

INFLUENCE OF SOCIO-ECONOMIC FACTORS ON DIABETES CARE

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ABSTRACT

Diabetes mellitus is emerging as a major health care problem in urban India, with a rapidly increasing prevalence. Health care delivery occurs in a variety of situations and depends on a number of independent factors. Data from the West showed that early identification and risk factor reduction increases life expectancy and lowers total health care costs. In the Bangalore Urban Diabetes Study (BUDS), among patients with similar duration of diabetes, twice the number of persons who were aware of diabetes and its complications were free of complications. Benefits were shown to occur for eye disease, end stage renal disease and lower limb amputations. It is now realized that diabetes complications account for 60% of diabetes related direct health costs, and almost 80-90% of indirect costs. In order to use health-resources effectively, studies have looked at various measures: education appeared to affect prognosis in diabetes, by improved understanding and preventive measures, or as a reflection of better economic status. Similarly monitoring of glycemic control and for early diagnosis of complication is also necessary. Though self home blood glucose monitoring (SHBGM) is expensive and was done by only 1% in BUDS, it is appalling that simple clinical examination of feet, measurement of blood pressure and examination of eye was done in less than 20%. The mean direct annual cost for outpatient care for patients with diabetes was Rs. 4,724/-. The mean cost of hospitalization was Rs. 12,781/-. In summary, proper treatment of diabetes may not be costly, not treating it properly, certainly is.

KEY WORDS: Health care delivery; Risk factors; Complications; Economic factors; Direct health cost; Indirect health cost; Bangalore Urban Diabetes Study; Economic value of individual.

INTRODUCTION

Diabetes is rapidly emerging as a major health care problem in India, especially in urban areas. The prevalence of type 2 diabetes has been steadily increasing in urban areas from a low 2.1% reported in early 1970 (1) to a whopping 11.6% (2) in 1996 in

the adult population. This number will further increase to 13.2 % in 2003. Moreover, there is an equally large pool of persons with IGT, many of whom will go on to develop type 2 diabetes in the future (2, 3). There is evidence to suggest that prevalence of type 2 diabetes is increasing even in rural areas (4). The rapid increase in population, increased longevity and high ethnic susceptibility to diabetes, coupled with rapid urbanization and changes from traditional lifestyles, will most likely trigger a diabetes epidemic (5). The WHO estimates that there were 19.4 million persons with diabetes in India in 1995 and that this number is likely to be 57.2 million in 2025 (6). These figures are based on lower estimated prevalence rates than that currently seen. Moreover, type 2 diabetes amongst Indians is being increasingly seen in younger, less obese persons, than reported in the west.

Health care delivery in India is provided either by doctors in the health centers, clinics, district, municipal and tertiary teaching hospitals run by the central and state governments; or through private practicing general practitioners, specialists in their clinics, nursing homes or large corporate hospitals. The quality and cost of care varies considerably from place to place, depending on the available resources, training and interest in diabetes of the treating doctor and the patients' ability to pay for it. Generally, care provided in government institutions is free or at low subsidized cost. These institutions are crowded, ill equipped, and have scant resources. Due to the scant and limited resources the system is geared towards care of acute pressing illnesses. While most of them strive to do their best, given the limited resources and infrastructure for chronic diseases like diabetes, the quality of care may suffer. Those seeking medical care in the private sector pay for everything on their own, as there is limited or no reimbursements. Here too the infrastructure for chronic care is limited. This is a unique situation where the lack of adequate facilities and capacity to pay indirectly affects long term prognosis. In most developed and developing countries, a diabetes care program fully supported by the state or through

insurance, usually exists. Some of them have education and awareness programs. When uniformly good quality care is accessible to all (as in many countries), it is the individual's own decision to take advantage of it or not; and the disease outcome is at least not pre determined by his /her socioeconomic standing.

The prevailing poverty, ignorance, illiteracy and poor health consciousness, further adds to the problem. Patients can access any level of care (primary, secondary or tertiary) based on close location, knowledge of its existence and resources. Thus many sociological factors determine long-term outcome of illness. A study of these factors and their influence on the prognosis and outcome are necessary to tackle diabetes in the community. Previous studies have looked at perceptions and attitudes of persons with diabetes and of the diabetes care providers and their significance to proper diabetes care delivery (7-9). There is emerging evidence that diabetes education, awareness and improving motivation for self care improves care, reduces complications and may thus reduce overall economic costs of diabetes. Assal JP (10) showed that simple measures like patient education and awareness about foot problems can bring about a remarkable reduction in amputation rates. They calculated that the cost of nine below knee amputations can pay the annual salary of 13 hospital staff members responsible for the care of 400 patients; giving 820 hours of group lectures and 1100 hours of one to one teaching; 1500 foot consultations; answering 1300 telephone calls; training 75 nurses and dieticians for one week.

Using computer modeling, incorporating data from population based epidemiological studies and multi-centric clinical trials, Javitt JC et al (11), have shown that the detection and treatment of diabetic eye disease in both the US and Scandinavia is not only cost effective, but is actually cost saving. Potential savings in the USA exceed \$600 million annually, while in Sweden potential savings of SEK 36 million maybe realized.

KB Johnsen (12) has shown that in type-1 diabetes, early detection of nephropathy by screening for micro albuminuria and immediate recourse to improved control with anti-hypertensive medication, not only increases life expectancy significantly but also at the same time reduces total health care costs.

In the Bangalore Urban Diabetes Study (13, 14), patients with similar diabetes duration, twice as many persons who were aware of diabetes and its

consequences were free of complications, as compared to those not aware.

From the data based on published results and use of computer modeling, Hermann and Eastmann(15) have shown that comprehensive care will bring about substantial reduction in complications as compared to standard care. These benefits accrue for eye disease, end stage renal disease and lower extremity amputations.

Persons with diabetes use higher health care resources. The excess cost is related to higher cost of treating late diabetic complications and the economic loss is due to lost man-days or lost economic opportunity. In the absence of significant or credible social security system to fall back on during illness or bad times, the Indian social support system is centered around the nuclear and extended family, which supports medical or other such calamities either by providing for the event, loaning money, or help by working, to augment the family income. Thus an illness affecting the earning or active member of the family, affects not only this individual but may often have significant effect on others as well. It may force other normally non-working members to start work, often prematurely at lower wages, cut short children's education with long-term financial consequences for them and the family.

Diabetes related complications account for 60% of diabetes related health care costs (direct costs) and almost 80-90% of indirect costs(16). For example, in 1986, the total cost of type 2 diabetes in the US was estimated at 20 billion dollars but it had increased to over a 100 billion US dollars in the mid 1990's, for diabetes related health care problems (18). This increase of over five times in a decade is astronomical, and amounts to a little lower than one third of India's GDP. Other studies on direct costs of type 2 diabetes have been carried out in Argentina, France and Denmark. The direct cost per patient per year for type 2 diabetes in Argentina was 330 US dollars, in France the cost was 675 US dollars and Denmark the cost was 3535 US dollars (16). The BUD Study (14) estimated that the annual direct cost for routine care in Bangalore, India in 1998 to be about 191 US dollars; the mean direct cost per hospitalization for a diabetes-related episode was about 208 US dollars.

From the available information it is clear that diabetes will pose a severe burden on the already fragile and under resourced health care system in

India, in the future. The per capita expenditure on health care in India is only 6.4% of the average world spending, while India accounts for 23.5% of the world's disability adjusted life years lost due to diabetes (DALYs) (18). Due to scant resources and burgeoning costs, health care planners and providers are being forced to cut resources worldwide. To be able to plan and allocate resources adequate background data is required. This includes amongst other information, an estimates of current costs.

Recently some studies have been published on the costs and sociological factors that influence it. In the absence of adequate public health programs to effectively deal with this problem, estimates of cost, however imprecise, will help conceptualize strategies to deal with the situation at local, regional and national level. This information is also useful to the individual with diabetes.

EDUCATION AWARENESS AND SOCIO-ECONOMIC STATUS

Education appears to have a major effect on diabetes prognosis. Whether this is related to greater understanding of the illness and therefore greater commitment to self-care or is a reflection of a better socioeconomic status and therefore better access to medical care, or both, is difficult to say.

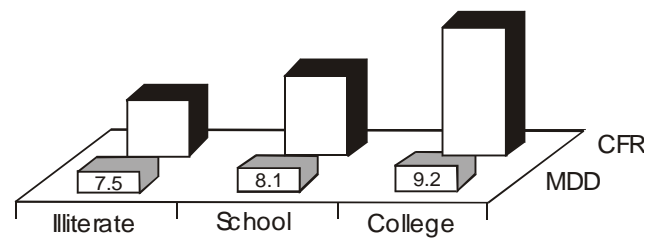
The level of education and place of residence were important determinants of how quickly diagnosis was made in both the CODI (19) and the BUD study (13, 14). In the CODI study, patients with a higher educational status were diagnosed at a younger age, 43.6 ± 10.7 years in college-educated patients compared with 45.4 ± 13.1 years in patients with school education and 50.4 ± 13.2 years in illiterate patients (19). This finding is consistent to the finding in the BUD study where an almost seven year delay in diagnosis between illiterate and college educated persons and an almost three year delay between city and semi-urban area was seen. Also despite a longer mean duration of diabetes, (perhaps reflecting earlier diagnosis) those with a college education had a much lower complication rate (13) (complication free rate 44.6% vs 19.8% for illiterates) (Fig. 1).

Shobhana et al (20) reported similar findings in their study from Chennai. Patients attending private hospitals had longer diabetes duration compared to those attending public hospitals. Patients in the private clinic had significantly higher income, higher education and higher employment level.

Figure 1: Relationship between Mean Duration of Diabetes (MDD), Complication Free Rate (CFR)

and Level of Education. (BUD Study)

Pre-diagnosis diabetes awareness may result in



earlier diagnosis. This was seen in the BUD study. Mean age at diagnosis was 48.3 years for those aware compared to 50.1 years for those not aware, 47.7 years for those with a family history compared to 50.5 years for those without. Despite similar mean duration of diabetes, those aware had much lower complication rate. However, no difference was noted between those with and without family history of diabetes.

In the CODI study 61% of patients' were aware of diabetes as a disease before diagnosis. The level of education was a determining factor for pre-diagnosis awareness: 57% of illiterate patients were unaware of their diabetes before diagnosis, compared with 42% of school-educated and 28% of college-educated patients (21). Pre-diagnosis awareness itself did not result in diagnosis of diabetes at a younger age, as the mean age at diagnosis was not significantly different between aware and non-aware patients in all income bands and educational backgrounds. This is in contrast to the finding in BUD study.

As type 2 diabetes produces few symptoms and is initially not life threatening, people often do not bother about the weakness and tiredness that is often the only manifestation of the disease. It is the actively working persons who take notice of the symptoms, as it influences their work capacity. Because of their economic situation and perhaps dependence on others, those not actively working, may not often seek medical attention till other incapacitating symptoms or complications develop. In the BUD study, there was an almost one decade's difference in the age of diagnosis between the actively working and non-working respondents. Similarly, there is a trend towards later diagnosis amongst those in the lower socioeconomic group. An over four year delay was noted between the highest and lowest socioeconomic groups. Patients with multiple complications are diagnosed on an average five years later compared to

those without complications currently. The place of stay seems to play an indirect role, those staying in the semi-urban / rural (taluka) areas had a higher complication rate, despite lower mean duration of illness, perhaps reflecting delayed diagnosis and availability of less than optimum care. Similar trend is noted with regard to employment/work. Persons currently employed or working had fewer or no complications, as compared to those not working or working as agricultural labor (13).

In the CODI study, it was noted that unless patients had a family history of diabetes, the symptoms tended to be ignored, leading to late diagnosis and possible complications. The majority of patients (46.9%) had been diagnosed in the past five years. The mean duration of diabetes was approximately eight years per patient, with little variation between different regions, although patients from urban areas had been aware of their diabetes for longer periods than patients from semi-urban areas. Patients with a higher level of education had been diagnosed with diabetes for a longer period than patients with a low level of education, and this trend was also apparent in patients with a higher MHI.

Higher family income increases the likelihood of proper care being provided to persons with diabetes; more so, if the affected family member is actively working (gainfully employed or a housewife). This greater care should translate into fewer diabetes related complications. In the BUD study those in the high family income group reported the highest complication free rate - 54.1% and lowest multiple complications (8.1% three or more complications), compared to those in the lowest socioeconomic group 22% no complication, 26% three or more complications.

MONITORING

To prevent diabetes complications, it is crucial that proper monitoring be carried out, first to assess response to treatment and secondly to detect any complications. In the given socioeconomic situation in India, the lack of proper health care infrastructure and support for chronic illnesses; the rampant ignorance and absence of clear cut, even barely minimum guidelines on protocols for care and monitoring, at the primary level means that diabetes care at this level is poor and the approach to the illness is ad-hoc. When resources are scant, and the option is to choose between monitoring and treating, it is quite understandable that monitoring is neglected and does not receive the attention it deserves. Many times of-course, it is not merely an issue of resources but knowledge about its need, which is the biggest

problem.

Table 1: Lab Tests / Clinical Examination Ever Undertaken (BUD Study)

Test	Percent
Urine examination	98.7
Blood sugar fasting	96.4
Post prandial	94.9
Glucose tolerance	66.1
Blood lipids	7.7
Kidney function	13.1
Blood pressure check	23.6
Eye exam	18.0
Check for circulation/ sensation in legs	11.9
X-ray exam	17.0
ECG	20.6
Others	3.9

This problem of monitoring is highlighted in the Bangalore Urban Diabetes Survey (13, 14). In this study only seven respondents out of 611 (1.1%) undertook home monitoring of blood glucose. Table 1 and Fig 2 provides the list and frequency of various lab and clinical tests that the respondents in this study indicated as having undergone. Lipid analysis, kidney function tests, X-ray, ECG etc. were either not done or carried out only in a few patients. Even simple clinical examination of the feet, measurement of blood pressure and examination of the eye was not done in over 80% of the cases.

Figure 2: Frequency of Blood and Urine Sugar Tests (BUD Study)

Similar findings were noted in the CODI study as

well. In this study, majority of patients (70%) were diagnosed by their general practitioner (GP) and 70% had approached their GP for some other problem. At diagnosis stage, approximately 93% of patients underwent urine tests and 90% underwent fasting

blood sugar (FBS) and post-prandial blood sugar (PPBS) tests. Other tests, including the glucose tolerance test (GTT) and an electrocardiogram (ECG), were only undertaken by less than 20% of patients. Specialized tests such as the HbA_{1c}, lipid analysis, blood circulation and kidney function assessments were undertaken by only 4-6% of patients, irrespective of zone or socioeconomic status. Blood pressure measurement and eye examinations were only carried out in a relatively low proportion of the patient population (43% and 18%, respectively). This may indicate a lack of awareness among GPs, or a feeling that, more specialized tests may not be necessary, or patients may have decided themselves not to have the tests. Cost may also have been a factor. However, lack of available facilities is unlikely to be the reason, as there was no difference between tests advised and undertaken in urban areas with better facilities, than semi-urban areas. Post-diagnosis, disease monitoring was poor. Although 48% of patients overall were aware of urine test strips, and 37% were aware of blood test strips, only half of these patients had ever used them. Only 6% of patients monitored their diabetes more than once a month. The rest monitored their diabetes once every two months or more (48%), or once every three months or more (47%). Patients with a school and college education, generally monitored their diabetes more frequently than illiterate patients (11 vs. 9 times/year, respectively), as did patients from middle- and high-income backgrounds compared with patients from low-income backgrounds (12 vs. 11 times/year, respectively). Patients with a higher level of education and greater monthly income tended to keep better records of tests carried out and prescriptions used; more than 37% of college-educated patients maintained proper records compared with 31% of school-educated patients and 23% of illiterate patients. In most cases however (approximately 60-70%), record keeping was sub-optimal (19).

The result of DiabCare-Asia India study (22) done in 26 tertiary care centres indicates similar data. Self-monitoring is poor. Approximately half the patients had poor control (HbA_{1c} > 2% points above upper limit of normal and FBG > 139mg/dl). Mean HbA_{1c} (central laboratory) was 8.9 ± 2.1% and FBG 150 ± 59 mg/dl. Over 54% patients had severe late complications, apart from a high frequency of associated hyperlipidemia, hypertension and renal function abnormalities. Mean HbA_{1c} level and frequency of complications was higher^{1f} in patients with longer diabetes duration. The rate and frequency

of self or lab based blood glucose monitoring in India was one of the lowest amongst the countries participating in the DiabCare Asia study and HbA_{1c} was amongst the highest (22).

PHYSICIAN RELATED ISSUES

Being a chronic disease, diabetes requires support service infrastructure and team approach to care. Whereas, generally the level of clinical care in most big cities in India is good, lack of support system, non availability of trained paramedical personnel, no health care insurance for chronic diseases such as diabetes, continue to be problematic. There are few diabetologists. Private practicing general practitioners and internists provide primary care even in urban areas. The quality of care varies considerably from place to place and practice to practice, depending upon the physician's interest, expertise and available infrastructure. Given the massive load of acute illnesses such as infections, fever, infestations etc., private medical practitioners tend to concentrate less on chronic diseases like diabetes, which are unrewarding as the time, effort and commitment needed is greater, both for the provider and patient. There are practically no nurse educators, no podiatrists and few dieticians, which means that the treating doctor must take the entire burden of responsibility of caring for these patients. The patient's inability/unwillingness to pay for these additional support services also hinders their development. Lack of medical reimbursement and poor state funding for health is a barrier to quality care, often because the patient is unable to afford certain tests or therapy.

Most of the patients (over 70%), initially visit a non-specialist for diagnosis. It is this segment of doctors who are the most important link in early diagnosis and guiding the patient properly, but are often ill-trained to handle diabetes related issues, unaware of the latest trends, or unable to devote time to diabetes due to their busy practice.

An important but generally un-researched dimension is health care provider behavior. Physicians are trained to provide acute care, where effort and success is easily measurable and is linked to a sense of achievement and power. Need for patient involvement and participation in therapeutic decision making is limited.

In chronic diseases this "mind set" doesn't work. There are no heroic efforts, no dramatic results (no cure), moreover, the patient may be asymptomatic, unaware or unwilling to comprehend consequences

of long term poorly managed disease. The physicians' position of power and minimal need of patient involvement prevailing under acute conditions does not work and requires different physician behavior - that of a counselor, a friend or family elder. This role transition is difficult in the setting of overburdened services and limited time. In good faith, physicians make decisions for the patients. Many have misplaced concerns about their patients' fears, apprehensions and capability for self-care. These impressions are colored by the "acute care" mind set and physicians' own feelings and are at best subjective and empirical. The inability / unwillingness to discuss treatment options and the patients inability (due to inadequate information) to initiate such discussions deprives him/her the opportunity to actively participate in management.

Are the doctors' perceptions of patient worries in line with the worries and problems patients actually face? There appears to be a gap in perceptions in the actual problems and worries that patients have and physicians' perception which makes one wonder - do physicians underestimate their patients' ability to learn and cope with insulin therapy when faced with it? Or is it that there are other barriers to effective and methodical approach to diabetes management?

In a still largely traditional society, the physician's attitudes do influence the patients and this is an important consideration. A recent study (23) mentions how clinical interactions between the doctor and patient can unwittingly create barriers to insulin. The authors of this study mention that patients often spoke of health care providers using insulin as a threat to promote behavioral changes, or as a punishment for failure to comply or as a bargaining tool in promising its withdrawal as a reward for behavioral change. While this works in the short term, to get desired results, in the long run it creates the impression that insulin is something that must be avoided and thus only serves to increase reluctance, and increase barriers to it. The health care providers ability to motivate a patient to change his/her attitude and behavior to an illness or accept a certain line of treatment can influence long- term prognosis (24).

ESTIMATION OF ECONOMIC BURDEN

Direct Costs

Cost of illness can be classified into direct, indirect and intangible costs as shown in table 2.

Table 2: Components of Cost of Illness

Direct Costs	Indirect Costs	Intangible Costs
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Consultation Monitoring, Costs of treating, Tax rebates.	Investigations Complications Pain, Anxiety, Depression, Loss of enjoyment.	Treatment- Visits Man days lost, payment, Social security,	Drugs, Hospitalization Disability
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Cost of Ambulatory Care

The cost of ambulatory care includes costs of routine visits to the clinic, laboratory costs and costs of medicines. The annual average expenditure on visit to the clinic, hospital or doctor is estimated by multiplying the average monthly expenditure by twelve and includes the fees and other expenses related to the visit. Similarly, mean expenses on recent tests are multiplied by the stated frequency of the tests to get estimates of average annual costs on monitoring and lab investigations, these costs must include travel and other miscellaneous expenses. The estimates for monthly expenditure on treatment is arrived by asking the patient what costs he incurs on medicines, disposables and fees paid to doctor or nurse for insulin injection, when not self injecting. The information collected must be cross checked with current known costs of medicines in use and the average dose.

The duration and number of complications often are a major determinant of direct ambulatory costs as well as hospitalization costs, as patients with more number or more severe complications require more laboratory investigations, more hospitalization and multiple therapies. This is clearly seen in the CODI study. The mean direct annual cost for outpatient care for all patients with diabetes was Indian rupees (INR) 4724/-. Those without complications had an 18% lower cost while those with three or more complications had a 48% higher cost.

Costs of Hospitalization

In the CODI study, almost 44% patients gave history of hospitalization for diabetes-related complications. The annualized estimate of costs on hospitalization is based on average hospital cost per event, multiplied by the number of hospitalizations due to diabetes related events since diagnosis and dividing it by the known diabetes duration. The mean cost of hospitalization in the CODI study was INR 12781/-. When annualized, it was INR 2434/-. Cardiac events were the commonest as well as the costliest cause of hospitalization, followed by a non-healing wound. As with costs for routine care, hospitalization cost increases with number of complications.

Indirect Costs

Data on indirect costs include man-days lost due to diabetes and the loss of personal as well as family income. All these put together constitute total indirect costs due to diabetes. Number of man-days lost is estimated for earning respondents and the monetary value of man-days lost is calculated by multiplying number of man-days lost with reported personal daily income (monthly income divided by 30). For non-earning respondents monetary value of lost man-days is calculated using the EVI model. EVI or the Economic Value of an Individual is calculated based on the replacement costs. Loss in personal and family income is calculated by reported percentage loss in income with the monthly income multiplied by 12. The intangible cost is difficult to compute in a society with a wide socioeconomic and cultural spread. In the CODI study, for non-earning respondents the total indirect cost was estimated to be INR 9748/- while for earning respondents it was INR 16831/-.

The cost of illness is dependent on many variables. When carrying out studies to estimate the cost of diabetes it is important to keep these in mind, particularly when comparing results from different studies. These include the type of services used; quality and nature of treatment; type of the disease; the number and severity of complications as well as the demographic characteristics of the study population. In a heterogeneous society like India, with great disparity in earning, access to medical care, as well as differing quality of care, it is very crucial that all factors are taken into account to get the correct picture. The lack of medical records makes it even more difficult to carry out such studies. As inflation influences the cost, a factor for correction of inflation must be done when comparing two studies carried out at two different time periods.

Three studies on costs of diabetes have been done recently. The Cost of Diabetes in India (CODI) is the most extensive and comprehensive amongst them. When comparing the results of the BUD study (14), the Chennai Study (20) and the CODI study (19), the data on costs corroborate quite well. The author has been closely associated with two of these - BUDS and CODI. The major differences are that in the CODI study patients are of a slightly younger age at diagnosis (45.3 ± 12.6 y versus 49.2 ± 10.9 y) than in the BUD study. The patients in the CODI study have a higher socioeconomic status as compared to BUDS. Although there were similar complications,

the rate of multiple complications (three or more) is higher in BUDS- 20% vs 17% in the CODI study; and finally there were more patients on insulin in BUDS (36.0% vs 22.2%). The estimates of costs are similar and the differences noted can be easily explained by differences in the study population. When South Zone data from the CODI study is used for comparison, the overall direct cost is similar in South Zone in the CODI study and the BUD Study. Direct cost of routine care - South Zone CODI study INR 4832/-; BUD study INR 5959/-. The slightly higher direct cost seen in the BUD study is most likely due to more patients receiving insulin. Cost per hospitalization- CODI study INR 10688/-; BUD Study INR 9944/-.

Two different, independent set of researchers in comparable populations, CODI (South zone) and Bangalore urban district have been able to obtain very similar figures for direct costs within a span of two years. These figures match a hospital based study in Chennai and provides reasonable assurance to state that the data obtained at the national level in the CODI study is indicative of the Cost of Diabetes in India.

SUMMARY

Many socio-economic factors impact the outcome of diabetes and consequently the costs. The most important is how early the diagnosis is made. General education level seems very important. Studies show that diagnosis can be delayed by 3-7 years in the less and uneducated sections of the population. Actively working people are diagnosed almost a decade earlier, either because of better affordability of care or the need to remain fit to earn a livelihood for the family. Lower income groups are diagnosed on an average four years later and so are people living in remote areas. Persons aware of diabetes or those with a diabetic family member maybe diagnosed slightly earlier. Factors that influence delay in diagnosis also determine complication rates; thus patients in rural and semi urban areas are likely to have more complications. Here again education plays a role. For similar diabetes duration, 45% of college pass have no complication vs 20 % illiterate group. Persons employed and working have fewer complications. For similar diabetes duration, larger proportions of persons from higher socioeconomic strata are free or have fewer complications (54% no complication, 8% three complications), compared to the lower socioeconomic group (22% no

complication, 26% three complications). Those aware of diabetes are less likely to have complications, however awareness alone cannot overcome the hurdles placed by socioeconomic factors, but within the same socioeconomic segments those aware do better than those not aware. Presence and severity of complications are the most important determinant of treatment and monitoring regimen and need for hospitalization and therefore is the most important factor related to costs.

Diabetes is often diagnosed late - perhaps too late, 50% of patients even in developed countries have complications at presentation (UKPDS). Untreated or improperly managed diabetes leads to complications. Complications requiring multiple therapies and prolonged hospitalization are responsible for most of diabetes related direct costs. Amongst patients hospitalized, the average annual direct costs are more than double those not hospitalized. Complications are also responsible for indirect costs in terms of productivity loss and absenteeism.

Our studies show that the uneducated, unemployed people, especially those living in semi urban or rural areas who cannot afford or do not have access to even bare minimum health care facilities, are likely to be diagnosed late, are likely to develop or have at presentation, diabetes related complications (because of delay in diagnosis and/or improper treatment). This has remarkable socioeconomic significance - those who will need more advanced / more expensive care for diabetes related complications, are often the ones who can ill afford such care. While some of these unfortunate people may still be able to afford routine care, when burdened with complications requiring advanced expensive care / it would be like the proverbial last straw that broke the camels backs, and would drive many of them to borrow and enter the debt trap with disastrous consequences to the individual and society.

Proper control can prevent, retard or arrest development of complications both in type 1 and type 2 diabetes as shown by the DCCT, UKPDS, Kumamoto, and numerous other studies. Without effective intervention, the diabetes epidemic will continue to grow. Effective intervention means prevention and prevention means primary prevention - life style changes, and secondary prevention - reducing the burden of complications by early diagnosis and proper care. Each of us involved in diabetes care needs to be aware of what drives cost. Proper treatment of diabetes is not costly; not treating it properly is very costly.

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