# Role of Social Determinants in Glycemic Control of Type 2 Diabetic Subjects

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## Abstract

*The increasing prevalence of type 2 diabetes rooting a major social and economic burden in the world especially in developing countries like India. To identify and address the role of Social Determinants in glycemic control of type 2 diabetic subjects. A community based cross-sectional study was conducted in urban field practice area of  Chitradurga. Considering the prevalence of diabetes 12%[5] with 95% confidence level and 5% of absolute precision the calculated sample was 165[7]. House to house survey was done to get the adequate sample size. Data regarding socio-demographic factors like religion, marital status, literacy, occupation, socioeconomic status. Other factors like BMI, duration of diabetes, type of treatment HbA1C levels, and causes for poor glycemic control was collected by using pre-designed, pre-structured questionnaire. Data was analysed using SPSS (version 18). Multivariate ANOVA was used to study the factors affecting poor glycemic control. Most of the subjects were married females, aged between 40 to 70 years and belonged to lower middle class (42%). Almost 67% had a poor glycemic control, as indicated by HbA1c levels (>7%). The factors which were significantly associated with a poor glycemic control were literacy ($p<0.05$), duration of the disease ($p<0.05$), worries ($p<0.05$), lack of awareness ($p<0.05$), where as BMI ($p>0.05$), occupation ($p>0.05$) and income ($p>0.05$) had no significant association with poor glycemic control. Conclusion: This study revealed that the social factors like family worries, unaffordability for medications poor accesses to health care and lack of awareness about the disease plays significant role in poor glycemic control of the disease. It can be improved by adequate family health education.*

**Keywords:** Type 2 diabetes, HbA1c, social determinants, prevalence of diabetes, stress in diabetes.

## Introduction

The increasing burden of NCDs is mainly due to changing lifestyles, unhealthy habits, stress and increased life expectancy. India is in transition phase and with the economical growth all these changes are inevitable. There is strong social patterning in the incidence of type 2 diabetes, which accounts for over 90%of all diabetes[1]. Exposure to "Obesogenic environment" is one of the important factors in diabetic epidemic. Apart from these, inequalities in health care delivery, lack of preventive care, poor access to health care and no or limited social security are the social factors responsible for increasing  burden of non communicable diseases.

WHO estimates that 382 million people in the world are living with diabetes and this number will rise to 592 million by 2030 without any intervention[2]. Today India top the world with over 32 million diabetic people and this number is expected to increase to 79.4 million by 2030. In India, according to recent data the prevalence of diabetes is 10 to 16 % in urban population and 5 to 8% in rural population[3,4]. The National Urban Diabetes Survey (NUDS), a population based study revealed that the prevalence of diabetes is more in the southern part of India compared to northern parts with highest percentage of 16.6 in Hyderabad, followed by 12.4 % in Bangalore  and 13.5% in Chennai[5].

In developing countries like India there is limited access to health care services and health insurance coverage, which makes the treatment unaffordable[6]. This results in delayed diagnosis with more complications, which in turn increase the cost of treatment. It has greatest social and economic impact on people especially from low-income groups.

**Objectives:** To identify and address the role of Social Determinants in glycemic control of type 2 diabetic subjects.

## Methodology

A community based cross sectional study was conducted in urban field practice area after obtaining an ethical committee approval from the institute. The urban field practise area has 11 wards with approximate total population of 31186. Considering the prevalence of diabetes 12%[5] with 95% confidence level and 5 % of absolute precision the sample size required was 165[7]. All 11 wards were considered as sampling units and 15 diabetics were selected randomly from each ward to meet the sample size of 165. House to house survey was carried out in each ward and subjects aged 20 years and above with type 2 Diabetes and under treatment for least 6 months were included in the study. Those who had Type I diabetics, pregnancy with diabetes and seriously ill were excluded from the study.

The verbal consent was taken from all the subjects and interviewed by using pre-designed, pre-structured questionnaire. The data regarding socio-demographic factors like religion, literacy, socio economic status and other factors like BMI, duration of diabetes, type of treatment, and type of health facilities utilized were collected.

HbA1c levels were taken to assess the glycemic control. HbA1c reveal average plasma glucose levels over the previous 8 to 12 weeks. It can be done at any time of the day without any special preparation such as fasting. These properties have made it an ideal test for assessing glycemic control in diabetes. The HbA1c levels of 7 and less than 7 was taken as good control where as more than 7 as poor control.

The causes for poor glycemic control like type of family worries, accessibility and affordability of treatment, lack of physical activity and lack of awareness about the disease including dietary habits were revealed in in depth interviewed.

The data thus obtained was compiled and analysed using SPSS (version 18). Multi variate ANOVA was used to study the factors affecting the glycemic control.  P value of less than 0.05 was considered statistically significant.

## Results and Discussion

Out of 165 subjects interviewed around 60% were aged between 50 to 75 years. Females were 52% and most of them were housewives. 86% were Hindu by religion and 60% were sedentary workers.  The education level of most of the respondents were up to primary education (47%) followed by secondary education (24%) and very few were graduates & above (13%). Regarding the socio economic status majority of them were belonged to lower middle class (42%) according to modified Kuppuswami's socio economic status scale. 84% of them were on oral medications and very few were using insulin (8%). 85% of the respondents were seeking treatment from private hospitals as shown in table – 1. The study was conducted in urban slum so most of the population we got were lower middle class.  Female respondents were more due to the timing of the study as the study was conducted in morning hours we got house wives at home.

In our study 67 % of the subjects had a poor glycemic control (HbA1c >7%). As shown in table-2, the gender difference was apparent with reference to poor glycemic control, which was being seen more in females (36%) than in males (32%). The factors like literacy (p=0.013), duration of the disease (p=0.011), worries (p=0.000) and lack of awareness (p=0.000) showed statistically highly significant association with poor glycemic control. Factors like occupation (0.08), BMI (p=0.70) and income (0.492) dint show any statistically significant association with poor glycemic control.

**Table-1**
**Socio demographic characteristics of respondents**

| Characteristics | No | (%) |
|---|---|---|
| Age | | |
| 25-49 | 49 | 30 |
| 50-74 | 99 | 60 |
| 75 & above | 17 | 10 |
| Sex | | |
| Male | 80 | 48 |
| Female | 85 | 52 |
| Religion | | |
| Hindu | 141 | 86 |
| Muslim | 24 | 14 |
| Marital status | | |
| Unmarried | 02 | 1 |
| Married | 142 | 86 |
| Divorced/separated | 02 | 1 |
| Widow/widower | 19 | 12 |
| Education | | |
| Illiterate | 26 | 16 |
| Up to High school | 78 | 47 |
| Secondary education | 40 | 24 |
| Graduate & above | 21 | 13 |
| Occupation | | |
| Sedentary | 102 | 62 |
| Moderate | 58 | 35 |
| Heavy | 05 | 3 |
| SES | | |
| Upper | 13 | 8 |
| Upper-middle | 43 | 26 |
| Lower -middle | 70 | 42 |
| Upper-lower | 36 | 22 |
| Lower | 03 | 2 |
| Type of treatment | | |
| Oral | 138 | 84 |
| Insulin | 13 | 8 |
| Both | 14 | 8 |

Table-3 shows the most important social causes for poor glycemic control were stress due to worries (26%), unaffordability for medications (24%) as most proportion of the family income was spent for medications and poor access to health care services (19%) which leads to non compliance of the treatment. This is followed by lack of awareness about the disease, lack of physical activity and fear of side effects of drugs.

**Table-2**
**Factors associated with glycemic control**

| Factors | | HbA1C </=7 Good control (%) | HbA1C>7 Poor control (%) | p-value |
|---|---|---|---|---|
| Age | 25-49 | 15 (9) | 34(21) | |
| | 50-74 | 30 (18) | 69(42) | 0.08 |
| | 75 & above | 08 (5) | 09 (5) | |
| Gender | Male | 27(16) | 53(32) | 0.288 |
| | Female | 26(16) | 59(36) | |
| Marital status | Unmarried | 1(1) | 1(1) | |
| | Married | 49(30) | 93(56) | |
| | Divorced/separated | 0(0) | 2(1) | 0.032 |
| | Widow/widower | 3(2) | 16(10) | |
| Education | Illiterate | 2(1) | 23(14) | |
| | Up to primary education | 24(15) | 54(33) | |
| | Up to Secondary education | 20(12) | 20(12) | 0.013 |
| | Graduate & above | 7(4) | 15(9) | |
| Occupation | Sedentary | 28(17) | 74(45) | |
| | Moderate | 23(14) | 35(21) | 0.085 |
| | Heavy | 02(1) | 03(2) | |
| SES | Upper | 6(4) | 7(4) | |
| | Upper-middle | 15(9) | 28(17) | |
| | Lower -middle | 25(15) | 45(27) | |
| | Upper-lower | 7(4) | 29(18) | 0.492 |
| | lower | 0(0) | 3(2) | |
| BMI Kg/m$^2$ | <25 | 11(7) | 23(14) | |
| | 25-30 | 31(19) | 63(38) | 0.709 |
| | >30 | 11(7) | 26(16) | |
| Duration of illness | <5 years | 30(18) | 42(25) | 0.011 |
| | >5 years | 23(14) | 70(42) | |
| Family history | Present | 24(15) | 57(35) | 0.501 |
| | Absent | 29(18) | 55(33) | |
| Co morbid conditions | Present | 30(18) | 50(30) | 0.153 |
| | Absent | 23(4) | 62(38) | |
| Stress/ Family worries | Present | 19(12) | 92(56) | 0.000 |
| | Absent | 34(21) | 20(12) | |
| No of Risk factors | 0 | 14(8) | 29(18) | |
| | <2 | 31(19) | 69(42) | 0.636 |
| | >2 | 38(23) | 14(8) | |
| Lack of awareness | Yes | 16(10) | 67(41) | 0.000 |
| | No | 37(22) | 45(27) | |

**Table-3**
**Social causes for poor glycemic control**

| Social causes for poor glycemic control | % |
|---|---|
| Family worries / stress | 26 |
| Un affordability of treatment | 24 |
| Poor access to health services | 19 |
| Lack of awareness about illness | 18 |
| Lack of physical activity | 8 |
| No care takers in the family | 3 |
| Fear of side effects of drugs | 2 |

The Prevalence of poor glycemic control in this study was 67%. In a study conducted by Hasimah Ismail et al in Malaysia were found 75% of subjects had poor glycemic control, the higher rate was most likely because it was a hospital based study and subjects were with complications[8].

In this study the gender difference was apparent with reference to poor glycemic control, which was seen more in females (36%) than in males (32%). Some literature shows a dual opinion on the gender determined glycemic control. Some reports[9, 10] showed a gender inequality, while others[11,12] have showed no difference among males and females.

Due to the status of women in family and gender discrimination which is prevalent in Indian society, females tend to neglect their health status, they have lack of awareness about their disease and its complications, and are non adherent to their medication as well as other self care activities. These factors contribute to a poor glycemic control among females.

In our study longer duration of diabetes was significantly associated with a poor glycemic control (p=0.011). Similar results were seen by Meena Verma et al[13] in their study. This is probably due to progressive impairment of the insulin secretion with time, due to beta cell failure.

The present study also found that patients revealed family problems and related worries as a reason for stress and poor glycemic control. There was very high significant association between the stress and the poor glycemic control (P value- 0.000), similar relationship was observed in other studies conducted by Sasi Sekhar TVD and B Longo-Mbenza[14,15].

In our study BMI (p=0.70), occupation (p=0.50), income (0.492) had no significant association with poor glycemic control , in contrast to the study conducted by Sasi Sekhar TVD et al[14].

In our study the most important societal causes for poor glycemic control were family worries, unaffordability for medications, poor access to health care services, this is followed by lack of awareness about the disease, lack of physical activity and fear of side effects of drugs. Similar findings were also reported by Pascal et al in a study in Nigeria[16].

## Conclusion

From the present study we conclude that social determinants like married females, illiterates and patients with long duration of illness are more prone to poor glycemic control. Along with lack of awareness, family worries and financial problems which are responsible for stress in most of the subjects contributes to poor glycemic control. In addition to all these factors, access to the services and type of health care are the factors which influence the cost of treatment which leads to late diagnosis and non compliance to treatment.

**Recommendations:** Diabetes is a long term disease where behavioural change is essential for keeping disease under control. The cost effective measures is adequate health education at family level. Culturally and linguistically appropriate health education, use of folk media will definitely help to reach underprivileged and improved self-help and follow-up. Efforts should be made to implement measures as sustained and an ongoing process.

The primary intervention that is likely to have the greatest impact on inequities in care for diabetes is the establishment of a system that provides access irrespective of the ability to pay, including access to consultations, medication and materials for monitoring.

**Limitations:** Our study population was largely from urban area of tribal district of Karnataka and study design was cross sectional, this limits us from making our findings generalized.

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