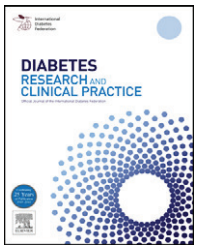
DIABETES RESEARCH AND CLINICAL PRACTICE 88 (2010) 217–221

Contents lists available at ScienceDirect

Diabetes Research and Clinical Practice

journal homepage: www.elsevier.com/locate/diabres



Diabetes Atlas

Looking beyond the issue of access to insulin: What is needed for proper diabetes care in resource poor settings

David Beran *, *John S. Yudkin*

International Insulin Foundation, Centre for International Health and Development, Institute of Child Health, University College London, 30, Guildford Street, London WC1N 1EH, United Kingdom

ARTICLE INFO

Article history:
Received 30 January 2010
Accepted 30 March 2010
Published on line 5 May 2010

Keywords:
Insulin
Access
Developing countries
Health systems

ABSTRACT

Insulin's indispensible nature is recognised by its inclusion in the World Health Organization's Essential Medicines List. Despite this insulin is still not available on an uninterrupted basis in many parts of the developing world. The International Insulin Foundation has conducted in-country assessments and based on these findings, the barriers to access to insulin were more to do with problems linked distribution, tendering and government policies than purely accessibility and affordability issues. Lack of insulin leads to poor outcomes for people with diabetes, but access to medicines alone cannot improve levels of health in resource poor settings. Aspects such as strong political will and local champions, data, trained healthcare workers and diabetes associations are just as necessary. Strengthening health systems and developing sustainable and locally owned solutions are vital to improve health and health care for people with diabetes and other chronic conditions in resource poor settings.

Contents

1. Introduction

Insulin is vital for the survival of people with Type 1 diabetes and used to improve management of blood glucose in people with Type 2 diabetes. Insulin's indispensible nature is recognised by its inclusion in the World Health Organization's (WHO) Essential Medicines List [1].

Despite this insulin is still not available on an uninterrupted basis in many parts of the developing world [2–7]. The reasons for this are linked to the problems of affordability (being able to meet the expense of a given good) and

* *Corresponding author*. Tel.: +44 207 242 9789x2140; fax: +44 207 404 2062.
E-mail address: david.beran@access2insulin.org (D. Beran).
0168-8227/$ – see front matter
doi:10.1016/j.diabres.2010.03.029

accessibility (the right or privilege to make use of something). In order to address the problem of access to insulin it is essential to understand how medicines get to the individuals needing them and how issues of affordability and accessibility impact overall access.

For this purpose the International Insulin Foundation (IIF) developed the Rapid Assessment Protocol for Insulin Access (RAPIA) in order to assess the path of insulin and other diabetes related supplies to identify problems with affordability and accessibility [8]. In addition this protocol helps identify other barriers to proper diabetes care. This paper will highlight the lessons learnt from the IIF's in-country experience.

The IIF has conducted in-depth assessments in Mali (2004), Mozambique (2003), Nicaragua (2007), Vietnam (2008) and Zambia (2003) [9–13]. Based on these findings, the barriers to access to insulin were more to do with problems linked distribution, tendering and government policies than purely accessibility and affordability issues. However, these difficulties in accessing insulin were only part of the larger problems of accessing proper diabetes care and treatment. These include access to syringes, tools for diagnosis and follow-up, availability of trained healthcare workers, government policies and the role of diabetes associations.

The absence of this "essential package" for diabetes care leads to poor outcomes with the life expectancy of a child with newly diagnosed Type 1 diabetes in much of sub-Saharan Africa being as short as 1 year [14,15] and life expectancy found to be 12 months and of 30 months in Mali and Mozambique, respectively [16]. This is in comparison to virtually normal life expectancy for a child with diabetes in industrialised countries.

Through the IIF's work what has become apparent is that the supply of insulin alone will not improve outcomes for people with diabetes. Insulin, syringes and testing equipment need to be present at the adequate facilities with the right infrastructure and personnel. The IIF has identified 11 points necessary for a "positive" diabetes environment [17]. These are:

1. Organisation of the health system;
2. Data collection;
3. Prevention;
4. Diagnostic tools and infrastructure;
5. Drug procurement and supply;
6. Accessibility and affordability of medicines and care;
7. Healthcare workers;
8. Adherence issues;
9. Patient education and empowerment;
10. Community involvement and diabetes associations;
11. Positive policy environment.

Points 5 and 6 are directly related to the issue of affordability and availability of insulin. However the issue of improving the lives of people with Type 1 diabetes needs to look beyond this small part of improving diabetes care in order to create a health system able to manage all aspects of diabetes care.

2. Results from 5 countries

In looking at affordability and availability of insulin and other diabetes supplies it is important to look at the differences in these factors between different areas of a country and between the public and private sector. In the 5 countries people living in urban areas and near large tertiary facilities had better access to insulin and diabetes care than those living in rural areas. In Mozambique in 2003, for example, Maputo Province represented only 11.3% of the total population, but received 77.3% of the national annual amount of insulin ordered [11].

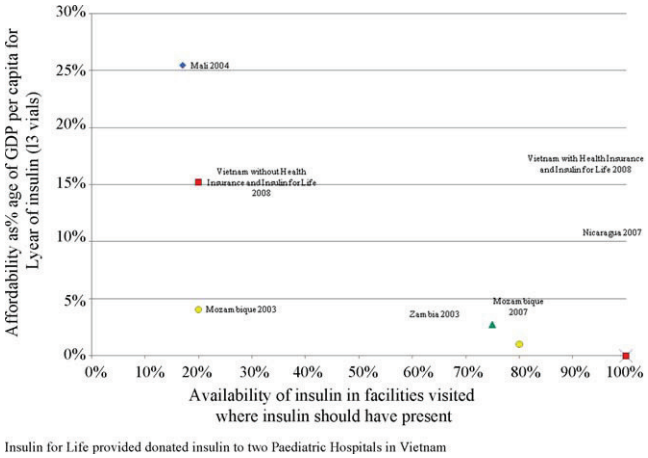


Fig. 1 – Affordablity and availablity of insulin.

Fig. 1 shows the availability and affordability of insulin. This was impacted by government policies influencing affordability (free insulin in Nicaragua, subsidies in Mozambique and Zambia, Health Insurance in Vietnam), policies with regards to tendering and distribution, and the level of the health system at which insulin should be available.

In none of the countries was there one single price for insulin. Instead, prices were dependent on location of purchase, the complexity of the supply chain and the method by which the medicine was purchased. Fig. 2 shows the different prices of insulin at different levels of the health system. Again policies and organisation of the purchasing of medicines will have an impact on the prices of medicines. Some countries had import duties and value added taxes (VAT) on insulin. Other factors impacted the cost of insulin to

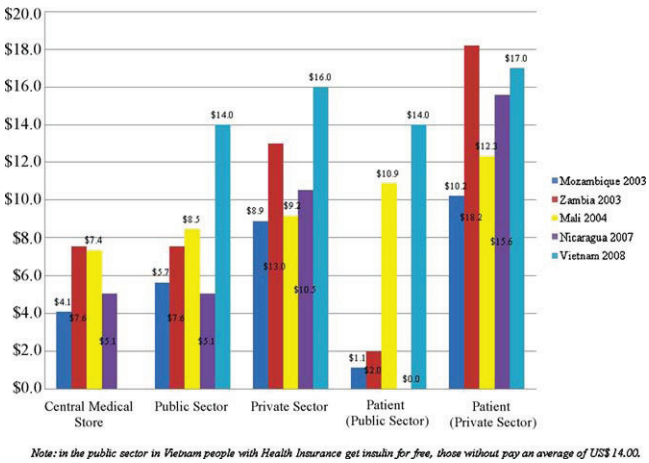


Fig. 2 – Average prices of insulin (10 ml 100 IU).

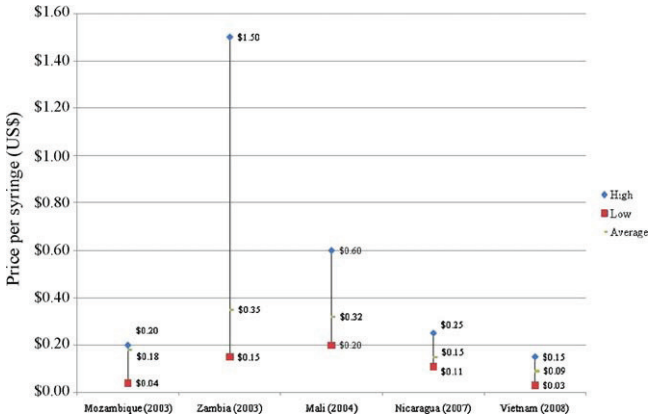


Fig. 3 – Price range per syringe in Mali, Mozambique, Niearagua, Vietnam and Zambia.

the person with diabetes, such as there being no centralised tendering in Vietnam, and facilities being charged for storage and transportation in Mozambique [10,11]. In Mali, with a national policy of cost recovery, these storage costs are even passed on to the individual [12].

Insulin alone is not enough. Syringes are needed for its delivery. In the countries surveyed all countries except for Nicaragua had VAT on syringes and in all countries they were not readily available in the public sector. Fig. 3 details the maximum, minimum and average prices paid for an individual single-use disposable syringe. Cost and availability of syringes also meant that people re-use single-use syringes.

Affordability and availability of diagnostic tools was also an issue. In Mali on average a urine glucose test cost US$ 0.89 and a blood glucose test US$ 2.38 [12]. In Mozambique laboratory tests for inpatients are free and some outpatients needed to pay a fee for blood glucose of US$ 0.21 [11]. Tests were free for all people with diabetes in Nicaragua [9].

In addition to the possible cost barrier there is also the actual availability of the testing equipment, as detailed in Table 1, when the person with diabetes goes to the health facility for initial diagnosis or follow-up.

In looking at overall costs for diabetes in each country, the cost of insulin is the most expensive aspect of diabetes care only in Mali. In two countries (Mozambique and Vietnam) travel costs are actually the highest item of expenditure. In Nicaragua and Zambia syringes represent the largest item of expenditure. This data is presented in Table 2.

Because of the availability of free insulin, testing and consultations, people with Type 1 diabetes in Nicaragua have the lowest financial burden due to diabetes. However this still represents 7% of annual income. In the other countries the burden is much higher. Despite a low burden on the individual, the items of diabetes care provided free still need to be paid for by someone. In Nicaragua this is the Government health system. For insulin alone these costs are upwards of US$ 90 per person per year in countries that can spend as little at US$ 3 per person per year on the provision of healthcare [18].

Table 1 – Availability of testing equipment.

Country	Presence of urine glucose strips	Presence of ketone strips	Presence of blood glucose meter
Mali	54%	13%	43%
Mozambique	18%	8%	21%
Nicaragua	59%	54%	95%
Vietnam	82%	59%	100%
Zambia	61%	49%	54%

3. Lessons learnt

Access to medicines alone cannot improve levels of health in developing countries. For this reason it is important to expand the concept of access to medicines to encompass that of access to treatment for the benefit of people with diabetes and the success of health systems in general [19]. Treatment includes such aspects as availaibility and affordability of diagnostic tools as well as trained healthcare workers, diabetes education and support provided by a diabetes association.

4. Healthcare workers

One vital factor is the role of healthcare workers in the initial diagnosis of Type 1 diabetes and its ensuing management. Healthcare workers in these 5 countries rarely encounter people with Type 1 diabetes. This lack of familiarity and unavailability of tools for proper diagnosis mean that diabetes in many people is likely to be missed or misdiagnosed. Diabetes in people presenting in a coma may be misdiagnosed as cerebral malaria or HIV/AIDS [20,21].

5. Diabetes Associations

In addition Diabetes Associations play a vital role in education, support, advocacy and also sometimes care of people with diabetes. The role of the Diabetes Association should be seen to evolve with the needs of people with diabetes. In Mozambique and Mali the associations delivered care as the health system was unable to do so. The Diabetes Association of Zambia provided some care, but this was mainly for Type 1 diabetes. A very active organization of parents with children and adolescents with diabetes was present in Nicaragua with its main role to support young people with Type 1 diabetes and their families. They organize monthly meetings, which provide the opportunity to discuss diabetes in the day-to-day life of children and their family, and raise funds to provide syringes, testing strips and glucose meters. For Vietnam the role of the national association was more a professional association, with some diabetes clubs for patients present at facilities.

The role of the association from care provider, to support network and finally to advocate takes time and is dependent on the needs of people with diabetes in the country as well as the association's capacity to fulfil these tasks. In several countries where the IIF has worked, a powerful partnership between the Diabetes Association and the Ministry of Health has taken forward action on diabetes care in a way that either

Table 2 – Cost of diabetes care.

	Insulin	Syringes	Testing	Consultation	Travel	Total per year	% of per capita income
Mali (2004)	38%	34%	8%	7%	12%	$339.4	61%
Mozambique (2003)	5%	24%	1%	9%	61%	$273.6	75%
Nicaragua (2007)	0%	73%	0%	0%	27%	$74.4	7%
Zambia (2003)	12%	63%	6%	6%	12%	$199.1	21%
Vietnam (2008)	39%	8%	5%	3%	46%	$427.0	51%

Assumptions:
1. 1 vial of insulin per month;
2. 1 syringe per day;
3. 1 blood glucose test per month;
4. 1 consultation per month;
5. Travel for 1 consultation per month;
6. 'Income' defined as per capita gross domestic product (GDP) [26].

organisation would be unable to undertake on its own. Diabetes Associations and Ministries of Health can collaborate in raising awareness, organising training and providing social support for people with diabetes.

6. Policies, data and training

Based on the IIF's experience in Mozambique and elsewhere, strong political will and local champions are necessary for a national diabetes programme to be established and for diabetes to be recognised as a health problem. This political will can be generated through different means, but one of the necessities is data on the size and scope of the problem of diabetes. In many countries this data has been in the form of the WHO stepwise approach [22] and the RAPIA. The development of a national diabetes programme/policy is needed in order to ensure continuity and guiding principles. This should help establish the organisation of the health system for care, medicines and other tools necessary for diabetes management. This should also include such elements as prevention and address the issues of accessibility and affordability of medicines and care. In parallel, education for healthcare workers needs to be implemented, both for those in training and those already practising. Healthcare workers need to work towards culturally adapted patient education and empowerment, in conjunction with the Diabetes Association. This is often done by organising centralised training of trainers who then return to their local provinces or districts and train their colleagues on the job.

One example of this progress can be found in Mozambique. With support from Diabetes UK and the IIF, an integrated National Non-Communicable Disease Plan, including diabetes, has been developed by the Ministry of Health, and the Diabetes Association is playing an expanded role in providing education and support to people with diabetes. In addition there has been a political decision to provide medicines at US$ 0.20 per prescription, meaning that people now pay only around US$ 0.20 for a month's supply of insulin [23].

7. Conclusion

Insulin supply is thus an essential element of care for people with insulin-requiring diabetes, but alone it is insufficient to provide good care. A complete package is required, the key elements of which are described in the World Health Organization's Innovative Care for Chronic Conditions Framework (ICCCF) [24]. The ICCCF contains 8 elements:

- Support a Paradigm Shift (from a focus on acute, episodic care to one that also includes chronic conditions);
- Manage the political environment;
- Build integrated health care;
- Align sectoral policies for health;
- Use health care personnel more effectively;
- Centre care on the patient and family;
- Support patients in their communities;
- Emphasize prevention (primary prevention is relevant to type 2 diabetes, while prevention of complications is relevant to both type 1 and type 2 diabetes).

The ICCCF considers the health environment at macro (policy and financing), meso (health care organization and community) and micro (patient and family) levels. The framework recognises the partnership required between the patient, the health care team and the community, a partnership that exists within the context of organized and well-equipped health care teams and a positive policy environment.

Using RAPIA provides the information required to assess the current status of the health system and its supporting environment following the ICCCF's framework. In addition the 11 elements described in the ''Diabetes Foundation report on implementing national diabetes programmes in sub-Saharan Africa'' provide a template for action based on the RAPIA's findings. What is clear from the experience of the IIF in these countries is that one aspect of diabetes care cannot be considered in isolation from others. Insulin and medicines without trained healthcare workers, a national strategy without the appropriate infrastructure, and a dedicated association without cooperation and coordination with the health system, will not have the positive overall impact that is needed to improve diabetes care.

Former U.S. President Bill Clinton has said, ''Until we build the human and physical infrastructure needed to deliver effective treatment, programs will not succeed'' [25]. This was in reference to HIV/AIDS, but the same is true for diabetes. Collaboration is needed between the IDF, WHO, international and local NGOs and foundations and between countries

(South-to-South collaborations, twinning programmes such as those between Diabetes UK and Mozambique and the Norwegian Diabetes Association and Zambia) to get these initiatives underway. However the, only way to ensure that sustainable and locally owned solutions exist is to improve the health care systems which are vital component of improving health and health care for people with diabetes and other chronic conditions in resource poor settings.

Acknowledgments

The authors would like to acknowledge the support of the Trustees of the International Insulin Foundation John Bowis MEP, Professor Maximilian de Courten, Professor Geoffrey Gill, Professor Harry Keen, Professor Ayesha Motala, Dr. Kaushik Ramaiya, Professor Solomon Tesfaye and Professor Nigel Unwin.

The pilot and development of the RAPIA was made possible thanks to a grant from the World Diabetes Foundation. For the work in Vietnam the International Insulin Foundation received a grant from the International Diabetes Federation, which received support from the Lilly Foundation for this project. The International Insulin Foundation has also received support from Diabetes UK, Diabetes Foundation and World Health Organization for its work.

Support from the following people is gratefully recognised for the research work in the different sites: Dr. Kate Armstrong, Dr. Catherine Atlan-Corea, Stephane Besancon, Professor Ta Van Binh, Aura Cuadra, Dr. Larry Deeb, Professor Aires Fernandes, Delice Gan, Professor Nguyen Thy Khue, Dr. Chishimba Lumbwe, Rosalina Machatine, Ana Julia Martinez, Dr. Carla Silva Matos, Dr. Nguyen Bich Phuong, Dr. Brenda Tapia, Dr. Susan Tembo-Zimba, Dr. Le Quang Toan, Dr. Hoang Kim Uoc and Professor Garry Warne.

Conflict of interest

There are no conflicts of interest.

REFERENCES

[1] World Health Organization, WHO Model List of Essential Medicines, World Health Organization, Geneva, 2007.
[2] K.G. Alberti, Insulin dependent diabetes mellitus: a lethal disease in the developing world, BMJ 309 (1994) 754–755.
[3] L. Deeb, M.H. Tan, K.G.M.M. Alberti, Insulin availability among International Diabetes Federation member associations, Diabetes Care 17 (1994) 220–223.
[4] D. McLarty, A.B.M. Swai, K.G.M.M. Alberti, Insulin availability in Africa: an insoluble problem? Int. Diabetes Digest 5 (1994) 15–17.
[5] A. Savage, The insulin dilemma: a survey of insulin treatment in the tropics, Int. Diabetes Digest 5 (1994) 19–20.
[6] International Diabetes Federation Task Force on Insulin, Test Strips and Other Diabetes Supplies, Survey on Access to Insulin and Diabetes Supplies 2006, International Diabetes Federation, Brussels, 2006.
[7] J.S. Yudkin, Insulin for the world's poorest countries, Lancet 355 (2000) 919–921.
[8] D. Beran, J. Yudkin, M. de Courten, Assessing health systems for insulin-requiring diabetes in sub-Saharan Africa: Developing a 'Rapid Assessment Protocol for Insulin Access', BMC Health Serv. Res. 6 (2006) 17.
[9] D. Beran, C. Atlan-Corea, B. Tapia, A.J. Martinez, Report on the Rapid Assessment Protocol for Insulin Access in Nicaragua, International Insulin Foundation and Handicap International, Mangua, 2007.
[10] D. Beran, T.V. Binh, N.T. Khue, H.K. Uoc, L.Q. Toan, N.B. Phuong, et al., Report on the Rapid Assessment Protocol for Insulin Access in Vietnam, International Insulin Foundation, London, 2009.
[11] International Insulin Foundation, Report of the International Insulin Foundation on the Rapid Assessment Protocol for Insulin Access in Mozambique, International Insulin Foundation, London, 2004.
[12] International Insulin Foundation, Final Report of the International Insulin Foundation on the Rapid Assessment Protocol for Insulin Access in Mali, International Insulin Foundation, London, 2004.
[13] International Insulin Foundation, Report of the International Insulin Foundation on the Rapid Assessment Protocol for Insulin Access in Zambia, International Insulin Foundation, London, 2004.
[14] W. Castle, A. Wicks, A follow-up of 93 newly diagnosed African diabetics for 6 years, Diabetologia 980 (1980) 121–123.
[15] M. Makame, for the Diabetes Epidemiology Research International Study Group, Childhood diabetes, insulin, and Africa, Diabet. Med. 9 (1992) 571–573.
[16] International Insulin Foundation, Diabetes Foundation Report on Insulin-requiring Diabetes in sub-Saharan Africa, International Insulin Foundation, London, 2005.
[17] D. Beran, The Diabetes Foundation Report on Implementing National Diabetes Programmes in sub-Saharan Africa, International Insulin Foundation, London, 2006.
[18] World Health Oragnization, 2009. http://www.who.int/countries/moz/areas/health_system/en/index1.html.
[19] D. Beran, A. McCabe, J.S. Yudkin, Access to medicines versus access to treatment: the case of type 1 diabetes, Bull. World Health Organ. 86 (2008) 648–649.
[20] J. Makani, W. Matuja, E. Liyombo, R.W. Snow, K. Marsh, D.A. Warrell, Admission diagnosis of cerebral malaria in adults in an endemic area of Tanzania: implications and clinical description, QJM 96 (2003) 355–362.
[21] A.B. Swai, P. Lyimo, F. Rutayuga, D.G. McLarty, Diabetes mellitus misdiagnosed as AIDS, Lancet 334 (1989) 976.
[22] World Health Organization, Summary Surveillance of Risk Factors for Noncommunicable Diseases The WHO STEPWise Approach, World Health Organization, Geneva, 2003
[23] C. Silva Matos, D. Beran, Improvements in care for people with diabetes in Mozambique, Diabetes Voice 53 (2008) 15–17.
[24] World Health Organisation, Innovative Care for Chronic Conditions: Building Blocks for Action, World Health Organisation, Geneva, 2002.
[25] W. Clinton, Turning the tide on the AIDS pandemic, N. Engl. J. Med. 348 (2003) 1800–1802.
[26] Central Intelligence Agency, 2009. http://www.cia.gov/library/publications/the-world-factbook/.