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Original Research Article

A STUDY TO UNDERSTAND THE ATTITUDE AND AWARENESS OF DIABETIC PATIENTS ABOUT THE LONG-TERM COMPLICATIONS OF DIABETES MELLITUS

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ABSTRACT

Background: Diabetes mellitus is a prevalent chronic disease with a significant burden on public health due to its long-term complications. In India, where the diabetic population is rapidly increasing, awareness and proper management of diabetes complications are crucial to improving patient outcomes. Previous studies have shown that education and awareness about diabetes significantly reduce the risk of complications. **Aim:** The study aims to assess the knowledge and attitudes of diabetic patients regarding the long-term complications of diabetes mellitus and to identify gaps in awareness, particularly among different demographic groups.

Materials and Methods: This cross-sectional study was conducted at a tertiary healthcare centre in Delhi, enrolling 120 diabetic patients. Participants were interviewed using a structured questionnaire assessing their socio-demographic background, knowledge of diabetes complications, and sources of healthcare information. Descriptive statistics and associations between socio-demographic factors and awareness levels were analysed.

Results: The study revealed that 80% of the participants believed in the importance of knowing diabetes complications, with the majority recognizing the impact on kidneys (60%) and eyes (59.17%). However, awareness of complications affecting the heart (27.5%), nerves (37.5%), and brain (10%) was comparatively low. The level of knowledge was strongly associated with educational qualifications and having a family history of diabetes. Additionally, 81.7% of participants were regular in taking medications, but only 19.2% could correctly name their medications. Clinicians were the primary source of information (50.8%), followed by friends and family (36.7%).

Conclusion: While there is a moderate level of awareness about the complications of diabetes, significant gaps exist, particularly in understanding the effects on the heart, nerves, and brain. The findings highlight the need for more targeted educational interventions and awareness programs to bridge these gaps, especially in under-informed demographic groups.

Keywords: Diabetes mellitus, complications, awareness, knowledge, attitudes, India, kidney, heart, neuropathy.

INTRODUCTION

Diabetes mellitus refers to a group of common metabolic disorders that happen to share the phenotype of hyperglycemia. Depending on the etiology of diabetes mellitus, it is seen that the common factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization and increased glucose production.[1] Diabetes mellitus is a major clinical and public health problem accounting for around 4.6 million deaths annually worldwide,[2] and the cases of diabetes

mellitus continue to increase rapidly in great numbers. The results of ICMR-INDIAB study showed that India had 62.4 million people with diabetes in 2011.[3] It was expected that these numbers would increase to 101.2 million by 2030(2).[4] However, latest 2023 figures by ICMR-INDIAB show the prevalence of diabetes over 101.3 million already.[5]

According to WHO, diabetes complications are divided into 2 categories, namely microvascular and macrovascular categories. The microvascular complications include retinopathy, leading to blindness, nephropathy leading to renal failure and neuropathy leading to impotence and diabetic foot disorders (which include severe infections leading to amputation). Under the category of macrovascular complications, cardiovascular diseases, strokes and insufficiency in blood flow to legs are included.[6]

Education is one of the key components in ensuring better treatment and control of diabetes. There is also evidence indicating that increasing knowledge within the community regarding the risk factors of diabetes and its complications has significant benefits including increase in compliance to treatment, thereby decreasing the complications associated with diabetes mellitus.[7,8] Individuals who are aware and understand the risks and complications of diabetes mellitus are more likely to be cautious and concerned about controlling their blood sugar level in optimum range along with adapting self-care practices like regular eye check-up, care of feet,[9] and a healthy lifestyle. At the same time, identification of the section of participants with insufficient knowledge in terms of risk factors, management and treatment methodologies of diabetes. Identification on the basis of gender, educational qualification and socio-economic status is required so that specific actions can be taken to specially focus on increasing their level of knowledge on different aspects of diabetes.

However, it is important to note that patient compliance can be achieved only if the information being spread in the community is authentic and scientifically reliable. Therefore, it is important to identify the major sources of information present in the community regarding the management of diabetes. Also, in case there is a deficiency of such sources, it is imperative to create programs to bridge this gap in order to build an aware and healthy society. Therefore, it is expected that if people in general are more aware about the consequences of the life-threatening complications of diabetes, they are expected to cooperate towards a healthy lifestyle and adhere to the treatment plan prescribed by the physician.

MATERIALS AND METHODS

This observational cross-sectional study was conducted among diabetic patients attending the outpatient department (OPD) of a tertiary healthcare center in NCT Delhi. Since, this study was a part of Short Term Studentship (STS) project, a purposive sampling of 120 diabetic patients, all above the age of 18 years were taken. Patients with any known cognitive or mental illnesses were excluded from the study. The study was completed in a duration of 2 months.

Data was collected online by sharing a pre-designed structured questionnaire which was validated by experts. It included questions about the demographic details, diet, physical activity and also assessed the knowledge and awareness of patients about different characteristics and aspects of diabetes. Furthermore, questions about the long-term complications of uncontrolled diabetes along with the source of information of patients was also included. Interview and personal interaction was done to translate or clear any doubts regarding any question asked in the questionnaire.

Ethical approval was obtained from the ethical committee of Hamdard Institute of Medical Sciences and Research. Confidentiality and anonymity of all participants was ensured throughout the study. Data was analysed using Microsoft Excel and Statistical Package for Social Services (SPSS) (version 26), appropriate statistical tests were applied to find association between the study variables.

RESULTS

A. Socio-demographic Profile of Participants

The study included a total of 120 patients, out of which, 62.5% were females and 37.5% were males. All participants were above 18 years of age and the mean age was 51.98 years with a standard deviation of 9.936. In terms of educational qualifications, 30.8% were illiterate, 41.7% had studied up to High School, 10.8% up to Senior Secondary, 12.5% were graduate and 4.2% were post-graduate.

44.2% of the participants were currently employed as professionals in different sectors and among the remaining 55.8%, majority of the female participants were housewives. 53.34% participants had family history of diabetes mellitus and 3.33% of the participants currently suffered from some complication of diabetes mellitus.

The participants were classified on the basis of B. G. Prasad Scale of socio-economic classification and 38.34% belonged to class-1, 29.17% belonged to class-2, 16.67% belonged to class-3 and 15.84% of the participants belonged to class-4.

The characteristics of the study population are summarized in Table1.

B. KNOWLEDGE OF COMPLICATIONS OF DIABETES MELLITUS

80% of the participants believed that it is important to be aware of the complications of diabetes mellitus. Upon being enquired about all the organs which the participants thought were affected with diabetes, it was revealed that the kidneys and eyes happened to be the most known organs with a percentage of 60% and 59.17% respectively; followed by 40.83% about

limbs, 35% about nerves being affected by diabetes and 32.5% had knowledge about the complications related to heart. A mere 11.67% of the participants were able to mention the brain as the organ affected by diabetes (figure 1).

Comparing the relation between the level of awareness about complications of diabetes on various organs with educational qualification, the data was statistically significant ($p < 0.05$) and directly associated (figure 2). Further comparison revealed that results obtained were in accordance to previous studies and showed that males were relatively more aware about the complications as compared to their female counterparts. The association with socio-economic status was insignificant ($P > 0.05$). The patients with a family history of diabetes had relatively more knowledge about the complications of diabetes on various organs and there was a statistically significant association with knowledge about complications affecting heart ($p=0.006$) and kidneys ($p=0.002$) (figure 3).

Upon enquiring the participants further about their awareness about each organ specifically, 50% patients could answer correctly that long standing, unmanaged diabetes could lead to nephropathy and kidney failure. Enquiring about the effect of unmanaged diabetes on eyes, the participants' knowledge showed a wide range of responses including retinopathy (1.7%), cataract (4.2%) and defective vision (17.5%). Among the responses with respect to eyes specifically, around 32.5% of the participants chose "All of the above" and 44.2% chose "Don't know".

Only 31.7% participants knew that long standing diabetes could lead to ulcers and gangrene in limbs and the knowledge of diabetes causing neuropathy include tingling sensation/sharp pain in the limbs was expressed by 37.5% participants. 27.5% of the participants knew that diabetes can be a cause of heart attack as it caused cardiovascular complications. However, only 10% participants identified stroke as a complication of unmanaged diabetes affecting the brain (table 2).

C. ATTITUDE AND TREATMENT SEEKING BEHAVIOUR OF DIABETIC PATIENTS

90% of the participants were not hesitant in approaching their doctor if they faced any problem in managing their diabetes. 81.7% participants were regular in taking their medication on time but only 19.2% participants knew the names of their current medicines. 59.2% believed that the best treatment methodology for controlling diabetes mellitus was a combination of diet and medicines along with regular exercise, while 33.3% insisted that diet and medication were enough to control diabetes and 7.5% participants believed that adopting a diabetic friendly diet only was sufficient to control diabetes.

D. SOURCES OF HEALTHCARE RELATED INFORMATION

50.8% participants claimed that their source of all information related to diabetes was their treating clinician, followed by friends and relatives (36.7%). Messages and posts on social media covered the information requirement of 9.2% of the participants and health-care related articles in newspapers were included by 1.7% participants. Seminars or awareness programs and health articles on Google were 0.8% each. In the study, no participant claimed advertisements on television as their source of information.

32.5% considered the internet as a source of reliable information while the 67.5% disagreed and claimed that they do not believe all the health-care related information surfacing online.

While associating various sources of Information of the participants with different factors, it was revealed that educational qualification had a major role to play in the approach of patients to healthcare related information. Also, only the results of association of gender and socio-economic classification were not statistically significant (figure-4 and figure-5). 84.2% participants felt that there is a need for health camps for spreading awareness about diabetes and its complications and expressed desire to attend the same.

Table 1: Characteristics of the study population

Parameter	Frequency (n)	Percentage (%)
Sex		
Male	45	37.5%
Female	75	62.5%
Educational Qualifications		
Illiterate	37	30.8%
Upto 10^{th}	50	41.7%
Upto 12^{th}	13	10.8%
Graduate	15	12.5%
Post graduate	5	4.2%
Occupation		
Working	53	44.2%
Not working	67	55.8%
Duration of diabetes		
Upto 1 year	21	17.5%
Upto 5 years	34	28.34%
Upto 10 years	33	27.5%
>10 years	32	26.67%

Table 2: The specific effect of long standing/ unmanaged Diabetes Mellitus have on various organs

Organ specific complication:	Correct responses: Frequency (n)	Percentage(%)
Kidney (Nephropathy/ Kidney Failure)	60	50%
Heart (Heart Attack)	33	27.5%
Nerves (Tingling sensation or sharp pain in limb)	45	37.5%
Limbs (Ulcer and gangrene)	38	31.7%
Brain (Stroke)	12	10%
Eyes a) Retinopathy b) Cataract c) Defective Vision d) All of the above	 a) 2 b) 5 c) 21 d) 39	 a) 1.7% b) 4.2% c) 17.5% d) 32.5%

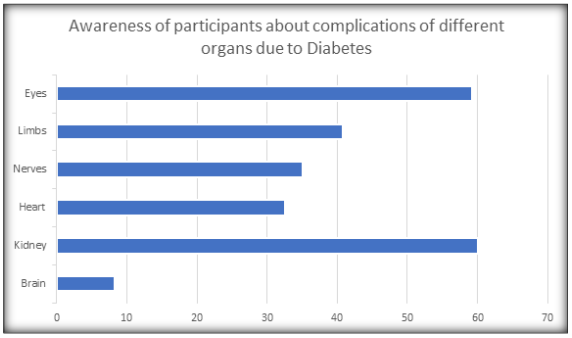

Figure 1: Awareness of participants about complications of different organs due to diabetes

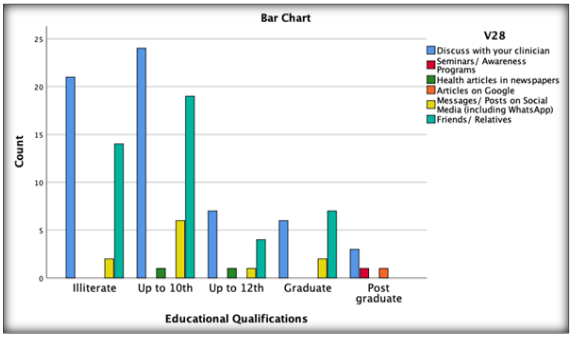

Figure 4: Association of Educational Qualifications with Source of Health-care related information

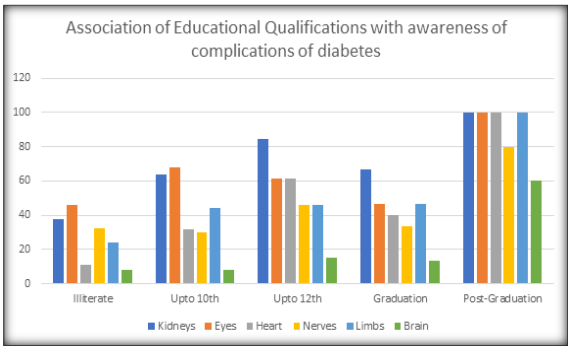

Figure 2: Association of Educational Qualifications with awareness of complications of diabetes

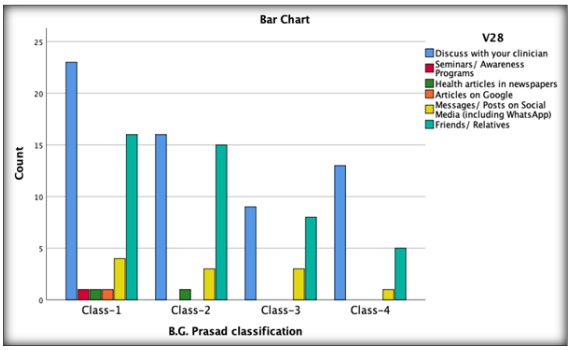

Figure 5: Association of Socio-economic status with source of healthcare related information

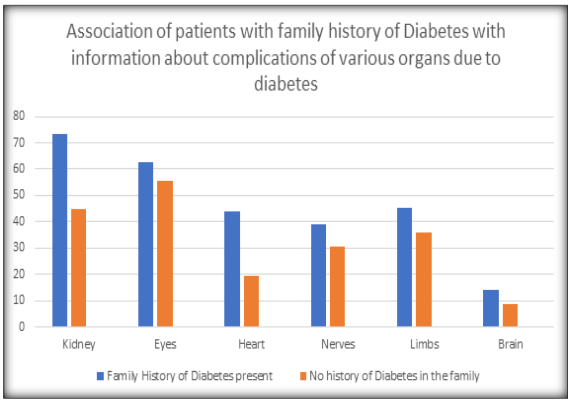

Figure 3: Association of patients with family history of diabetes with information about complications of various organs due to diabetes

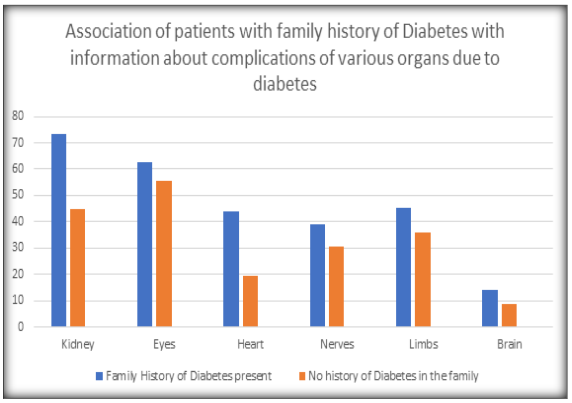

Figure 6: Association of patients with family history of diabetes with information about complications of various organs due to diabetes

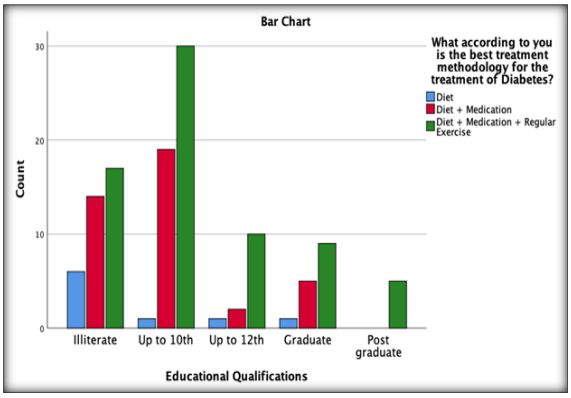

Figure 7: Association of educational qualification with approach to treatment methodology

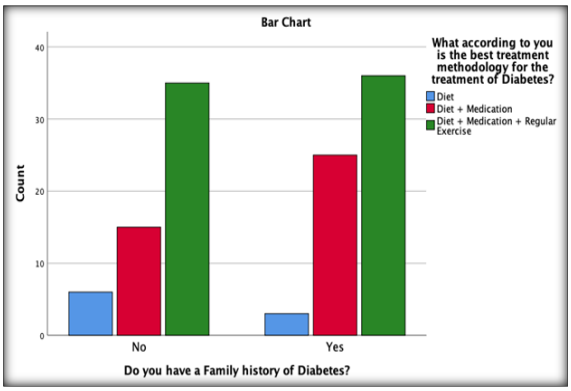

Figure 8: Association of family history of diabetes with approach to treatment methodology

DISCUSSION

Diabetes mellitus is a chronic disorder and it is characterized by elevated blood sugar levels resulting from inadequate functioning of pancreas wherein either the pancreas does not produce enough insulin or there is inefficient utilization of insulin by the body. The former is termed type 1 diabetes mellitus and the latter as type 2 diabetes mellitus.[10] Diabetes mellitus is also considered as one of the most common noncommunicable diseases.[11] The rate at which diabetic patients are increasing, diabetes can now be considered as a Global pandemic. The global prevalence of diabetes is over 589 million. Whereas, in INDIA, study estimates the prevalence to be 101 million.[12,13,14] The global prevalence of diabetes has doubled from 7% in 1990 to 14% in 2022 according to NCD Risk Factor Collaboration.[15] The rapidly rising cases of diabetes is a cause of concern for many healthcare professionals. It is worrisome that India is now a home to the second largest number of people with diabetes.[3].The study was conducted with an aim to assess the knowledge and attitude of Diabetic patients of different socio-demographic profiles and also to identify their source of healthcare related information.

Diabetes mellitus is a major clinical and public health problem accounting for over 3.4 million deaths annually worldwide.[2] If not controlled, it leads to complications of various organs. Long-standing unmanaged hyperglycaemia is associated with chronic damage and failure of various organ systems mainly affecting the eyes, nerves, kidneys, and the heart.[16]

Since the participants were selected indiscriminate of their gender and it was observed that majority of the participants were females, this suggests that there is a probability of a greater incidence of diabetes in females in this region where our hospital is located. However, broader studies covering more patients are required to establish this fact.

The enormous rise in the number of diabetic cases is undoubtedly a burden on the healthcare system of any country. However, previous studies have shown that education about the disease plays a key role in ensuring better management and treatment of the disease. Their results indicate that increasing knowledge about diabetes and its complications has been significantly associated with a positive attitude of the patients by increasing compliance to the treatment. This ultimately decreases the risk of complications of diabetes.[7,8]

The results of our study showed that 80% participants believed that it was important to be aware about the complications of diabetes mellitus. This implied that the patients are now willing to learn more about their disease and its complications. The findings of our study revealed that maximum participants had more knowledge about kidneys and eyes being affected with long standing diabetes. These findings are supported by another study by Dariya et al in which 83% participants were aware about complications due to diabetes with highest likelihood od kidney disease (75%).[17] Relatively lesser participants were able to name heart, nerves, limbs as the organs affected with diabetes. The organ about which participants had least knowledge of getting affected with diabetes was brain (11.67%). This is in accordance with previous studies.[18,19] However, one significant factor at which our results deferred from them was about the knowledge of Neuropathy in patients.

Majority of the earlier studies available on the subject indicated an overall poor level of awareness in the community with regard to complications of diabetes on various organs of the body. However, it is important to mention that there is an improvement in this regard in the previous few years. After an analysis of the results, we can conclude that slowly but steadily the level of knowledge and awareness has shown an increasing trend in the community, especially with regard to information about eyes and kidneys.[4] While in our study, the participants had relatively good knowledge about diabetes. Around 35% participants knew that diabetes could cause numbness, tingling sensation or sharp pain in limbs. This shows that more patients are now aware about neuropathy as a complication of diabetes.

One trend observed in our study was that although more participants could identify the organs affected by long standing diabetes, there was still a lesser fraction who were aware of the exact complication

related to that organ. Even though 60% participants knew that kidneys are affected with diabetes, only 50% participants could point out that nephropathy or kidney failure was the complication including kidneys.[Table 2]

59.2% of the participants had knowledge about diabetes affecting the eyes in accordance with previous studies.[20] Only 32.5% participants knew that diabetes can lead to all the complications like retinopathy, cataract and defective vision. Similar trend was observed for other organs as well. The most probable reason for this seems to be the lack of detailed knowledge about the etiopathogenesis of the disease among the participants.

An analysis of previous studies showed that literacy is associated with awareness and practices of diabetic patients.[21,22,23] Similar finding was observed in our study that educational qualification was significantly associated with knowledge about complications of diabetes mellitus (p value <0.05). However, we did not find a significant association between socio-economic status and knowledge about complications of diabetes. One probable reason for this may be the easy approachability and availability of free government hospital services of urban patients to healthcare facilities. This is an important factor to be considered in recent studies indicating the requirement for a holistic approach by health-care professionals while targeting different groups in the population.

53.3% of the participants had a family history of diabetes and this factor showed statistically significant association with knowledge about complications affecting heart (p=0.006) and kidneys (p=0.002) (figure 6). Possible reason for this could be the exposure of the family members of a diabetic individual to the clinician and other health-care professionals while accompanying them for hospital visits. The family members are also involved in taking care of the patient and hence they tend to know about the risks and treatment methodologies of the disease.

Our study showed that 81.7% participants were regular in taking their medicines. However, only 19.2% participants knew the name of the medicines they had been taking for managing diabetes. Whether the patient knew the name of their medicines was strongly and statistically significantly associated with educational qualification (p=0.000), gender (p=0.000), employment (p=0.002) and socio-economic status (p=0.000). This indicated that opportunities which enable more social interaction had an impact on the behaviour and self-awareness in an individual. Also, some patients with high literacy also could not name their medicines. This indicated negligence. The knowledge of the patients about the names of their medicines can prove to be very useful in case of an emergency.

Previous studies suggested after being diagnosed, majority of the patients believed that medication was important and were regular in taking their medicines on time. Apart from medication, many patients insisted that healthy and planned eating was an essential part of treatment and they adhered to a diabetic-friendly diet. Awareness about regular exercise as a part of diabetes management is a slowly emerging trend and indicates towards adoption of lifestyle modifying practices by diabetic patients.[24,25] The fact that healthy planned eating and exercising regularly can delay diabetes and its complications is well established.[26] These lifestyle interventions are the cornerstones of successful diabetic therapy. Previous studies have shown that drugs and dietary modification were the most practiced management option among diabetic patients. Our study showed a positive finding that 59.2% participants believed in including dietary modification, medication along with regular exercise as the best treatment methodology in treatment of diabetes. The approach of inclusion of regular exercise indicates the adoption of healthy practices.

Furthermore, considering the source of health-care related information about diabetes, majority of the studies showed similar findings. Maximum participants included in the previous studies claimed that they received most of their information from friends, family or neighbours. It cannot be ignored that these people may not be a reliable scientific source of information and thus it becomes all the more necessary to have more official and reliable source find a reach in the community. The frequencies of other sources of information showed fluctuation in each study considering other factors regarding the study population. Some studies suggested that media and internet is an emerging source of information in the young population. At the same time, there are participants who receive an ample amount of information from their doctors through the means of discussion and information leaflets.[18,19]

The results of our study indicated that 90% of the participants approached their treating clinician without any hesitation. This could be one of the probable reasons of 50.8% participants claiming that their source of healthcare related information was discussion with their clinician, which is undoubtedly the most authentic source of information. Secondly, information about diabetic management from friends and family came out to be 36.7%. This indicates that there is an active discussion about diabetes and its management in the community. However, it must be noted that the authenticity of this information is questionable. Therefore, an active strategy must be adopted to provide correct and authentic information to the community.

The third major source of information was messages and posts on social media (9.2%), the authenticity of which is relatively less. Only 0.8% participants claimed to have attended Seminars or Awareness Programs on Diabetes. Not even a single participant had seen diabetes awareness related advertisements on television. It is probable that majority of the participants got their information from their treating clinician because of the urban setting of our study.

Since 84.2% of the participants agreed that they feel the need for Health camps for awareness on diabetes, it suggestive of the fact that it can prove to be a an effective and patient-friendly way to deliver authentic diabetes related information to the community by trained Diabetic educators, clinicians and nurses.

Our study also focussed on multiple aspects and their associations affecting the awareness and attitude of diabetic patients and also throws light on how some of these trends have continued in accordance while have been contradicted with time. (figure7 & figure8)

CONCLUSION

This study underscores the importance of increasing awareness about diabetes complications, particularly for under-informed demographic groups. It indicates that while most diabetic patients are aware of complications involving the kidneys and eyes but knowledge about other organ complications is low. Awareness level is associated with factors like gender, education, and family history of diabetes. A positive shift towards regular exercise as a treatment method was observed, mainly among literate participants. Patients are willing to participate in awareness programs and seek authentic information about their disease. Efforts should be made to provide reliable information through various mediums.

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REFERENCES

1. Alvin C. Powers. Diabetes Mellitus: Diagnosis, Classification and Pathophysiology. In, Kasper, Fauci, Hauser, Longo, Jameson and Loscalzo. Harrison's Principles of Internal Medicine, Volume-II, 19th Edition, Mc Graw-Hill Education, 2012; 2399.
2. Unwin N, Whiting D, Guariguata L, Ghyoot G, Gan D, editors. Diabetes Atlas. 5th ed. Brussels, Belgium: International Diabetes Federation; 2011. International Diabetes Federation; pp. 11–74.
3. Anjana RM, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian Council of Medical Research-INdiaDIABetes (ICMR-INDIAB) study. Diabetologia. 2011;54:3022–7.
4. Deepa M, Bhansali A, Anjana RM, Pradeepa R, Joshi SR, Joshi PP, et al. Knowledge and awareness of diabetes in urban and rural India: The Indian Council of Medical Research India Diabetes Study (Phase I): Indian Council of Medical Research India Diabetes 4. Indian J Endocrinol Metab. 2014;18:379–385. doi: 10.4103/2230-8210.131191.
5. Anjana RM, Deepa M, Pradeepa R. Prevalence of diabetes in urban and rural India—ICMR-INDIAB study. InCardiometabolic Diseases 2025 Jan 1 (pp. 37-48). Academic Press.
6. Chawla A, Chawla R, Jaggi S. Microvascular and macrovascular complications in diabetes mellitus: distinct or continuum? Indian Journal of Endocrinology Metabolism. 2016;20(4):546. doi: 10.4103/2230-8210.183480.
7. Visser A, Snoek F. Perspectives on education and counseling for diabetes patients. Patient Educ Couns. 2004;53:251–5.
8. Rani PK, Raman R, Subramani S, Perumal G, Kumaramanickavel G, Sharma T. Knowledge of diabetes and diabetic retinopathy among rural populations in India, and the influence of knowledge of diabetic retinopathy on attitude and practice. Rural Remote Health. 2008;8:838.
9. Goie TT, Naidoo M. Awareness of diabetic foot disease amongst patients with type 2 diabetes mellitus attending the chronic outpatients department at a regional hospital in Durban, South Africa. Afr J Prim Health Care Fam Med. 2016;8:e1–e8.
10. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007 Mar;125(3):217-30. PMID: 17496352
11. Ramachandran A, Snehalatha C, Ma RC. Diabetes in South-East Asia: An update. Diabetes Res Clin Pract. 2014;103:231–7.
12. Whiting D R, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94(03):311–321.
13. Unnikrishnan R, Pradeepa R, Joshi S R, Mohan V. Type 2 diabetes: demystifying the global epidemic. Diabetes. 2017;66(06):1432–1442.
14. Podder V., Srivastava V., Kumar S., Nagarathna R., Sivapuram M.S., Kaur N., Sharma K., Singh A.K., Malik N., Anand A., et al. Prevalence and Awareness of Stroke and Other Comorbidities Associated with Diabetes in Northwest India. J. Neurosci. Rural. Pr. 2020;11:467–473. doi: 10.1055/s-0040-1709369.
15. Li J, Pandian V, Davidson PM, Song Y, Chen N, Fong DY. Burden and attributable risk factors of non-communicable diseases and subtypes in 204 countries and territories, 1990–2021: a systematic analysis for the global burden of disease study 2021. International Journal of Surgery. 2025 Mar 1;111(3):2385-97.
16. Standards of Medical Care in Diabetes-2016: Summary of Revisions. Diabetes Care. 2016 Jan;39 Suppl 1:S4-5. doi: 10.2337/dc16-S003. PMID: 26696680.
17. Dariya SS, Maheshwari A, Viswanathan V, Virmani AK, Aslam M, Modi A, Tewari AK, Chaturvedi A, Kedia AK, Ramchandani GD, Saxena R. Assessment of the Awareness of Risk Factors and Current Behavior Among Individuals With Type 2 Diabetes Mellitus in India: A Cross-Sectional Study. Cureus. 2025 Mar 13;17(3).
18. Shirmohammadi N, Soltanian AR, Borzouei S. Public Awareness of Early and Late Complications of Type 2 Diabetes - Application of Latent Profile Analysis in Determining Questionnaire Cut-Off Points. Osong Public Health Res Perspect. 2018 Oct;9(5):261-268. doi: 10.24171/j.phrp.2018.9.5.08. PMID: 30402382; PMCID: PMC6202015.
19. Gudlavalleti MV, Anchala R, Gudlavalleti AS, Ramachandra SS, Shukla R, Jotheeswaran AT, Babu RG, Singh V, Allagh K, Sagar J, Bandyopadhyay S, Gilbert CE. Perceptions and practices related to diabetes reported by persons with diabetes attending diabetic care clinics: The India 11-city 9-state study. Indian J Endocrinol Metab. 2016 Apr;20(Suppl 1):S26-32. doi: 10.4103/2230-8210.179771. PMID: 27144133; PMCID: PMC4847446.
20. Khandekar R, Harby SA, Harthy HA, Lawatti JA. Knowledge, attitude and practice regarding eye complications and care among Omani persons with diabetes – A cross sectional study. Oman J Ophthalmol. 2010;3:60–5.
21. Foma MA, Saidu Y, Omoleke SA, Jafali J. Awareness of diabetes mellitus among diabetic patients in the Gambia: A strong case for health education and promotion. BMC Public Health. 2013;13:1124.
22. Chavan GM, Waghachavare VB, Gore AD, Chavan VM, Dhobale RV, Dhumale GB. Knowledge about diabetes and relationship between compliance to the management among the diabetic patients from rural Area of Sangli District, Maharashtra, India. J Fam Med Prim Care. 2015;4:439–43.
23. Rahman MS, Akter S, Abe SK, Islam MR, Mondal MN, Rahman JA, et al. Awareness, treatment, and control of diabetes in Bangladesh: A nationwide population-based study. PLoS One. 2015;10:e0118365.
24. Mukhopadhyay P, Paul B, Das D, Sengupta N, Majumder R. Perceptions and practices of type 2 diabetics: A cross sectional study in a tertiary care hospital in Kolkata. Int J Diabetes Dev Ctries. 2010;30:143–9.
25. Kishore J, Kohli C, Gupta N, Kumar N, Sharma P. Awareness, practices and treatment seeking behavior of type 2 diabetes mellitus patients in Delhi. Ann Med Health Sci Res. 2015;5:266–273.
26. Koenigsberg MR, Bartlett D, Cramer JS. Facilitating treatment adherence with lifestyle changes in diabetes. Am Fam Physician. 2004;69:309–16.