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Research Article

STRUCTURED COMBINED INTERVENTIONAL STUDY IN HIGH RISK MEDICAL STUDENTS FOR TYPE II DIABETES MELLITUS

Dr Mouna H S [1], Dr Nandish Kumar S [2], Dr Priyadarsini N J [3]

[1.]Associate Professor, Department of Community Medicine, Apollo Institute of Medical Sciences and Research, Chittoor, Andhra Pradesh .
[2.] Assistant Professor, Department of Community Medicine, Sri Madhusudan Sai Institute of Medical Sciences and Research, Chikkaballapura, Karnataka.
[3.] Associate Professor, Department of Community Medicine, Dayananda Sagar University, Chandramma Dayananda Sagar Institute of Medical Education and Research, Bengaluru, Karnataka.

*Corresponding Author
Dr Mouna H S
Associate Professor,
Department of Community Medicine,
Apollo Institute of Medical Sciences and Research,
Chittoor, Andhra Pradesh.
Email ID : drmounahs@gmail.com

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Abstract: ***Introduction:*** Diabetes is estimated to affect 387 million globally, with disease prevalence expected to increase to 592 million by the year 2035. Current guidelines for the prevention of type 2 diabetes (T2D) in people at high risk are based around achieving moderate weight loss (3–7% weight loss) via dietary change and increasing physical activity. The problem with the diabetes-prevention studies conducted to date is that to achieve the required behavioral changes has required very intensive interventions. Hence forth a "structured combined interventional study" was conducted in high risk medical students for type II Diabetes Mellitus to assess the improvement in behavioral outcomes such as change in healthy dietary habits and increased physical activity. This cross-sectional study was conducted among 150 medical students of PES Institute of Medical Sciences, Kuppam for a period of 6 months and the students were selected by simple random technique and Indian Diabetic Risk Score (IDRS) assessment was administered to identify the risk group. There after motivational interview technique with structured Profarma was used to change their life style habits like diet, physical activity and sleep.
Among 150 students, 43 (28.7%) belonged to moderate to high risk category of IDRS. With application of structured combined interview technique, 40% students modified their diet and physical activity pattern.

Keywords: Type II Diabetes, Physical Activity, Indian Diabetic Risk Score, behavioral changes, Medical Students.

INTRODUCTION

India is grappling with a dual burden as the presence of communicable diseases continue to afflict her populace and lifestyle disorders like Hypertension and Diabetes are expediting to make their mark as well, both in urban and rural areas. 14 The societal burden of Type 2 Diabetes Mellitus (T2DM) has increased in the past decades due to population ageing and increasing prevalence of underlying risk factors, such as obesity, increased sedentary activity and unhealthy diet. 3

T2DM is associated with a two- to four-fold increased risk of developing cardiovascular disease (CVD) and micro-vascular complications, which may be present even before diagnosis. It is, therefore, important to detect people with an increased risk of T2DM at an early stage. To facilitate targeted prevention of T2DM, many risk assessment models have been developed to identify people at high risk of developing T2DM or with undiagnosed T2DM. 2 Many of these models included similar predictors such as age, sex, Body Mass Index, waist circumference, blood pressure and family history of T2DM. 7

Longitudinal studies have shown that obesity is the preeminent risk factor and one of the most powerful

predictor of Type 2 diabetes development.1,5 Several studies indicate that waist circumference or waist-to-hip ratio, which reflect visceral (abdominal) fat, may be better indicators of the risk of developing Type 2 diabetes than body mass index. 15

Physical activity levels have decreased over recent decades in many populations, and this has also been a major contributor to the current global rise of obesity. Reportedly physical inactivity has found to be an independent predictor of Type 2 diabetes in men and women, as stated in both cross-sectional and longitudinal studies.8 Furthermore evidence from laboratory and epidemiologic studies in recent years have propounded that decreased sleep duration and/or quality may adversely affect glucose regulation and increase the risk of type 2 diabetes mellitus.11

Medical students life is enervating and grueling owing to fulfill their academic requirements, toting to physical inactivity and altered sleep pattern. Substantial studies focusing on diet, sleep and physical activity among Indian medical students are meager.12 Therefore the current study was undertaken to screen the risk of diabetes and enforcing lifestyle interventions among medical undergraduates.

MATERIALS AND METHODS

This cross-sectional study was conducted among students of PES Institute of Medical Sciences & Research (PESIMSR), Kuppam, Andhra Pradesh. The study was conducted over a period of 6 months from September 2023 to February 2024.

Sample size calculation: Sample size was calculated based on the findings by Meghachandra et al (2019), using the formula $4pq/d^2$, where prevalence (p) = 77% who were having low diabetes risk , q = 23% , absolute precision 6.9%. A sample size of 143 was obtained, which was rounded off to **150.**

Sampling method: Simple Random sampling. 150 students were selected randomly among the medical students studying from first year to final year MBBS part II.

Inclusion criteria: Those who were willing to participate in the study

Exclusion criteria: Those who had Juvenile (Type 1) diabetic

Method of collection of data and study tool:
Data was collected using a pre-designed structured questionnaire for socio-demographic and other details. Followed by Indian Diabetic Risk score (IDRS) a validated questionnaire was used to assess the diabetes risk among the students.[13] IDRS assesses the risk by various paramaters like age, abdominal obesity, physical activity, family history of diabetes.[19, 18]
Each variable has a scoring ranging from 0 to 30, with a maximum score of 100 depending upon the responses from participants. After the final scoring they were categorized into low, moderate and high risk. Participant with an IDRS of <30 was categorized as low risk, 30 – 59 as medium risk and > 60 as high risk for diabetes.
After explaining the purpose of study to the participants, written informed consent was obtained. Participants were interviewed for the details regarding general data & IDRS assessment including anthropometric measurements were noted using bathroom weighing scale for weight, stadiometer for height and measuring (inch) tape for waist & hip circumference. Observations were noted in the study Profarma.

Statistical Analysis of data:
Data was entered into MS Excel version 16 and analyzed using SPSS version 23. Descriptive statistics were expressed as percentages and mean, median, standard deviation and 95% confidence interval were calculated. Inferential statistics were done by tests of significance like Mann Whitney U test, student t test and paired t-test etc, where $p<0.05$ were considered to be statistically significant.

Data was collected using a validated Indian Diabetic Risk score (IDRS) along with socio-demographic factors, detailed information regarding their family history of diabetes & exercise, and other factors.

STRUCTURED COMBINED INTERVENTION
After preliminary data analysis, students were categorized into low, moderate and high risk groups as per the IDRS assessment method. Students with low risk were provided with general preventive education material in relation to Diabetes for future usage. We applied structured combined interventional method for moderate and high risk students. Specific health educational material in the form of literature, audio-visual clips, journals and individual case studies related to Diabetes were provided to the students under risk categories to improve their cognitive knowledge in initial three weeks. Under combined interventional methods students were motivated to bring behavioral changes in their diet, physical activity and sleep patterns.
Students were requested to limit consumption of high calorie junk, processed foods and beverages, not more than twice a week and non-vegetarian food once a week. Mess in charge personnel were directed to include fiber , protein rich food fresh fruits and sprouts at least in one meal per day. They were also instructed to limit the serving of fried foods twice a week.

Students were motivated to initiate physical activities twice a day at least 20 minutes each both in the morning and evening. Activities like cycling, running, skipping and other physical exercises were promoted in the morning session. Walking, yoga & meditation, sports

and dance activities were chosen by students in the evening session. Electronic gadgets like smart watches were used to monitor these physical activities.

These students were requested to follow minimum of 8 hrs sleep in night. On weekly basis student counseling sessions were conducted under Motivational Interview Technique to sustain these behavioral changes permanently in their lifestyle. Guidelines from National and international health organizations were provided. Interactive sessions with chronic diabetic patients were also arranged.

RESULTS

Table 1: Socio Demographic characteristics of study participants (N=150)

Variables		N (%)
Mean Age (in years)		**20.72 ± 1.54 years**
Gender	Male	67(44.7)
	Female	83(55.3)
Religion	Hindu	120(80.0)
	Muslim	15(10.0)
	Christian & others	15(10.0)
Modified BG Prasad Classification	Class I	111(74.0%)
	Class II	26(17.3%)
	Class III	13(8.7%)

Mean age among study population is found to be 20.72 ± 1.54 years, males and females were 67(44.7%) and 83(55.3%) respectively. . Majority were Hindu by religion 120(80.0%). Based on BG Prasad classification, 111(74.0%) belonged to Class I.

Table 2: Indian Diabetes Risk Score among study participants (N=150)

Risk score	Female	Male	Total = 150 (N%)
Low	56	51	107 (71.3%)
Moderate	26	16	42(28.0%)
High	1	0	1(0.7%)

The above table shows risk score among participants, 107 (71.3%) had low risk, 42(28.0%) had moderate risk and high risk was reported in only 1(0.7%) participant.

Table 3: Anthropometry among participants (N=150)

Variables		Female	Male	Total =150 N(%)
BMI	Underweight	17(20.5%)	4(6.0%)	21(14.0%)
	Normal	30(36.1)	28(41.8%)	58(38.7%)
	Overweight	17(20.5%)	17(20.5%)	34(22.7%)
	Obese	19 (22.9%)	18(26.9%)	37(24.6%)
WHR	Normal	31(37.3%)	42(62.7%)	73(48.7%)
	Abnormal	52(62.7%)	25(37.3%)	77(51.3%)

The above table shows anthropometry observations of BMI and WHR. In BMI, 21(14.0%) were underweight, 58(38.7%) were normal and 71(47.3%) had increased BMI; whereas 77(51.3%) had abnormal WHR.

Table 4 : Association of diabetes risk with participants' characteristics (N=150)

Variables		Low risk	Mod to high risk	Total = 150 N(%)	P value
Family H/o of DM	Present	45(55.6 %)	36(44.4 %)	81(55.0%)	0.00*
	Absent	62(89.9 %)	7(10.1%)	69(45.0%)	
BMI	≤ 24.9	61(77.2 %)	18(22.3 %)	79(52.7%)	0.02**
	≥ 24.9	46(64.8 %)	25(35.2 %)	71(47.3%)	
WHR	Normal	65(89.1 %)	8(10.9%)	73(48.7%)	0.00*
	Abnormal	42(54.5 %)	35(45.5 %)	77(51.3%)	
Physical activity	No/mild	68(62.9 %)	40(37.1 %)	108(72.0 %)	0.00*
	Mod to vigorous	39(92.9 %)	3(7.1%)	42(28.0%)	

Note: *Mann Whitney U test, **Student t test, p value of <0.05 considered as statistically significant

Table 4 shows association of risk of diabetes with characteristics of study participants, where all the factors like Family H/o of DM, BMI, WHR and Physical activity were found to statistically significant.

Table 5: Structured Combined Intervention among Moderate- to High risk participants

Variables	Pre-intervention	Post-intervention	p-value
High calorie/Processed food (per week)	6.81 ± 2.03	2.09 ± 1.37	0.025*
Protein/Fibre rich foods (per week)	2.77 ± 1.98	5.19 ± 1.59	< 0.01*
Physical activity (minutes/day)	18.01 ± 1.11	55 ± 3.75	0.01*
Body Mass Index	24.65 ± 4.33	21.58 ± 3.75	0.03*
WHR	0.98 ± 0.94	0.91 ± 0.88	< 0.01*
Sleep (Hours/day)	5.09 ± 1.37	7.15 ± 1.59	< 0.01*
Note: *Paired t test, p-value <0.05 is considered to be statistically significant			

The frequency of intake related to high calorie & processed food decreased from 6.81 ± 2.03 to 2.09 ± 1.37 per week after intervention. Consumption of protein & fibre rich foods increased from 2.77 ± 1.98 to 5.19 ± 1.59 per week . The mean physical activity period of study subjects increased from 18.01 ± 1.11 to 55 ± 3.75 min per day. The average BMI which was 24.65 ± 4.33 before intervention reduced to 21.58 ± 3.75. The WHR of study subjects also decreased notably from 0.98 ± 0.94 to 0.91 ± 0.88. The duration of sleep was also markedly enhanced from average 5.09 ± 1.37 to 7.15 ± 1.03

hours per day. The application of Motivational Interview Techniques resulted in remarkable improvements across all study parameters**.**

DISCUSSION

Our study findings had low risk 71.3%) and moderate to high risk in 28.7% these study findings almost correlates with study done by Mongjam et al which reports low risk in 77% and moderate to high risk 23%. 8 Also, studies by Gopala Krishnan et al (1.9%) and Bhatia et al (1%) also reveals similar results in high risk group.9,4

Mongjam study revealed BMI < 23 in 54.1% and BMI > 23 in 45.9% which almost corresponds to our study reports which was 52.7% and 47.3% respectively. 7 48.7% had normal and 51.3% had increased Waist-Hip ratio reported in this study. On contrary a study by Tejaswini among medical students also had 62.5% normal and 37.5% had abnormal WHR.20 Another study by Komal quotes 28% and 72% had low and moderate to high risk WHR among the study participants.2

The current study shows significant association between, Body Mass Index, Family History, Physical activity and IDR Score, which coincides to the studies done by Gopalakrishnan et al and Chowdry et al.9, 6

In the current study, post intervention including intake of healthy (fruits,vegetables) & unhealthy (fat rich) foods, physical activity, BMI, WHR and sleep was found to be statistically significant which coincides with study by Anjela et al which also reports similar findings with respect to healthy and unhealthy diet and physical activity.16 Another study by Greaves also mentioned post interventional changes in achieving weight loss(BMI), reduction in waist circumference and increase in physical activity minutes which correlates with our study. 10 Another study by Mahadevan focused on sleep abnormalities and diabetes risk also showed significant association with metabolism as well.17

CONCLUSION

This current study the application of Indian Diabetes Risk Score to identify undiagnosed and at risk diabetic subjects among medical undergraduates. We found out that, 107 (71.3%) had low risk, 42(28.0%) had moderate risk and high risk was reported in only 1(0.7%) participant. There was a statistically significant association between Family H/o of DM, BMI, WHR and Physical activity with that of the risk score. 43(28.7%) Participants belonging to moderate to high risk score underwent Structured Combined Intervention along with motivational interview technique for 4 months. This method focused to achieve lifestyle changes among the risk group. Post intervention appreciable results were noticed and all the parameter were also found to be significant statistically.

Strengths

Promoting awareness and education on diabetes risk at an early age will motivate the young generation to adopt healthy life style involving healthy diet, physical activity and sleep pattern.

Limitations

This study was conducted in a small group and short time period, thus results cannot be generalized. To bring desired healthy life style modification and sustained behavioral change life long, extended or prolonged monitoring is required.

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