

South Asian women with diabetes: Psychosocial challenges and management: Consensus statement

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ABSTRACT

Diabetes is the ninth leading cause of death in women globally. In South Asians mortality in women with diabetes stands second highest. There is a marked gender discrimination which is faced by women across South Asia esp in access to services and support for diabetes, resulting in high rates of morbidity and mortality in women with diabetes. The most important risk factor identified for the diabetes epidemic is obesity along with genetic susceptibility. Lack of health care, social and cultural disparity, discrimination at work, disparity in marriage, restricted medical facilities are prevalent. Diabetes and depression are common in women. Increasing age, low level of education, low socioeconomic conditions, difficulties posed in finding partners, frequent divorce and family history of psychiatric illness are significant risk factors for diabetes and depression. Such patients usually have poor metabolic control, higher complication rates, increased healthcare costs, lost productivity, lower quality of life as well as increased risk of death. Preconception counseling should be incorporated in the routine diabetes clinic visit for all women of childbearing potential. Women with diabetes should have information and access to contraception. Proper family planning counseling and psychological support can help stop practices such as female foeticide and multiple pregnancies. Psychological support to patients and their families are needed to break the barrier. There is emerging evidence that women with diabetes are more prone to untoward outcomes as compared to men. Central obesity, metabolic syndrome and the polycystic ovary syndrome show ethnic specific differences in South Asian women. Optimal sexuality is an integral part of holistic health. Shortage of trained female health care professionals, lack of privacy in over-crowded health care facilities, a social taboo attached to such matters, and lack of confidence in patients contribute to the neglect of sexual issues in women attending diabetes clinics across South Asia. Guidelines for counselling in female sexual dysfunction, written in culturally appropriate manner for South Asia, are needed. Diabetes affects women more severely because of their unique biological, cultural and socioeconomic circumstances. Women have limited access to health care facilities because of illiteracy, ignorance and negative social customs. Transcending the gender hierarchy and inequality is a formidable challenge. Sensitising men, empowering women on self care and providing peer support maybe the answer to this challenge. It is essential for health care providers to use appropriate coping mechanism such as building psychological contact with the patient, including family and friends as part of social support and empower patient with complete process of managing diabetes. Increasing awareness through the media, seminars, posters, group discussions and education, regular monitoring and consulting the doctor, support group for women and facilities for aerobic exercises are recommended. The health care systems should consider custom-designed prevention and control programs tailored for women based on local and regional attitudes on health care, cultural beliefs, and available social support systems. Policies that empower adolescent girls and young women to take control of their metabolic management must be encouraged. Provision of gender specific diabetes education with a holistic life-cycle approach is recommended.

Key words: South Asian region, Women with diabetes, gender disparity, health care access, social & cultural factors, Women empowerment

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INTRODUCTION: STATUS OF DIABETES AND WOMEN IN SOUTH ASIA

Over 371 million people worldwide have diabetes and approximately half of these are women, as a result of increasing lifespan, the number of women at high risk of diabetes is rising. Gender differences and inequalities have

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been identified in relation to causes and consequences of diabetes and access to services, support between women and men among different groups of women. The health toll diabetes takes on women is significant, particularly in terms of diabetes-related complications such as heart disease. This results in high rates of mortality and morbidity of women with diabetes.^[1] WHO reports that 55% of diabetes deaths occur in women.^[2] A substantial 80% increase will be seen in middle to low income countries and the highest rise will be seen in Indian sub-continent.^[3]

South Asians are those whose ethnic origin is the Indian subcontinent, which comprises India, Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Maldives and Afghanistan. The combined population of these eight countries is about 1.5 billion, representing more than 20% of the global population.^[4] Diabetes is a particular problem in the South Asian community, as people from this ethnic origin are 4 times more likely to develop the condition than other groups.^[5] South Asian people with type 2 diabetes also have a greater risk of developing cardiovascular disease and renal problems and a higher diabetes-related mortality rate is seen among this group than in the general population.^[6] Asian women are also at greater risk of gestational diabetes, thereby putting their children at risk for type 2 diabetes later in life.^[7] Although, data on prevalence of diabetes are limited in many parts of the world, there is evidence that diabetes is a problem for women in both high- and low-income countries. There is a dearth of sex-disaggregated statistics on the consequences of diabetes. In some parts, of the world women and girls may be discriminated against if their diabetic status is known. They may have difficulties in marrying or if already married, may be deserted or divorced, leaving them in difficult economic circumstances and undermining their potential to receive adequate treatment and care.^[8] Currently, South-East Asia accounts for 71.4 million diabetics. This number is expected to increase to 120.9 million by 2030.^[1] The nationwide prevalence of diabetes in India now tops 9%. However, in urban areas of south India, the prevalence of diabetes has reached nearly 20%.^[9] Currently, India has the second largest number of individuals, 61.3 million, with type 2 diabetes globally, with projections of the figure reaching approximately 101.2 million in 2030.^[1] Age standardised prevalence of diabetes and impaired glucose tolerance have shown no gender difference.^[10] In Pakistan, prevalence of diabetes is high ranging from 7.6 to 11%. Variations according to age, sex, location and urbanization have been noted. Rates of gestational diabetes in Pakistan range from 3.2% to 3.5%, comparable to Western populations but the rates of complications both to mother and foetus have been found to be higher possibly due to poor glycaemic

control.^[11] In a cross-sectional survey it was found that newly diagnosed diabetes was seen in 6.8% of women as compared to 5.1% in men in the urban areas. Prevalence of impaired glucose tolerance (IGT) was markedly higher in women, 14.2% versus 6.3% in men in urban areas and 10.9% versus 6.9% in men in rural areas.^[12] Statistics for people with diabetes registered at the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM) in 2000 indicated that 32% of those registered were women. In rural areas 50% of women with diabetes were illiterate and only 34% had completed primary schooling resulting in both poor awareness and comprehension about diabetes. It was also noted that within a few years of the onset of diabetes, 95% of young women from the lower socioeconomic groups in Bangladesh had either been divorced or deserted by their husbands, sometimes left with one or more children. This phenomenon was also observed in many middle-income and a few high-income households.^[13]

Prevalence of diabetes was 7.9% in women while IGT was noted in 15.4% women in a semi-urban population of Nepal. Among women, the prevalence of diabetes and IGT was 2.9% and 12.8% in 21 to 40 years age group, 9.7% and 13.8% in 41 to 60 years age group and 15.4% and 27.7% in >60 years age group.^[14] A cross-sectional study showed, the prevalence of diabetes in Sri Lankan women to be higher (10.9%) as compared to men (9.8%).^[15] Every woman with diabetes has the right to basic diabetes treatment. Efforts need to be made to identify the differences and inequalities between women and men in risks, causes, consequences, treatment and coping strategies in relation to diabetes. In developing policies and programs, it must be ensured that there are no inequalities in access to information, prevention activities, services and all treatment options for diabetes and related complications. The United Nations resolution on diabetes calls for national plans of action providing an important opportunity for enhancing work on women and diabetes. Good practice examples of efforts to give attention to women and gender equality aspects in data collection, research, policy and program development, and budgetal locations should be documented and disseminated.^[16]

RISK FACTORS FOR DIABETES IN WOMEN

The rising incidence of Type 2 diabetes globally, particularly in Asia, is a big challenge for the coming century. This increase is most pronounced among South Asians with India having the second highest number of known diabetics worldwide.^[1] In UK, people of South Asian origin are 4 times more likely to develop type 2 diabetes than their

European counterparts. Also, type 2 diabetes presents a decade earlier in South Asian's than in Chinese, Japanese and UK population. The most important risk factor identified for the diabetes epidemic is obesity, both overall and abdominal, a fore runner of insulin resistance, the core defect of type 2 diabetes. In Asia, obesity is no more a disease of the rich. In fact, obesity is now observed in higher ratios in the lower socio-economic strata.^[17] The reason is behaviour or lifestyle changes, seen as reduced physical activity and high calorie diet. An important predisposing factor is a genetic susceptibility to insulin resistance.^[18] The FTO (fat mass- and obesity-associated) gene for susceptibility to adiposity is associated to type 2 diabetes.^[19]

Gestational Diabetes Mellitus (GDM) is encountered in a higher frequency in South Asian women. Although GDM reverts to normal after childbirth, but the mother has a high risk of developing diabetes in later life.^[20]

In South Asia, low literacy, traditions such as consanguineous marriages and urbanization multiply the risk for diabetes. Cultural barriers prevent the adoption of a healthy life style.

Risk factors

The risk factors for the high prevalence of diabetes amongst South Asians include a genetic susceptibility to insulin resistance. The thrifty genotype (ability to store adipose tissue is a metabolic adaptation that provides a survival advantages in circumstance of frequent famine) and the thrifty phenotype (intrauterine growth retardation and catch up growth in early infancy give rise to metabolic programming resulting in high risk of diabetes in adulthood) hypothesis has been proposed.^[21] In this present era of freely accessible caloric dense food along with sedentary life style leads to obesity and increase in type 2 diabetes. Studies performed on Women with Diabetes in various countries of South Asia have concluded that adiposity plays a lead role in causing diabetes. FTO gene for susceptibility to adiposity was identified. A study of FTO in South Asian's conducted in Northern India showed a very weak association between FTO and BMI.^[22] It was observed that the FTO association with Type 2 diabetes remained after adjusting for BMI.^[23] For a given BMI South Asians have a higher intra abdominal fat, which is metabolically active and deleterious, as compared to Caucasians. This has to led to lower cutoffs of BMI and waist circumference for South Asians by WHO and IDF. Having more visceral fat is associated with a higher degree of insulin resistance even in the absence of obesity. High level of Leptin, high-sensitive C-reactive protein, fatty acids and low levels of Adiponectin are associated with insulin resistance and studies have found these in South

Asian patients as well.^[24] In a study, Oslo (Norway) on female Pakistani immigrants aged 25-65 years, 90% had high scores using both the Findrisc and Indian Risk score system for type 2 diabetes. A BMI greater than 23 kg/m² was seen in 98% of this population, Impaired Glucose Tolerance (IGT) in 32%, Metabolic Syndrome in 41% and 13% had type 2 diabetes.^[25] In another Norwegian study, Chawla *et al.*,^[26] found that 0.013% of Caucasian pregnancies were affected with Gestational Diabetes while the corresponding number among South Asian women was 5-10 times higher. Gestational Diabetes is a well-known risk factor for established type 2 diabetes.

In a study, from Pakistan, Iqbal *et al.*,^[27] aiming to identify life style predictors of GDM in South Asian women, found that increased maternal age and increased body fat is associated with high risk of GDM and physical activity was inversely related to developing GDM. Yates *et al.*, in his study in UK found that South Asian men and women were significantly less physically active than their western counterparts and that within both ethnicities men were more active than women. There was significant association between level of physical activity and waist circumference in women and HDL cholesterol in men.^[28] Rates of urbanization in Pakistan and India are more than 30% and slightly less in Bangladesh and Sri Lanka. Urbanization is the main determinant besides aging for the rise of global prevalence of diabetes. Physical activity decreases and BMI and upper body adiposity increases substantially due to a diverse diet and more macronutrients and animal food.^[29] Migration to more affluent countries results in high prevalence of diabetes in many populations, particularly seen in Asian Indian migrants.^[30]

Problem statement

1. Rising obesity in women – contributing factors
Low literacy: Only 57% of girls and women can read and write in Pakistan.^[31]
Similar; literacy rates exist in other South Asian countries with the literacy rate in adult females over 15 years being 50.1%.^[32] Being illiterate makes a woman the slave of the family, she does not have the confidence to take decisions, especially regarding health problems and treatment. Alternative therapies, wrong beliefs and poor advice cause confusion and she can be misled to seek wrong help, lack of knowledge on selecting a healthy diet and exercise adds to the development of obesity
2. Lack of health care - contributing factors
Gender inequality: The belief that girls are born to serve and boys to earn and rule, prevails in most South Asian countries. Gender discrimination begins from early childhood. In a limited income family, the boy

is given better food and provided education. The girl child gets poor nourishment and is made to do the household chores from a very young age. A woman in the family is placed at a low social status. She has no power to take decisions. This reflects on all aspects starting from the kitchen to raising children and health care. She is dependent on the male members of the family, For example: A woman cannot receive needed health care because norms in her community prevent her from travelling alone to a clinic

3. Social and Cultural Disparity

Discrimination at work: A woman with diabetes may be denied an employment and may not be able to acquire a job of her choice unless she is outstanding. It is also a fact that females have lower cash incomes than men.

Disparity in marriage: A girl with diabetes can have difficulties in finding a good match for marriage. Lack of sufficient knowledge on diabetes can turn away a proposal. Considered factors are future family life, pregnancy, ability to perform household chores and the cost of treatment pave a way for contemplation. In arranged marriages they can go back never to return. Male domination makes it easy for a diabetic male to find a wife. At times the disorder is not even disclosed

4. Role of the health care provider

Caring for a diabetic patient is a totally different scenario for a physician. It is a team work involving dieticians, educators, diabetes nurse and the doctor. Not all team members are available in every institution thus, putting the burden on the doctor. Insufficient doctors cuts down the time for each patient. This care is thus compromised. South Asia is facing an explosion in the figures of type 2 Diabetes. The reason identified is the rising incidence of obesity attributed to a changed life style. Dense calorie diet and reduced physical activity are the main supporting factors. Women in South Asia are more handicapped due to cultural rights and low literacy. They lack the independence to take decisions regarding health and treatment. Low literacy aids in accepting myths and wrong beliefs which promotes the development of risk factors for diabetes and its complications. Marriage for a young girl with diabetes can prove to be a trial as finding a good match is difficult. Men do not prefer marrying a girl with diabetes due to wrong beliefs regarding physical and reproductive health. Cost of the lifelong treatment is also a discouragement. Gestational Diabetes is on the rise in South Asia. Obesity, multiple pregnancies and inadequate ante-natal care are the main etiological factors.

Restricted medical facilities with overworked medical

professionals are unable to give the required time to diabetes patient's which leads to suboptimal treatment. Insufficient members of the diabetes team deprive the diabetic patient from the required education.

Recommendations

- Increasing awareness through the media, seminars, pamphlets, posters and small group discussions
- Teaching the families of women with diabetes on a one-to-one basis by health workers
- Pregnancy, Family Planning and number of children for a woman with diabetes should be the priority of the women
- Young girls with diabetes should be educated on how to live well with this disorder especially after marriage
- Regular monitoring and consulting the doctor should be stressed upon all family members of the women with diabetes
- A support group for women of different ages provides them confidence
- Facilities for aerobic exercise and games for women are an essential requirement.

PREVALENCE OF COMORBID DEPRESSION AND PSYCHOSOCIAL IMPACT OF DIABETES MELLITUS IN BANGLADESHI POPULATION

Diabetes and depression are both commonly occurring conditions. Worldwide estimates of depression prevalence among people with diabetes appear to vary by diabetes type and among developed and developing nations. Studies have shown that people with diabetes are more likely to have depression than individuals who do not have diabetes. Risk is higher for women with diabetes than for men (10% of men and 20% of women will experience depression in their lifetime).^[33] However the mechanisms linking these conditions are not entirely clear. A review of studies found that depression was associated with a 60% increase of type 2 diabetes while type 2 diabetes was only associated with a moderate (15%) increase in risk of depression.^[34] Andersen *et al.*,^[35] in 2001 concluded that the presence of diabetes doubles the odds of having co-morbid depression In a large meta-analysis incorporating 42 studies. A population-based study from rural Bangladesh showed that 29% of male and 30.5% of female subjects with diabetes and 6.0% of male and 14.6% of female subjects without diabetes had depressive symptoms.^[36] Other hospital-based study in capital Dhaka, Bangladesh found that 27.2% of subjects with diabetes had depression. Increasing age, female sex, low level of education, low socioeconomic condition, unmarried, divorce and family history of psychiatric illness were found significant indicators for diabetes and depression in both rural and urban population.

Along with the conventional risk indicator a recent rural study found significant association of depression with diabetes (odds ratio, 3.52; $P < 0.001$) and impaired glucose regulation (odds ratio, 2.44; $P < 0.001$).^[37] People with diabetes who have depression often find it more difficult to follow diabetes treatment recommendations and have poor metabolic control, higher complication rates, increased healthcare use and costs increased disability and lost productivity, lower quality of life as well as increased risk of death.^[35,38] However, evidence suggests that treatment of depression in people with diabetes is both efficacious and cost effective and can result in improved overall diabetes outcomes. The challenges of treating people with diabetes and depression are influenced by both the individual and the healthcare system. Factors such as stigma and poor provider knowledge have limited the chances of people with diabetes and depression receiving optimal quality care. One recent estimate suggests that more than three-quarters of cases may go undetected. At diagnosis and sometimes for the rest of their lives, people with diabetes can feel isolated and perplexed. This often means that comprehensive diabetes education must be delayed while counselling needs are being met. Provision of contact with other people with diabetes may be helpful. Children with diabetes have their own specific needs, including the need for psychological guidance. In conclusion, our study data emphasize that depressive symptom in our culture is common, especially in women. Depression is particularly common in those with diabetes. Psychotherapy may be necessary in addition to lifestyle changes to prevent the exponential increase in the occurrence of diabetes. In addition, a common approach including psychiatric treatment in diabetes care may be necessary to achieve improved glycaemic control as well as to improve quality of life in this population.

Reproductive years in women with diabetes

Compared with Western population, Asians develop diabetes at younger ages, at lower degrees of obesity, and at much higher rates given the same amount of weight gain.^[39] Moreover, in South Asia, there is an increasing epidemic of diabetes.^[40] As we develop diabetes at younger age group, it is reasonable, that we will be seeing more and more women in childbearing years with diabetes, including those women who go on to have diabetes during pregnancy (gestational diabetes). The challenges faced by South Asian women with diabetes are unique and difficult. In addition to the medical complications of diabetes, with and without pregnancy they have to face problems from the society and families. The goal of universal access to reproductive health was added to Millennium Development Goal,^[41] but due to lack of knowledge, lack of resources, health and gender inequity, in South Asia mostly disadvantaged women and

adolescents -- still lack access to Sexual and reproductive Health (SRH) information and services. Adolescent girls are at a greater risk of reproductive ill health. Almost 15 million adolescent girls become mothers every year. Among women who become mothers under age 20, infant mortality rates are almost double the ratio among older women. In South Asia, adolescent and child marriage continues to be a strong social norm, particularly for girls. The legal age of marriage for women in Bangladesh was increased to 18 years, but a third of women are either pregnant or mothers by age 20.^[42] Women in South Asia lack preconception care, let alone one prenatal and postnatal care. Pregnant women attended by trained personnel during pregnancy are 44% in Nepal, 27% in Bangladesh, 51% in India 100% in Maldives and 97% in Sri Lanka.^[43] In this background, we have put diabetes care.

Preconception care of women with diabetes

All the women with diabetes, regardless of their socioeconomic status have a right to preconception care. Off-springs of mothers with pre-gestational diabetes are at risk of congenital malformation. A meta-analysis of 16 studies comparing preconception care *vs.* non-preconception care showed decrease in the rate of congenital abnormalities [2.1% *vs.* 6.5% RR 0.36, CI 0.22 to 0.59].^[44] The American Diabetes Association recommends that A1C levels should be as close to normal as possible (7%) in an individual patient before conception is attempted.^[45] Starting at puberty, preconception counselling should be incorporated in the routine diabetes clinic visit for all women of childbearing potential. Women with diabetes who are contemplating pregnancy should be evaluated and if indicated, treated for diabetic retinopathy, nephropathy, neuropathy and CVD. Medications used by such women, should be evaluated prior to conception, since drugs commonly used to treat diabetes and its complications may be contraindicated or not recommended in pregnancy, including statins, Angiotensin Converting Enzyme (ACE) inhibitors, Angiotensin Receptor Blockers (ARBs) and most noninsulin therapies. Since, many pregnancies are unplanned, consider the potential risks and benefits of medications that are contraindicated in pregnancy in all women of childbearing potential and counsel women using such medications accordingly. To maximize interventions associated with improved pregnancy outcome, smoking cessation and folic acid use should be promoted.

Psycho-social and cultural issues

Women with diabetes have to face stigmas. There may be problem of marriage due to diabetes. We need to give psychological support to our patients and families to break the barrier and reassure that a woman with diabetes also has sexual and reproductive right and with proper

preconception counselling and care she can get pregnant and lead a normal life. Sometimes, question may arise as to whether or not to disclose the fact about underlying diabetes to potential future groom. Sincerity and honest discussion should be encouraged to avoid future problems. To overcome this barrier, we need massive advocacy and campaign at individual and societal level. Women with diabetes should also have information and access to contraception. As there is increased fetal, neonatal and maternal complications associated with uncontrolled diabetes, family planning should be advised. Many a times, a woman with diabetes may be pressurized to keep on getting pregnant in an effort to get a male child despite the difficulties of management of diabetes during pregnancy. Counselling and psychological support should be given to discourage such attempts. Sometimes, they may be coerced into sex identification and abortion of female fetus. Proper family planning counseling and psychological support can help stop such practices.

Gestational diabetes

The definition of gestational diabetes mellitus is carbohydrate intolerance resulting in hyperglycemia of variable severity with onset or first recognition during pregnancy.^[46] The prevalence of GDM in India varied from 3.8 to 21% in different parts of the country.^[47]

Gestational diabetes is associated with an increased risk of adverse perinatal outcomes. The Hyperglycemia and Adverse Pregnancy Outcomes [HAPO] study, 25505 women underwent a 75 g oral glucose test between 24 and 32 weeks gestation. This study, showed association between maternal glucose levels and adverse outcomes such as macrosomia, neonatal hypoglycemia and cesarean delivery at levels below what we currently use as abnormal.^[48] American Diabetes Association advises screening for GDM is screened at 24-28 weeks gestation, using a 75-g 2-h OGTT and the diagnostic criteria as are more than 92 fasting, more than 180 in an hour postprandial and more than 153 in 2 h postprandial.^[45] But in our South Asian context, the International Diabetes Federation (IDF) guideline of using 2 h pp sugar of 140 mg/dl, after 75 gm glucose regardless of last meal will be more practical, as the patient may not even come the next day for follow up. There is a preponderance of evidence that any type of treatment of GDM *vs.* no treatment is beneficial for both the mother and fetus. In Australian Carbohydrate Intolerance Study in Pregnant Women, a RCT of 1000 women, the babies of women with intensive control, as compared with the babies of women in the routine-care group, had a significantly reduced risk of perinatal death, shoulder dystocia, bone fracture, and nerve palsy.^[49]

Management of gestational diabetes mellitus

A team approach is ideal for managing women with GDM. The team would usually comprise an obstetrician, diabetologist, a diabetes educator, midwife and a pediatrician. Due to limited resources, this may not always be possible. There are many effective treatments for gestational diabetes, Oral medications appear to be well tolerated and effective for treatment of gestational diabetes and may offer a greater patient compliance. A randomized trial of GDM with insulin treatment *vs.* glyburide showed that the treatments were equivalent in terms of maternal glycemic control, rates of macrosomia and neonatal hypoglycemia.^[50] In the MiG Trial, study comparing metformin to insulin for the treatment of GDM showed no difference in birth weights or anthropometric measurements, in the rate of admission to or length of stay in the neonatal intensive care unit.^[51] Regular Human Insulin, long acting Neutral Protamine Hagedorn (NPH) and detemir insulin have been proven to be safe in pregnancy. Regular and NPH in appropriate combination can be given twice daily to keep the sugars in desired range. Due to convenience, ease of use, premix insulin with regular insulin and NPH combination or rapid acting analogs and NPH combination may be used. Rapid acting insulin analogues, (Aspart and Lispro) have been found to be safe and effective in achieving the targeted post prandial glucose value during pregnancy. The goal is to get blood sugars in desired range without getting hypoglycemia.

Medical nutrition therapy

All women with GDM should receive nutritional counselling. The meal pattern should provide adequate calories and nutrients to meet the needs of pregnancy. The expected weight gain during pregnancy is 300 to 400 gm/week and total weight gain is 10 to 12 kg by term. Excess weight gain should be avoided but should aim to provide sufficient calories to sustain adequate nutrition for the mother and fetus and to avoid post prandial hyperglycemia. Calorie requirement depends on age, activity, pre pregnancy weight and stage of pregnancy. Approximately 30 to 40 Kcal/kg ideal body weight or an increment of 300 kcal/day above the basal requirement is needed. Pregnancy is not the ideal time for obesity correction. Underweight subjects or those not gaining weight as expected, particularly in the third trimester, require admission to ensure adequate nutrition to prevent low birth weight infants.

Recommendations

- The negative impact of gestational diabetes on maternal and fetal and neonatal health has been recognized
- Screening for gestational diabetes, for feasibility and ease, is recommended using IDF guidelines for diagnosis of gestational diabetes *vs.* check 2 hr post-prandial blood sugar after 75 gm glucose intake,

without regarding the time of last meal, use diagnostic cut off as more than 140 mg/dl

- Self- monitoring of glucose where feasible to keep fasting sugar range between 80-95 mg/dl and PP range between 100-120 mg/dl
- Monitoring fasting and PP sugar in a lab at least 2 times a week and where not feasible to self monitor glucose with glucometer
- Medical nutrition therapy and exercise (if not contraindicated by obstetrician) in all patients of gestational diabetes
- Metformin is recommended to obese, overweight patients not too far away from glycemic goal
- Glycemic control should be done with insulin without or with metformin (with metformin if associated with obesity) to keep glucose in target range to reduce fetal, neonatal and obstetric complications of gestational diabetes
- Regular antenatal visits complemented by follow up by diabetologist, endocrinologists, if not possible, by internist or GP
- Preconception counseling of all females of pregnancy potential is strongly recommended
- Keeping the blood sugar in normal range or below 7% before pregnancy is recommended to prevent congenital malformation
- Folic acid and smoking cessation recommended to all patients with diabetes going expecting conception
- A woman's right to sexual and reproductive health care is warranted in women with diabetes
- Right to contraception is upheld. Contraception counselling and intervention should be offered to all the female patients with diabetes
- Awareness of prevalent cultural prejudices, and provision of psychological support to female patients with diabetes is recommended.

DIABETES AND INCREASED RISK OF ENDOMETRIAL CANCER

Diabetes is associated with increased risk for some cancers (liver, pancreas, endometrial, colon and rectum, breast, bladder). Diabetes (primarily type 2) has been associated with an increased risk of endometrial cancer in most studies. A meta-analysis by Friberg *et al.*,^[52] supports a relationship between diabetes and increased risk of endometrial cancer. In this meta-analysis 16 studies were reviewed, total 96,003 participants and 7,596 cases of endometrial cancer were studied. Diabetes was statistically significantly associated with an increased risk of endometrial cancer (summary RR 2.10, 95% CI 1.75-2.53). The association between diabetes and some cancers may partly

be due to shared risk factors between the two diseases, such as aging, obesity, diet and physical inactivity. Due to lack of health care resources, screening for cancer by pap's smear and mammogram and breast exam, is limited in South Asian countries. In a study of 809 females in rural Kerala, the utilization of Pap's smear was 6.9%.^[53] Though there is no specific screening test for endometrial cancer, Pap smear may show some abnormalities indicative of endometrial cancer. We recommend screening for breast and endometrial cancer for our female patients, with diabetes. We recommend healthy lifestyle for our patients. As obesity is associated with endometrial cancer, we recommend healthy diet and exercise to avoid obesity in our female patients with diabetes.

Women and complications of diabetes

Women are no exception to the pandemic of type 2 diabetes. Diabetes in women is a much neglected area that requires urgent attention from the global and regional perspectives. Diabetes affecting south Asian women is unique due to various reasons, its regional prevalence undoubtedly is rising with the added burden of insulin resistance from puberty that predisposes women to long term ill health from a young age.^[54] Women of reproductive age with diabetes have potential to affect the health of future generations and therefore become a unique health challenge. In view of its occurrence at a younger age in South Asia, a gender specific review of its long-term outcomes that impact on morbidity and mortality is extremely crucial. Such an analysis would help ascertain a more pragmatic approach to managing diabetes in women within the region. The lower cutoff for recognizing obesity in Asians (BMI ≥ 25 kg/m²) personifies the high risk of diabetes and CVD linked to the central obesity that often afflicts women of South Asia.^[55] Abdominal fat correlates with insulin resistance, diabetes, hypertension, ischemic heart disease, strokes, hepatic steatosis and gall bladder disease. This is often overlooked particularly in women, due to the common perception that the female gender is "protected" from long-term complications. On the contrary there is emerging evidence that women with diabetes are more prone to untoward outcomes even more than men.^[56] The implications of this is very important for the South Asian region that is undergoing major epidemiological and demographic transition that makes our populations increasingly vulnerable; affected women in particular requiring special attention. There is duality of purpose in such an approach because addressing women's health throughout their life cycle would also help ensure a metabolically healthier future generation due to improved fetal programming through creating a healthier uterine environment. This synopsis on complications of type 2

diabetes in women will also help extrapolate the recognized specific risks in women *viz.*, central obesity, metabolic syndrome and the polycystic ovary syndrome (PCOS) that show ethnic specific differences in South Asian women that require appropriate action.^[57] Although acute and chronic complications of diabetes are well recognised, we need to impose a new and important public health dimension to diabetes care from a different perspective which highlights any gender bias related to health outcomes. Women with diabetes face the same problems, but with an added element: They battle a chronic disease with various social and personal challenges every hour of the day, which are characteristic of the social and cultural arena of South Asia. Women have made many strides in fostering equity in their social status; nevertheless, there are ingrained values and structures in our society that continue to negatively impact on the health of women in general.

Adolescence

The primary form of diabetes among children and adolescents is type 1 diabetes. Recently, type 2 diabetes has emerged as an important health problem among adolescents, particularly in South Asian ethnic subgroups.^[54] For women, adolescence is a time of transition, both psychological and physical that impacts on their metabolic health through the development of insulin resistance and abnormal glucose tolerance. This could be a summative of a greater genetic potential magnified by unhealthy environmental changes.^[58]

Acute complications

Acute complications are more common during adolescence with greater impact on life expectancy. Diabetic ketoacidosis is the most common acute complication and often heralds the onset of type 1 diabetes. The risk for this complication is greatest among adolescents, common among women than men, and is associated with poor standards of living including inadequate social support.^[59] Therefore, despite its lesser numbers; type 1 diabetes in the girl child of South Asia must not be ignored. A significant comorbidity of diabetes in adolescence is periodontal disease, that typically coincides with the onset of puberty in children with type 1 diabetes and requires due attention.^[60] Diabetes in pregnancy is a serious condition, that is unique to women because of its potential to affect the health of both the mother and her unborn child. Whilst the impact of gestational diabetes is a topic in its own right, the acute complications that it predisposes to such as pre-eclampsia and eclampsia need to be recognised as life-threatening. Furthermore, post partum gain in body weight that is perceived as a natural event in local cultures can also lead to a greater risk of developing type 2 diabetes in young South Asian women at risk. Furthermore, that diabetes increases

the vulnerability to develop tuberculosis in countries with high incidence must not be overlooked in women, since pregnancy can unmask this risk due to altered maternal immunity.^[61]

Psychosocial issues

Psychosocial issues of diabetes in children and young adults must be treated as a recognised complication that can lead to poor compliance and morbidity. Eating disorders that afflict, the adolescent have a greater prevalence among young women with type 1 diabetes. The two most common eating disorders are anorexia nervosa and bulimia nervosa.^[62] Depression is another risk factor for adolescents with diabetes, particularly girls. Adolescent girls with diabetes have a higher rate of depression and anxiety, with reports of a more negative impact of diabetes on their lives than among adolescent boys residing in the west.^[63] This problem among women of South Asia requires further study.

Chronic complications

The long term burden of diabetes falls disproportionately on women,^[64] the risk for cardiovascular disease, which is most common complication attributable to diabetes is more serious among women than men. Particularly, women with diabetes lose their premenopausal protection from ischemic heart disease and have a risk that is comparable to that of diabetic or non-diabetic men. Women have worse survival and quality of life measures as well.^[65] Women are also at greater risk for blindness due to diabetes than men. It was found that adolescent girls have a higher risk of progressing to proliferative retinopathy (PDR) than age matched boys. Pregnancy is a known risk factor for the progression of retinopathy among women with type 1 diabetes. In a case-control study, pregnant women were twice as likely to progress to PDR as non-pregnant women (7.3% versus 3.7%).^[66] Diabetic nephropathy is the most common single cause of end-stage renal disease (ESRD) and predisposes to cardiovascular morbidity and mortality. Among 164 adolescents with diabetes, adolescent girls were nearly 60% more likely than boys to develop microalbuminuria after 8 years of follow up (24% and 15%, respectively). In the reproductive years, diabetic nephropathy may be diagnosed somewhat earlier in women than men as nearly 25% of women with diabetic nephropathy are diagnosed during pregnancy. Women with pre-existing diabetic nephropathy may have a marked increase in protein excretion because of the pregnancy related rise in glomerular filtration from early pregnancy. This physiological phenomenon may increase the likelihood of earlier manifestation of diabetic nephropathy; although pregnancy does not seem to adversely affect the course of early diabetic renal disease. However, pregnancy accelerates the onset of end-stage

renal disease in the presence of more severe impairment as manifested by hypertension and decreased renal function.^[67] The Diabetes Control and Complications Trial (DCCT) suggests that intensive therapy to control hyperglycaemia in adolescents effectively delays the onset and slows the progression of both diabetic retinopathy and nephropathy.^[68] Unfortunately, intensive therapy undoubtedly increases a person's risk of becoming overweight. The increased risk of weight gain could hinder adherence to this regimen, particularly among adolescent girls who are more vulnerable to psychological effects from obesity. Additionally, the Reduction of Endpoints in NIDDM with Angiotensin II Antagonist Losartan (RENAAL) study provides a unique opportunity to compare various ethnic groups by gender. Of the 956 men and 557 women in their 60s whose baseline laboratory and clinical variables were stratified by ethnicity, urinary albumin: Creatinine ratio was highest in Hispanics and Asians; with women showing greater abnormality than men. It is significant that Asian women were the exception to having a lower prevalence of obesity. It was evident that blood pressure, insulin requirement, degree of proteinuria and abnormal lipids were higher in women with poorer glycaemic control. Smoking varied with gender and ethnic origin, and more Asian and Hispanic men smoked compared with women. Thus, at baseline, women appeared to have more abnormal manifestations of type 2 diabetes and nephropathy than men.^[69]

Problem statement

There is an increasing burden of diabetes and its complications in women of South Asia with negative impact on long term metabolic disease among future generations. Women experience higher mortality and morbidity from diabetic complications than their male counterparts. Although, there is paucity of country specific data, the available data suggests that Asian women are at specific risk of diabetes related macrovascular complications such as coronary artery disease and cerebrovascular disease. No regional data is available on gender specific diabetic foot problems or nephropathy. In order to determine the cause of observed gender differences of diabetes related complications, we must explore any link to hormonal, pathological or socio-cultural issues. Furthermore, the impact of diabetes on the incidence of cancers in women, particularly of breast and the endometrium requires due attention. With increasing incidence of risk factors such as obesity and lack of physical activity among South Asian women, diabetes related complications are likely to increase, which are preventable. Pregnancy related diabetes needs special emphasis, which needs regional and local guidelines to ensure long-term follow up of women at risk.

Recommendations

- There is insufficient recognition of problems of women and diabetes by policy makers, planners and the general public. More information is required on how behavioural and social factors interact with biological factors to affect the health of diabetic women in South Asia
- The health care systems should consider custom-designed prevention and control programs tailored for women based on local and regional attitudes on health care, cultural beliefs, and available social support systems
- Policy makers can play an important role in the development and promotion of strategies to reduce barriers to diabetes care in women throughout their life cycle
- Policies that empower adolescent girls and young women to take control of their metabolic management must be encouraged
- Provision of gender specific diabetes education with a holistic life-cycle approach is recommended
- Self-management behaviours for women with diabetes must be facilitated in order to improve their long term health status.

LIFE EXPECTANCY IN WOMEN WITH DIABETES

According to WHO report in 2004, about two-thirds of deaths due to diabetes occur in developing countries especially in East Asia and the Pacific.^[70] In 2010, over 2.1 million women died worldwide as a result of diabetes, 2 compared to 1.8 million men.^[71] Diabetes is the 9th leading cause of death in women globally.^[72] In South-east Asia (WHO classification of countries include countries in South Asia), mortality due to diabetes accounted for almost 25% of all deaths in women in the 50-59 age group while it was responsible for 15% of deaths in men in the same age group above.^[71] According to IDF diabetes atlas, the mortality of the South Asian region stands second highest and India contributes largest number of death due to diabetes.^[1] Diabetic women with coronary heart disease have lower survival rates than men. The relative risk of coronary death from diabetes was 2.58 (95% CI 2.05-3.26) for women and 1.85 (1.47-2.33) for men.^[73] Death rates for women aged 25-44 years with diabetes are more than 3 times the rate for women without diabetes.^[74] Premature mortality caused by diabetes results in an estimated 12 to 14 years of life lost.^[75,76] Comparing to Western developed countries, life expectancy of South Asian women with diabetes are relatively shorter because of gender discrimination leading to poor access to health care services. The gender bias in region led to devaluation of women's health, affecting life expectancy.^[77]

Access to health care for women with diabetes – social, economic and political barriers

Proper access to health care services is essential for diabetes management as diabetes is a lifelong disease requiring complex daily decisions and demanding self-management and monitoring skills and routines.^[78] Involving patients as partners in their care may lead to more effective management of chronic diseases like diabetes and there has been a call to empower patients with diabetes through education to encourage self-management.^[79] Access to appropriate and affordable care and education about their disease are the right of all people with diabetes, not a privilege.^[78] Children and adults with diabetes are denied both the rights to life and health when their diabetes is undetected or they lack access to affordable technologies and medicines. Millions of people with diabetes face stigma and discrimination. Social stigma can be a serious barrier to early diagnosis, effective self-management and appropriate access to health care. Compared to male diabetes mellitus, females are less accessible to health care. There is ample evidence confirming that access to effective health care is a major problem in the developing world. South Asian women with diabetes particularly have various barriers. Lack of knowledge, about illnesses contributes to their delay in seeking care. Women constitute more than half of South Asian adult illiterates. Due to illiteracy and ignorance, rural women often prefer traditional treatment at times of sickness. Low level of education leads to misunderstanding of Western medicine. A large proportion of women do not seek pre- and antenatal care leading to poor outcome in gestational diabetes. Many South Asian socio-cultural factors influence the access to health care. Rural women with diabetes are often subjected to family rejection especially in divorcees, old and widower women. Gender attitudes and roles are particularly important determinants of health seeking behaviour. Majority of South Asian men rule and women obey across religious and cultural divides. The male head of the family possesses the power of making major family decisions. The health and well-being of women are often ignored as family members and women themselves place a very low value on women's lives. Women are often not allowed to see a male doctor, even in life-threatening situations. They often deprived of their right to seek out treatment for themselves.^[80] Socio-economic factors also play an important role for accessibility to health care services. Women are economically dependent on men in many societies of developing countries. Women are usually not allowed to handle cash.^[81] Many cannot afford medicine and treatment services, the majority do not have health insurance or access to other finance solutions, and the healthcare system is lacking the necessary resources to treat diabetes. Other barriers include lack of high-quality health

care professionals and clinics, inaccessibility to facilities due to long distance and cost of transportation, inadequate health facilities for diagnosis, insufficient specialist services for the management of diabetes, the absence of health educators, and a lack of health information regarding diabetes.^[82] The following are the recommendations for improving health care access in South Asian women with diabetes. We need to promote health education and raise awareness of diabetes risks among the South Asian population, to increase the general literacy and education level of South Asian women, to reduce the gender discrimination in providing health care, to increase resources within the primary care setting, to increase finance and funding for health care facilities, and to provide professional skills and support including training and education.

Sexual dysfunction in women with diabetes

Sexual function has a directional relationship with psychosocial health, both in men and women. Optimal sexuality is an integral part of holistic health and poor psychological health may impact sexual function negatively.

Problem statement

This aspect of health however is another area in which the South Asian women with diabetes are discriminated against. Minimal work has been carried out to quantify female sexual dysfunction in women with diabetes in South Asia. Even lesser work has been done to assess various management strategies for this condition. An Indian study has reported poor knowledge regarding sexual function in women, but a strong need for sexual counseling, provided the health care professional initiates discussion. Most women report that doctors rarely discuss sexual health with them.^[83] No studies are available to analyze the impact of female sexual dysfunction on glycemic control and vice-versa, in women. Most discussion on female dysfunction tends to focus on psycho-emotional aspects, as opposed to biological issues. Thus, South Asian health care professionals may not be fully trained and/or sensitized to the needs of women with sexual dysfunction. Compounding this lack of access is the shortage of trained female health care professionals, with whom South Asian women feel more comfortable while discussing personal matters. Lack of privacy in busy, over-crowded health care facilities, a social stigma or taboo attached to such matters, and lack of confidence in patients add to the neglect of sexual issues in women attending diabetes clinics across South Asia. Validated instruments, such as the Female Sexual Function Index are available for diagnosis and classification.^[84] Simple instruments like Whooley's two question list^[85] can be used in primary care and non-psychiatric practices to screen for concomitant depression. These diagnostic tools are easy to use, do not

consume much time or resources and lend themselves to easy translation. The biological aspects which influence sexual function can be assessed by a sensitive history taking and complete physical examination. One commonly missed condition is the vestibular syndrome (vulvodynia), which presents as dyspareunia, and may be a manifestation of diabetes neuropathy.

Non-pharmacological treatment such as sex therapy, couple therapy, cognitive behavioral therapy and sexual focus exercises can be utilized for female sexual dysfunction, but trained (and sensitive) health care professionals are necessary for this. While detailed guidelines are available for the counseling of male sexual dysfunction, similar guidance has not yet been drafted to help counsel women.

Relatively few drugs are available for management of female sexual dysfunction, such as yohimbine, sulbutiamine, and hormonal therapy. South Asian women with diabetes may not have uniform access to these drugs.

Recommendations

- Health care professionals should elicit a sexual history in women with diabetes, in a sensitive, culture-specific manner. This should preferably be done by female physicians or paramedical staff
- Diabetes care providers should be trained in the various non pharmacological methods of therapy for sexual disorders
- Guidelines for counselling in female sexual dysfunction, written in culturally appropriate manner for South Asia, are needed
- Research, both qualitative and quantitative, is needed to assess the actual impact of sexual dysfunction on glycemic control, and vice versa.

Empowering south Asian women with diabetes

The International Diabetes Federation estimates that as many as 70 million individuals in the south Asian region have diabetes.^[86] Assuming that 50% of these are women, the number of women with diabetes in south Asia stands at approximately 35 million.

The problem statement

In addition to the problems faced by women with chronic non-communicable diseases all over the world, women in south Asia face certain unique challenges, on account of various socioeconomic, demographic and cultural factors. Early marriage is common in south Asia. This leads to earlier and more frequent pregnancies. The prevalence of gestational diabetes mellitus (GDM) is much higher among women of south Asian origin.^[87] Although most of these women can count on much greater degrees of family support

than their western counterparts, this can occasionally prove counterproductive as well meaning parents and relatives often propagate myths and misconceptions regarding the management of diabetes. Post-delivery, the woman often gains weight, is subject to depression and mood swings and starts to neglect herself. Due to physical inactivity and increased consumption of high calorie foods in an effort to “eat for two”, obesity worsens. During this period, health checkups dwindle and repeated pregnancies further compound the problem. Older women in south Asia can expect a greater degree of support from their families, compared to their western counterparts. However, this advantage is often nullified by low literacy levels^[88] and lack of economic independence, making these women highly dependent on their men folk for all their health related needs.

Recommendations

- Education is the key to empowerment of women with diabetes
- Nutrition education, including healthy cooking practices, should be taught to all women
- The importance of physical activity should be emphasized and facilities for the same provided to all women
- During pregnancy, excess weight gain should be avoided. Self-monitoring of glucose levels is imperative.
- The need for postpartum follow-up and regaining the pre-pregnancy weight should be emphasized. This provides a golden window of opportunity for preventing type 2 diabetes, post GDM.

In summary, south Asian women need to be encouraged to take charge of their diabetes and empowered to make informed decisions, which will go a long way in better management of diabetes in this population. In addition, a woman who is aware of the threat posed by Non Communicable Diseases (NCDs) and the means to prevent them, will act as an effective ambassador and transmit these messages to her children and grandchildren, which will help in reducing the incidence of these diseases in the future.

PUBLIC HEALTH ISSUES OF REDUCING THE BURDEN OF DIABETES AMONG WOMEN

Major social and economic change has brought an escalating diabetes epidemic to low- and middle-income countries. While the ratio of men-to-women afflicted with diabetes is roughly equal, women are uniquely and often more severely, affected by the complications of diabetes. Diabetes kills and disables, impoverishes families, imposes a huge economic burden on governments and business, and overwhelms health systems.^[89] The quintessential Indian

woman subjugates her interests to that of her husband, children and in-laws during youth and middle age, her husband and daughter-in-law during old age. Added to this is the fact that 30-80% of people in India with diabetes are not diagnosed and are left untreated.^[90]

Problem statement

In 2008, age-standardized adult diabetes prevalence in the world was 10% in men and 9% in women.^[91] Almost half of diabetes deaths occur in people under the age of 70 years and 55% of these deaths are among women.^[92] In India the prevalence of diabetes seems to be more or less the same in both genders.^[93] Diabetes affects women more severely because of their unique biological, cultural and socioeconomic circumstances. Health and well being continue to elude the majority of rural women as a result of gender inequality.^[94]

Social, economic, and political barriers sometimes block high-quality care and easy access to health care for women with diabetes.^[95] Women have limited access to health care facilities because of illiteracy, ignorance and negative social customs like the need to be accompanied to hospital, heavy work burden as a result of which time is scarce.^[94] Social and economic issues will leave many older women with diabetes living alone and poor. Poverty is also a major concern for women of childbearing age who have diabetes. Women with diabetes have a shorter life expectancy than women without diabetes, and women are at greater risk of blindness from diabetes than men.^[96] Uncontrolled diabetes also causes fatigue and restricts ability to work, thus leading to higher rate of job loss and discrimination at the work place.^[94] Diabetes places additional care burden on girls and women. Prevention of diabetes promotes women's health. Prevention of diabetes reduces the care burden for women and girls. Detecting and managing diabetes reduces maternal mortality and morbidity and improved maternal and infant nutrition reduces the prevalence of obesity and diabetes.^[89] Pregnancy offers a great window of opportunity for the intergenerational prevention of several chronic diseases like diabetes, stroke etc.^[94] The diabetes epidemic has moved to low and middle income countries and threatens to reverse development gains made in low income countries.^[89] Diabetes affects the most vulnerable: Studies in India have shown that people living in slums show especially high prevalence rates 10.3% in urban slums compared to the national average of 7.1%.^[97] Diabetes is also a cause of poverty: Lost income, lost jobs and high costs of treatment and complications (such as amputation, blindness, stroke, heart attack) which can push poor families into destitution.^[97] Stress among women with diabetes is a major factor which is difficult to measure too. Across the socioeconomic

gradient, stress on women in India increases as she has to work and make ends meet in extremely resource constrained conditions due to the inbuilt gender hierarchy. Among working women in Canada and Sweden studies show that low levels of job control were associated with an increased risk of diabetes among women, but not among men.^[98,99] Stressful life events could lead to the onset of diabetes mellitus.^[100] Stress and a waist circumference above 80 cm can act synergistically to increase risk to women. Millennium Development Goals (MDG) goals captures the multidimensionality of poverty and diabetes, women are linked to MDG 1 (eradicating extreme poverty and hunger), 2 (universal primary education), 3 (reducing gender inequality and empowering women), 4 (child mortality), 5 (improving maternal health), 6 (reducing the prevalence of HIV/AIDS, Malaria and 7 (ensure environmental sustainability); summarising the multiple effects of diabetes on the lives of women, families, communities and on the country. Transcending the gender hierarchy and inequality is a formidable challenge. Sensitising men, empowering women on self care and providing peer support maybe the answer to this challenge.

PSYCHOSOCIAL, CULTURAL AND ECONOMIC ASPECTS IN COPING WITH DIABETES

Study of Health and illness is like brain and body which is well connected and cannot be separated. It has been seen that health and disease is affected not only because of medical issues but also because of psychosocial, environmental and cultural factors.^[101] Zinc also provided evidence of research that social support helps in physical and psychological well being of a person.^[102] In similar context cultural factors such as belief, religion also effects outcome of diabetes by effecting perception of individual causing them to believe diabetes is result of fate and bad luck.^[103] Further review provides strong evidence of diverse support sources such as economic support, social contact and sharing personal problems directly associated with better health outcomes.^[104]

Problem statement

To study, psychosocial, cultural and economic reactions of diabetes and its impact on management.

Psychosocial reactions and diabetes

When an individual is diagnosed with diabetes different kind of defence mechanisms are used such as denial, guilt, aggression, avoidance etc., which if used for a longer time can obstruct the treatment of disease as individual is not ready to accept or is having fear of society. This further can deteriorate quality of life of an individual.^[105]

Cultural reactions and diabetes

With diversity in culture it has become very essential for health care providers to understand cultural differences of an individual as one's behaviour [diet, physical activity, and thoughts] is result of its beliefs, values and attitude which intervenes in dealing with diabetes. Thus lack of knowledge about cultural variables can aggravate the disease.

Economic reactions and diabetes

Knowledge and resources present with an individual determines its acceptance and management of a disease. Poverty, ignorance, lack of knowledge has direct impact on economic cost of diabetes management, as it not only includes medical cost but also cost due to delay in diagnose, development of related problems, absenteeism and low productivity.^[106,107] As, it was said by Sir Geoffrey Rose "The primary determinants of disease are mainly economic and social, and therefore its remedies must also be economic and social."^[108]

Coping mechanisms

While studying above reactions it becomes very essential for health care provider to use appropriate coping mechanism such as building psychological contract with the patient, including family and friends as part of social support and empower patient with complete process of managing diabetes.

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