

*Original research article***PREVALENCE AND FACTORS INFLUENCING DIABESITY AND DIABETES SELF-CARE PRACTICES AMONG PERSONS WITH TYPE 2 DIABETES MELLITUS LIVING IN RURAL AREA OF TIRUVALLUR DISTRICT – A CROSS SECTIONAL STUDY.**

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Abstract

Introduction: Diabetes mellitus is a chronic condition which requires good self-care and continuous monitoring. Diabesity is a term used for clinical association of diabetes with obesity, a subgroup of syndrome X/Metabolic syndrome

Objectives: 1. To estimate the proportion of people with obesity and assess various associated factors. 2. To assess the self-care practises among people with Type 2 diabetes mellitus.

Material and methods: A Community based cross sectional study was conducted among 251 adults (>18 years) in 3 villages (selected randomly out of 8 villages) under the Rural field practise area of Nayapakkam. Subjects were interviewed by a validated questionnaire after obtaining consent. Questionnaire consists of Sociodemographic profile, Detailed Diet analysis, Comorbidity profile and “Summary Diabetes Selfcare Activities (SDSCA)”.

Results: The prevalence of diabesity was 63.1% (diabetics with BMI >25), of which 26.7% had abdominal obesity. Among 251 diabetics, 47.8% followed healthy eating habits for at least 3 to 5 days a week. 48.2% had been doing moderate physical activity for at least 2 days a week. Around 44.6% had checked their blood sugar once at least in past 3 months. Almost 66.8% of them maintained foot care for at least 2 days a week.

Conclusion: The prevalence of obesity among diabetics was high among the study participants. The self-care practises among diabetics was quite poor which needs to be focussed.

Keywords: Diabetes, Diabesity, Obesity, Metabolic syndrome, Risk factors, Self-care practises

Introduction

Diabetes mellitus is a complex and chronic illness requiring continuous self-care to achieve glycemic control to prevent acute as well as long-term complications and to improve the quality of life.¹ It also reduces the burden on health-care services. It has attained epidemic proportions in India, and an estimated 98 million people will be suffering from diabetes by the year 2030.²

Around one-tenth of the world’s adult population is suffering from type 2 DM (T2DM), and 80% of these patients belong to the low-and middle-income countries (“LMIC”).³ On the other hand, the prevalence of obesity has tripled since 1975–13% worldwide in 2016 with the major increase in “LMIC” s. Eventually, the prevalence of diabetes and obesity in India was 10% and 13%, respectively, in 2017.

Cardiovascular diseases (CVDs) are one of the major causes of deaths worldwide and have fueled the already escalating costs of health care. Furthermore, the risk of CVDs and its mortality increases exponentially when diabetes mellitus (DM) and obesity coexist.

Therefore, in a steady pace, these two epidemics with or without the presence of other comorbidities such as dyslipidemia or hypertension have gained its ground in India. More so in South India, the prevalence of both diabetes and obesity is higher in Tamil Nadu. The term diabetes was first coined by Sims *et al.* in 1973 after the frequent coexistence of both the conditions in the developed nations.⁴

The pathophysiology of obesity causing diabetes was well understood as diminished physical activity, and excessive calorie-dense food spurs the incidence of obesity, which further leads to insulin resistance and T2DM. One of the major risk factors for diabetes was found to be an unhealthy diet.⁵ Diabetes self-care includes certain activities to be performed by the people with or at risk of diabetes.⁶

The activities include healthy food choices every day and eating a healthy amount of food at each meal, staying physically active by doing the required exercise, self-monitoring of blood glucose, taking the recommended medication regularly, reducing risky behaviors, and developing problem-solving and healthy coping skills.⁷

The objective of the study were to estimate the proportion of people with obesity and assess the sociodemographic, dietary, and morbidity-related factors associated among persons with T2DM and to determine the existing self-care behaviors and its associated factors among people with Type 2 diabetes mellitus.

Material and methods

This Community based cross sectional study was done in the rural field practice area – Nayapakkam during Jan to Mar 2022. The study population consists of adults (>18 years) and who are known diabetics, mainly type – II diabetes mellitus. The

Inclusion criteria: Individuals above 18 years of age, having diabetes for duration of more than 1 year, and willing to give written consent. Exclusion criteria: Any eligible person who was found seriously ill or not willing to give consent. Sample size was calculated based on the previous study “Diabetes prevalence and its risk factors in rural area of Tamilnadu” by Sanjay kumar gupta et al⁸, the prevalence of diabetes was found to be 17.24%. Using the formula,

$$\text{Sample size (n)} = \frac{4pq}{d^2}$$

p= 17.24, q= 82.76, d= allowable error = 5 %, Sample size (n) = 228. Considering the non-response rate to be 10% & calculating our total sample size, total sample is 251. And we have collected sample of 257. Sampling technique used was *Simple random sampling* using lot method (without replacement).

Study tool:

Pretested, structured questionnaire consisting of 47 questions (including personal data) will be collected using google forms by face to face interview (adhering to the covid precautions).

A structured questionnaire which comprises of four parts:

Part I - consists of sociodemographic details of the respondent such as age, sex, education, occupation, socioeconomic status, marital status, duration of disease, smoking habits, and alcohol intake.

Part II - contained the prevalidated “Summary Diabetes Selfcare Activities (SDSCA)” Questionnaire,⁹ which included details of the diabetes self-care activities with respect to diet, exercise, blood glucose monitoring, and drug adherence in the previous week prior to the interview.

Part III - comprised of dietary history: 24-h dietary recall method was used. The nutrient content of each food item was estimated, and the diet intake was expressed as excess or deficit if it was 20%

more or less respectively based on the Recommended Dietary Allowances for Indians.

Part IV - details related to the comorbidity of the participants (The diagnoses of coronary artery disease, retinopathy, and diabetic foot were obtained from the records).

Ethical consideration: The study protocol was submitted to the IHEC of ACS medical college and hospital and was approval (No.396/2022/IEC/ACSMCH). Informed Consent was obtained after explaining the study objectives and benefits of the study. Ensuring human participant protection, the study was conducted.

Data entered in google sheets were exported and imported into SPSS for detailed analysis after data coding. Descriptive statistics such as frequency and percentages were calculated and Inferential statistics were used to look for association between different variables and diabetes.

Results

Among the study participants of 257, majority were in age group of 46-65 years. Males were 54.2% and Females were 45.8%. The prevalence of diabetes (diabetics with BMI >25) was found to be 63.1 %, of which 26.7% had abdominal obesity. Obesity definition was based on the WHO Asia Pacific Guidelines of body mass index >24.99 kg/m² - with or without abdominal obesity. Most of the persons with diabetes belong to age <55 years compared to people >55 years. The sociodemographic profile of the study participants is given in the table below.

As seen in Table 1, Most of the study participants belong to middle class (41.2%). Almost 89% were married and 66 % were living in Nuclear families. Figure 1 shows the distribution of diabetes across the different age groups among the study participants. Across the age groups the prevalence of diabetes is almost constant in comparison to the age frequency.

From table 2, it was found that 37 % of participants were Overweight, followed by 31.5% who had

normal BMI and 21.8% had BMI (30-34.9) ie., class I Obesity. 25.1% having BMI of 30 or more are classified as having Diabetes. Around 35.86% had their HbA1C levels under control. 89.7% have been adhering to their treatment regimen.

Table 1: Sociodemographic details of the study participants (n=257)

Socio-demographic Variables		N	%
Age (in years)	18-25	4	1.6%
	26-35	16	6.2%
	36-45	44	17.1%
	46-55	94	36.6%
	55-65	68	26.8%
	>65	31	12.1%
Gender	Male	140	54.2%
	Female	117	45.8%
Socio economic status (Modified BG prasads 2022)	Upper	42	16.3%
	Upper middle	67	26.1%
	Middle	106	41.2%
	Lower middle	34	13.2%
	Lower	8	3.1%
Marital status	Unmarried	9	3.5%
	Married	229	89.1%
	Widow	12	4.7%
	Widower	7	2.7%
Type of family	Nuclear	170	66.1%
	Joint	70	27.2%
	Extended	17	6.6%

Fig 1: Distribution of diabetes mellitus and diabetes based on age among the study participants. (n=257)

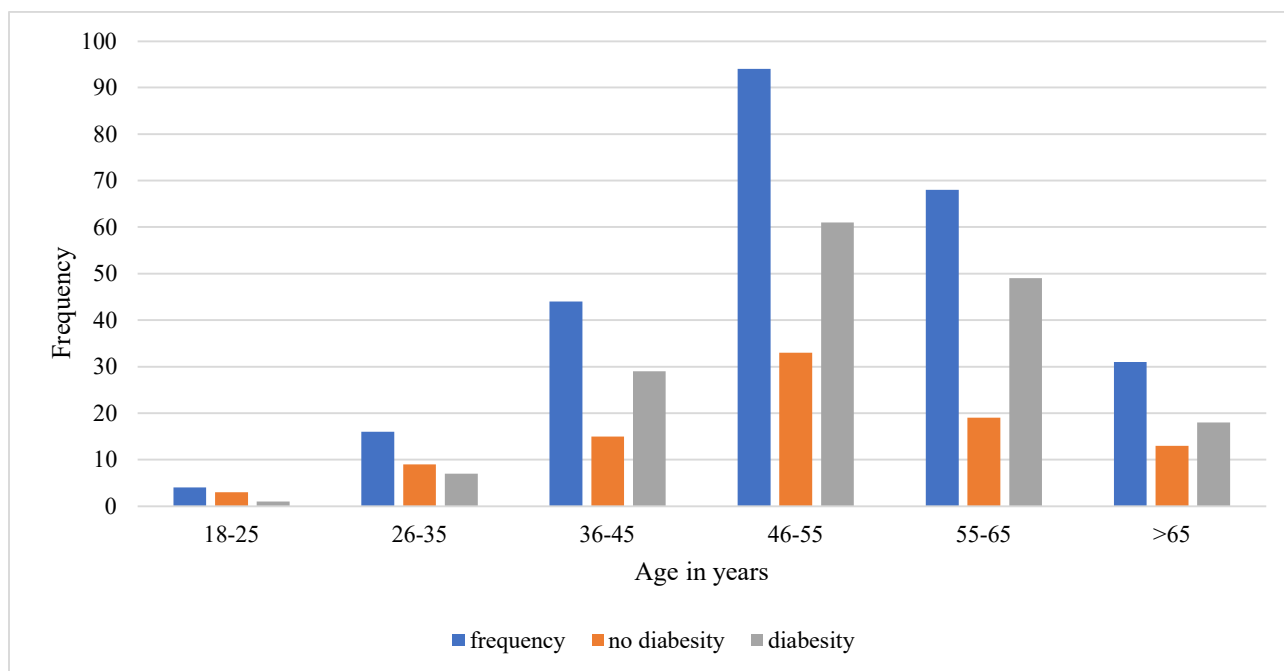


Table 2: Diabetes Mellitus and treatment profile of the study participants (n=257)

Variables	Responses	N	%
Duration of Diabetes mellitus	<1 year	26	10.1%
	1-3 years	51	19.8%
	3-5 years	51	19.8%
	5-10 years	91	35.4%
	>10 years	38	14.8%
Body Mass Index	<18.4	14	5.4%
	18.5-24.9 (Normal)	81	31.5%
	25-29.9 (Overweight)	95	37%
	30-34.9 (Obese-class I)	56	21.8%

	35-40 (Obese-class II)	9	3.5%
	>40 (Morbid obesity)	2	0.8%
HbA1C under control	Yes	92	35.86%
	No	165	64.14%
Taking medicines /Insulin regularly in last week	0-3 days	13	5%
	4-5 days	14	5.3%
	5-7 days	230	89.7%
Family H/O of Diabetes Mellitus	Yes	165	64.6%
	No	92	35.4%

Assessment of Diabetes Self care practises and Dietary pattern

Among 257 diabetics, 47.8% followed healthy eating habits for at least 3 to 5 days a week. 48.2% had been doing moderate physical activity for at least 2 days a week. Around 44.6% had checked their blood sugar once at least in past 3 months. Almost 70% has their fasting blood glucose under

control. 69.6% had good amount of daily fat intake. Almost 66.8% of them maintained foot care for at least 2 days a week.

Figure 2 shows the peak in reported HbA1C levels to be around 6. The following table shows the dietary and physical activity profile of the study participants.

Fig 2: Graph showing distribution of HbA1C based on last reports. (n=257)

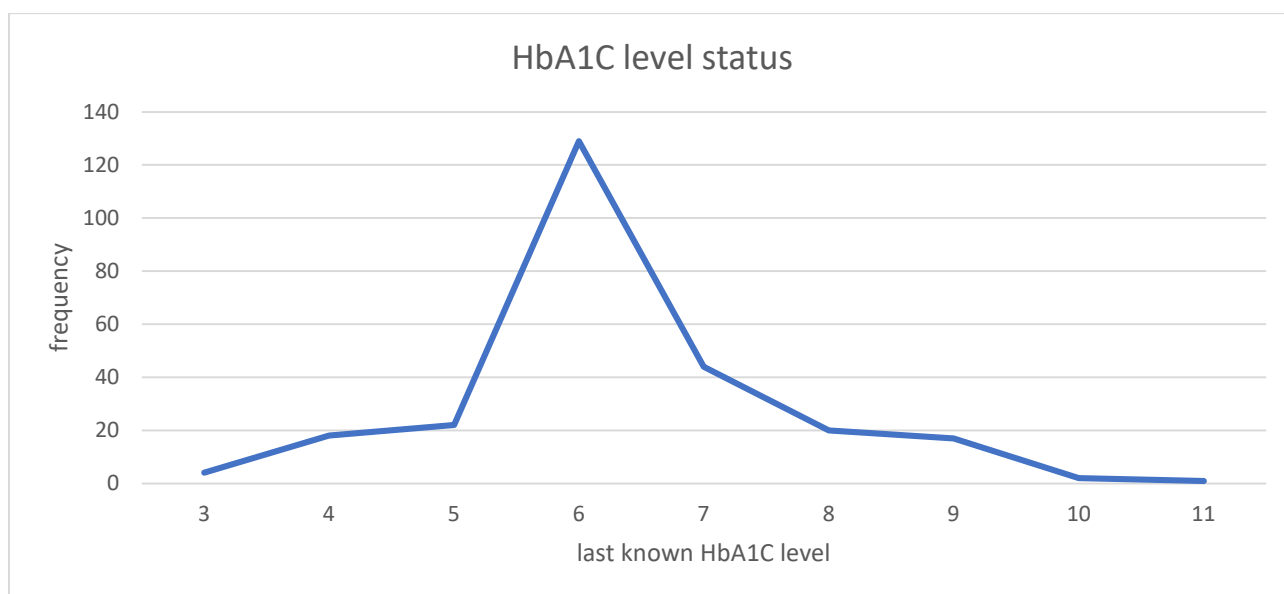


Table 3: Dietary and physical activity profile of the study participants. (n=257)

Variables		N	%
Follow healthful eating habits in last 7 days	0-2 days	82	31.9%
	3-5 days	123	47.8%
	6-7 days	52	20.3%
Consumed fruits in the last 7 days	0-2 days	135	52.6%
	3-5 days	97	37.8%
	6-7 days	25	9.6%
Participated in specific exercise session (Swimming, walking)	0-2 days	170	66.1%
	3-5 days	57	22.3%
	6-7 days	30	11.6%

Table 4: Co-morbidities profile of the participants. (n=257)

S.No	Co morbidities	Percentage
1	Hypertension	50.2 %
2	Dyslipidemia	31.9 %
3	Coronary Artery disease	12.1 %
5	Diabetic foot	10.5 %

Table 5: Association between various factors and diabetes among the rural diabetics. (n=257)

Variable	Responses	Diabetes with no obesity (n=92)	Diabetes (n=165)	Chi-Square test
Age (in years)	18-25	3	1	0.11
	26-35	9	7	
	36-45	15	29	
	46-55	33	61	
	56-65	19	49	
	>65	13	18	
Gender	Male	54	56	0.38
	Female	38	79	
Socio economic status (Modified BG prasads 2022)	Upper	10	32	0.25
	Upper middle	24	43	
	Middle	34	72	
	Lower Middle	18	16	
	Lower	6	2	
Marital Status	Unmarried	4	5	0.71
	Married	80	149	
	Widow	5	7	
	Widower	3	4	
Type of family	Nuclear	65	105	0.61
	Joint	18	52	
	Extended	9	8	
HbA1C regularly under control	Yes	40	52	0.020*
	No	52	123	
Mode of treatment	Insulin for 1 to 2 times a day	7	23	0.18
	Insulin for 3 times a day	0	2	
	Oral hypoglycemic drugs	84	140	
Taking medicines /Insulin regularly in last week	0-3 days	2	15	0.46
	4-5 days	16	11	
	5-7 days	73	139	
Followed healthful eating habits in last 7 days	0-2 days	17	62	0.11
	3-5 days	51	72	
	6-7 days	23	31	
Consumed fruits in last 7 days	0-2 days	35	97	0.01**
	3-5 days	45	53	
	6-7 days	11	15	
Participated in specific exercise session (swimming, walking)	0-2 days	62	102	0.91
	3-5 days	24	34	
	6-7 days	3	26	

*p<0.05 is statistically significant.

Among the factors, few variables had significant association with diabetes, namely Controlled status of HbA1C ($p=0.02$) and Consumption of fruits ($p=0.01$). Whereas age, gender, socioeconomic status, marital status, type of family, mode of treatment and specific physical activity were not significantly associated with Diabetes.

Discussion

The prevalence of diabetes (diabetics with BMI >25) was found to be 63.1% in our study. Most of the persons with diabetes belong to age <55 years compared to people >55 years. It was found that 37 % of participants were Overweight, followed by 31.5% who had normal BMI and 21.8% had BMI (30-34.9) i.e., class I Obesity.

Whereas in a study on Prevalence and Factors Influencing Diabetes among Persons with Type 2 Diabetes Mellitus in Urban Puducherry, it was found that the proportion of diabetes was found to be 66.9%. And that the Obesity was significantly high among T2DM patients aged 50 years and less compared to >60 years.¹⁰ The prevalence of diabetes in both studies look fairly similar.

Among the study participants, majority of the diabetes had the disease for 5-10 years (35.4%). 9.16% had Diabetes for less than a year, 19.8 had for 1-3 years, 19.8% had 3-5 years, 14.8 % had the disease for more than 10 years. In a study by MR N Baghel RK on Prevalence and factors influencing type 2 diabetes mellitus in rural Mysore it was found that majority of the diabetics, 47.9 % had diabetes for 1-3 years, 38.3% had for 3-5 years, 11.7% had 5-7 years and only 2.1% had for >7 years.¹¹ The difference in the duration of disease can be because of different place of study. The duration of diabetes disease less than 3 years is higher in urban area as compared to rural area, which might be because people are diagnosed early by screening programmes in urban areas compared to rural. This needs future evaluation for evidence.

In our study, around 35.86% had their HbA1C levels under control. Controlled status of HbA1C levels ($p=0.02$) were significantly associated with

Diabetes in our study. Whereas, In a study by Vanitha Durai on HbA1c levels among diabetics those having HbA1C ≤ 7 were 62.8% and HbA1C >7 was 37.2%. Almost 52 % of them had checked their levels regularly.¹² There is poor control of HbA1C among rural participants in our study.

In our study, 89.7% have been adhering to their treatment regimen, mostly diet and oral diabetic drugs. In a study done by MR N, Baghel RK, 97.4% followed proper treatment with diet and oral drugs.¹³

In our study, majority (47.8%) followed healthy eating habits for at least 3 to 5 days a week. Around 52.6% consumed fruits for 0-2 days a week, 37.8% consumed fruits for 3-5 days a week. Consumption of fruits ($p=0.01$) were significantly associated with Diabetes in our study. Whereas, In a study by Rajasekharan D, 45.9% (majority) had a healthy eating plan for all days of the week. 26.2% had fruits consumption for at least 3 to 5 days a week in last 7 days.¹⁴ Both the studies, majority of them had followed healthy eating habits for 3-5 days a week, but consumption of fruits among study participants is less in our study. In the same study, the proportion of diabetes was found to 66.9%, and deficient in fruits intake and high fat consumption had significant association with diabetes.

In our study, 48.2% had been doing moderate physical activity for at least 2 days a week. Whereas in a study by Rajasekharan D, 17.6% have been doing moderate physical activity for at least 2 days a week. (14) In study by Yun I, 46% of the participants followed Walking or yoga for at-least $\frac{1}{2}$ h for 3 or more days in a week.¹⁵

In our study, around 44.6% had checked their blood sugar once at least in past 3 months. In our study, almost 70% has their fasting blood glucose under control. In a study on Level of self-care practice among diabetic patients in Ethiopia, 90% of them regularly checked their blood glucose levels (FBS and postprandial) once in 3 months at the RHTC. (15) In a study by Rajasekharan, the awareness on current (most recent) FBS and PPBS values was

higher 161 (41.3%) compared to that of target values 60 (15.5%).¹⁴

In our study, almost 66.8% of them maintained foot care for at least 2 days a week. In a study by Rajashekar, Washing feet on all days of the week (64.8%), Drying in between the toes on all days of the week (70.7%) and Examining feet on all days of the week (13%).¹⁴

In our study, the comorbidities associated with diabetics are hypertension (50.2%), Dyslipidaemia (31.9%), coronary artery disease (12.1%), Diabetic foot (10.5%). Whereas in a study by Durai et al on Self-care practices among diabetics, 71% had hypertension, 66% (n = 99).¹⁵ In another study by Rehman T, the co-morbidities among diabetics were hypertension 71%, Coronary artery disease 7%, Diabetic foot 2%, Diabetic retinopathy 2%.⁴

Conclusions

The prevalence of diabetes (diabetics with BMI>25) was high (63.1%) of which 26.7% had abdominal obesity. Almost 37 % of participants were Overweight and 21.8% were in Class I Obesity. It was found that although many diabetics had good treatment adherence, the self-testing for blood sugars and self-care practices were quite poor among the rural diabetics. Lifestyle and nutritional status showed that only half of the participants have been consuming fruits and eating healthily for 3-5 days at least per week. Almost 66.1% of the diabetics get involved in specific exercise sessions like swimming, walking for less than 2 days in a week. Controlled status of HbA1C levels (p=0.02) and consumption of fruits (p=0.01) were associated with Diabetes.

The diabetes, being recognized as a part/ precursor of Metabolic syndrome must be prevented by use of primordial and primary prevention strategies. Self-care in diabetes, importance of maintaining ideal weight and self-testing of blood sugars at prescribed intervals needs to be emphasized and educated among the rural diabetic people.

Recommendations

Healthy Diet and Good Physical activity can prevent the development of Obesity and Complications in the Diabetics. Annual diabetes health checkups and educating the diabetics about good self-care practices, Importance of regular self-blood glucose testing needs emphasis.

Limitations

Limited sample size and question of generalizability.

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References

1. American Diabetes Association. Standards of medical care for patients with diabetes mellitus. *Diabetes care*. 2002 Jan 1;25(suppl_1):s33-49.
2. Nag T, Ghosh A. Cardiovascular disease risk factors in Asian Indian population: A systematic review. *Journal of cardiovascular disease research*. 2013 Dec 1;4(4):222-8.
3. Rehman T, Rajaa S, Kumar G, Jayalakshmy R. Prevalence and factors influencing diabetes among persons with type 2 diabetes mellitus in urban Puducherry: a cross-sectional analytical study. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*. 2020 Jul;45(3):315.
4. Ezzati M, Obermeyer Z, Tzoulaki I, Mayosi BM, Elliott P, Leon DA. Contributions of risk factors and medical care to cardiovascular mortality trends. *Nature Reviews Cardiology*. 2015 Sep;12(9):508-30.
5. Ahmed B, Sultana R, Greene MW. Adipose tissue and insulin resistance in obese.

- Biomedicine & Pharmacotherapy. 2021 May 1;137:111315.
6. Shrivastava SR, Shrivastava PS, Ramasamy J. Role of self-care in management of diabetes mellitus. *Journal of diabetes & Metabolic disorders*. 2013 Dec;12(1):1-5.
 7. Chandrika K, Das BN, Syed S, Challa S. Diabetes self-care activities: A community-based survey in an urban slum in Hyderabad, India. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*. 2020 Jul;45(3):307.
 8. Gupta SK, Singh Z, Purty AJ, Kar M, Vedapriya DR, Mahajan P, Cherian J. Diabetes prevalence and its risk factors in rural area of Tamil Nadu. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*. 2010 Jul;35(3):396.
 9. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale. *Diabetes care*. 2000 Jul 1;23(7):943-50.
 10. Yun I, Joo HJ, Park YS, Park EC. Association between Physical Exercise and Glycated Hemoglobin Levels in Korean Patients Diagnosed with Diabetes. *International Journal of Environmental Research and Public Health*. 2022 Mar 10;19(6):3280.
 11. MR N, Baghel RK, Siddalingappa H. Prevalence and factors influencing type 2 diabetes mellitus in rural Mysore. *International Journal of Diabetes in Developing Countries*. 2015 Sep;35:75-8.
 12. Durai V, Samya V, Akila GV, Shriram V, Jasmine A, Muthuthandavan AR, Gayathri T, Mahadevan S. Self-care practices and factors influencing self-care among type 2 diabetes mellitus patients in a rural health center in South India. *Journal of Education and Health Promotion*. 2021;10.
 13. Asif M. The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. *Journal of education and health promotion*. 2014;3.
 14. Rajasekharan D, Kulkarni V, Unnikrishnan B, Kumar N, Holla R, Thapar R. Self care activities among patients with diabetes attending a tertiary care hospital in Mangalore Karnataka, India. *Annals of medical and health sciences research*. 2015 Feb 4;5(1):59-64.
 15. Ketema DB, Leshargie CT, Kibret GD, Assemie MA, Alamneh AA, Kassa GM, Alabel A. Level of self-care practice among diabetic patients in Ethiopia: a systematic review and meta-analysis. *BMC Public Health*. 2020 Dec;20:1-2.

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