"EFFECT OF SELF-CARE BEHAVIORS ON GLYCEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS RESIDING IN RURAL AND URBAN FIELD PRACTICE AREAS OF NORTH KARNATAKA"

Submitted by

(REG. NO. BD0121009)

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"EFFECT OF SELF-CARE BEHAVIORS ON GLYCEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS RESIDING IN RURAL AND URBAN FIELD PRACTICE AREAS OF NORTH KARNATAKA."**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee.

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LIST OF ABBREVIATIONS USED

S.No.	Abbreviation	Expansion
1	BCC	Behavior Change Communication
2	BMI	Body Mass Index
3	CHO	Community Health Officer
4	CME	Continuing Medical Education
5	DM	Diabetes Mellitus
6	ICMR	Indian Council of Medical Research
7	IEC	Information Education Communication
8	NCD	Non-communicable Diseases
9	NHM	National Health Mission
10	NP-NCD	National Program for Prevention and Control of Non-Communicable Diseases
11	PDQ	Personal Diabetes Questionnaire
12	PHC	Primary Health Center

13	PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
14	SD	Standard Deviation
15	SDSCA	Summary Diabetes Self-care Activities
16	SES	Socio-economic status
17	T2DM	Type-2 Diabetes Mellitus
18	UHC	Urban Health Center
19	WHO	World Health Organization

ABSTRACT

Effect of self-care behaviors on glycemic control among patients with type 2 diabetes mellitus residing in rural and urban field practice areas of North Karnataka

Background:

Though various bodies, including the World Health Organization, stress the need for self-care in the management of diabetes, the available studies report poor compliance of patients regarding the same. Very few studies regarding this are community based, and almost none compare between rural and urban field practice areas.

Objectives:

This study intended to assess and compare the effect of self-care behaviors on glycemic control in type 2 diabetes mellitus patients residing in rural and urban field practice areas. Also, to find out the barriers to self-care behaviors among them.

Methodology:

This community based comparative cross-sectional study was carried out between September 2022 and December 2023 among 346 patients residing in the field practice areas of Kinaye (rural) and Ashok Nagar (urban), using validated questionnaires. Venous blood sample was collected for estimation of HbA1c levels. Collected data was entered using Microsoft Excel software and analyzed in SPSS software.

Results:

Mean age of the participants in rural and urban areas were 60.24 ± 12.77 and 55.76 ± 12.72, respectively. Female participants (242, 69.9%) were more than males. Hindu participants (291, 84.1%) were the majority. Majority education level was till primary school (99, 28.6%). Significant association was found between self-care levels and HbA1c levels, area of residence, education levels, and barrier scores. Significant correlation was found between self-care levels and HbA1c levels, and barrier scores.

Conclusions:

Self-care behaviors have an effect on glycemic control. The self-care levels vary between the rural and urban areas significantly. Barriers to self-care behaviors are significantly associated with the self-care levels.

Keywords: Self-care, diabetes, rural, urban, barriers

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INTRODUCTION

Diabetes mellitus (DM), along with other non-communicable diseases (NCDs), is on the rise, worldwide. As per the "World Health Organization" (WHO) factsheet, as of 2014, 8.5% of adults had diabetes. Diabetes was the direct cause of 1.5 million deaths, and 48% of all deaths due to diabetes occurred before the age of 70 years.[1] India, in particular, is facing an epidemiological transition, with a rapid increase in the prevalence of NCDs.[2] As per the "Indian Council of Medical Research – India Diabetes" (ICMR INDIAB) study published in 2023, the prevalence of diabetes in India is 11.4% - around 10.1 crores people are living with diabetes.[3] The high prevalence and continuing rise in the cases is a potential threat toward achieving the 2030 target for Sustainable Development Goal 3.4, which is: "reduce by one-third the premature mortality from NCDs through prevention and treatment." For working toward this goal, the Government of India has strengthened the National Program for Prevention and Control of Non-Communicable Diseases (NP-NCD), as part of National Health Mission (NHM). The focus of the program is the following: "health promotion and awareness generation; strengthening infrastructure; and human resource development." Its aims are to improve the prevention, early diagnosis, management, and referral to an appropriate level of healthcare facility for the treatment of the NCDs.[4]

Efficient treatment of type-2 diabetes mellitus (T2DM) calls for a multi-pronged approach. Apart from drugs self-care is also very important for successful treatment outcome. Self-care behaviors include "healthy coping, healthy eating, being physically active, regular blood glucose monitoring, medication adherence, problem solving, and reducing risks."[5] India especially, which is a developing country, where

the population to be covered is huge and resources are limited, along with increasing treatment costs, practicing self-care behaviors among patients with T2DM can lead to better therapeutic outcomes while also being economical.[6-8] The American Diabetes Association reported a four-fold increase in diabetic complications among individuals with T2DM who had not received formal education concerning self-care practices.[9] Also, studies have shown that the prevalence of non-adherence to treatment is high among T2DM patients, who will have to take the drugs for a continuous and prolonged period of time, often for their whole lifetime.[6] This stresses the need for health education and constant motivation to the patients to carry out the self-care behaviors.

In line with these recommendations, self-care is incorporated into the national programme. Apart from the provision of testing with glucometer and free drugs, the Ayushman Bharat Health Wellness Centres are also involved in health education – Information Education Communication (IEC) activities - and behavior change communication (BCC), regarding healthy eating and living. This includes "Eat Right Initiative, Safe and Nutritious Food at Home" and "Aaj se thoda kum" awareness activities and "Fit India and Khleo India" movements and Yoga implemented by Ministry of Youth Affairs and Sports by the Ministry of AYUSH, respectively.[4]

The six domains of self-care are:

1. Diet: following a healthful eating plan, eating more of fruits and vegetables, eating less of high fat foods.
2. Exercise: doing at least 30 minutes of physical activity, involving in physical activity apart from what is done routinely as part of household or work-related activities.

3. Blood sugar testing: regular testing of blood sugar, as recommended by the healthcare provider.
4. Foot care: checking of feet, inspecting the inside of shoes, washing and soaking the feet, dry between the toes after washing.
5. Smoking: avoiding smoking.
6. Medication: taking recommended medication and recommended number of pills.[10]

Various important bodies stress on the importance of self-care behaviors in controlling T2DM.[11] However, many studies show that carrying out self-care behaviors has many barriers and overall diabetes self-management is difficult. Some of the common barriers identified in the available literature were: difficulty in adjustments to lifestyle after being diagnosed with T2DM, lack of knowledge regarding the self-care behaviors, lack of culturally relevant knowledge, and not recognizing the importance of self-management practices.[12-16] Though the barriers can be classified at various levels like individual, community, socio-cultural, economic, environmental, psychological etc., the commonly observed barriers are classified thus: diet barriers, medication barriers, blood glucose monitoring barriers and exercise barriers.[17]

The available studies regarding self-care practices report poor compliance of diabetic patients regarding self-care behaviors. They also stress the immense need for extensive research in the effectiveness of self-care management, especially in the rural areas of developing nations.[18-22]

The present study adds to the evidence of the role of self-care behaviors in the management of T2DM in India by assessing the prevalence of self-care behaviors among T2DM patients and its correlation with glycemic control. This study also compared the practices and barriers related to self-care behaviors between rural and urban populations, which could be used for planning targeted community-based interventions.

OBJECTIVES OF THE STUDY

Primary Objective:

To assess the relationship between self-care behaviors and glycemic control in T2DM patients residing in rural and urban field practice areas.

Secondary Objective:

To find out the barriers to self-care behaviors among T2DM patients residing in rural and urban field practice areas.

REVIEW OF LITERATURE

Self-management of diseases is a growing field of interest in medicine. Especially with the rapid rise of non-communicable diseases, it has been proven that NCDs can be better management by the practice of self-care behaviors by the patient. Apart from medical benefit, this self-care management has social and economic benefits also. It might reduce the burden on the healthcare workers, while minimizing the costs incurred for the patient, reduce the onset of complications, and overall lead to a better quality of life. A review of literature regarding the same is as follows.

A cross-sectional study done in Mangalore, studied the self-care practices of 290 patients with T2DM attending a tertiary care facility in Mangalore. Their study results were: A healthy eating plan was followed by 45.9% of the study participants daily. Daily exercise for minimum 30 minutes was followed by 43.4% of the participants. Regular blood sugar monitoring was done by 76.6% of the participants. Daily adherence to medication was observed among 60.5%. Among the participants, 66.9% were adherent to daily insulin injections. Most of the study participants, 64.8% washed their feet every day. Among them, 70.7% dried between their toes after washing. However, very few participants, 28.3% checked their feet on all days of the week, and only few, 13.4% participants examined the inner surface of their shoes. The authors concluded that self-care behaviors were unsatisfactory in all aspects, except for blood glucose monitoring and adherence to drugs. They also recommended that as these behaviors are essential for prevention of complications and to lead a better quality of life, more efforts should be made to educate the patients.[23]

A cross-sectional study involving 376 diabetic patients registered in the Diabetes Research Center, Yazd studied the relationship between self-care management with glycemic control. The study results showed that the mean HbA1c level in the patients was 7.93% ± 1.38%. The mean of the self-care score was 30.53 ± 11.4. The authors concluded that there was a significant relationship between the self-care mean score, age, BMI, and HbA1c with a p-value <0.05. The level of self-care in patients with controlled diabetes mellitus, which was taken as a HbA1c value < 7 g% in this study, was more than patients with uncontrolled diabetes mellitus, which was taken as a HbA1c value of ≥ 9 g%. The study reported that as proper lifestyle strategies and self-care behaviors are essential elements in the prevention and control of T2DM, non-adherence of the same can cause severe complications. They recommended the cooperation of physicians and nurses, and also family support, which are essential in order to provide continuous education to the patients regarding the same.[24]

A descriptive analytic cross-sectional study conducted in Binjai City, Sumatera Utara Province, studied the self-care behaviors and the level of HbA1C of patients with T2DM. Their objective was to find if a correlation existed between the two variables. The study results revealed that among the 118 T2DM patients included in the study, 86.4% of the them had low self-care behaviors, and 72.9% patients showed uncontrolled HbA1c levels. They concluded that there was a significant correlation between self-care behaviors and HbA1c levels, that is, the better the self-care behaviors score the lower was the HbA1c levels. So, self-care behavior is the determinant factor in controlling diabetes mellitus. They recommend that cooperation between doctors and health workers is needed to provide continuing education about

self-care behaviors to patients so as to increase their understanding and independence.[25]

A review article published in the Journal of Diabetes & Metabolic Disorders discusses the role of self-care in the management of T2DM. It mentions the seven essential self-care behaviors among T2DM patients as: healthy eating, being physically active, monitoring of blood sugar, compliant with medications, good problem-solving skills, healthy coping skills and risk-reduction behaviors. These are predictors of good outcome. All of these behaviors are positively correlated with good glycemic control, reduction of complications, thereby leading to an improved quality of life of the patients. They also observe that patients with T2DM have been shown to make an improvement regarding the progression and development of the disease when they are taught and continuously motivated to participate in their own care by means of these self-care behaviors. They go on to add that despite these facts, the compliance or adherence to the prescribed self-care behaviors has been found to be low, especially the long -term adherence. Though multiple demographic, socio-economic and social support factors are taken into considered as positive contributors in the facilitation of self-care behaviors among these patients, the emphasis should be placed on the role of clinicians in promoting self-care, which is vital. The authors recommend that as the problem is multi-faceted, a systematic and multi-pronged integrated approach is required for promoting self-care behaviors among T2DM patients to prevent long-term complications. The authors also mention the following as the implications for future research: “As most of the reported studies are from developed countries so there is an immense need for extensive research in rural areas of developing nations.”

They also emphasise that field research should be promoted in developing countries. It should focus on the perceptions of patients regarding the effectiveness of their self-care management. This will help in efficient use of allocated resources for diabetes mellitus management. The present study aimed to do exactly that by comparing the self-care practices between rural and urban populations, which can be used for planning targeted community-based interventions.[26]

A cross-sectional study conducted among 520 T2DM patients attending the outpatient clinics of medical and endocrinology departments of three hospitals in Jordan reported that an overwhelming majority of the patients (92.7%) had poor glycemic control. They also found that greater adherence to diabetes self-care behaviors was associated with better glycemic control. Exercise was the most important predictor of HbA1c, followed by general diet, specific diet, and blood sugar testing. Moreover, the Body Mass Index, treatment type, and income were significant predictors. They recommended that to enhance patients' self-care behaviors and lifestyles changes, the patients need tailored diabetes self-care management educational and supportive programs, conducted by qualified diabetes educators using culturally sensitive strategies.[27]

A cross-sectional study conducted among 288 T2DM patients attending the Indus Hospital, Karachi found that majority of the patients (81.6%) had uncontrolled glycemic control. Less than half of the patients (48.6%) had inadequate diabetes-related self-care activities. They concluded that there was no significant relationship between diabetes-related self-care activities and glycemic control. Also, it was found

that a greater proportion of study participants with a longer duration of diabetes had poor glycemic control, even though they were found to have adequate self-care activities. This is the only study that was found during literature search that reported no association between self-care behaviors and glycemic control.[28]

A literature review performed with a narrative synthesis following the PRISMA statement through four databases: PubMed, CINAHL, Scopus, and Embase, included 29 articles having a high-quality evaluation. They reported that more males performed better behaviors aimed at maintaining health and clinical stability than females, but mainly in relation to physical activity. Whereas, more females performed adequate behaviors aimed at monitoring their signs and symptoms, albeit having worse glycemic control and diabetic complications.[29]

A cross-sectional study conducted in Sullia, Karnataka, among 400 diabetes patients, reported that only 24.25% of them had good knowledge regarding self-care behaviors. Among the self-care practices, foot care was the most neglected area. They also found that adherence to some components of the self-care behaviors was poor. They recommended that creation of new and strengthening existing government policies will help in making guidelines on management of diabetes, funding to various community programs, creating awareness among the public, better availability and affordability of medicines and diagnostic services. Apart from these, continuing medical education (CME) programs for health-care providers is also needed to keep themselves updated.[30]

A qualitative study carried out in Mangalore Taluk of Dakshina Kannada district of Coastal Karnataka, conducted 12 focus group discussions (FGD) among the health-care providers regarding challenges and barriers in the delivery and utilization of healthcare with regard to diabetes mellitus. Lack of training, lack of motivation, lack of consultation time due to high patient load, lack of adequate staff were found to be some of the lacunae. Patients related barriers were also reported: socio-economic constraints, cultural constraints, difficulty in diet restriction, and difficulty in changing behaviour, and lack of skills in self-care. They concluded that health system in public sector had gaps in all aspects. They recommended to improve IEC materials for better prevention of control of T2DM.[31]

A systematic review studied the foot-care practices among T2DM patients. It included 14 publications. The common themes identified were: "high clinical and lifestyle burden of diabetic foot ulcers, poor foot self-care knowledge, perception barriers and resistance, adoption of self-management practices, and discordance between patient and provider impressions and expectations." They concluded that many barriers existed regarding the foot care in T2DM patients both with & without foot ulcers. They recommended that clinical interventions should be tailored to the individual to identify and address the patient-specific barriers.[32]

A cross-sectional study carried out with the PDQ questionnaire regarding the barriers to self-care behaviors in Iran reported that the mean score of barriers was 75.08 ± 24.14. The study was carried out among 681 T2DM patients attending a diabetic center in Kerman, Iran in 2018. The mean scores for each subset of the barriers- diet,

medication, and blood glucose monitoring and exercise barriers, were found to be 18.29 ± 5.70, 19.92 ± 6.96, 20.49 ± 7.38, and 16.85 ± 6.52, respectively. They also found out that BMI, marital status, monthly income, and HbA1C were significant predictors of the barriers score.[33]

A cross-sectional study conducted in a lifestyle clinic of a tertiary hospital in Nadia, West Bengal, India, among 178 T2DM patients reported that the overall mean barrier score was 134 ± 13. They had also found that 60.7% participants showed non-adherence to medications; moderate adherence was seen in 37.6% participants, and high adherence seen only in 1.7% participants. They reported that Barriers to self-care practice and medication adherence were observed across all socio-economic classes.[34]

A cross-sectional study carried out among 158 diabetic patients registered at the Karnataka Institute of Endocrinology and Research (KIER) facility set out to find the barriers and facilitators to diabetic foot-assessment and care (one of the self-care behaviors). The study reported that socioeconomic position, employment conditions, religious customs, time and cost, and medication non-adherence were found to be the barriers to self-care. They concluded that almost all diabetic foot complications may be avoided with foot care education, regular foot assessments as the standard of treatment, and self-care as a preventive/therapeutic strategy, highlighting or necessitating the need of self-care behaviors in the comprehensive management of T2DM patients.[35]

Though many such studies have been conducted exploring the self-care behaviors in T2DM patients, very few compare the practices of T2DM patients residing in rural and urban areas. As known already, the variables affecting the health of rural and urban population are many and quite different. The challenges and barriers faced by these patients are also varied. This study intended to assess and compare the relationship between self-care behaviors and glycemic control in T2DM patients residing in rural and urban field practice areas. Also, to find out the barriers to self-care behaviors among T2DM patients residing in rural and urban field practice areas.

METHODOLOGY

Source of Data:

Patients diagnosed with T2DM residing in the field practice areas of Kinaye (rural) and Ashok Nagar (urban), obtained from respective NCD registers.

Study Design:

Community-based comparative cross-sectional study.

Study Period:

The study was carried out from October 2022 to September 2023.

Sample Size:

The sample size was calculated using G-Power software by considering: effect size, d= 0.35, alpha, $\alpha = 0.05$, power $(1-\beta) = 0.90$ ($\beta=0.10$), with ratio 1:1, the sample size was 346, 173 in each place, i.e., 173 in rural field practice area and 173 in urban field practice area.

Sampling technique:

Four field practice areas are covered under Jawaharlal Nehru Medical College, KAHER in Belagavi, North Karnataka- two in urban areas: Rukmini Nagar and Ashok Nagar, and two in rural areas: Vantamuri and Kinaye. The urban field practice area of Ashok Nagar and rural field practice area of Kinaye were chosen by simple random sampling by the lottery method. The Primary Health Center - Kinaye has 9 sub centres – Desur, Karle, Khadarwadi, Kinaye, Macche-I, Macche-II, Peeranwadi,

Santibastwad, Waghwade. From these the sub center Peeranwadi was chosen randomly by lottery method.

For the selection of study participants, systematic sampling method was used, where a random sample, with a fixed periodic interval, is selected from a larger population.

For Rural Area:

Peeranwadi has a total population of 12,831, out of which the total diabetic population is 608. Peeranwadi has a total of 2149 houses. The details of diabetic patients' households were obtained from the Community Health Officers (CHO).

The sample size for rural field practice area was 173 and the sampling interval was 3. A random number (5) was chosen. The study was started with 5th house of the field practice area of sub center Peeranwadi under PHC Kinaye and thereafter every 3rd house was chosen till the complete sample size was obtained. If selected household had no participant satisfying the inclusion criteria, the next household was included in the study.

For Urban Area:

The total diabetic population in UHC Ashok Nagar is 419 and it has a total of 1200 houses. The details of diabetic patients' households were obtained from the Health Worker Female.

Th sample size for urban field practice area was 173, and the sampling interval was 2. A random number (5) was chosen. The study was started with 5th house of the field practice area of UHC Ashok Nagar and thereafter every 2nd house was chosen till the

complete sample size was obtained. If selected household had no participant satisfying the inclusion criteria, the next household was included in the study.

S.No.	**Name of field practice area**	**Total diabetic population**	**Proportion of population for the study**
1	Peeranwadi (rural)	608	173
2	Ashok Nagar (urban)	419	173
Total		1027	346

Inclusion Criteria:

i. Men and women who have been diagnosed with T2DM, with the duration of illness of minimum 1 year.

ii. Patients with T2DM residing in the field practice areas for a minimum of 1 year.

Exclusion Criteria:

i. Patients with T2DM with acute febrile illness and/or bed-ridden.

ii. Patients with T2DM diagnosed with cardiovascular disease, renal disease or cerebrovascular disease within 1 month from the date of interview.

Data collection procedure:

1. Socio-demographic characteristics of the participants such as age, gender, marital status, literacy level, socio-economic status, anthropometric measurements, duration of diabetes, presence of complications, comorbid conditions, and current anti-diabetic medications were obtained by an interview with the patient using a predesigned, pretested questionnaire.

2. After obtaining informed consent from the patients, information regarding self-care activities was collected using the "revised version of summary diabetes self-care activities questionnaire" (SDSCA). The SDSCA has undergone two sets of validations, one with three studies (Toobert & Glasgow, 1994), and one with seven studies (Toobert, Hampson, & Glasgow, 2000).[10] The revised SDSCA consists of five self-care behaviors: diet, exercise, blood sugar testing, smoking, and foot care. Under each section, the participants were asked to respond how often they practiced the self-care behaviors in the past seven days. The scoring was done on an ordinal scale of 0–7 based on the participants' responses. Prior to the onset of the present study, the questionnaire was translated into Kannada, and pre-tested with a small group of participants with T2DM and necessary modifications, as needed, were made in terms of comprehensibility by the participants and content of the questionnaire.

3. After obtaining informed consent from the patients, information regarding barriers to self-care activities was collected using the "Personal Diabetes Questionnaire" (PDQ). It is a validated questionnaire.[17] The PDQ is defined as "a useful measure of diabetes self-care behaviors and related perceptions and barriers." The questionnaire is found to be reliable, valid and feasible through various studies. Based on this questionnaire data about diabetes self-management barriers can be

obtained which may help in guided patient care. For the purpose of this study the barriers aspect of the questionnaire is chosen, and an additional section 'foot-care barriers' has been added in the line of the questionnaire. In total, it contains 5 sections each containing a self-care behavior. The barriers are grouped under environmental, social, and emotional factors which interfere with attempts at each self-care behavior. The questionnaire has been pre-tested among small group of patients with diabetes and was found to be suitable in terms of comprehensibility by the participants and content.

4. After obtaining informed consent from the patient and explaining the procedure of venous blood sample collection, 5 ml of venous blood sample was drawn from the antecubital vein and sent in EDTA tubes to diagnostic laboratory for estimation of the levels of HbA1c.

Data processing and analysis/statistical analysis:

Collected data was entered using Microsoft Excel software and analyzed in SPSS software. Frequencies and percentage were calculated for categorical data. Mean and standard deviation were calculated for continuous data. Chi- square test was employed as the test of significance for categorical data. A p value of less than 0.05 was taken to be statistically significant.

Ethical Considerations:

Ethical clearance was obtained from the Institutional Ethics Committee (Ref No. MDC/JNMCIEC/210). Informed consent was obtained from each participant before collection of data.

Reference Values:

HbA1c

The target for good glycemic control was taken to be a value <7% as per the American Diabetes Association Standards.[36] The Indian standards set by Indian Council of Medical Research is also <7%.[37]

Body Mass Index

The Asian BMI standards were used for the purpose of this study.[38]

1. <18.5: Underweight

2. 18.5- 22.9: Normal

3. 23.0- 24.9: Overweight

4. >25: Obese

Self-care behaviors level

The SDSCA standard scoring system was used to classify the self-care behaviors of the study participants.[10]

1. Total score of the questionnaire: 0-99
2. Poor self-care: 0-33
3. Moderate self-care: 34-67
4. Good self-care: 68-99

Socio-economic status (SES)

The SES was classified based on the Modified B.G.Prasad's socioeconomic status classification, which considers the per-capita income in rupees as given below.[39]

I. Upper class: 8763
II. Upper middle-class: 4381.5 – 8675.3
III. Middle class: 2630-4294
IV. Lower middle-class: 1314.5 - 2541.27
V. Lower class: <1314.5

RESULTS

This community based comparative cross-sectional study was carried out between October 2022 and September 2023 among 346 patients residing in the field practice areas of Kinaye (rural) and Ashok Nagar (urban), using validated questionnaires. Venous blood sample was collected for estimation of HbA1c levels. Data was entered using Microsoft Excel software and analyzed in SPSS software.

The results are presented under the following sections:

I. Socio-demographic details

II. Diabetes status

III. Comparison of self-care with other variables

IV. Barriers to self-care behaviors

V. Comparison of self-care levels and barriers

I. SOCIO-DEMOGRAPHIC DETAILS

1. Age (in years):

Table 1: Distribution of participants according to age

Variable	**Rural**		**Urban**	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**
Age	60.24	12.77	55.76	12.72

The mean and standard deviation of the age of the participants residing in rural and urban field practice areas are 60.24 ± 12.77 years and 55.76 ± 12.72 years, respectively.

2. Gender:

Table 2: Distribution of participants according to gender (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Gender	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Male	63	36.4	41	23.7	104	30.1
Female	110	63.6	132	76.3	242	69.9
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 36.4% were males and 63.6% were females.

Out of 173 participants residing in urban field practice area, 23.7% were males and 76.3% were females.

Overall, the female participants (242, 69.9%) were more than males.

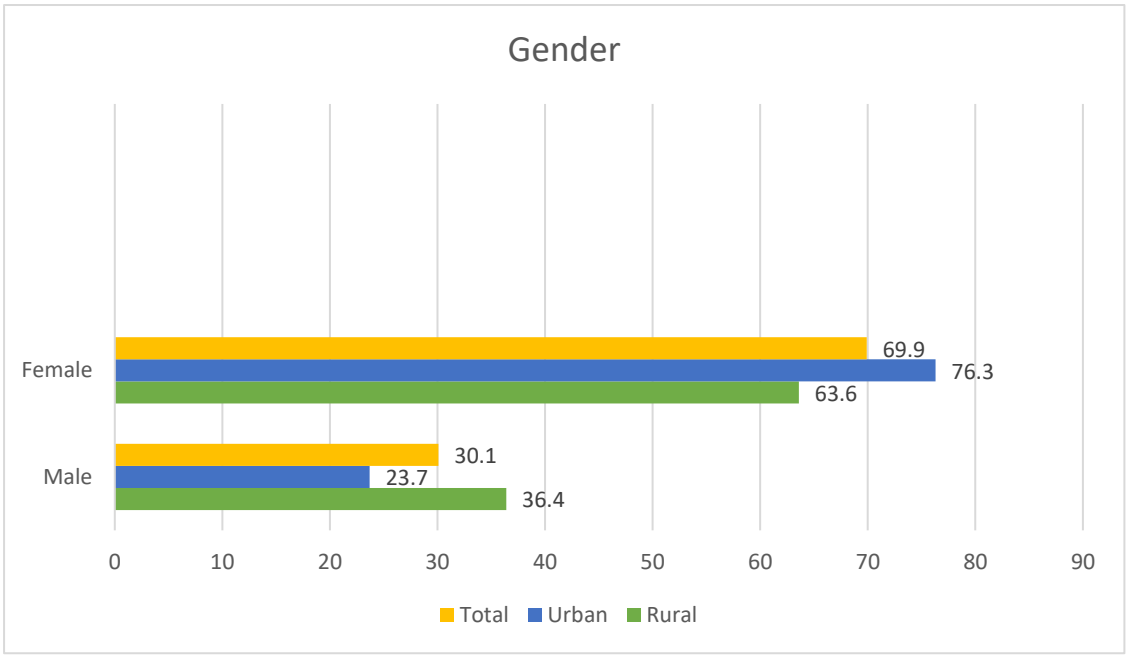

Figure 1: Distribution of participants according to gender (n=346 for total, n=173 for each rural and urban

3. Religion:

Table 3: Distribution of participants according to religion (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Religion	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Hindu	165	95.4	126	72.8	291	84.1
Muslim	8	4.6	46	26.6	54	15.6
Others	0	0	1	0.6	1	0.2
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 95.4% were Hindu and 4.6% were Muslim.

Out of 173 participants residing in urban field practice area, 72.8% were Hindu and 26.6% were Muslim, and 0.6% belonged to other religion (Christianity).

Overall, most of the participants were Hindu (291, 84.1%).

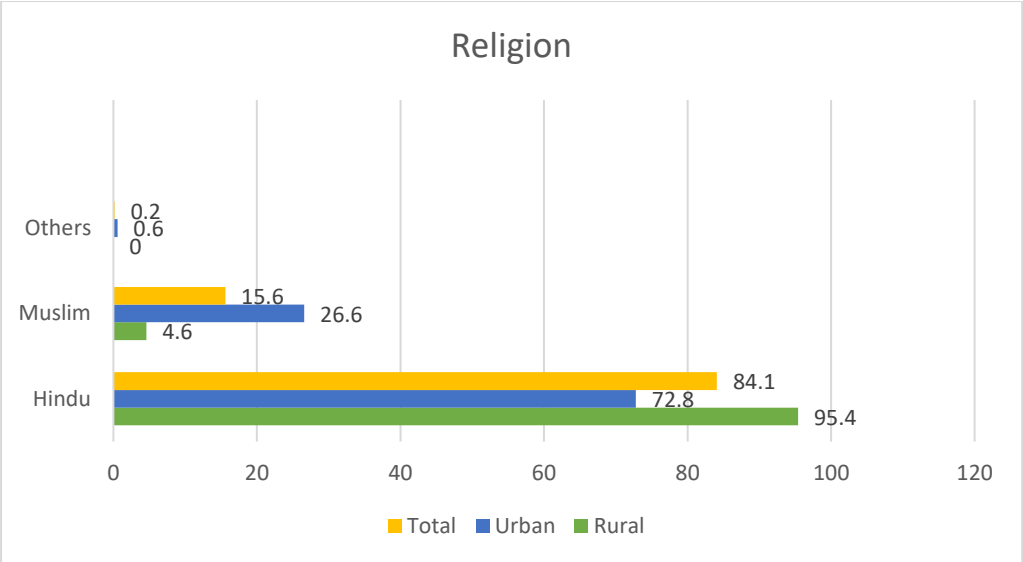

Figure 2: Distribution of participants according to religion (n=346 for total, n=173 for each rural and urban)

4. Education:

Table 4: Distribution of participants according to education (n=346 for total, n=173 for each rural and urban)

Variable	**Rural**		**Urban**		**Total**	
Education	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
No formal schooling	30	17.3	33	19.1	63	18.2
Less than primary school	7	4.0	6	3.5	13	3.7
Primary school completed	57	32.9	42	24.3	99	28.6
Secondary school completed	32	18.5	20	11.6	52	15.0
High school completed	14	8.1	27	15.6	41	11.8
College/ University completed	32	18.5	39	22.5	71	20.5
Postgraduate degree	1	0.6	6	3.5	7	0.2
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 17.3% had no formal schooling, 4% had received less than primary school education, 32.9% completed primary school, 18.5% completed secondary school, 8.1% completed high school, 18.5% completed college/university, 0.6% had completed postgraduate degree.

Out of 173 participants residing in urban field practice area, 19.1% had no formal schooling, 3.5% had received less than primary school education, 24.3% completed primary school, 11.6% completed secondary school, 15.6% completed high school, 22.5% completed college/university, 3.5% had completed postgraduate degree.

Overall, most of the participants had completed till primary school education (99, 28.6%).

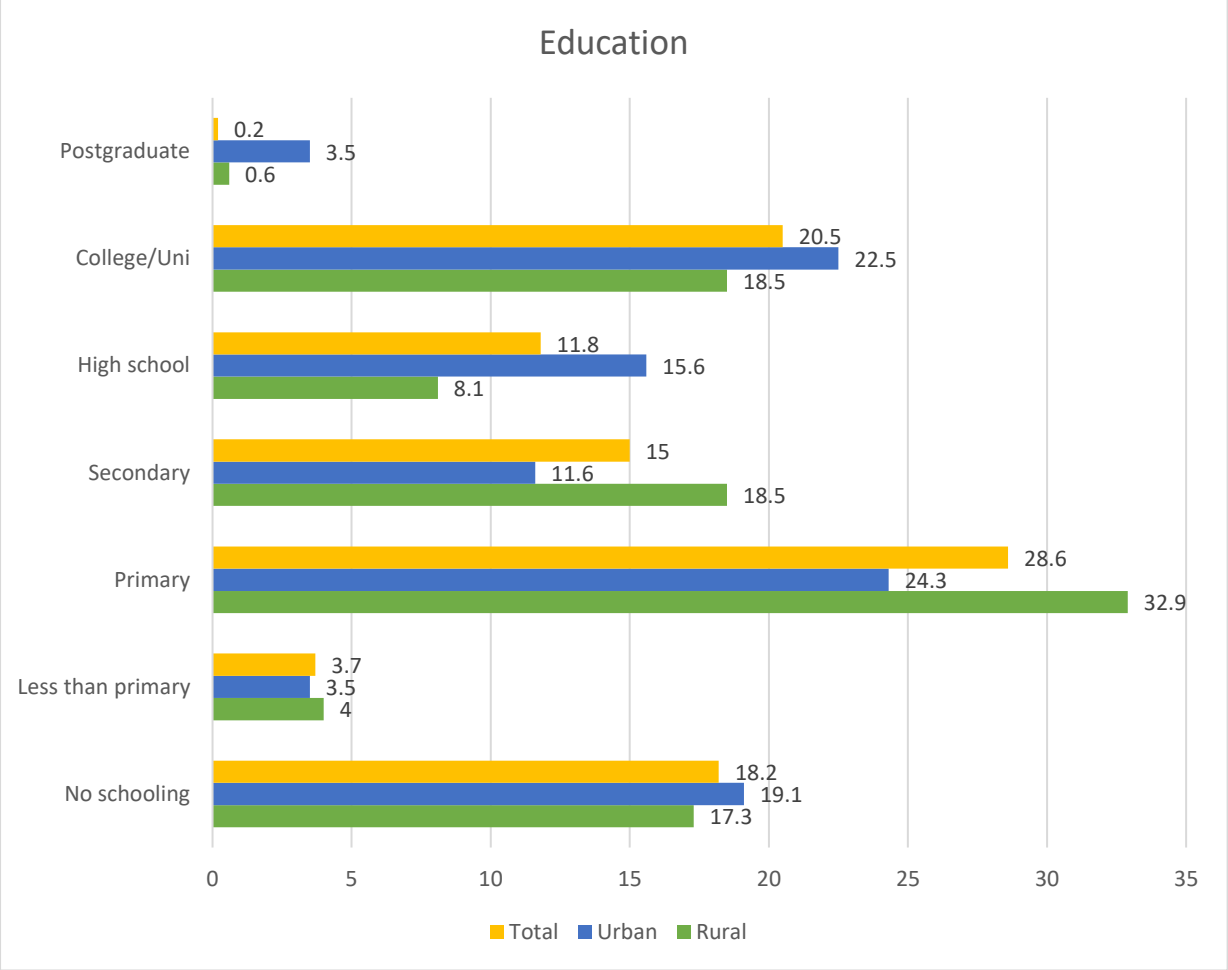

Figure 3: Distribution of participants according to education (n=346 for total, n=173 for each rural and urban)

5. Occupation:

Table 5: Distribution of participants according to occupation (n=346 for total, n=173 for each rural and urban)

Variable	**Rural**		**Urban**		**Total**	
Occupation	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Government Employee	12	6.9	22	12.7	34	9.8
Non-government Employee	3	1.7	21	12.1	24	6.9
Self-employed	35	19.8	21	11.9	56	16.1
Homemaker	92	53.2	90	52	182	52.6
Retired	31	17.9	19	11	50	14.4
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 6.9% were government employee, 1.7% were non-government employee, 19.8% were self-employed, 53.2% were homemaker and 17.9% were retired.

Out of 173 participants residing in urban field practice area, 12.7% were government employee, 12.1% were non-government employee, 11.9% were self-employed, 52% were homemaker and 11% were retired.

Overall, the major occupation among the participants was homemaker (182, 52.6%).

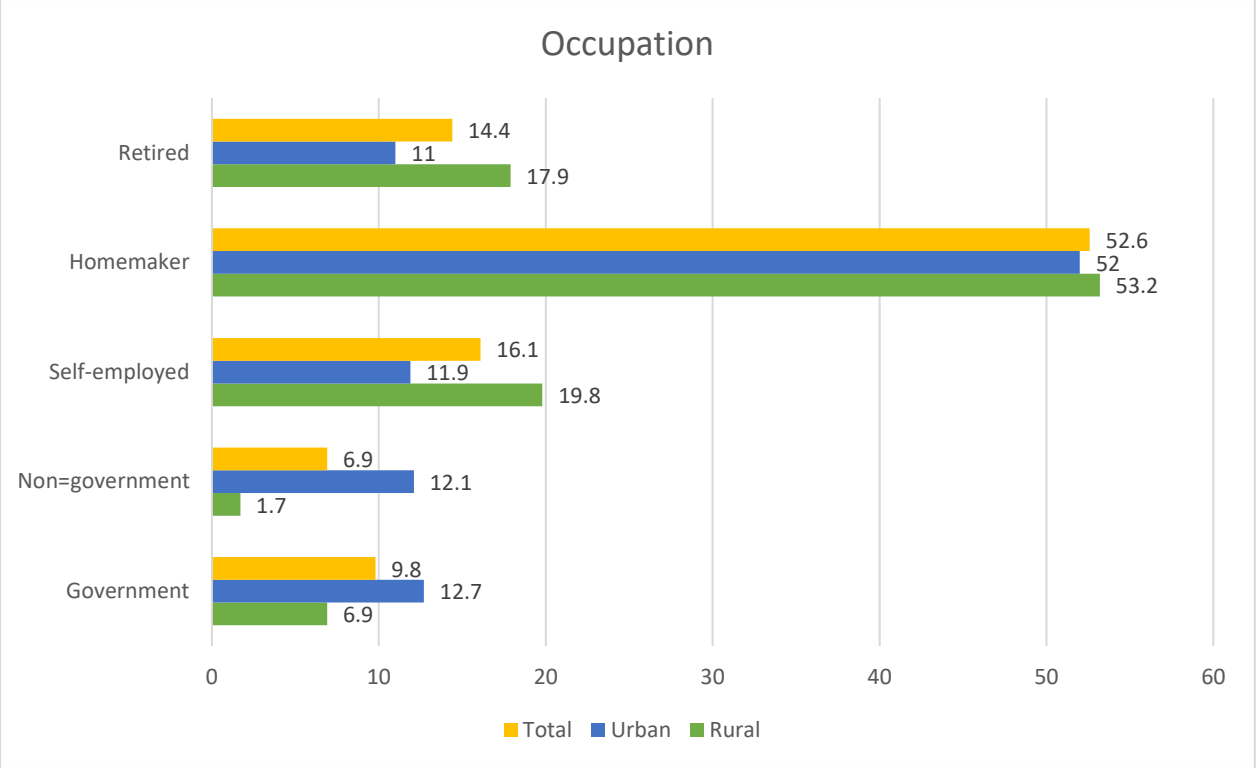

Figure 4: Distribution of participants according to occupation (n=346 for total, n=173 for each rural and urban)

6. Marital Status:

Table 6: Distribution of participants according to marital status (n=346 for total, n=173 for each rural and urban)

Variable	**Rural**		**Urban**		**Total**	
Marital Status	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Single	10	5.8	1	0.6	11	3.2
Married	141	81.5	155	89.6	296	85.5
Separated / Divorced	0	0	3	1.7	3	0.9

Widowed / Widower	22	12.7	14	8.1	36	10.4
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 5.8% were single, 81.5% were married, 0% were separated/divorced, and 12.7% were widowed/widower.

Out of 173 participants residing in urban field practice area area, 0.6% were single, 89.6% were married, 1.7% were separated/divorced, and 8.1% were widowed/widower.

Overall, most of the participants were married (296, 85.5%).

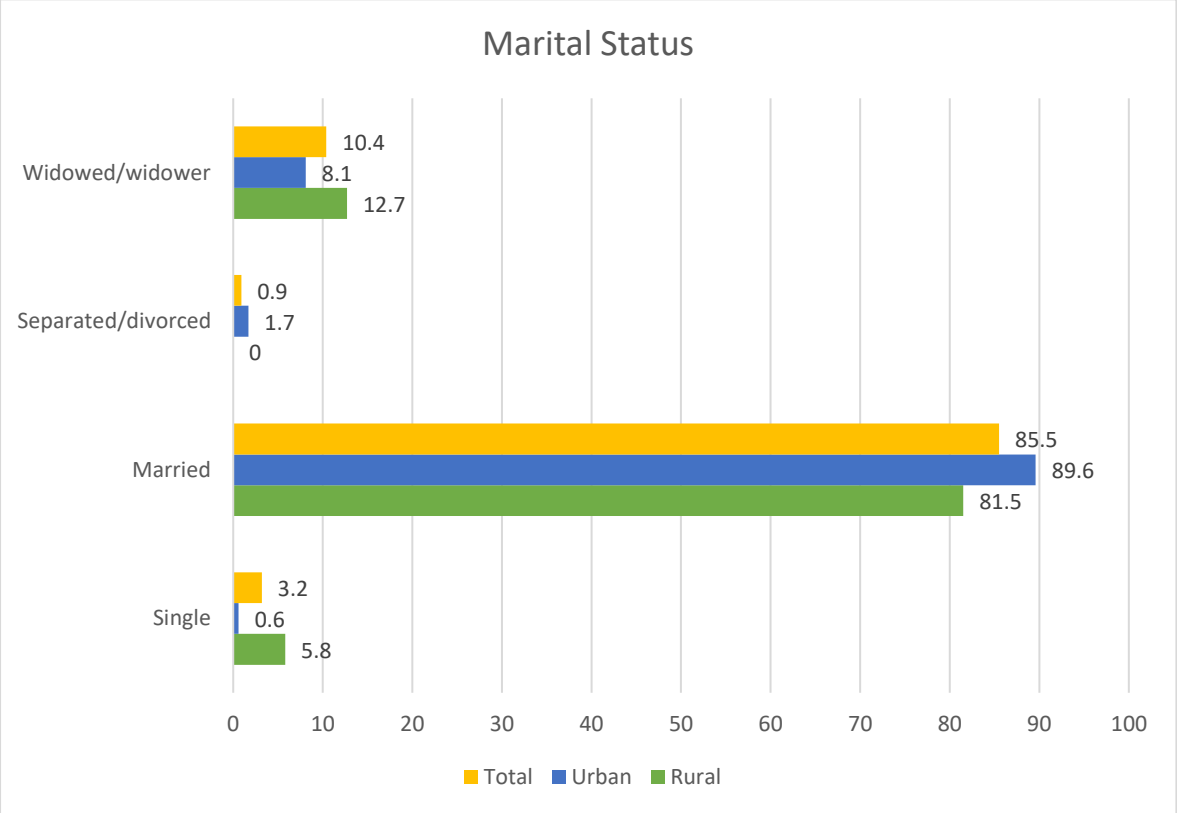

Figure 5: Distribution of participants according to marital status (n=346 for total, n=173 for each rural and urban)

7. Family Type:

Table 7: Distribution of participants according to family type (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Family Type	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Joint	66	38.2	81	46.8	147	42.4
Nuclear	97	56.1	79	45.7	176	50.8
Three-generation	0	0	7	4.0	7	2.2
Broken	6	3.5	6	3.5	12	3.4
Problem	4	2.3	0	0	4	1.2
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 38.2% lived in joint family, 56.1% in nuclear family, 0% in three-generation family, 3.5% in broken family and 2.3% in problem family.

Out of 173 participants residing in urban field practice area, 46.8% lived in joint family, 45.7% in nuclear family, 4.0% in three-generation family, 3.5% in broken family and 0% in problem family.

Overall, most of the participants were living in nuclear family (176, 50.8%).

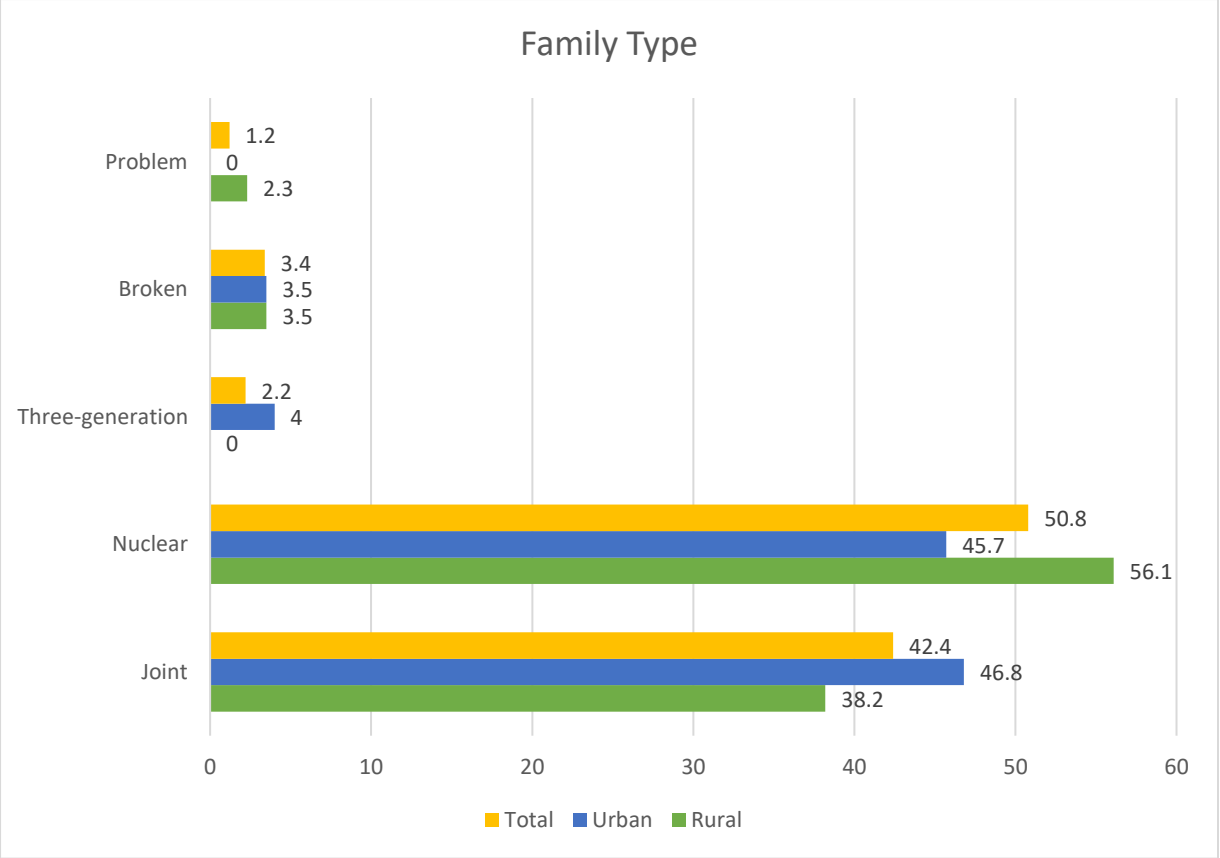

Figure 6: Distribution of participants according to family type (n=346 for total, n=173 for each rural and urban)

8. Socio-economic class:

Table 8: Distribution of participants according to socio-economic class (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Socio-economic class	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Class I	11	6.4	17	9.8	28	8.1
Class II	39	22.5	50	28.9	89	25.6

Class III	49	28.3	65	37.6	114	32.9
Class IV	41	23.7	31	17.9	72	21
Class V	33	19.1	10	5.8	43	12.4
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 6.4% belonged to Class I, 22.5% belonged to Class II, 28.3% belonged to Class III, 23.7% belonged to Class IV and 19.1% belonged to Class V.

Out of 173 participants residing in urban field practice area, 9.8% belonged to Class I, 28.9% belonged to Class II, 37.6% belonged to Class III, 17.9% belonged to Class IV and 5.8% belonged to Class V.

Overall, most of the study participants belonged to Class III (114, 32.9%), according to modified B.G.Prasad's socio-economic status classification.

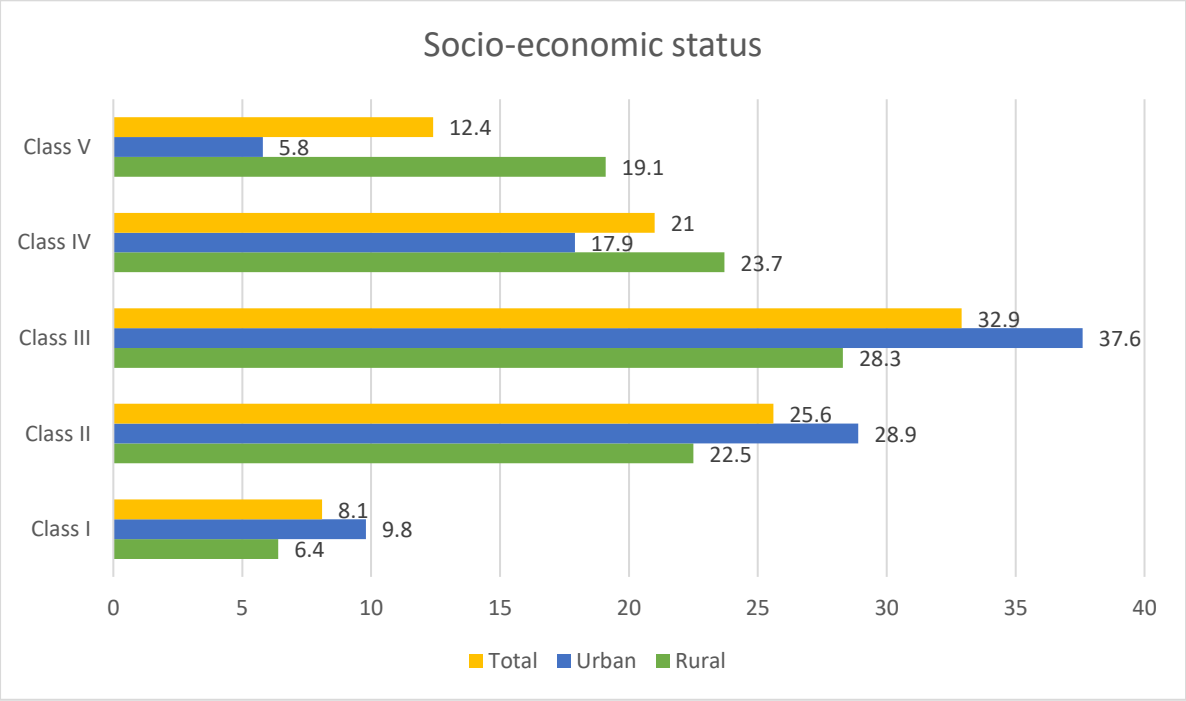

Figure 7: Distribution of participants according to socio-economic class (n=346 for total, n=173 for each rural and urban)

II. DIABETES STATUS

1. Diabetes duration:

The mean and standard deviation of duration of diabetes in years is as follows:

Table 9: Distribution of participants according to duration of diabetes (in years):

Variable	**Rural**		**Urban**	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**
Duration of diabetes	6.64	5.397	5.94	5.651

2. Diabetes management:

Out of 173 participants residing in rural field practice area, 2.3% were only on diet control, 97.7% were on diet and oral hypoglycemic drugs, and none were on insulin.

Out of 173 participants residing in urban field practice area, 1.2% were only on diet control, 97.1% were on diet and oral hypoglycemic drugs, and 1.8% were on insulin.

Overall, most of the participants were on oral hypoglycemic drugs (337, 97.3%).

Table 10: Distribution of participants according to diabetes management (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Diabetes Management	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Only diet modifications	4	2.3	2	1.2	6	1.8
Diet and Oral hypoglycemic drugs	169	97.7	168	97.1	337	97.3
Diet, Oral hypoglycemic drugs, and Insulin	0	0	3	1.8	3	0.9
Total	173	100	173	100	346	100

3. HbA1c levels:

Out of 173 participants residing in rural field practice area, 34.1% had HbA1c <7 g% and 65.9% had >7 g%.

Out of 173 participants residing in urban field practice area, 37.6% had HbA1c <7 g% and 62.4% had >7 g%.

Overall, majority of the participants had HbA1c >7 g% (222, 64.2%).

Table 11: Distribution of participants according to HbA1c levels (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
HbA1c	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
<7.0 g%	59	34.1	65	37.6	124	35.8
>7.0 g%	114	65.9	108	62.4	222	64.2
Total	173	100	173	100	346	100

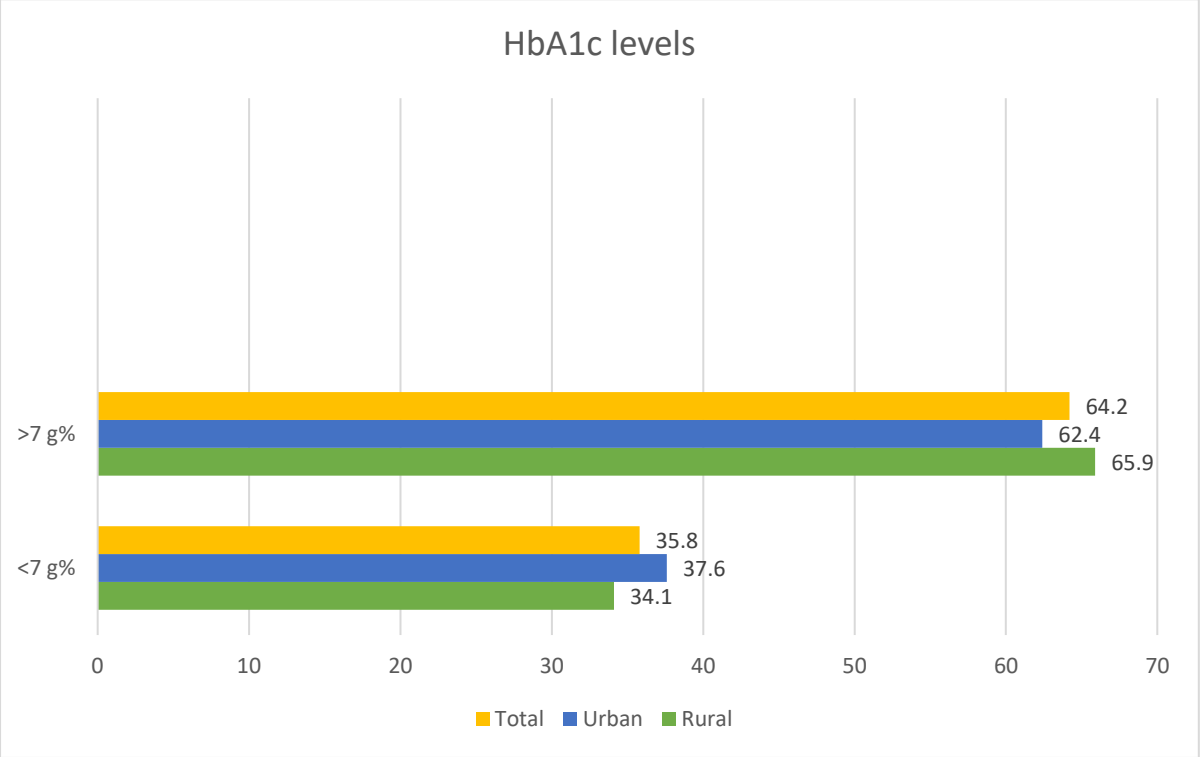

Figure 8: Distribution of participants according to HbA1c levels (n=346 for total, n=173 for each rural and urban)

4. Comorbidities:

Out of 173 participants residing in rural field practice area, 53.8% had no comorbidities, 45.1% had hypertension, and 1.2% had cancer (oral cancer).

Out of 173 participants residing in urban practice area, 45.1% had no comorbidities, 48.6% had hypertension, 5.7% had thyroid disorders. and had 0.9% had cancer (oral cancer).

Overall, most of the participants had no comorbidities (171, 49.4%).

Table 12: Distribution of participants according to comorbidities (n=346 for total, n=173 for each rural and urban)

Variable	**Rural**		**Urban**		**Total**	
Comorbidities	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
No comorbidities	93	53.8	78	45.1	171	49.4
Hypertension	78	45.1	84	48.6	162	46.8
Thyroid disorders	0	0	10	5.7	10	2.9
Cancer	2	1.2	1	0.6	3	0.9

5. Body Mass Index

Out of 173 participants residing in rural field practice area, 4% were underweight, 22% had normal BMI, 17.3% were overweight, and 56.6% were obese.

Out of 173 participants residing in urban field practice area, 0.6% were underweight, 20.8% had normal BMI, 17.9% were overweight, and 60.7% were obese.

Overall, most of the participants were obese (203, 58.6%).

Table 13: Distribution of participants according to BMI (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
BMI	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Underweight	7	4.0	1	0.6	8	2.4
Normal	38	22.0	36	20.8	74	21.4
Overweight	30	17.3	31	17.9	61	17.6
Obese	98	56.6	105	60.7	203	58.6
Total	173	100	173	100	346	100

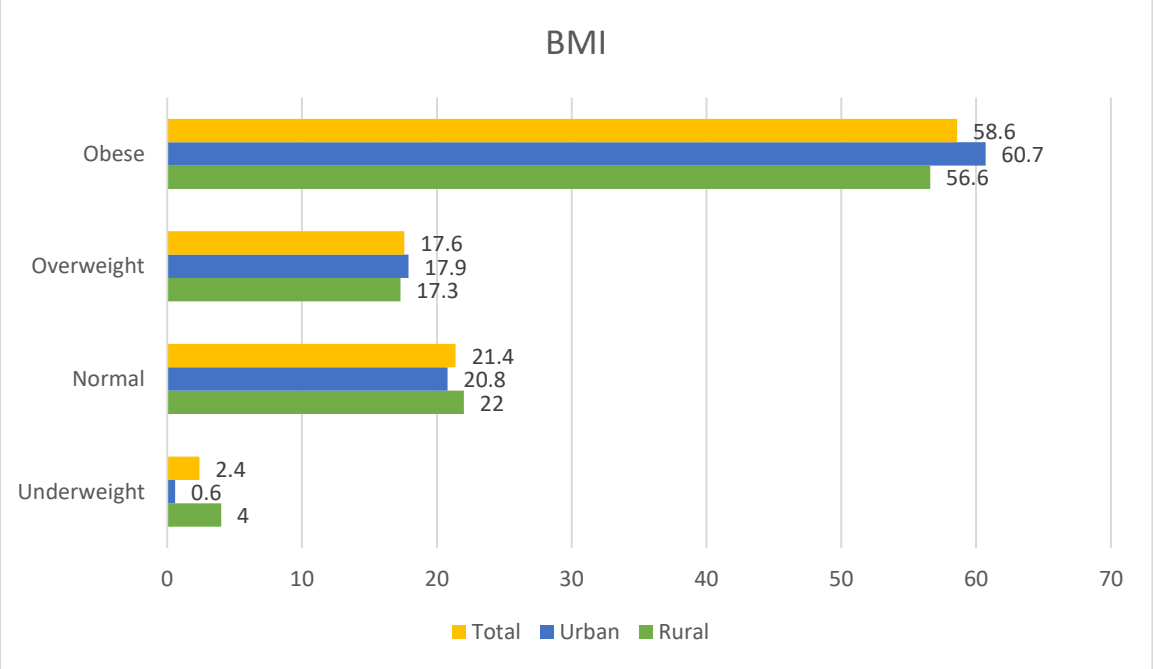

Figure 9: Distribution of participants according to BMI (n=346 for total, n=173 for each rural and urban)

6. Self-care levels

Table 14: Distribution of participants according to self-care levels (n=346 for total, n=173 for each rural and urban)

Variable	Rural		Urban		Total	
Self-care level	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Poor (0-33)	59	34.1	43	24.9	102	29.4
Moderate (34-67)	93	53.8	91	52.6	184	53.2
Good (68-99)	21	12.1	39	22.5	60	17.4
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 34.1% had poor self-care level, 53.8% had moderate self-care level, and 12.1% had good self-care level.

Out of 173 participants residing in urban field practice area, 24.9% had poor self-care level, 52.6% had moderate self-care level, and 22.5% had good self-care level.

Overall, majority of the participants had moderate self-care level (184, 53.2%).

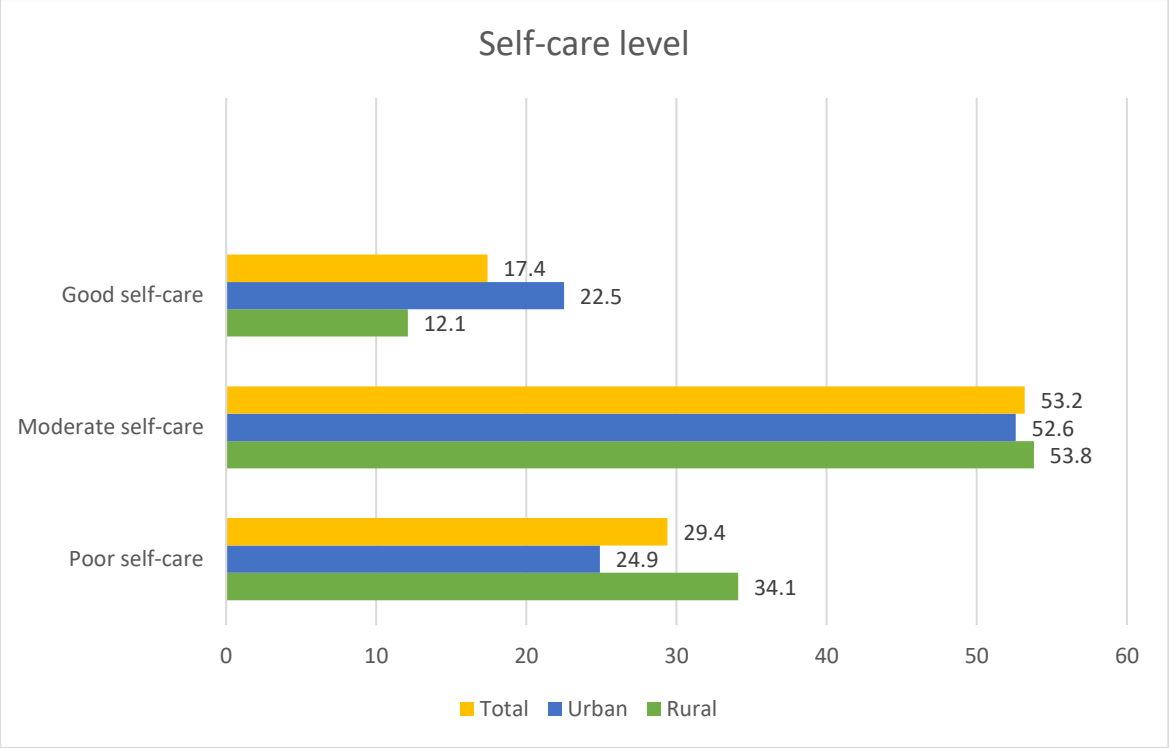

Figure 10: Distribution of participants according to self-care levels (n=346 for total, n=173 for each rural and urban)

III. COMPARISON OF SELF-CARE WITH OTHER VARIABLES

1. Association between HbA1c and self-care levels:

Table 15: Comparison of HbA1c and self-care levels

Hba1C	**Selfcare Level**			**Chi square**	**P value**
	Poor Self-Care (0-33)	**Moderate Self-Care (34-67)**	**Good Self-Care (68-99)**		
<7 g% (N=124)	7 (5.65%)	77 (62.1%)	40 (32.26%)	64.931	<0.001
>7 g% (N=222)	95 (42.79%)	107 (48.2%)	20 (9.01%)		

Participants with HbA1c <7 g%, i.e., good glycemic control, had a higher percentage of participants at self-care level 3 (good self-care score) - 32.3% compared to those with HbA1c >7 g% - 9%, i.e., poor glycemic control. Conversely, those with HbA1c >7 g% had a higher percentage of participants at self-care level 1 (poor self-care score) - 42.8% compared to the participants with HbA1c <7 g% - 5%.

The results suggest that participants with higher self-care levels are more likely to have good glycemic control, whereas those with lower self-care levels tend to have poor glycemic control. This indicates that HbA1c levels and self-care practices are significantly associated with a p-value < 0.001***

2. Correlation between HbA1c levels and self-care scores

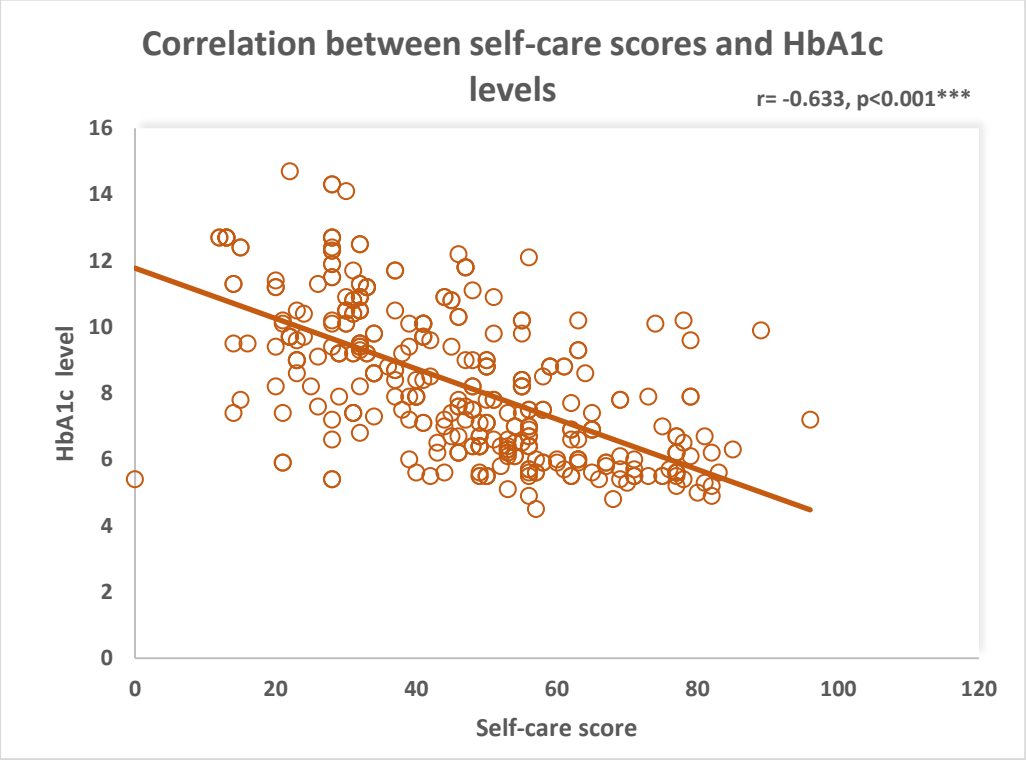

Figure 11: Correlation graph showing negative correlation between HbA1c levels and self-care scores

The Spearman's correlation coefficient of (-0.633) with p<0.001*** was found out between HbA1c and self-care behaviors which indicates moderate negative correlation between HbA1c and self-care levels. This indicates that as self-care behaviors score increases, HbA1c levels tend to decrease.

3. Association between self-care levels and place of residence

Table 16: Comparison of self-care levels and place of residence

Address	**Selfcare Level**			**Chi square**	**P value**
	Poor Self-Care (0-33)	**Moderate Self-Care (34-67)**	**Good Self-Care (68-99)**		
Urban (N=173)	43 (24.86%)	91 (52.6%)	39 (22.54%)	7.932	0.019
Rural (N=173)	59 (34.1%)	93 (53.76%)	21 (12.14%)		

The table shows that less participants residing in urban field practice area had poor self-care behaviors than those residing in rural field practice areas. The results suggest urban participants are more likely to have higher self-care levels, whereas those in rural tend to have lower self-care levels. This indicates that area of residence and self-care behaviors are significantly associated with a p-value of 0.019**.

4. Association between education and self-care levels and education

Table 17: Comparison of self-care levels and education

Education	**Selfcare Level**			**Chi square**	**P value**
	Poor Self-Care (0-33)	**Moderate Self-Care (34-67)**	**Good Self-Care (68-99)**		
No formal schooling (N=63)	27 (42.86%)	26 (41.27%)	10 (15.87%)	31.225	0.002
Less than primary school completed (N=13)	2 (15.38%)	10 (76.92%)	1 (7.69%)		
Primary school completed (N=100)	30 (30%)	63 (63%)	7 (7%)		
Secondary school completed (N=51)	18 (35.29%)	18 (35.29%)	15 (29.41%)		
High school completed (N=41)	11 (26.83%)	21 (51.22%)	9 (21.95%)		
College/university completed (N=71)	12 (16.9%)	42 (59.15%)	17 (23.94%)		
Postgraduate (N=7)	2 (28.57%)	4 (57.14%)	1 (14.29%)		

The table shows that more participants with lower education levels had poor self-care behaviors than those with higher education levels. The results suggest participants with higher education levels are more likely to have higher self-care levels, whereas those with lower education levels tend to have lower self-care levels. This indicates that education and self-care behaviors are significantly associated with a p-value of 0.002**.

IV. BARRIERS TO SELF-CARE BEHAVIORS

1. Individual barriers

Table 18: Mean scores of individual barriers

Variable	**Rural**		**Urban**	
Individual barriers	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Diet barrier	25.03	12.746	26.30	12.994
Medication barrier	29.66	15.049	29.67	12.951
Blood glucose monitor barrier	30.03	13.618	31.14	12.543
Exercise barrier	25.03	12.670	23.53	12.065
Footcare barrier	10.57	6.321	14.99	9.537

In both rural and urban areas, the maximum barrier scores were for the blood glucose monitoring barrier – 30.03 in rural and 31.14 in urban.

The lowest barrier score was for footcare – 10.57 in rural and 14.99 in urban.

2. Barrier score

The mean and standard deviation of the barrier score of the participants are as below.

Table 19: Mean and standard deviation of barrier scores of participants

Variable	Rural		Urban		Total	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Barrier score	120.32	51.143	125.64	48.893	123.17	50.107

3. Distribution of participants according to mean barrier score

Table 20: Distribution of participants according to mean barrier score

Variable	Rural		Urban		Total	
Mean barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	76	43.9	77	44.5	153	44.2
Above mean	97	56.1	96	55.5	193	55.8
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 43.9% had barrier score less than the mean and 56.1% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 44.5% had barrier score less than the mean and 55.5% had barrier score more than the mean.

Overall, majority of the participants had barrier score more than the mean (193, 55.8%).

4. Diet barrier score

Table 21: Distribution of participants according to diet barrier mean scores

Variable	**Rural**		**Urban**		**Total**	
Diet barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	85	49.1	67	38.7	152	43.9
Above mean	88	50.9	106	61.3	194	56.1
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 49.1% had barrier score less than the mean and 50.9% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 38.7% had barrier score less than the mean and 61.3% had barrier score more than the mean.

Overall, majority of the participants had barrier score more than the mean (194, 56.1%).

5. Medication barrier

Table 22: Distribution of participants according to medication barrier mean scores

Variable	Rural		Urban		Total	
Medication barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	35	20.2	74	42.8	109	31.5
Above mean	138	79.8	99	57.2	237	68.5
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 20.2% had barrier score less than the mean and 79.8% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 42.8% had barrier score less than the mean and 57.2% had barrier score more than the mean.

Overall, most of the participants had barrier score more than the mean (237, 68.5%).

6. Blood glucose monitoring barrier

Table 23: Distribution of participants according to blood glucose monitoring barrier mean scores

Variable	Rural		Urban		Total	
Blood barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	75	43.4	74	42.8	149	43
Above mean	98	56.6	99	57.2	197	57
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 43.4% had barrier score less than the mean and 56.6% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 42.8% had barrier score less than the mean and 57.2% had barrier score more than the mean.

Overall, majority of the participants had barrier score more than the mean (197, 57%).

7. Exercise barrier

Table 24: Distribution of participants according to exercise barrier mean scores

Variable	Rural		Urban		Total	
Exercise barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	43	24.9	86	49.7	129	37.2
Above mean	130	75.1	87	50.3	217	62.8
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 24.9% had barrier score less than the mean and 75.1% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 49.7% had barrier score less than the mean and 50.3% had barrier score more than the mean.

Overall, majority of the participants had barrier score more than the mean (217, 62.8%).

8. Footcare barrier

Table 25: Distribution of participants according to footcare barrier mean scores

Variable	**Rural**		**Urban**		**Total**	
Footcare barrier score	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Below mean	129	74.6	115	66.5	244	70.5
Above mean	44	25.4	58	33.5	102	29.5
Total	173	100	173	100	346	100

Out of 173 participants residing in rural field practice area, 74.6% had barrier score less than the mean and 25.4% had barrier score more than the mean.

Out of 173 participants residing in urban field practice area, 66.5% had barrier score less than the mean and 33.5% had barrier score more than the mean.

Overall, majority of the participants had barrier score less than the mean (244, 70.5%).

6. COMPARISON OF SELF-CARE LEVELS AND BARRIERS

1. Diet barrier and self-care levels

Table 26: Comparison of mean diet barrier and self-care levels

Selfcare level	Diet Barrier Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	31.97 ± 11.06				
Moderate self-care (34-67)	24.27 ± 12.93	7.70	4.75	10.65	<0.001
Good self-care (68-99)	19.43 ± 11.36	12.54	8.65	16.42	<0.001

The table shows that participants who had poor self-care levels had higher diet barrier scores, and those who had good self-care levels had lower diet barrier scores. This result indicates that diet barrier is associated with self-care levels with p-value <0.001***

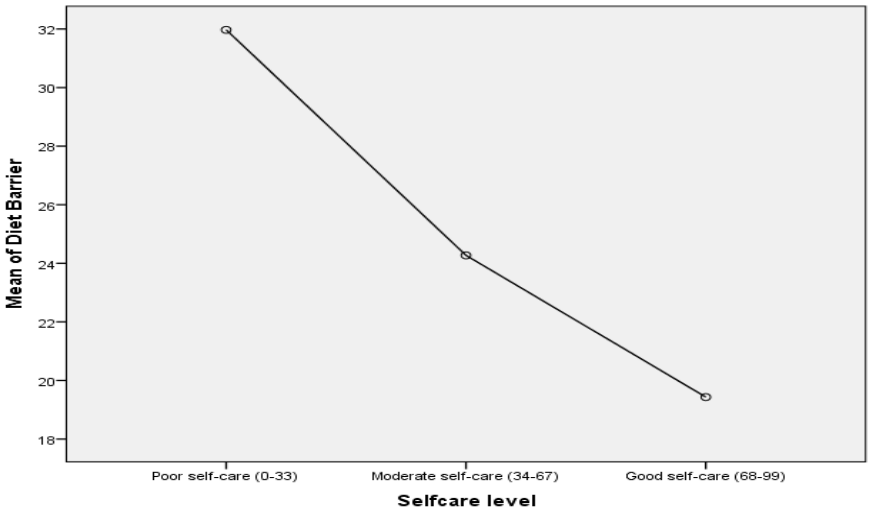

Figure 12: Graph showing higher diet barrier scores for poor self-care and lower diet barrier scores for good self-care

2. Medication barrier and self-care levels

Table 27: Comparison of mean medication barrier and self-care levels

Selfcare level	Medication Barrier Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	35.49 ± 12.29				
Moderate self-care (34-67)	28.85 ± 14.48	6.64	3.39	9.90	<0.001
Good self-care (68-99)	22.55 ± 11.63	12.94	8.65	17.23	<0.001

The table shows that participants who had poor self-care levels had higher medication barrier scores, and those who had good self-care levels had lower medication barrier scores. This result indicates that medication barrier is associated with self-care levels with p-value <0.001***

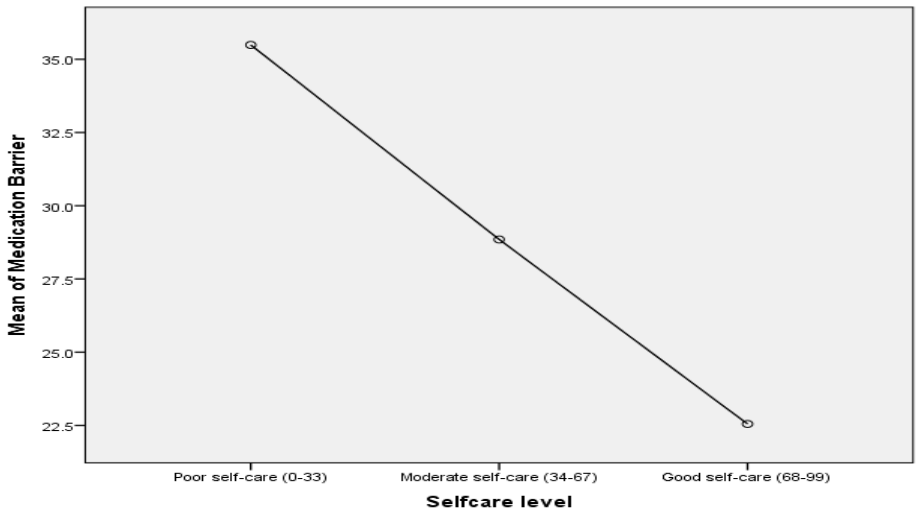

Figure 13: Graph showing higher medication barrier scores for poor self-care and lower medication barrier scores for good self-care

3. Blood glucose monitoring barrier and self-care levels

Table 28: Comparison of mean blood glucose monitoring barrier and self-care levels

Selfcare level	Blood Barrier Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	36.34 ± 10.81				
Moderate self-care (34-67)	29.54 ± 13.67	6.80	3.78	9.82	<0.001
Good self-care (68-99)	24.23 ± 11.05	12.11	8.12	16.09	<0.001

The table shows that participants who had poor self-care levels had higher blood glucose monitoring barrier scores, and those who had good self-care levels had lower blood glucose monitoring barrier scores. This result indicates that blood glucose monitoring barrier is associated with self-care levels with p-value <0.001***

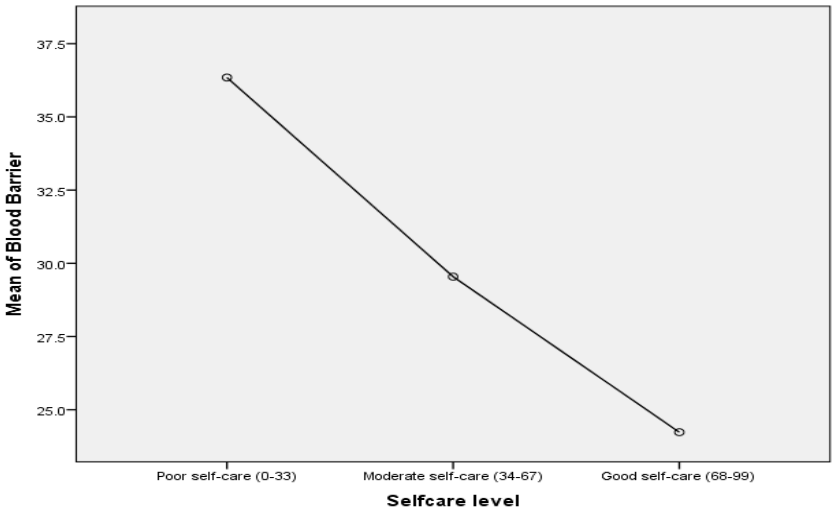

Figure 14: Graph showing higher blood glucose monitoring barrier scores for poor self-care and lower blood glucose monitoring barrier scores for good self-care

4. Exercise barriers and self-care levels

Table 29: Comparison of mean exercise barrier and self-care levels

Selfcare level	Exercise Barrier Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	29.25 ± 10.58				
Moderate self-care (34-67)	24.06 ± 12.91	5.19	2.34	8.03	<0.001
Good self-care (68-99)	16.92 ± 9.47	12.33	8.58	16.08	<0.001

The table shows that participants who had poor self-care levels had higher exercise barrier scores, and those who had good self-care levels had lower exercise barrier scores. This result indicates that exercise barrier is associated with self-care levels with p-value <0.001***

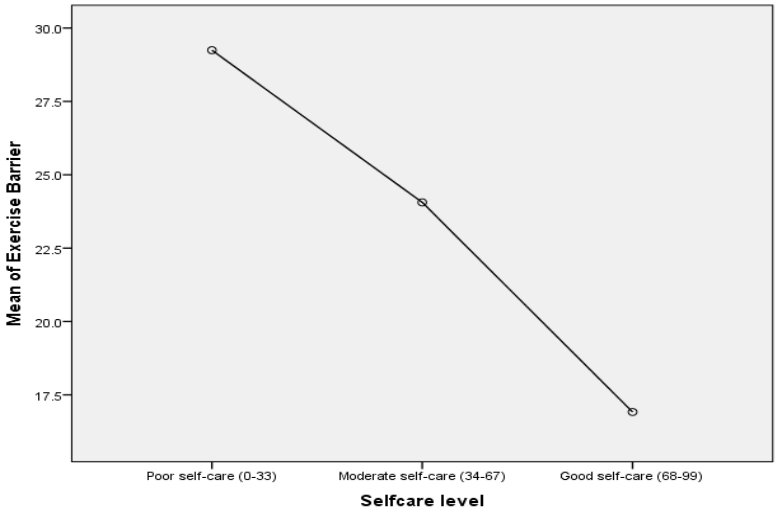

Figure 15: Graph showing higher exercise barrier scores for poor self-care and lower exercise barrier scores for good self-care

5. Foot-care barrier and self-care levels

Table 30: Comparison of mean foot-care barrier and self-care levels

Selfcare level	Foot Barrier Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	12.66 ± 10.26				
Moderate self-care (34-67)	11.35 ± 6.06	1.30	-0.67	3.28	0.194
Good self-care (68-99)	17.3 ± 9.46	4.64	-7.24	-2.04	<0.001

The table shows that participants who had good self-care levels had higher foot-care barrier scores. This result indicates that exercise barrier is associated with self-care levels with p-value <0.001***

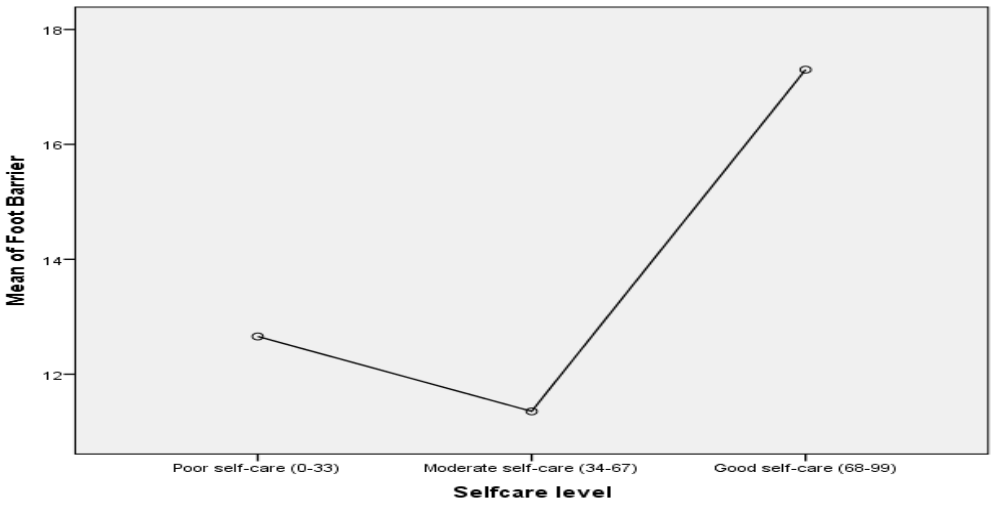

Figure 16: Graph showing higher foot-care barrier scores for good self-care

6. Total barrier score and self-care levels

Table 31: Comparison of mean of total barrier score and self-care levels

Selfcare level	Total Barrier score Mean ± SD	Mean difference	95% CI		P value
			Lower	Upper	
Poor self-care (0-33)	145.71 ± 41.93				
Moderate self-care (34-67)	118.09 ± 51.25	27.62	16.05	39.19	<0.001
Good self-care (68-99)	100.43 ± 45.16	45.27	30.03	60.52	<0.001

The table shows that participants who had poor self-care levels had higher mean barrier scores, and those who had good self-care levels had lower mean barrier scores. This result indicates that barrier is associated with self-care levels with p-value <0.001***

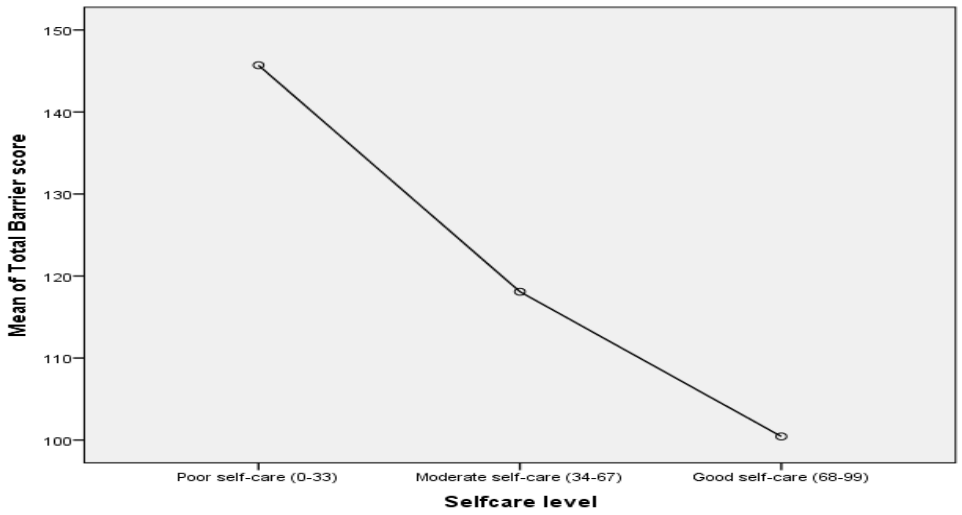

Figure 17: Graph showing higher total barrier scores for poor self-care and lower total barrier scores for good self-care

7. Correlation between self-care levels and total barrier score

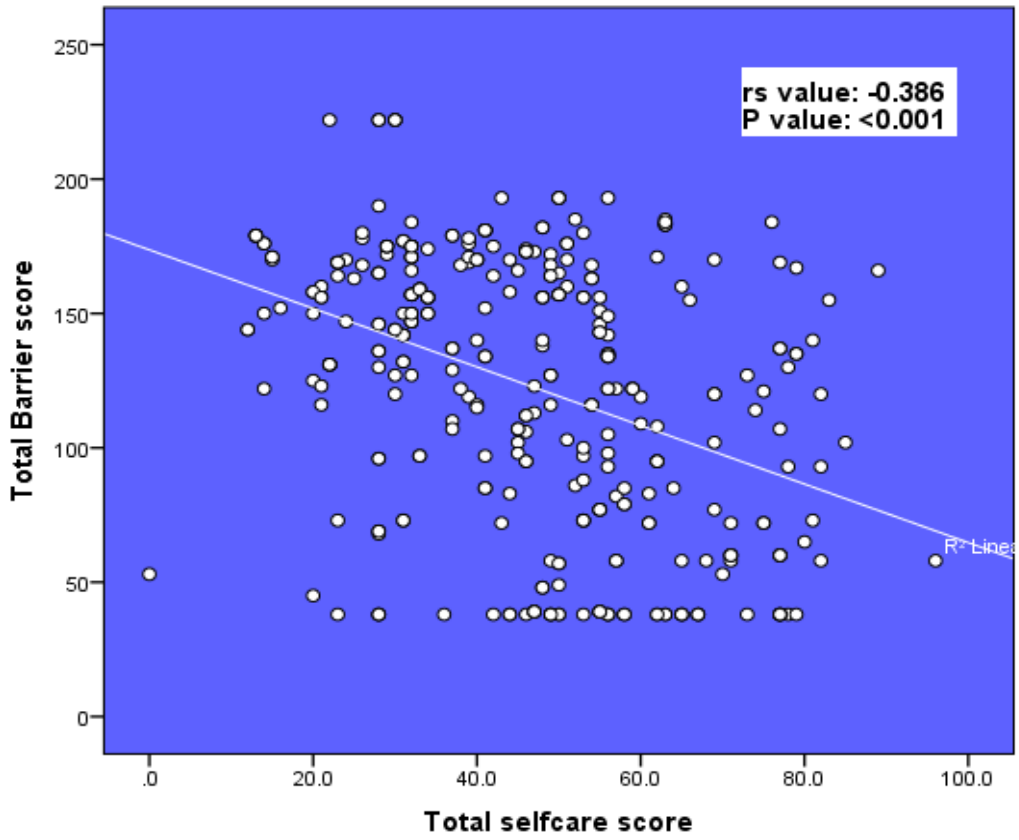

Figure 18: Correlation graph showing negative correlation between total barrier scores and self-care scores

The Spearman's correlation coefficient of (-0.386) with p<0.001*** was found out between total barrier scores and self-care behavior scores which indicates moderate negative correlation between total barrier score and self-care levels. This indicates that as self-care behaviors score increases, barrier scores tend to decrease.

DISCUSSION

The present cross-sectional study carried out between October 2022 and September 2023 among patients diagnosed with T2DM residing in the field practice areas of Kinaye (rural) and Ashok Nagar (urban), intended to assess and compare the relationship between self-care behaviors and glycemic control in T2DM patients residing in rural and urban field practice areas. Also, to find out the barriers to self-care behaviors among T2DM patients residing in rural and urban field practice areas.

I. Socio-demographic variables

Table 1: Distribution of participants according to age

In the present study, the mean ± standard deviation age of the participants in rural area was 60.24 ± 12.77, and in the urban area was 55.76 ± 12.72.

This is similar to the studies conducted by Modarresi et al.[24] – 54.5 ± 10.9, Amelia et al.[25] range 56-65 years, Almomani MH et al.[27] – 55.86 ± 11.8, and various other studies.

This in accordance with the disease pattern of T2DM where the risk of getting the disease increases after 30 years of age, and most patients are in the fourth or fifth decades of their life.

Table 2: Distribution of participants according to gender (n=346 for total, n=173 for each rural and urban)

In the present study, the female participants (242, 69.9%) were more than males.

This is similar to the studies conducted by Modarresi et al.[24] – 58% were female, Amelia et al.[25] – 75.4% were female, Hai AA et al.[28] – 72.6% were female, where females were more than males.

However, other studies by Rajasekharan D et al.[23], Almomani MH et al.[27], Dinesh PV et al.[30], have reported that males were more than females.

The opinion of whether males or females are more susceptible to T2DM is divided in the available literature. While some studies like that of Nordström A et al.[40] report that prevalence of T2DM is more in older men than in older women – men had about/approximately twice the odds of having type 2 diabetes compared with women (odds ratio [OR], 1.95; 95% confidence interval [CI], 1.38-2.76), other studies report that women are at greater risk of T2DM because of social factors.[41] According to NFHS-5 estimates the prevalence of T2DM increased with age and was higher for males (16.8% (16.6–16.9%)) than for females (15.4% (15.2–15.4%)).[42]

Table 3: Distribution of participants according to religion (n=346 for total, n=173 for each rural and urban)

In the present study overall, the Hindu participants (291, 84.1%) were the majority. This is line with various other studies as Hindu is the major religion in India.

Table 4: Distribution of participants according to education (n=346 for total, n=173 for each rural and urban)

In the present study, overall, most of the participants had completed till primary school education (99, 28.6%).

This is in line with the studies by Almomani MH et al.[27], Hai AA et al.[28], Dinesh PV et al.[30], who have similar results of education till primary school. However, in a

country like India the education status vary widely depending on the area, and other socio-economic and cultural factors. The urban-rural divide is still present as seen in the present study where 15.6% have completed till high school in urban area and only 8.1% have completed high school in rural area.

Table 5: Distribution of participants according to occupation (n=346 for total, n=173 for each rural and urban)

In the present study, the major occupation among the participants was homemaker (182, 52.6%). Again, this varies widely in various studies. We can surmise that since majority of the study participants in the present study where female (69.9%) and in a country like India married women are given the role of housewife/homemaker, the major occupation is homemaker.

Table 6: Distribution of participants according to marital status (n=346 for total, n=173 for each rural and urban)

In the present study, most of the participants were married (296, 85.5%).

This is similar to studies by Rajasekharan D et al.[23], Dinesh PV et al.[30]. This is the expected results in a country like India where marriage is universal.

Table 7: Distribution of participants according to family type (n=346 for total, n=173 for each rural and urban)

In the present study, most of the participants were living in nuclear family (176, 50.8%).

This varies in different studies. However, this result can be understood with that background that there is a rising trend of nuclear families, one-child norm etc. due to

various socio-economic reasons. Previously, rural India had joint family setup, but in the present study nuclear families are more in both urban and rural areas.

Table 8: Distribution of participants according to socio-economic class (n=346 for total, n=173 for each rural and urban)

In the present study, the majority of the participants belonged to Class III (114, 32.9%), according to Modified B.G. Prasad's socio-economic status classification. Different studies have used different classification systems for assessing the socio-economic status. However, majority participants belong to middle class with a monthly per-capita income of 2630-4294, as comparable in different classification systems.

II. Diabetes Status

Table 9: Distribution of participants according to duration of diabetes (in years):

In the present study, the mean ± standard deviation of diabetes duration in years was 6.64 ± 5.397 in rural field practice area and 5.94 ± 5.651 in urban field practice area.

This is similar to other studies: Rajasekharan D et al.[23] report majority (70.3%) were <10 years in duration since diagnosis and Modarresi et al.[24] report 9.53 ± 8.39 as the mean duration of diabetes.

Table 10: Distribution of participants according to diabetes management (n=346 for total, n=173 for each rural and urban)

In the present study, most of the participants were on oral hypoglycemic drugs (337, 97.3%) as a management of T2DM.

This is similar to Modarresi et al.[24] and Hai AA[28] where 54.3% and 61.7% were on oral hypoglycemic drugs, respectively. This is in line with the standard treatment regime where the T2DM patients are put on oral hypoglycemic drugs mainly.

Table 11: Distribution of participants according to HbA1c levels (n=346 for total, n=173 for each rural and urban)

Most of the participants in the present study had HbA1c >7 g% (222, 64.2%), i.e., uncontrolled glycemic status.

Modarresi et al.[24] reported in their study a mean HbA1c of 7.93 ± 1.39, i.e., uncontrolled HbA1c levels. Amelia R et al.[25] reported 72.9% of their study participants had less controlled diabetes status. Almomani MH et al.[27] reported 92.7% of their study participants had high HbA1c levels. Overall, in literature many studies have reported uncontrolled/high HbA1c levels in T2DM patients.[43-45]

This is a worrying result as poor glycemic control will lead to serious health complications.[46]

Table 12: Distribution of participants according to comorbidities (n=346 for total, n=173 for each rural and urban)

In the present study, most of the participants had no comorbidities (171, 49.4%). Among those who had comorbidities, 45.95% had hypertension.

Almomani MH et al.[27] reported 52.9% of their study participants had comorbidities.

The reason for low comorbid conditions among the present study participants may be because they have not checked themselves for other conditions.

Table 13: Distribution of participants according to BMI (n=346 for total, n=173 for each rural and urban)

Majority of the participants in the present study were found to be obese (203, 58.6%).

This is in line with other studies that have reported a majority of obese study participants.[24,27,28]

This is in line with the increasing trend in overweight and obesity throughout the country. Compared with NFHS-4, the prevalence of overweight or obesity has increased in most States/UTs in NFHS-5. Overall, in India, it increased from 21% to 24% among women and 19% to 23% among men. According to NFHS-5, 24% women and 22.9% men are overweight or obese, and it is higher in urban area than in rural area.[47] These statistics are in line with the study results where overweight and obesity were seen more in urban than in rural areas.

Table 14: Distribution of participants according to self-care levels (n=346 for total, n=173 for each rural and urban)

In the present study, out of 173 participants residing in rural field practice area, 34.1% had poor self-care level, 53.8% had moderate self-care level, and 12.1% had good self-care level. Out of 173 participants residing in urban field practice area, 24.9% had poor self-care level, 52.6% had moderate self-care level, and 22.5% had good self-care level.

Overall, majority of the participants had moderate self-care level (184, 53.2%).

Rajasekharan D et al.[23] reported that among their study participants self-care practices was found to be unsatisfactory. Modarresi et al.[24] reported 62.5% participants had poor self-care level; 37.5% had moderate self-care level; and zero participant had

good self-care level. Amelia R et al.[25] reported 86.4% had poor self-care level. Almomani MH et al.[27] reported only 20.8% had satisfactory self-care levels. Hai AA et al.[28] reported 48.6% had poor self-care levels. Other studies across the literature also report poor self-care levels among the T2DM patients.[29,30]

III. Comparison of self-care with other variables

Table 15: Comparison of HbA1c and self-care levels

In the present study it was found that HbA1c levels are significantly associated with self-care behaviors with a p-value < 0.001***. Participants with HbA1c <7 g% -good glycemic control had a higher percentage of self-care scores- 32.3% compared to those with HbA1c >7 g% - poor glycemic control- 9%. Conversely, participants with poor glycemic control had a higher percentage of poor self-care scores - 42.8% compared to those with good glycemic control - 5%.

Modarresi et al.[24] Almomani MH et al.[27] reported a similar finding: the mean of self-care score was higher in patients with HbA1C $\leq$ 7 g% with p-value <0.001**.[27]

This is in line with many studies available in the literature which report significant association between lower HbA1c levels and higher self-care scores.[45,46,48-50]

Figure 11: Correlation graph showing negative correlation between HbA1c levels and self-care scores

In the present study, the Spearman's correlation coefficient of (-0.633) with p<0.001*** was found out between HbA1c and self-care behaviors which indicates moderate negative correlation between HbA1c and self-care levels. This indicates that as self-care behaviors score increases, HbA1c levels tend to decrease.

Studies by Modaressi et al.[24], Shrivastava SR et al.[26], Almomani MH et al.[27] Amelia R et al.[25], all report a negative correlation between HbA1c levels and self-care behaviors.

Table 16: Comparison of self-care levels and place of residence

In the present study it was found that less participants residing in urban field practice area had poor self-care behaviors than those residing in rural field practice areas. The results suggest urban participants are more likely to have higher self-care levels, whereas those in rural tend to have lower self-care levels. This indicates that area of residence is significantly associated with self-care behaviors with a p-value of 0.019**

Though many studies have been conducted exploring the self-care behaviors in T2DM patients, very few compare the practices of T2DM patients residing in rural and urban areas. As known already, the urban-rural divide is well present and increasing. Also, variables affecting the health of rural and urban population are many and quite different.

Reasons for better self-care behaviors among urban participants than rural participants may be better awareness by means of better education (see below), lifestyle, occupation etc. Further studies are required which analyse the different variables that affect the self-care behaviors among the rural and urban populations.

Table 17: Comparison of self-care levels and education

In the present study it was found that more participants with lower education levels had poor self-care behaviors than those with higher education levels. The results suggest participants with higher education levels are more likely to have higher self-

care levels, whereas those with lower education levels tend to have lower self-care levels. This indicates that education is associated with self-care behaviors with a p-value of 0.002**

Studies by Modaressi et al.[24] and Almomani MH et al.[27] also report higher self-care scores in participants with higher education levels.

The result can be reasoned that with increasing levels of education people are better aware of their health status and disease and the role played by them in the management of the same – they are more aware of the importance of the self-care behaviors in disease management and show a better adherence than those with low education levels who may have low awareness and consequently low adherence.

IV. Barriers to self-care behaviors

Table 19: Mean and standard deviation of barrier scores of participants

In the present study, the mean ± standard deviation of barrier scores for rural area was 120.32 ± 51.143, and in the urban area it was 125.64 ± 48.893.

Overall, it was 123.17 ± 50.107.

Jafari S et al.[33] reported that among their study participants the mean barrier score was 150.63 ± 50.7. Ghosh A et al.[34] reported an overall barrier score of 134 ± 30. Various other studies in the literature have reported similar results.[51-53]

Table 20: Mean total barrier score

In the present study, no significant difference was found between rural and urban field practice areas, i.e., the barrier scores were similar in rural and urban field practice areas. In both areas of residence, the maximum barrier scores were for the blood

glucose monitoring barrier – 30.03 in rural and 31.14 in urban. The lowest barrier score was for footcare – 10.57 in rural and 14.99 in urban.

Different studies report different barriers, but the majority of the barriers were found to be medication adherence, lack of diet control, irregular exercise/physical activity, and improper glucose monitoring.[33,34,51-54]

Blood glucose monitoring requires purchasing and using glucometer and strips, which are usually self-operated and are often expensive. Also, people may not be comfortable to prick themselves to check the blood glucose level. These might be the reasons for the increased blood glucose monitoring barrier scores in the present study.

The low score for footcare barrier may be attributed to the prevailing socio-cultural practices in the country. In both Hindu and Muslim traditions, the two major religions in India and in the present study, it is a practice to wash the feet regularly, before entering the house, before/after eating, before prayer etc. These ingrained habits would have made the people to follow these self-care behaviors as part of their routine life without any difficulties, and hence the low score.

However, a study by BGS et al. found out that 18.9% of their participants were part of the very-high-risk group for development of diabetic foot related complications.[35] Among various other practices the purchase and usage of special footwear (MCR) is found to be still lacking.

V. Comparison of self-care levels and barriers

Table 31: Comparison of mean of total barrier score and self-care levels

In the present study, it was found that participants who had poor self-care levels had higher mean barrier scores, and those who had good self-care levels had lower mean

barrier scores. This result indicates that barrier is associated with self-care levels with p-value <0.001***

Also, almost all self-care domains were highly significantly associated with the barrier domains, i.e., participants with high self-care scores tend to have low barrier scores.

In the present study, the Spearman's correlation coefficient of (-0.386) with p<0.001*** was found out between total barrier scores and self-care behavior scores which indicates moderate negative correlation between total barrier score and self-care levels. This indicates that as self-care behaviors score increases, barrier scores tend to decrease.

Ghosh A et al in their study report strong inter-relationships among all self-care components. They also found that the relationship was high for environmental barrier score for exercise, glucose testing and medications (39-62%).[34] These findings are in line with the present study.

CONCLUSION

Based on a comprehensive analysis of the present study, the following conclusions are made:

- Self-care behaviors have an effect on glycemic control. People with high levels of self-care behaviors tend to have good glycemic control.
- Self-care behaviors are significantly correlated with HbA1c levels. As the person's self-care levels increase the HbA1c levels decrease.
- The self-care levels vary between the rural and urban areas significantly. People in urban areas tend to have higher self-care levels when compared with people in rural areas.
- Education is significantly associated with self-care behavior levels. Persons with higher education levels are more likely to have higher self-care levels, whereas those with lower education levels tend to have lower self-care levels.
- Barriers to self-care behaviors are significantly associated with the self-care levels. Persons with poor self-care levels tend to have higher mean barrier scores, and those who have good self-care levels tend to have lower mean barrier scores.
- Barriers to self-care behaviors are significantly correlated with self-care levels. That is, as self-care behaviors score increases, barrier scores tend to decrease.

This study adds to the evidence of the need for self-care behaviors in T2DM. Emphasis is placed on the adherence to these self-care behaviors for good glycemic control, thereby preventing serious complications, and thus forming a comprehensive and holistic approach to the management of T2DM.

RECOMMENDATIONS

After arriving at these conclusions and studying the present state of affairs, we propose the following recommendations:

- **Education and awareness:**

  As it has been made clear that self-care behaviors have an effect on glycemic control, and also that majority of people do not have good self-care levels, various Information, Education, Communication (IEC) activities like roleplay, skit, giving out pamphlets, must be undertaken at the grassroot level by the community health workers to spread awareness among the people, especially in the rural area where self-care levels are significantly lower than the urban area, ultimately bringing about a change for the better with regard to self-care behaviors - Behavior Change Communication (BCC).

- **Self-care monitoring charts:**

  A calendar-based chart with the six-domains of self-care printed on it can be provided to the T2DM patient. The patient will daily fill in the chart based on the self-care behaviors that he/she is carrying out. The new cadre of staff appointed especially for NCDs- Community Health Officers (CHO) can regularly check these cards, and advise the patient to make changes, if any needed, or encourage them to continue the good self-care behaviors. This is an efficient and effective method to remember and keep track of the self-care behaviors, and also acts as tool for documentation and review.

- **Tailored counselling:**

  As made clear by the present study, the divide between rural and urban areas is wide. Also, the patient's education level and his/her ability to understand the

importance of self-care behaviors and adhere to the same may be different. So, the healthcare workers, preferably, the CHOs should spend time with each newly diagnosed patient. During this time when the patient is in the initial stages of the disease, the need for adherence to self-care behaviors should be emphasised on him/her. Apart from the patient themselves, their family should also be counselled regarding the need for adherence to self-care behaviors. A responsible person from the patient's family can be asked to look after and remind the patient regarding the regular following of these good self-care behaviors.

- **Addressing the barriers:**

  As seen in the present study, barriers were present in both rural and urban areas. The main barrier being blood glucose monitoring barrier. Government or non-governmental organisations may come up with cheap or free glucometers and strips which will enable wide purchase and usage of the same for glucose monitoring by the patients. Also, the CHOs can make home visits every month to check the blood glucose status of the patients who are not able to visits the health centres for various reasons.

- **Further research:**

  Though many studies have been conducted exploring the self-care behaviors in T2DM patients, very few compare the practices of T2DM patients residing in rural and urban areas. Further research is required to analyse the different variables that affect the self-care behaviors among the rural and urban populations.

STRENGTHS

While most studies on diabetes are done in hospitals, diabetic clinics/care centres, this community based comparative cross-sectional study collected data at the ground level in the community - from the field practice areas of Kinaye (rural) and Ashok Nagar (urban), using systematic sampling technique, which is a major strength of the present study. This adds to the external validity of the study and increases the generalisability of the results.

This study is a first of its kind in India which assessed and compared the self-care behaviors and its barriers in urban and rural areas. It adds to the evidence that self-care behaviors are better in urban area in comparison to rural area, emphasising the need for target-specific interventions.

The study used two standard validated questionnaires to collect the data, with proper scoring to evaluate and present the results in a comprehensive manner, finding out associations and correlations between the variables.

Apart from collecting the data on self-care behaviors, we also analysed the HbA1c levels of the participants using standard techniques and compared the two, thereby generating evidence that self-care behaviors are significantly associated with glycemic control.

These add to the internal validity of the study, increasing its validity, reliability, and repeatability.

Moreover, the data collection period was used as an opportunity to educate the patients regarding the need for self-care behaviors, thereby increasing awareness.

LIMITATIONS

Though the internal and external validity of the study are robust, it is not without limitations, which need to be addressed.

Firstly, the collected data is self-reported information, which has a potential for self-reporting bias and also white coat bias, leading participants to provide answers they perceive as correct and not what they actually practice. This limitation could impact the accuracy of the collected information.

The nature of the questionnaire is such that it collects self-care behaviors practiced in the last seven days and extrapolating it to the person's overall practice. Though care has been taken in exclusion criteria to remove such people who may have acute febrile illness and/or bed-ridden, or diagnosed with cardiovascular disease, renal disease, or cerebrovascular disease within 1 month from the date of interview, which may hamper their practice of self-care behaviors, there is still a chance for the persons to not practice good self-care behaviors in the past 7 days due to various other reasons, which is a limitation.

Finally, the cross-sectional type of the study itself is a limitation, where data is collected at one point of time. Further studies of a follow-up nature are required to more comprehensively analyze the objectives.

These limitations have to be considered when interpreting the findings. Addressing these limitations in future research could further advance the holistic and comprehensive management strategies of T2DM.

SUMMARY

Diabetes mellitus (DM), along with other non-communicable diseases (NCDs), is on the rise, worldwide. Though self-care is incorporated into the national programme - provision of free check-ups, free drugs, and health education, the available studies regarding self-care practices report poor compliance of diabetic patients regarding the same. They also stress the immense need for extensive research in the effectiveness of self-care management, especially in the rural areas of developing nations.

Though many such studies have been conducted exploring the self-care behaviors in T2DM patients, very few compare the practices of T2DM patients residing in rural and urban field practice areas. This study intended to assess and compare the relationship between self-care behaviors and glycemic control in T2DM patients residing in rural and urban areas. Also, to find out the barriers to self-care practices among T2DM patients residing in rural and urban field practice areas.

This community based comparative cross-sectional study was carried out between October 2022 and September 2023 among 346 patients diagnosed with T2DM residing in the field practice areas of Kinaye (rural) and Ashok Nagar (urban), 173 in each area.

After obtaining informed consent, sociodemographic details were collected using a predesigned, pretested questionnaire. Data regarding the self-care behaviors were collected using a validated standard questionnaire, the “revised version of summary diabetes self-care activities questionnaire” (SDSCA). Data regarding the barriers were collected using another validated standard questionnaire, the “personal diabetes

questionnaire" (PDQ). Venous blood sample was drawn from the antecubital vein and sent in EDTA tubes to diagnostic laboratory for estimation of the levels of HbA1c.

The data was entered into Microsoft Excel soand analyzed in SPSS software. Chi-square and Spearman correlation were used.

The mean ± standard deviation age of the participants in rural field practice area was 60.24 ± 12.77, and in the urban field practice area was 55.76 ± 12.72. The female participants (242, 69.9%) were more than males. Hindu participants (291, 84.1%) were the majority. The majority education level was till primary school (99, 28.6%). The major occupation among the participants was homemaker (182, 52.6%). The majority of the study participants belonged to Class III (114, 32.9%), according to Modified B.G. Prasad's socio-economic status classification.

The mean ± standard deviation of diabetes duration in years was 6.64 ± 5.397 in rural field practice area and 5.94 ± 5.651 in urban field practice area. Majority of the participants had HbA1c >7 g% (222, 64.2%), i.e., uncontrolled glycemic status. Overall, majority of the participants had moderate self-care level (184, 53.2%).

HbA1c levels are significantly associated with self-care practices. Spearman's correlation coefficient was found significant between HbA1c and self-care behaviors which indicates moderate negative correlation between HbA1c and self-care levels. Urban participants are more likely to have higher self-care levels, whereas those in rural tend to have lower self-care levels. Participants with higher education levels are more likely to have higher self-care levels, whereas those with lower education levels tend to have lower self-care levels.

In the present study, in both rural and urban areas, the maximum barrier scores were for the blood glucose monitoring barrier. Participants who had poor self-care levels had higher mean barrier scores, and those who had good self-care levels had lower mean barrier scores.

This study adds to the evidence of the need for self-care behaviors in T2DM. Emphasis is placed on the adherence to these self-care behaviors for good glycemic control, thereby preventing serious complications, and thus forming a comprehensive and holistic approach to the management of T2DM.

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ANNEXURE – I

INFORMED CONSENT FORM

"EFFECT OF SELF-CARE BEHAVIORS ON GLYCEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS RESIDING IN RURAL AND URBAN FIELD PRACTICE AREAS OF NORTH KARNATAKA"

Objective: 1. To assess the effect of self-care practices on glycemic control in T2DM patients residing in rural and urban areas. 2. To find out the barriers to self-care practices among T2DM patients residing in rural and urban areas.

Introduction: Diabetes mellitus is on the rise worldwide. The present study would add evidence regarding the self-care component in the management of type 2 diabetes mellitus in India by assessing the self-care practices and its effect on glycemic control. The present study also compares the self-care practices between rural and urban populations, which can be used for planning targeted community-based interventions. For this study, we will ask you questions to evaluate the self-care behaviors and its barriers and also collect blood sample for the estimation of HbA1c levels.

Explanation of procedure: Questions regarding self-care behaviors and its barriers will be asked in your native language. 5 ml of venous blood sample will be drawn from your antecubital vein and sent in EDTA tubes to diagnostic laboratory for estimation of the levels of HbA1c.

Withdrawal from participation in the study: Participation in this study is voluntary. You will be free to decide whether to participate in this study or continue participation once enrolled. In case you decide to withdraw your participation, you are free to do so. However, please convey the decision to the principal investigator.

Possible benefits from participating in the study: You will/will not have nor get any benefits by participating in this study. The data gathered will help the population at large.

Possible risks from participating in the study: There are no risks involved in participating in this study

Privacy and confidentiality: The information collected from you will be coded, to prevent any person from identifying you. Your identity will never be revealed. The data collected from you will be kept confidential and only processed or aggregated data will be used for publication.

Financial incentives: You will not receive any payment for participating in this study.

Authorization for publication of aggregated data: Results obtained after processing of the aggregated data will be published for scientific purposes and or presented to scientific groups. However, your identity will never be revealed.

Legal rights: By signing this consent form, we are not waiving any of your legal rights.

CONSENT STATEMENT

I am making a voluntary decision to participate in the study 'Effect of self-care behaviors on glycemic control among patients with type 2 diabetes mellitus residing in rural and urban field practice areas of North Karnataka.' My signature below indicates that I have decided to participate and I have read the information provided above or the information provided above has been read to me in the language that I understand best. I was given the opportunity to ask questions and that they have been answered to my satisfaction.

Name of the participant:

Signature or left thumb impression of the participant:

Name of the witness:

Signature or left thumb impression of the witness:

Name of the investigator:

Signature of the investigator:

Date:

Place:

ANNEXURE – II

QUESTIONNAIRE

EFFECT OF SELF-CARE BEHAVIORS ON GLYCEMIC CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS RESIDING IN RURAL AND URBAN FIELD PRACTICE AREAS OF NORTH KARNATAKA

(Note: The personal data provided by you will be kept confidential. Only aggregated results will be presented/ published without revealing your personal identity).

Sl. No. _____ Date of interview:

RESEARCH QUESTIONNAIRE

A. SOCIO-DEMOGRAPHIC DETAILS

1. Name:
2. Age in years:
3. Address:
4. Gender: 1. Male 2. Female
5. Religion: 1. Hindu 2. Muslim 3. Christian 4. Others, specify:

6. Educational Qualification: 1. No formal schooling 2. Less than primary school 3. Primary school completed 4. Secondary school completed 5. High school completed 6. College/ University completed 7. Postgraduate degree

7. Occupation: 1. Government Employee 2. Non-government Employee 3. Self-employed 4. Student 5. Homemaker 6. Retired 7. Unemployed

7. Marital Status: 1. Single 2. Married 3. Separated/ Divorced 4. Widowed/ Widower

8. Type of family: 1. Joint 2. Nuclear 3. Three-generation 4. Broken 5. Problem

9. Total members in family: Total income of family:

Per capita income: Socio-economic class:

10. Duration of Diabetes:

11. Medications for diabetes: 1. Only diet restriction 2. Diet and Oral hypoglycemic drugs 3. Diet and Oral hypoglycemic drugs and insulin

12. Comorbidities:

13. Weight:

14. Height:

15. BMI:

16. HbA1c Level:

B. THE SUMMARY OF DIABETES SELF-CARE ACTIVITIES

Diet	Scoring 0 1 2 3 4 5 6 7
How many of the last SEVEN DAYS have you followed a healthful eating plan?	
On average, over the past month, how many DAYS PER WEEK have you followed your eating plan?	
On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables?	
On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products?	
Exercise	Scoring 0 1 2 3 4 5 6 7
On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking).	

On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work?	
Blood Sugar Testing	Scoring 0 1 2 3 4 5 6 7
On how many of the last SEVEN DAYS did you test your blood sugar?	
On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider?	
Foot Care	Scoring 0 1 2 3 4 5 6 7
On how many of the last SEVEN DAYS did you check your feet?	
On how many of the last SEVEN DAYS did you inspect the inside of your shoes?	

On how many of the last SEVEN DAYS did you wash your feet?	
On how many of the last SEVEN DAYS did you soak your feet?	
On how many of the last SEVEN DAYS did you dry between your toes after washing?	
Smoking	Scoring 0 1 2 3 4 5 6 7
Have you smoked a cigarette—even one puff—during the past SEVEN DAYS?	0. No 1. Yes. If yes, how many cigarettes did you smoke on an average day? Number of cigarettes:
Medications	Scoring 0 1 2 3 4 5 6 7

On how many of the last SEVEN DAYS, did you take your recommended diabetes medication? OR On how many of the last SEVEN DAYS did you take your recommended insulin injections?	
On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?	

C. PERSONAL DIABETES QUESTIONNAIRE (PDQ)

DIET BARRIERS

Questions	1. Never	2. 1 time per month or less	3. 2-3 times per month	4. 1-2 times per week	5. 4-6 times per week	6. 1 or more times per day
1. Eating problems when feeling, stressed, anxious depressed, angry, or bored.						
2. Eating problems because of hunger or						

food cravings.						
3. Eating problems because family or friends tempt you or are not very supportive of your efforts to eat right.						
4. Eating problems when eating away from home (e.g., fast food, restaurants, relatives, pot lucks).						
5. Eating problems because you feel deprived due to trying to follow a diet.						
6. Eating problems because you feel discouraged due to lack of results (e.g., no weight loss, high blood sugars).						
7. Eating problems because you are too busy with family, work, or other responsibilities.						

MEDICATION BARRIERS

Questions	1. Never	2. 1 time per month or less	3. 2-3 times per month	4. 1-2 times per week	5. 4-6 times per week	6. 1 or more times per day
1. Feeling stressed, anxious depressed, angry, or bored.						
2. The medicine has unpleasant side effects.						
3. Family or friends are not very Supportive.						
4. When away from home (e.g., on vacation, business trips, at restaurants, pot lucks).						
5. My daily schedule (waking, going to bed, eat, work, etc.) is different from one day to the next.						

6. Feel discouraged due to lack of results (e.g., no weight loss, high blood sugars).						
7. Being too busy with family, work, or other responsibilities.						
8. The medication is too expensive						

BLOOD GLUCOSE MONITORING BARRIERS

Questions	1. Never	2. 1 time per month or less	3. 2-3 times per month	4. 1-2 times per week	5. 4-6 times per week	6. 1 or more times per day
1. Feeling stressed, anxious depressed, angry, or bored.						
2. I hate to stick myself.						
3. Family or friends are not very						

supportive.						
4. When away from home (e.g., on vacation, business trips, at restaurants, relatives).						
5. My daily schedule (waking, going to bed, eat, work, etc.) is different from one day to the next.						
6. Feel discouraged due to lack of results (e.g., no weight loss, high blood sugars).						
7. Being too busy with family, work, or other responsibilities.						
8. The testing supplies are too expensive						

EXERCISE BARRIERS

Questions	1. Never	2. 1 time per month	3. 2-3 times per month	4. 1-2 times per week	5. 4-6 times per week	6. 1 or more times per day

		or less				
1. Feeling stressed, anxious depressed, angry, or bored.						
2. Exercise and physical activity cause pain and discomfort for me.						
3. Family or friends are not very supportive.						
4. When away from home (e.g., on Vacation, business trips, at relatives).						
5. My daily schedule (waking, to bed, eat, work, etc.) is different from one day to the next.						
6. Feel discouraged due to lack of results (e.g., no weight loss, high blood sugars).						
7. Being too busy with family, work, or other responsibilities.						

FOOT CARE BARRIERS

Questions	1. Never	2. 1 time per month or less	3. 2-3 times per month	4. 1-2 times per week	5. 4-6 times per week	6. 1 or more times per day
1. Feeling stressed, anxious, depressed, angry, or bored.						
2. The footwear causes pain and discomfort for me.						
3. Family or friends are not very supportive.						
4. When away from home (e.g., on Vacation, business trips, at relatives).						
5. My daily schedule (waking, to bed, eat, work, etc.) is different from one day to the next.						
6. Feel discouraged due to lack of results (e.g., no weight loss, high blood sugars).						
7. Being too busy with family,						

work, or other responsibilities.						
8. The footwear is too expensive for me						

THANK YOU FOR PARTICIPATING IN THE STUDY

ANNEXURE-III

KEY TO MASTER CHART

Pre-validated and pre-coded questionnaires (SDSCA and PDQ) were used in the present study. The coding for additional variables were made as follows:

I. Address

1- Urban 2- Rural

II. Gender:

1- Male 2- Female

III. Religion:

1- Hindu 2- Muslim 3- Christian 4- Others, specify:

IV. Educational Qualification:

1- No formal schooling 2- Less than primary school 3- Primary school completed 4- Secondary school completed 5- High school completed 6- College/ University completed 7- Postgraduate degree

V. Occupation:

1- Government Employee 2- Non-government Employee 3- Self-employed 4- Student 5- Homemaker 6- Retired 7- Unemployed

VI. Marital Status:

1- Single 2- Married 3- Separated/ Divorced 4- Widowed/ Widower

VII. Type of family:

1- Joint 2- Nuclear 3- Three-generation 4- Broken 5- Problem

VIII. Socioeconomic class

1- 8397

2- 4156-8396

3- 2460-4155

4- 1272-2456

5- 1272

IX. BMI

1- <18.5: Underweight

2- 18.5- 22.9: Normal

2- 23.0- 24.9: Overweight

3- >25: Obese

X. Medications for diabetes:

1- Only diet restriction

2- Diet and Oral hypoglycemic drugs

3- Diet and Oral hypoglycemic drugs and insulin

XI. Comorbidities

1- none

2- hypertension

3- thyroid

4- cancer

XII. HbA1c levels

1- >7%

2- <7%

XIII. Self-care levels

Total score of the questionnaire: 0-99

1- Poor self-care: 0-33

2- Moderate self-care: 34-67

3- Good self-care: 68-99

ANNEXURE – IV

MASTER CHART