sup> With over 50% of the population in Tanzania living below the poverty line together with recurrent recessions<sup>19</sup> the situation still looks desperate for the time being.

## The health sector

The Tanzanian government has been proud to demonstrate its ability to deliver social services – for example, there is now one dispensary for every 20,000 people<sup>20</sup> and one doctor for every 26,000 people<sup>25</sup> (compared to 625 people in the UK).<sup>2</sup> Similarly, in hospitals, between 1990 and 1998, there were approximately 0·9 hospital beds/1,000 people in Tanzania (compared to 4·5/1,000 people in the UK).<sup>2</sup> Access to healthcare is demonstrated by 72% of Tanzanians living within 5 km and 95% within 10 km of a health facility.<sup>19</sup> However, as one person put it in a national newspaper: 'You might have as many dispensaries and health centres as possible, but what's the use when they are not stocked with drugs?'<sup>26</sup> This again was reinforced by a study in which patients would go straight to hospital for certain conditions rather than the local government dispensary or health centre because frequently there were no medicines available there.<sup>27</sup> In this study patients would occasionally attend the hospital in Zanzibar because there were no blood glucose measuring sticks in the local village pharmacy. Persistent shortages of drugs and equipment,<sup>19</sup> however, is not a new thing. Reasons include shortage of imported drugs due to lack of foreign exchange, lack of locally produced drugs for similar reasons, poor storage and distribution, inadequate utilisation and lack of quality of assurance.<sup>28</sup>

Efforts have been made to encourage the community to become more involved in their own health. The Community Health Fund (CHF) has been pre-tested in Igunga District as a pre-payment scheme that ensures greater security of access to healthcare and empowers households and communities in healthcare decisions and participation. It has now expanded to other districts and in February 2001 a bill supporting the CHF scheme was passed in the National Parliament.<sup>19</sup>

## Government health expenditure

In 1990 the per capita expenditure on health in Tanzania was just US\$4<sup>29, 30</sup> and drug consumption per capita (estimated) set at US\$2–3.<sup>31, 32</sup> The World Bank has estimated that the minimal cost of providing basic healthcare including essential drugs is four to five times this amount.<sup>33</sup> In Zanzibar in 1997–8 the amount available was the equivalent of just 20p (STG) per person per year;<sup>34</sup> compare this to Europe where the per capita expenditure on health can be up to US\$2,500. With reference to diabetes, it was estimated that nearly US\$4 million would have been required to care for all diabetic patients in Tanzania during 1989–90.<sup>30</sup> Therefore, if the government was the sole provider of healthcare for diabetic patients this would equate to 8·1% of the health expenditure budget simply devoted to one cause,<sup>30</sup> compared to approximately 3–6% in eight European countries as shown in the CODE-2 study.<sup>2</sup>

In addition, government expenditure on health has fallen from 7·1% of the total expenditure in 1977–8 to just 4% in 1999–2000<sup>35, 36</sup> in Europe the percentage GNP spent on health can be up to 8·8%. In 1990–1 the total annual drugs bill was 6·2 billion Tsh\* of which 35% was financed through the public sector, with the rest covered by grants, loans and other external support.<sup>37</sup> In 1992, Tanzania depended on importation for up to 80% of its drugs.<sup>28</sup>

## Drug supply

The Essential Drugs Programme (EDP) was created in Tanzania in 1983. It was intended that the EDP would create reliable obtainment of drugs and efficient distribution, and the Programme was considered to be a component of the 20-year term of the Ministry of Health (MOH) Plan (1980–2000).<sup>38</sup> Several problems have been discovered with the system. The fact that an essential drugs list existed did not mean that it was implemented: its implementation was still voluntary for drug producers, importers and distributors. The obtainment of drugs was based on the old system, which is still largely in place as demonstrated in this study, whereby drugs were bought from the Central Medical Stores (CMS) for MOH-owned health units and certain voluntary agency (VA) units. In addition, VA units could acquire drugs through direct purchasing or by donations from abroad. Since processes such as the selection, distribution, storage and drug utilisation have not been

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institutionalised, this undermines the quality assurance as well as the ability of the state to obtain and distribute drugs effectively.<sup>38</sup>

Such problems still exist – a 2001 newspaper article highlighted the shortage of anti-tuberculosis drugs in Tanzania, due to health officials delaying their purchase to favour a supplier of their choice, despite confirmation by WHO that the lowest bidder was just as competent and complied with the necessary requirements.<sup>39</sup> Other problems included inappropriate use of money given by the government to purchase drugs.

The Tanzanian National Drug Policy was created in 1991 ‘to make available to all Tanzanians at all times the essential pharmaceutical products which are of quality, proven effectiveness and acceptable safety at a price that the individual and the community can afford’.<sup>40</sup> However, this policy experienced such problems as the increasing cost of maintaining these health facilities, drugs and medical supplies. In 1984 this situation was so serious that supplies and services were severely reduced or completely cut out, and funds taken from other equally important sectors. Furthermore, the expansion of the health services did not grow in parallel with an increase in relevant pharmaceutical and medical personnel. This lead to inadequacies in supply and distribution, and storage facilities.<sup>40</sup>

A plethora of other problems was highlighted in the report: lack of patient education leading to non-compliance with treatment; inappropriate prescribing practices leading to drug shortages; increased demand for services and shortage of qualified health professionals; absent or inefficient record-keeping of patient attendance, morbidity and drug prescribing causing inaccurate estimates of drug requirements, in turn leading to overstocking and expiry of drugs; large gaps in people’s knowledge of self-diagnosis and treatment, correct utilisation and storage of drugs and appropriate use of healthcare facilities; and lack of enforcement of existing drug laws such as control of importation, which has resulted in non-essential and occasionally harmful drugs of questionable quality entering the country.<sup>40</sup> Ironically, most, if not all, of the problems highlighted still exist today and are relevant to the supply of insulin.

## International Diabetes Federation

The International Diabetes Federation (IDF) is a non-governmental organisation (NGO) which works alongside WHO and the Pan-American Health Organisation (PAHO) and has done so since 1957.<sup>1</sup> Its aim is to provide information and undertake activities to improve the welfare of people with diabetes.<sup>41</sup> It has also been involved with the formation of the St Vincent Declaration (1989) for Europe, which recognises the scale of the problem and highlights such goals as

improving detection and control of diabetes, raising awareness, promoting independence of people, and reducing complications such as blindness and kidney disease. Since then various declarations and statements have been made to support this<sup>41, 42</sup> and the African Declaration on Diabetes is currently under creation by the IDF Africa Region (IDF Africa, personal communication).

The IDF is also responsible for the setting up of Task Forces for example the Task Force on Insulin which has been examining issues such as the cost of insulin and insulin standardisation etc.<sup>43</sup> It has also undertaken an International Insulin Accessibility project; at the moment, however, it is focusing on central and Eastern Europe.<sup>43</sup> In 1992 and 1997 the Task Force conducted a survey on access to insulin and found that affordability, distribution and transportation were the main barriers to insulin accessibility.

## THE PROJECT

The aim of this project was to assess insulin availability, and the barriers to its availability, in three regions with hospitals – Dar Es Salaam, Teule Hospital in Muheza and Mnazi Mmoja Hospital in Zanzibar.

## Dar Es Salaam

Dar Es Salaam, a large city on the east coast of Tanzania, has a population of over two million and an area of more than 1,350 square km. Most citizens are of African origin, but there are sizeable minorities of Indians, Asians, Arabs and people of mixed race. There are several government hospitals in Dar Es Salaam and many private hospitals. The IDF Africa and Tanzanian Diabetes Association (TDA) Offices are in a private hospital called the Hindu Mandal Hospital and this is where I was based for my entire stay. All three of the hospitals that I visited obtain their insulin through the TDA. The TDA receives donations of insulin (usually from Novo Nordisk) and with the money earned from the clinic through selling insulin to patients, is then able to purchase more insulin from the CMS to then sell to patients. For example, one vial of insulin, bought from the CMS, costs 1,250Tsh. In a pharmacy this would normally cost anything between 3,500–5,000Tsh. The insulin is then sold to the patient at the clinic for 1,000Tsh and if they cannot afford it, the idea is that they are given it for free. Other donations from foreign companies include glucometres and penfils, fridges and glucostix surplus. The TDA is also in touch with an organisation called Insulin for Life which has been operating for about 16 years and recently sent 200 vials of insulin and blood glucose strips.

## Illala hospital

The Illala hospital which lies to the west of Dar Es Salaam is a fairly large district council/government hospital with 150 beds. Approximately 1,300 patients with Type 1 and Type 2 diabetes are registered at the

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diabetic clinic of whom approximately 24% are insulin dependent (TDA, personal communication). Initially patients may be seen as an out-patient at another clinic or present to accident and emergency, where the cost of diagnosis using a blood glucose measuring stick is 1,000Tsh after which they are referred to the diabetic clinic. Clinics take place three times a week and are run by two medical officers qualified in general medicine but who have also received training in diabetes, one clinical officer and one nurse assistant. There are no facilities for an oral glucose tolerance test (although this can be done at the Muhimbili hospital) or (glycosylated haemoglobin) HbA1c testing. If patients develop any problems, they are referred to the Muhimbili hospital.

The insulin prescribed includes soluble and lente insulin. Several members of the medical staff have reported a habit of patients diluting the insulin to make it last longer although I could find no evidence of this. Depending on the patient's glucose levels and general health the patient may be seen every fortnight, month, three months or four months. If patients are unable to afford insulin, there is a welfare officer in the hospital who can give them an exemption. However, I met plenty of patients who had problems affording their treatment, yet none of them had been awarded an exemption. See Appendix I for further information on Illala hospital.

## *Temeke hospital*

Temeke hospital is a district council hospital which lies south west of the Dar Es Salaam city centre. It has 150 beds and a diabetic clinic run by a consultant and two staff nurses. There are approximately 1,455 Type 1 and 2 diabetics on record and clinics take place three times a week.<sup>44</sup> Patients see a doctor in out-patients at a cost of 300Tsh and if found to be diabetic are referred to a diabetic clinic which is free to attend. However, a blood glucose measuring test costs 1,000Tsh. The protocol is for patients to have their weight and height taken, and a blood glucose measuring test to be carried out and then to see the doctor who takes the blood pressure, pulse and writes a prescription. A new patient will be seen two weeks later, then one month later and then every three months thereafter. If the patient is admitted, there is a one-off fee of 2,000Tsh. No oral glucose tolerance test facilities exist however an HbA1c can be done at a cost of 2,000Tsh. Insulin, if bought from the hospital, costs 500Tsh; and if patients wish to buy the monitoring kits, the strips alone cost 20–30,000Tsh for 50 strips. If patients are unable to afford their insulin, they can approach the social welfare officer who awards an exemption permit so that insulin is free.

## *Muhimbili hospital*

This is the largest government and teaching hospital in Dar Es Salaam and runs diabetic clinics twice a week. Attendance at the clinic is free; however insulin costs 1,500Tsh and a blood glucose measuring test 1,000Tsh.

Those unable to afford their insulin can again be exempted by a social welfare officer. The hospital has facilities for oral glucose tolerance testing. The TDA is currently in the process of trying to set up a diabetes education centre.

## **Muheza**

### *Teule hospital*

Teule hospital in Muheza, Tanga region contains 280 beds, usually at 150% occupancy, catering for its attachment of 250,000 (indeed on ward rounds, it is not uncommon to find two or three patients sharing each bed). Muheza itself has a population of 30,000 and lies 35 km from Tanga and 350 km from Dar Es Salaam. The hospital is partly government-funded but also receives overseas aid. It was originally an Anglican Mission Hospital and still receives help from the church. Patients pay about 2,000Tsh for a week in hospital which is equivalent to one week's income.

No diabetic clinics exist, but two general medicine clinics take place each week. It is free to attend, as are investigations such as blood pressure, blood glucose monitoring. Insulin costs 400Tsh, and needles and syringes 100Tsh. Every patient has a blood glucose measuring test taken every two months. If they require hospital admission, it costs 2,000Tsh for the first week and 1,000Tsh per week thereafter. Examples of other treatment costs include 10,000Tsh for a major amputation and 1,000Tsh for catheterisation.

## **Zanzibar**

### *Mnazi Mmoja hospital*

Zanzibar consists of two main islands called Unguja and Pemba, and lies off the east coast of Tanzania. It has a population of about 900,000<sup>45</sup> and a fairly young population, with about 50% being young adults aged 20 or under. A huge influx of local people looking for jobs related to tourism has caused a significant rural-to-urban migration leading to pressure on the employment and social amenities including the healthcare facilities.<sup>46</sup>

Mnazi Mmoja hospital, where my work was carried out, is the largest hospital and acts as a referral hospital for the whole country. The art of traditional healing is widespread and the practice of reducing the amount of insulin taken and using herbal medicine instead is quite common (Dr Salim, personal communication). Non-communicable diseases such as diabetes, hypertension, coronary heart disease and cancers are on the increase in Zanzibar<sup>47</sup> especially in urban areas, although no reliable data is available and there is no national programme to deal with NCDs in Tanzania.<sup>45</sup> Diabetes is fast becoming a disease of major public health importance accounting for approximately 4% of all hospital-specific deaths in Zanzibar.<sup>48</sup>

In the early 1980s, diabetes and hypertension clinics

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were opened in Mnazi Mmoja hospital which takes referrals for the whole of Zanzibar. The Diabetes Association of Zanzibar (DAZ) with assistance from the MOH runs these clinics. When money allows, they provide transport and free donations of insulin, drugs and other equipment. They are also in the process of setting up a diabetes education centre in the Mombasa region of Zanzibar town. Various research proposals have been submitted for funding, for example to conduct a community-based survey on the prevalence of diabetes in Zanzibar, which is still not known.<sup>49</sup>

The hospital has 400 beds and an intensive care unit. Diabetic clinics take place twice a week. Financial constraints however are vast and due to under-funding most of the doctors spend a considerable amount of their time doing private work. Supplies of insulin to the clinic were once provided by the government of Zanzibar; however for the past six years this has not been the case. Instead DAZ has been purchasing insulin through the Medical Store department, if it has any spare funds, at a cost price of 1,800Tsh. It then attempts to provide the insulin free of charge to patients.

This does not occur, however, and often DAZ relies on donations: for example, it recently received a donation of 300 insulin pens and 200 vials which will be supplied to patients over the following few months. Outwith these times, however, patients have to buy from the hospital pharmacy or other dispensaries and it can cost 4,800Tsh for 40 iu of insulin or anything between 6,000–10,000Tsh for 100 iu (Dr Salim, personal communication). In addition, travelling costs for medical staff attending clinics in Pemba, used to be paid by the MOH but now are funded by DAZ and can be nearly US\$200 for each visit (Dr Salim, personal communication). Other costs to the patient include:

- blood glucose measuring sticks at dispensary: 1,200Tsh
- blood glucose measuring sticks at clinic: 800Tsh
- Needles and syringes: 100–200Tsh
- Public transport: 200–600Tsh

A welfare officer is employed to give exemptions. I did not come across any patient who was exempt despite many being needy; and it was not made apparent to them that this system was in place. Other financial constraints on the hospital include lack of an ophthalmoscope – an application was made to the MOH two years ago and the hospital is still waiting for money to purchase this. Despite these problems, however, advances have been made, for example, the number of amputations in diabetics has fallen rapidly from 14 in 1998–9 to just one in 2001 (Dr Salim, personal communication). Other information found is presented in Appendix 2.

By September 2001, 214 new patients had been seen. In total over the years, this equates to 2,256 patients being seen on a fairly regular basis (assuming death rate is low) of which 28·4% were treated with insulin, 54·5% with oral hypoglycaemic agents and 16% with diet alone (Dr Salim, personal communication).

## METHODS

Diabetic clinics were attended in all three regions and the patients attending were selected on the basis that they were using insulin. Each patient was interviewed using a questionnaire that was written in Kiswahili (see Appendix 3 for translation). Due to difficulties with language and literacy it was, at times, not possible to fully complete the questionnaires and hence the results are extracted only from those completed questionnaires. In addition if the patient was able to speak a little English then I discussed with them various issues surrounding their diabetic care and personal experiences.

I also sought other information about the hospitals, running of clinics, local beliefs and cultural differences, including a meeting with a local village herbalist. Efforts were made unsuccessfully to arrange visits with the MOH, as well as hospitals in other regions. Additional information was gathered from WHO offices in Dar Es Salaam and IDF Africa.

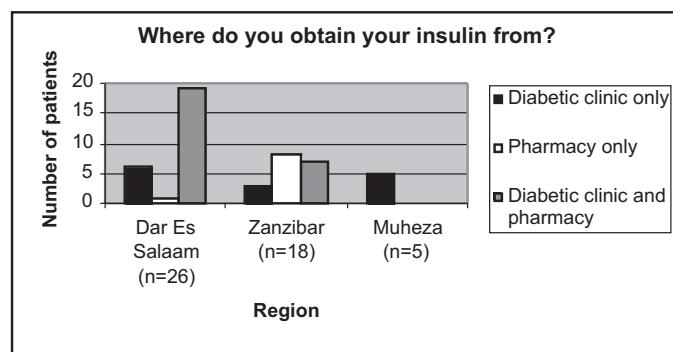
## DISCUSSION

Insulin has been declared by the WHO as an essential drug. However, the availability of insulin to patients in developing countries is known to be compromised – these countries have 84% of the world's population and approximately 65% of the diabetic population but use only 30% of the world's total insulin produced each year.<sup>50</sup> Many people in the world are dying due to lack of access to insulin; a survey carried out by the IDF in 1997<sup>51</sup> concluded that up to 20% of people with Type I diabetes do not always have access to the insulin they require. Reasons for lack of insulin in Africa have been previously studied.<sup>51</sup> In decreasing order, the most often quoted factors were affordability, distribution and transportation. Other barriers include storage, taxation, inappropriate healthcare, lack of epidemiological data, lack of diabetes education, traditions and beliefs, cultural differences, language barriers, literacy rates and mal-distribution of healthcare professionals.

### Insulin affordability for the patient

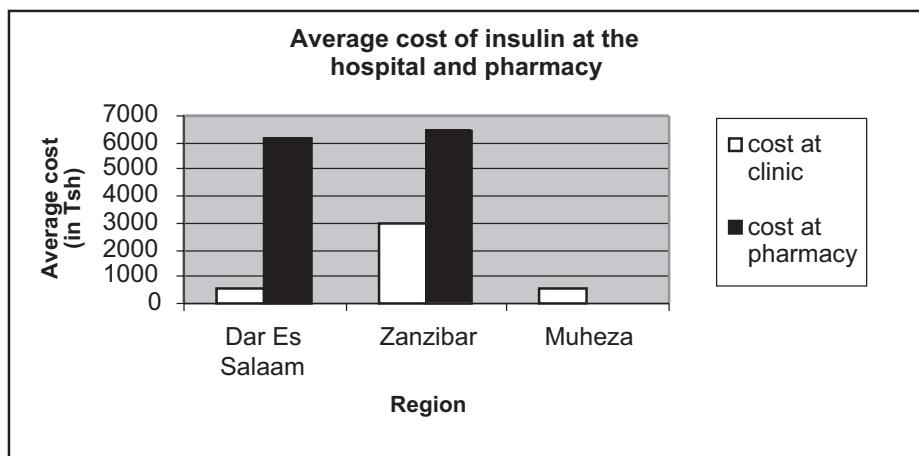
The main purpose of this project was to discover if the supply of insulin is indeed short and try to ascertain why this might be the case. In this study the availability of insulin varied between the regions studied. In Dar Es Salaam and Zanzibar a large proportion of patients had to rely on obtaining insulin from the pharmacy whether or not they also acquired insulin from the diabetic clinic (see Figure 1). For those patients who did manage to meet all their insulin needs by the clinic, the issue

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**FIGURE 1**

In Dar Es Salaam and Zanzibar, the vast majority obtained insulin from the diabetic clinic and pharmacy when supplies at the clinic ran out. Interestingly in Muheza, all patients obtained insulin from the clinic.



**FIGURE 2**

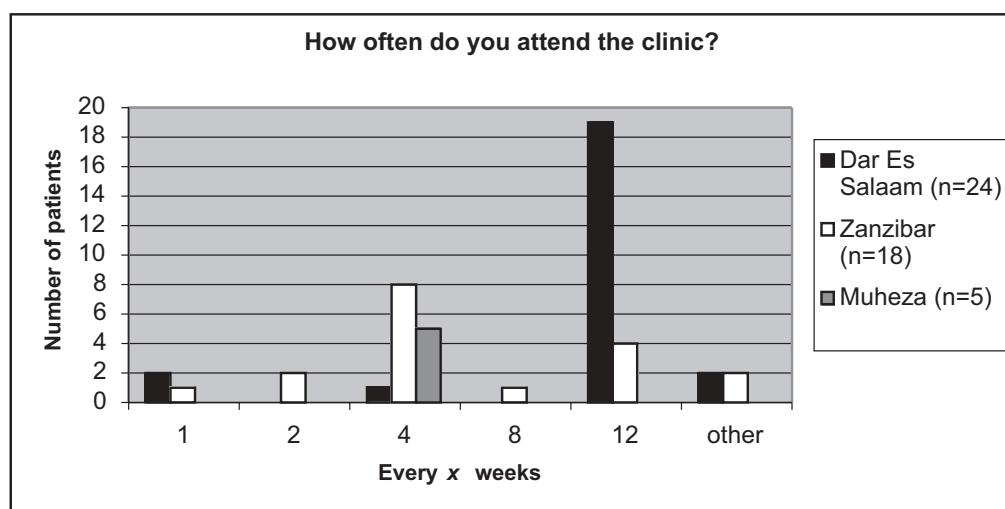
The average cost of insulin varied: approx. 2,000Tsh at the clinic and nearly 6,000Tsh at the pharmacy. In Muheza, insulin cost was low and patients did not have to obtain insulin from the pharmacy.

surrounding affordability is not quite so acute – with prices ranging from being free to 500Tsh (see Figure 2). This is presuming that the clinic has a constant supply of insulin available to sell at this price and furthermore that patients attended the clinics on a frequent basis in order to guarantee their supply. Often this was not the case and the clinic bought insulin privately accounting for the prices seen – in some scenarios up to 10,000Tsh for 10 ml of 100 iu of insulin. In addition, most patients attended the clinic once a month or even every three months (see Figure 3). While I was in Zanzibar, each patient received one free vial of insulin due to short supplies – which obviously is nowhere near their required amount for one to three months. As such, many patients rely on going to the pharmacy where insulin can cost anything between 4,000Tsh to above 10,000Tsh. Not surprisingly, trying to foot this bill is not easy for many people especially since most patients relied on themselves or relatives to meet costs and when the majority (if not all) patients asked had a family

income of below 30,000Tsh per month (see Figure 4). Indeed, in Dar Es Salaam over 80%, and in Zanzibar 100% found that their insulin supply was interrupted. In Zanzibar, patients were asked why this was the case and out of those who answered 92% said it was due to lack of money (see Figure 5). Interestingly, in Dar Es Salaam, where it could be argued there is more wealth, if a patient's supply was interrupted, the majority would buy more insulin from the pharmacy; in Zanzibar, however, many either do nothing or obtain traditional medicine. Generally if patients could afford the insulin they would buy more at their next clinic appointment; otherwise they would not take anything. In Muheza, patients would seek medical advice if in short supply (see Figure 6).

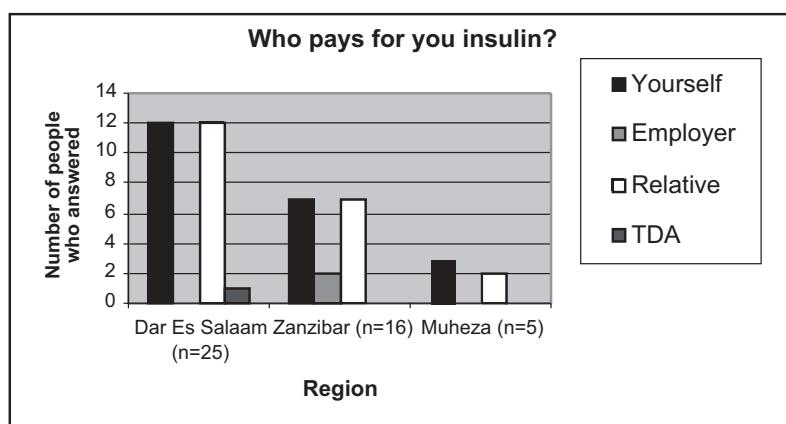
The following are examples of problems faced by patients who attended the diabetic clinics and illustrate how affordability is a problem:

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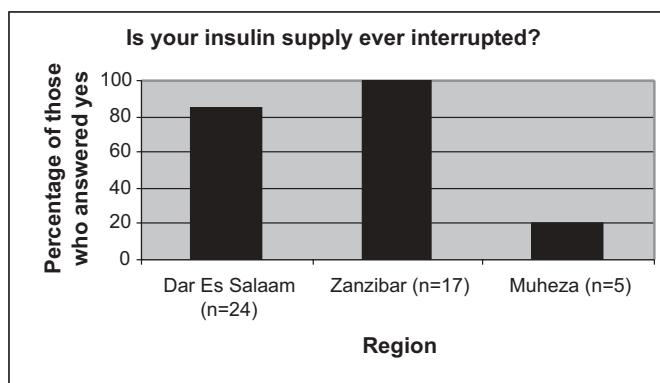
**FIGURE 3**

In Zanzibar and Muheza, on average, patients attended the clinic once a month. In Dar Es Salaam, nearly 80% only attended every three months.



**FIGURE 4**

Paying for insulin. Most patients either paid for the insulin themselves or relied on help from relatives. The percentage of patients with a household income below 30,000 Tsh per month is 65% in Dar Es Salaam; 53% in Zanzibar; and 100% in Muheza.



**FIGURE 5**  
**Interruption of insulin.**

All patients in Zanzibar and 80% in Dar Es Salaam said that their insulin supply was interrupted. In Muheza only one patient had a problem with insulin supply.

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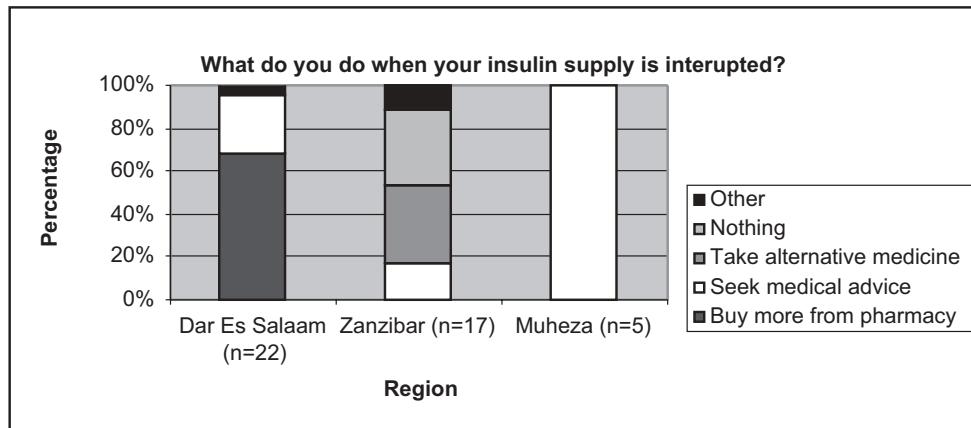


FIGURE 6

In Muheza all patients said they would seek medical advice in the event of insulin supply being interrupted. In Zanzibar the majority said they would do nothing or take alternative medicine. In Dar Es Salaam they would simply buy more from the pharmacy.

Illala hospital – 59-year-old woman who was diagnosed with diabetes in 1982. She is widowed (her husband died of AIDS) and lives at home with her son on whom she depends financially. The household income is under 30,000Tsh per month. She attends the clinic once a month to buy two vials of insulin at 500Tsh each as well as 12 needles and syringes and to check her blood glucose (the only time it is checked). However due to the fact that there is very limited supply of insulin at the clinic, more often than not she has to buy her insulin from the pharmacy at 4,000Tsh per vial, bringing the total monthly minimum of 10,000Tsh. In addition, last month, other family members were ill and cost the family 50,000Tsh in just one month for treatment.

Mnazi Mmoja hospital – 31-year-old man who was diagnosed with diabetes seven years ago. He is a mechanic and his income varies each month: for example, last month he did not get any work and therefore had no income, however, this month his income has been 40,000Tsh. He does not have enough money to buy insulin and therefore relies on local medicine for treatment. He attends the diabetic clinic every one to three months in order to obtain free insulin. If there is no free insulin available, he does not have enough money to purchase insulin from the out-patient dispensary. He last attended the clinic three months ago and had a blood glucose reading of 22.5 mmol/l. He was given an appointment for two weeks later but he did not attend because he could not afford the bus fare to the hospital. He then attended on World Diabetes Day to obtain free insulin. His blood glucose reading was 30.7 mmol/l. As far as monitoring is concerned, he attends an out-patient dispensary every three months which costs him

1,000Tsh. His main form of treatment is local medicine.

Little is known about the economics of diabetes care in Africa. Studies that have been carried out include those in Ghana, Malawi and Tanzania and as such many of the conclusions focus upon these countries. Insulin injection therapy for an individual costs more than the average income for many people in this world.<sup>52</sup> In 1997, a one-year supply of insulin at 35 iu per day was worked out as follows (Raab, President of Insulin for Life Inc, personal communication): see Table I.

TABLE 1  
Comparison of the affordability  
of insulin in the UK, India and Tanzania.

	GNP per capita US\$	Insulin cost US\$	Days of GNP
UK	20,870	145.12	2.54
India	370	154.93	152.8
Tanzania	210	156	271.1

In other words, for a person to afford the same amount of insulin, they would have to work for the equivalent of nine months compared to just two and a half days in the UK. The average annual direct cost for an insulin-dependent diabetic is US\$229 – 68% of which is for the purchase of insulin and 13.3% for the treatment of infections and chronic complications such as diabetic ketoacidosis.<sup>30</sup> The cost of US\$229 is equivalent to about six months of a family's income in most developing countries.<sup>2</sup> Therefore, the statement that insulin is available and in reasonable supply does not mean that it is affordable for the individual.

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## *Additional costs*

Unfortunately, the lack of access to insulin and treatment facilities will result in the development of early complications and premature death.<sup>53</sup> People with diabetes have a substantially reduced life-expectancy approximately twice that of the non-diabetic population in developed countries.<sup>54</sup> For example, in Tanzania, one study found a five-year mortality rate of adult insulin-independent diabetics to be 71%.<sup>15</sup> The following example from a patient I interviewed illustrates the vicious cycle that exists for patients in Tanzania.

Mr SJ is a 24-year-old man who was diagnosed with diabetes in 1994. Within three years of diagnosis he lost his sight in one eye and has poor vision in the other. He also suffers from hypertension and consistently high blood sugar levels. Due to his visual impairment he cannot find work and as such cannot afford to pay for insulin.

Treatment of complications can account for the second-highest direct costs.<sup>30</sup> Many of these complications could have been prevented by better patient education and improved control of their diabetes. It is well known that effective control of glucose leads to a decrease in complications and is therefore cost-effective.<sup>55</sup> Other costs that patients have to address include disposable syringes and needles, transport and treatment of complications. It is therefore not surprising that so few people can afford blood-glucose metres when prices vary: for example in Nigeria a blood-glucose metre costs US\$150 compared to the UK where it costs US\$32.<sup>56</sup>

## **Factors that affect people's decision to consult and therefore limit access to insulin**

### *Social problems*

- Distance

In this project, patients often had to come quite far to attend the clinic (for example, one patient seen in Teule hospital lived 200 km away, see Table 2). Not only do patients have to pay for these travel costs but in addition they have to take into consideration the time it takes to reach the clinic, particularly if they are women and have children to look after.

The push for having access to insulin in rural areas and closer to the patients has many benefits. Providing care at local clinics in rural areas, where the young, elderly and female predominate (due to limited access to transport and not enough spare time in their daily routine) was found to be particularly beneficial and reduced clinic congestion, particularly problematic in some of the clinics that I attended.

- Cultural beliefs

People's perception of their illness is complex and influenced by cultural differences.

It is not just the classification of an illness that determines the course of action but also the cause of it. A traditional healer (mganga) may want to enquire about arguments and any broken human relationships in the family that may have caused a curse, with the thinking behind it being that reconciliation and forgiveness are preconditions for healing. In this way the cause of an illness can also be classified as being 'normal' or 'out of order'.<sup>57</sup> 'Normal' illnesses are a natural creation by God and are part of normal human

**TABLE 2**  
**Type of patients sampled.**

	Dar Es Salaam	Zanzibar	Muheza
<b>N=</b>	26	18	5
<b>male</b>	14	9	4
<b>female</b>	12	9	1
<b>Average age (years)</b>	45·07 (19–65)	36·1 (23–65)	51·2 (33–66)
<b>Main occupation (highest three taken)</b>	peasant farmer housewife professional	professional peasant farmer other	peasant farmer retired
<b>Average distance from clinic (kms)</b>	14·1 (0·5–65)	9·28 (1–50)	62·6 (5–200)
<b>Average years since diagnoses</b>	9·42 (0·5–22)	6·32 (0·2–20)	0·92 (0·1–2)
<b>Average age at diagnosis</b>	35·5	30·1	51·7

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life and no intention is seen as causing them: these include malaria, schistosomiasis and worms. The most efficient treatment for hospital diseases being 'Western medicine' or 'white man's medicine' whereas local illnesses have to be treated by local healers or local medicine (see Appendix 4).<sup>58,59</sup>

'Out of order' illnesses include afflictions such as impotence, mental disturbances and chronic disorders. These are regarded as untreatable at the hospital but require traditional healers who have the appropriate skills. Diagnosis here is obtained through divination, using the power of spirits to identify the cause of the illness.

The structure of family networks is also vital in the way in which people seek medical assistance. Usually the costs of treatment are met by the family rather than the individual. 'Out of order' illness is perceived as affecting the extended family or social group, and therefore it is up to the wider group, to assist in decision-making as well as financially since the whole group, rather than the one individual, is endangered.<sup>57</sup>

- Self-perception of illness

The diabetic patients I spoke with were at times unaware of the complications and seriousness of diabetes if left untreated. I concluded that this was due either to lack of education or, as one author put it, 'unrealistic optimism'.<sup>59</sup> There seems to be a culture that 'being ill' is a taboo subject. As one man put it: 'diabetes is not an illness, it is an inability of the body to cope'. This is hardly surprising – a person who is ill may not be able to work and thus is financially unable to contribute to the village or family as much as anticipated. Their social status is affected, especially if the patient is the eldest male in the family and expected to provide. Furthermore, there is discrimination against diabetics

with regards to employment, insurance, social life, marriage and adoption. Having an illness can weaken a person's self-image and they may feel inferior to others in the group, particularly in families in which money is a scarce resource – if a person is ill and unable to work then they feel like a burden to others – being diabetic certainly puts a strain on the family's resources. It is therefore not surprising that such people become anxious and depressed, and use a series of defence mechanisms to cope, often denying that they require insulin to keep well.

In general, people's attitudes to treatment are also influenced by where they perceive the responsibility lies for their health. I got the distinct impression that very few patients considered that their outcome depended mainly on themselves (indeed many felt that what happened to them was down to fate). For example, many felt that insulin dosages should only be changed by the doctor.

- Levels of patient education

The problem in Tanzania which I did not appreciate before arriving, is the level of education that people had received. A household population survey<sup>16</sup> found that 41·7% of women and 31·6% of men had had no form of schooling and in those that had, the average number of years of attendance was 1·2 years for women and 2·8 years for men. The illiteracy rate in Tanzania in women is 41·1% and in men 19·9%.<sup>16</sup> At times this made applying my questionnaire somewhat challenging.

A disease like diabetes and its outcome depends very much upon the choices and decisions made by the patient with the role of the physician or carer simply to act as an adviser and provider of services. What became apparent throughout my study was that very little time was devoted to providing information and educating

**TABLE 3**  
Percentage of patients that answered questions correctly.

Question	Dar Es Salaam	Zanzibar	Muheza
What would you do if your blood glucose was too low?	57·7%	44·4%	60%
What would you do if your blood glucose was too high?	7·7%	0%	0%
What should the normal blood glucose level be?	42·3%	50%	20%

**TABLE 4**  
Where did you learn about diabetes?

The vast majority of people learnt about diabetes from the hospital:		
Dar Es Salaam	83·3%	
Zanzibar	81·2%	
Muheza	75%	

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patients about their diabetic care (see Table 3 and 4). The role of education in the management of diabetes is crucial not only with reference to information about the disease and its complications, but also practical elements such as the skills required to inject, the ability to self-monitor and perhaps most importantly, empowering patients with the knowledge which will enable them to change their management and adjust their insulin dose safely. One example is of a man who attended the Mnazi Mmoja hospital in Zanzibar.

He is a 24-year-old man who works as a vegetable farmer and was first diagnosed with diabetes two months ago. He is a first-time attender at the clinic. He relies on his parents to pay for his insulin as well as additional costs such as attending the clinic. After waiting in the clinic for two hours to be seen, he was handed one vial of free 40 iu actrapid insulin and told to come back in a week's time. He received no information regarding his diabetes and its management. When I asked him specific questions it became apparent that he had not been properly shown how to inject himself and certainly did not know what to do if he had a low or high blood sugar level. He had not been told what a normal glucose should be. He was only told that he was required to take insulin three times a day and told the doses to take. He had no needles and the syringe he had was a 10 ml syringe and had not been taught how to use it. As far as storage was concerned – it was to remain in his pocket until the following visit because he had not been told otherwise.

During my stay, it became apparent that information was lacking at a basic level as well as an understanding and acceptance of what diabetes entails (see Table 3). Whilst most people knew what to do if they had a low blood glucose level, a very small proportion knew what to do if it was high. This is hardly surprising, however, since so few people monitor their blood or urine glucose levels on a regular basis to know this. For example, the patients in Zanzibar were the most knowledgeable group, but it was still only 50% who knew the correct glucose range.

Currently programmes are being put together to try and alleviate these educational problems, but again this presumes that patients are already attending the clinic. In Kilimanjaro Christian Medical Centre (KCMC), a diabetes education programme is being conducted. This focuses on patients attending the clinic as well as inpatients, their relatives and friends. The aim is to educate patients on a whole range of topics within six to eight months of diagnosis.<sup>60</sup> In Dar Es Salaam, the Tanzanian Diabetic Association (TDA) is in the process of developing a system with the Tanzania Food and Nutrition Centre that will train nurses who will then provide education to patients.<sup>60</sup> The TDA is currently

pursuing a project to set up a diabetes education centre in the Muhimbili hospital. In Zanzibar there was a training workshop for healthcare workers which focused on all aspects of diabetes including practical skills such as taking blood pressures, glucose readings and maintaining clinic records.<sup>60</sup> The DAZ is also in the process of setting up a diabetes education centre.

The most obvious and opportunistic way to inform patients and provide them with advice is in the clinic setting (see Table 4). In this project in all three regions, the vast majority of people learnt about diabetes from the hospital (see Table 4). As already pointed out, however, qualified medical staff are already overstretched: for example, in Pemba<sup>34</sup> there is only one qualified pharmacist on the whole island and he is currently on unpaid leave. The problem in Africa lies in that education and screening programmes for diabetes is seen as a heavy economic burden. In addition, the incidence of diabetes is a lot lower than developed countries and in comparison to problems such as HIV/AIDS, it seems of minor importance at present.

Patients in Tanzania should be given the opportunity to discuss how they feel about such matters. For example, one patient thought that diabetes meant having a large amount of sugar in his blood and by taking a tablet or insulin, lowered his sugar thereby curing his diabetes. Indeed it may be difficult for patients especially if they feel well (hypertension in the developed world being a prime example) to believe that they have diabetes.

In conclusion, in certain countries, fairly sophisticated models of diabetes care have been established at the primary care level. In others, however, such as Tanzania, where the focus of healthcare is on communicable diseases, diabetes care is often provided on an ad hoc basis and delivered by community workers with limited knowledge and training in diabetes care.<sup>61</sup>

#### *Distribution, transportation and storage*

As illustrated by the following patient from Temeke hospital, Dar Es Salaam, it is apparent that affordability on the patient's part is not the only problem with gaining access to insulin.

Mr K is a 49-year-old man who was diagnosed with diabetes in 1992. He earns over 100,000Tsh per month as a tourist guide and despite the fact that he buys insulin from the clinic for 500Tsh per vial, of which only one vial lasts him an entire month, he still finds that his supply is interrupted. He himself said that money was not a problem: the problem was simply that he could not get hold of insulin often enough due to lack of supplies in medical centres.

Frequently clinics and hospitals do not have insulin in stock to provide for patients, as in Zanzibar where

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patients have to regularly attend the pharmacy and yet reports of no blood glucose measuring sticks being in stock were numerous. This, however, is not a new problem.<sup>62</sup> Lack of accurate data on the incidence and prevalence of diabetes leads to several problems, including the perception that the disease is not a problem, resulting in lack of resource allocation and funding for the area. In Pemba for example, there is no system in place to ascertain drug purchasing and disease patterns, or even monitoring of drug prescribing or availability.<sup>34</sup> Furthermore due to poor stock keeping, 6,100 expired bottles of 100 iu Actrapid insulin were found in stock.<sup>34</sup> Similarly in 1999, 1,000 vials of insulin were found to be expired in Ilala hospital.<sup>44</sup>

There are also problems with storage of insulin for both patients, during transport and at clinics, with a consequent gradual loss of potency, which is mainly temperature-dependent: insulin requires to be stored at below 4°C (see Figure 7). Furthermore sunlight increases the degradation rate several hundred times.<sup>51</sup> In this study, whilst most people in Dar Es Salaam had a fridge they could keep the insulin in (although there were frequent electricity shortages), areas such as Zanzibar and Muheza, relied on plastic bags in cold water and clay pots.

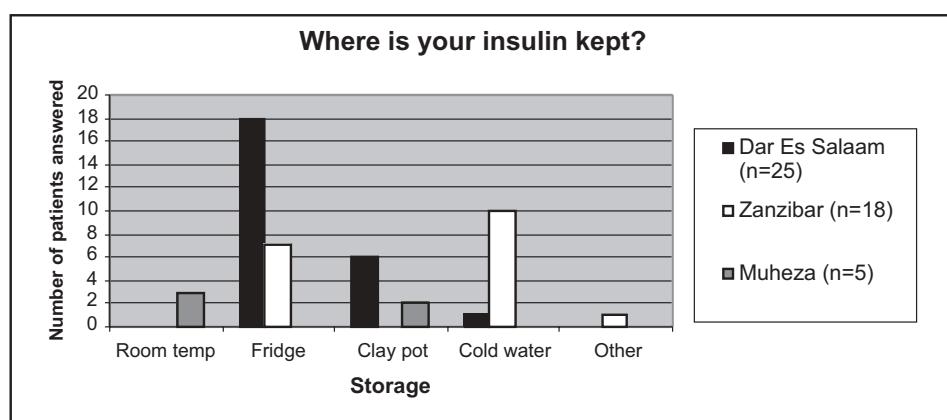
## Inappropriate diagnosis

Previous studies have found a higher than expected rate of insulin use and doubt has been placed on how many patients receive insulin unnecessarily.<sup>13, 63-5</sup> In this study, in Zanzibar, nearly 30% of patients were using insulin. In many of these patients, the diagnosis of Type I diabetes was used interchangeably with insulin-treated diabetes which questions the validity of the data from previous studies as well as data collected by the clinics.

In many places, the diagnosis was based on the patient's age at diagnosis. Surprisingly the general patient population seemed a lot older at diagnosis than one

would expect (in Dar Es Salaam, Zanzibar and Muheza, the age at diagnosis being 35.5, 30.7 and 51.7 years respectively). This is in keeping with previous studies where the mean age of onset of diabetes in patients requiring insulin was 37 years.<sup>66</sup> Interestingly, diagnosis of Type I diabetes in Zanzibar was made on the grounds of having a high blood glucose and being under the age of 30. Those over the age of 30 were diagnosed as being Type 2 and given oral hypoglycaemics. Using this cut-off would suggest that in all three regions studied there were patients diagnosed with diabetes who may not have needed insulin. It was suggested that patients develop this form of diabetes later than in other countries but it could also be argued that they simply present later, perhaps after seeking alternative medicine. Alternatively, it could be argued that patients with Type 2 diabetes being prescribed oral hypoglycaemics were either unable to afford medication or were non-compliant for whatever reason and were thus switched to insulin due to consistently high glucose levels.

People with diabetes, especially those with an onset before the age of 30, have been known in various studies to receive insulin treatment on the basis of an elevated blood glucose concentration or symptoms related to hyperglycaemia. This can be laden with problems: according to studies done in Tanzania, it is possible that some of the apparently newly-discovered patients may not in fact have diabetes, the elevated blood glucose levels being an acute phenomenon due to other factors. When the oral glucose tolerance test (OGTT) was repeated within five days of the first test in 557 patients, the mean fasting and two-hour blood glucose decreased significantly in the entire population – 80% of patients who had IGT on the initial test had normal glucose tolerance on the second test (Swai *et al.*, unpublished observations). Furthermore, it is well known that many older patients who develop diabetes and require insulin can have it safely withdrawn after some time.<sup>30</sup> Other diagnostic problems recently include the use of dipsticks



**FIGURE 7**

In Dar Es Salaam, patients tend to store insulin in the fridge, however, other means such as cold water and room temperature was often the case in more rural areas.

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alone to diagnose patients in Pemba. In several patients this was the wrong diagnosis and following prescription of insulin, developed hypoglycaemic episodes (Dr Salim, personal communication). Not only was this dangerous for patients, but then a second visit had to be made at large cost in order to sort the problem out.

### The problems faced with self-monitoring and hence knowing the need for insulin

In 1993, the Diabetes Control and Complications Trial (DCCT)<sup>67</sup> and the Stockholm Diabetes Intervention Study (SDIS)<sup>68</sup> demonstrated the beneficial effects of effective glycaemic control on diabetic complications. Patients need to understand the importance of monitoring and the benefits it provides, especially for those who find it financially a struggle, that the money they spend on it is money well spent. The problem encountered however for Tanzanian patients is the affordability of self-monitoring. In my study, 88% of patients did not monitor their own blood glucose levels and even those that did, did so on average once a week (see Figure 8). The rest of the patients usually attended the pharmacy or out-patient dispensary at a cost ranging from 800–2,500Tsh and even then the majority of patients had readings taken once a month or even less frequently. This is a far cry from the recommendations put by one study that patients should be monitoring four times per day.<sup>69</sup> As found in one study, the most common reason for not monitoring, in 34 out of 42 respondents, was expense.<sup>70</sup> In my study, patients that could afford to self-monitor were having to pay between 65,000–150,000Tsh simply for a glucose monitor (one patient managed to acquire a meter from Nigeria costing 12,000Tsh) and 800–2,500Tsh per test strip.

In Tanzania, where blood glucose monitoring is

expensive and simply not feasible to do at home, for most, urine testing remains the simplest, cheapest and least invasive. Despite this, however, the vast majority of patients neither tested themselves at home nor had readings taken at a pharmacy or dispensary. In 1982, Worth *et al.*<sup>71</sup> showed how testing the urine for glucose can provide satisfactory metabolic control as long as sufficient education is provided during their management programme.

There is also the question of the appropriateness of checking patient's blood glucose in clinics every month or even less in certain cases. Blood glucose measured on different days can have a coefficient variation of 30–50% in the average patient. Therefore even if the readings are used to adjust dosages, several measurements would have to be made to initiate these changes if it is to be done safely and with confidence. In addition, any individual's lifestyle varies from day-to-day and adjustments should be made for different types of activities and eating patterns.

### CONCLUSION

Figure 9 and Tables 5, 6 and 7 illustrate problems patients encounter when they become ill. The importance of NCDs such as diabetes cannot be overemphasised. Diabetes is a major problem the prevalence of which continues to rise rapidly throughout the world. In developing countries, as the number of patients with diabetes and its incidence seems to be increasing, there is the very real threat that even more financial burden will be placed on an already over stretched healthcare system. A predominantly hospital-based model for diabetes care is unlikely to cope with the increasing demand for diabetes services. Tanzania is one of the poorest countries in the world and is still trying to win

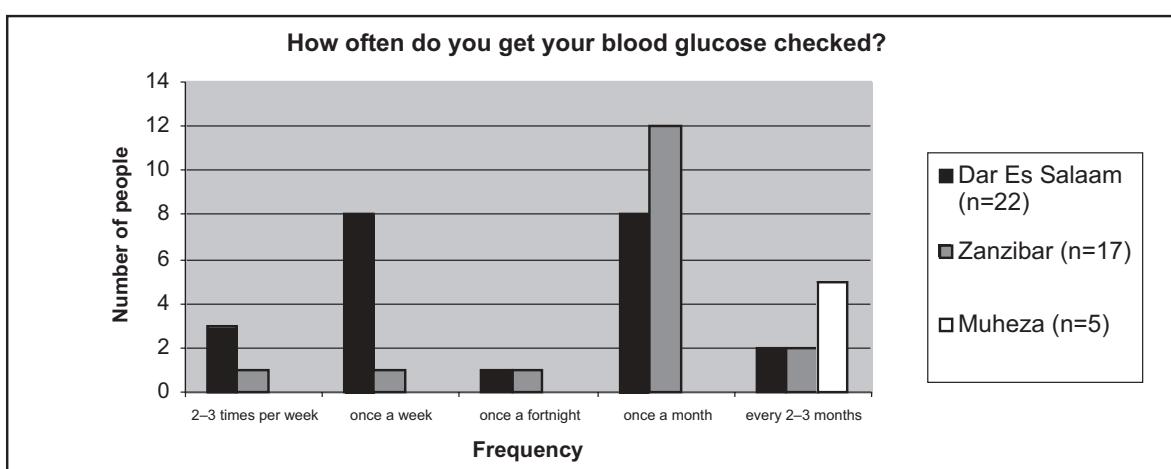
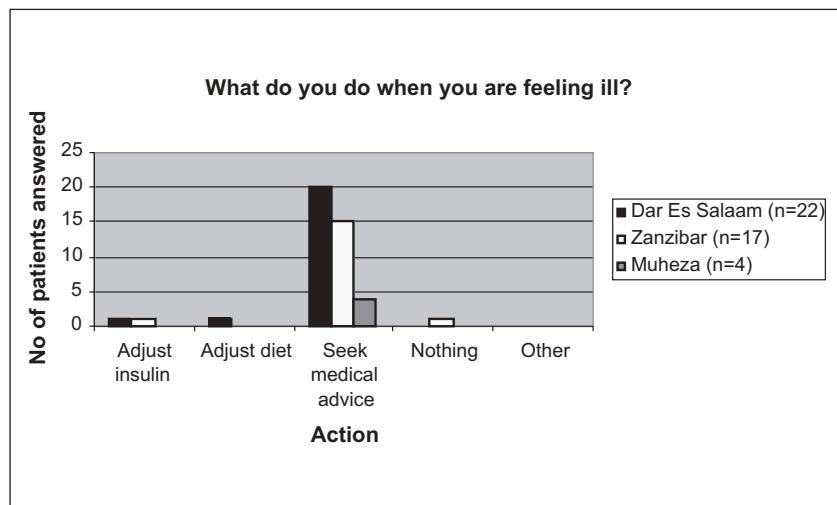


FIGURE 8

In Dar Es Salaam and Zanzibar patients usually monitored their blood glucose levels once a month. In Muheza it was only once every two to three months, usually at the clinic.

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**FIGURE 9**  
What patients do when they are feeling ill.

**TABLE 5**  
Who looks after you if you are ill?

	Dar Es Salaam	Zanzibar	Muheza
I go into hospital	14	6	4
A relative at home	9	11	1
I look after myself	1	0	0

**TABLE 6**  
Average number of hospital admissions per person in the last year.

Dar Es Salaam – 0.75 (range 0–3)
Zanzibar – 0.94 (range 0–3)
Muheza – 0.8 (range 0–2)
Patients in rural areas were more likely to be admitted to hospital than those from Dar Es Salaam

**TABLE 7**  
Reasons for being admitted to hospital.

	Dar Es Salaam	Zanzibar	Muheza
Diabetic ketoacidosis	2	6	2
Hypoglycaemia	2	1	0
Renal failure	1	0	0
Cardiovascular problems	0	0	0
Neuropathic problems	0	0	0
Other	3	3	1

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the battle against infectious diseases. There is an urgent need to address the problems outlined before the predicted explosion of diabetic cases appears.

Although mortality for people with Type I diabetes in developed countries has markedly dropped since the advent of insulin, in developing countries, the majority of children with insulin-dependent diabetes die within five years of diagnosis.<sup>63, 72</sup> A situation similar to the pre-insulin era.<sup>13</sup> The aim of this project was to assess insulin availability and barriers that patients face.

Although financial affordability is a large factor hindering people's accessibility to the drug, many other factors have to be considered, from supply at the governmental level right through to the pharmacies and out-patient dispensaries, drug supply and storage, people's self-perception of ill health, level of education, cultural beliefs, as well as inappropriate healthcare whereby people are misdiagnosed and unnecessarily taking insulin.

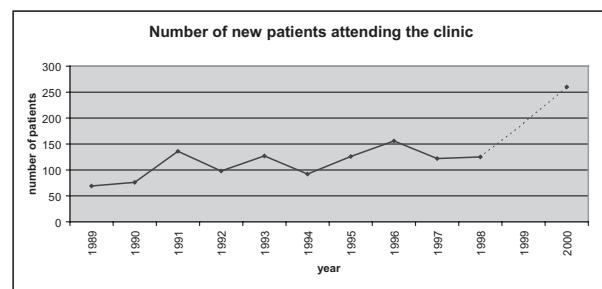
Providing insulin free of charge with the current health system in place, would only be of limited value. The health system in many developing countries is underdeveloped and would not be able to provide a service for monitoring and ensuring a constant supply of insulin was always available. Diabetic care cannot simply consist of dispensing more insulin: an increase in monitoring, education and general follow-up for patients is required to ensure that management is adequate.

Therefore this project supports the recent proposal of the establishment of an International Insulin Foundation which would coordinate a programme of insulin supply and education in highly indebted poorer countries including Tanzania.<sup>73</sup> It also must ensure, however, that other projects are in place to accommodate other needs so that all aspects of diabetic care are met.

## APPENDIX 1

### ILLALA HOSPITAL, DAR ES SALAAM

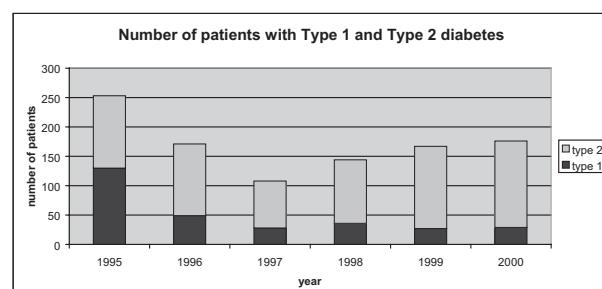
Below are details of the number of new patients seen at the diabetic clinic in Illala hospital. A larger percentage of males had Type I diabetes (66·5% compared to 57·5% with Type 2). The number of deaths related to diabetes decreased from 12 in 1995 to none in 2000 (Tanzanian Diabetes Association, personal communication). In 1999 Illala, saw four admissions to hospital and 14 referrals of diabetic patients.<sup>44</sup>



## APPENDIX 2

### MNAZI MMOJA HOSPITAL, ZANZIBAR

In the late 1980s a study was done that found the estimated crude age 0–19 annual incidence of IDDM was approximately 2·1/100,000.<sup>47</sup> Figures provided by the clinic show that the number of new patients seen over the past ten years has vastly increased and is shown below. Of these approximately 56% were male and 42% female, and only 1·5% were children (Dr Salim, personal communication).



## APPENDIX 3

### QUESTIONNAIRE FOR PATIENTS WITH INSULIN-DEPENDENT DIABETES

#### Place and Date

#### General information

#### Name

Sex (please circle)      female/male

#### Age

#### Occupation

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**How far do you live from the hospital?**

kms

**Date of diagnosis**

**How were you diagnosed**

- (a) Incidentally
- (b) You had symptoms of diabetes
- (c) Advised by a friend or relative to seek medical help

## Insulin supply

**1 Where do you obtain your insulin from?**

- (a) hospital
- (b) pharmacy
- (c) diabetic clinic
- (d) other – please specify

**2a How much does one vial of your insulin cost when you buy it from the hospital?**

- (a) free
- (b) 1,000Tsh
- (c) 500Tsh
- (d) 1,500Tsh

**2b How much is it from the pharmacy?**

- (a) 4,000–6,000
- (b) 6,000–8,000
- (c) 8,000–10,000
- (d) 10,000+

**3 How long does one vial of insulin last?**

- (a) 3–4 days
- (b) one week
- (c) two weeks
- (d) one month

**4 Is your supply ever interrupted?**

- (a) yes – please go to question 5
- (b) no – please go to question 6

**5 If it is interrupted, what do you do?**

- (a) buy more from the pharmacy
- (b) go to the hospital/seek medical advice
- (c) take alternative medicine
- (d) nothing
- (e) other (please specify)  
(please go to Q6)

## Financial details

**6 Who pays for the insulin?**

- (a) yourself
- (b) your company
- (c) a relative
- (d) you get it free from TDA

**7 What is your household income per month?**

- (a) 0–30,000Tsh
- (b) 30,001–50,000Tsh
- (c) 50,001–80,000Tsh
- (d) 80,001–100,000Tsh
- (e) 100,000+ Tsh

**8a Expenditure on diabetic member**

- (a) in the last month
- (b) in the last year

**8b Expenditure on whole family**

- (a) in last month
- (b) in last year

## Knowledge and Education

**9 What do you do if your blood glucose is too low/you have symptoms of low blood sugar?**

- (a) inject more insulin
- (b) skip the next meal
- (c) eat something sugary
- (d) I don't know

**10 What do you do if your blood glucose is too high?**

- (a) inject more insulin immediately
- (b) change the dose of insulin before the next meal
- (c) seek medical advice
- (d) nothing
- (e) I don't know

**11 Do you know what a normal blood glucose level should be?**

- (a) 8–14 mmol/l
- (b) 4–8 mmol/l
- (c) 2–12 mmol/l
- (d) I don't know

**12 Where did you learn about diabetes?**

- (a) media
- (b) family/friends
- (c) hospital
- (d) books/papers
- (e) other, please specify

**13 Do you monitor your own blood glucose levels?**

- (a) yes – please go to Q 15
- (b) no – please go to Q 14

**14 If you do not, how often do you come to the hospital to get your readings taken?**

- (a) 2–3 times per week
- (b) once a week
- (c) once a fortnight
- (d) once a month
- (e) I don't get my readings taken  
(please go to question 19)

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**15 If you do, how often do you take readings?**

- (a) every day
  - (b) every 1–2 days
  - (c) twice a week
  - (d) once a week
  - (e) every 3 months
- (please go to question 16)

**16 How much did your blood glucose monitor cost you?**

Tsh

**17 How much do the test strips cost?**

Tsh

**18 How often do you have to buy new strips?**

- (a) once a month
- (b) every 2–3 months
- (c) every 3–6 months
- (d) once a year

**19 Do you test your urine for glucose at home?**

- (a) yes – please go to Q20
- (b) no – please go to Q21

**20 If you do buy your own strips, how much does it cost you?**

Tsh

(please go to Q21)

**21 What form of follow-up do you receive?**

- (a) I come to hospital every 3 months for a check-up
- (b) I don't, I only come to hospital if I have a problem
- (c) I come every week
- (d) I come every 3 weeks

**22 What do you do when you are ill**

- (a) adjust insulin take more/less (please circle)
- (b) eat more/less (please circle)
- (c) seek medical advice

**Storage details****23 Where is your insulin kept?**

- (a) in a box at home at room temperature
- (b) in the fridge
- (c) other, please specify

**Hospital admissions and complications****24 Who looks after you if you fall ill from your diabetes?**

- (a) go into hospital
- (b) a relative at home
- (c) a friend
- (d) I look after myself

**25 How many hospital admission have you had in the past year?****26 For what reason were you admitted?**

- (a) diabetic ketoacidosis
- (b) hypoglycaemia
- (c) renal failure
- (d) cardiovascular problems
- (e) neuropathic problems
- (f) other, please specify

**27 How many hypoglycaemia episodes do you have a month?**

- (a) none
- (b) 1–4
- (c) 5–9
- (d) 10+

**28 Which of the following difficulties do you encounter with the management of your diabetes?**

- (a) social stigma
- (b) financial problems
- (c) lack of facilities to store insulin
- (d) not enough understanding of management of diabetes
- (e) lack of health resources

**Thank you for your time and cooperation**

## APPENDIX 4

### THE ROLE OF HOSPITAL MEDICINE VERSUS TRADITIONAL MEDICINE

Traditional healers (*mganga*) are a well-established sector of the healthcare system in Tanzania. The earliest recorded treatment for diabetes involved the use of plants: in 1550 BC, the Papyrus Ebers, recommended a diet of wheat, grains and ochre.<sup>74</sup> Since then more than 400 traditional plant treatments for diabetes have been recorded. For example, metformin is derived from French lilac which has been used for diabetes since the Middle Ages.<sup>75</sup> Plants such as garlic cloves and raw onion bulbs (*Allium cepa*) have been used in Asia, Europe and the Middle East.<sup>76</sup>

It is not uncommon for insulin injections to be replaced by local treatments from time to time. Indeed at one time, the WHO estimated that in Africa 80% of the population living in rural areas in developing countries depended on traditional medicine.<sup>77</sup> The question I wish to ask is why so many patients chose to visit traditional healers at times when insulin supply was interrupted. In my study, nearly 40% of patients in Zanzibar sought advice from a traditional healer when insulin supply was compromised.

# OCCASIONAL COMMUNICATIONS

## ADVANTAGES OF LOCAL HEALER

There have been many studies looking into aspects of traditional healers compared to hospital medicine. Patients may feel that they will be reprimanded for any delay in seeking medical care from a hospital.<sup>78</sup> The set-up of the clinics are also problematic, for example, in another study comments included: 'There are so many people at the clinic I hardly got a chance to open my mouth and explain what was wrong.' 'The doctor didn't tell me what was wrong, he just told me to take these pills, I still don't know what they are.' The relationship formed influences people's decision to consult. Treatment from a *mganga* often takes several days with daily visits to the patient's home or even paired visits to surrounding streams, caves and vegetation. The treatment course is well known and the decision to seek further medical care is a joint one between the *mganga* and the patient's care group. At first presentation, it is usually a trained friend or relative who treats at home or in familiar surroundings and who would charge very little for the initial visit. Compare this to a hospital physician's clinic which is busy and where very little time is devoted to listening to the patient's problems, explaining what the management entails and certainly very little time or any spent on opportunistic education or information. Hospital personnel have also been accused of being rude and giving very little information.<sup>78,79</sup>

## COSTS

Since the introduction of fees for patients attending government health facilities, the affordability of basic medical care has been widely discussed. As already demonstrated, a fairly large proportion of people visit their local traditional healer. In rural areas, the elder men have a vital role in the village as far as health-seeking behaviour is concerned in that almost every financial matter requires their approval.<sup>59</sup> In another study, it was found that the cost of being treated by local healers is higher than that in government hospitals.<sup>80</sup> Fees vary according to the health problem, duration of treatment and wealth of the client. In one study<sup>57</sup> basic therapy by an ordinary healer cost approximately US\$1 for divination and US\$5–15 for a week's worth of treatment. This has sometimes led to the assumption that if they can afford the local healer, then they can also afford basic healthcare at government hospitals. During my work in Tanzania I did at times question whether if patients were given free insulin, would they (a) still take the medication and (b) still attend diabetic clinics.

It could, however, be argued that there are other aspects to consider, for example, in an article by Muela et al.<sup>61</sup> it was suggested that the ability to pay for traditional medicine differs from that being able to pay for hospital services for two reasons. Firstly, many *waganga* offer alternative methods of payment (e.g. personal possessions, labour work or on a credit basis). Furthermore, the fees are negotiable and differ

according to the wealth of the patient's family and the payment can be made during treatment or even after recovery. In comparison, in a hospital clinic, payment is received before treatment is started, only cash is accepted and all treatments and medications are a fixed price.<sup>59</sup>

## VISIT TO THE TRADITIONAL HEALER

In this study, patients in Mnazi Mmoja hospital, Zanzibar, described four alternative medicines prescribed by their local healers: *mchanda*, *shubir dohani*, *mzambaan* (pink fruit from tree with nut inside), and the *muarabaini* tree. As a result, I visited the *mganga* in a village called Jambiani on the eastern side of Zanzibar. Mr Suleiman who prescribes remedies or medicine (*miri*) is a 63-year-old man who is very well known throughout the island of Zanzibar as a local herbalist. Four generations of his family have lived in Jambiani and he is currently in the process of training his son to become a *mganga*. He specialises in treating women and children but also frequently sees diabetic patients. He says most diabetic patients attend the hospital as a first port of call and then go the herbalist either because they cannot afford their medication or they simply seek advice. In the case of diabetic patients, he recommends one of six medicines, if they are feeling unwell. Depending on the symptoms, patients can be treated with different plants: a root called *mbono* is used for polydypsia, *muumbuzi* is used for polyuria, *mjanle vitel* for retinopathy, *mzmbrau* for impotence. Each of these medicine are cut into small pieces and boiled for ten mintues with freshwater and salt or seawater. The water should then be drunk three times a day for at least one week. In this way, the medicine remains in the body for the whole day. At his first consultation he usually uses the plant *muumbuzi* for one week. If the patient returns with no relief then he uses *muarabaini* for another week. If the patients experiences side-effects then they are told to keep taking it and wait – it is simply the body adjusting itself. Unlike insulin, there are no storage problems. The water can be stored in a bag at room temperature and remains fresh for up to three months. Furthermore they are safe to use alongside other drugs. The drugs are thought to work through being bitter which dilutes the sweetness of the blood. It may indeed work in the same way as karela (*Momordica charantia*) which also has a bitter taste and is often included in the diet of patients in Asia and Australasia.<sup>81</sup> Interestingly, it has been found that karela stimulates insulin release from normal isolated islets of Langerhans *in vitro*.<sup>82</sup> Similarly to the Shohani treatment, *Cyamopsis tetragonolobus* (Indian cluster bean) is recognised in Asian folklore as a treatment for diabetes,<sup>83,84</sup> the seeds of which can be made into *guar* (a form of gum) the viscosity of which delays the rate of glucose absorption and therefore decreases postprandial hyperglycaemia.

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