



## Assessing the Knowledge, Attitude and Practice (KAP) among the newly diagnosed Prediabetes screened in selected districts of South India

Mohsina Hyder K<sup>1</sup>, Raja D<sup>1</sup>, Jithin Mohan<sup>2</sup>, Ponnusankar S<sup>\*1</sup>

<sup>1</sup>Department of Pharmacy Practice, JSS College of Pharmacy, JSS Academy of Higher Education and Research, Ooty – 643 001, The Nilgiris, Tamil Nadu, India

<sup>2</sup>Department of General Medicine, Specialist-Internal Medicine, Aster Wayanad Speciality Hospital, Wayanad, Kerala, India

### Article History:

Received on: 10 May 2020

Revised on: 25 May 2020

Accepted on: 02 Jun 2020

### Keywords:

Knowledge, Attitude, Practice, prediabetes, screening, India

### ABSTRACT

Currently, 314 million people in the world are Prediabetes, and it is predicted that around 500 million would be burdened by the year 2025. Continuing education of diabetes and its complications is crucial, but it should be accompanied with regular assessment of Knowledge Attitude and Practice (KAP) among the high-risk population. This study was carried out to assess the Knowledge, Attitude and Practice among the newly diagnosed Prediabetes screened over selected districts of South India. This study was conducted through prediabetes screening camps over districts of Calicut, Wayanad and Malappuram in Kerala and The Nilgiris district in Tamilnadu from September 2017 to October 2019. A questionnaire survey was done as a part of a prospective open-label interventional study with 308 prediabetes individuals. Baseline characteristics of the participants were obtained, and their knowledge, attitude and practice regarding Prediabetes were assessed. The finding of the present study revealed 90% of the respondents had poor knowledge, 9% had average knowledge, and only 1% had good knowledge of Prediabetes. In the attitude assessment, only 1.9% had a strongly positive attitude, 14% had a positive attitude, 54% had neutral attitude while 17% had a negative attitude and 13% had a strongly negative attitude. Regarding healthy lifestyle practices, 35.4% had a deplorable practice that scored below 6. Around half of the population, 52.3% had poor practice, 12% had proper training, while only 0.3% had a perfect practice. Knowledge and practice regarding lifestyle modifications among prediabetes participants were found to be reduced. The mixed response was obtained regarding their attitude towards Prediabetes and its management.



### \*Corresponding Author

Name: Ponnusankar S

Phone: +91-9489613428

Email: [ponnusankarsivas@gmail.com](mailto:ponnusankarsivas@gmail.com)

ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11i3.2780>

Production and Hosted by

IJRPS | [www.ijrps.com](http://www.ijrps.com)

© 2020 | All rights reserved.

### INTRODUCTION

Prediabetes is an intermediate high-risk state of diabetes which is mostly undiagnosed and undervalued among the public due to lack of awareness. Prediabetes is now recognised as a reversible condition which also increases an individual's risk for development of diabetes five to six-fold ([Khaodhiar et al., 2009](#)). Once diagnosed with type 2 diabetes mellitus, reversal is quite difficult because Type 2 diabetes has long been identified as an incurable chronic disease ([Hallberg et al., 2019](#)). According

to IDF diabetes atlas 2019, 77 million people have diabetes in India while it was just 32.7 million in the year 2000. India also ranks 4th among the top ten countries in the world with impaired glucose tolerance holding 25.2 million cases (Atlas, 2019). At present, 314 million people in the world are prediabetic, and it is predicted that around 500 million would be burdened with Prediabetes by the year 2025 (Sahai *et al.*, 2011).

Moreover, this Asian Indian phenotypes immigrated to developed countries resulted in nutrition and economic transformations in India, which would double the chances of diabetes and prediabetes cases shortly (Mohan, 2004). High prevalence of impaired glucose tolerance in India indicates the large pool of population with high potential to develop diabetes in the coming years (Jagannathan *et al.*, 2014). Since it is an asymptomatic silent killer disease, there is a real need for effective screening for primary prevention of diabetes (Gilmer and O'Connor, 2010). Identification of prediabetic population through mass screening, assessing their awareness on the disease and improving their Knowledge, Attitude and Practice (KAP) would be an urgent step to be taken in a country like India (Muthunayanan *et al.*, 2015). An estimated 70% of Prediabetes eventually develops diabetes indicates the importance of prediabetes screening and initiation of lifestyle modification among them (Tseng *et al.*, 2017). Education already proved to be a potent weapon to fight against diabetes and its complications. Still, it would be more effective if the level of knowledge, attitude and practice is prior assessed (Man-gaiarkkarasi *et al.*, 2012). Awareness and motivation are the two significant factors which aid in self-management and disease prevention. Questionnaires would be an effective and efficient tool to collect an enormous amount of data from a large sample of the population. Presently there is a lack of validated and reliable KAP instruments for Prediabetes.

Moreover, no KAP questionnaire survey was conducted among Prediabetes, especially in India. Such data is essential to plan preventive measures and public health policies in a developing country like India. Therefore, the objective of this study was to assess Knowledge, Attitude and Practice among newly diagnosed Prediabetes participated in the prediabetes screening program organised over selected districts of Kerala and Tamilnadu.

### Aim

This study aimed to assess the Knowledge, Attitude and Practice among Prediabetes screened over four districts of south India, including Kerala and Tamilnadu.

## MATERIALS AND METHODS

### Study Setting

We conducted this study through prediabetes screening camps held in districts of Calicut, Wayanad and Malappuram in Kerala and The Nilgiris district in Tamilnadu from September 2017 to October 2019 under the supervision of doctors from Aster Wayanad Speciality Hospital, Wayanad, Kerala, India. The blood testing was carried out at VrindavanLab and Diagnostic Centre, Wayanad, Kerala.

### Ethical Considerations

The Institutional Review Board (IRB) of JSS College of Pharmacy, Ooty, India approved this prospective study (Approval number: JSSCP/DPP/IRB/06/2015-16) and the doctors who were willing to join this prediabetes screening camps given their written consent. Questionnaire respondents were provided written, informed consent to participate in the study.

### Study design

This questionnaire survey was part of a prospective open-label interventional study funded by Department of Science and Technology, New Delhi (SR/WOS-B/746/2016) conducted in 30 places in 4 districts of south India including Kerala and Tamilnadu.

### Study population

The study population was newly diagnosed Prediabetes group. They were screened through prediabetes screening camps conducted over the districts of Calicut, Wayanad and Malappuram in Kerala and The Nilgiris district of Tamilnadu. The inclusion criteria were male & female subject's age between 25-55 years having impaired fasting glucose, HbA1c 5.5 to 6.4 and who consented to participate in the study. Known type 2 diabetes mellitus patients, pregnant and lactating women, Type 1 DM and other types of diabetes, patients with significant hepatic and renal dysfunction, patients with severe macro-vascular and microvascular complications were excluded from this questionnaire survey. We determined that the detected 308 prediabetic subjects make an adequate sample size after adding 5% non-response. It was found to be sufficient to decide association with other variables having a 95% confidence interval with  $\alpha = 0.05$ , power of 0.90 calculated using power analysis and sample size software.

### Data collection

This questionnaire was developed by present researchers to collect data from the prediabetes

**Table 1: Demographic details of participants with Prediabetes(n=308)**

Age group	Age distribution	
	Frequency	Percentage
25-30	11	3.6
31-35	17	5.5
36-40	50	16.2
41-45	63	20.5
46-50	79	25.6
51-55	88	28.6
<b>Education</b>		
Primary school	1	0.3
High school	170	55.2
Higher secondary	75	24.4
Degree and above	62	20.1
<b>Occupation</b>		
Unskilled/skilled labor	122	39.6
Executive/business class	53	17.2
House hold jobs	133	43.2
<b>BMI Pattern</b>		
Normal	68	22.1
Over weight	163	52.9
Obese	75	24.4
Under weight	2	0.6
<b>Waist to hip ratio</b>		
Low	19	6.2
Moderate	132	42.9
High	157	51

population. It was developed and validated through a standardised methodology that included steps such as conceptualisation, literature review, questionnaire design, experts review, pre-test, pilot tests and also validation procedures like face validity, factor analysis and Cronbach's alpha. This questionnaire is interviewer-administered, and interviewing technique was a conversational interview. Questions were written in simple English language concise and clear that even grade seven can answer. Prediabetes, who agreed to participate in the study signed informed consent. All the respondents were assured of confidentiality and anonymity. The data collected from the subjects included baseline demographic characteristics, anthropometric measurements, past medical history, values of blood variables, knowledge, attitude and their usual practice. The average time taken to complete the questionnaire ranged from 15 to 20 minutes.

#### Scoring on the questionnaires

Knowledge, Attitude and Practice - Prediabetes Assessment Questionnaire (KAP-PAQ) had ten ques-

tions on knowledge mostly regarding benefits of exercise, calorie restriction and weight loss. 10 questions on attitude especially their attitude towards lifestyle modification, myths and beliefs and also ten questions on lifestyle modification practices. In the knowledge section, out of the ten multiple-choice questions, each correct answer by the participant can earn a score of '1' and each incorrect answer makes a score of '0'. Out of the total 17 marks, below ten marks were 'Poor knowledge', 10 to 13 marks were 'Average knowledge', and 14 to 17 scores were 'Good knowledge'. Responses to the item evaluating attitudes towards Prediabetes were 3 points like rt scale (Strongly disagree, Neither Agree nor Disagree, Strongly agree). Each correct attitude can score '1', wrong attitude scores '-1' and neutral attitude scores '0'. Out of the total ten marks, less than 0 were considered strongly negative attitude, 0 to 2 as a negative attitude, 3 to 6 as neutral attitude, and 7 to 8 as positive attitude and 9 to 10 as strongly positive attitude. In the practice section as per weightage of their excellent practices can score 4 or 2 or 1 marks and bad practice '0' marks. Out of total 26

**Table 2: Characteristics of participants with Prediabetes(n=308)**

Smoking status	Characteristics of Prediabetes	
	Frequency	Percentage
Yes	98	31.8
No	199	64.6
Currently stopped	11	3.6
<b>Alcohol intake</b>		
Yes	91	29.5
No	211	68.5
Currently stopped	6	1.9
<b>Blood checkup pattern</b>		
Monthly	0	0
Six months or below	27	8.8
Yearly	67	21.8
Never or long back	214	69.5
<b>Family history of diabetes</b>		
Yes	171	55.5
No	121	39.3
Unknown	16	5.2
<b>Physical activity</b>		
Light	246	79.9
Moderate	62	20.1
Heavy	0	0

marks below six targets were considered deplorable practice, 7 to 13 as poor practice, 14 to 20 as good practice and above 20 as perfect practice.

#### Reliability and validity

A pilot study on 100 prediabetic subjects was done, and the questionnaire was refined according to the feedback received from the pilot study. The questionnaire was also pre-tested on 40 subjects. Factor analysis and Cronbach's alpha were used to establish the validity and reliability of the questionnaire. Kaiser -Meyer Olkin test was done to show attitude items meet the criteria required for factor analysis.

#### Data analysis

The data from the questionnaires were captured in Microsoft excel 2007 and exported to SPSS Statistics for Windows, version 22 (SPSS Inc., Chicago) where they were analysed by a statistician using descriptive statistics. Linear correlation and P-values were calculated to ascertain the statistical significance of key findings.

## RESULTS AND DISCUSSION

### Baseline characteristics of the respondents

A total of 2990 subjects satisfying the inclusion criteria of the study were screened from both states

of Kerala and Tamilnadu. Among which, 315 prediabetes obtained were recruited for the study. The 5% non-response rate when looked upon, 7 were not interested in participating, and 308 prediabetes were involved in this study. The total prevalence of 9.8% was detected from selected districts of Kerala, and 12% was detected from The Nilgiris district of Tamilnadu state of south India. Out of this 308 participants, 158 (51.3%) was male, and an equal proportion of 150 (48.7%) was female. 178 (57.8%) participants were recruited from the urban area, while 130 (42.2%) participants were recruited from the rural area. The religion distribution of the participants was Muslims 106 (34.4%), 101 (32.8%) were Hindus, and 101 (32.8%) were Christians. Around 86% were married, and about 8 per cent were unmarried, while approximately 6% were widow/ separated. Diet pattern of prediabetics shown that 255 (82.8%) were non-vegetarians, and 53 (17.2%) were vegetarians. Demographic details like age distribution, education status, occupation, BMI and waist to hip ratio shown in Table 1. Characteristics like smoking, alcohol intake and usual practice of blood check-up, family history of diabetes and level of physical activity are given in Table 2.

### Assessment of knowledge on Prediabetes

Table 3 represents the response of participant's

**Table 3: Frequency distribution and percentage of respondent's knowledge regarding prediabetes**

Questions on Prediabetes knowledge	Frequency	Percentage
1. Prediabetes condition can lead to		
A. Type 2 diabetes mellitus*	79*	25.6*
B. Type 1 diabetes mellitus	96	31.2
C. Both	87	28.2
D. None	46	14.9
2. What is the chance of one getting prediabetes if both their parents have type 2 Diabetes?		
A. 25-40 Percentage	106	34.4
B. More than 50 percentage	71	23.1
C. 10-15 percentage	58	18.8
D. 0 percentage	73	23.7
3. Which is the best method for detecting prediabetes conditions?		
A. Blood testing	97	31.5
B. Urine testing	53	17.2
C. Both	120	39
D. None of the above	38	12.3
4. What is the fasting blood glucose level (after an overnight fast of 10 hours) in prediabetes?		
A. 140-199 mg/dl	87	28.2
B. < 100 mg/dl	91	29.5
C. 100-125 mg/dl	92	29.9
D. >200 mg/dl	38	12.3
5. Average blood glucose for the past 3 months is given by the blood test		
A. HbA1c Test	84	27.3
B. Fructosamine Test	75	24.4
C. Fasting Blood Glucose Test	82	26.6
D. Oral Glucose Tolerance Test	67	21.8
6. What is the importance of testing insulin levels along with glucose levels in prediabetes?		
A. To identify insulin tolerance	140	45.5
B. To identify insulin overdose	62	20.1
C. To identify insulin resistance	41	13.3
D. None of the above	65	21.1
7. Preferred recommendation for prediabetes		
A. Diet control and exercise	153	49.7
B. Insulin Injections	88	28.6
C. Dental check up	26	8.4
D. None of the above	41	13.3
8. The Prediabetes should take regularly		
A. Foods that are high in fat	72	23.4
B. Soft drinks and energy drinks	46	14.9
C. High fiber foods	134	43.5
D. Foods rich in carbohydrate	56	18.2
9. How often prediabetes should do exercise?		
A. Once a week for at least 30 mins	66	21.4
B. Most days of the week for at least 30 mins	163	52.9
C. Once a month for at least one hour	44	14.3
D. None of the above	35	11.4
10. How far weight reduction help prediabetes condition in obese patient?		
A. Will Not help	75	24.4
B. Greatly help	56	18.2
C. Slightly help	111	36
D. Unsure	66	21.4

\*correct answer given by respondent

**Table 4: Frequency distribution and percentage of respondent's attitude towards prediabetes**

Questions on Prediabetes Attitude	Frequency	Percentage
11. I can do a lot for my prediabetes		
A. Strongly Disagree	45	14.6
B. Neither Agree nor Disagree	82	26.6
C. Strongly Agree*	181*	58.8*
12. Prediabetes should keep their blood sugar close to normal		
A. Strongly Disagree	35	11.4
B. Neither Agree nor Disagree	82	26.6
C. Strongly Agree	191	62
13. Control of blood sugar is difficult in prediabetes		
A. Strongly Disagree	77	25
B. Neither Agree nor Disagree	112	36.4
C. Strongly Agree	119	38.6
14. There is not much use in blood sugar control in prediabetes because type 2 diabetes mellitus will happen anyway		
A. Strongly Disagree	103	33.4
B. Neither Agree nor Disagree	97	31.5
C. Strongly Agree	108	35.1
15. Prediabetes happens only to a cursed person		
A. Strongly disagree	133	43.2
A. Neither Agree nor Disagree	111	36
B. Strongly Agree	64	20.8
16. People with prediabetes should be taught about diabetes mellitus		
A. Strongly Disagree	23	7.5
B. Neither Agree nor Disagree	51	16.6
C. Strongly Agree	234	76
17. Prediabetes condition is ignored much by the society		
A. Strongly Disagree	34	11
B. Neither Agree nor Disagree	86	27.9
C. Strongly Agree	188	61
18. Support from family is important in dealing with prediabetes		
A. Strongly Disagree	47	15.3
B. Neither Agree nor Disagree	90	29.2
C. Strongly Agree	171	55.5
19. Prediabetes should be taught about life style modifications		
A. Strongly Disagree	28	9.1
B. Neither Agree nor Disagree	77	25
C. Strongly Agree	203	65.9
20. I can lead a normal life in spite of prediabetes		
A. Strongly Disagree	67	21.8
B. Neither Agree nor Disagree	80	26
C. Strongly Agree	161	52.3

\* correct answer given by respondent

**Table 5: Frequency distribution and percentage of respondent's practice among prediabetes**

Questions on Prediabetes Practice	Frequency	Percentage
21. How many hours per week do you perform exercises like cycling, walking, yoga etc.?		
A. 3 to 6 hours a week*	12*	3.9*
B. 1 to 2 hours a week	82	26.6
C. Less than 1 hour a week	77	25
D. None	137	44.5
22. How often you consume sugar sweetened beverages (soda, carbonated beverages and non-carbonated fruit drinks)?		
A. 5 or more times a week	49	15.9
B. 3 or 4 times a week	53	17.2
C. 1-2 times a week	84	27.3
D. Almost Never	122	39.6
23. How frequently you substitute fiber rich foods like oats, whole grains, fruits or vegetable salads over normal meals?		
A. 5 or more times a week	79	25.6
B. 3 or 4 times a week	64	20.8
C. 1-2 times a week	84	27.3
D. Almost never	81	26.3
24. How often you sleep less than six hours/ night?		
A. 5 or more times a week	42	13.6
B. 3 or 4 times a week	40	13.0
C. 1-2 times a week	94	30.5
D. Almost Never	132	42.9
25. How often you skip meals?		
A. 5 or more times a week	19	6.2
B. 3 or 4 times a week	29	9.4
C. 1-2 times a week	94	30.5
D. Almost Never	166	53.9
26. How often you consume high fat foods (like fried snacks and meat, fast foods, chocolates)?		
A. 5 or more times a week	101	32.8
B. 3 or 4 times a week	60	19.5
C. 1-2 times a week	91	29.5
D. Almost Never	5	18.2
27. How often you eat food while watching TV/ using mobile phone/ reading books (Distracted eating)?		
A. Every time	107	34.7
B. Twice a day	44	14.3
C. Once a day	85	27.6
D. Almost Never	7	23.4
28. How long you spend in front of computer/TV in a day?		
A. More than 6 hours a day	62	20.1
B. 4-6 hours a day	66	21.4
C. 1-3 hours a day	125	40.6
D. Almost Never	55	17.9
29. How often you check blood sugar at home/lab?		
A. Once in 6 months or yearly	81	26.3
B. Once in 2 or 3 months	35	11.4
C. Weekly or monthly once	9	2.9
D. Never	183	59.4
30. How often you check cholesterol profile at lab?		
A. Once in 10 years	31	10.1
B. Once in 5 years	13	4.2
C. One or more times in 2 years	63	20.5
D. Never	201	65.3



**Table 6: Pearson correlation coefficient of Knowledge, Attitude and Practice among prediabetes**

Correlation	Pearson correlation	P-value
Prediabetes knowledge and attitude	0.244	0.000
Prediabetes knowledge and practice	0.20	0.000
Prediabetes attitudes and practice	0.161	0.005

knowledge on Prediabetes. The finding of the present study revealed that 277 out of 308 (89.9%) had poor knowledge of Prediabetes. We found that 28 subjects (9.1%) had average knowledge and three subjects (1%) only had good knowledge of Prediabetes. 44 prediabetes (14.3%) scored 0 marks which even included graduates and professionals.

#### Assessment of attitude towards Prediabetes

Only 6 (1.9%) had a strongly positive attitude, 43 (14%) had a positive attitude, 165 (53.6%) had neutral attitude while 53 (17.2%) had a negative attitude and 41 (13.3%) had a powerfully negative attitude—Table 4 shows Prediabetes responses (n=308) towards attitude questions.

#### Assessment of practice among Prediabetes

Table 5- represents the response of participant's practice on Prediabetes. Regarding healthy lifestyle practices, 35.4% (n=109) had deplorable practice who scored below 6. Around half of the population 52.3% (n=161) had poor practice while 12% (n=37) had good practice while only 0.3% (n=1) had very good practice. Almost all of these newly diagnosed Prediabetes did not follow any controlled balanced or planned diet. Majority of the participants, 44.5% (n=137) reported that they did not perform any regular exercises and 79.9% (n=246) undergone only light physical activity in their daily routines.

#### Correlation between knowledge, attitude and practice among Prediabetes

Table 6 shows a positive Pearson correlation of 0.244 (p=0.000). The correlation between the knowledge level and attitude level of Prediabetes; a significant positive Pearson correlation of 0.20 (p=0.000) between knowledge level and practice level; and also a positive Pearson correlation of 0.161 (p=0.005) between the attitude level and practice level was observed among our study respondents.

We could not establish a solid comparison of this study with existing pieces of literature due to the inadequacy of published writings in this area. This study was conducted with an equal proportion of male and female in the rural and urban regions of selected south Indian districts. Majority of the par-

ticipants, 55.2% (n=170) had a high school education, and the term prediabetes itself was new to them. This study was conducted in the age group of 25-55 years, and we could assess that after screening more cases were detected with increasing age. Our reviews also revealed that majority of the cases was obtained in the age group of 40 to 55 years as it already proved that increasing age and family history are the two non-modifiable risk factors for Prediabetes (Dasappa et al., 2015). 56% (n=171) of the individuals had a positive family history of diabetes which implies their genetic contributions to their aetiology. Only 17.2% (n=53) were from the executive/business class while 82.8% (n=255) were skilled/unskilled labourers, and those doing household jobs. The main objective of this study was to assess the awareness level among the ordinary people of the society who don't have much access to the continuing health education programs. The high prevalence of overweight (52.9%) and obesity (24.4%) among the participants was similar to the findings in 2019 by another Kerala prediabetes study where their prevalence of overweight and obesity was quite high (46%) in their cohort (Vijayakumar et al., 2019). Another critical finding during prediabetes screening is that 51% (n=157) had high and 42.8% (n=132) had moderate waist to hip ratio. This finding supports the fact that abdominal obesity is a significant health issue associated with glucose intolerance, insulin resistance, hyperinsulinemia and subsequent progression to type 2 diabetes mellitus (Gaudreault et al., 2008). The current study shows that the usual practice of blood check-up was too low among the south Indian population. Around 70% of the study population did their blood tests long back/never, 21.8% (n=67) did their check-up yearly, and only 8.8% (n=27) did test every six months that clears the fact that 50% of those with diabetes and Prediabetes remain undiagnosed in India.

In terms of knowledge assessment, only 25% (n=79) knew that prediabetes condition could lead to type 2 diabetes. Most of them were unable to distinguish between type 1 and type 2 diabetes mellitus. Even though 56% of the Prediabetes had a solid family history of diabetes, only 23.1% (n=71) know that more than 50 per cent chance is there to get dia-



betes if both their parents have type 2 diabetes. Only 32% of the participants know that blood testing is the best method for detecting prediabetes condition. This lack of knowledge shows the reason behind the lack of blood tests and screening among this population. 70% (n=216) were unable to choose the fasting blood glucose, typical values, and 73% (n=224) don't know what HbA1c and other related blood glucose tests are. Only 13% (n=41) understood the importance of testing insulin levels along with glucose levels in Prediabetes which indicate they are ignorant about insulin resistance and prediabetes conditions. Around 50% (n=153) knew that diet control and exercise is the preferred recommendation for Prediabetes, while the rest was unaware of it. Approximately 53% (n=163) knew that exercises should be performed five days a week for at least 30 mins, but only 3.9% (n=12) carried it out in their daily routine. This finding was similar to the results of 2019 diabetes study in urban Tamilnadu where only 33% of them engaged in recreational activities, and others spent an average of 7 hours per day on sedentary behaviour (Paulin and Subramanian, 2019). Only 18.2% (n= 56) had the information that even moderate weight loss in obese subjects play a vital role in diabetes prevention. Even a 5% weight loss can improve pancreatic  $\beta$ -cell function and the sensitivity of liver and skeletal muscle to insulin (Franz, 2017). Regarding the diet pattern to be followed by Prediabetes, 44% answered high fibre foods, while 18% given the option foods rich in carbohydrates. 23.4% reported high-fat foods, while 15% still believed that soft drinks and energy drinks are good for Prediabetes. These different findings may be due to the differences in the literacy level and the availability of information regarding diabetes and Prediabetes to them.

Attitude touch on their feelings, beliefs as well as preconceived ideas they may have towards this condition. Surprisingly we could find that 17.2% (n=53) had a negative attitude and 13.3% (n=41) had strongly negative approach towards Prediabetes and its management. Majority of the participants 60% (n=181) still believed that they could do a lot for their fight against Prediabetes as well as 62% (n=191) had a positive attitude that Prediabetes should always keep their blood sugar close to normal. One of the vital questions that showed the negative attitude and depression among the newly diagnosed Prediabetes was 'control of blood sugar is difficult in prediabetes'. Only 25% (n=77) disagreed with this statement. Another question that portrayed the anxiety and subsequent underlying depression symptom among this newly diagnosed Prediabetes was the statement "There is not much

use in blood sugar control in prediabetes because type 2 diabetes mellitus will happen anyway'. Only 33% (n=103) disagreed to this statement while 35% (n=108) strongly agreed, and the rest of them had a neutral attitude to it. A similar study conducted on Prediabetes and depression in 2016 stated that combination of Prediabetes and depressive or anxiety symptoms were strongly associated with an increased risk of developing diabetes (Deschênes *et al.*, 2016). Even in this modern era, 21% (n=64) among 308 still believed the myth that Prediabetes happens only to a cursed person and 36% (n=111) gave a neutral response to this statement. Most of them had a positive attitude towards the comments Prediabetes should be taught about diabetes mellitus and lifestyle modifications 76% (n=234) and 66% (n=203) respectively. 61% (n=188) agreed that prediabetes condition is ignored much by society. The mixed response was obtained for the statement support from family is important in dealing with Prediabetes in which only 56% agreed to it. Half of the population 52.3% (n=161) only had a positive attitude that they can lead a healthy life despite Prediabetes. Emotional well-being is paramount in any disease management. Comorbid depression can worsen glycemic control which is often undiagnosed and untreated (Hermanns *et al.*, 2013). So screening for depression and anxiety in the prediabetes stage itself is highly beneficial.

Concerning the practice of regular exercise like cycling or walking or yoga, majority of the participants 45% (n=137) did not perform any workout in their daily routine, and only 3.9% (n=12) did the exercise for 3 to 6 hrs—a week. Low physical activity and sedentary behaviour are vital drivers of hyperglycaemia (Farni *et al.*, 2014). One of the main findings of our study is that nearly 60% (n=186) of the participants were found to have frequent consumption of sugar-sweetened carbonated beverages as sugar-sweetened beverage intake may contribute to the risk of developing T2DM (Papier *et al.*, 2017). Only 26% (n=79) had the habit of substituting fibre rich foods like oats, whole grains, fruits and vegetable salads over healthy meals. Around 57% (n=176) had the habit of sleeping less than 6 hours per night in a week. Previous studies have proven that sleep deprivation is associated with insulin resistance and glucose intolerance (Cauter, 2011). Half of the population around 46.1% (n=142) had the usual practice of skipping meals, and 82% (n=252) had the habit of regular consumption of high-fat foods like fried snacks and meat, fast foods and chocolates. Consumption of foods with high fat combined with lower intake of foods with fibre such as fruits, vegetables, and whole grains can increase

the risk of diabetes (Whiteney and Rolfes, 2012). Nearly 77% (n=236) had the habit of distracted eating while watching TV/ using mobile phones and reading books. Attending to food and encoding and retrieving memories of recently eaten foods play an important role in appetite via influences on meal size and the inter-meal interval which helps in weight loss (Higgs, 2005). We could also find that around 42% (n=128) of respondents spends a long time in front of TV/ computer in a day. Relatively high amounts of sedentary time exceptionally prolonged sitting have been associated with a significantly higher risk for developing type 2 diabetes and metabolic syndrome (Hamilton et al., 2014). Only 2.9% (n=9) and 20.5% (n=63) did regular blood check-ups of diabetes and cholesterol levels respectively among this screened Prediabetes. Individuals known to have diabetes represent only the tip of the iceberg, as an equal or even more significant number of patients have undiagnosed diabetes in India (Joshi, 2016). These results suggest that special attention and increased care are required for the prediabetes population who are at high risk of developing diabetes shortly.

A Pearson correlation coefficient was carried out to assess the relationship between the knowledge, attitude and practice among the Prediabetes. The correlation was significant at the 0.01 level (2-tailed). The significant positive correlation (p=0.000) between the knowledge level and attitude level among Prediabetes indicates that the more knowledge they attain, more chances to develop a positive attitude towards disease management. A significant positive correlation (p=0.000) between knowledge level and practices indicates that more knowledgeable the participants better would be their lifestyle practices. A positive relationship (p=0.005) between attitude levels and practices suggests that developing a positive attitude among Prediabetes can significantly better their lifestyle practices. Proper education and guidance towards diabetes will make a significant improvement in lifestyle, which will be helpful for reasonable glycaemic control (Jaiswal et al., 2019).

## CONCLUSIONS

Proper education and awareness programs have previously been shown to change the attitude of the public towards disease management. Improving knowledge of the people can improve their attitude towards Prediabetes and diabetes, which subsequently change their practices to adopt healthy lifestyles like calorie restriction, proper sleep and regular physical activity. There is a shortage of

trained personnel like diabetes educators in India to provide education about diabetes and its future complications to the public. Further research needs to be done regarding the felt needs of this population for effective diabetes prevention in India.

## ACKNOWLEDGEMENT

We sincerely thank Department of Science and Technology, Govt. of India, New Delhi and JSS Academy of Higher Education & Research, Mysuru, India for providing all the necessary facilities.

## Conflict of Interest

None.

## Financial Support

Department of Science and Technology, Govt. of India, New Delhi for providing financial support for this project through Women Scientist Scheme- B (WoS-B) to Ms Mohsina Hyder (SR/WOS-B/746/2016).

## REFERENCES

- Atlas, I. D. 2019. *International Diabetes Federation*. Busan, 9th edition edition .
- Cauter, E. V. 2011. Sleep disturbances and insulin resistance. *Diabetic Medicine*, 28(12):1455–1462.
- Dasappa, H., Fathima, F., Prabhakar, R., Sarin, S. 2015. Prevalence of diabetes and pre-diabetes and assessments of their risk factors in urban slums of Bangalore. *Journal of Family Medicine and Primary Care*, 4(3):399–399.
- Deschênes, S. S., Burns, R. J., Graham, E., Schmitz, N. 2016. Prediabetes, depressive and anxiety symptoms, and risk of type 2 diabetes: A community-based cohort study. *Journal of Psychosomatic Research*, 89:85–90.
- Farni, K., Shoham, D. A., Cao, G. 2014. Physical activity and Prediabetes –an unacknowledged mid-life crisis; Findings from NHANES 2003-2006. *Peer J*, 2:499–499.
- Franz, M. J. 2017. Weight Management: Obesity to Diabetes. *Diabetes Spectrum*, 30(3):149–153.
- Gaudreault, V., Després, J. P., Alméras, N., Bergeron, J., Tremblay, A., Poirier, P. 2008. Hemodynamic Response To Exercise In Subjects With The Metabolic Syndrome. *Journal of Cardiopulmonary Rehabilitation and Prevention*, 28:340–340.
- Gilmer, T. P., O'Connor, P. J. 2010. The Growing Importance of Diabetes Screening. *Diabetes Care*, 33(7):1695–1697.
- Hallberg, S. J., Gershuni, V. M., Hazbun, T. L., Athinayan, S. J. 2019. Reversing Type 2 Diabetes:

- A Narrative Review of the Evidence. *Nutrients*, 11(4):766–766.
- Hamilton, D. G. M. T., Hamilton, T. W., Zderic 2014. Sedentary behaviour as a mediator of type 2 diabetes. *Med Sport Sci*, 60:11–26.
- Hermanns, N., Caputo, S., Dzida, G., Khunti, K., Meneghini, L. F., Snoek, F. 2013. Screening, evaluation and management of depression in people with diabetes in primary care. *Primary Care Diabetes*, 7(1):1–10.
- Higgs, S. 2005. Memory and its role in appetite regulation. *Physiology & Behavior*, 85(1):67–72.
- Jagannathan, R., Nanditha, A., Selvamsundaram 2014. Screening among male Industrial workers in India shows high prevalence of impaired glucose tolerance, undetected diabetes and cardiovascular risk clustering. *J Assoc Physicians India*, 62:312–315.
- Jaiswal, K., Moghe, N., Mc, M. 2019. Knowledge, attitude and practices of type 2 diabetes mellitus patients in a tertiary care teaching institute of central India. *Journal of diabetes, metabolic disorders and control*, 6(1):1–4.
- Joshi, S. R. 2016. Diabetes Care in India. *Annals of Global Health*, 81(6):830–830.
- Khaodhiar, L., Cummings, S., Apovian, C. M. 2009. Treating diabetes and prediabetes by focusing on obesity management. *Current Diabetes Reports*, 9(5):348–354.
- Mangaiarkkarasi, A., Nitya, S., Mehar, R. A., Ramaswamy, S. A. 2012. A study to assess the knowledge, Attitude and practice about diabetes among diabetic patients in Pondicherry. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 3(4):1185–92.
- Mohan, V. 2004. Why are Indians more prone to diabetes? *J Assoc Physicians India*, 52:468–74.
- Muthunarayanan, L., Ramraj, B., Russel, J. 2015. Prevalence of prediabetes and its associated risk factors among rural adults in Tamil Nadu. *Archives of Medicine and Health Sciences*, 3:178–178.
- Papier, K., D'Este, C., Bain, C., Banwell, C., Seubsmann, S., Sleight, A., Jordan, S. 2017. Consumption of sugar-sweetened beverages and type 2 diabetes incidence in Thai adults: results from an 8-year prospective study. *Nutrition & Diabetes*, 7(6):e283–e283.
- Paulin, G., Subramanian, R. 2019. Physical Inactivity among Diabetic Patients in Urban Tamilnadu: A Community-Based Study. *J Community Med Health Educ*, 9(649):2161–0711.
- Sahai, S., Vyas, D., Sharma, S. 2011. Impaired Fast-ing glucose: A study of its prevalence documented at a tertiary care centre of central India and its association with anthropometric variables. *JACM*, 12(3):187–92.
- Tseng, E., Greer, R. C., O'Rourke, P., Yeh, H.-C., McGuire, M. M., Clark, J. M., Maruthur, N. M. 2017. Survey of primary care providers' knowledge of screening for, diagnosing and managing prediabetes. *Journal of General Internal Medicine*, 32(11):1172–1178.
- Vijayakumar, G., Manghat, S., Vijayakumar, R., Simon, L., Scaria, L. M., Vijayakumar, A., Sreehari, G. K., Kutty, V. R., Rachana, A., Jaleel, A. 2019. Incidence of type 2 diabetes mellitus and prediabetes in Kerala, India: results from a 10-year prospective cohort. *BMC Public Health*, 19(1):140–140.
- Whitney, E., Rolfes, S. 2012. *Understanding nutrition*, volume 13. Wadsworth Publishing, Belmont.