Original Article

The Correlation between Knowledge, Attitude, and Practice Related to Diabetes Involving Ayurveda and Yoga in two Ayurveda and Allopathy Hospitals of Bengaluru

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Abstract

Introduction: Diabetes is classified as an epidemic disease necessitating utmost contemplation for both controlling its onset and managing the condition effectively. To achieve this, a fundamental awareness of diabetes and the benefits Ayurveda and yoga can provide to combat the disease must be familiarized. **Aims:** The objective of the study is to understand the awareness of diabetes, perception and practices related to it and the role of Ayurveda and Yoga in its management within the population. **Materials and Methods:** It is a multi-centric hospital-based analytical cross-sectional study with a sample of 1200 participants. Eligible candidates visiting two government Ayurveda hospitals and allopathy hospitals each situated in urban and rural regions of Bangalore situated in Southern India of South Asia were made to answer or fill the structured questionnaire. It was subsequently converted to a digital format for statistical analysis. Overall KAP scores were calculated using Bloom's cut-off point. P-value less than 0.05 and less than 0.001 were considered statistically significant. A Pearson correlation coefficient was employed to determine the relationship between knowledge, attitude and practice. **Results:** Our study showed good knowledge (49.58%) but moderate attitude (58.67%) and practice (47.5%) among the population. There was a weak but significant correlation between knowledge and attitude (r=0.181) as well as between knowledge and practice (r=0.349). But no correlation was found between attitude and practice (r=0.048). **Conclusions:** Combating the diabetes epidemic requires more than just raising awareness about the disease. Encouraging healthy behaviors and shifting people's perspective around lifestyle choices is paramount to effectively address the root cause of increasing rate of diabetes.

Keywords: Attitude, Ayurveda, Bengaluru, correlation, diabetes, knowledge, practice, South Asia, Southern India, yoga

Introduction

Diabetes is one of the leading causes of death and disability worldwide, impacting people irrespective of age, gender, and nationality.[1] According to the global burden of disease, diabetes mellitus (DM) has resulted in 70.9 million DALYs, viz., disability-adjusted life year (a standardized metric to measure the overall burden of the disease in a population) in 2019, which is 2.8% of the total global DALYs.[2] South Asia, which is home to approximately a quarter of the world's population, is undergoing an epidemiological transition with an explosion in the prevalence of noncommunicable diseases like diabetes. It was reported by the Indian Council of Medical Research that the diabetes epidemic had stabilized in developed states of India, but it was increasing in many other states.[3] As per the study published in 2023, in India, the prevalence of diabetes is 10.1 crores.[4] According to National Health Family Survey-5 2023, around 10.7% of Karnataka's population has diabetes. In Bangalore, 19.4% of women and 21.3% of men suffer from diabetes.[5]

International Diabetes Federation estimates that by 2045, approximately 783 million people will be living with diabetes. The key contribution to the rise of type-2 diabetes is urbanization, a decrease in physical activity, and an increase in the prevalence of obesity and overweight. However, diabetes can often be prevented, and its impact can be reduced by

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taking preventive measures, early diagnosis, and proper care for patients with the condition.[6] Knowledge, Attitude, and Practice (KAP) studies gather information on what people know, feel, and do regarding a particular topic within a specific community. Understanding these three entities can enable more efficient policies to be implemented by policymakers.[7] This study was devised to gather data about knowledge of diabetes and the role of Ayurveda and Yoga in diabetes among people visiting allopathy and Ayurveda hospitals situated in urban and rural parts of Bangalore of Southern India. This paper has focused on the determination of the correlation between knowledge, attitude, and practice and to identify the gap between them.

Materials and Methods

Subjects and methods

A multi-centric hospital-based analytical cross-sectional study was conducted using a simple random sampling method to recruit 1200 subjects from two Allopathic hospitals and two Ayurveda hospitals (each center 300 subjects) situated in urban and semi-urban/rural parts of Bangalore, Karnataka, India [Figure 1]. It was initiated after obtaining approval from Institutional Ethical Committee (F.No. 6-5/2022-CARI/BNG/ETHI.COMMI./2404 date February 9, 2023) and was also registered in CTRI (CTRI/2023/03/050478 on March 9, 2023). The data collection was done from February 2023 to June 2023.

Questionnaires

A comprehensive questionnaire was developed to assess KAP regarding the influence of Ayurveda and Yoga on diabetes management. Since no validated questionnaires existed on this specific topic, our questions were structured based on literature reviews and patient-based queries frequently encountered by Ayurveda physicians. The questionnaire comprised 21 questions evaluating knowledge, 18 assessing attitude, and 13 examining practices. The knowledge section included questions related to the fundamentals of diabetes such as causative factors, symptoms, potential complications, prevention, and management approaches related to Ayurveda and Yoga; the attitude section focused on common myths about diabetes and individual's perspective on diabetic care and their confidence in using Ayurveda and Yoga for its management; practice section addressed questions regarding self-care practices and medical care routines followed for the prevention or management of diabetes and also practice of using health products shown in media. It was approved by the panel of the expert advisory committee of the Centre of Excellence in Madhumeha and the Institutional Ethical Committee of the institute. All subjects who were willing to give consent to participate, who were above the age of 18 years and visiting the respective hospital as a caregiver or patient, were approached for the survey. The social workers issued the survey form to the eligible respondents, who could read and write it to fill it out. Subjects who required help to read or understand the questionnaires were interviewed and the answers were filled by the social workers who were trained to administer the questions in a standard manner. All the answers were transferred to a digital format.

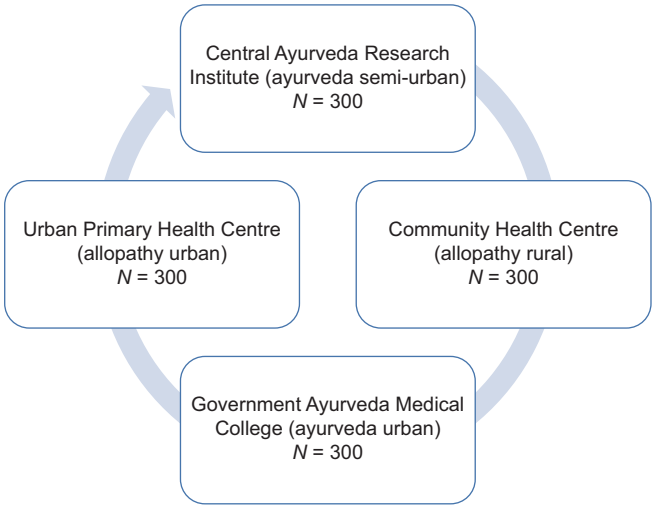

Figure 1: Study sites of knowledge, attitude, and practice study

Sampling

This multi-centric analytical cross-sectional study employed simple random sampling to recruit 1200 subjects from two Allopathic and two Ayurveda hospitals in Bangalore, Karnataka, India. The sample size for the study was calculated using standard statistical methods, considering an average of 50% KAP in the population. Each hospital served as a cluster, and 300 subjects were randomly selected from each cluster. This design effect due to clustering was considered in sample size calculations to ensure a margin of error of not more than 4%. The sampling frame included patients and caregivers visiting the hospitals who were above 18 years old and willing to provide consent.

$$n = \frac{Z^2 \times P(1-P)}{e^2} \times d$$

where, Z is the standard normal table value corresponding to 5% of α

P is the anticipated prevalence

e is the margin of error

d is the design effect due to clustering.

$$n = \frac{1.96^2 \times 0.50(1-0.50)}{0.04^2} \times 2 = 1200$$

Data handling and statistical analysis

Data were entered into an Excel spreadsheet and organized for statistical analysis. Analysis of data was carried out using STATA software version 18.01 from StataCorp LLC, Texas, United States. The independent variables were gender, age, marital status, education, religion, occupation, income, mental stress, dietary habits, physical activity, family history of DM, and known cases of DM. KAP scores were the dependent variables. The rationale for selecting these independent variables

was based on their potential impact on diabetes management and KAP scores, as supported by existing literature**.** KAP scores were determined by assigning 1 point for each correct answer and 0 point for incorrect or "not sure" answers. The overall KAP scores of respondents were calculated using the original Bloom's cutoff point: scores between 80% and 100% were considered good, scores between 60% and 79% were classified as moderate, and scores below 60% were deemed poor. The data were analyzed using frequency distributions for categorical variables, and mean ± standard deviation for continuous variables was then provided. The strength of all independent variables on KAP variables was assessed using odds ratio (OR) and confidence intervals (CIs). A $P < 0.05$ and <0.001 was considered statistically significant. Finally, the Pearson correlation coefficient was used to determine the correlations between KAP.

Results

Characterization of the study population

The sample consisted of 51.7% of females, 92.7% Hindu and had a mean age of 43 ± 14.8. Out of the total study participants, about 1024 (85.3%) are ever married. Approximately 17.08% of the surveyed population was illiterate and about 32.67% graduated. Many of the respondents (47.8%) were professional workers, while 46.4% were unemployed and a smaller proportion was engaged in fieldwork. More than half the family had > 20,000 monthly incomes. Most respondents (93.6%) reported being physically active in a moderate way, whereas fewer reported being inactive. Only 60 (5%) respondents reported experiencing severe stress (mental pressure on the majority of the days), while 229 (19.08%), 659 (54.9%), reported no stress (occasional mental pressure) and less stress (sometimes mental pressure), respectively. A family history of diabetes was not present in 61.5% of the respondents. More than half of our study participants were not diabetic [Table 1].

Table 1: Sociodemographic characteristics of respondents

Variables	Total (1200), *n* (%)
Age (mean±SD)	43±14.8
Gender	
Male	579 (48.25)
Female	621 (51.75)
Marital status	
Ever married	1024 (85.33)
Never married	127 (10.58)
Separated/widow/widower	49 (4.08)
Religion	
Christian	8 (0.67)
Hindu	1113 (92.75)
Muslim	79 (6.58)
Education	
Illiterate	205 (17.08)
Primary school	175 (14.58)
Secondary school	428 (35.67)
College and above	392 (32.67)
Occupation	
Professional and semi-professional	574 (47.83)
Fieldwork	69 (5.75)
Unemployed	557 (46.42)
Nature of physical activity	
Moderate	1124 (93.67)
Sedentary	69 (5.75)
Strenuous	7 (0.58)
Level of mental stress	
No stress	229 (19.08)
Less stress	659 (54.92)
Medium stress	241 (20.08)
High stress	60 (5)
Extreme stress	11 (0.92)
Dietary habits	
Mixed diet	1056 (88)
Ovo-vegetarian	6 (0.50)
Vegetarian	138 (11.50)
Family history of diabetes	
No	738 (61.50)
Yes	457 (38.08)
Don't know	5 (0.42)
Monthly income of the family	
<20,000	458 (38.17)
20,000–50,000	656 (54.67)
50,000–100,000	66 (5.50)
>100,000	20 (1.67)
Known case of diabetes	
Yes	387 (32.25)
No	809 (67.42)
Don't know	4 (0.33)

SD: Standard deviation

Table 2 presents the ordinal logistic regression analysis of KAP toward diabetes. Age was not significantly associated with knowledge or practice, but respondents aged 40–49 had lower attitude scores (Adjusted [OR] =0.59, 95% CI = 0.39–0.88, $P < 0.05$). Male respondents had lower knowledge scores (AOR = 0.92, 95% CI = 0.69–1.22), while unmarried respondents had lower knowledge (AOR = 0.62, 95% CI = 0.40–0.97, $P < 0.05$) and practice scores (AOR = 0.57, 95% CI = 0.37–0.88, $P < 0.05$). Education level was positively associated with knowledge (AOR = 2.47, 95% CI = 1.69–3.61, $P < 0.001$) and practice scores (AOR = 2.23, 95% CI = 1.53–3.27, $P < 0.001$). Moreover, the positive association between education level and KAP scores highlights the importance of education in diabetes management. These insights can inform the development of tailored strategies to enhance diabetes knowledge, attitudes, and practices among vulnerable populations. Fieldwork occupation was linked to lower knowledge (AOR = 0.41, 95% CI = 0.25–0.67, $P < 0.001$) and practice scores (AOR = 0.57, 95% CI = 0.35–0.93, $P < 0.05$). Higher family income was positively associated with knowledge (AOR = 1.25, 95% CI = 0.98–1.60) and practice scores (AOR = 0.67, 95% CI = 0.52–0.85, $P < 0.001$). Physical activity and mental stress levels also showed significant associations with KAP scores. Respondents with a family

Table 2: Ordinal logistic regression of knowledge, attitude, and practice toward diabetes

Variables	Knowledge		Attitude		Practice	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
Age						
20–29	Reference		Reference		Reference	
30–39	1.08	0.74–1.57	0.83	0.57–1.22	0.86	0.60–1.24
40–49	1.00	0.67–1.50	0.59*	0.39–0.88	1.18	0.80–1.73
50–59	1.17	0.76–1.79	0.66	0.43–1.03	1.30	0.86–1.97
60–69	0.75	0.46–1.22	0.65	0.39–0.08	1.14	0.71–1.82
70 and above	0.80	0.41–1.54	0.43*	0.21–0.82	1.79	0.94–3.39
Sex						
Male	0.92	0.69–1.22	1.08	0.81–1.44	0.94	0.71–1.24
Female	Reference		Reference		Reference	
Religion						
Christian	Reference				Reference	
Muslim	0.69	0.17–2.78	0.56	0.11–2.70	0.74	0.18–2.96
Hindu	1.40	0.36–5.30	0.97	0.21–4.41	0.98	0.26–3.68
Marital status						
Married	Reference		Reference		Reference	
Not married	0.62*	0.40–0.97	0.75	0.47–1.19	0.57*	0.37–0.88
Widow/widower	1.37	0.73–2.55	1.43	0.77–2.67	0.96	0.51–1.77
Education						
Illiterate	Reference		Reference		Reference	
Primary	1.60*	1.06–2.41	0.97	0.65–1.47	1.45	0.96–2.17
Secondary	1.45*	1.03–2.04	0.94	0.66–1.33	1.71*	1.20–2.41
College above	2.47**	1.69–3.61	1.036	0.70–1.52	2.23**	1.53–3.27
Occupation						
Desk work	Reference		Reference		Reference	
Fieldwork	0.41**	0.25–0.67	0.87	0.51–1.48	0.57*	0.35–0.93
Unemployed	0.86	0.63–1.17	1.03	0.76–1.39	1.19	0.88–1.59
Monthly income						
<20,000	Reference		Reference		Reference	
20,000–50,000	1.25	0.98–1.60	0.89	0.69–1.14	0.67**	0.52–0.85
50,000–100,000	1.08	0.63–1.85	0.86	0.48–1.51	0.42**	0.25–0.72
≥100,000	2.16	0.85–5.46	1.99	0.78–5.09	1.52	0.61–3.81
Dietary behavior						
Nonvegetarian	Reference		Reference		Reference	
Ovo-vegetarian	0.54	0.11–2.48	0.95	0.15–6.06	1.75	0.38–8.06
Vegetarian	1.03	0.71–1.50	0.70	0.47–1.03	1.51*	1.05–2.18
Physical activity						
Moderate	Reference		Reference		Reference	
Sedentary	3.18**	1.79–5.62	1.51	0.91–2.51	0.31**	0.19–0.52
Strenuous	0.16*	0.042–0.66	0.21*	0.046–0.99	0.35	0.08–1.53
Level of mental stress						
No stress	Reference		Reference		Reference	
Less stress	2.70**	1.99–2.70	0.74	0.54–1.02	2.79**	2.04–3.82
Medium stress	2.48**	1.73–2.48	0.55*	0.37–0.81	3.76**	2.58–5.48
High stress	2.54**	1.45–2.54	0.29**	0.16–0.54	5.67**	3.24–9.92
Extreme stress	3.99*	1.11–14.37	0.84	0.26–2.66	7.59**	2.38–24.1
Family history of DM						
Yes	1.83**	1.43–2.35	1.06	0.83–1.36	1.22	0.96–1.55
No	Reference		Reference		Reference	
Don’t know	0.26	0.04–1.41	0.68	0.07–6.68	0.46	0.08–2.55
Known cases of diabetes						
Yes	Reference		Reference		Reference	
No	0.68*	0.53–0.89	1.00	0.769–1.31	0.73*	0.56–0.95
Don’t know	1.75	0.23–13.0	0.80	0.111–5.83	0.92	0.16–5.19

*P<0.05 significance level, **P<0.001 significance level. AOR: Adjusted odds ratio, 95% CI: 95% confidence interval, DM: Diabetes mellitus

history of diabetes had higher knowledge scores (AOR = 1.83, 95% CI = 1.43–2.35, $P < 0.001$). Likewise, those who had higher family income had higher KAP respectively. These findings highlight the importance of demographic factors in shaping diabetes-related knowledge, attitudes, and practices.

Distribution of knowledge, attitudes, and practices among participants

Approximately 49.58% of participants had a high knowledge score, whereas 27.75% and 22.67% had a moderate and poor knowledge score, respectively [Figure 2]. Over half of the respondents (58.67%) had moderate attitudes, whereas 13.42% had a poor attitude and only 27.92% had a good attitude. Finally, the practice levels were good among 20% and moderate in 47.5% of the participants.

Correlation between knowledge, attitude, and practice

The relationships between KAPs are shown in Table 3. We found a weak but significant positive correlation between knowledge and attitude score ($r = 0.181$), and knowledge and practice ($r = 0.349$). Individuals with greater knowledge about diabetes and its associated variables tended to demonstrate positive attitudes and better practices toward the management of diabetes and vice versa. However, there was no significant correlation between attitude scores and practice ($r = 0.048$).

Overall, the study participants demonstrated good knowledge, a moderate attitude, and practice regarding diabetes. A weak but statistically significant correlation was derived between knowledge and attitude as well as between knowledge and practice. However, no correlation was found between attitude and practice.

Discussion

This survey was conducted in hospitals following different systems of medicine situated in both urban and rural parts of Bangalore. The participant's knowledge was assessed based on awareness of diabetes and the influence of Ayurveda and Yoga on diabetes. This study showed that 49.58% of the population had good knowledge, which is similar to other studies conducted in India.[8-11] However, this is contrary to the studies done in a hospital in eastern India where diabetic patients had average knowledge.[12] Two other studies in Bangladesh also resulted in average scores of knowledge.[13,14] This may be attributed to the differences in the questionnaires used in both studies, as our study included questions specifically related to Ayurveda and Yoga. In our study, the health literacy of females was better when compared to males, which were akin to other studies where female knowledge was more satisfactory than that of males.[15,16] This emphasizes the prioritization of women's health in the society. Education and supportive social norms have provided women with a valuable avenue to access health information. In older age groups, particularly those aged 40–49 and 70 and above, exhibited lower odds of having positive attitudes. This finding suggests a potential generational gap in perceptions or priorities regarding a disease, warranting further investigation into age-specific interventions like organizing outreach programs catering to the needs of older people, or involving their caregivers in learning sessions to make them understand better. Subjects whose family members had diabetes had more knowledge than those without a family history. This is from the apparent fact that a family member's disease becomes a topic of discussion at home and as a result, other members gain knowledge on the same. Education is most of the time an indicator of better KAP. Likewise, in our study, subjects who completed college and above education had better disease knowledge, positive outlook, and habits related to diabetes. This may be due to better access to information, awareness, and indulgence in self-care practices promptly with a positive attitude.

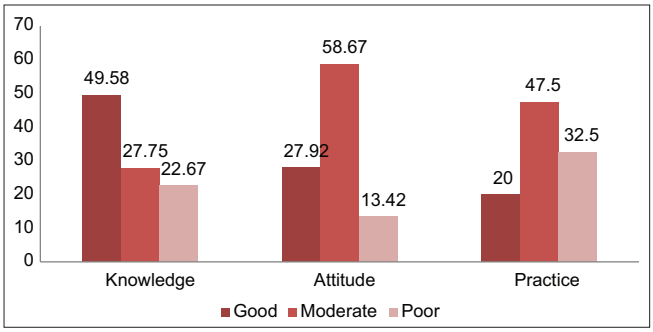

Figure 2: Distribution of knowledge, attitudes, and practices among participants

Table 3: Correlation of the level of knowledge, attitudes, and practice of participants

Indicators	Pearson *r*	*P*
Knowledge and attitude	0.181	<0.001*
Knowledge and practice	0.349	<0.001*
Attitude and practice	0.048	NS

*Significant correlation at $P<0.001$. NS: No significant correlation

As the family income increases, there is an improvement in KAPs related to diabetes. Wealth facilitates access to good quality education, health care and related resources and also contributes to an improved outlook on life. Ruben Silva-Tinoco *et al*.[17] and various studies also concluded that socioeconomic gradients influence diabetes knowledge and practice. Although the knowledge and practice result of diabetic respondents were superior to nondiabetic subjects, their attitude was inferior. The nondiabetic population might be healthier, and their perspective on life might be more optimistic compared to a diabetic patient. Thus, we got a positive attitude among the nondiabetic population.

Knowledge alone is insufficient to combat a disease but attitude and motivation are also pivotal. In this study, more than half of the respondents had moderate attitude and only 27.92% had positive attitude. This contrasts with the findings of other study done in rural northern India,[9] where both knowledge and attitude were good. However, knowledge does not always result in change in behavior and it needs to be reinforced.[18]

The reduced willingness to engage in healthy maintenance has consecutively resulted in moderate practice (47.5%), with only

20% of the subjects following good self-care practices. Since the government sector and rural region people were a part of the study, affordability, and inconvenience to get required medical attention and the psychological belief that regularly visiting the doctor or actively managing one's health is unnecessary may have hindered them from adopting diabetic amicable practices. This result is identical to a study conducted in eastern India and eastern Bihar, where practice was not satisfactory.[19,20] However, it was contrary to a study done in a tertiary teaching hospital and private allopathy hospital in Bangalore, where self-care practices were relatively more satisfactory than the domain of knowledge.[21,22] The significant association between marital status and practice highlights the importance of social support in promoting healthy behaviors. Future studies could explore the mechanisms underlying these associations and develop interventions that utilize social support systems to enhance diabetes management practices.

There was a weak but statistically significant positive correlation between knowledge and attitude as well as between knowledge and practice. Subjects with good knowledge had better attitudes and were more conscientious about indulgence in healthy practices. However, there was no relation between attitude and practice, which implies that attitudes do not necessarily translate directly into corresponding behaviors. This discrepancy suggests a gap between respondents' attitudes and actual practices, potentially due to factors such as intentions versus actions, knowledge gaps, environmental influences, or specific behaviors not aligning with attitudes. These findings emphasize the importance of enhancing knowledge to promote favorable positive attitudes and practices regarding diabetes management, while also highlighting the necessity for further exploration into the complex relationship between attitudes and actual behaviors. As per the health belief model developed by the US Public Health Service, the paucity of consequences of complications of the disease among the subjects can lead to such outcomes. This could also be due to other impediments like time consumption, increased expense, or inconvenience to perform the recommended actions. This study indicates a lack of cues to prompt the decision-making process for accepting the recommended health actions.[23]

Conclusions

This study demonstrates a wide gap between knowledge and attitude practice. People had good diabetes literacy but lacked motivation, and desire to perform disease-specific lifestyle adjustments. There is a need to initiate self-empowerment programs, community initiatives, and policy changes to improve the population's outlook toward the disease and motivate them to practice a healthy lifestyle. By empowering individuals to make healthier choices and fostering environments that support those choices, we can work toward reducing the prevalence of diabetes and improving overall public health. This suggests that policies should not focus only on improving diabetic literacy; instead, greater emphasis should be placed on motivating the public to incorporate it into their daily routines and practices.

Limitations

As this survey was done in only four hospitals, the result may not be the true reflection of the population of Bangalore. However, there is scope for analyzing the difference of KAP between people visiting Ayurveda Hospital and Allopathy Hospital and also between urban and rural regions of Bangalore, which will be published as separate research articles.

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Conflicts of interest

There are no conflicts of interest.

References

1. Ong KL, Stafford LK, McLaughlin SA, Boyko EJ, Vollset SE, Smith AE, *et al*. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: A systematic analysis for the Global Burden of Disease Study 2021. Lancet 2023;402:203-34.
2. Available from: https://www.healthdata.org/research-analysis/gbd. [Last accessed on 2024 Jul 24].
3. Anjana RM, Unnikrishnan R, Deepa M, Pradeepa R, Tandon N, Das AK, *et al.* Metabolic non-communicable disease health report of India: The ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). Lancet Diabetes Endocrinol 2023;11:474-89.
4. Available from: https://pib.gov.in/PressReleasePage.aspx?PRID=1944600#:~:text=As%20per%20Indian%20Council%20of,of%20diabetes%20is%2010.1%20crores. [Last accessed on 2024 Jul 24].
5. Available from: https://rchiips.org/nfhs/factsheet_NFHS-5.shtml. [Last accessed on 2024 Jul 24].
6. Available from: https://idf.org/about-diabetes/diabetes-facts-figures. [Last accessed on 2024 Jul 24].
7. AshaRani PV, Abdin E, Kumarasan R, Siva Kumar FD, Shafie S, Jeyagurunathan A, *et al.* Study protocol for a nationwide knowledge, attitudes and practices (KAP) survey on diabetes in Singapore's general population. BMJ Open 2020;10:e037125.
8. Srinivasan NK, John D, Rebekah G, Kujur ES, Paul P, John SS. Diabetes and diabetic retinopathy: Knowledge, attitude, practice (KAP) among diabetic patients in a tertiary eye care centre. J Clin Diagn Res 2017;11:C01-7.
9. Gupta RK, Shora TN, Jan R, Raina SK, Mengi V, Khajuria V. Knowledge, attitude and practices in type 2 diabetes mellitus patients in rural Northern India. Indian J Community Health 2015;27:327-33.
10. Priyanka Raj CK, Angadi MM. Hospital-based KAP study on diabetes in Bijapur, Karnataka. Indian J Med Spec 2010;1:80-3.
11. Debnath P, Natasha K, Ali L, Bhaduri T, Roy TK, Bera S, *et al.* Ayurpharmacoepidemiology perspective: Health literacy (knowledge and practice) among older diabetes patients visiting Ayurveda teaching hospitals in India. J Evid Based Complementary Altern Med 2017;22:242-50.
12. Das AK, Ghosh D, Ghosh J. Assessment of patients' knowledge, attitude and practice regarding diabetes mellitus in a tertiary care hospital in Eastern India. Assessment 2023;16:29-34.
13. Saleh F, Mumu SJ, Ara F, Ali L, Hossain S, Ahmed KR. Knowledge, attitude and practice of type 2 diabetic patients regarding obesity: Study in a tertiary care hospital in Bangladesh. J Public Health Afr 2012;3:e8.
14. Saleh F, Mumu SJ, Ara F, Begum HA, Ali L. Knowledge and self-care practices regarding diabetes among newly diagnosed type 2 diabetics in Bangladesh: A cross-sectional study. BMC Public Health 2012;12:1112.

15. George H, Rakesh P, Krishna M, Alex R, Abraham VJ, George K, *et al.* Foot care knowledge and practices and the prevalence of peripheral neuropathy among people with diabetes attending a secondary care rural hospital in Southern India. J Family Med Prim Care 2013;2:27-32.
16. Al-Mutawaa KA, Farghaly AH, Nasir R, Loares AM, Skaroni I, Al-Thani M, *et al.* Level of knowledge, attitude and practice towards diabetes among nationals and long-term residents of Qatar: A cross-sectional study. BMJ Open 2022;12:e052607.
17. Silva-Tinoco R, Cuatecontzi-Xochitiotzi T, De la Torre-Saldaña V, León-García E, Serna-Alvarado J, Orea-Tejeda A, *et al*. Influence of social determinants, diabetes knowledge, health behaviors, and glycemic control in type 2 diabetes: An analysis from real-world evidence. BMC Endocr Disord 2020;20:130. doi: 10.1186/s12902-020-00604-6. PMID: 32843004; PMCID: PMC7449009.
18. McManus R, Stitt L, Bargh G. Population survey of diabetes knowledge and protective behaviours. Can J Diabetes 2006;30:256-63.
19. Das Choudhury S, Das SK, Hazra A. Survey of knowledge-attitude-practice concerning insulin use in adult diabetic patients in Eastern India. Indian J Pharmacol 2014;46:425-9.
20. Kumar S. KAP (knowledge attitude, practice) study about type 2 diabetes among person visiting a rural community health center in Eastern Bihar. IJDMSR 2021;3:685-91.
21. Lakshman RL, Nuthi S, Valsangkar S. An assessment of knowledge and self care practices among diabetics in an urban area. MRIMS J Health Sci 2014;2:11-4.
22. Navaneeth VM, Fathima N, Mamatha K, Suryanarayana VS. A study on knowledge, attitude and practice (KAP) in diabetic patients attending endocrinology OPD at a tertiary care hospital. SASTech Tech J RUAS 2017;16:53-6.
23. Available from: https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories2.html. [Last accessed on 2024 Jul 24].