Pharmacoeconomic Evaluation of Anti-Diabetic Therapy in A Nigerian Tertiary Health Institution

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Abstract

Background: The major problem that prompted the study is scarcity of facts on actual cost of illness to the patient and society at large.

Methods: It is a retrospective study and involved using 277 prescriptions from randomly selected 37 case notes of diabetic patients. In addition, stop watch time studies and standard cost accounting technique was employed. The hospital pharmacy costs of the drugs were used. Pieces of information such as demographic data prescribed drugs, fasting blood sugar level, blood pressure were abstracted from the case notes. The various cost components such as drug procurement, transport, personnel and diagnostic test costs over one year period were determined for each patient and added up. These were summed up to calculate the direct cost of illness for all the patients and the average determined.

Results: No of patients studied = 37; No of patients on insulin= 4; No of patient on concurrent medication =32; Duration of diabetes (Range) = 4 months- 33 years (mean 8.1 years); Cost per-patient for those on insulin = N116,026.79 ($828.76); Cost per-patient for those on oral agents =N27,159.38 ($194.00); Cost per patient for concomitant medication=N39,404.69 ($281.46). Hypertension occurred as a concurrent illness in most of the patients (n=31; 83.78%) and were equally treated for hypertension. The total cost of drugs in all the patients= N1,219,932.70 ($8,713.81); Total cost of illness (COI) for one year for the 37 patients =N1,360.369.80($9716.93); Average cost of illness per patient/year= N36,766.75($262.22); 84% of annual per capital income. The cost of treating an estimated 3% prevalence of diabetes mellitus in the country is about N150 billion annually excluding the indirect cost.

Conclusion: The cost associated with diabetes is enormous. Adequate consideration for cost implication of chosen therapy is indispensable. Economic evaluation of therapy should be encouraged to ensure improved cost effectiveness and efficiency in management. Regularly up-dated drug formulary and evidence-based standard treatment guidelines would ensure better choice of therapeutic options. More importantly, a concerted effort is needed to reduce the incidence of diabetes mellitus in the society.

Key words: Pharmacoeconomics, diabetes mellitus, cost of illness analysis

Résumé

Introduction : Le problème majeur qui a provoqué cette étude est la pénurie des informations sur le priz véritable de la maladie pour le patient et la société en détail.

Méthodes : Il s’agit d’une étude à effet rétroactif qui implique l’utilisation de 277 ordonnances des 37 dossiers médicaux des patients diabétiques avec une sélection au hasard. De plus, études à travers l’utilisation chronomètre et coût standard système comptable. La pharmacie dans l’hôpital donne le coût des drogues utilisées. Des informations telles que ordonnances des drogues et ; données démographiques, diète de taux de sucre dans le sang, tension artérielle ont été sortis des dossiers médicaux. Des coûts des éléments divers tels que acquisitions des drogues, transport, coût des personnel et épreuves diagnostiques, au cours d’une période d’une année ont été calculés pour chaque patient et l’addition de tous. Tous étaient calculé afin de donner le coût direct de la maladie pour tous les patients et on avait calculé le moyen.

Résultat : Nombre des patients étudies = 37, nombre des patients sur insulin= 4, nombre des patients sur médicaments simultanés = 32, durée de diabétes (Tranche) = 4 mois-33 ans (moyen 8, 1 ans) coût par-patient pour ceux sur insulin = N116,026.79 ($828.76). Coût par patient pour ceux sur agents orals = N27,159.38 ($194.00), coût par patient pour médicament concomitant = N39,404, 69 ($281.46). Hypertension est arrivée comme une maladie simultanée chez la majorité des patients. (n=31 ; 83, 78%)
et ont été également traité pour l’hypertension. Coût total des drogues chez tous les patients = N1, 219,932.70 ($8,713.81). Coût total de la maladie (CDM) pour une année pour 37 patients = N1, 360,369.80 ($9,716.93). En moyen, coût de la maladie par patient/année = N36, 766.75 ($262.22) 84% de revenue par capital annuel. Le coût de traitement un estime 3% fréquence de miellitus diabètes dans le pays est environ N150 milliard annuel à l’exception du coût indirect.

**Conclusion :** Le coût associé à la diabètes est enorme. Une étude adéquate pour l’implication du coût d’une thérapie choisie est indispensable. Evaluation économique d’une thérapie devrait être encouragé afin d’assurer une amélioration de la rentabilité et efficacité dans la prise en charge. Une remise à jour régulière de la formule de drogues et des directives du traitement standard et basées sur des preuves devraient assurer une meilleure choix des options thérapeutiques. Ce qui est plus important, action d’ensemble est nécessaire afin de reduire la fréquence de diabètes mellitus dans la société.

**Mot clés :** Pharmacoéconomique, diabètes mellitus, analyse de coût de la maladie

### Introduction

The health care system is clearly in state of rapid revolution. Traditional approaches to healthcare decisions will no longer suffice; therefore, new tools will be needed. Medical, ethical and societal concerns about costs, access and quality of care are causing healthcare practitioners to consider a more comprehensive model for medical decision making. These trends led to the evolution of Pharmacoeconomics. Cano and Crane defined Pharmacoeconomics as the economic evaluation of drug therapy, pharmacy program or pharmacy technology. Pharmacoeconomic evaluation of therapy is increasingly being advocated even in developed countries where per capital income is much higher. However, this is less so in Nigeria among other African countries where resources are much more limited. Traditionally, emphasis is basically on clinical outcomes of therapy with little critical consideration for economic and psychosocial (humanistic) outcomes of therapy. The research article is focusing on economic outcome of therapy using Cost of Illness Analysis (CIA).

CIA shows the cost of the condition in question (diabetes mellitus in this case) to the patient and the society over a period of time. It is a pure cost analysis and health outcomes are not evaluated unlike comparative cost analytical methods such as cost-effect analysis.

All costs caused by the condition over a defined period of time (one year in this case) are evaluated and added up. It is the only type of analysis that gives a true picture of the cost implication of a disease condition to the patient and the society.

Diabetes Mellitus is a major health problem. It is a chronic illness, which in most cases is treated for life, hence the cost associated with it is enormous. Few data exists as regard its cost to the patient and the society in developing countries. Such costs, if available, are useful tools in policy formulations, decision taking and motivation for adherence to preventive measures by the populace.

As a result of its chronicity, of the seriousness of its complications and of the resources that must be used to fight it, diabetes is a very expensive disease not only for the patient and the family, but also for the states’ system of health.

The overall costs of diabetes to the health care system and the society depends on its prevalence, in addition to the severity, type of drug used, compliance to medications by the patients and development as well as progression of complications.

The prevalence of diabetes in the developed countries is well established but less so in developing ones. The World Health Organisation stated in 1998 that a 122% rise in the number of adults with diabetes is projected by 2005, to reach 300 million adults worldwide 76% of this in developing countries.

The prevalence of diabetes mellitus in Nigeria has been reported but with very wide variation. Owoaje et al in 1997 reported a prevalence rate of 2.8% in a Yoruba community in Ibadan, South-West, Nigeria, Olatubosun et al in 1998 also reported a rate of 2.2% (a decrease!) in the same region. Obasohan and colleagues in 1997 found abnormal glucose tolerance in 36% of newly diagnosed hypertensive compared to 1.9% in normotensive. One in three individual with impaired glucose tolerance (IGT) will develop type 2 diabetes within 10 years if left untreated. Bakari and Onyemelukwe in 2004 reported IGT of 7.7% among Hausa-Fulani in Northern-Nigeria who has no history of diabetes mellitus nor hypertension. Nwafor and Owohji (2001) reported a prevalence of 23% and 16% for high and low socio-economic class respectively among residence of Port-Harcourt, South-South, Nigeria out of which 18.9% was previously undiagnosed. Despite the wide variation there is no controversy as to the increase in its prevalence world-wide.

The magnitude of the prevalence has been shown to be different between different ethnic groups. Unwin et al 1998 reported increase prevalence of 4.8%-7.1% in Caucasians, 4.7%-6.2% among Chinese and 20.1%-21.4% among the people of South Asia. Declerques and colleagues in 2001 reported a prevalence of 22.2% in the Yoruba community in Ibadan, South-West, Nigeria.

Diabetics as a group are at increase risk of heart diseases, blindness, (due to glaucoma, cataract, retinopathy), neuropathy, nephropathy, gangrene etc. All these contribute to the cost of management and to poor quality of life in cases where the blood glucose level, are poorly controlled. Through our literature search, we did not come across any similar study on cost implications of diabetes locally, making the study more desirable.
Materials and Methods

It is mainly a retrospective study. In addition, time and Motion Studies were employed. The location of the study was Olabisi Onabanjo University Teaching Hospital Sagamu, Ogun State. The study addressed diabetic out patients of the hospital. It involved reviewing 277 prescriptions. These were the prescriptions of 37 diabetic patients, in randomly sampled case notes over one year period (July 2003 to June 2004). The following data were noted and recorded from the case notes; demographic data, date of visits, fasting blood glucose level at first and subsequent visits, blood pressure at each visit, concurrent illness (s), number of visits and prescribed drugs (antidiabetic and antihypertensive) at each visit as well as duration of therapy. Evidence of diagnostic tests was also noted and recorded. Only the direct costs were considered. These include the costs for personnel, drugs, transportation and diagnostic tests.

Time and motion studies was carried out to calculate the personnel costs for physicians, pharmacists and nurses. Average time for 15 random observations for completion of tasks such as consultation, dispensing, and measurement of blood pressure was determined and recorded. The salary of health professionals were obtained from the accounts department of the hospital, average considered where necessary and the mean salary per minute calculated.

\[
\text{Mean salary/min} = \frac{\text{annual salary}}{\text{Hours/wk} \times \text{no of wks/annum} \times 60}
\]

In the calculation the respective number of visits was considered. Also computed were the transport costs for each patient for all the visits using the standard tariff of National Union of Road Transport Workers (NURTW) and the patients’ destination. This was obvious from the stated address of the patients in the case notes. Drug costs were obtained from the pharmacy department of the hospital and the cost per defined daily dose (C/DDD) calculated taking the duration of therapy into consideration. In addition the cost of diagnostic tests was obtained from the laboratory of the hospital. All these costs were added up for each patient and for all the patients to obtain the total. The average cost per patient was then calculated and recorded.

Results

No. of patient studied \(= 37\); No. of type 2 diabetic patients \(= 35\); No. of type 1 diabetic patients \(= 2\); No. of patients on insulin \(= 4\); No. of patients on oral anti-diabetic patient \(= 35\) (two patients were on both insulin and oral agents); No. of patients on concurrent medications \(= 35\); No. of patients with hypertension \(= 32\) (86.5%). Average number/type of drugs (for diabetes and hypertension) per patient was 4.5 indicating combination therapies in almost all the patients.

Cost of diabetes in each of the class above

Type 2 diabetic patients: Range = \(2618.44 \text{ ($18.70)} - 11017.05 \text{ ($835.82)}\), Mean = \(29366.44 \text{ ($209.76)}\);

Type 1 diabetic patients: Range = \(63968.48 \text{ ($456.92)} - 268572.81 \text{ ($1918.37)}\), Mean= \(166270.65 \text{ ($1187.65)}\);

Patients on insulin: Range = \(14550.16 \text{ ($103.93)} \) – \(268572.81 \text{ ($1918.37)}\), Mean = \(116026.79 \text{ ($828.76)}\);

Patients on oral antidiabetic agents: Range = \(2618.44 \text{ ($18.70)} - 11017.05 \text{ ($835.82)}\), Mean = \(29366.44 \text{ ($209.76)}\);

Patients on concurrent medication: Range = \(268572.81 \text{ ($1918.37)}\), Mean = \(36757.56 \text{ ($262.55)}\);

Hypertensive diabetic patients: Range = \(4065.64 \text{ ($29.04)} \) – \(268572.81 \text{ ($1918.37)}\), Mean = \(39404.69\).

Contribution of each agents/class to the total cost of diabetes

Insulin = \(111558.00 \text{ ($2939.70)}\) (30.3%); Oral antidiabetic agents = \(277667.50 \text{ ($1983.34)}\) (20.4%); Anti-diabetic agents (total) = \(689225.50 \text{ ($4923.03)}\) (50.6%); Aspirin = \(53337.40 \text{ ($381.00)}\) (3.9%); Cost of illness = \(1360366.80 \text{ ($9716.91)}\) (100.0%); Transport cost = \(30696.70 \text{ ($219.26)}\) (2.3%); Diagnostic test cost = \(56400.00 \text{ ($402.86)}\) (4.2%); Personnel cost = \(53337.40 \text{ ($381.00)}\) (3.9%); Cost of illness per patient/year = \(36766.75 \text{ ($262.22)}\), Range = \(2618.44 \text{ ($18.70)} - 268572.81 \text{ ($1918.37)}\).

Most widely used drugs (as combination therapy) were: Metformin (a biguanide) in 89.19% of patients, at a cost of \(53337.40 \text{ ($381.00)}\) (3.9%); Cost of illness = \(1360366.80 \text{ ($9716.91)}\) (100.0%); Transport cost = \(30696.70 \text{ ($219.26)}\) (2.3%); Diagnostic test cost = \(56400.00 \text{ ($402.86)}\) (4.2%); Personnel cost = \(53337.40 \text{ ($381.00)}\) (3.9%); Cost of illness per patient/year = \(36766.75 \text{ ($262.22)}\), Range = \(2618.44 \text{ ($18.70)} - 268572.81 \text{ ($1918.37)}\).

Most widely used antihypertensive agent was lisinopril (70.3% of patients) at a cost = \(1,219,932.70 \text{ ($8713.80)}\) (89.7%); Average cost of illness per patient/year = \(36766.75 \text{ ($262.22)}\), Range = \(2618.44 \text{ ($18.70)} - 268572.81 \text{ ($1918.37)}\).

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Table 1: Total cost/year of individual drug for the 33 diabetic patients on oral agents

<table>
<thead>
<tr>
<th>Drug</th>
<th>Total cost N (US$)</th>
<th>% total drug cost</th>
<th>% total illness cost</th>
<th>No. patients involved</th>
<th>% patients involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>120,890.50 (863.50)</td>
<td>15.7</td>
<td>13.5</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>Glibenclamide</td>
<td>110,195.00 (787.11)</td>
<td>14.3</td>
<td>12.3</td>
<td>31</td>
<td>93.9</td>
</tr>
<tr>
<td>Chlorpropamide</td>
<td>792.00 (5.66)</td>
<td>0.1</td>
<td>0.1</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Glimepiride</td>
<td>26,460.00 (189.00)</td>
<td>3.0</td>
<td>3.0</td>
<td>3</td>
<td>9.1</td>
</tr>
<tr>
<td>Aspirin</td>
<td>3,344.65 (23.90)</td>
<td>0.4</td>
<td>0.4</td>
<td>32</td>
<td>97.0</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>338,780.00 (2419.86)</td>
<td>43.9</td>
<td>37.8</td>
<td>25</td>
<td>75.0</td>
</tr>
<tr>
<td>Co-amilozone</td>
<td>4,788.00 (34.20)</td>
<td>0.6</td>
<td>0.5</td>
<td>6</td>
<td>18.2</td>
</tr>
<tr>
<td>Nifedipine</td>
<td>136,990.00 (978.50)</td>
<td>17.7</td>
<td>15.3</td>
<td>10</td>
<td>30.3</td>
</tr>
<tr>
<td>Methylpapa</td>
<td>9,915.00 (70.82)</td>
<td>1.3</td>
<td>1.1</td>
<td>4</td>
<td>12.1</td>
</tr>
<tr>
<td>Captoriol</td>
<td>16,940.00 (121.00)</td>
<td>2.2</td>
<td>1.9</td>
<td>3</td>
<td>9.1</td>
</tr>
<tr>
<td>Furosemide</td>
<td>828.00 (5.91)</td>
<td>1.1</td>
<td>0.9</td>
<td>3</td>
<td>9.1</td>
</tr>
<tr>
<td>Hydrochlorothiazide</td>
<td>2520.00 (18.00)</td>
<td>13.3</td>
<td>2.8</td>
<td>2</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>772,443.15 (5517.45)</strong></td>
<td><strong>100.0</strong></td>
<td><strong>86.2</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Cost of Illness for the 33 diabetic patients on oral agents

<table>
<thead>
<tr>
<th>Cost components</th>
<th>Total costs N (US$)</th>
<th>% of Total cost of illness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug</td>
<td>772,443.15 (5517.45)</td>
<td>86.2</td>
</tr>
<tr>
<td>Transport</td>
<td>25,576.70 (182.69)</td>
<td>2.9</td>
</tr>
<tr>
<td>Diagnostic tests</td>
<td>50,200.00 (358.57)</td>
<td>5.6</td>
</tr>
<tr>
<td>Personnel costs</td>
<td>48,039.80 (343.14)</td>
<td>5.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>896,259.65 (6401.85)</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 3: Total cost/year of individual drug for the 4 patients on insulin

<table>
<thead>
<tr>
<th>Drug</th>
<th>Total cost N (US$)</th>
<th>% total drug cost</th>
<th>% total illness cost</th>
<th>No. patients involved</th>
<th>% patients involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin</td>
<td>411,558.00 (2939.70)</td>
<td>92.0</td>
<td>88.7</td>
<td>4</td>
<td>100.0</td>
</tr>
<tr>
<td>Metformin</td>
<td>9695.00 (69.25)</td>
<td>2.2</td>
<td>2.1</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>Glibenclamide</td>
<td>9635.00 (68.82)</td>
<td>2.2</td>
<td>2.1</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>Aspirin</td>
<td>221.55 (1.58)</td>
<td>0.1</td>
<td>0.1</td>
<td>3</td>
<td>75.0</td>
</tr>
<tr>
<td>Lisinopril</td>
<td>16,380.00 (117.00)</td>
<td>3.7</td>
<td>3.5</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>447,489.55 (3196.35)</strong></td>
<td><strong>100.0</strong></td>
<td><strong>96.4</strong></td>
<td><strong>4</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 4: Cost of Illness for the 4 patients on insulin

<table>
<thead>
<tr>
<th>Cost components</th>
<th>Total costs N (US$)</th>
<th>% of Total cost of illness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug</td>
<td>447,489.55 (3196.35)</td>
<td>96.4</td>
</tr>
<tr>
<td>Transport</td>
<td>5,120.00 (36.57)</td>
<td>1.1</td>
</tr>
<tr>
<td>Diagnostic tests</td>
<td>6,200.00 (44.29)</td>
<td>1.3</td>
</tr>
<tr>
<td>Personnel costs</td>
<td>5,297.60 (37.84)</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>464,107.15 (3315.05)</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Discussion

The total cost of illness for the period under review (July2003-June2004) for all the 37 patients was N1,360,369.80($9716.93). The average cost per year was N36, 766.75per patient. This represents about 84.7% of yearly per capital income in the country. This takes into account only the direct cost of therapy; the procurement cost of drugs, transport cost, cost of diagnostic test(s) and personnel costs of health professionals. Spending 84.7% of per capital income on disease management is a great burden. The indirect cost; loss productivity was excluded in the analysis. The total cost of drugs was N1, 219,932.70 (89.68%) of total cost of illness. This is enormous. Therefore any measure taken to promote more rational drug selection such as economic evaluation of therapy, provision of regularly up-dated formulary
and evidence based standard treatment guidelines will be invaluable in promoting efficient use of limited resources.

About 84% of the patients have hypertension as a concurrent illness and were placed on antihypertensive drugs as well, which form part of the drug cost (₦530, 707.20; 43.50%). Out of this amount, the cost of lisinopril alone was ₦355, 160.00 (66.9% of antihypertensive drug cost; 29.11% of the total drug cost). Lisinopril has a cost per/DDD of between ₦30 (2.5mg od) to ₦180 (15mg od) and was prescribed for 26 patients (70.29% of the entire patients but 83.87% of hypertensive patients; n=31). Nifedipine with a cost/DDD of between ₦10.00 (10mg od) and ₦80.00 (40mg bd) was used in 10 patients and share a total cost of ₦136,990.00 (11.23% of total drug cost and 25.81% of antihypertensive drugs).

The fact that lisinopril has been shown to stabilize renal functions in hypertensive diabetics might be responsible for its high degree of usage.23, 24 Screening of patients for those at risk of nephropathy might be beneficial as well as subsequent regular monitoring of their renal functions.23, 24 High cost of therapy may lead to poor compliance by some patients leading to other complications in addition to renal problems, which will adversely affect their quality of life. Affordability by patients may be the determinant of choice of therapy for core poor patients even if it is only moderately efficacious.

The total cost of anti-diabetic agents was ₦689, 225.50 (56.50% of total drug cost and 50.6% of total diabetic cost) out of which insulin (for 4 patients; 10.81%) was ₦411, 558.00 (33.74% of total drug cost but 59.71% of total anti-diabetic drug cost). Insulin has a cost/DDD of between ₦235.00 (10 units od) to ₦705.00 (30 units od).

Measures such as diabetic compatible life style improve compliance to medication and diet, need to be taken in order to prevent complications of their diabetes. Other modalities include possible home visits by social workers or pharmaceutical care by neighborhood registered pharmacy. These are not without costs, and should be weighed against the benefits as well as affordability by patients. It can equally be restricted to selected patients. Enlightenment of the patients on grave implications of non-compliance is important, and the patient as well as the society on dietary habits is of absolute necessity.

Aspirin was prescribed in 94.6% of the patients and costs just ₦3566.20. This is in order as it prevents/minimizes incidence of cardiovascular disease such as thrombo-embolic disorders.25

With an average cost per patient of ₦36, 766.75 per year; The cost of treating 1000 cases will be ₦36, 766,750.00. Giving a prevalence rate of about 3% in the country, with an estimated population of 132.8million (UNDP 2004).26 About 3,984,000 people or even more may be suffering from diabetes mellitus. A direct cost of diabetes mellitus may be about ₦146, 478,722,000.00 ($1,071,428,500.00) i.e. about ₦150 billion annually. This amount which is believed to be under estimated, because of prevalence rate of 3% chosen and the non inclusion of indirect cost (cost due to morbidity, disability, premature mortality and loss of productive output etc) is a lot. Indirect costs are difficult to evaluate, but Gray et al27 has shown that it may be as high as the direct cost.

The fact that poverty is on the increase is no longer new and is another reason to be more proactive. The percentage of core poor, rising from 6.2% in 1980 to as high as 29.3% in 1997 and reaching 58.2% in 1999 is a cause for concern.28 In UNDP 2004 report, about 70.18% (93.2 million) Nigerians live below the poverty line, earning less than US$1 (about ₦140.00) per day.26 This is worrisome. Diabetes is widely known to be on increase world wide.10-17 and Africa will be the most affected.10 More so, low income, uneducated, and poor people are more affected29,30 hence, instituted therapy should be as cost effective as possible. Effective policy, adequate information, education and communication (IEC) strategy must be put in-place to safe guard the health of the nation from ruin by diabetes mellitus among other chronic illnesses. Currie et al31 reported 8.7% of acute sector fund for diabetes mellitus in the UK with an average of £2,101 cost per year for resident with diabetes mellitus compared to £308 per year for resident without diabetes mellitus.

With increasing HIV/AIDS epidemics, hypertension, tuberculosis, malaria and their attendant costs; increase cost of therapy for other chronic condition like diabetes can further cripple the depressed economy, hence limited resources must be use more wisely through economic evaluation of therapeutic options among others.

Policy on dietary guidelines for the populace is mandatory as obesity/ over-weight and eating habit are important risk factors.32 The prevalence of diabetes might be associated with affluent diet–a high fat consumption and the corresponding reduced complex carbohydrate intake and sedentary life style,33 hence the need to minimize it. Screening in at risk population can also be beneficial and screening of diabetic patients for up-coming complications as well.34

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