ORIGINAL RESEARCH ARTICLE

Risk of Diabetes Mellitus and Level of Physical Activity Among Young Adults Affiliated to A Medical College in Chengalpattu District

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ABSTRACT

Background: India is home to 77 million diabetics. Roughly 30% of overweight people have diabetes and 85% of diabetics are overweight. Young adults are especially prone to diabetes due to increased junk food consumption and sedentary lifestyle. Many young adults would be leading a life as diabetic if they are not educated about and screened for the risk factors. This will also allow us to timely strategize effective prevention therapies.

Methods: This was a Cross sectional study conducted among 210 young adults aged between 18-35 years and are affiliated to a medical college in Chengalpattu. Two validated study tools were used: Indian diabetic risk score (IDRS) and International physical activity questionnaire (IPAQ). Frequency, Chi-square test, One Way ANOVA and correlation was used for analysis.

Results: 36.7% were obese. 27.1% and 55.2% had high and moderate risk of Diabetes mellitus respectively. BMI showed statistically significant association with IDRS risk. 53.3% of study participants were physically inactive. Age and gender were significantly associated with physical activity and Total MET min/week. Negative correlation was seen between IDRS score and Total MET minutes/week.

Conclusion: There is an urgent need to screen the young adults for risk of diabetes and thereby reduce the incidence. Indian youth are at high risk for diabetes, which calls for an urgent action plan through intensive efforts to promote lifestyle modifications.

Keywords: Pre-diabetes, lifestyle modification, Abdominal obesity, Risk factors

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INTRODUCTION

Diabetes Mellitus is a chronic metabolic non-communicable disease which affects many of the end-organs in the long run. Diabetes prevalence has seen an increasing trend in past few decades and it is in one among the top ten leading causes of mortality alongside cardio-vascular diseases, respiratory diseases and cancer. Diabetes is a rising cause of death in lower-middle income countries and is the 9th leading cause of death and has shown doubling in disease-specific mortality rate since 2000. [1] India, which was majorly burdened with Communicable diseases is now facing an increased burden of non-Communicable diseases. The prevalence of diabetes in India has increased from 7.1% in 2009 to 8.9% in 2019.[2] Currently, 25.2 million adults have Impaired Glucose Tolerance, which is predicted to increase to 35.7 million by 2045. India with 77 million diabetic people ranks second to China. [3] As per the India State-Level Disease Burden Initiative Diabetes study collaborators, Tamil Nadu had the highest prevalence of Diabetes in 2016. [4, 5] It has become very crucial to address this issue and target the risk factors to reduce the rising trend of Diabetes. Modifiable risk factors like eating behaviour, sedentary lifestyle, obesity and overweight need our attention.[6]

Increasing childhood obesity have in turn increased diabetes in adolescents and young adults emerging as a significant public health problem. [7, 8] Onset of DM is found to be two decades earlier in Indians in comparison to western countries. [9] Overweight was found to be the most vital risk factor in India contributing to 36% of Diabetes DALYs in 2016. The prevalence of overweight among young adults in India has increased to 20·4% in 2016. In India for every 100 overweight adults aged more than 20 years, 38 adults were found with diabetes, compared to the global average of 19 adults.[10] We see that young adults are more involved in junk food consumption which again contributes to the overweight.[11] Apart from this, several studies in India have also noted suboptimal physical activity among young adults.[12-15] A study done in Southeast Asian population revealed a higher prevalence (17.6%) of suboptimal physical activity among young adults.[13] In South India around 28.6% young adults were physically inactive.[14]

The young adults affiliated to the medical field are constantly exposed to the facts related to diabetes and its complications. We wanted to assess the practices related to risk prevention in the young adults who are so close to diabetes information.With this backgound this study was conducted among young adults with an aim to esimate the risk of Diabetes mellitus and to determine the role of physical inactivity and obesity as risk factors in diabetes among young.

The objectives of the study were to estimate the risk of diabetes mellitus and the level of physical activity among young adults affiliated to medical college in Chengalpattu district and also to determine the association between risk of diabetes with physical activity and obesity.

METHODOLOGY

Study design, area, and study population: This was a Cross-sectional study conducted at a Medical College in Chengalpattu District. Young adults affiliated to a medical college were the study population. The study was conducted between August 2022 to January 2023.

Sample Size: Based on the study done by Nagarathna R et.al.[11] the prevalence of High-risk criteria based on Indian Diabetes Risk Score (IDRS) in south zone was 13.8%. Using the formula $4PQ/L^2$, with 5% absolute precision the sample size was calculated as 190 and adding 10% non-response to this the minimum sample size was calculated to be 210.

Inclusion criteria: Study participants between 18-35 years age group who were willing to participate were selected for the study. Medical undergraduate and postgraduate students, teaching faculty, administration faculty and non-teaching staff were included in the study. The study participants were individuals with no history of Pre-diabetes or Diabetes Mellitus.

Exclusion criteria: Not available or absence to duty on the day of data collection.

Selection of study participants: The medical college consists of 1000 undergraduates,170 postgraduates, 365 teaching faculty, 200 non-teaching faculty. Off these, those satisfying the eligibility criteria were selected. The required sample size was divided into all four categories by population probability proportion to size sampling and then the study subjects were selected from the sampling frame by simple random sampling method using random number tables.

Method of Data Collection: The data was collected after obtaining informed consent. The questionnaire was self -administered for students, teaching faculty and some non-teaching faculty. Interview method was used for few of the non-teaching faculty as the questionnaire was in English. Demographic details, components of IDRS and IPAQ was obtained by the questionnaire. The anthropometric measurements like height, weight and waist circumference were measured. Body Mass Index was calculated.

Ethical consideration, Study tool and Data collection method: Data collection was started after obtaining ethical clearance from the Institutional Ethical committee of Sree Balaji Medical College and Hospital with reference number 002/SBMCH/IHEC/2022/1906. A written informed consent was obtained from study participants.

Study Tool: The risk of Diabetes Mellitus was found using Indian Diabetes Risk Score (IDRS) The level of

physical activity was done using International Physical Activity Questionnaire (IPAQ)-Short Form.

The Indian Diabetes Risk Score (IDRS)[16]: IDRS is validated scale developed by Madras Diabetes Research Foundation. It includes four simple parameters namely age, abdominal obesity, family history of diabetes, and physical activity. A maximum score of 100 is given for them. Subjects with an IDRS of <30 are categorized as low risk, 30-50 as medium risk and those with ≥ 60 as high risk for diabetes.

International Physical Activity Questionnaire (IPAQ) Short form[17]: The development of an international measure for physical activity commenced in Geneva. It is a validated self-reported scale of physical activity. The IPAQ short form asks about three specific types of activity undertaken in the three domains and sitting. The specific types of activity that are assessed are walking, moderate-intensity activities and vigorous intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity. The subjects are then classified into three categories based on the scores: a) Inactive b) Minimally active c) HEPA active (health enhancing physical activity; a high active category). The physical activity was also calculated as Total MET min/week.

Metabolic equivalents: MET is the ratio of a person's working metabolic rate relative to the resting metabolic rate. One MET was defined as the energy cost of sitting quietly and was equivalent to a caloric consumption of 1 kcal/kg/hour.[18] Total MET min/week can be computed by weighting each type of activity by its energy requirements defined in METS (METs are multiples of the resting metabolic rate) to yield a score in MET minutes. A MET-minute is computed by multiplying the MET score by the minutes performed. The selected MET values were derived from work undertaken during the IPAQ Reliability Study undertaken in 2000-2001.An average MET score was derived for each type of activity. These following values continue to be used for the analysis of IPAQ data: Walking = 3.3 METs, Moderate PA = 4.0 METs and Vigorous PA = 8.0 METs.[19]

Data Analysis: Data was entered in Microsoft Excel and analysed using SPSS software version 21. Frequency and Bivariate analysis were used for categorical data and multinomial and binomial logistic regression was performed to find the Adjusted Odds Ratio. For Total MET min/week, Kruskal Wallis test was used as it was not normally distributed. Spearman's correlation was used to find correlation between IDRS score and Total MET min/week. 95% confidence intervals and P value <0.05 was considered statistically significant.

RESULTS

Table 1 depicts the socio-demographic characteristics of the study participants. Majority of the participants belonged to 21-25 years age group and were females. Undergraduates comprised the major part of study participants and were unmarried population. 26.7% of the study participants had agreed to have abdominal obesity. 59.5% agreed that they voluntarily take certain actions to keep themselves healthy.

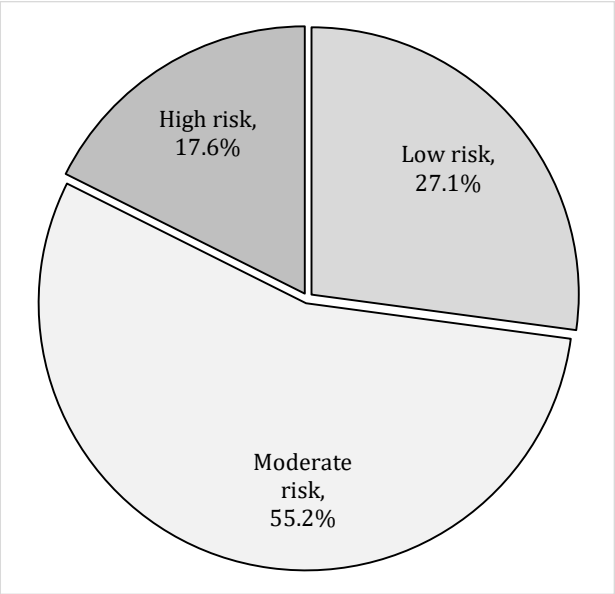
Table 1: Socio- demographic profile and attitude to health of study participants (n=210)

Socio- demographic Parameter	Participants (%)
Age (in years)	
18-20	17 (34.8%)
21-25	113(53.8%)
26-30	18 (8.6%)
31-35	6 (2.9%)
Gender	
Male	67 (31.9%)
Female	143 (68.1%)
Marital Status	
Unmarried	193 (91.9%)
Married	17 (8.1%)
Designation	
Undergraduate	138 (65.7%)
Postgraduate	23 (10.95%)
Teaching faculty	35 (16.6%)
Non-teaching faculty	14 (6.66%)
Routinely take any steps to stay healthy	
Yes	125 (59.5%)
No	28 (13.3%)
May be	57 (27.1%)
Steps taken to stay healthy*	
Dietary Modification	141 (67.40%)
Exercise	125 (59.80%)
Avoiding smoking/alcohol	121 (57.60%)
Meditation/Yoga	51 (24%)
Abdominal Obesity	
Yes	56(26.7%)
No	124(59%)
May be	30(14.3%)

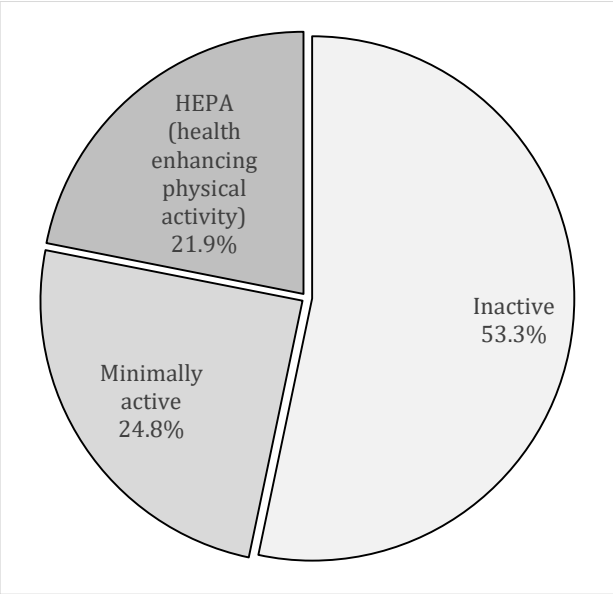
*Multiple responses

Diabetes risk and its associated factors among the study participants (n=210)

Based on the IDRS scores, it was found that 17.6% had high risk and majority (55.2%) of participants had moderate risk of Diabetes. (Figure 1). The existing risk factors among the were; 47.14% of study participants reported with either of the parent with history of diabetes and 14.2% with both parents' diabetic. 36.7% of them were obese and 23% were overweight based on the BMI. 39% had higher waist circumference. Table 2 shows the multinomial logistic regression of the factors with diabetes risk category. BMI showed statistically significant association with diabetes risk with p value <0.05. The adjusted Odds Ratio (AOR) between low and moderate risk was 1.43 and between low and high was 2.08 with multinomial logistic regression. The AOR was statistically significant at 95% Confidence Interval. Suggesting that overweight & obese category are at 1.43 times more at moderate risk and 2.08 times more at high risk of Diabetes compared to Normal BMI group.



Risk Category Based on IDRS



1.2 IPAQ Category

Figure 1: Diabetes risk and level of physical activity category distribution (n=210)

Table 2: Multinominal logistic regression of factors with Diabetes risk category

Parameter	Low (%)	Moderate (%)	High (%)	Chi square	P value
Gender					
Male	23(40.35)	34(29.31)	10(27.03)	3.75	0.15
Female	34(59.65)	82(70.69)	27(72.97)		
AOR	Reference	1.782	2.284		
95% CI of AOR		(0.892-3.56)	(0.88-5.91)		
Marital Status					
Single	51(89.47)	108(93.10)	32(86.49)		
Married	6(10.52)	8(6.90)	5(13.51)	1.09	0.58
AOR	Reference	0.545	0.558		
95% CI of AOR		(0.170-1.74)	(0.122-2.56)		
BMI					
Underweight	6(10.52)	14(12.07)	5(13.51)		
Normal	25(43.86)	35(30.17)	0	11.57	**0.003***
Overweight	14(24.56)	20(17.24)	14(37.84)		
Obese	12(21.05)	47(40.52)	18(48.65)		
AOR	Reference	**1.43**	**2.08**		
95% CI of AOR		(1.04-1.97)	(1.33-3.24)		

AOR- Adjusted Odds Ratio; *Enter method used for Multinomial logistic regression

Level of Physical Activity

The IPAQ scores showed that 53.3% of the study participants were physically inactive. 22% were in the HEPA category. (Figure 1) Table 3 depicts the level of physical activity. 18–20-year age group were more involved in vigorous intensity activities than those in 26-35 years. In all the categories of age group the participants in inactive category were more in number. Both age and gender showed statistically significant association (P value <0.05) with the level of physical activity with Bivariate analysis. Then Binomial logistic regression was performed on the significant variables (age, gender, family history) along with BMI as literature suggests a relationship between BMI and physical activity (Table 4). The regression performed showed that the AOR was significant for age and gender at 95% Confidence Interval. Age category showed that higher the age group, the study population were less likely to be inactive. Gender variable can be interpreted as females were less likely of being inactive by 85% compared to males. Similarly overweight category of BMI showed statistical significance. Table 5 shows the results of Kruskal Wallis test performed between various variable and Total MET minutes/week. The total MET min/week was expressed as Median and Interquartile Range as it was not normally distributed. Age, gender and IDRS risk category showed statistically significant association with MET min/week with p value <0.05. Spearman's correlation between the IDRS scores and Total MET minutes/week showed a negative correlation with Spearman coefficient -0.209 at p value 0.00 which was statistically significant. This can be interpreted likewise as an increase in Total MET min/week leads to decrease in IDRS risk. Figure 2 shows the negative correlation between IDRS scores and Total MET minutes/week.

Table 3: Bivariate analysis of the factors with Level of physical activity among study participants (n=210)

Category of Physical Activity based on IPAQ	Inactive/ Minimally active (n=164)	HEPA (n=46)	Chi-square	P value	OR	95% CI
Age						
18-20	47(28.66)	26(56.52)	15.87	**0.014***	Reference	
21-25	97(59.15)	16(34.78)			3.35	1.64-6.93
26-35	20(12.2)	4(8.7)			2.77	0.85-8.96
Gender						
Male	39 (23.78)	28(60.87)	22.99	**0.000***	4.99	2.5-9.97
Female	125(76.22)	18(39.13)			Reference	
Marital Status						
Single	149(90.85)	44(95.65)	2.75#	0.25	2.22	0.48-10.06
Married	15(9.15)	2(4.35)			Reference	
Family History of Diabetes						
Both parent's diabetic	22(13.41)	8(17.39)	7.54	**0.02***	Reference	
Both parents not diabetic	70 (42.68)	11(23.91)			2.31	0.83-6.48
Either of parent diabetic	72(43.9)	27(58.7)			0.97	0.39-2.44
BMI						
Normal	68(41.46)	17(36.95)	0.36	0.84	Reference	
Overweight	37(22.56)	11(23.91)			0.84	0.36-1.98
Obese	59(35.98)	18(39.13)			0.82	0.39-1.73

Fischer exact value; OR- Odds Ratio, AOR-Adjusted Odds Ratio, CI- Confidence Interval

Table 4: Binomial logistic regression of the factors with Level of physical activity (n=210)

Category of Physical activity based on IPAQ	AOR	95% CI	P value
Age			
18-20	Ref		
21-25	0.21	0.09-0.47	**0.00***
26-35	0.19	0.05-0.72	**0.01***
Gender			
Male	0.15	0.07-0.34	**0.000***
Female	Ref		
Family History of Diabetes			
Both parent's diabetic	Ref		
Both parents not diabetic	0.17	0.04-0.78	**0.02***
Either of parent diabetic	0.61	0.16-2.3	0.47
BMI			
Normal	Ref		
Overweight	2.7	1.59-7.4	**0.04***
Obese	1.51	0.61-3.7	0.37

Variables included in the regression model = Age, Gender, Family history of Diabetes. Method Used = Enter Method.

Table 5: Association of variables with Total MET minutes/week (Kruskal Wallis test)

Variable	Median (IQR)	P value
Age (in years)		
18-20	1732 (742-2782)	**0.002***
21-25	1500 (660-2524)	
26-35	1047 (0-2445)	
Gender		
Male	1884 (1188-3585)	**0.000***
Female	996 (528-2372)	
BMI Classification		
Normal	996(660-2112)	0.15
Overweight	1732 (660-2738)	
Obese	1732 (495-2940)	
Diabetes Risk Category		
Low	1620 (767-3559)	**0.05***
Moderate	1620 (680-2124)	
High	1272(0-2732)	

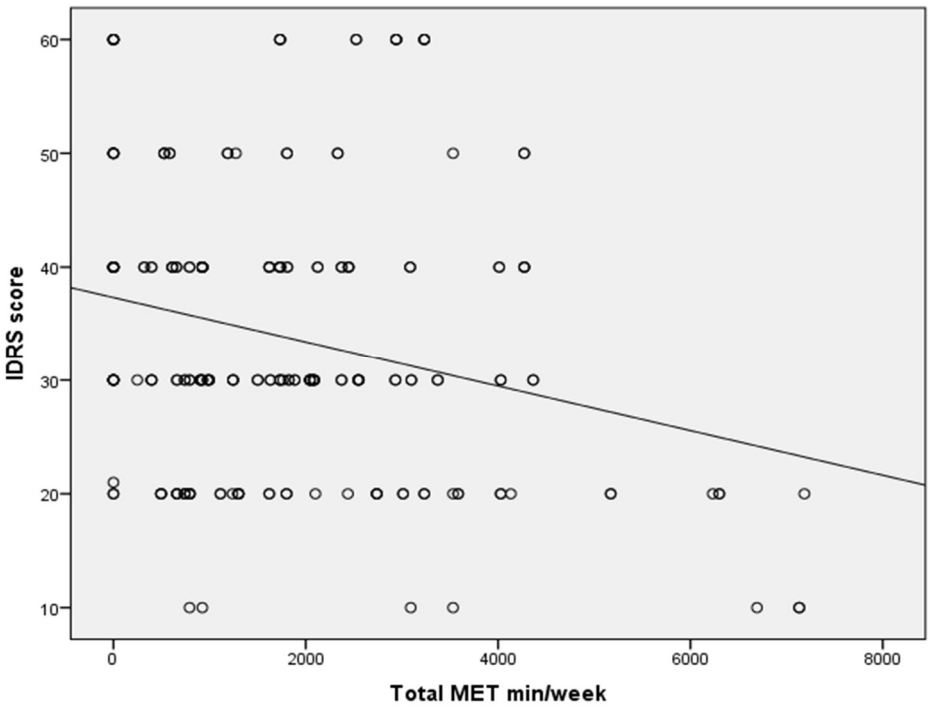
IQR- Interquartile Range

DISCUSSION

The study was conducted with the aim to identify the diabetes risk among young adults for which the IDRS; a validated tool was used. It was noted that majority of the young population in our study could be categorized to either moderate or high risk of diabetes. Most of them had one or the other risk factors like family history of diabetes, abdominal obesity, higher BMI and lesser physical activity. When the physical activity was measured using IPAQ scale, more than 50% were found to be inactive or minimally active. This suggests the existence of lack of awareness, poor attitude and lack of implementation of measures for risk factor prevention and reduction. It was evident in the study that even a small change in physical activity level can lead to reduction in the diabetes risk.

Risk of Diabetes Mellitus among young adults:

Our study showed around 18% study participants have high risk of diabetes which was similar to the study by Gupta SK et al., Mohan et al., Subramani et al, where the proportion of high-risk category were 18.6%, 31.2% and 12.1% respectively. [20,21,22] Our results were in contrast with other studies conducted in medical colleges like Singh M M et al., Gopalakrishnan S et al and Bhatia T et al. where the high risk of diabetes was 1% ,1.9% and 1% respectively. [23, 24, 25] This difference can be because our study included wider age range of young adults and not limited to medical students alone. Moderate risk of diabetes was found among 55% of the study participants in our study which was similar to the results of studies by Gopalakrishnan S et al.,(57.4%), Mohan et al.(50.3%), Subramani et al. (74.7%) and Bhatia et al. (68%). [24, 21,22,25] Our results were slightly higher when compared to study done by Singh MM et al. (22%) and Vardhan et al. (28%)[23,26]



*Correlation is significant at 0.01 level (2-tailed) with Correlation Coefficient of (-0.209)

Figure 2: Negative Correlation between IDRS score and Total MET minutes/week

Low risk category were 27% in our study which is similar to study conducted by Bhatia et al. (31%) and Gupta SK et al. (31.34%).[25,20]

The study found Statistically significant association between factors like BMI and Diabetes risk. This finding was similar to studies by Singh MM et al. and Chowdhury R et al. where BMI showed statistically significant association.[23,27] A study by Nagarathna R et al. showed significant association between physical activity and diabetes risk.[11]

Our study showed that 62% had family history of diabetes, 47% had increased waist circumference and 53% were inactive which is similar to the finding of Singh MM et al.[23] The study findings of physically inactive is in contrast to the study by Subramani R et al.[22] This can explained by the difference in the study setting as our study was in urban area.

Level of Physical activity

Based on IPAQ score it was found that 53% of the study participants were inactive and 25% were minimally active. This finding is similar to the findings of Anjana R M et al. where 54% of 14227 individuals were inactive. Age and gender showed significant association with physical activity which is similar to the finding by Anjana R M et al. where males were more active than females.[12] In another study done in Maharashtra the physical inactivity prevalence was 53%. [13] Our study finding was in contrast from the World Health Survey where the prevalence of physical inactivity in India was 17.7%.[28] This difference can be because the WHS was conducted way in the past and India has seen much urbanization and growth in technology which could be a reason for increasing trend in physical inactivity and also may be due to smaller sample size in our study. With Kruskal Wallis test it was found that age, gender and diabetes risk score was significantly associated with Total MET minute/week score. There was negative correlation between diabetes risk score and Total MET minute/ week. This suggests even a unit increase in MET min/week will cause a reduction in diabetes risk.

The negative correlation found between MET min/ week and IDRS score need further evidence with more sample size and wide study area. Some limitations of this study are; a small sample size, single centric study and utilization of IPAQ questionnaire which is mostly based on self-reporting and has a potential for recall and information bias. Other risk factors like diet, junk food consumption and stress were not assessed.

CONCLUSION

The study showed that majority of the young adult participants were at moderate-high risk of Diabetes. The proportion of risk factors was also more when compared to studies done a decade ago. This is an alarming state as a greater number of young adults are developing the risk factors of diabetes which will contribute to increased burden of diabetes in India in near future. The level of physical inactivity is very high, even with the fact that the study participants were affiliated to medical college and are aware of the benefits of physical activity. This necessitates an

urgent need of health promotion with physical activity and also reinforcement about its benefits. Educating younger generation will help us to curtail the diabetes burden in the future.

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